Spark Save到表和HDFS路径的性能对比

Spark version	Hadoop version	Hive version
3.3.2	3.3.0	3.1.3

前言

看到一篇文章说Spark写Hive慢，可以直接写道HDFS中，比较快。我不确定他的Spark版本，但是为了验证的这个说法，我决定测试一下。

我计划编写两个Spark APP来分别使用DataFrame.insertInto(tableName: String)和DataFrame.save(path: String)方法实现对同一张表的写入，写入数量都是100w条，各写10次，来测试这两个API的性能差异，同时抓包分析。

性能测试

APP源码

```
import com.wbx.entity.CallHistory
import com.wbx.utils.CallHistoryFactory
import org.apache.spark.SparkConf
import org.apache.spark.sql.types._
import org.apache.spark.sql.{DataFrame, Row, SaveMode, SparkSession}

import java.util

object SparkWriteHiveOrc {

  def main(args: Array[String]): Unit = {
    //spark设置
    System.setProperty("HADOOP_USER_NAME", "root")
    val conf = new SparkConf().setAppName("SparkWriteHiveOrc").setMaster("local[1]")
    val spark = SparkSession.builder().config(conf).enableHiveSupport().getOrCreate()
    //创建100w条数据
    val list : util.ArrayList[Row] = new util.ArrayList[Row]()
    for (_ <- 1 to 1000000) {
      list.add(converter(CallHistoryFactory.build()))
    }
```

```scala
22        //创建test.call_history_orc表
23        val df: DataFrame = spark.createDataFrame(list, callHistorySchema())
24        val sql = "CREATE TABLE IF NOT EXISTS test.call_history_orc (" +
25          "impi_from STRING," +
26          "impi_to STRING," +
27          "call_time BIGINT," +
28          "call_duration INT," +
29          "impi_from_location STRING)" +
30          "USING orc"
31        spark.sql(sql)
32        //写入
33        val startTime = System.currentTimeMillis()
34        df.write.mode(SaveMode.Append).format("orc").insertInto("test.call_history_orc")
35        //另一个程序只有这一行不一样，就是将API替换一下，直接传表的HDFS地址
36        //df.write.mode(SaveMode.Append).format("orc").save("hdfs://192.168.137.104:9000/user/hive/warehouse/test.db/call_history_orc")
37        val endTime = System.currentTimeMillis()
38        System.out.println("执行时间为：" + (endTime - startTime) + "ms")
39      }
40
41      private def converter(callHistory: CallHistory): Row = {
42        val impiFrom = callHistory.getImpiFrom()
43        val impiTo = callHistory.getImpiTo
44        val callTime = callHistory.getCallTime
45        val callDuration = callHistory.getCallDuration
46        val impiFromLocation = callHistory.getImpiFromLocation
47        Row(impiFrom, impiTo, callTime, callDuration, impiFromLocation)
48      }
49
50      def callHistorySchema(): StructType = {
51        StructType(Array(StructField("impi_from", StringType),
52          StructField("impi_to", StringType),
53          StructField("call_time", LongType),
54          StructField("call_duration", IntegerType),
55          StructField("impi_from_location", StringType)))
56      }
57    }
```

时间结果

DataFrame.save(path: String)方法：

在不同的session中执行10次

该方法平均执行时间为：6685 ms

在同一个session中执行10次

该方法平均执行时间为：4148.8 ms

DataFrame.insertInto(tableName: String)方法：

在不同的session中执行10次

该方法平均执行时间为：7258.8 ms

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在同一个session中执行10次

该方法平均执行时间为：4317.8 ms

createTempView + .sql(insert into select * from viewName)方法：

在不同的session中执行10次

该方法平均执行时间为：6860 ms

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在同一个session中执行10次

该方法平均执行时间为：4365.5 ms

抓包对比

只记录APP发的请求

save(path: String)	insertInto(tableName: String)	createTempView(viewName: String) .sql(insert into select * from viewName)
执行时间为：127112ms	执行时间为：132511ms	执行时间为：132233ms
9083	9083	9083
CALL set_ugi	CALL set_ugi	CALL set_ugi
CALL get_database default	CALL get_database default	CALL get_database default
CALL get_table test.call_history_orc	CALL get_table test.call_history_orc	CALL get_table test.call_history_orc
	CALL get_database global_temp	CALL get_database global_temp
	CALL get_database test	CALL get_database test
	CALL get_table test.call_history_orc	CALL get_table test.call_history_orc
9000	9000	9000

	getFileInfo /user/hive/warehouse/test.db/call_history_orc	getFileInfo /user/hive/warehouse/test.db/call_history_orc
	getFileInfo /user/hive/warehouse/test.db/call_history_orc/_spark_metadata	getFileInfo /user/hive/warehouse/test.db/call_history_orc/_spark_metadata
	getListing /user/hive/warehouse/test.db/call_history_orc	getListing /user/hive/warehouse/test.db/call_history_orc
mkdirs /user/hive/warehouse/test.db/call_history_orc/_temporary/	mkdirs /user/hive/warehouse/test.db/call_history_orc/_temporary/	mkdirs /user/hive/warehouse/test.db/call_history_orc/_temporary/
create /user/hive/warehouse/test.db/call_history_orc/_temporary/0/_temporary/attempt_202310121703225018414972358688901_0000_m_000000_0/part-00000-ad3face5-1c4c-4c22-a802-86e714baf7bc-c000.snappy.orc	create /user/hive/warehouse/test.db/call_history_orc/_temporary/0/_temporary/attempt_2023101216052373109625323 0854165_0000_m_000000_0/part-00000-4af679a0-3ef8-412e-9e76-010664abbb1d-c000.snappy.orc	create /test.db/call_history_orc/_temporary/0/_temporary/attempt_2023101217032250184149723586889 01_0000_m_000000_0/part-00000-ad3face5-1c4c-4c22-a802-86e714baf7bc-c000.snappy.orc
addBlock	addBlock	addBlock
getServerDefaults	getServerDefaults	getServerDefaults
9866	9866	9866
发送创建文件信息	发送创建文件信息	发送创建文件信息
发送数据	发送数据	发送数据
发送结束	发送结束	发送结束
9000	9000	9000
complete user/hive/warehouse/test.db/call_history_orc/_temporary/0/_temporary/attempt_202310121703225018414972358688901_0000_m_000000_0/part-00000-ad3face5-1c4c-4c22-a802-86e714baf7bc-c000.snappy.orc	complete /user/hive/warehouse/test.db/call_history_orc/_temporary/0/_temporary/attempt_2023101216052373109625323 0854165_0000_m_000000_0/part-00000-4af679a0-3ef8-412e-9e76-010664abbb1d-c000.snappy.orc	complete /user/hive/warehouse/test.db/call_history_orc/_temporary/0/_temporary/attempt_20231015152812710786554768966568_0000_m_000000_0/part-00000-f9cb2084-3a5f-4627-b464-98e3a57824a6-c000.snappy.orc
getFileInfo /user/hive/warehouse/test.	getFileInfo /user/hive/warehouse/test.	getFileInfo. /user/hive/warehouse/test.

db/call_history_orc/_tempo rary/0/_temporary/attempt _202310121703225018414 972358688901_0000_m_0 00000_0/part–00000– ad3face5–1c4c–4c22– a802–86e714baf7bc– c000.snappy.orc	db/call_history_orc/_tempor ary/0/_temporary/attempt_ 20231012160523731096253 230854165_0000_m_0000 00_0/part–00000– 4af679a0–3ef8–412e– 9e76–010664abbb1d– c000.snappy.orc	db/call_history_orc/_tempo rary/0/_temporary/attempt _202310151528127107865 54768966568_0000_m_00 0000_0/part–00000– f9cb2084–3a5f–4627– b464–98e3a57824a6– c000.snappy.orc
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getFileInfo o/user/hive/warehouse/tes t.db/call_history_orc/_temp orary/0/task_20231012170 3225018414497235868890 1_0000_m_000000	getFileInfo /user/hive/warehouse/test. db/call_history_orc/_tempor ary/0/task_2023101216052 3731096253230854165_00 00_m_000000	getFileInfo n/user/hive/warehouse/tes t.db/call_history_orc/_temp orary/0/task_20231015152 8127107865547689665 68_ 0000_m_000000
rename /user/hive/warehouse/test. db/call_history_orc/_tempo rary/0/_temporary/attempt _202310121703225018414 972358688901_0000_m_0 00000_0 /user/hive/warehouse/test. db/call_history_orc/_tempo rary/0/task_202310121703 22501841497235868890 1_ 0000_m_000000	rename /user/hive/warehouse/test. db/call_history_orc/_tempor ary/0/_temporary/attempt_ 20231012160523731096253 230854165_0000_m_0000 00_0 /user/hive/warehouse/test. db/call_history_orc/_tempor ary/0/task_2023101216052 3731096253230854165_00 00_m_000000	rename /user/hive/warehouse/test. db/call_history_orc/_tempo rary/0/_temporary/attempt _202310151528127107865 54768966568_0000_m_00 0000_0 /user/hive/warehouse/test. db/call_history_orc/_tempo rary/0/task_202310151528 12710786554768966568_0 000_m_000000
getListing /user/hive/warehouse/test. db/call_history_orc/_tempo rary/0	getListing /user/hive/warehouse/test. db/call_history_orc/_tempor ary/0	getListing /user/hive/warehouse/test. db/call_history_orc/_tempo rary/0
getFileInfo /user/hive/warehouse/test.	getFileInfo /user/hive/warehouse/test.	getFileInfo /user/hive/warehouse/test.

/user/hive/warehouse/test.db/call_history_orc	/user/hive/warehouse/test.db/call_history_orc	/user/hive/warehouse/test.db/call_history_orc
getListing /user/hive/warehouse/test.db/call_history_orc/_temporary/0/task_20231012170322501841497235 8688901_0000_m_000000	getListing /user/hive/warehouse/test.db/call_history_orc/_temporary/0/task_202310121605237310962532 30854165_0000_m_000000	getListing /user/hive/warehouse/test.db/call_history_orc/_temporary/0/task_202310151528127107865547 68966568_0000_m_000000
getFileInfo /user/hive/warehouse/test.db/call_history_orc/part–00000–ad3face5–1c4c–4c22–a802–86e714baf7bc–c000.snappy.orc	getFileInfo /user/hive/warehouse/test.db/call_history_orc/part–00000–4af679a0–3ef8–412e–9e76–010664abbb1d–c000.snappy.orc	getFileInfo /user/hive/warehouse/test.db/call_history_orc/part–00000–f9cb2084–3a5f–4627–b464–98e3a57824a6–c000.snappy.orc
rename /user/hive/warehouse/test.db/call_history_orc/_temporary/0/task_20231012170322501841497235 8688901_0000_m_000000/part–00000–ad3face5–1c4c–4c22–a802–86e714baf7bc–c000.snappy.orc /user/hive/warehouse/test.db/call_history_orc/part–00000–ad3face5–1c4c–4c22–a802–86e714baf7bc–c000.snappy.orc	rename /user/hive/warehouse/test.db/call_history_orc/_temporary/0/task_202310121605237310962532 30854165_0000_m_000000/part–00000–4af679a0–3ef8–412e–9e76–010664abbb1d–c000.snappy.orc /user/hive/warehouse/test.db/call_history_orc/part–00000–4af679a0–3ef8–412e–9e76–010664abbb1d–c000.snappy.orc	rename /user/hive/warehouse/test.db/call_history_orc/_temporary/0/task_202310151528127107865547 68966568_0000_m_000000/part–00000–f9cb2084–3a5f–4627–b464–98e3a57824a6–c000.snappy.orc /user/hive/warehouse/test.db/call_history_orc/part–00000–f9cb2084–3a5f–4627–b464–98e3a57824a6–c000.snappy.orc
delete /user/hive/warehouse/test.db/call_history_orc/_temporary	delete /user/hive/warehouse/test.db/call_history_orc/_temporary	delete /user/hive/warehouse/test.db/call_history_orc/_temporary
create /user/hive/warehouse/test.db/call_history_orc/_SUCCESS	create /user/hive/warehouse/test.db/call_history_orc/_SUCCESS	create /user/hive/warehouse/test.db/call_history_orc/_SUCCESS
complete 6/user/hive/warehouse/test.db/call_history_orc/_SUCCESS	complete /user/hive/warehouse/test.db/call_history_orc/_SUCCESS	complete /user/hive/warehouse/test.db/call_history_orc/_SUCCESS
delete a/user/hive/warehouse/test.db/call_history_orc/.spark	delete /user/hive/warehouse/test.db/call_history_orc/.spark–	delete a/user/hive/warehouse/test.db/call_history_orc/.spark

–staging–ad3face5–1c4c–4c22–a802–86e714baf7bc	staging–4af679a0–3ef8–412e–9e76–010664abbb1d	–staging–f9cb2084–3a5f–4627–b464–98e3a57824a6
	getListing /user/hive/warehouse/test.db/call_history_orc	getListing /user/hive/warehouse/test.db/call_history_orc

总结

从请求次数来看：

- DataFrame.save(path: String)方法：共26次请求

- DataFrame.insertInto(tableName: String)方法：共33次请求

- createTempView + sql(insert into select * from viewName)方法：共33次请求与insertInto完全一样

从时间来看：

三个方法的运行时间基本一样，对于离线任务来说并无明显区别。

save(path: String)方法在请求次数上少了7次，剩下的26次请求与insertInto方法中一致，因此会有一定的时间优势，但是在不知道表对应的HDFS path的场景无法使用。

createTempView方法创建了一个临时表，内存再用更大，请求流程与insertInto方法完全一致，因此在不需要临时表的场景尽量使用save方法或insertInto。