Apache Spark: Explode Function

BigDataEnthusiast Follow 6 min read · Aug 15, 2023

Apache Spark built-in function that takes input as an column object (array or map type) and returns a new row for each element in the given array or map type column. Refer official documentation here.

Explode

Here is the example of `explode` function.

```
package com

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

```
import org.apache.spark.sql.functions._

object InvokeCode extends App {

  val spark: SparkSession = SparkSession
    .builder()
    .master("local[1]")
    .appName("learn")
    .getOrCreate()

  val sc = spark.sparkContext
  sc.setLogLevel("OFF")

  import spark.implicits._

  val df = List(
    ("1", "A", List("1654123", "2654122", "3654121")),
    ("2", "B", List("1254123", "2354122", "3454121")),
    ("3", "C", List()),
    ("4", "D", null)
  ).toDF("id", "name", "phone_details")

  df.show(false)
  df.printSchema()

  val df_exploded =
    df.withColumn("phone_details_exploded", explode($"phone_details"))

  df_exploded.show(false)
  df_exploded.printSchema()
}
```

```
Input Dataframe: df

+---+----+---------------------------+
|id |name|phone_details              |
+---+----+---------------------------+
|1  |A   |[1654123, 2654122, 3654121]|
|2  |B   |[1254123, 2354122, 3454121]|
|3  |C   |[]                         |
```

```
|4  |D   |null                        |
+---+----+----------------------------+

Output Dataframe: df_exploded

+---+----+----------------------------+----------------------+
|id |name|phone_details               |phone_details_exploded|
+---+----+----------------------------+----------------------+
|1  |A   |[1654123, 2654122, 3654121]|1654123               |
|1  |A   |[1654123, 2654122, 3654121]|2654122               |
|1  |A   |[1654123, 2654122, 3654121]|3654121               |
|2  |B   |[1254123, 2354122, 3454121]|1254123               |
|2  |B   |[1254123, 2354122, 3454121]|2354122               |
|2  |B   |[1254123, 2354122, 3454121]|3454121               |
+---+----+----------------------------+----------------------+
```

If you have noticed here, exploded doesn't include empty list/null values. To include these null values we have to use `explode_outer` function.

```
val df_exploded =
  df.withColumn("phone_details_exploded", explode_outer($"phone_details"))

df_exploded.show(false)
```

```
Output Dataframe: df_exploded using explode_outer

+---+----+----------------------------+----------------------+
|id |name|phone_details               |phone_details_exploded|
+---+----+----------------------------+----------------------+
|1  |A   |[1654123, 2654122, 3654121]|1654123               |
|1  |A   |[1654123, 2654122, 3654121]|2654122               |
|1  |A   |[1654123, 2654122, 3654121]|3654121               |
|2  |B   |[1254123, 2354122, 3454121]|1254123               |
|2  |B   |[1254123, 2354122, 3454121]|2354122               |
|2  |B   |[1254123, 2354122, 3454121]|3454121               |
|3  |C   |[]                          |null                  |
|4  |D   |null                        |null                  |
```

```
+---+----+---------------------------+----------------------+
```

Let’s explode if we have array of objects instead array of strings/integers.

Explode — Array of Struct

In this example we will explore array of struct.

```
package com

import org.apache.spark.sql.{Row, SparkSession}
import org.apache.spark.sql.functions.explode
import org.apache.spark.sql.types._

object InvokeCode extends App {

  val spark: SparkSession = SparkSession
    .builder()
    .master("local[1]")
    .appName("learn")
    .getOrCreate()

  val sc = spark.sparkContext
  sc.setLogLevel("OFF")

  import spark.implicits._

  val dataSchema = new StructType()
    .add("name", StringType)
    .add("id", StringType)
    .add(
      "phone_details",
      ArrayType(
        new StructType()
```

```
            .add("phone_type", StringType)
            .add("number", StringType)
            .add("primary", BooleanType)
        )
      )

    val data = List(
      Row(
        "1",
        "A",
        List(Row("home", "+1 1254", true), Row("office", "+1 12345", false))
      ),
      Row(
        "2",
        "B",
        List(Row("home", "+1 1254", false), Row("office", "+1 12345", true))
      ),
      Row(
        "3",
        "C",
        List(Row("home", "+1 1254", true), Row("office", "+1 12345", false))
      ),
      Row("4", "D", List()),
      Row("5", "D", null)
    )
    val rdd = spark.sparkContext.parallelize(data)
    val df = spark.createDataFrame(rdd, dataSchema)

    df.show(false)
    df.printSchema()

    val df_exploded =
      df.withColumn("phone_details_exploded", explode($"phone_details"))

    df_exploded.show(false)
    df_exploded.printSchema()
```

```
Input Dataframe: df
+----+---+-----------------------------------------------------+
```

```
|name|id |phone_details                                          |
+----+---+-------------------------------------------------------+
|1   |A  |[[home, +1 1254, true], [office, +1 12345, false]]|
|2   |B  |[[home, +1 1254, false], [office, +1 12345, true]]|
|3   |C  |[[home, +1 1254, true], [office, +1 12345, false]]|
|4   |D  |[]                                                     |
|5   |D  |null                                                   |
+----+---+-------------------------------------------------------+

Output Dataframe: df_exploded
+----+---+-------------------------------------------------------+---------------
|name|id |phone_details                                          |phone_details_e
+----+---+-------------------------------------------------------+---------------
|1   |A  |[[home, +1 1254, true], [office, +1 12345, false]]|[home, +1 1254,
|1   |A  |[[home, +1 1254, true], [office, +1 12345, false]]|[office, +1 123
|2   |B  |[[home, +1 1254, false], [office, +1 12345, true]]|[home, +1 1254,
|2   |B  |[[home, +1 1254, false], [office, +1 12345, true]]|[office, +1 123
|3   |C  |[[home, +1 1254, true], [office, +1 12345, false]]|[home, +1 1254,
|3   |C  |[[home, +1 1254, true], [office, +1 12345, false]]|[office, +1 123
+----+---+-------------------------------------------------------+---------------
```

```
Input Dataframe Schema:

root
 |-- name: string (nullable = true)
 |-- id: string (nullable = true)
 |-- phone_details: array (nullable = true)
 |    |-- element: struct (containsNull = true)
 |    |    |-- phone_type: string (nullable = true)
 |    |    |-- number: string (nullable = true)
 |    |    |-- primary: boolean (nullable = true)

Output Dataframe Schema:
root
 |-- name: string (nullable = true)
 |-- id: string (nullable = true)
 |-- phone_details: array (nullable = true)
 |    |-- element: struct (containsNull = true)
 |    |    |-- phone_type: string (nullable = true)
 |    |    |-- number: string (nullable = true)
 |    |    |-- primary: boolean (nullable = true)
 |-- phone_details_exploded: struct (nullable = true)
 |    |-- phone_type: string (nullable = true)
 |    |-- number: string (nullable = true)
 |    |-- primary: boolean (nullable = true)
```

Notice in the above schema comparison, how the array of struct converted to struct after explode.

Elegant way to select all columns from `struct` see below example.

```
val df_exploded =
    df.withColumn("phone_details_exploded", explode($"phone_details"))

df_exploded
    .select("id", "name", "phone_details_exploded.*")
    .show(false)
```

```
+---+----+----------+--------+-------+
|id |name|phone_type|number  |primary|
+---+----+----------+--------+-------+
|A  |1   |home      |+1 1254 |true   |
|A  |1   |office    |+1 12345|false  |
|B  |2   |home      |+1 1254 |false  |
|B  |2   |office    |+1 12345|true   |
|C  |3   |home      |+1 1254 |true   |
|C  |3   |office    |+1 12345|false  |
+---+----+----------+--------+-------+
```

Other way of selecting columns by explicitly giving column names from struct.

```
df_exploded
    .select(
      "id",
      "phone_details_exploded.phone_type",
      "phone_details_exploded.number"
    )
    .show(false)
```

Explode Multiple Columns

Suppose we want to explode multiple columns: If we go with one by one approach for exploding multiple columns, it can create bunch of redundant data. We can do first `zip` columns & then explode. See below example.

```
package com

import org.apache.spark.sql.{Row, SparkSession}
import org.apache.spark.sql.functions.{explode, arrays_zip}
import org.apache.spark.sql.types._

object InvokeCode extends App {

  val spark: SparkSession = SparkSession
    .builder()
    .master("local[1]")
    .appName("learn")
    .getOrCreate()

  val sc = spark.sparkContext
  sc.setLogLevel("OFF")

  import spark.implicits._

  val dataSchema = new StructType()
    .add("name", StringType)
    .add("id", StringType)
```

```
      .add(
        "phone_details",
        ArrayType(
          new StructType()
            .add("phone_type", StringType)
            .add("number", StringType)
            .add("primary", BooleanType)
        )
      )
      .add(
        "address_details",
        ArrayType(
          new StructType()
            .add("address_type", StringType)
            .add("address", StringType)
            .add("primary", BooleanType)
        )
      )

    val data = List(
      Row(
        "1",
        "A",
        List(
          Row("home", "+1 1254", true),
          Row("home", "+1 1233", false),
          Row("office", "+1 12345", false)
        ),
        List(Row("home", "XYZ Lane", true), Row("office", "YZ CITY", false))
      ),
      Row(
        "2",
        "B",
        List(Row("home", "+1 1254", false), Row("office", "+1 12345", true)),
        List(Row("home", "ADC Lane", true), Row("office", "AYZ CITY", false))
      ),
      Row(
        "3",
        "C",
        List(Row("home", "+1 1254", true), Row("office", "+1 12345", false)),
        List(Row("home", "XSD Lane", true), Row("office", "XS CITY", false))
```

```
      ),
      Row("4", "D", List(), null),
      Row("5", "D", null, List())
    )
    val rdd = spark.sparkContext.parallelize(data)
    val df = spark.createDataFrame(rdd, dataSchema)

    df.show(false)
    df.printSchema()

    val df_exploded = df
      .withColumn(
        "zip_col",
        explode(arrays_zip($"phone_details", $"address_details"))
      )
      .drop("phone_details", "address_details")
      .select("id", "name", "zip_col.*")

    df_exploded.printSchema()

    df_exploded.show(false)
```

```
Input Dataframe:
+----+---+----------------------------------------------------------------
|name|id |phone_details
+----+---+----------------------------------------------------------------
|1   |A  |[[home, +1 1254, true], [home, +1 1233, false], [office, +1 12345,
|2   |B  |[[home, +1 1254, false], [office, +1 12345, true]]
|3   |C  |[[home, +1 1254, true], [office, +1 12345, false]]
|4   |D  |[]
|5   |D  |null
+----+---+----------------------------------------------------------------

root
 |-- name: string (nullable = true)
 |-- id: string (nullable = true)
 |-- phone_details: array (nullable = true)
 |    |-- element: struct (containsNull = true)
 |    |    |-- phone_type: string (nullable = true)
 |    |    |-- number: string (nullable = true)
 |    |    |-- primary: boolean (nullable = true)
 |-- address_details: array (nullable = true)
```

```
 |    |-- element: struct (containsNull = true)
 |    |    |-- address_type: string (nullable = true)
 |    |    |-- address: string (nullable = true)
 |    |    |-- primary: boolean (nullable = true)

Output Dataframe:

+---+----+------------------------+------------------------+
|id |name|phone_details           |address_details         |
+---+----+------------------------+------------------------+
|A  |1   |[home, +1 1254, true]   |[home, XYZ Lane, true]  |
|A  |1   |[home, +1 1233, false]  |[office, YZ CITY, false] |
|A  |1   |[office, +1 12345, false]|null                    |
|B  |2   |[home, +1 1254, false]  |[home, ADC Lane, true]  |
|B  |2   |[office, +1 12345, true] |[office, AYZ CITY, false]|
|C  |3   |[home, +1 1254, true]   |[home, XSD Lane, true]  |
|C  |3   |[office, +1 12345, false]|[office, XS CITY, false] |
+---+----+------------------------+------------------------+

root
 |-- id: string (nullable = true)
 |-- name: string (nullable = true)
 |-- phone_details: struct (nullable = true)
 |    |-- phone_type: string (nullable = true)
 |    |-- number: string (nullable = true)
 |    |-- primary: boolean (nullable = true)
 |-- address_details: struct (nullable = true)
 |    |-- address_type: string (nullable = true)
 |    |-- address: string (nullable = true)
 |    |-- primary: boolean (nullable = true)
```

posexplode

Creates a new row for each element with position in the given array or map column. Uses the default column name `pos` for position, and `col` for elements in the array and `key` and `value` for elements in the map unless specified otherwise.

```
package com

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

```
import org.apache.spark.sql.functions._

object InvokeCode extends App {

  val spark: SparkSession = SparkSession
    .builder()
    .master("local[1]")
    .appName("learn")
    .getOrCreate()

  val sc = spark.sparkContext
  sc.setLogLevel("OFF")

  import spark.implicits._

  val df = List(
    ("1", "A", List("1654123", "2654122", "3654121")),
    ("2", "B", List("1254123", "2354122", "3454121")),
    ("3", "C", List()),
    ("4", "D", null)
  ).toDF("id", "name", "phone_details")

  df.show(false)
  df.select($"id",$"name", posexplode($"phone_details")).show(false)
}
```

```
Input Dataframe:
+---+----+---------------------------+
|id |name|phone_details              |
+---+----+---------------------------+
|1  |A   |[1654123, 2654122, 3654121]|
|2  |B   |[1254123, 2354122, 3454121]|
|3  |C   |[]                         |
|4  |D   |null                       |
+---+----+---------------------------+

Output Dataframe:
+---+----+---+-------+
|id |name|pos|col    |
+---+----+---+-------+
```

```
|1  |A   |0  |1654123|
|1  |A   |1  |2654122|
|1  |A   |2  |3654121|
|2  |B   |0  |1254123|
|2  |B   |1  |2354122|
|2  |B   |2  |3454121|
+---+----+---+-------+
```

If you are using `posexplode` in `withColumn` it might fail with this exception. Checkout this issue for more details: SPARK-20174

```
val df_exploded =
    df.withColumn("phone", posexplode($"phone_details"))

Exception in thread "main" org.apache.spark.sql.AnalysisException: The numbe
```

So better to use `posexplode` with `select` or `selectExpr`.

```
import spark.implicits._

val df = List(
  ("1", "A", List("1654123", "2654122", "3654121")),
  ("2", "B", List("1254123", "2354122", "3454121")),
  ("3", "C", List()),
  ("4", "D", null)
).toDF("id", "name", "phone_details")

df.selectExpr("*", "posexplode(phone_details) as (p,c)")
  .drop("phone_details")
  .show(false)
```

```
Output:

+---+----+---+-------+
|id |name|p  |c      |
+---+----+---+-------+
|1  |A   |0  |1654123|
|1  |A   |1  |2654122|
|1  |A   |2  |3654121|
|2  |B   |0  |1254123|
|2  |B   |1  |2354122|
|2  |B   |2  |3454121|
+---+----+---+-------+
```

Refer other blogs:

Apache Spark — createDataFrame

createDataFrame is an overloaded method present in SparkSession class (org.apache.spark.sql) and there are…

bigdataenthusiast.medium.com

Apache Spark — implicits Object (Implicits Conversions)

In the SparkSession class there is one object defined as implicits, which extends SQLImplicits abstract class. So once…

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References:

- https://spark.apache.org
- SPARK-20174

Apache Spark | Spark Scala Tutorial

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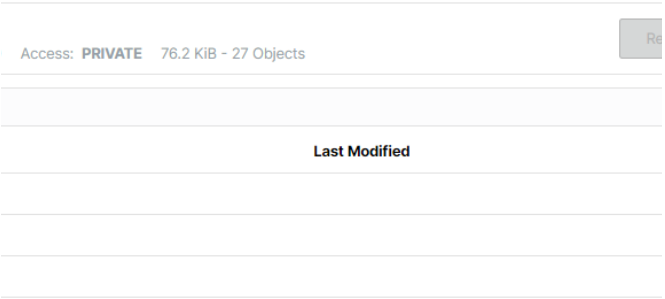

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Apache Iceberg—Hidden Partitioning

In this blog we will explore “Hidden Partitioning” concept in Apache Iceberg.

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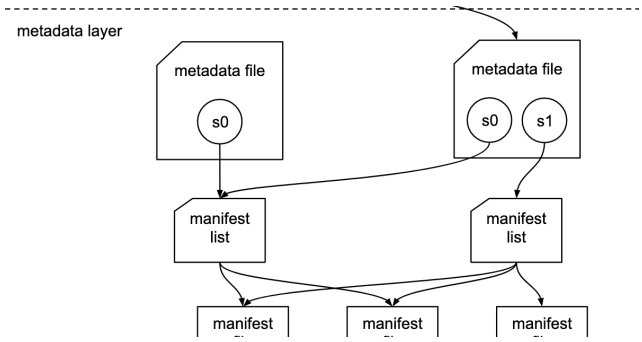

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Apache Iceberg Table Format Versions

In this blog we will explore mainly these things.

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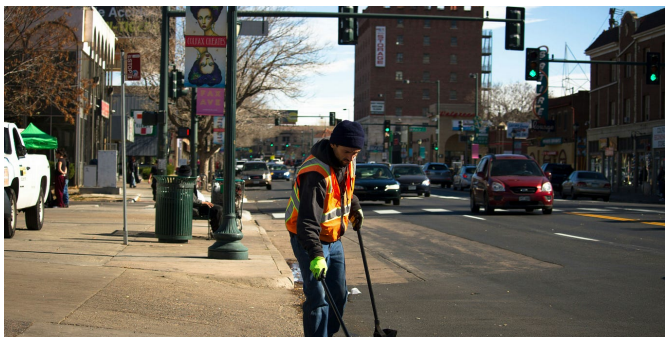

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Introduction

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Overwrite Entire Table	Small tables	Simple	Inefficient for large tables
Update Specific Partitions	Partitioned tables	Efficient for large tables	Limited to partition-level updates
Merge Using Delta Lake	Frequent updates, ACID compliance	Scalable, ACID-compliant	Requires Delta Lake
Use a Join to Update Records	Standard Spark tables	Flexible	Requires overwriting the entire table
Use a Temporary Table	Atomicity without Delta Lake	Ensures atomicity	Requires additional storage
SQL `UPDATE`	Delta Lake, SQL-based	Simple and	Requires Delta Lake

Sujatha Mudadla

Section 2: Data Processing—Updating Records in a Spark…

In data processing, Type 1 updates refer to overwriting existing records with new data…

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See more recommendations