

lack of a value) and columns have type information that must be consistent for every row in the collection. To Spark, DataFrames and Datasets represent immutable, lazily-evaluated plans that specify what operations to apply to data residing at a location to generate some output. When we perform an action on a DataFrame we instruct Spark to perform the actual transformations and return the result. These represent plans of how to manipulate rows and columns to compute the user's desired result. Let's go over rows and column to more precisely define those concepts.

note

Tables and views are basically the same thing as DataFrames. We just execute SQL against them instead of DataFrame code. We cover all of this in the Spark SQL Chapter later on in Part II of this book.

In order to do that, we should talk about schemas, the way we define the types of data we're storing in this distributed collection.

Schemas

A schema defines the column names and types of a DataFrame. Users can define schemas manually or users can read a schema from a data source (often called *schema on read*). Now that we know what defines DataFrames and Datasets and how they get their structure, via a Schema, let's see an overview of all of the types.

Overview of Structured Spark Types

Spark is effectively a programming language of its own. Internally, Spark uses an engine called Catalyst that maintains its own type information through the planning and processing of work. This may seem like overkill, but it doing so, this opens up a wide variety of execution optimizations that make significant differences. Spark types map directly to the different language APIs that Spark maintains and there exists a lookup table for each of these in each of Scala, Java, Python, SQL, and R. Even if we use Spark's Structured APIs from Python or R, the majority of our manipulations will operate strictly on Spark types, not Python types. For example, the below code does not perform addition in Scala or Python, it actually performs addition *purely in Spark*.

scala

```
val df = spark.range(500).toDF("number")
df.select(df.col("number") + 10)
// org.apache.spark.sql.DataFrame = [(number + 10): bigint]
```

python

```
df = spark.range(500).toDF("number")
df.select(df["number"] + 10)
# DataFrame[(number + 10): bigint]
```

Apache Spark The Definitive

RC Schank



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