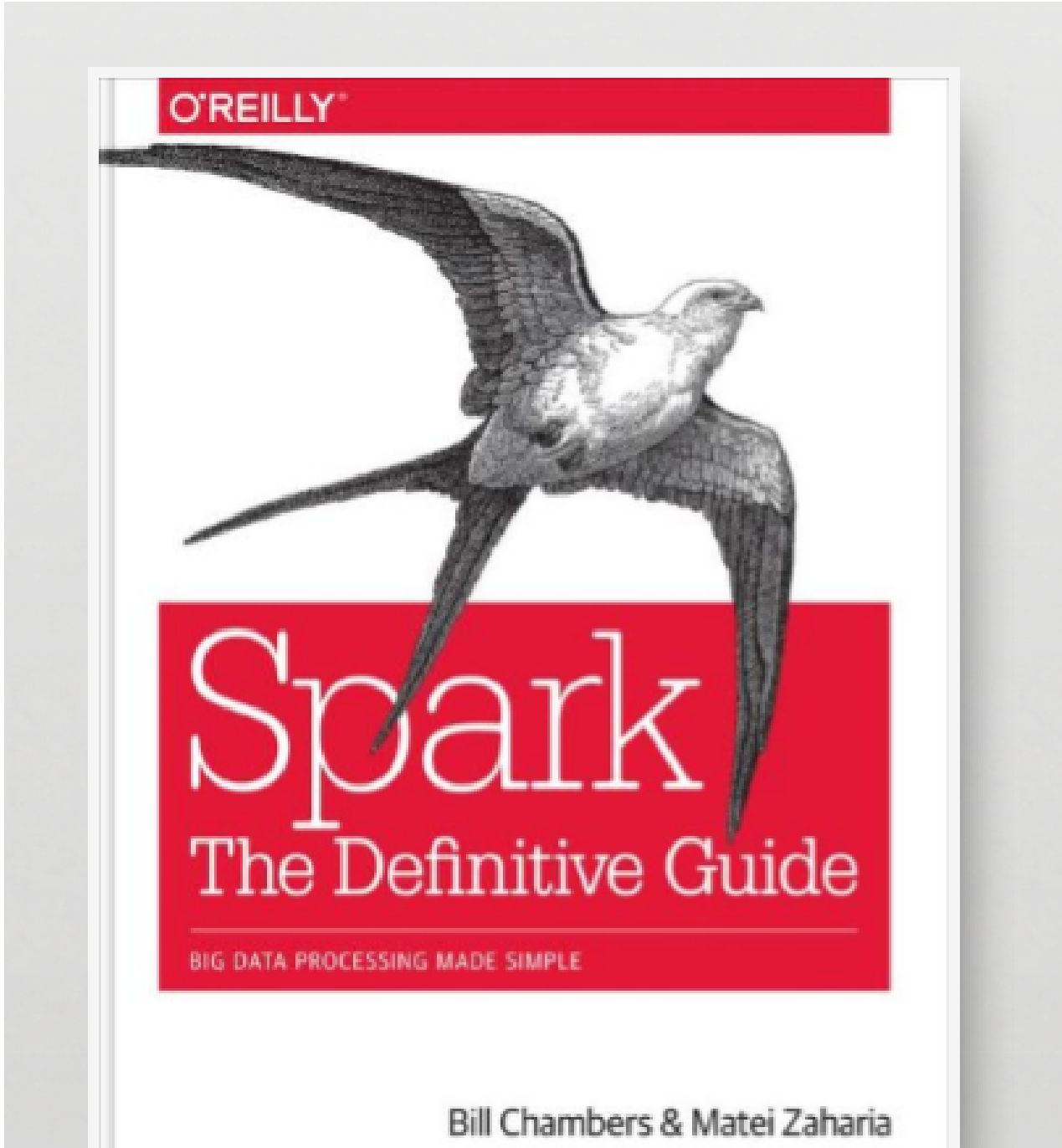
Spark the Definitive Guide 2nd Edition

Chapter 03

A Tour of Spark's Toolset

A Tour of Spark's Toolset

Text Book


O'REILLY
Spark
The Definitive Guide
BIG DATA PROCESSING MADE SIMPLE
Bill Chambers & Matei Zaharia

Objectives and Outcomes

- Take a tour of Spark's toolset
- Understand how to run production Spark applications
- Understand type-safe APIs for structured data
- Understand Structured Streaming and Machine Learning
- Understand SparkR and Resilient Distributed DataSets

Review

So far we have:

- learned about core architecture of Spark
  - learned about executors
  - learned about partitions
  - learned about drivers
- learned about datatypes
  - DataFrames
  - APIs
- learned about transformations
- learned about actions
- learned how to put it together from the Spark CLI

Spark Overview

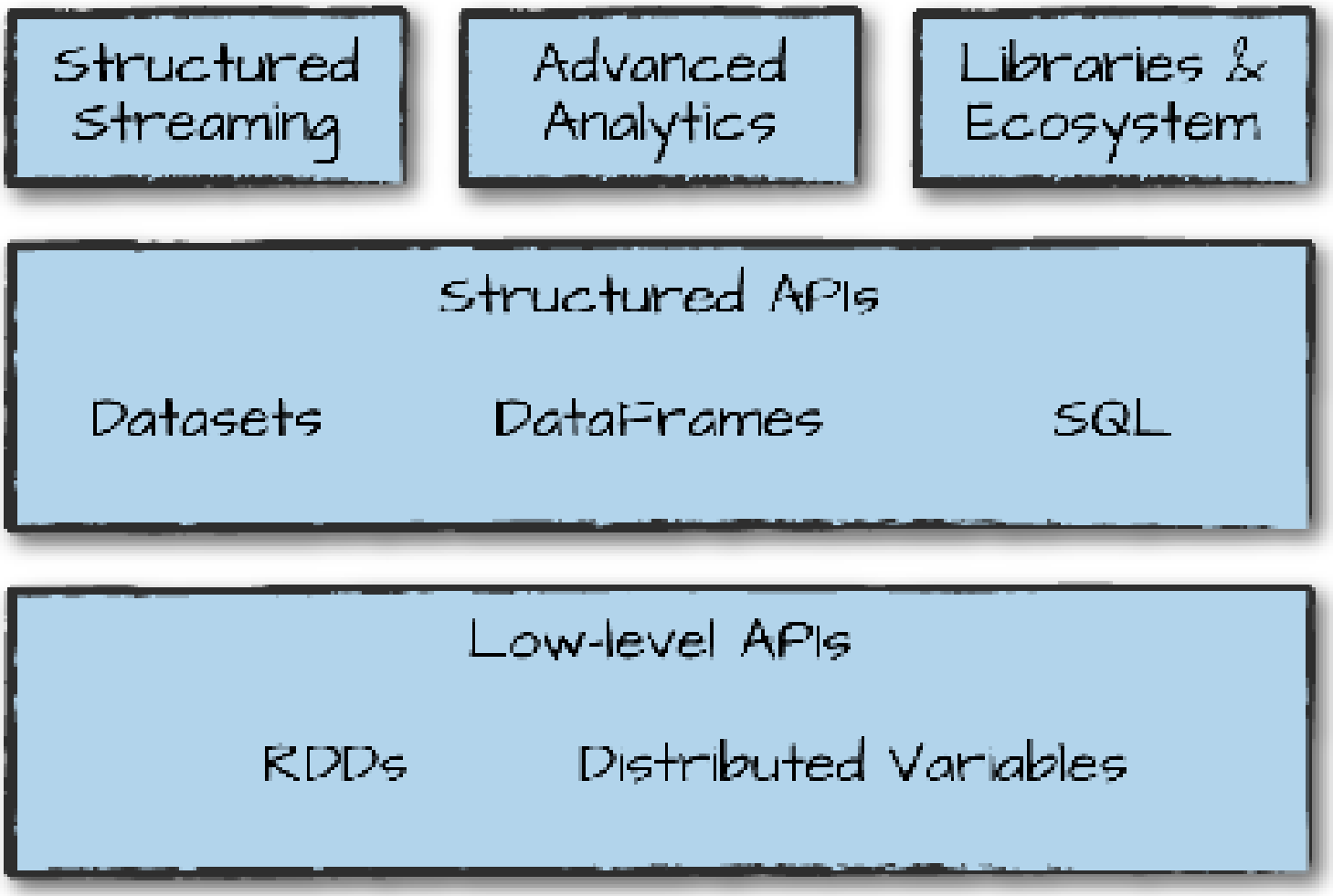


Figure 1-1. Spark's toolkit

Running Production Applications

- `spark-submit`
  - Different from the interactive shell commands we saw in chapter 02
  - `spark-submit` does one thing: send your code to a cluster for execution
  - Application will run until finished or reports and error
- Types of **cluster managers include**:
  - local system (as threads)
  - Mesos
  - YARN

Sample Code

- `spark-submit --class org.apache.spark.examples.SparkPi --master local examples/jars/spark-examples_2.11-2.4.4.jar 10`
  - The file name was changes since we are using version 2.4.4 not 2.2.0
  - The job can also be submitted to a cluster by changing the `--master local` to `--master yarn` or `--master mesos`

Type-Safe DataSets

- Spark uses multiple languages:
  - Scala, Java, Python, R, and SQL
  - Java and Scala are statically typed languages
  - Python and R are not statically typed, but dynamically typed
- How to handle type-safety?
  - Recall that DataFrames (chapter 2) are a distributed collection of objects of type **Row**
  - DataSet API allows you to assign a Java/Scala class to the records within a DataFrame
  - Manipulate that data like a Java ArrayList or Scale Seq
- DataSets can be used as needed
  - DataSets can be cast back into DataFrames
  - Allows for *casting* of data depending on your needs
  - Large applications logic will need/enforce type safety, but data analysis via SQL won't need type safety
  - DataSets Covered in depth in Chapter 11

Example code of DataSets 39

```
case class Flight(DEST_COUNTRY_NAME: String,
ORIGEN_COUNTRY_NAME: String, count: BigInt)
val flightsDF = spark.read
.parquet("/data/flight-data/
parquet/2010-summary.parquet/")
val flights = flightsDF.as[Flight]
```

Structured Streaming

- High-level API for stream processing
  - Added in Spark 2.2, 2017-07-11
- Structured Streaming takes batch mode operations and run them in a streaming fashion
- See page 40 to page 44 in the e-book or class video for demonstration

Machine Learning and Advanced Analytics

- Has a built in Spark Library called MLlib
- Allows for many options:
  - Preprocessing
  - Munging
  - training of models

k-Means clustering

- Using data loaded in the previous example we will:
  - ingest raw data
  - build up transformations
  - train our simple model to make predictions
- MLlib requires data to be represented as numerical data
  - Sample shopping data is of all different types
  - Need to use *transformations* to change the datatype
  - P. 45-48 in the e-book has the steps needed
  - Book has the steps needed to split our dataset into training and test sets

Lower-Level APIs

- RDDs - you should mostly stick to higher level APIs
- This section we will skip for now

SparkR and Other Packages

- Is a tool for running R on Spark
- Similar to the Python language but uses R syntax
  - Can import other Spark libraries to make programming more R-like
- https://spark-packages.org
  - Spark for dotNet
  - Work through the tutorial and see if you can get the results

Conclusion

- We learned Spark's programming model
- We learned how to run production code
- We were introduced to type-safe data structures in Spark
- We were introduced to Structured Streaming on Spark
- We were introduced to Machine Learning on Spark
- We were introduced to 3rd party Spark packages

Questions

- Questions?