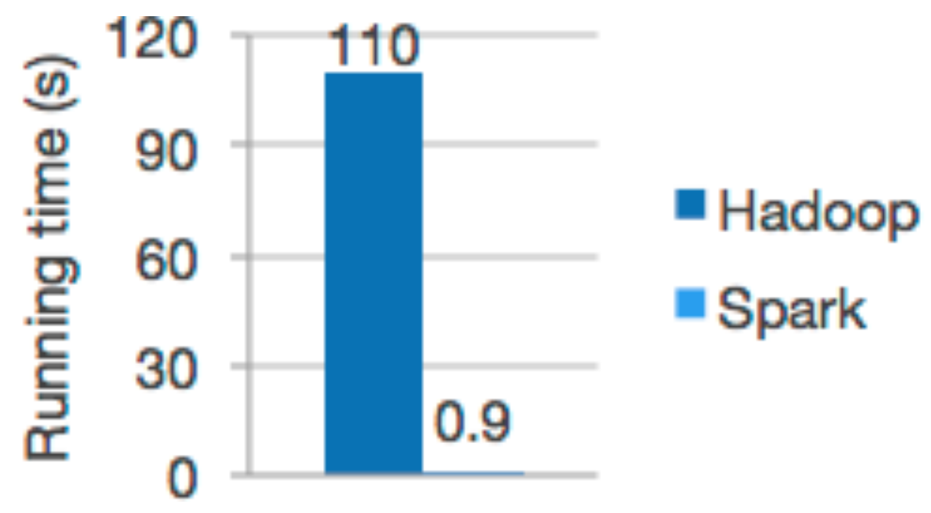
Cluster Computing With Apache Spark - Technology Landscape

Apache Spark is an analytics engine to process data at a large scale. To accomplish high speed while analysing, it provides an interface for programming **clusters**, so that data can be processed simultaneously. It also provides fault tolerance through **Resilient Distributed Datasets** (RDDs) at its architectural foundation. Spark itself needs a **Cluster Manager** and a **Distributed Storage System** to work with.

APACHE Spark

Spark helps implementing iterative algorithms as well as interactive or exploratory data analysis. Hence, repeated data querying run faster.



Spark SQL introduces **Data Frames** on top of Spark API, so that structured and semi-structured data can be analysed through a DSL for Python, Java or Scala.

Spark Streaming provides an API for building scalable applications for **stream processing.** It supports Kafka, Flume, Twitter, Zero MQ, Kinesis and TCP/IP-Sockets. Alternatives are Storm and Apache Flink Streaming.

Spark MLlib *The Machine Learning Library* includes functions for **machine learning** while it leverages the speed of Spark for **iterative algorithms** to run faster than e.g. Apache Mahout or Vowpal Wabbit.

GraphX is a distributed **graph processing** framework, providing two API's for the implementation of parallel algorithms, but only capable of processing **immutable graphs**. A similar framework is Apache Giraph, which uses Hadoop's MapReduce algorithm.

Supported programming languages

python, Scala, Java, R

Distributed Data Storage Systems

ALLUXIO, MAPR, amazon web services S3, cassandra, hadoop HDFS

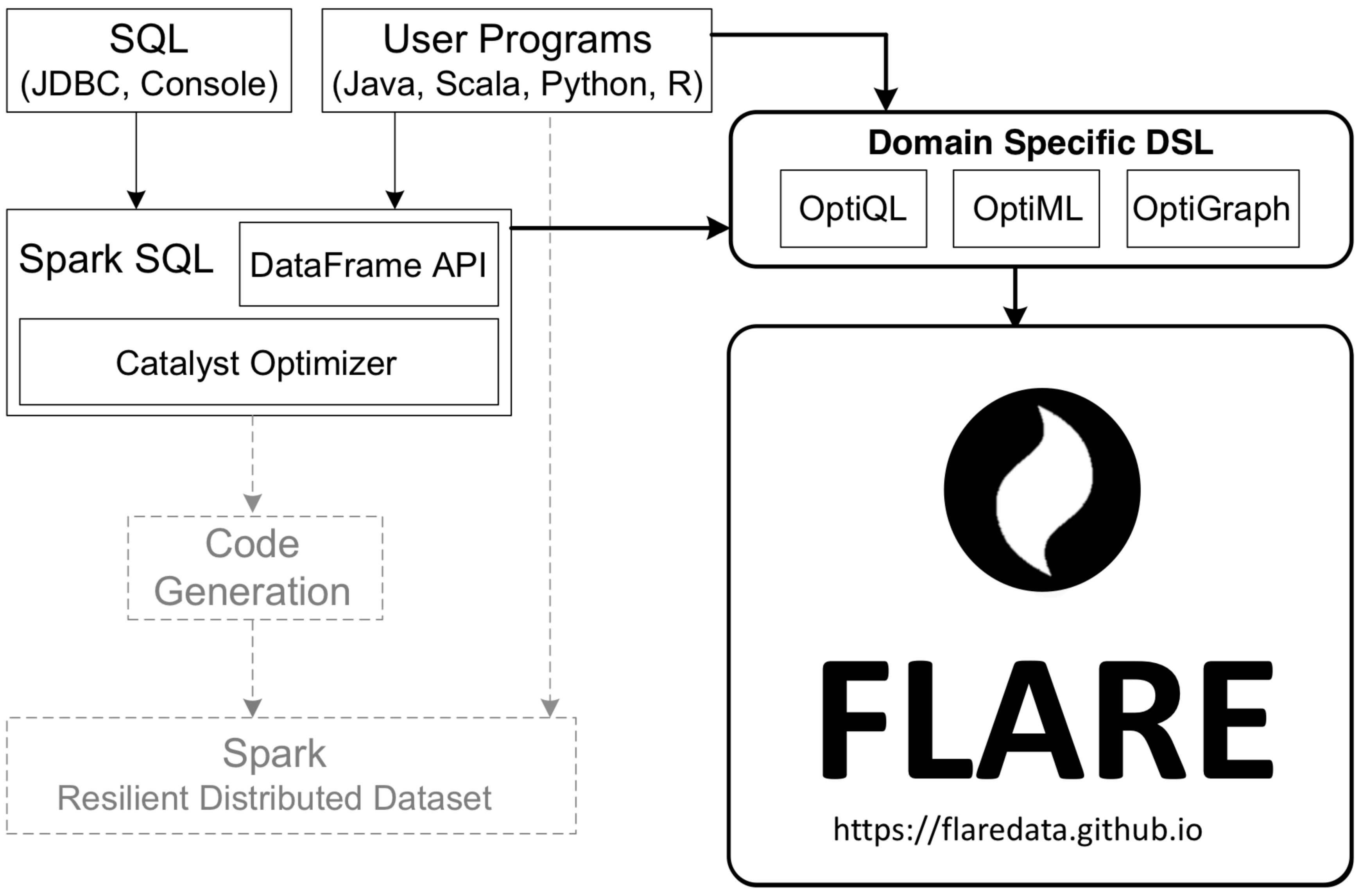
Cluster Managers

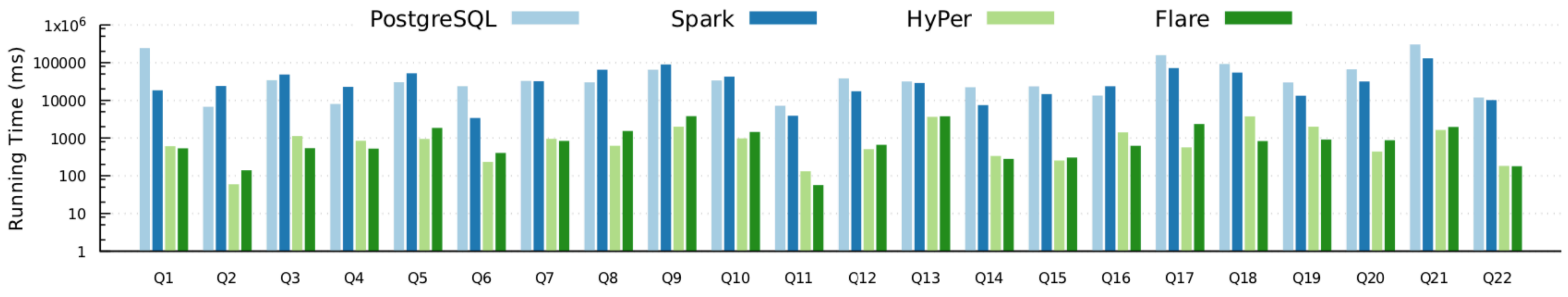
hadoop, kubernetes, Apache MESOS

https://spark.apache.org
https://flaredata.github.io

Turning a Spark into a Flare

Spark was originally designed to **scale-out** on clusters and though it might scale well, it creates an **overhead** that makes executing a simple query 20 times slower in Spark than executing it in C. To speed up Spark, **Flare** provides a **compiler** for Catalyst query plans, turning them to native code. This achieves a similar performance as the C code.





Lecture: "A Programming Language and Compiler View on Data Management and Machine Learning Systems" by Tiark Rompf

Lecture Series on Practical Data Engineering by Prof. Tilmann Rabl, Prof. Felix Naumann

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