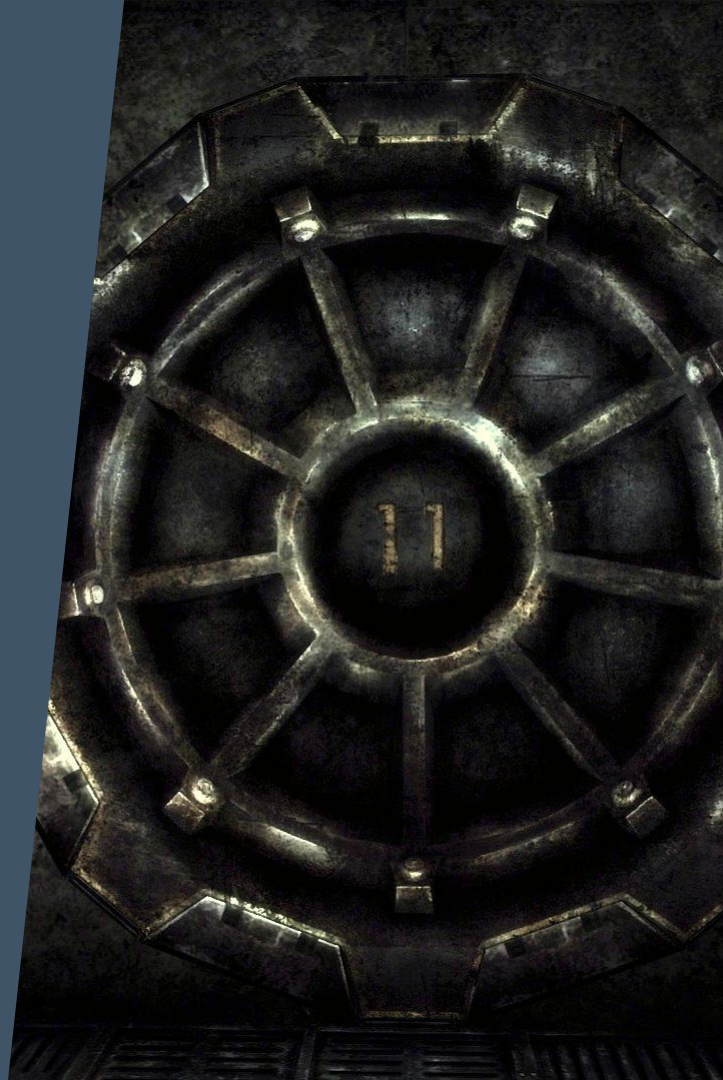
STRATIO

Spark Over a Mesos Secured Productive Environment



MesosCon EUROPE

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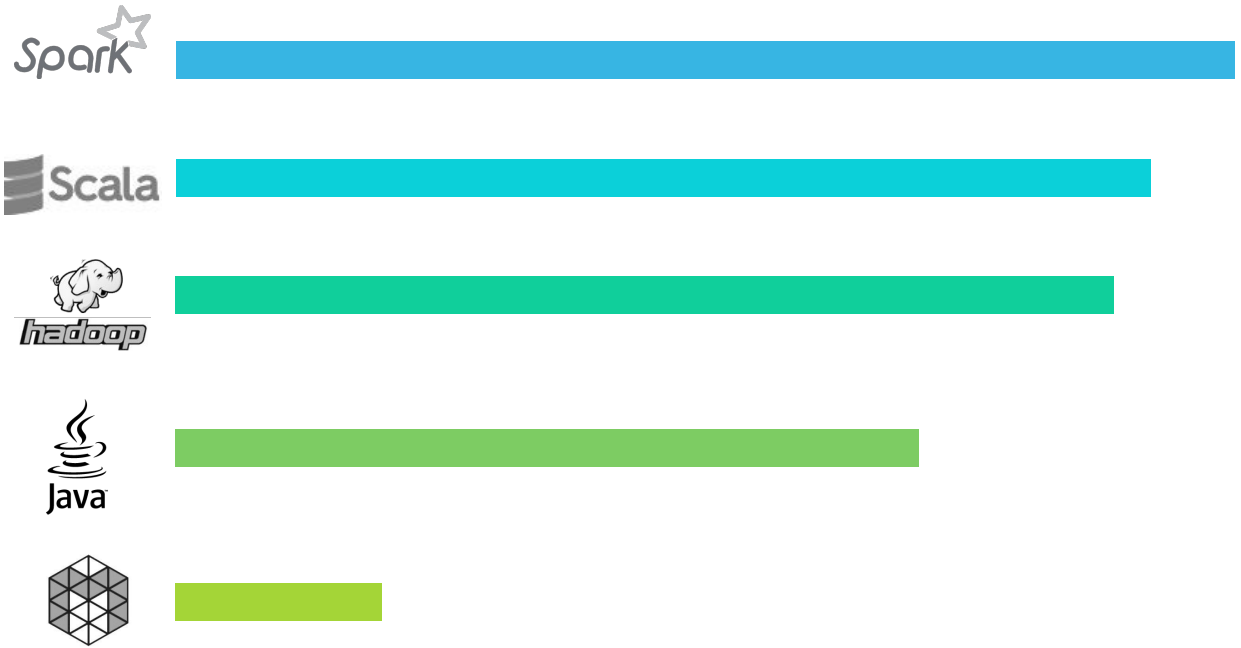
1 Presentation

Presentation

JORGE LÓPEZ-MALLA
@jorgelopezmalla

After working with traditional processing methods, I started to do some R&S Big Data projects and I fell in love with the Big Data world. Currently I'm doing some awesome Big Data projects and tools at Stratio.

SKILLS



Presentation

MARCOS PEÑATE
@marcosmi5

Coming from the Dark Side I found a place to grow and innovate at Stratio.

I am passionate about astrophysics, a compulsive SciFi consumer and I really enjoy automating and Dockerizing everything around me!

SKILLS

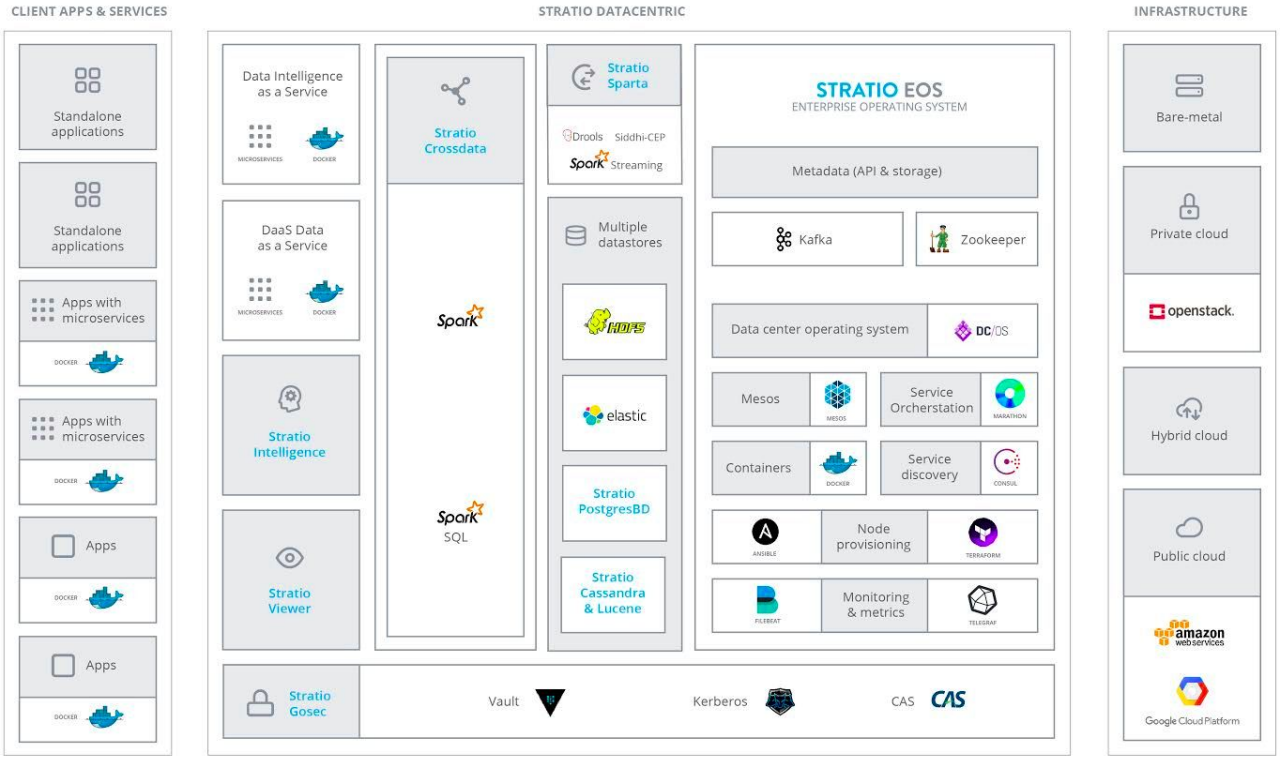
Our Company

Stratio accompanies businesses on their journey through complete Digital Transformation. Through hard work and creativity, our ambition is to reinvent companies around their data so they can compete in a changed world.

Our solution is a transformational product that uses third generation Big Data technologies to execute the most comprehensive form of Digital Transformation, ensuring scalability, maximum flexibility and adaptation to new markets.

If you have any questions or would like a demonstration of our product, get in touch: **contact@stratio.com**

Our product


CLIENT APPS & SERVICES
Standalone applications
Standalone applications
Apps with microservices
Apps with microservices
Apps
Apps
STRATIO DATACENTRIC
Data Intelligence as a Service
DaaS Data as a Service
Stratio Intelligence
Stratio Viewer
Stratio Crossdata
Spark
Spark SQL
Stratio Sparta
Drools
Siddhi-CEP
Spark Streaming
Multiple datastores
HDFS
elastic
Stratio PostgresBD
Stratio Cassandra & Lucene
STRATIO EOS
ENTERPRISE OPERATING SYSTEM
Metadata (API & storage)
Kafka
Zookeeper
Data center operating system
DC/OS
Mesos
Service Orcherstation
Containers
Service discovery
Node provisioning
Monitoring & metrics
Stratio Gosec
Vault
Kerberos
CAS
INFRASTRUCTURE
Bare-metal
Private cloud
openstack.
Hybrid cloud
Public cloud
amazon web services
Google Cloud Platform

2 Use Case

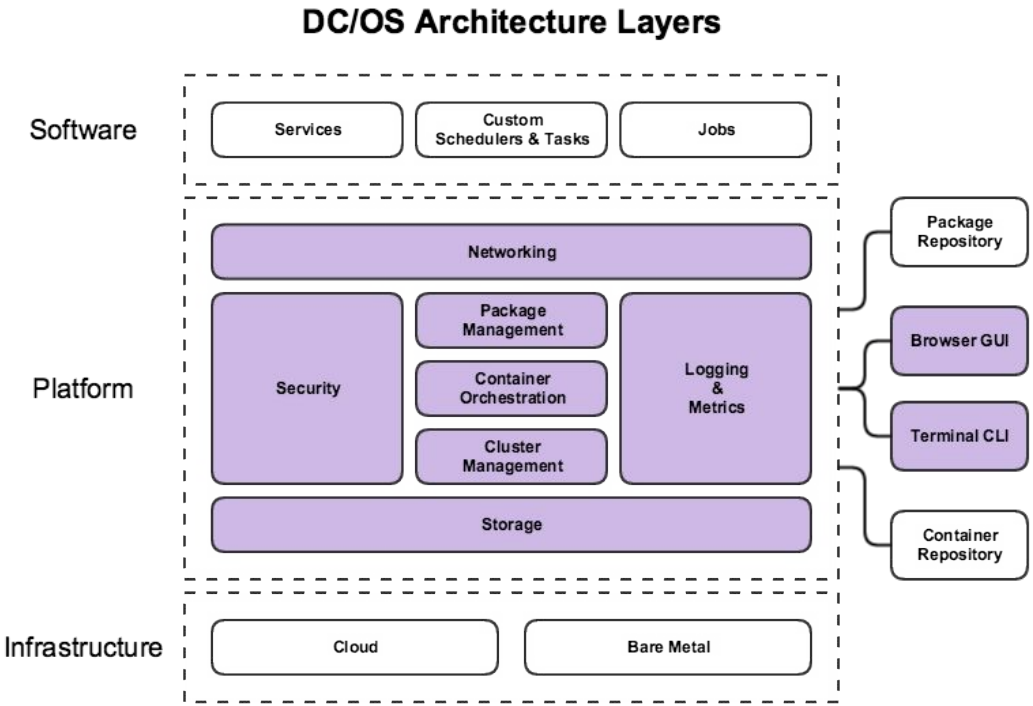
DC/OS

- DC/OS is an open-source distributed operating system, based on Apache Mesos kernel. DC/OS manages multiple services and its instances (whether on cloud or on-premise) from a single interface.

- Users can deploy containers for distributed services and legacy applications.

- DC/OS provides a network layer, service discovery and resource management.

DC/OS


DC/OS Architecture Layers
Software
Services
Custom Schedulers & Tasks
Jobs
Platform
Networking
Security
Package Management
Container Orchestration
Cluster Management
Logging & Metrics
Storage
Package Repository
Browser GUI
Terminal CLI
Container Repository
Infrastructure
Cloud
Bare Metal

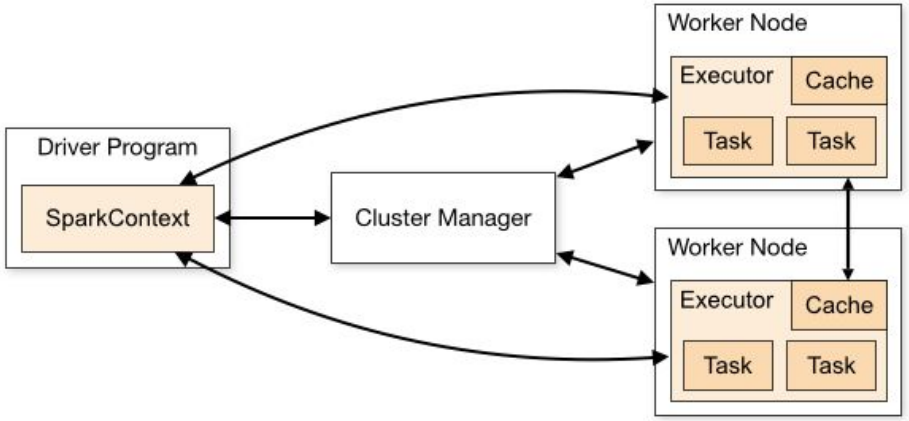
DC/OS Use Case: preconditions

- Clients look for user profiling and highly scalable distributed services.
- The access to these resources must be done using secured connections.
- Not all services are secured using the same protocol.
- Clients don’t want to manage their secrets.
- Spark is Stratio’s distributed processing framework.

3 Spark, Kerberos & Mesos

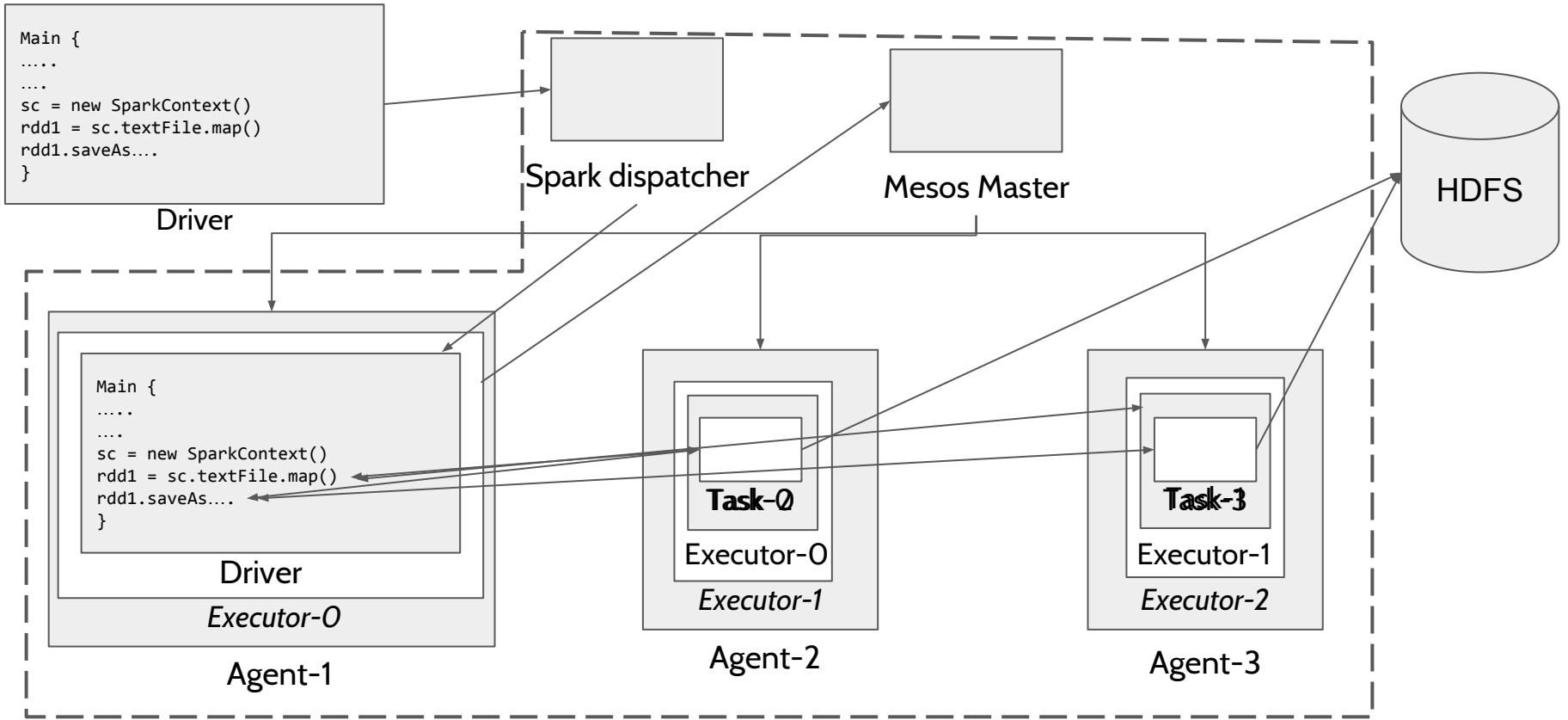
Spark <3 Mesos

- Spark was born as a Mesos use case validation.



- Spark can be deployed both in a client and cluster mode over mesos.
- In enterprise environments only the cluster mode is recommended.

Mesos - Cluster



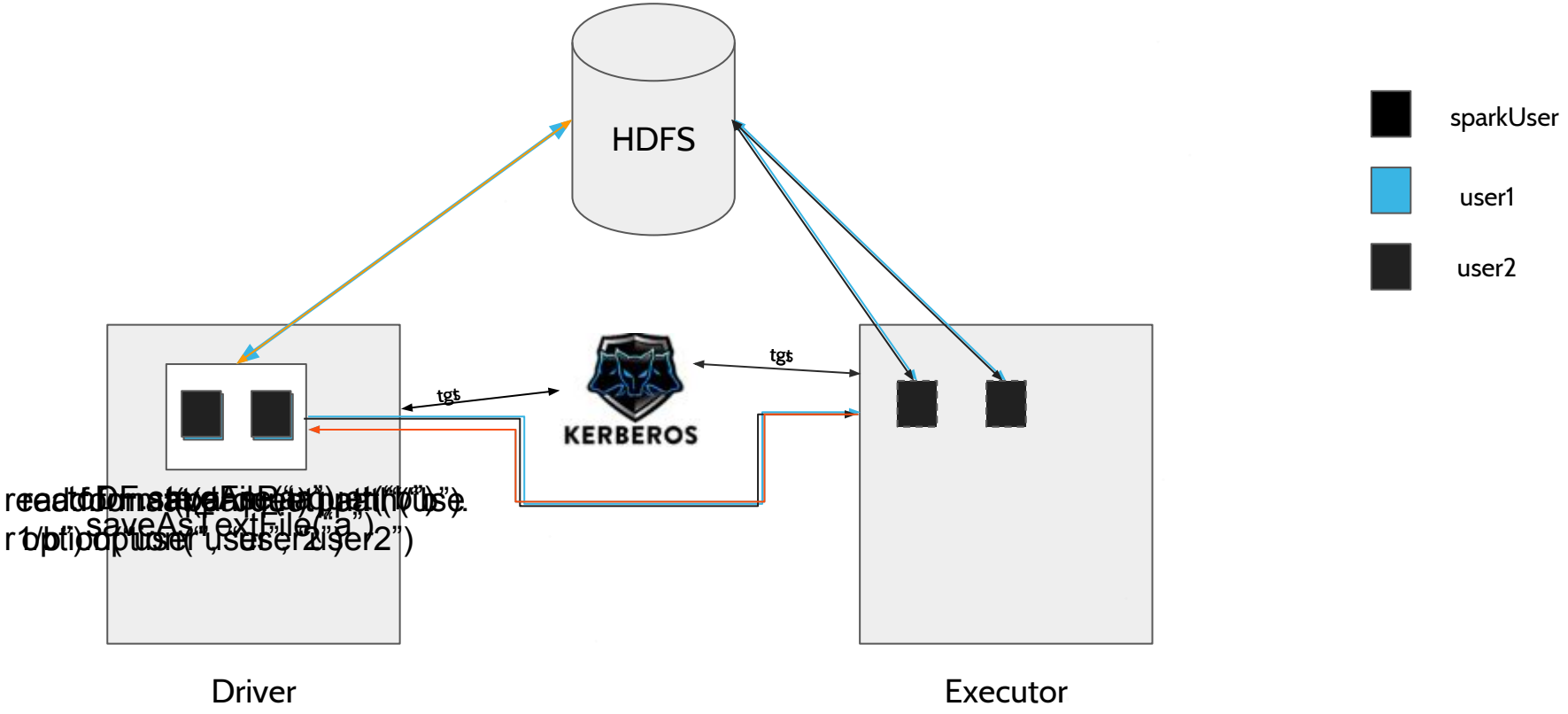
Adding Kerberos to the equation

- HDFS was the first datastore certificated by Stratio.
- Kerberos is used as Hadoop security protocol (HDFS and YARN).
- It handles users and systems identities.
- It is based on principal, keytab and delegated tokens:
  - **Principal:** user or service identity
  - **Keytab:** file that contains a key associated to the principal
  - **Tokens:** Hadoop uses delegated Tokens

Adding Kerberos to the equation

- Spark using Mesos did not allow any Kerberos options.
- Stratio Spark team integrates Spark's Kerberos functionalities (1.6.2, 2.1.0 and 2.2.0).
- New functionality added: using proxy user for each task.
- All is explained in Spark Summit East 2017.

Stratio's Solution



4 Dynamic authentication

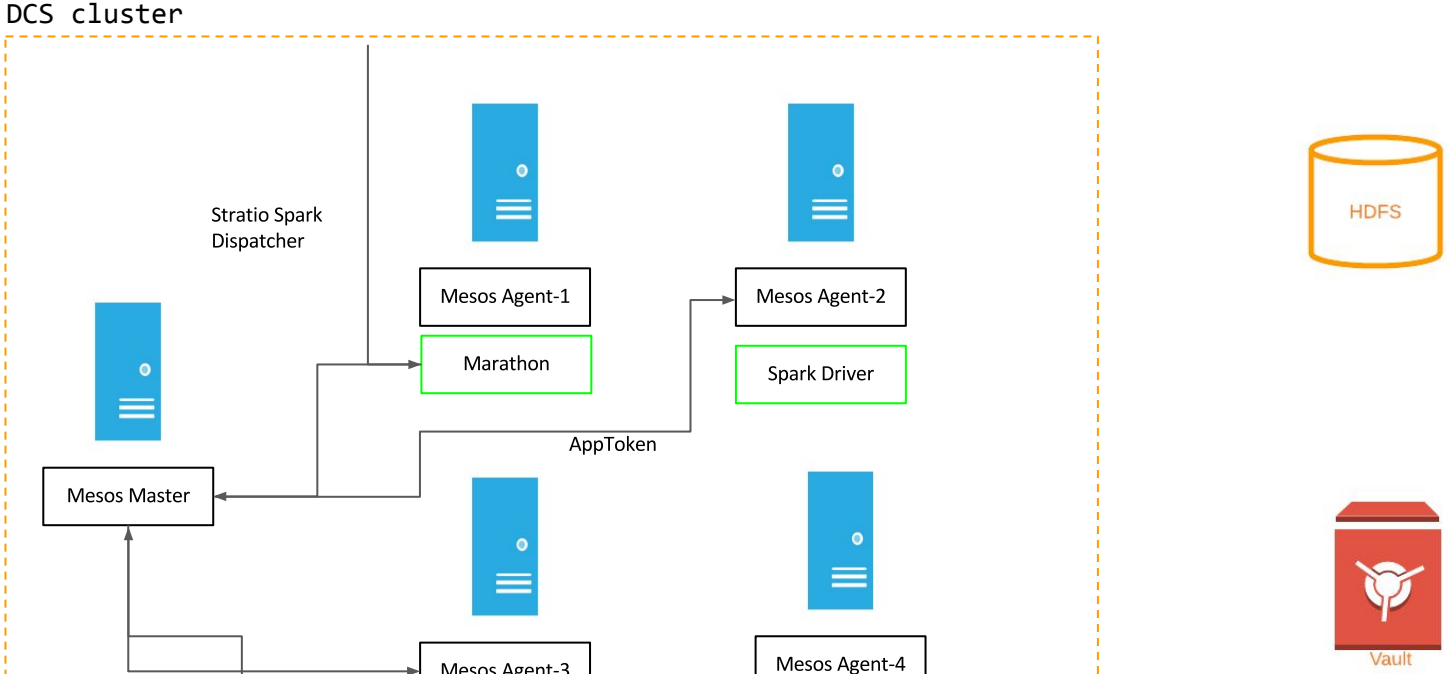
KMS

- Each technology will have its own security protocol.
- The secrets have to be accessible from all the machines inside the cluster.
- Stratio security team integrated a KMS in the Stratio platform to store and manage all the platform secrets.

Dynamic authentication

- Ok, we have a secret storage. But how do our processes access it in a secured way?
- Who keeps the key that opens the

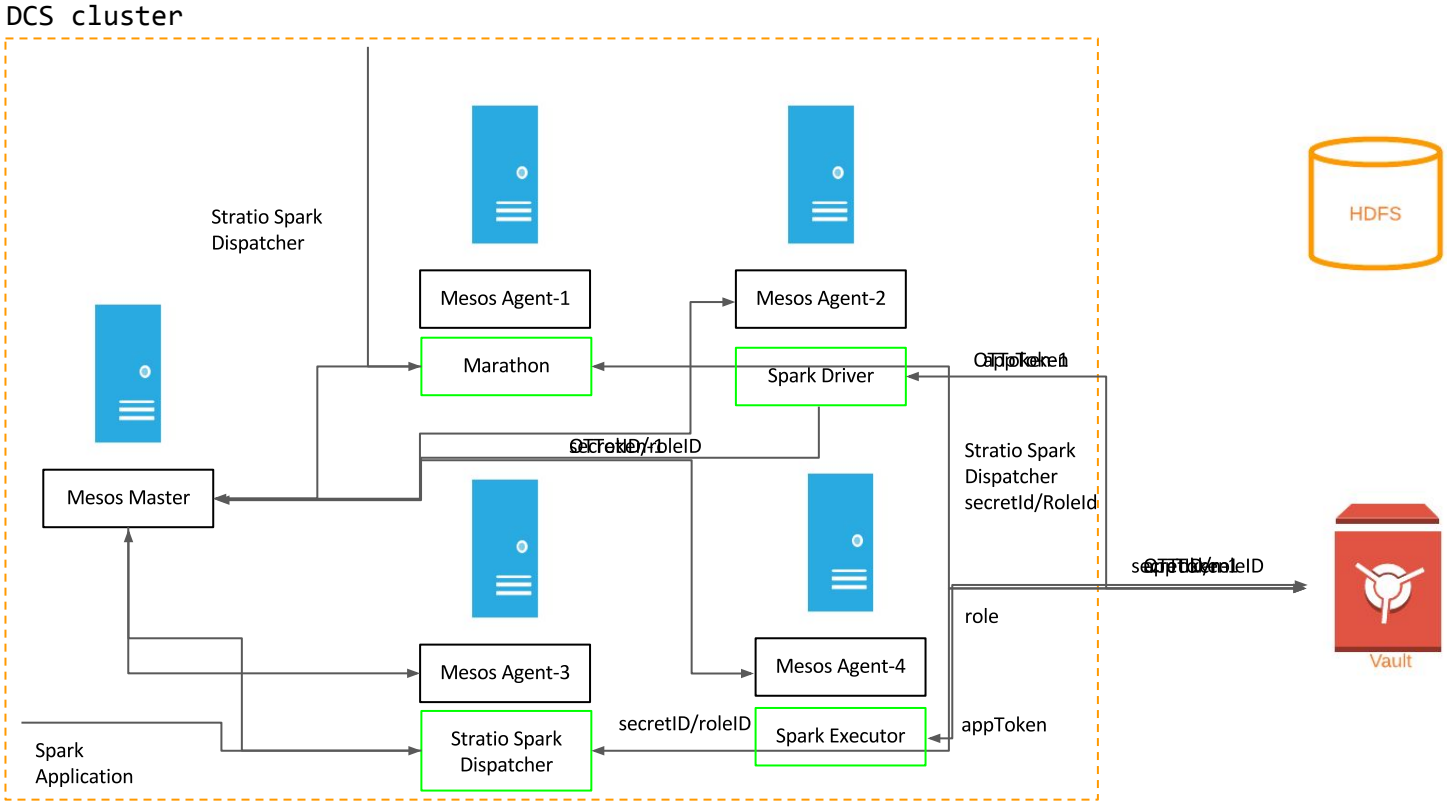
Spark - KMS


DCS cluster
Stratio Spark Dispatcher
Mesos Agent-1
Mesos Agent-2
Marathon
Spark Driver
AppToken
Mesos Master
Mesos Agent-3
Mesos Agent-4
Spark Application
AppToken
Stratio Spark Dispatcher
HDFS
Vault

Spark - KMS

- The application token is written in executor logs.
- Sensitive information is sent using a non secured transportation layer.
- The application log is also written in

Spark - KMS Dynamic Authentication



Spark - KMS Dynamic Authentication

- ★ Non sensitive information is shared.
- ★ If there is any token intervention we can detect it.
- ★ No sensible information is stored in
- 🤘 Our secrets are safe!

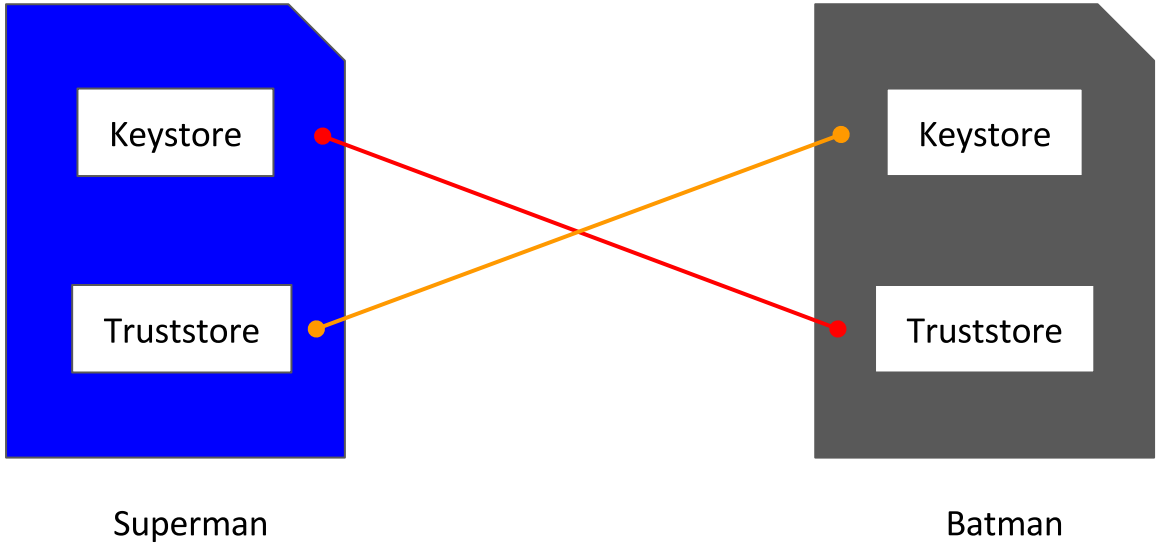
5 Mutual TLS

Mutual TLS Datastores

Mutual authentication or two-way authentication refers to two parties authenticating each other at the same time, being a default mode of authentication in some protocols.

Most Big Data technologies allows the implementation of Mutual TLS, which provides a way to identify clients, servers and multiple instances for services.

Mutual TLS Datastores



Mutual TLS Datastores

Wikipedia:

> *"[…] As* ***it requires provisioning of the certificates to the clients and involves less user-friendly experience****, it's rarely used in end-user applications."*

Mutual TLS Datastores

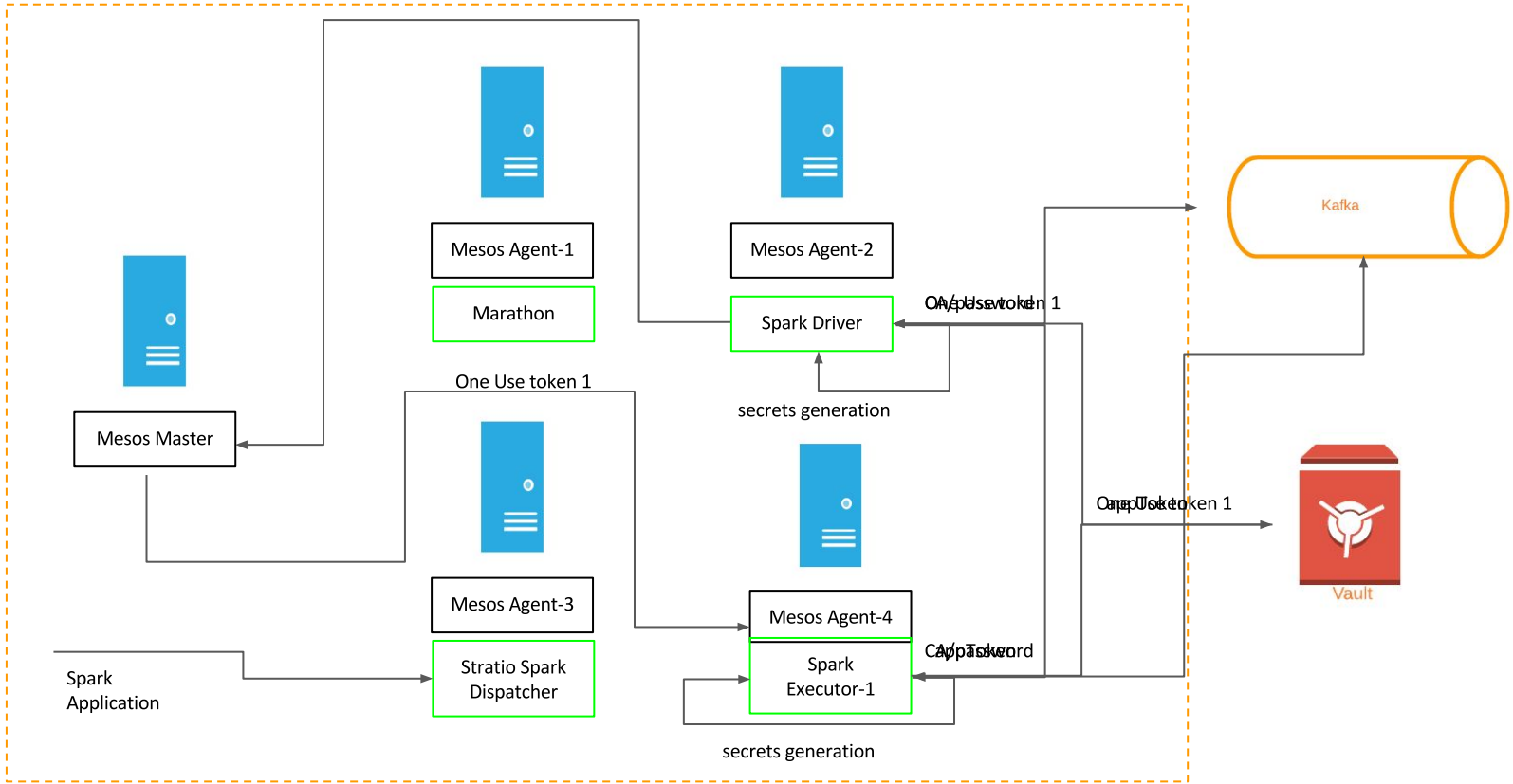
Stratiopedia:

> *"By default most users are not used to playing with big data things. Let's do things as easy as we can, so hack something with that TLS thing"*

Mutual TLS Datastores

```scala
def main(args: Array[String]): Unit = {
  val sparkConf = new SparkConf().setAppName("ElasticSearch_ATJob")
  val elasticOptions = extractElasticSecurityOption(args(0), args(1), sparkConf)
  val spark = SparkSession.builder().config(sparkConf).getOrCreate()
  spark.sparkContext.setLogLevel("DEBUG")

  elasticOptions.foreach({
    case (key, value) => println(s"KEY: $key, VALUE: $value")
  })

  val dataset = spark
    .read
    .format("org.elasticsearch.spark.sql")
    .options(elasticOptions)
    .load()
  println(dataset.rdd.getNumPartitions)
  dataset.printSchema()
  dataset.show(10)
}

def extractElasticSecurityOption(host: String, port: String, sparkConf: SparkConf): Map[String, String] = {

  val options = Map("es.index.auto.create" -> "true",
    "es.nodes"-> host,
    "es.resource" -> "test/type1",
    "es.port"-> port)

  val prefixSparkElastic = "spark.ssl.datastore."
  val prefixElasticSecurity = "es.net.ssl"

  if (sparkConf.getOption(prefixSparkElastic + "enabled").isDefined
    && sparkConf.get(prefixSparkElastic + "enabled") == "true") {

    val configElastic = sparkConf.getAllWithPrefix(prefixSparkElastic).toMap
    options ++ Map( s"$prefixElasticSecurity" -> configElastic("enabled"),
      s"$prefixElasticSecurity.keystore.pass" -> configElastic("keyStorePassword"),
      s"$prefixElasticSecurity.keystore.location" -> s"file:${configElastic("keyStore")}",
      s"$prefixElasticSecurity.truststore.location" -> s"file:${configElastic("trustStore")}",
      s"$prefixElasticSecurity.truststore.pass" -> configElastic("trustStorePassword"))
  } else {
    Map()
  }
}
```

Spark - Mutual TLS Datastores



6 Postgres

Postgres

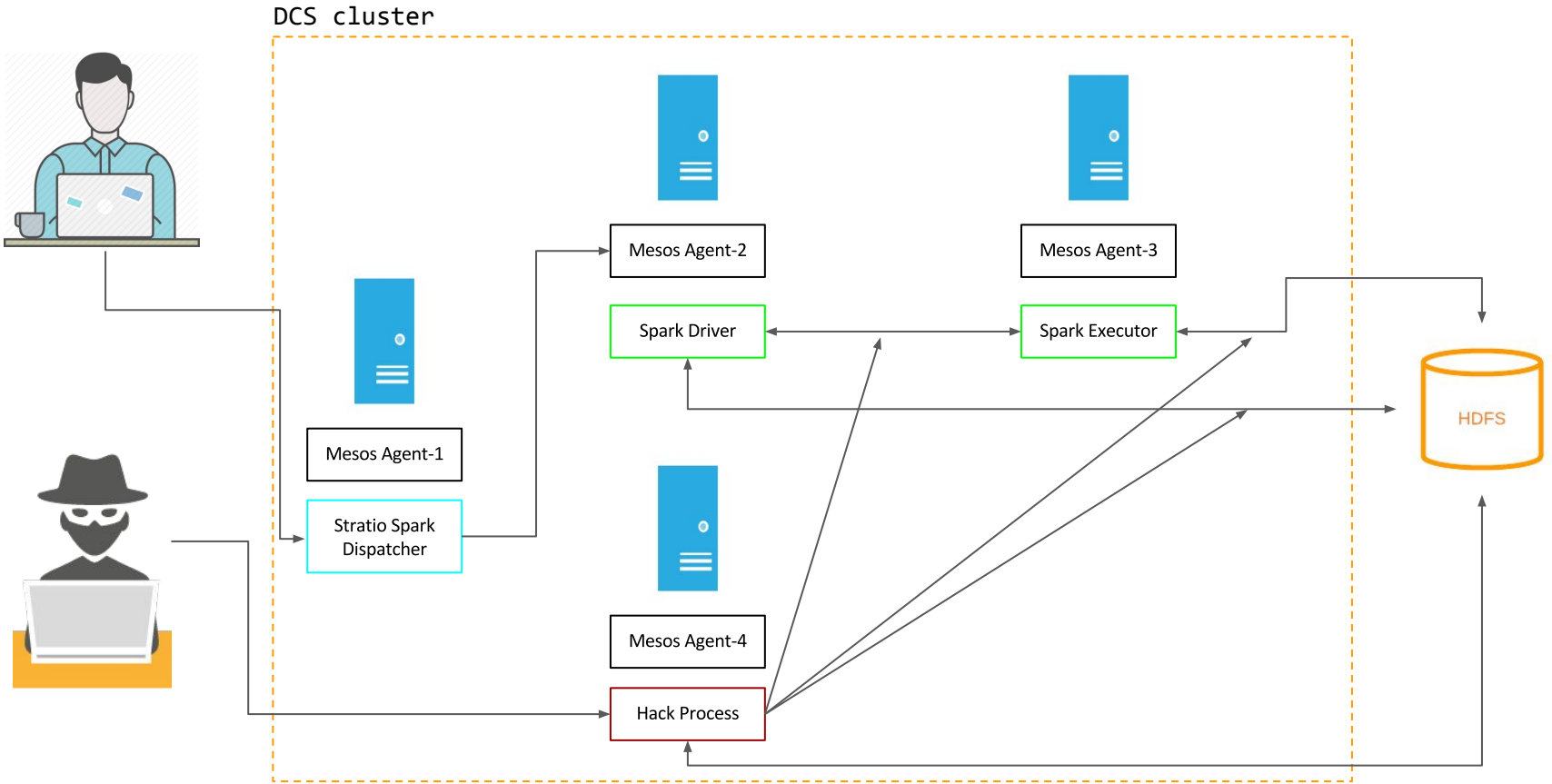
- Just when everything seemed to work harmoniously a new use case appeared needing to access a secure postgres.
- JDBC connection chain includes a **PKCS8** format certificate.
- No parsing method exists from pem to PKCS8.

Postgres

- **First approach:** spark-env.sh + openssl hack.
- **Nowadays:** Scala class to parse from pem to pkcs8.
- **Future Improvements:** Provide a SSLSocketFactory.

7 Network isolation

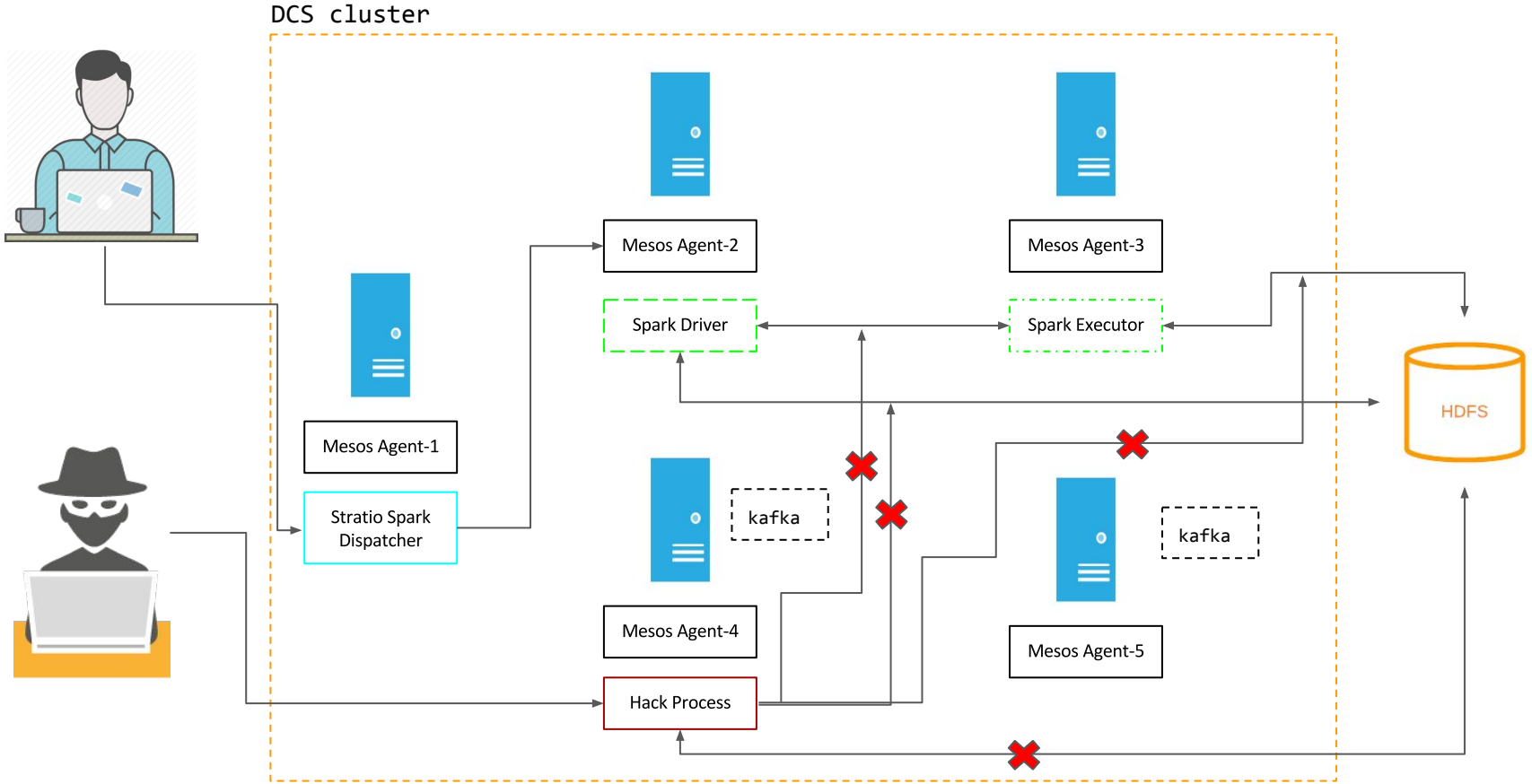
Are you sure that your cluster is secure?



SDN

- Stratio security team integrates Mesos with SDN (Software Defined Networks).
- SDN allows us to create isolated virtual networks with access to the resources defined **for each user**.
- SDN does not add any limitation to the Mesos architecture.
- We can assign just the resources needed **by each user.**
- Mesos still has its awesome elasticity.

Are you sure that your cluster is secure?



7 Live Demo

8 Q&A

WE ARE HIRING

people@stratio.com


@StratioBD


STRATIO
BIG DATA
A CHILD'S PLAY