On Premise Spark-as-a-Service on YARN

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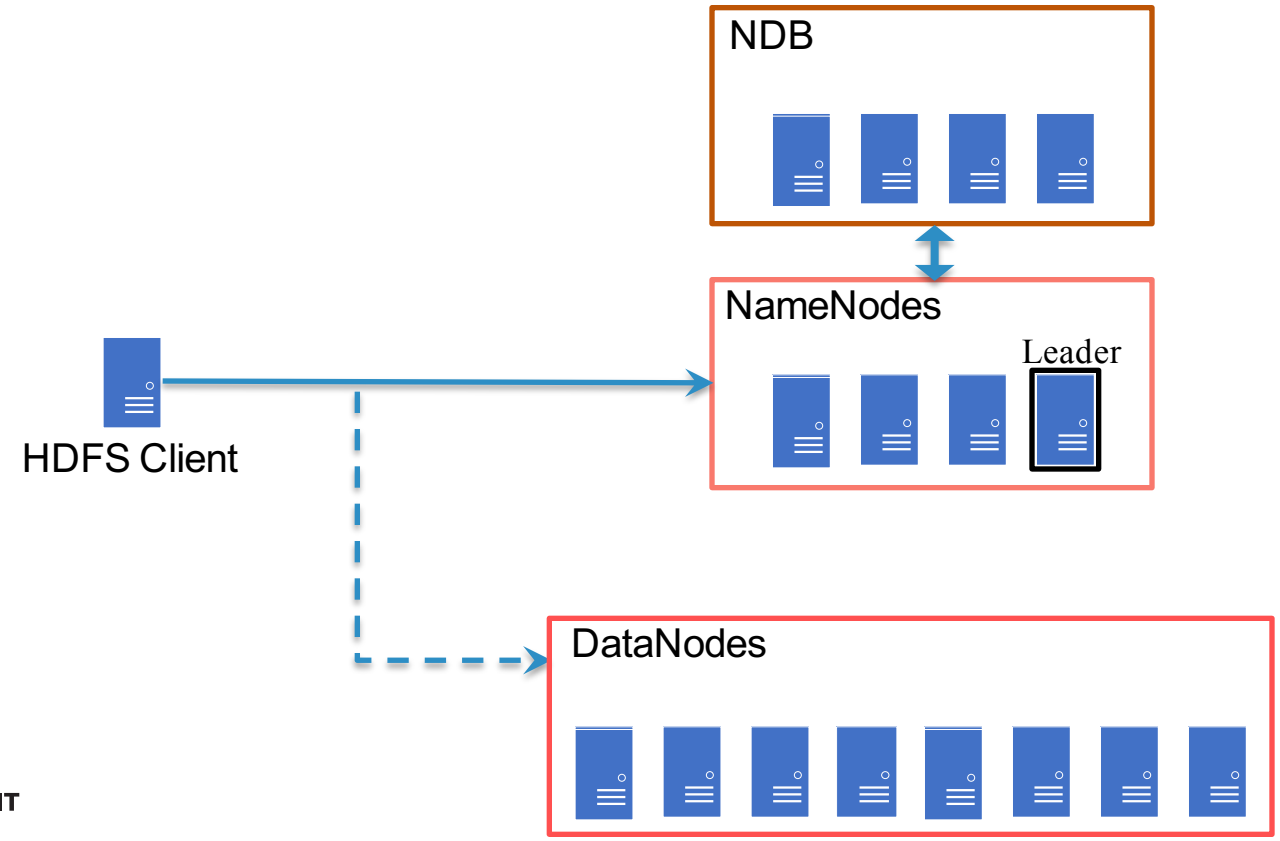
SPARK SUMMIT EUROPE 2016

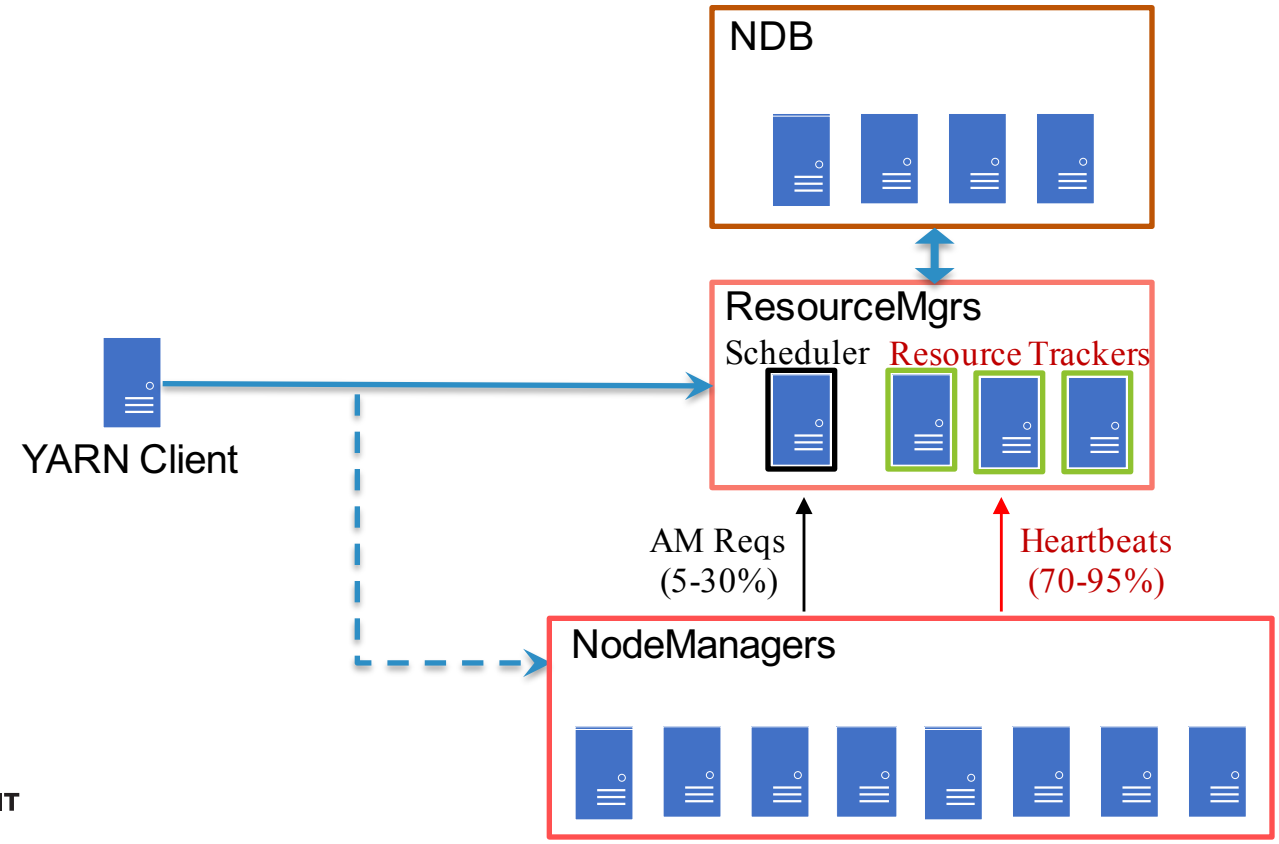
Spark-as-a-Service in Sweden

- **SICS ICE:** datacenter research and test environment
- **Hopsworks:** Spark/Kafka/Flink/Hadoop-as-a-service
  - Built on Hops Hadoop (www.hops.io)
  - Over 100 active users
  - Spark the platform of choice

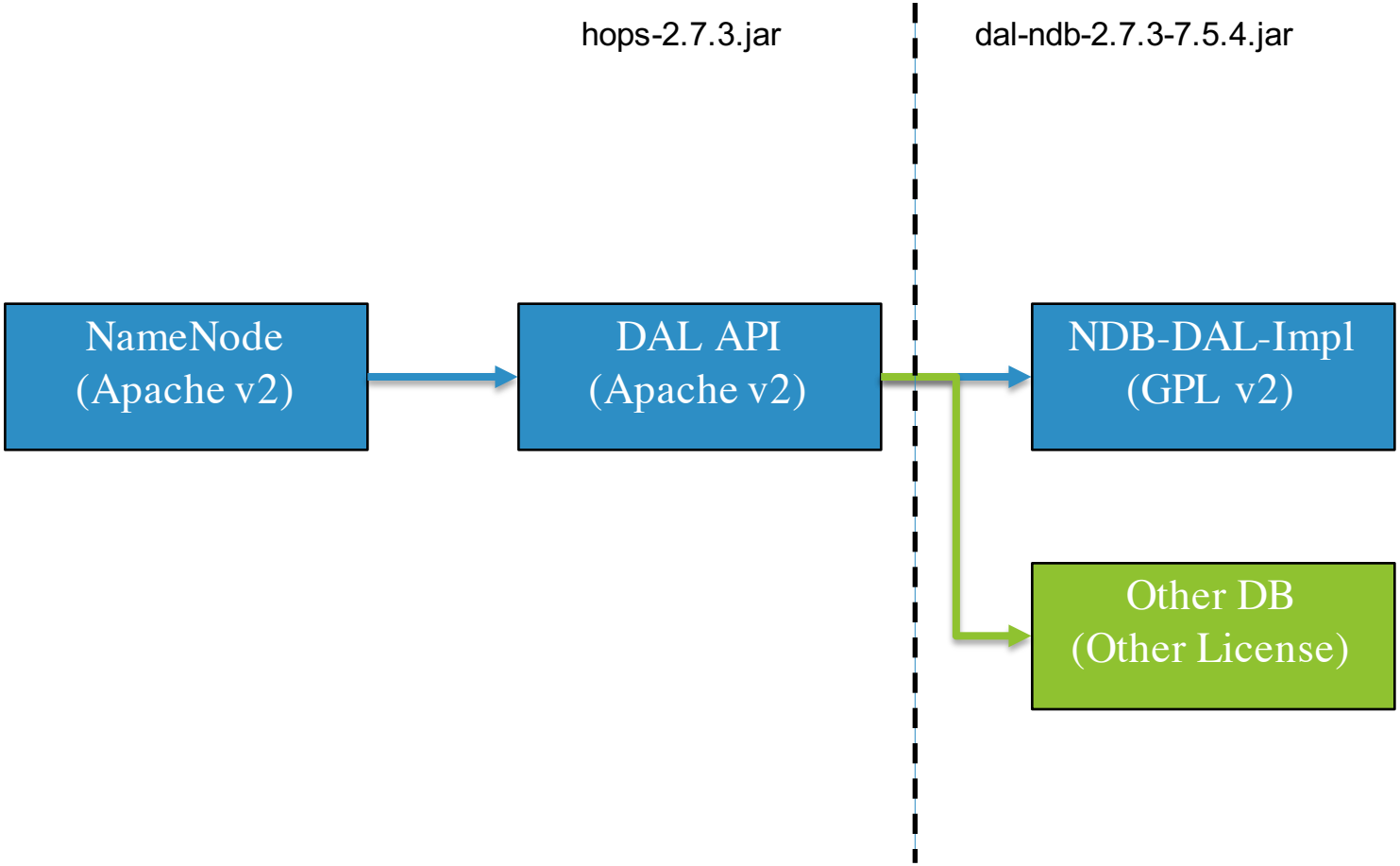
HopsFS Architecture



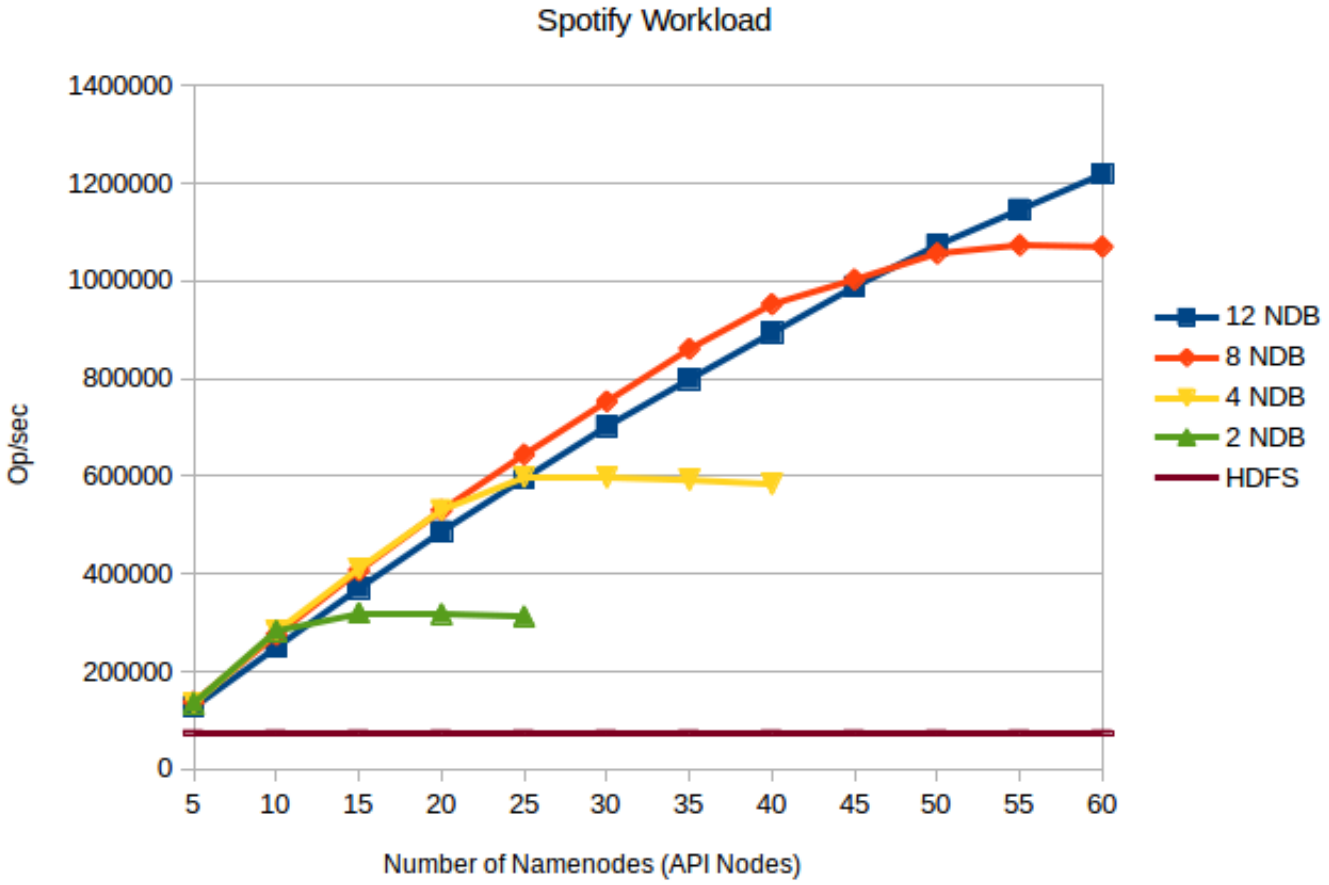
Hops-YARN Architecture



Pluggable DB: Data Abstraction Layer



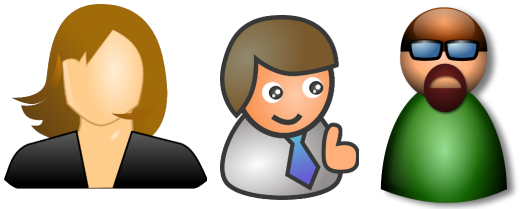
HopsFS Throughput vs Apache HDFS

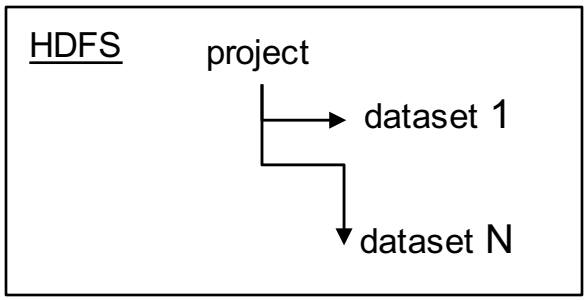


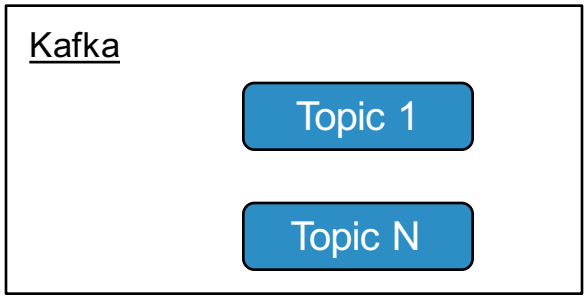
NDB Setup: Nodes using Xeon E5-2620 2.40GHz Processors and 10GbE.
NameNodes: Xeon E5-2620 2.40GHz Processors machines and 10GbE.

HOPSWORKS

Project-Based Multi-Tenancy

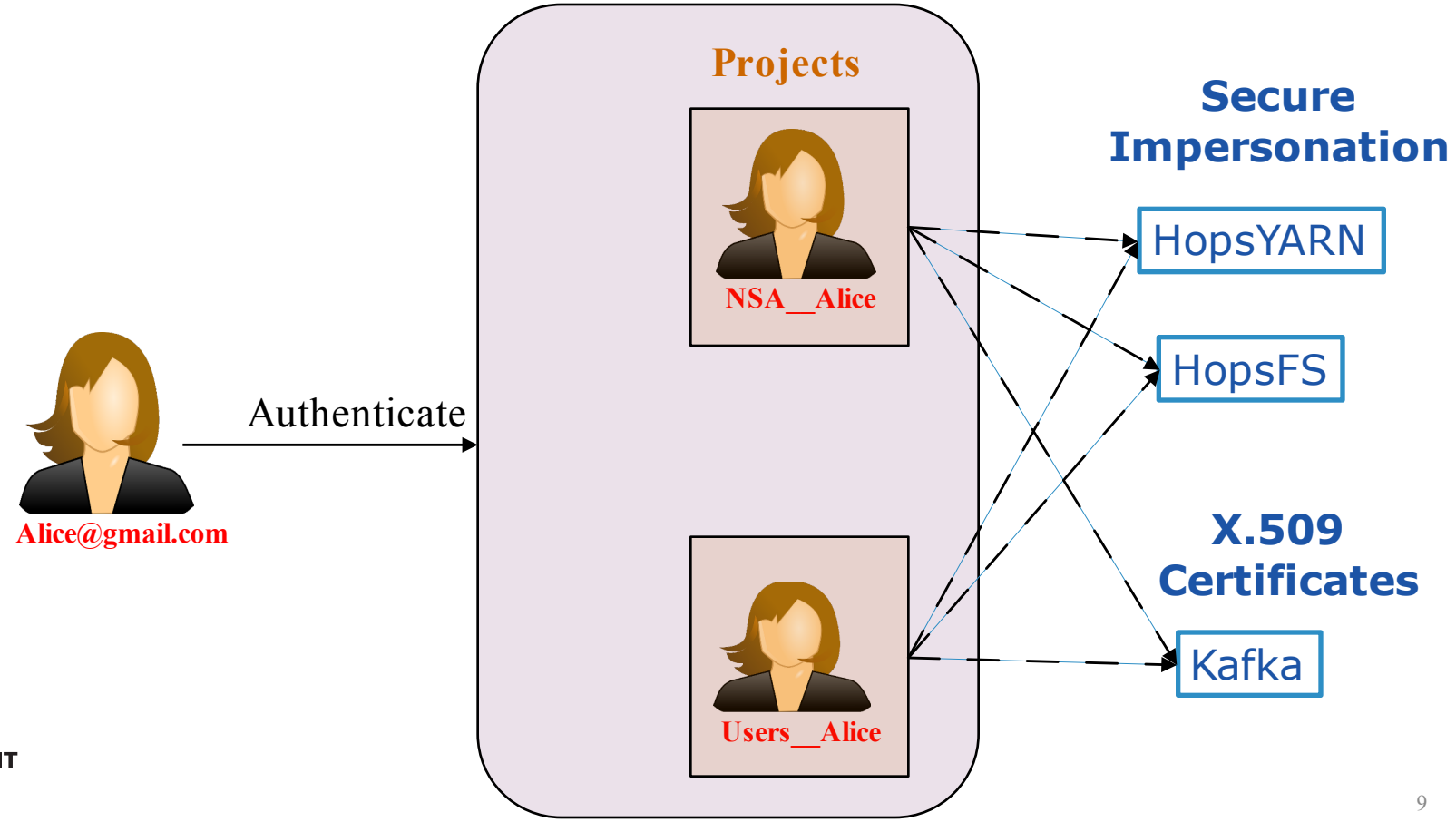






- A project is a collection of
  - Users with Roles
  - HDFS DataSets
  - Kafka Topics
  - Notebooks, Jobs
- Per-Project quotas
  - Storage in HDFS
  - CPU in YARN
    - Uber-style Pricing
- Sharing across Projects
  - Datasets/Topics

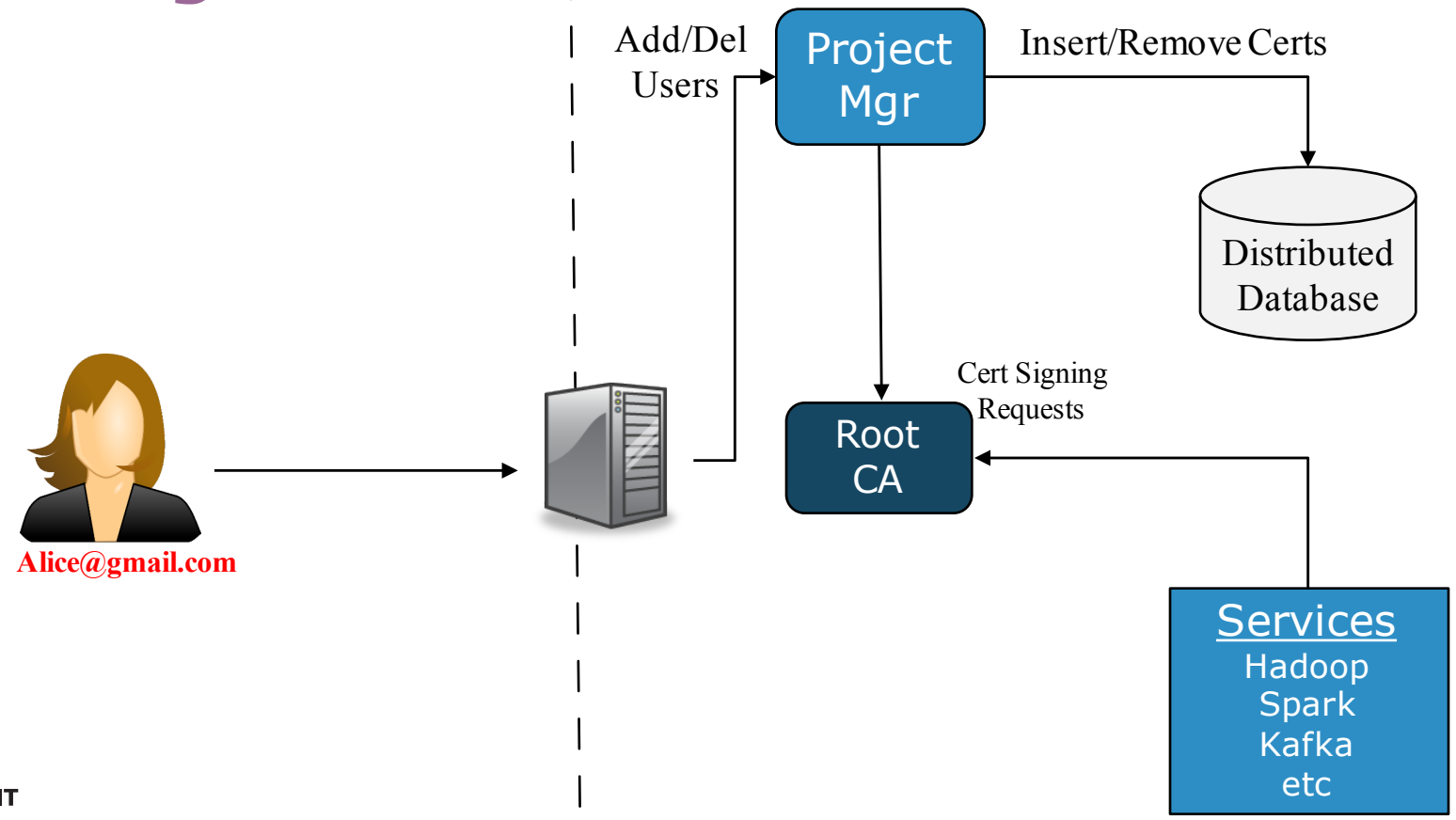
Dynamic Roles for Hadoop/Kafka



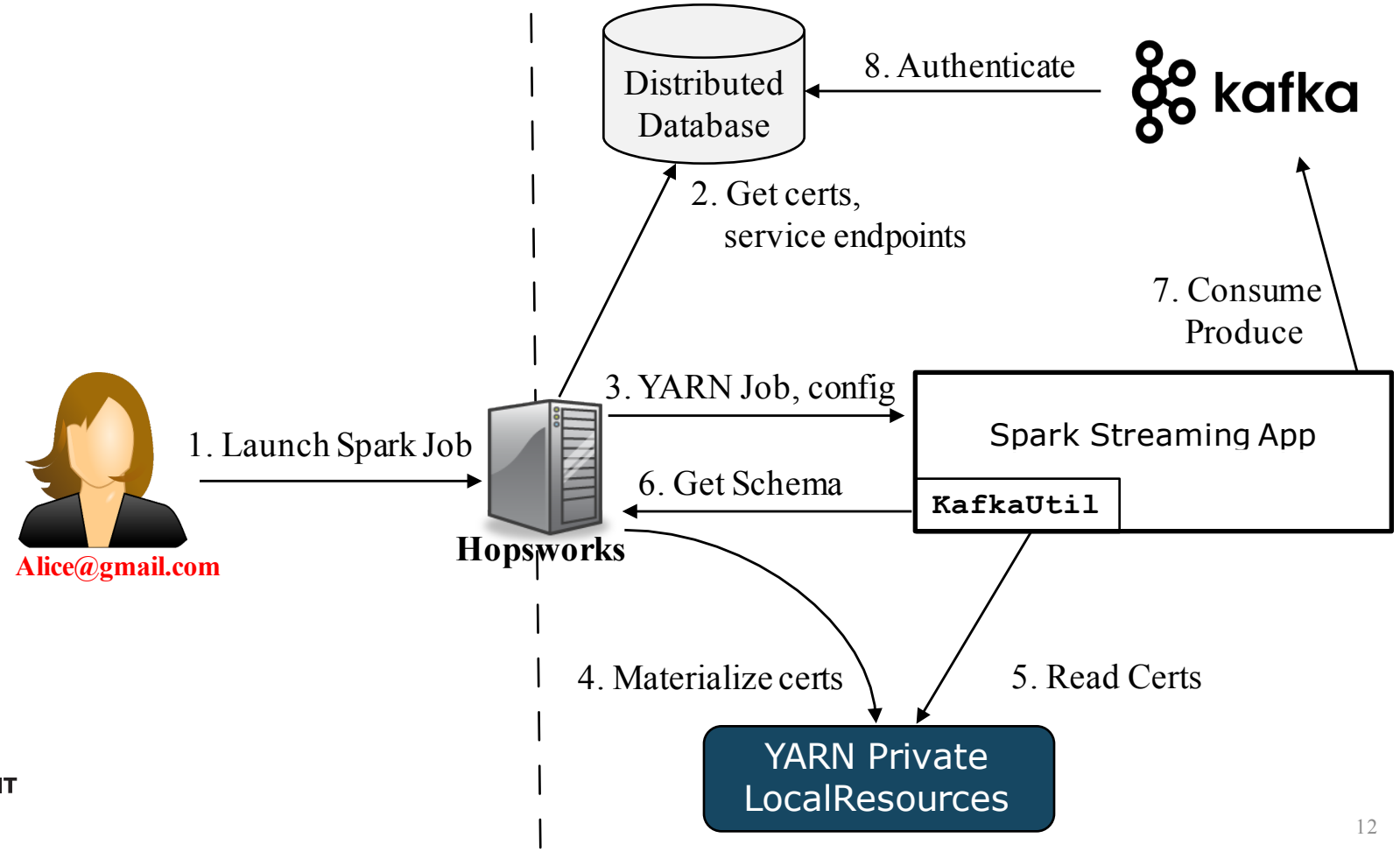
Look Ma, No Kerberos!

- For each project, a user is issued with a X.509 certificate, containing the project-specific userID.
  - Inspired by Netflix' BLESS system.
- Services are also issued with X.509 certificates.
  - Both user and service certs are signed with the same CA.
  - Services extract the userID from RPCs to identify the caller.

Project-User Certificates



Spark Streaming on YARN with Hopsworks



Spark Stream Producer in Secure Kafka

```
SparkConf sparkConf = …
JavaSparkContext jsc = …
```

1. **Discover:** Schema Registry and Kafka Broker Endpoints
2. **Create:** Kafka Properties file with certs and broker details
3. **Create:** producer using Kafka Properties — Developer
4. **Download:** the Schema for the Topic from the Schema Registry
5. **Distribute:** X.509 certs to all hosts on the cluster
6. **Cleanup securely** — Operations

```
// write to Kafka
```

Spark Streaming Producer in Hopsworks

```
List<String> topics =  KafkaUtil.getTopics();
…
SparkProducer sparkProducer =
    KafkaUtil.getSparkProducer(topic);
…
Map<String, String> message = …
sparkProducer.produce(message);
…
sparkProducer.close();
```

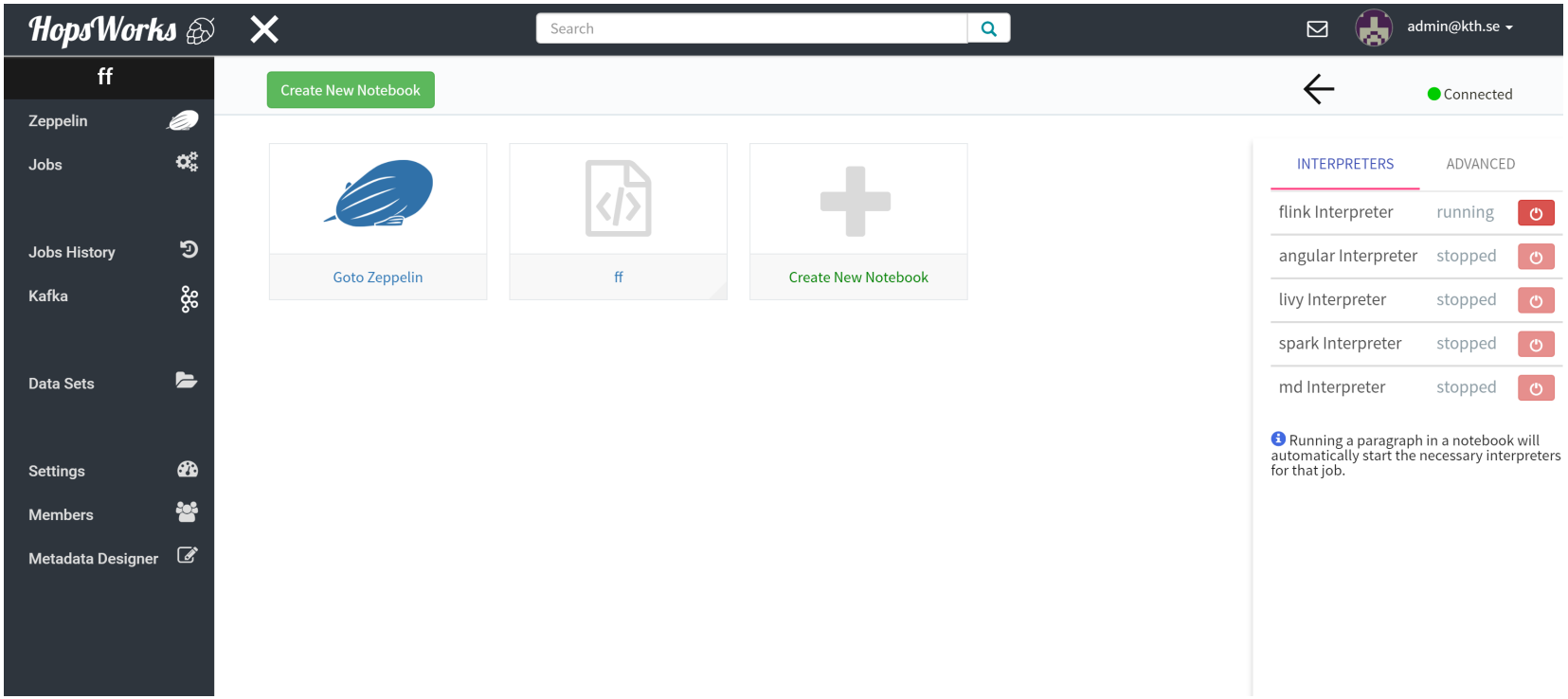

https://github.com/hopshadoop/hops-kafka-examples

Spark Streaming Consumer in Hopsworks

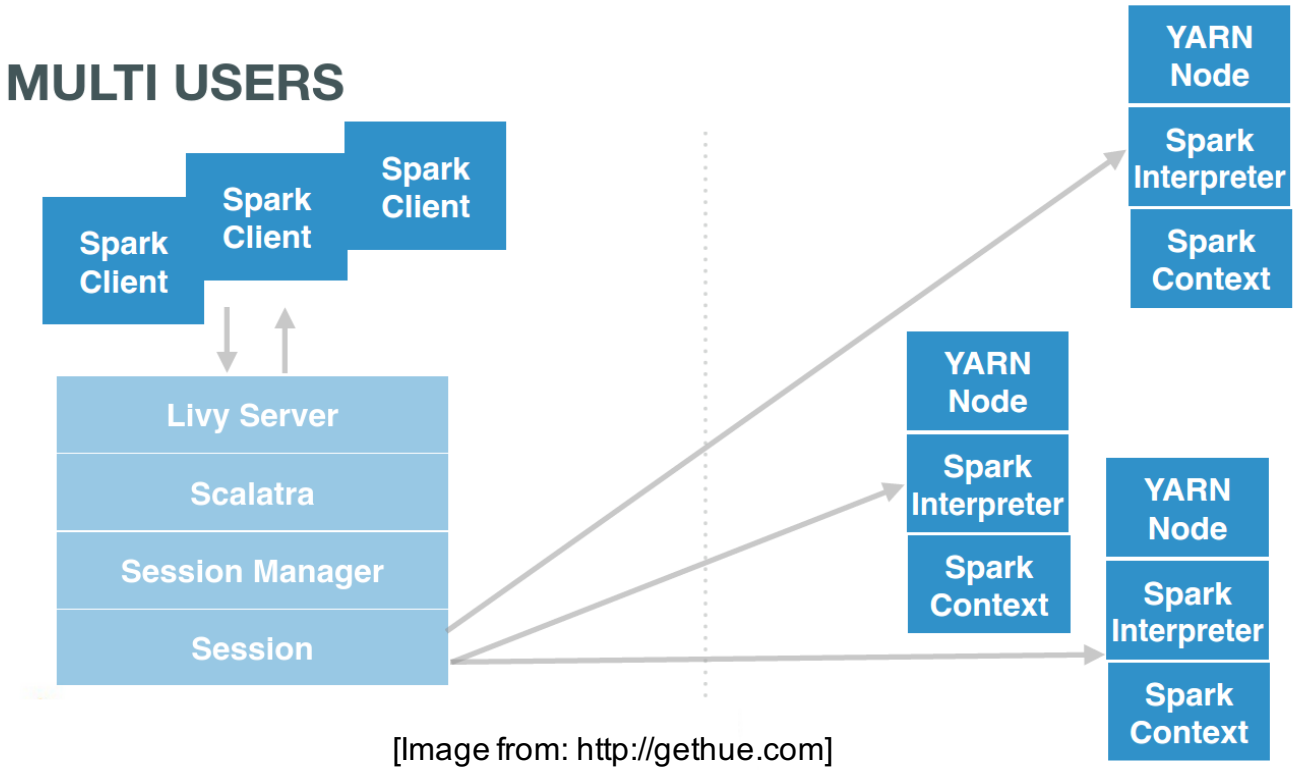
```
JavaStreamingContext jssc = …
List<String> topics =  KafkaUtil.getTopics();
…
SparkConsumer consumer = KafkaUtil.getSparkConsumer(jssc, topics);
…
// Avro schema downloaded by framework here
GenericRecord genericRecord = KafaUtil.getRecordInjections()
.get(topic);
…
jssc.start();
jssc.awaitTermination();
```


https://github.com/hopshadoop/hops-kafka-examples

Zeppelin Support for Spark/Livy



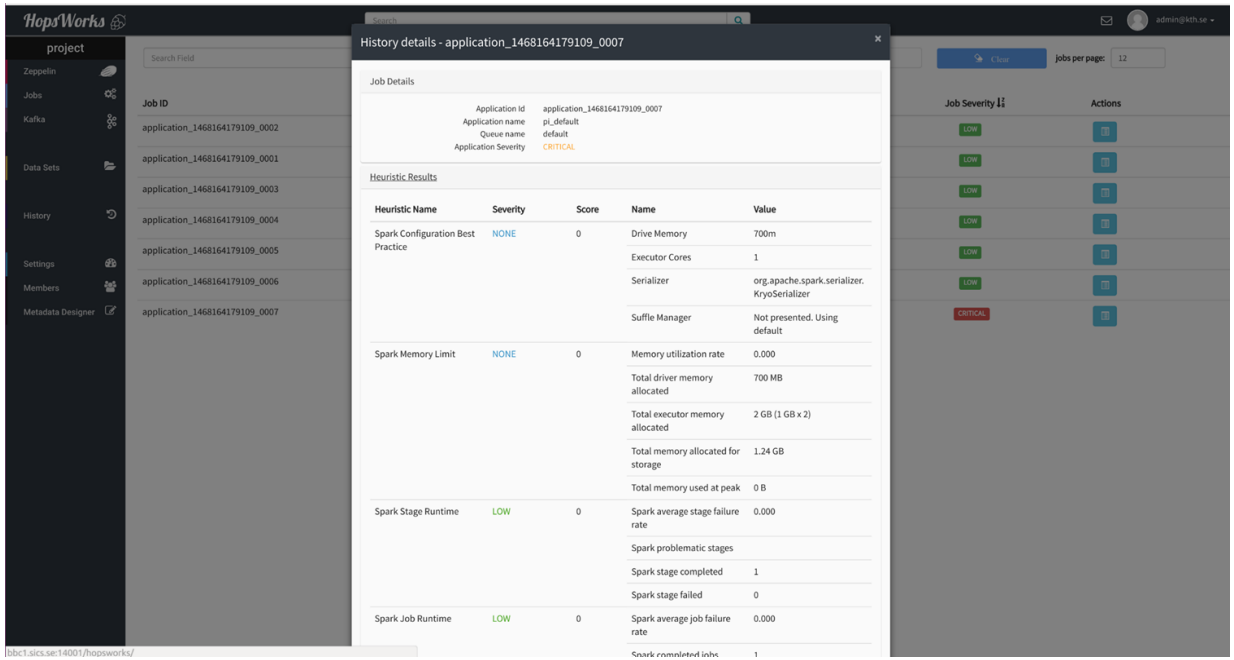
Livy to launch Spark 2.0 Jobs



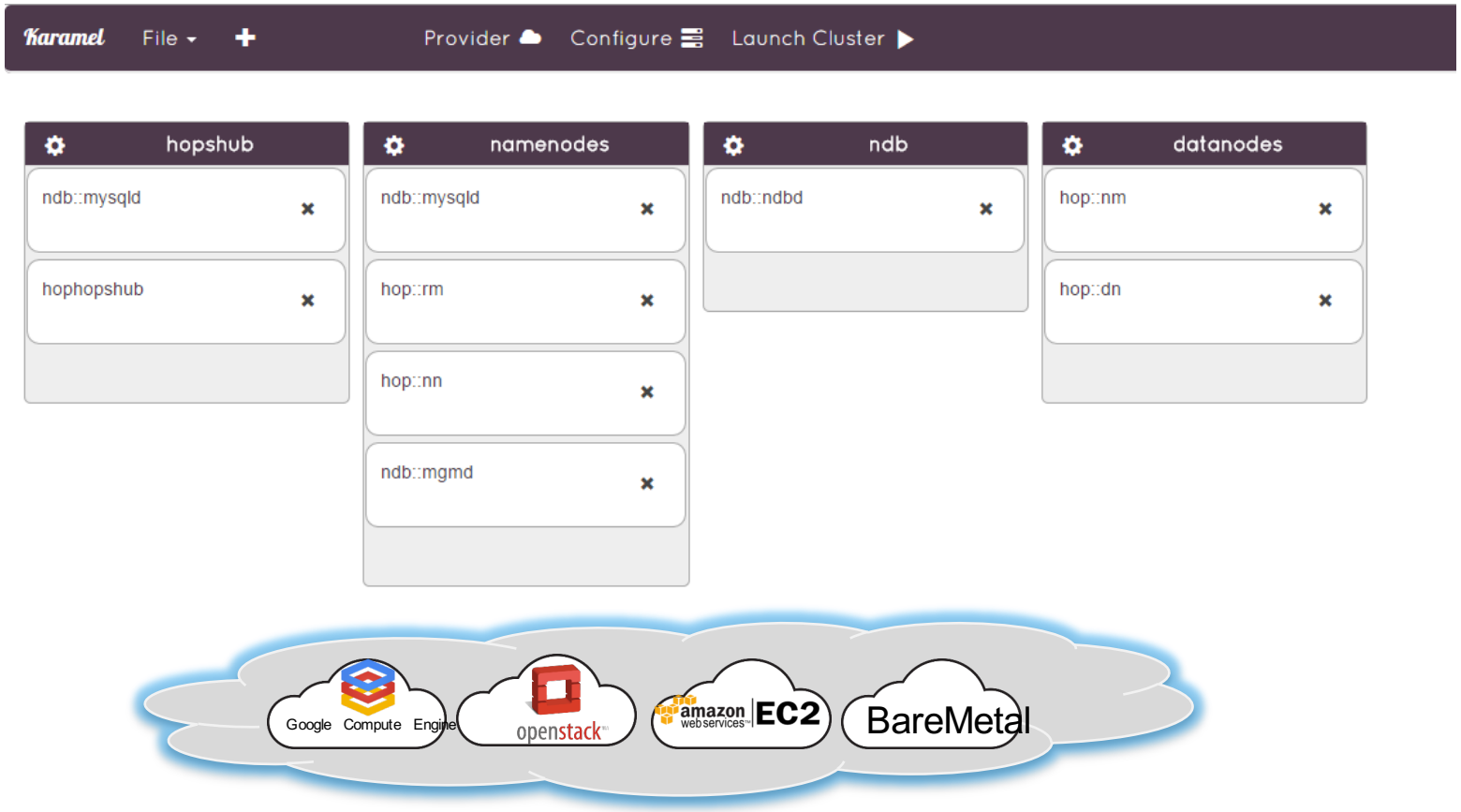
[Image from: http://gethue.com]

Debugging Spark with DrElephant

- Project-specific view of performance/correctness issues for completed Spark Jobs
- Customizable heuristics
- Doesn't show killed jobs



Karamel/Chef for Automated Installation



Demo

Summary

- Hopsworks provides first-class support for Spark-as-a-Service
  - Streaming or Batch Jobs
  - Zeppelin Notebooks

Hops

[Hadoop For Humans]

- Hopworks simplifies writing secure SparkStreaming applications with Kafka

Hops Team

Active: Jim Dowling, Seif Haridi, Tor Björn Minde, Gautier Berthou, Salman Niazi, Mahmoud Ismail, Theofilos Kakantousis, Konstantin Popov, Antonios Kouzoupis, Ermias Gebremeskel.

Alumni: Vasileios Giannokostas, Johan Svedlund Nordström, Rizvi Hasan, Paul Mälzer, Bram Leenders, Juan Roca, Misganu Dessalegn, K "Sri" Srijeyanthan, Jude D'Souza, Alberto Lorente, Andre Moré, Ali Gholami, Davis Jaunzems, Stig Viaene, Hooman Peiro, Evangelos Savvidis, Steffen Grohsschmiedt, Qi Qi, Gayana Chandrasekara, Nikolaos Stanogias, Ioannis Kerkinos, Peter Buechler, Pushparaj Motamari, Hamid Afzali, Wasif Malik, Lalith Suresh, Mariano Valles, Ying Lieu.

THANK YOU.

www.hops.io