Hadoop Ecosystem

PIG

- PIG Latin – high level language
- Runs a map reduce program
- Users can create their own user defined functions
- Mainly used for ETL
- Powerful transformation capabilities

Running pig

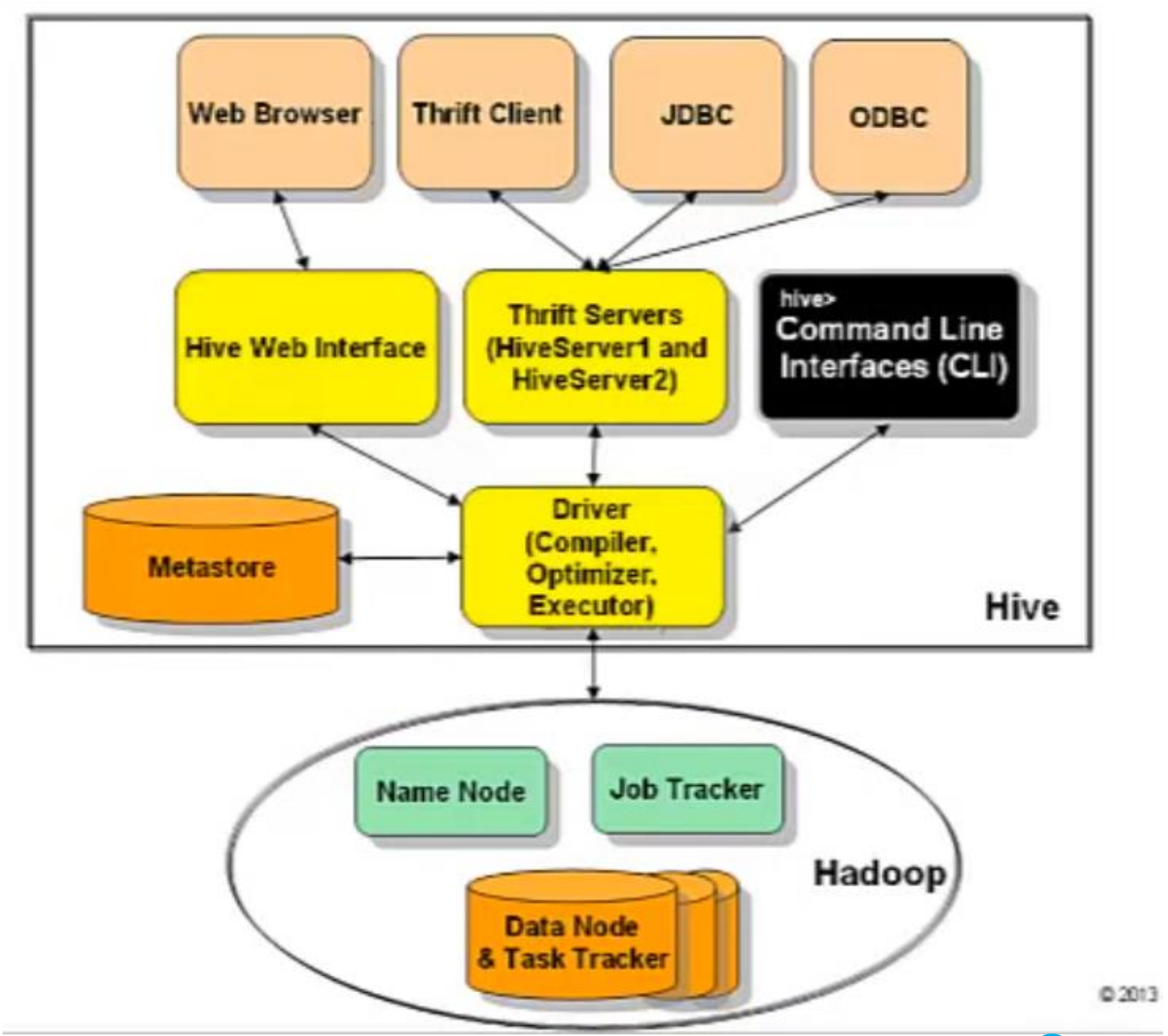
- Local mode : pig –x local
- Grunt shell : pig
- Script : pig myscript.pig

HIVE

- Hadoop warehouse (DW built on top of hadoop)
- Developed at facebook
- Currently used at fb for reporting dashboards and adhoc analysis
- Facilitates easy data summarisation, ad-hoc queries analysis of large datasets
- Provides a SQL interface (HQL)
- Runs as map reduce jobs in background

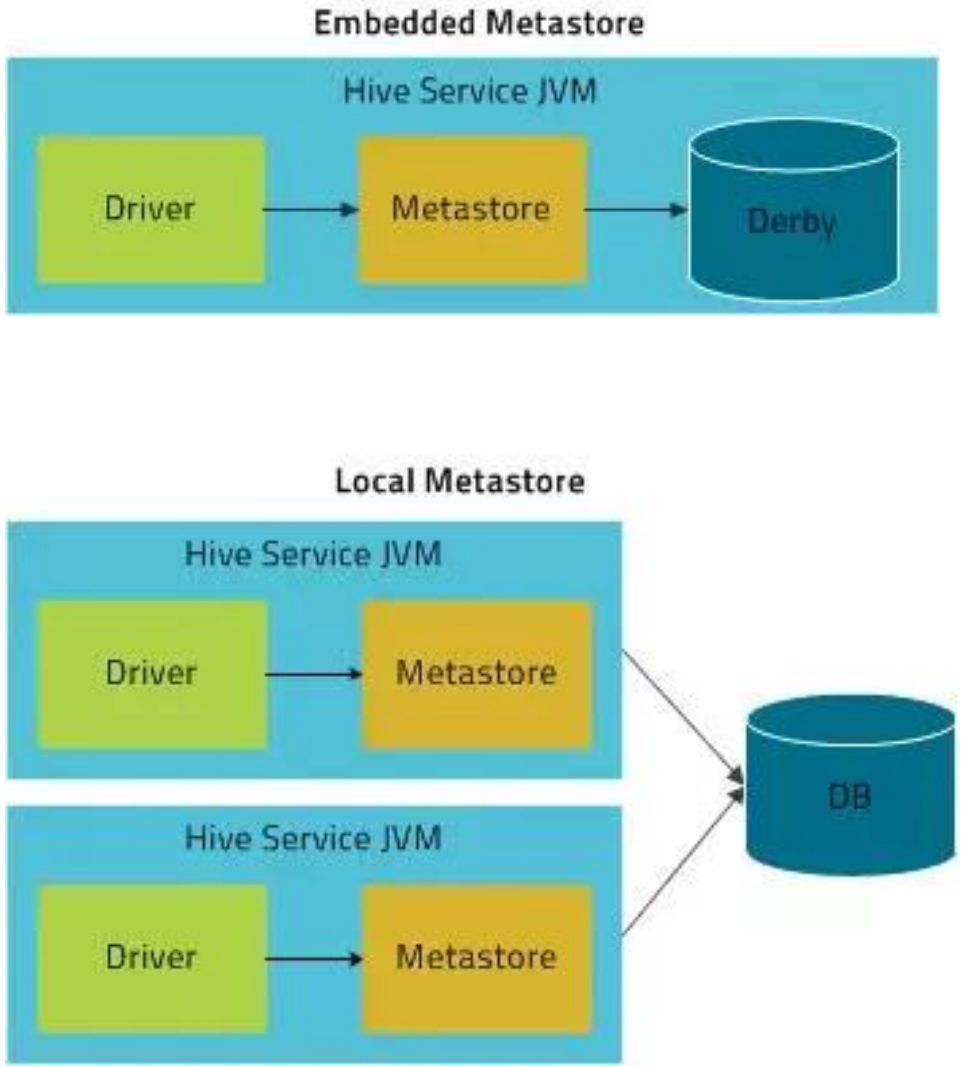
- **Metastore** - The Metastore stores the system catalog and metadata about tables, columns, partitions and so on.
- The metastore makes mapping file structure to a tabular form possible in Hive
- **Hcatalog** - HCatalog is built on top of the Hive metastore and incorporates Hive's DDL. Hcatalog provides read and write interfaces for Pig and MapReduce and uses Hive's command line interface for issuing data definition and metadata exploration commands.
- HCatalog makes it easier for users of Pig, MapReduce, and Hive, to read and write data on the grid
- **Warehouse Directory –** In hive your data is stored in the warehouse directory as configured in the hive-site.xml

Hive Components

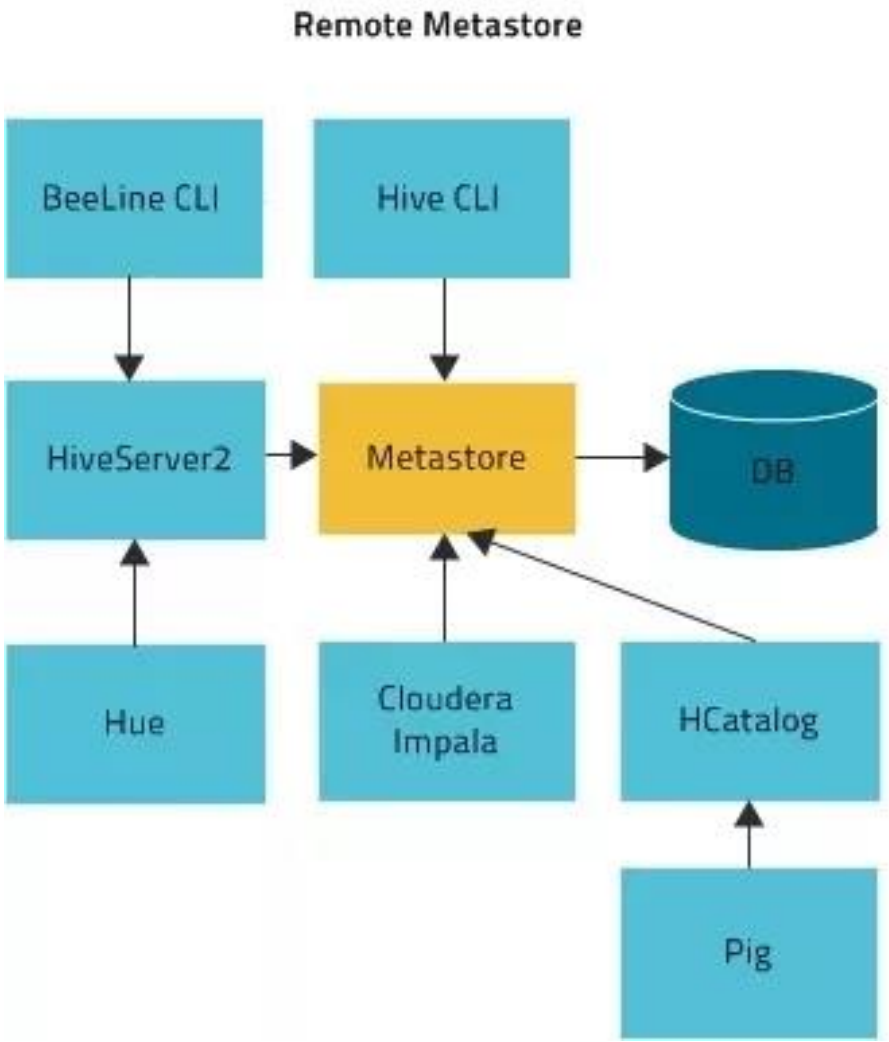


Cloudlytics

Hive metastore deployment



Hive metastore deployment



Sqoop

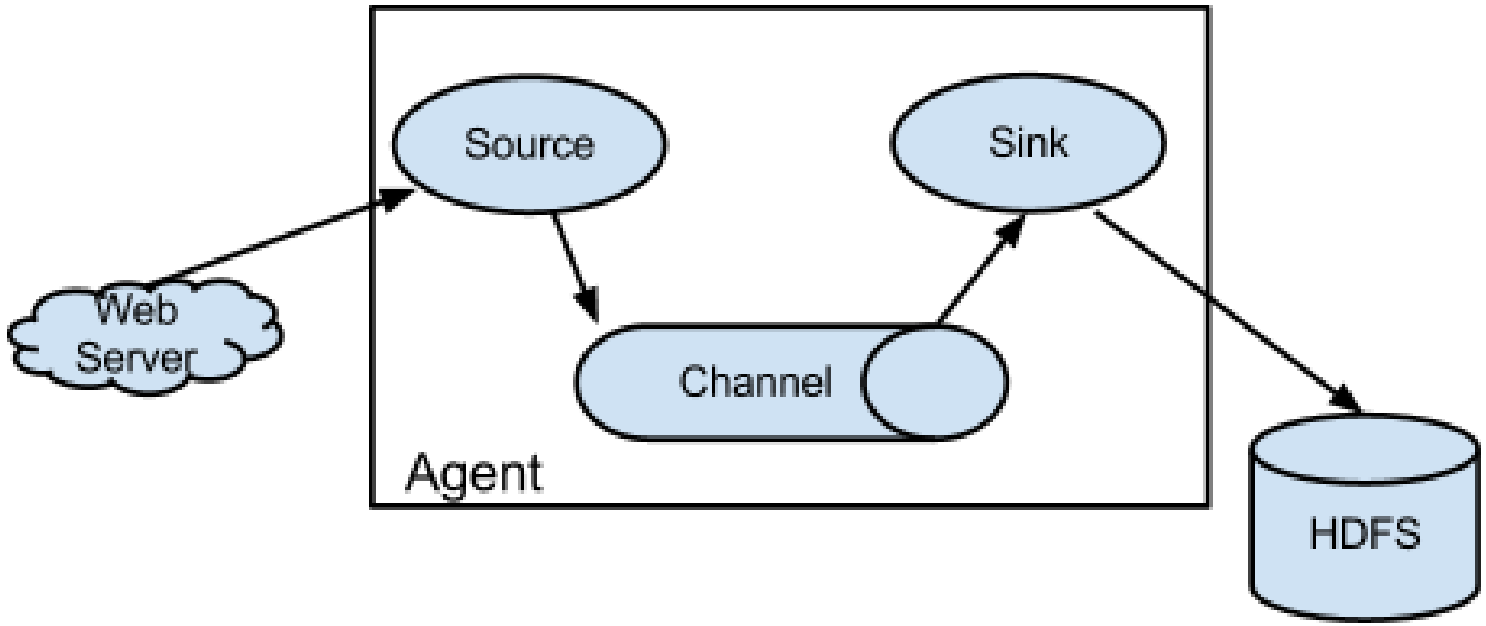
- Apache Sqoop is a tool designed for efficiently transferring bulk data between Apache Hadoop and structured datastores such as relational databases.
- Uses map reduce to import and export data

Cloudlytics

Flume

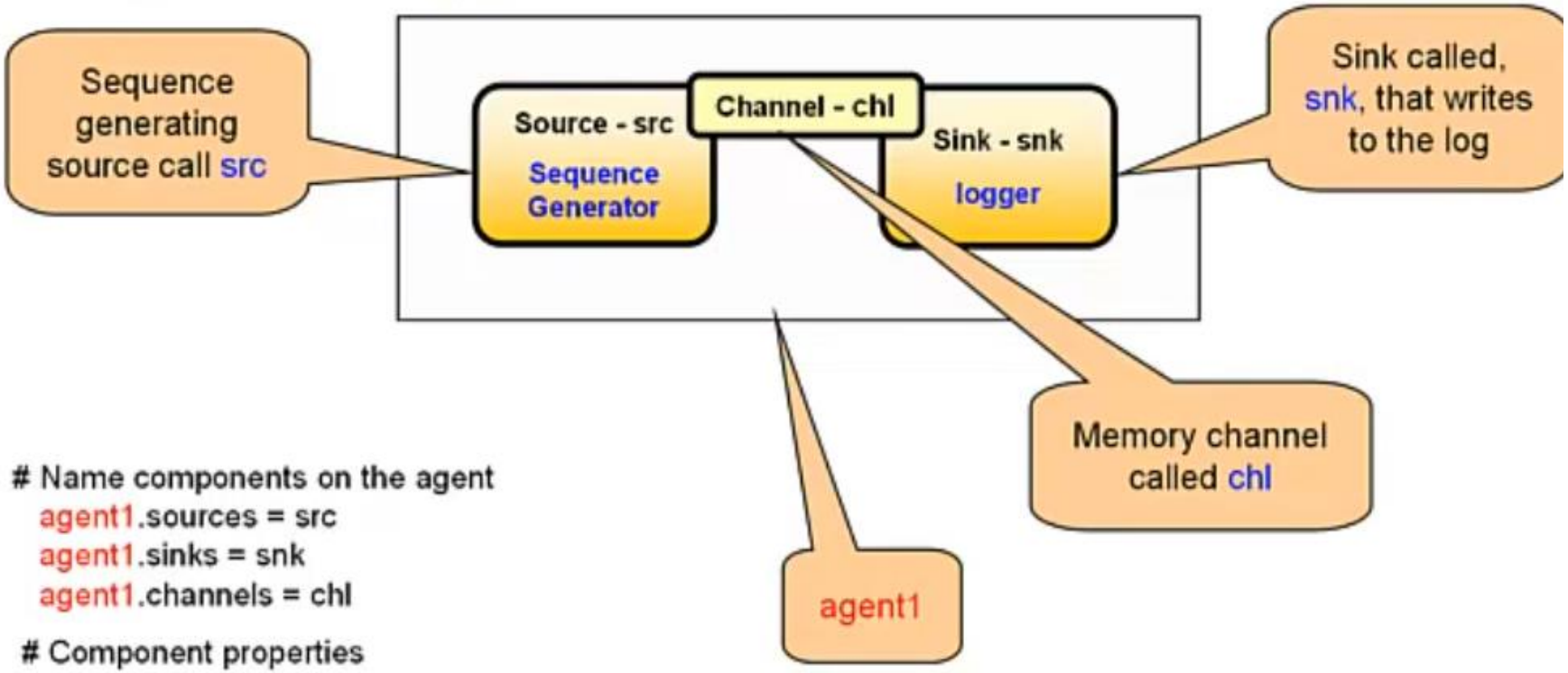
- Flume is a distributed, reliable, and available service for efficiently collecting, aggregating, and moving large amounts of log data.
- Built on concept of flows
- It has a simple and flexible architecture based on streaming data flows.

Flume architecture



Flume configuration

Configuration example




```
# Name components on the agent
  agent1.sources = src
  agent1.sinks = snk
  agent1.channels = chl

# Component properties
  agent1.sources.src.type = seq
  agent1.sinks.snk.type = logger
  agent1.channels.chl.type = memory
  agent1.channels.chl.capacity = 100

# Bind the components
  agent1.sources.src.channels = chl
  agent1.sinks.snk.channel = chl
```

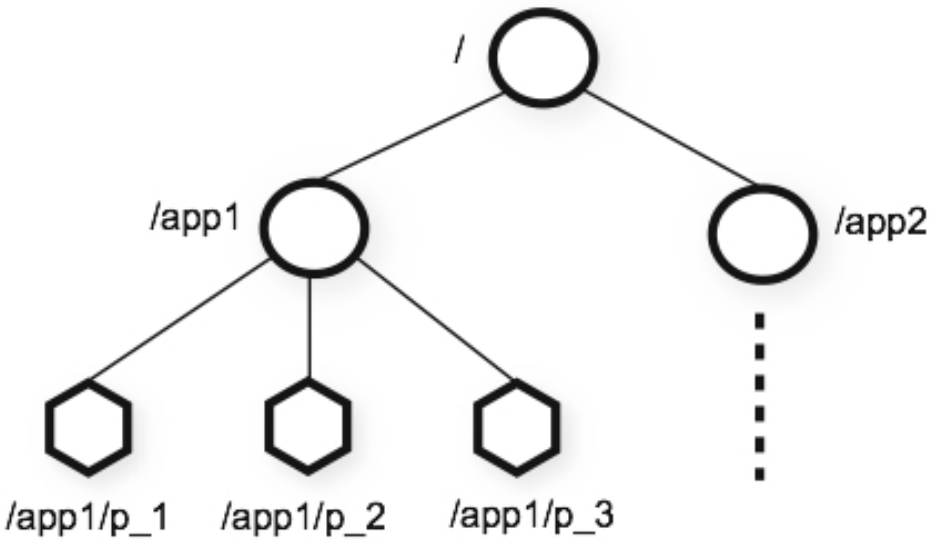
Cloudlytics

Zookeeper

- Apache ZooKeeper, is a highly available, high performance coordination service
- Apache ZooKeeper provides operational services for a Hadoop cluster. ZooKeeper provides a distributed configuration service, a synchronization service and a naming registry for distributed systems.

- Challenges with distributed systems,
  - Coordination
  - Partial failures

Data Model

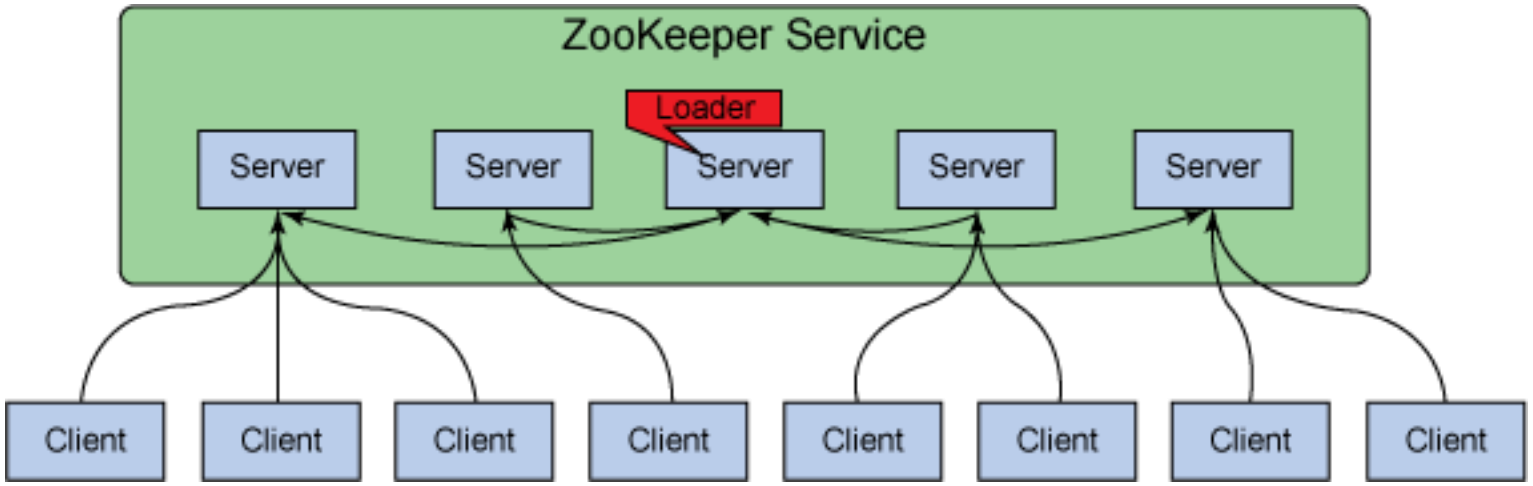


- Hierarchical namespace
- Each node in the namespace is called **znode**
- Every node in the namespace is identified by a path
- znode types – persisitent and ephemeral
- Each znode has data and can also have children

Implementation

- Zookeeper service can run in two modes : standalone mode and replicated mode
- Implementation of replicated mode uses a protocol called ***zab*** that runs in two phases,
    1. Phase 1 : Leader Election
    2. Phase 2 : Atomic broadcast

Consistency



- Sequential consistency
- Atomicity
- Single system image
- Durability
- Timeliness

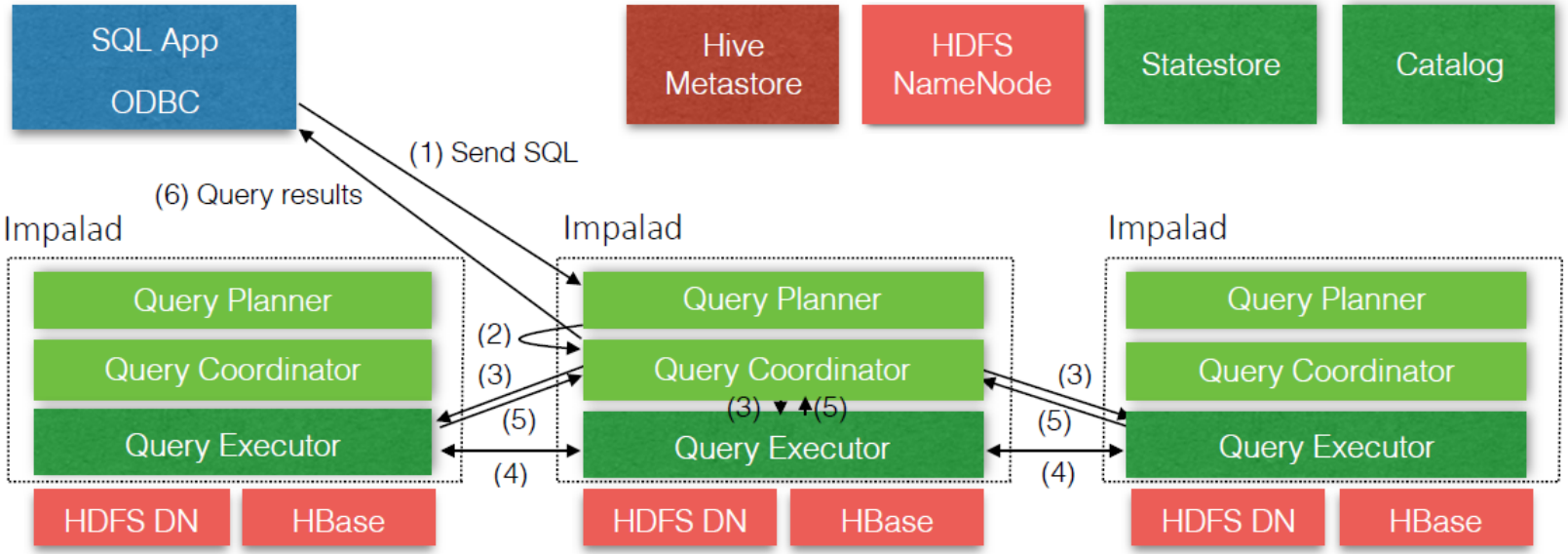
Impala

- **Cloudera Impala** is a modern, open-source MPP SQL engine architected from the ground up for the Hadoop data processing environment. Impala provides low latency and high concurrency for BI/analytic read-mostly queries on Hadoop.

- Impala integrates with the Apache Hive metastore database, to share databases and tables between both components. The high level of integration with Hive, and compatibility with the HiveQL syntax, lets you use either Impala or Hive to create tables, issue queries, load data, and so on.

- Impala's goal is to combine the familiar SQL support and multi-user performance of a traditional analytic database with the scalability and flexibility of Apache Hadoop and the production-grade security and management extensions of Cloudera enterprise.

Architecture



Resource Management

- Resource Workload management
  - Challenges – Run along with existing system
  - Llama and YARN
  - Admission Control

THANK YOU