ISIT312 Big Data Management

Hive

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Hive

Outline

Hive ? What is it ?

Hive is a software system that provides tabular view of data stored in HDFS and SQL-like methods for manipulating data in HDFS

Apache Hive project started at Facebook in 2010 to provide a high-level interface to HDFS

Contrary to Pig, Hive provides SQL-like abstractions on top of MapReduce

A language called HQL (Hive Query Language) implements SQL-92 standard (almost)

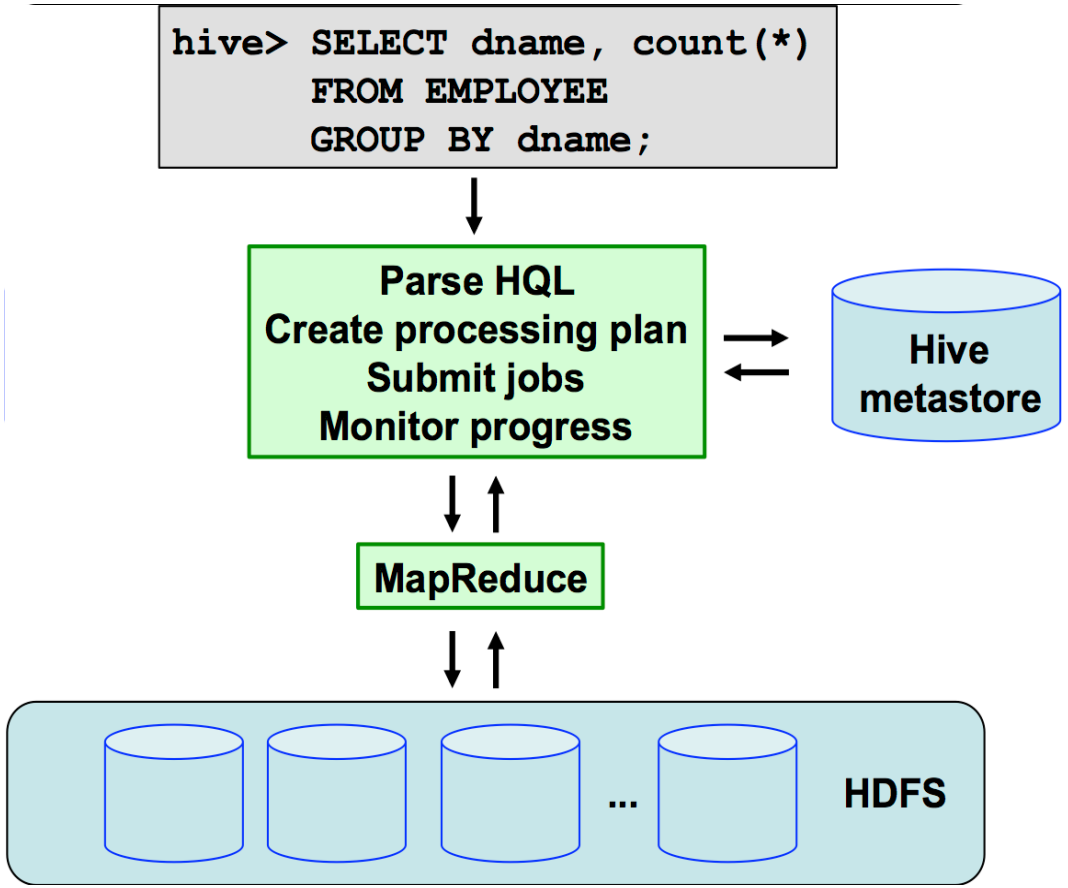
HQL provides a tabular view of data and it can be used to access data located in HDFS

Hive frees data analysts from Java MapReduce programming skills (not completely)

HQL statements are parsed by the Hive client and translated into a sequence of Java MapReduce operations, which are later on processed by Hadoop

Hive ? What is it ?

The results of processing by Hadoop are returned to the client or saved in HDFS



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Deployment and Configuration

Hive is available on all of commercial distributions of Hadoop and on Hadoop installation on our virtual machine

A relational embedded database system Derby is used for implementation of metastore

It is possible to use other relational database systems fror implementation of metastore like for example MySQL

To use Hive Hadoop and HDFS must be "up and running"

A top level view of data provided by Hive consists of databases and tables

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Metastore

Metastore contains the mappings of tables to the directory locations in HDFS

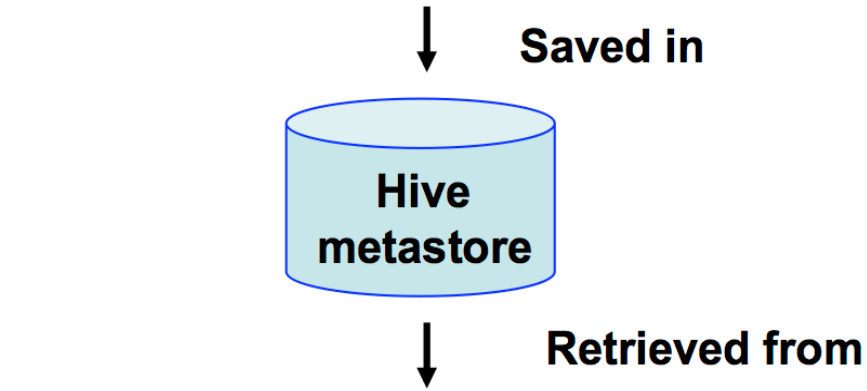
Metastore is a relational database read and written by Hive client

Metastore also includes the input and output formats for the files represented by the table objects, e.g. CSV InputFormat, etc, and SerDes (Serialization/ Deserialization) functions

Input and output formats for the files and functions are used by Hive to extract records and fields from the files

Metastore

```
hive> CREATE TABLE DEPARTMENT
      ( dname string,
        budget bigint,
        cdate date );
```




```
hive> SELECT dname
      FROM DEPARTMENT
      WHERE budget > 100000;
```

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Interfaces

Hive provides Command Line Interface (CLI) that accepts and parses HQL commands

Hive provides JDBC/ODBC connector (drivers) to work with other tools such as:

- beeline (CLI),
- Oracle SQL Developer (GUI),
- Talend Open Studio (data extraction, transformation, loading, and integration tools),
- Jasper reports, QlikView (usiness intelligence reporting tools),
- Microsoft Excel 2013 (data analysis tools), and Tableau (data visualization tools)

Hive provides a storage handler mechanism to integrate with HBase

HUE (Hadoop User Experience) provides a unified web interface to HDFS and Hive in an interactive environment

HCatalog provides metadata management system for Hadoop, Pig, Hive, and MapReduce

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HQL

HQL consists of Data Definition Language, Data Selection and Scope Language, Data Manipulation Language, and Data Aggregation and Sampling Language

Data Definition Language is used for creating, deleting, and altering schema objects like database tables, views, partitions, and buckets

Data Selection and Scope Language is used for querying data, linking data, and limiting the data ranges or scopes

Data Manipulation Language is used for exchanging, moving, sorting, and transforming data

Data Aggregation and Sampling Language is used for exchanging, moving, sorting, and transforming data

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Hive versus relational DBMS

Similarities

- Tabular view of data objects in HDFS
- Directories and files viewed as tables
- Types of columns in tables
- Access to tables through HQL very similar to SQL
- API interface the same as JDBC programming interface

Differences

- Load and read-only data management system based on implementation of HDSF
- It is still possible to access data visible in tabular format in Hive directly through HDFS
- `UPDATE` supported as coarse-grained transformation instead of fine-grained transformation in relational DBMSs
- No transaction processing system
- No verification of consistency constraints, e.g. primary keys, foreign keys, domains constraints, etc

References

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Lee D., Instant Apache Hive essentials how-to: leverage your knowledge of SQL to easily write distributed data processing applications on Hadoop using Apache Hive, Packt Publishing Ltd. 2013 (Available through UOW library)

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