

Introduction to Apache Hive (and HCatalog)

Mark Grover

github.com/markgrover/nyc-hug-hive



Me!

- Contributor to Apache Hive
- Section Author of O'Reilly's Programming Hive book
- Software Developer at Cloudera
- @mark_grover
- mgrover@cloudera.com
- <https://github.com/markgrover/nyc-hug-hive>

Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- HCatalog
- Demo!

Preamble

- This is a remote talk
- Feel free to ask questions any time!

Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- HCatalog
- Demo!

Hive

- Data warehouse system for Hadoop
- Enables Extract/Transform/Load (ETL)
- Associate structure with a variety of data formats
 - Logical Table -> Physical Location
 - Logical Table -> Physical Data Format Handler (SerDe)
- Integrates with HDFS, HBase, MongoDB, etc.
- Query execution in MapReduce

Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- HCatalog
- Demo!

Why use Hive?

- MapReduce is catered towards developers
- Run SQL-like queries that get compiled and run as MapReduce jobs
- Data in Hadoop even though generally unstructured has some vague structure associated with it
- Benefits of MapReduce + HDFS (Hadoop)
 - Fault tolerant
 - Robust
 - Scalable

Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- HCatalog
- Demo!

Hive features

- Create table, create view, create index - DDL
- Select, where clause, group by, order by, joins
- Pluggable User Defined Functions - UDFs (e.g. from_unixtime)
- Pluggable User Defined Aggregate Functions - UDAFs (e.g. count, avg)
- Pluggable User Defined Table Generating Functions - UDTFs (e.g. explode)

Hive features

- Pluggable custom Input/Output format
- Pluggable Serialization Deserialization libraries (SerDes)
- Pluggable custom map and reduce scripts

What Hive does NOT support

- OLTP workloads - low latency
- Correlated subqueries
- Not super performant with small amounts of data
 - How much data do you need to call it “Big Data”?

Other Hive features

- Partitioning
- Sampling
- Bucketing
- Various join optimizations
- Integration with HBase and other storage handlers
- Views – Unmaterialized
- Complex data types – arrays, structs, maps

Connecting to Hive

- Hive Shell
- JDBC driver
- ODBC driver
- Thrift client

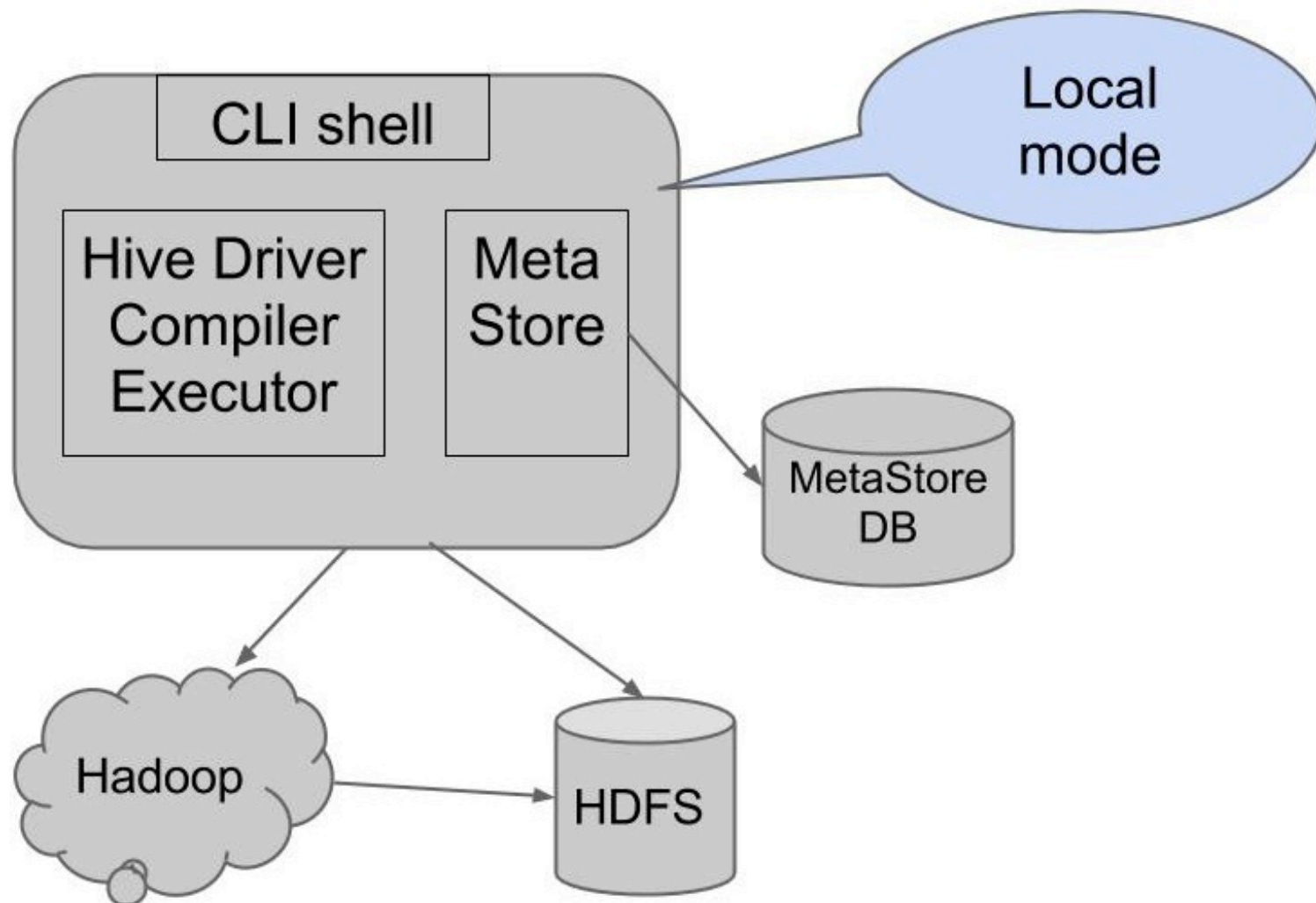
Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- HCatalog
- Demo!

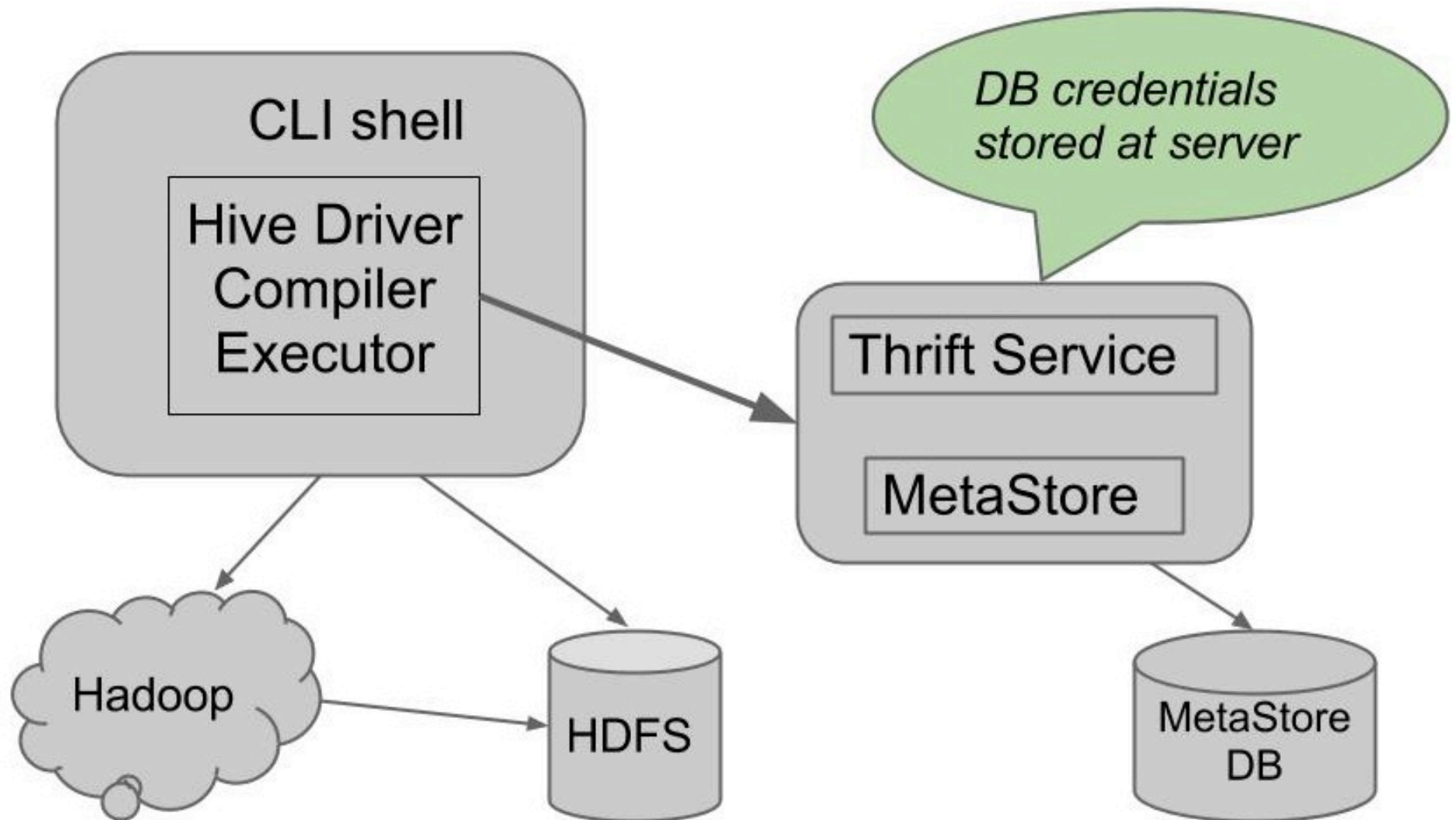
Hive metastore

- Backed by RDBMS
 - Derby, MySQL, PostgreSQL, etc. supported
- Default Embedded Derby
 - Not recommend for anything but a quick Proof of Concept
- 3 different modes of operation:
 - Embedded Derby (default)
 - Local
 - Remote

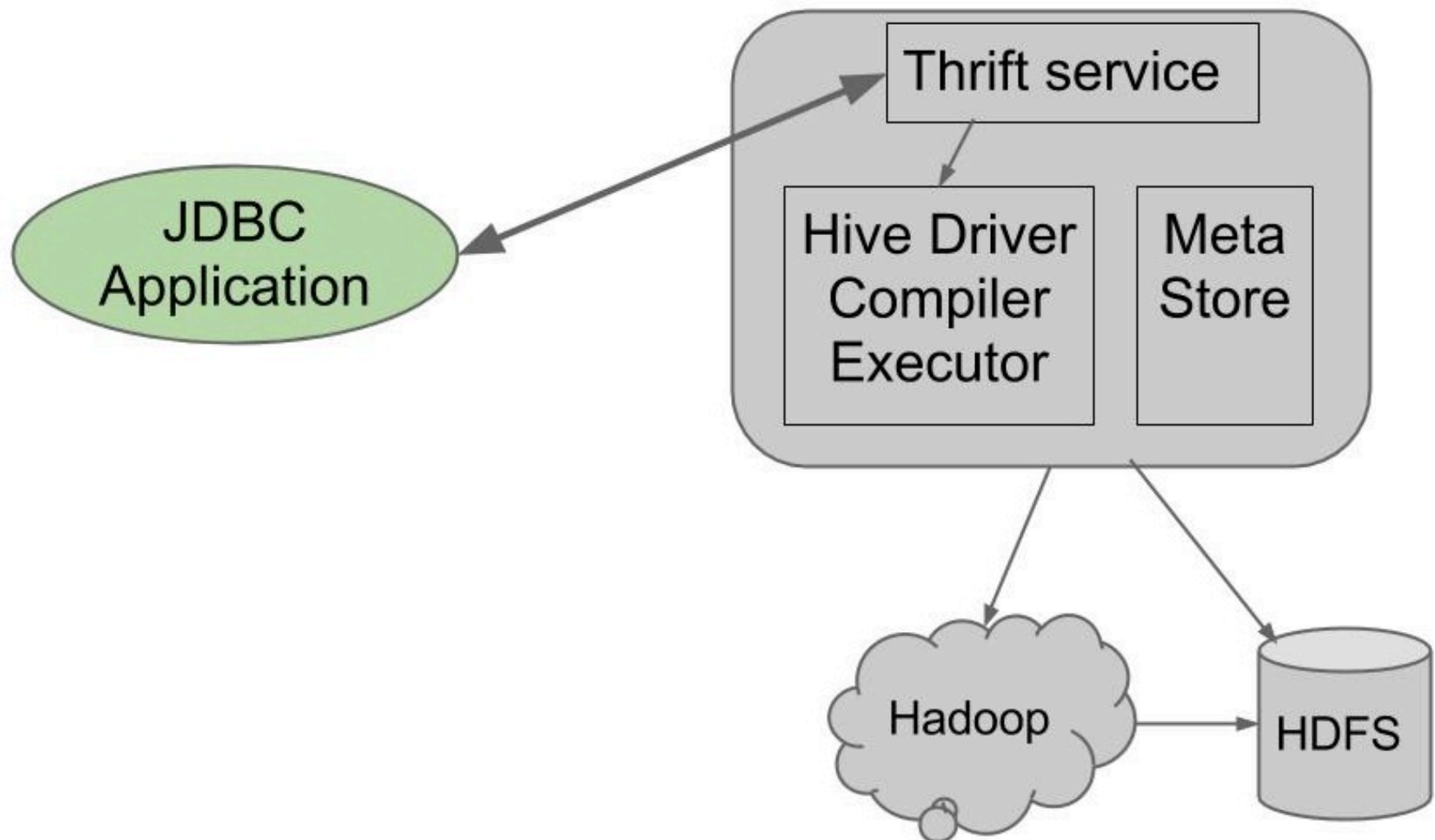
Hive architecture



Hive Remote Mode



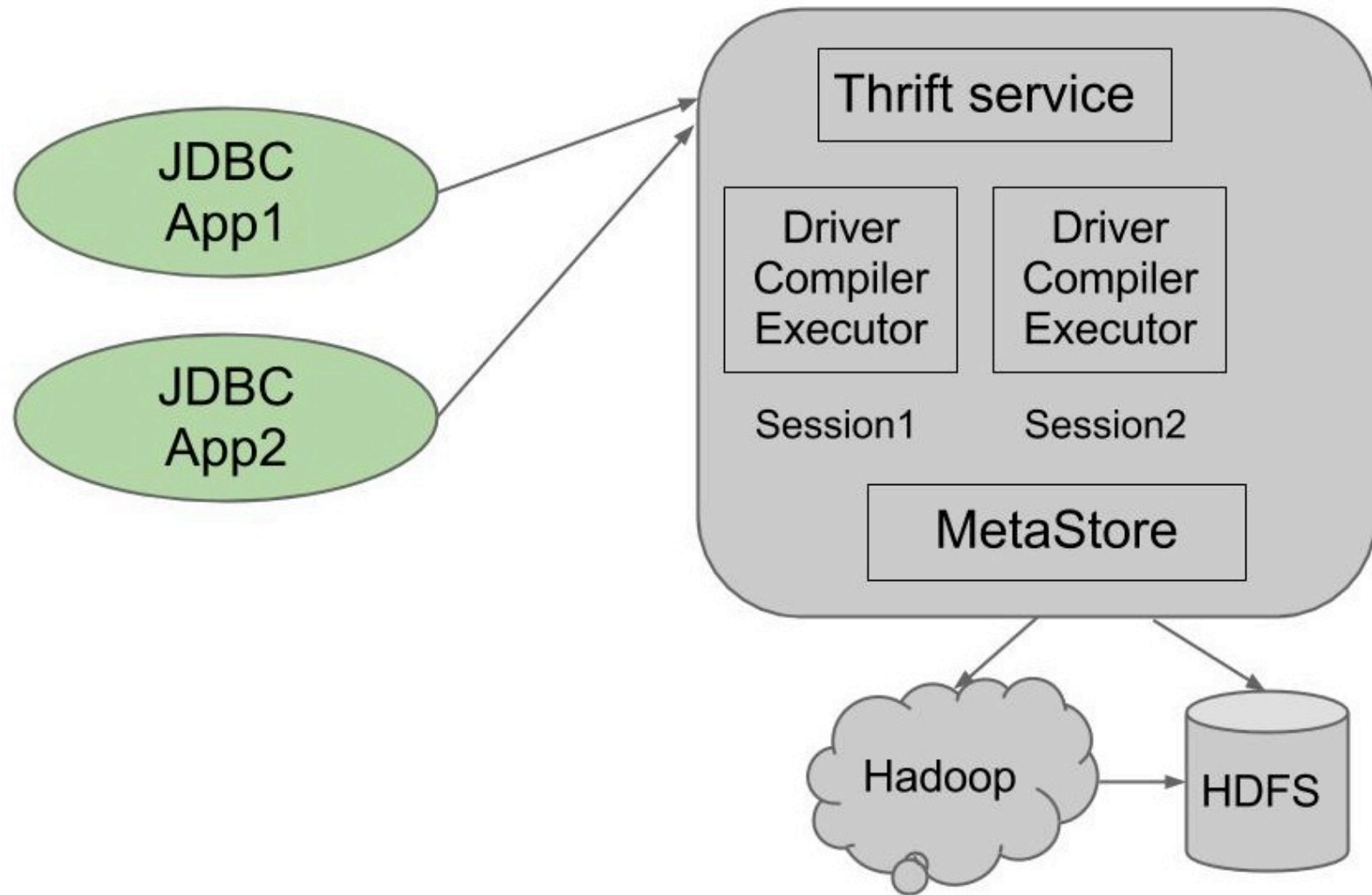
Hive server



Problems with Hive Server

- No sessions/concurrency
- Essentially need 1 server per client
- Security
- Auding/Logging

Hive server 2



Hive architecture

- Compiler
 - Parser
 - Type checking
 - Semantic Analyzer
 - Plan Generation
 - Task Generation

Hive architecture

- Execution Engine
 - Plan
 - Operators
 - SerDes
 - UDFs/UDAFs/UDTFs
- Metastore
 - Stores schema of data
 - HCatalog

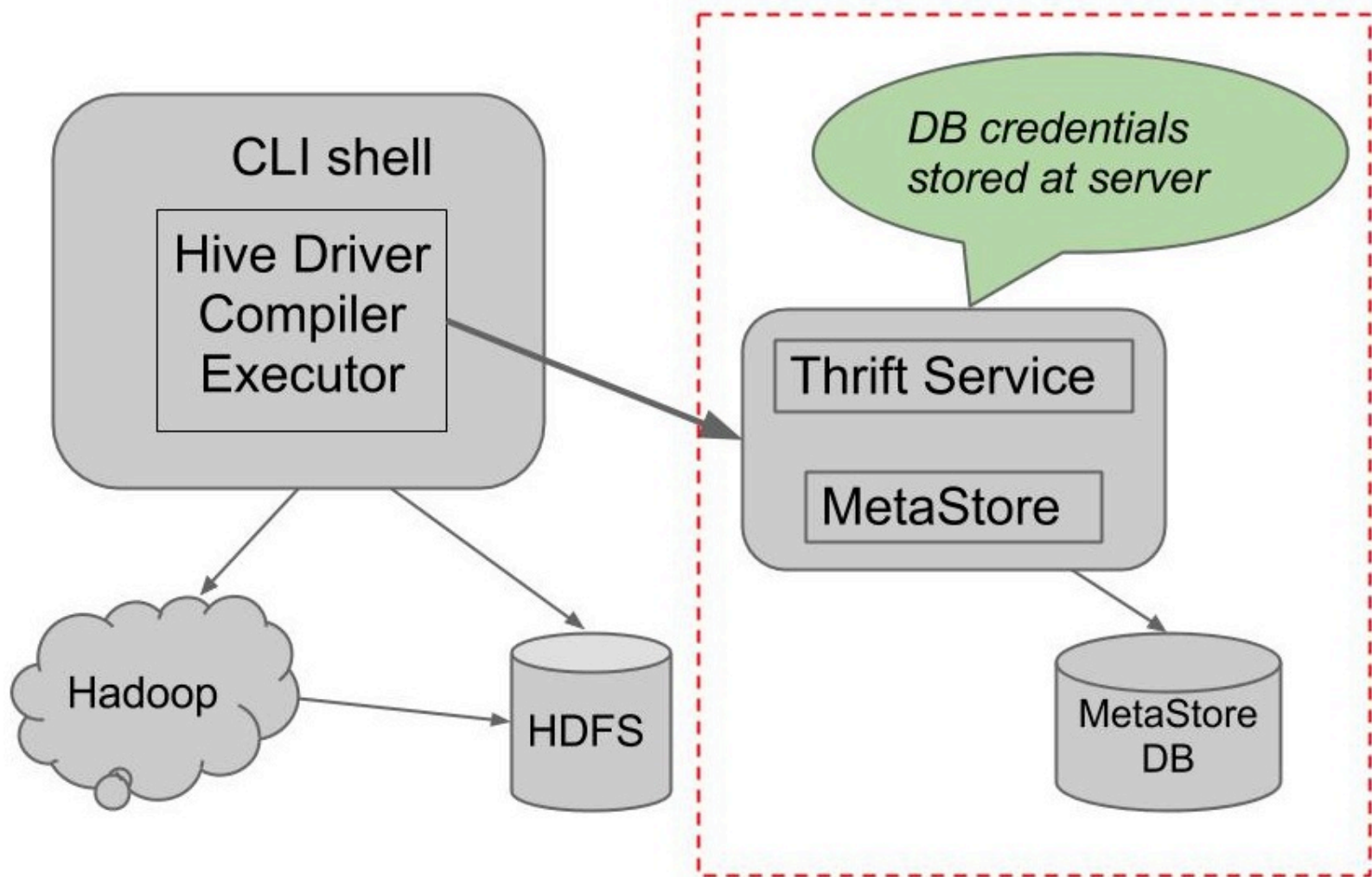
Architecture Summary

- Use remote metastore service for sharing the metastore with HCatalog and other tools
- Use Hive Server2 for concurrent queries

Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- **HCatalog**
- Demo!

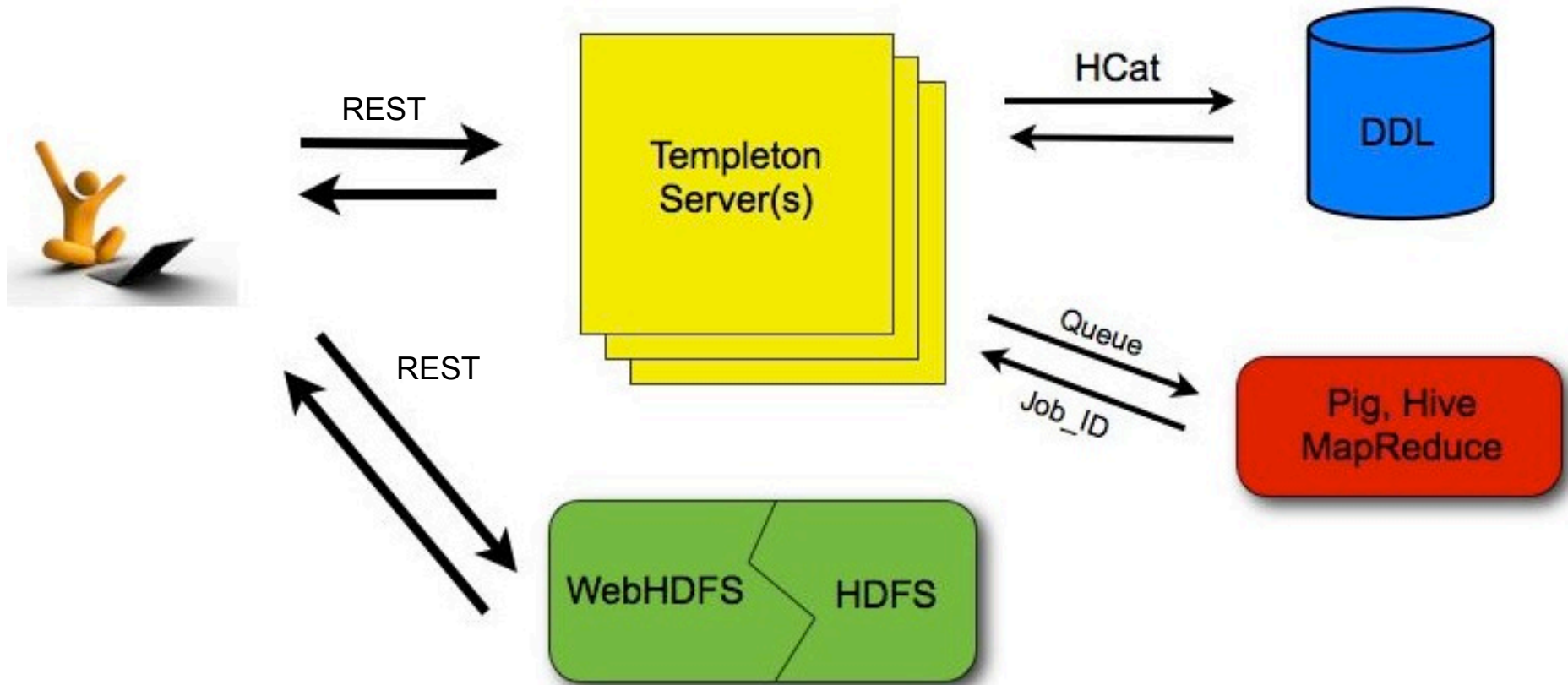
Hive Metastore Remote Mode



HCatalog

- Sub-component of Hive
- Table and storage management service
- Public APIs and webservice wrappers for accessing metadata in Hive metastore
- Metastore contains information of interest to other tools (Pig, MapReduce jobs)
- Expose that information as REST interface
- WebHCat: Web Server for engaging with the Hive metastore

WebHCat



Agenda

- What is Hive?
- Why use Hive?
- Hive features
- Hive architecture
- HCatalog
- Demo!

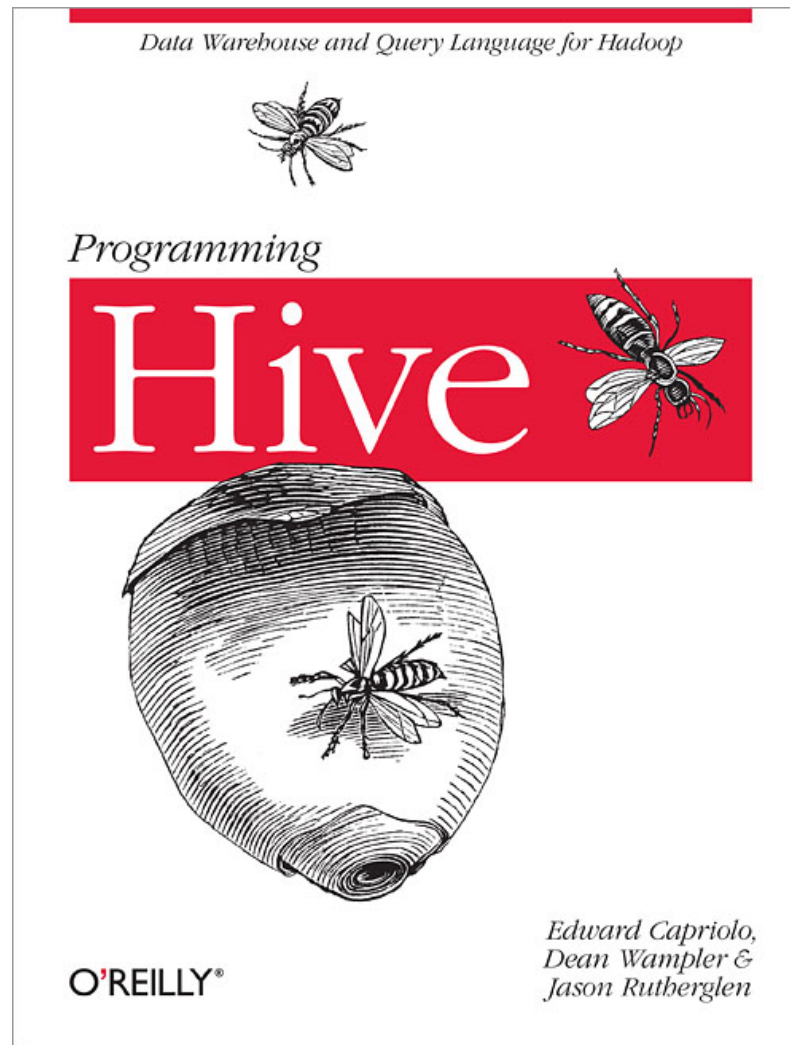
Applications of Hive

- Web Analytics
- Retail
- Healthcare
- Spam detection
- Data Mining
- Ad optimization
- ETL workloads

How to install Hive

- Download Apache Hive tarball
- Use Apache Bigtop packages
- Use a Demo VM

Want to learn more about Hive?



Contact info

@mark_grover

github.com/markgrover

linkedin.com/in/grovermark

mgrover@cloudera.com