

# **Kylin On Druid Storage**

## What Kylin On Druid Storage

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Kylin On Druid Storage means using Druid instead of HBase as Kylin storage engine.

## Why Kylin On Druid Storage

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The issues for Kylin On HBase Storage:

1. Rowkey is the primary index, no secondary index so far
2. HBase is a key-value instead of a columnar storage

Why Kylin On Druid Storage:

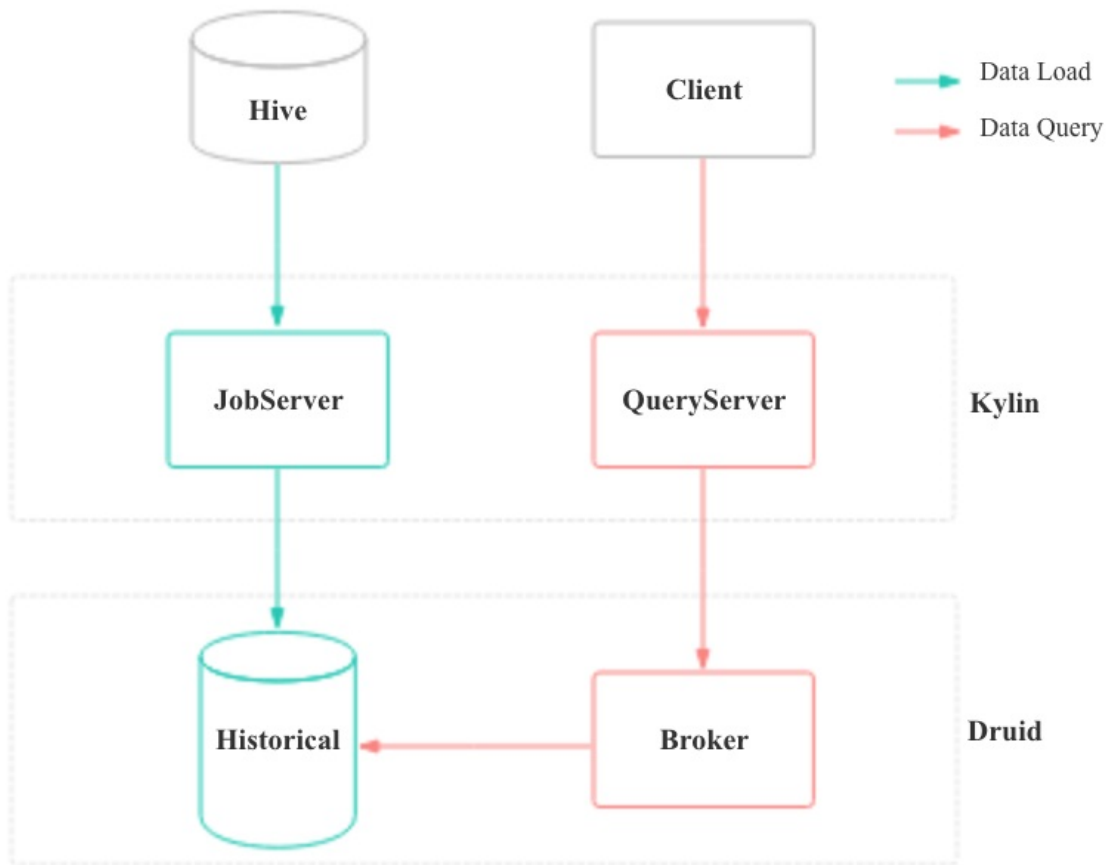
1. Druid Storage is a columnar storage
2. Druid Storage supports inverted indexes
3. Druid Storage has a good aggregate operators implementation

In a word, Druid Storage has good Scan, Filter, Aggregate performance.

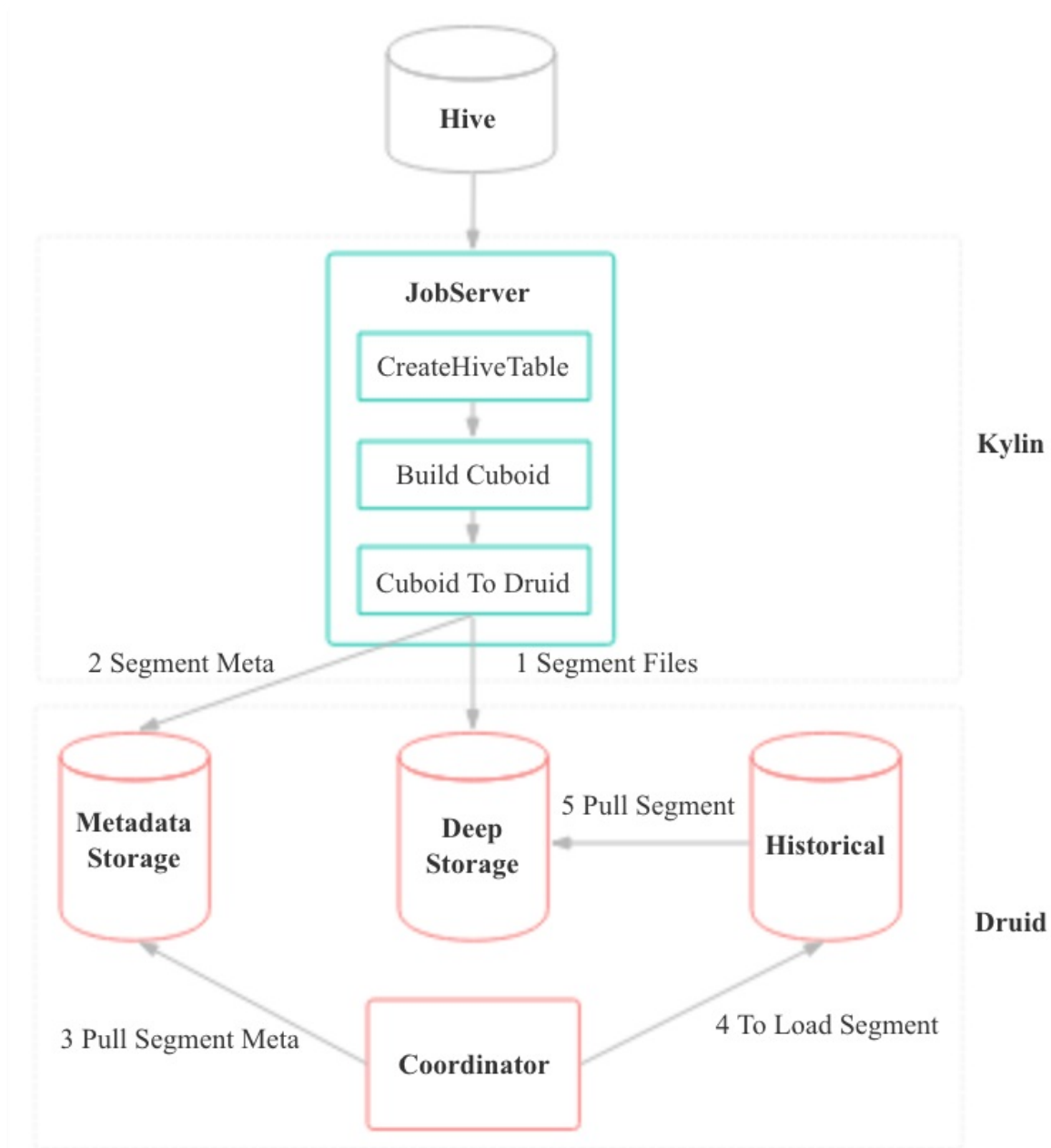
## How Kylin On Druid Storage

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In short, we only need to replace HBase with Druid Storage based on Kylin plugin architecture. The following is a simplified Kylin On Druid architecture picture.



## 1 Data Load



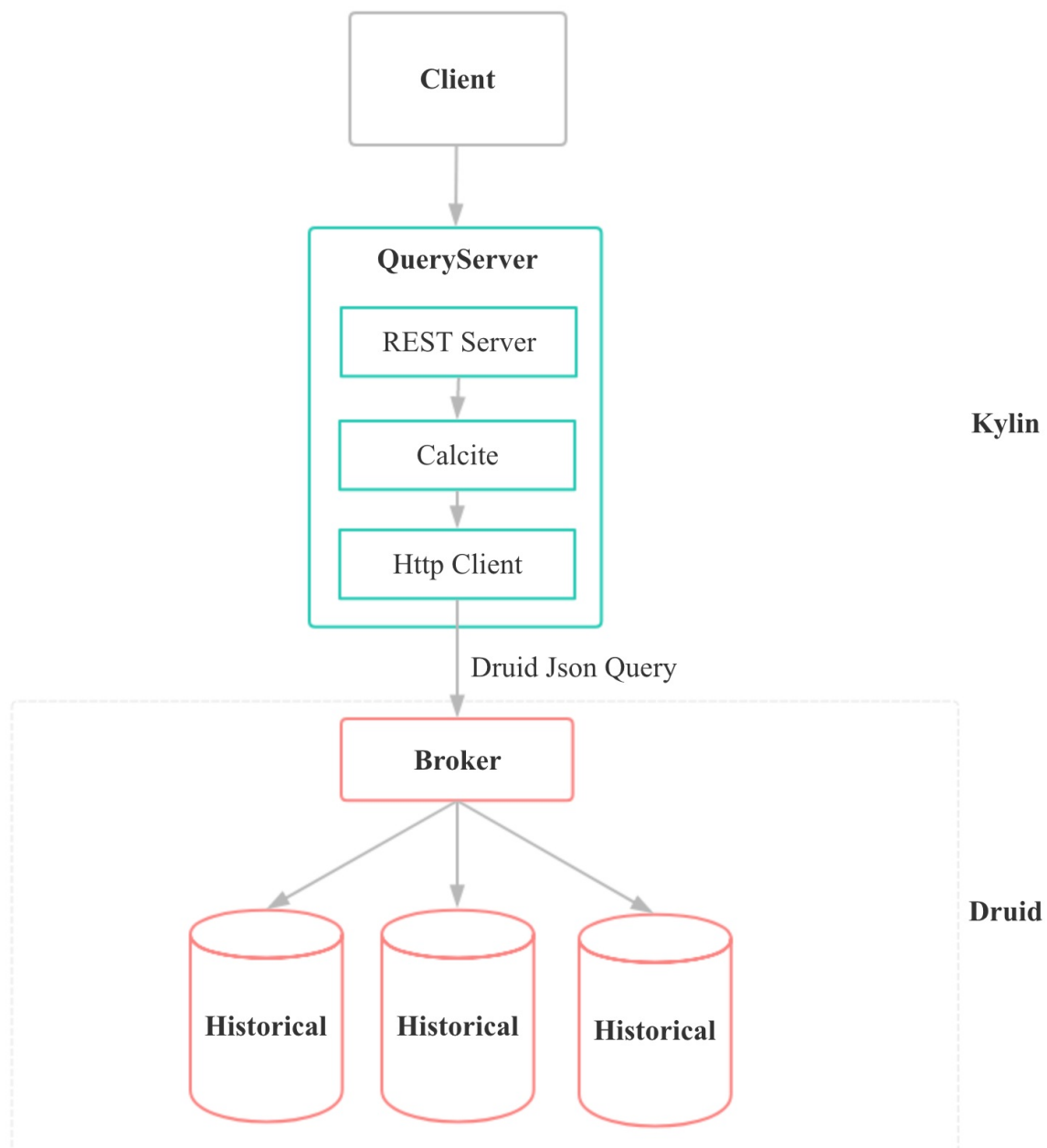
The flow for Kylin on Druid Storage Cube build:

1. As Kylin on HBase, we need to generate all cuboids firstly
2. As Convert cuboids to HFile in Kylin on HBase, we need to convert cuboids to Druid segments
3. Publish Druid segments metadata to Druid metadata store (Currently, we only support mysql metadata store)
4. (Druid internal flow) Druid Coordinator pull segments metadata from metadata store periodically, when Coordinator found a new

segment, Coordinator will create some temporary information about the new segment under load queue path of the Historical

5. (Druid internal flow) Druid Historical pull segment from the deep storage and begin servicing it

## 2 Data Query



When receive a query, we firstly convert the Kylin SQL to Druid query JSON, and then request Druid Broker by http.

### 3 The data schema mapping

	Dimensions			Measures		
	Year	City	Version	Price	Cost	Profit
Kylin	2016	beijing	1	50	20	30
	2016	shanghai	2	90	50	40
	2017	beijing	1	80	50	30

	Cuboid	Year	City	Version	Price	Cost	Profit
	00000111	2016	beijing	1	50	20	30
Druid	00000111	2016	shanghai	2	90	50	40
	00000111	2017	beijing	1	80	50	30

The data schema mappings from Kylin to Druid are following:

1. Kylin Cube -> Druid DataSource
2. Kylin Segment -> Druid Segment
3. Kylin Dimension -> Druid Dimension (Kylin Cuboid as a single Druid Column)
4. Kylin Measure -> Druid Measure (We need to implement Kylin peculiar measures in Druid, such as Kylin extend column measure, Kylin precisely count distinct measure)
5. Kylin Partition Date column -> Druid timestamp column

### 4 The Change for Cube building

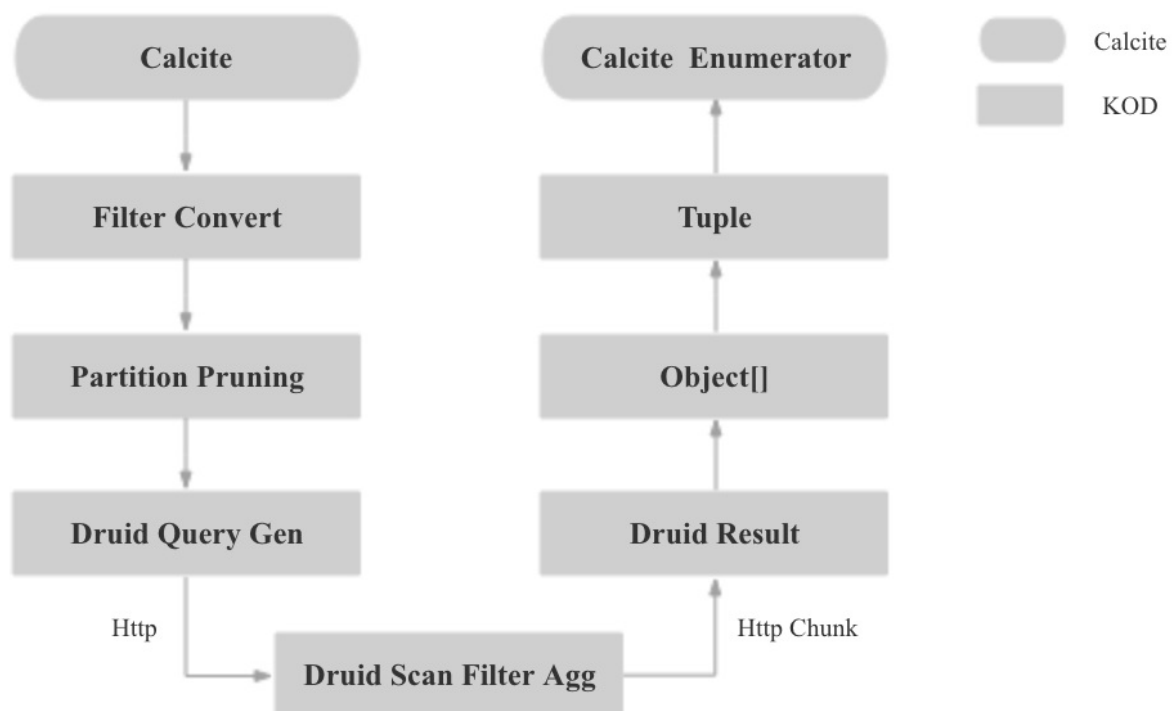
we need to add the following steps:

1. **CalculateShardsStep**: calculate and save cuboid->shards map

based on cuboid size stats

2. **UpdateDruidTierStep**: support business isolation with Druid Tier
3. **ConvertToDruidJob**: convert cuboids to Druid Segments, and save Druid Segments to HDFS.
4. **LoadDruidSegmentStep**: publish Druid segments metadata to Druid metadata store and wait segment load into Druid Historical

## 5 The Change for Cube Query



1. Get the Calcite query plan firstly
2. Convert Kylin filters to Druid filters
3. Partition Pruning
4. Construct Druid query JSON with cube, dimensions, measures, filters info
5. Request Druid Broker by http
6. Receive Druid response by http chunk
7. Convert Druid query result to tuples
8. Calcite Enumerator iterate over the tuples

## 6 Others

We also need to make following tools and operations support Druid Storage Engine:

1. Cube Migration tool
2. Storage Cleanup tool
3. Cube purge, drop, retention operations

## Kylin on Druid Storage Features

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1. Fully compatible Kylin: SQL, web, and so on
2. Support partition pruning
3. Support storage business isolation
4. When query, needn't load dictionary
5. When only build base cuboid, **Kylin On Druid Storage query performance is two orders of magnitude better than Kylin On HBase**

## Some Limitations We have known

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1. Convert Cuboids to Druid Segments need more memory than Convert Cuboids to HFile
2. For the same cuboids definition, Kylin On Druid Storage maybe need more storage space
3. For single ultra high cardinality column point query case, Kylin on HBase could do better than Kylin on Druid Storage

## Source Code

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<https://github.com/apache/kylin/commit/31cacb5cf7b5c5141d0928a239>