Cursors in Apache Phoenix

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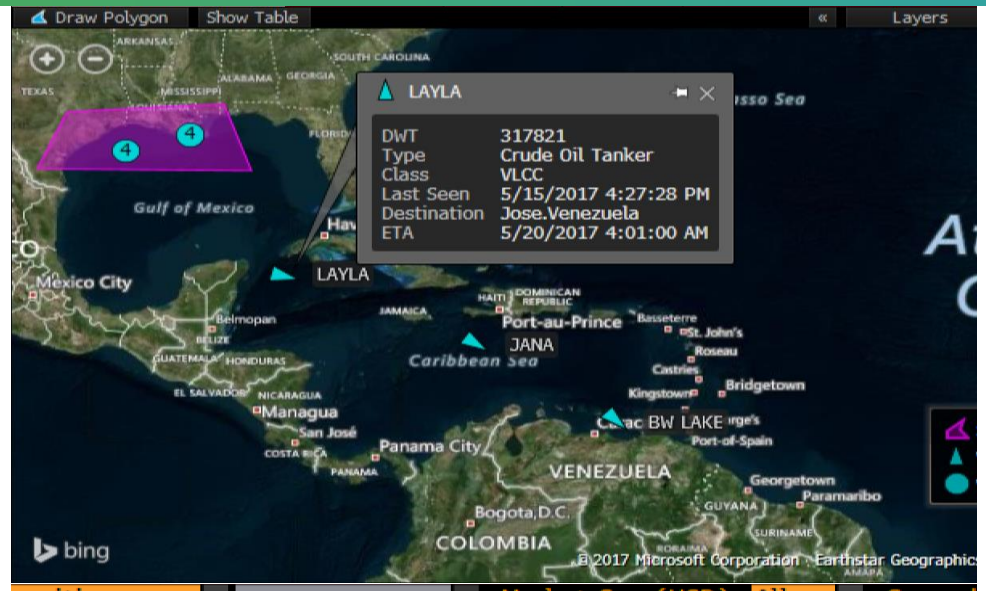

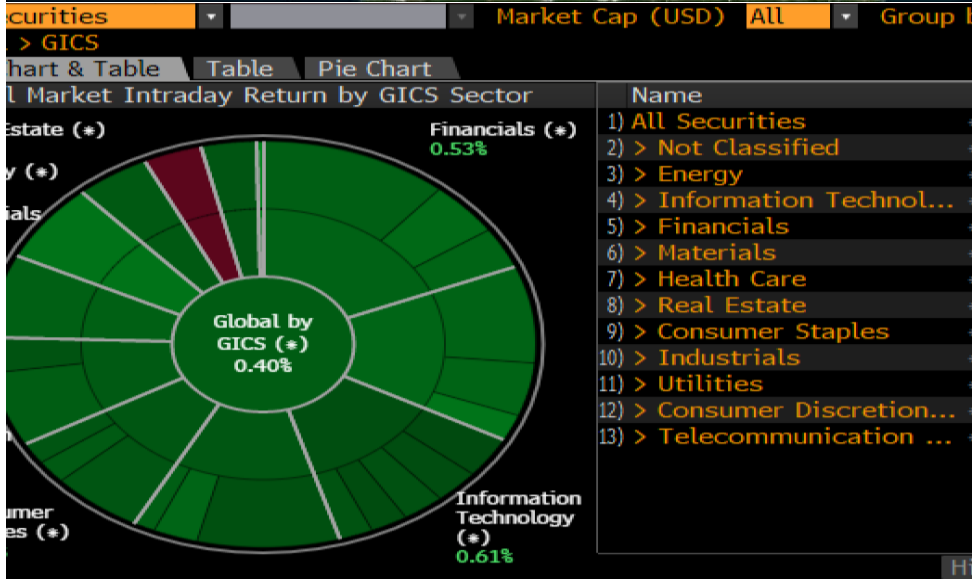

Reality of working with data

- The data model changes over time
- Users querying the data model don’t necessarily change
- Alternate query patterns for the same dataset
- Data infrastructure usage needs to be simple

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Apache Phoenix

- Recipes of best practices for using HBase over a familiar SQL'ish grammar

- It is so much more than SQL
  - User defined functions for push-down
  - Secondary indices
  - Statistics collections, optimizations based on heuristics
  - ORM libraries
  - JDBC, ODBC support with Query servers
  - Integrations: Spark, Kafka, MR and others

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Extending Apache Phoenix

- A very active and helpful community
- Our ongoing work
  - Apache Calcite
  - Distributed tests and nightly performance build
  - Multi-DC replication
  - Deep paging with cursor implementation

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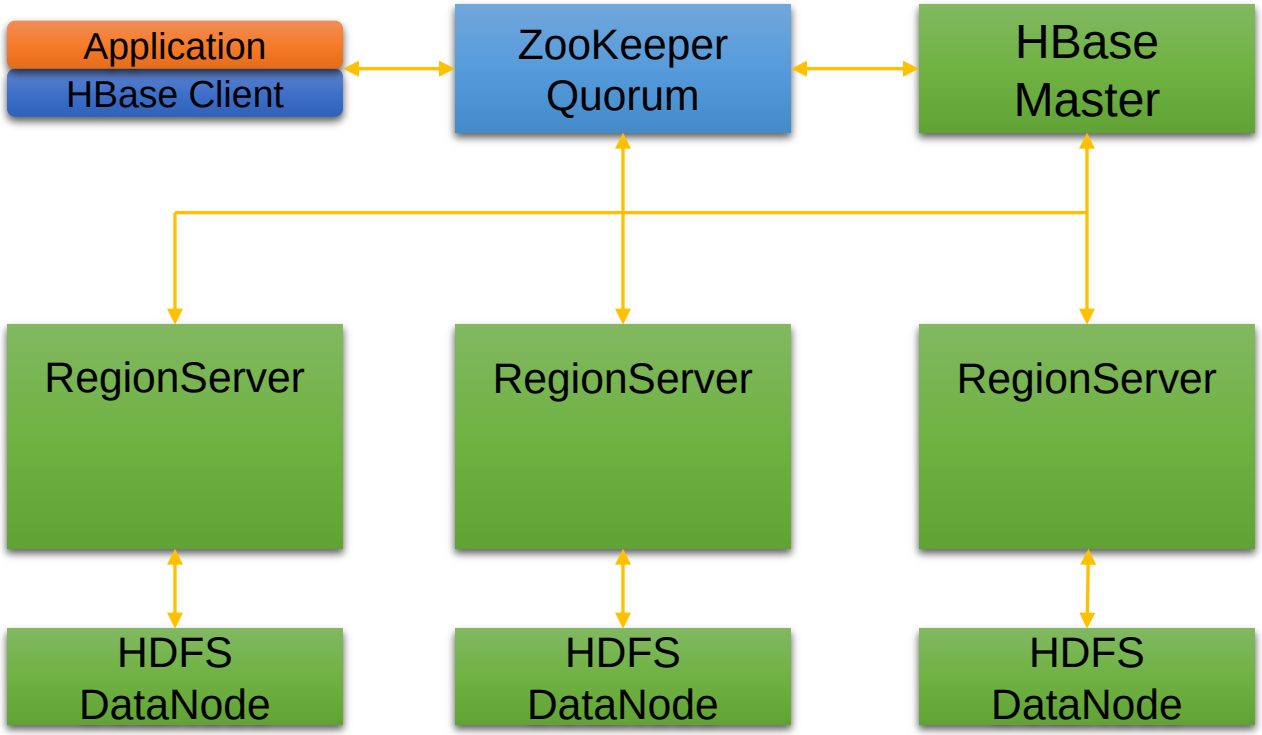
HBase



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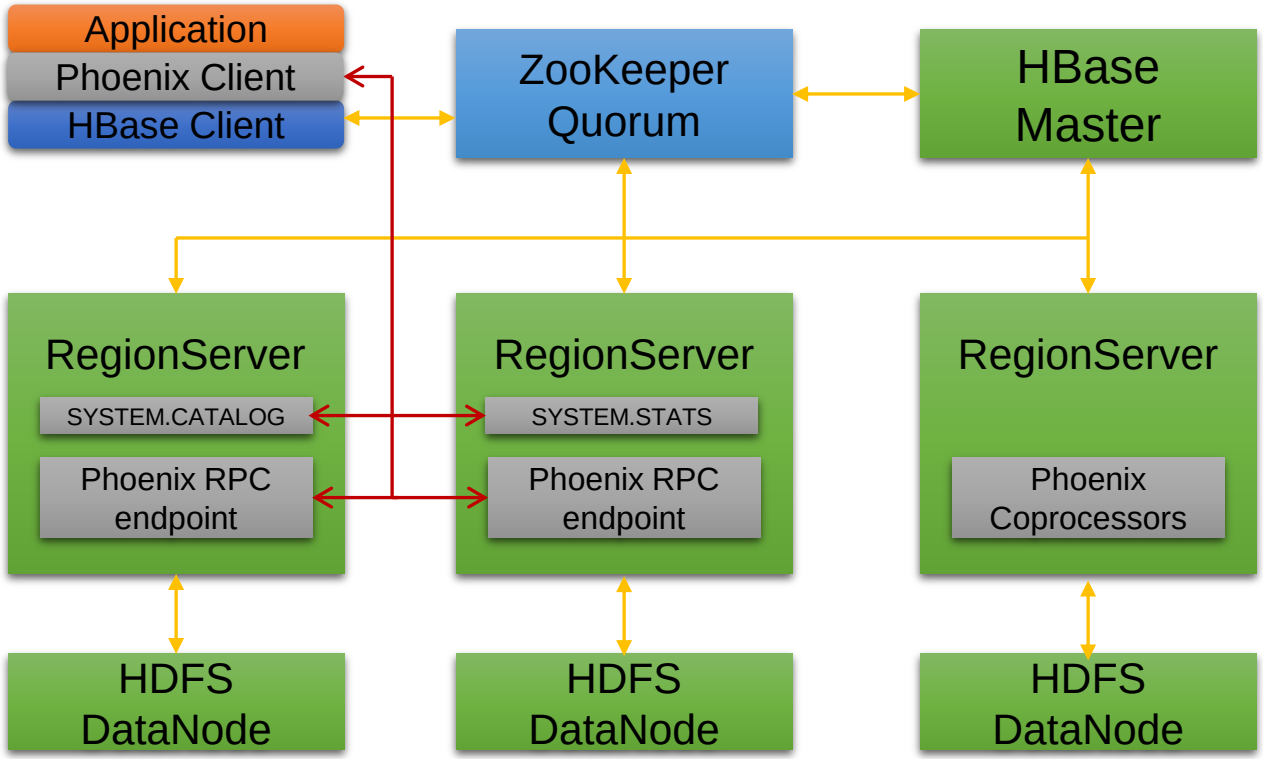
Phoenix



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https://www.slideshare.net/enissoz/apache-phoenix-past-present-and-future-of-sql-over-hbase
http://phoenix.apache.org/presentations/OC-HUG-2014-10-4x3.pdf

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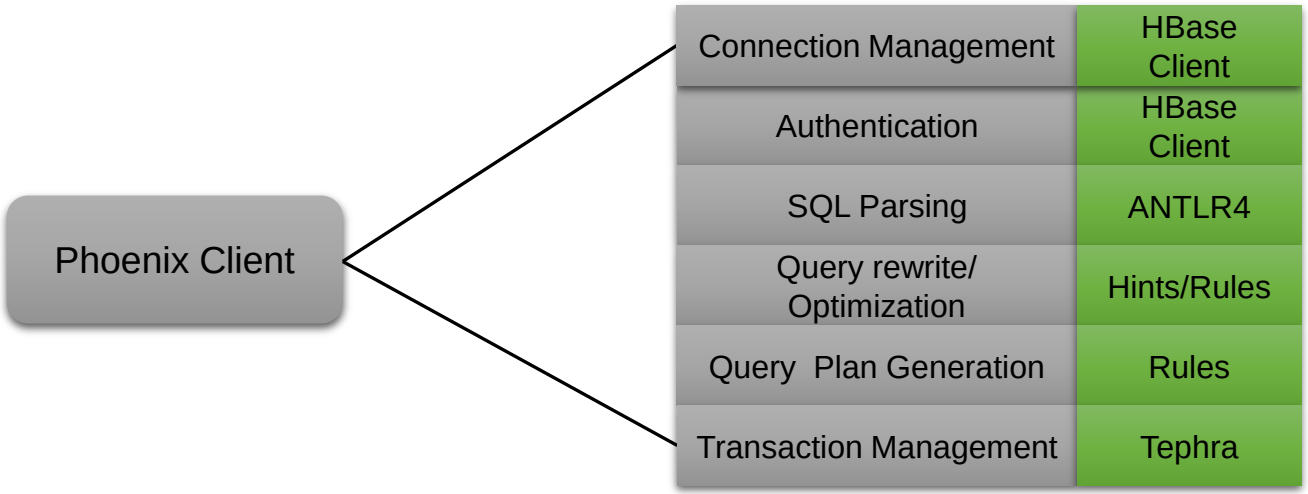
Phoenix Client



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Phoenix query execution

```
Connection con =
   DriverManager.getConnection("jdbc:phoenix:zkquorum:2181:/hbase:principal:keytabfile")
   ;

…

PreparedStatement statement = con.prepareStatement("select * from TBL");

…

ResultSet rset = statement.executeQuery();

…

while  (rset.next() != null)

…

rset.close()

…
```


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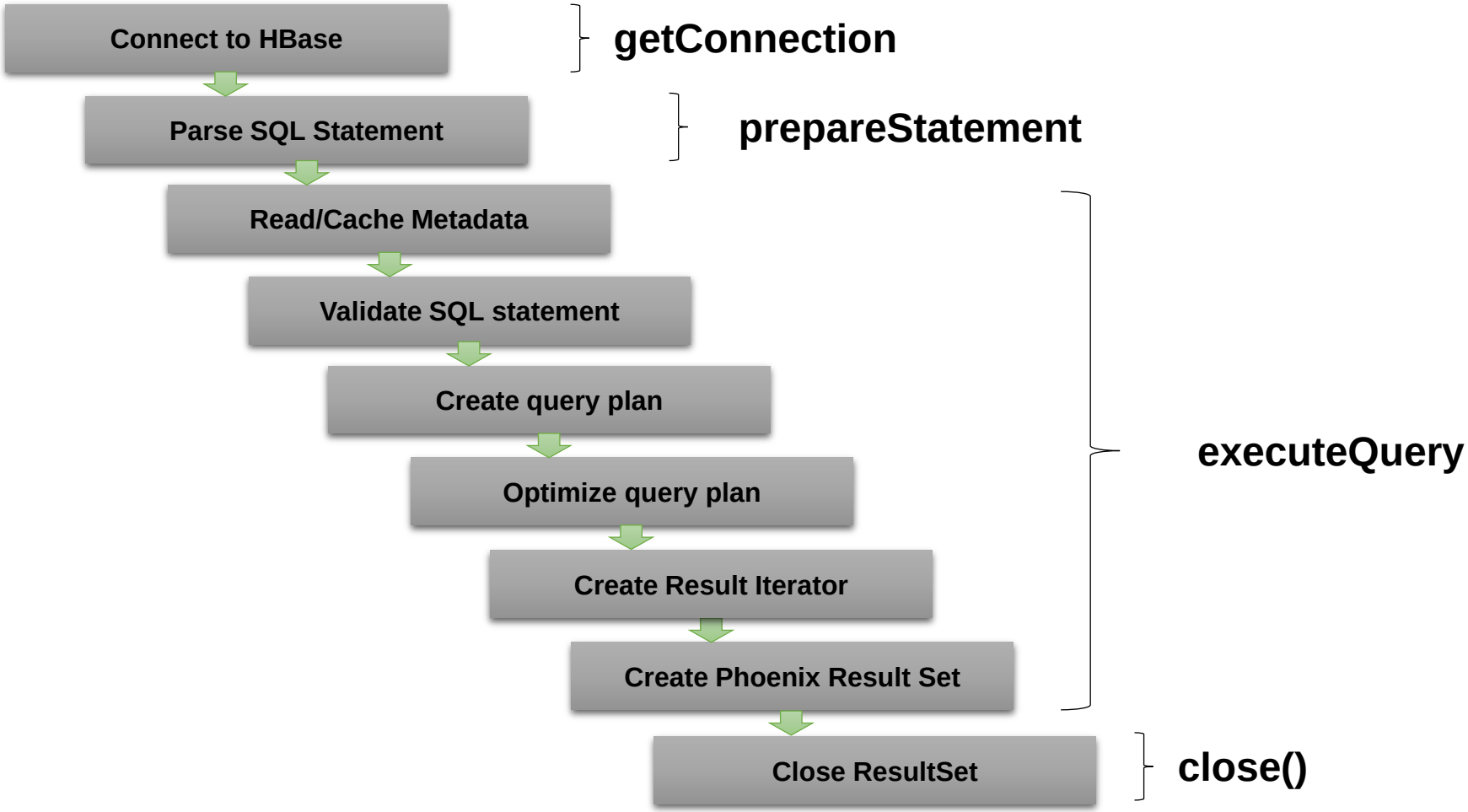
Phoenix query execution



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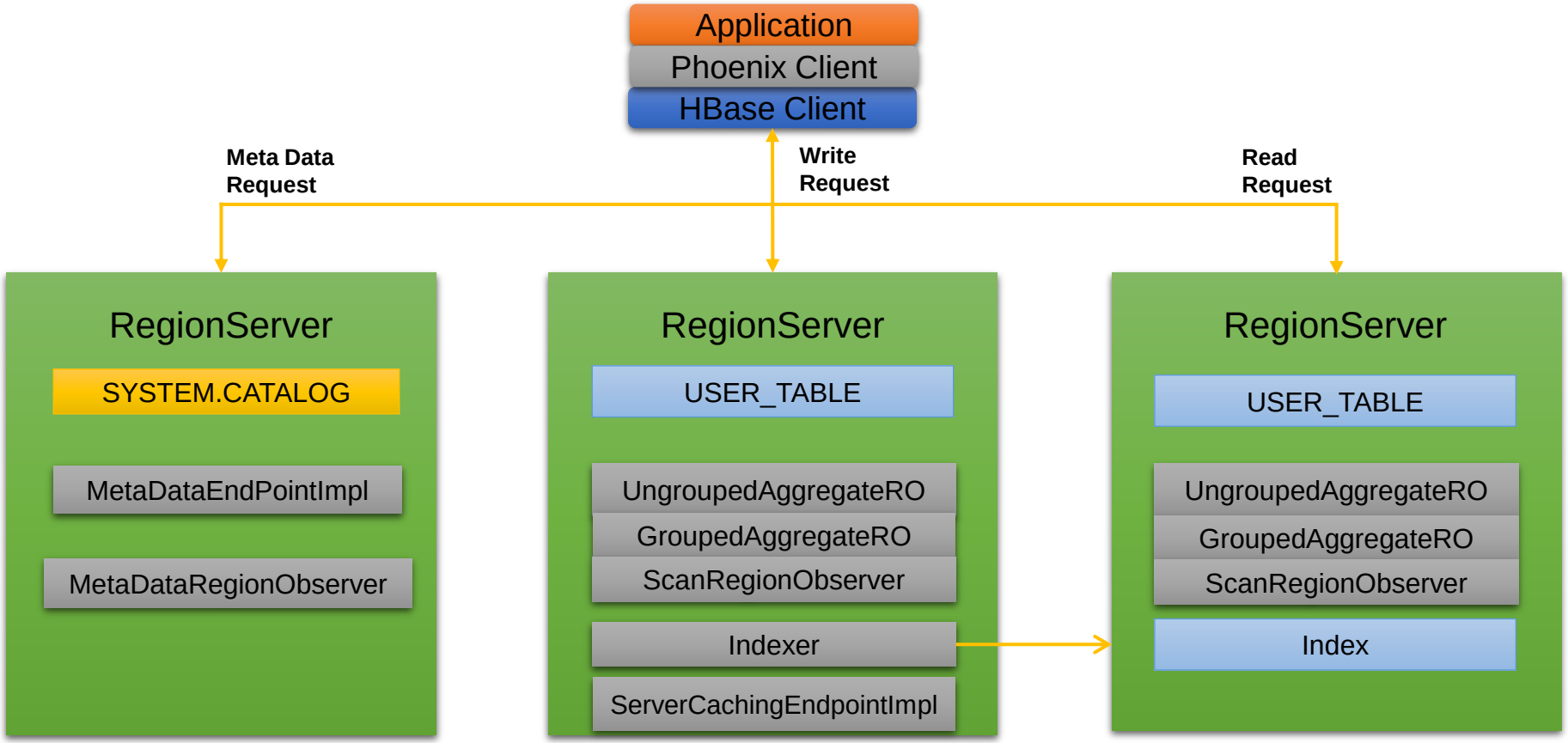
Phoenix Server



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Cursors

- To support row pagination
  - Should support forward and backward traversal
- Support required for select queries only
- Data needs to be consistent during traversal

Cursors

- DECLARE tCursor CURSOR FOR SELECT * FROM TBL
- OPEN tCursor
- FETCH NEXT 10 ROWS FROM tCursor
- FETCH PRIOR 5 ROWS FROM tCursor
- CLOSE tCursor

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Implementation options

- PHOENIX-2606

- Use row value constructors
  - Query rewrite and complex

- Wrapper over available query Resultsets
  - Can leverage Resultsets and so relatively simple

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Cursor Lifecycle

```
PreparedStatement statement = con.prepareStatement("DECLARE tCursor CURSOR
   FOR SELECT * FROM TBL");
statement.execute();
…
statement = con.prepareStatement("OPEN tCursor");
statement = con.prepareStatement("FETCH NEXT FROM tCursor");
ResultSet rset = statement.execute();
while (rset.next != null)
…
statement = con.prepareStatement(“CLOSE tCursor");
statement.execute();
```


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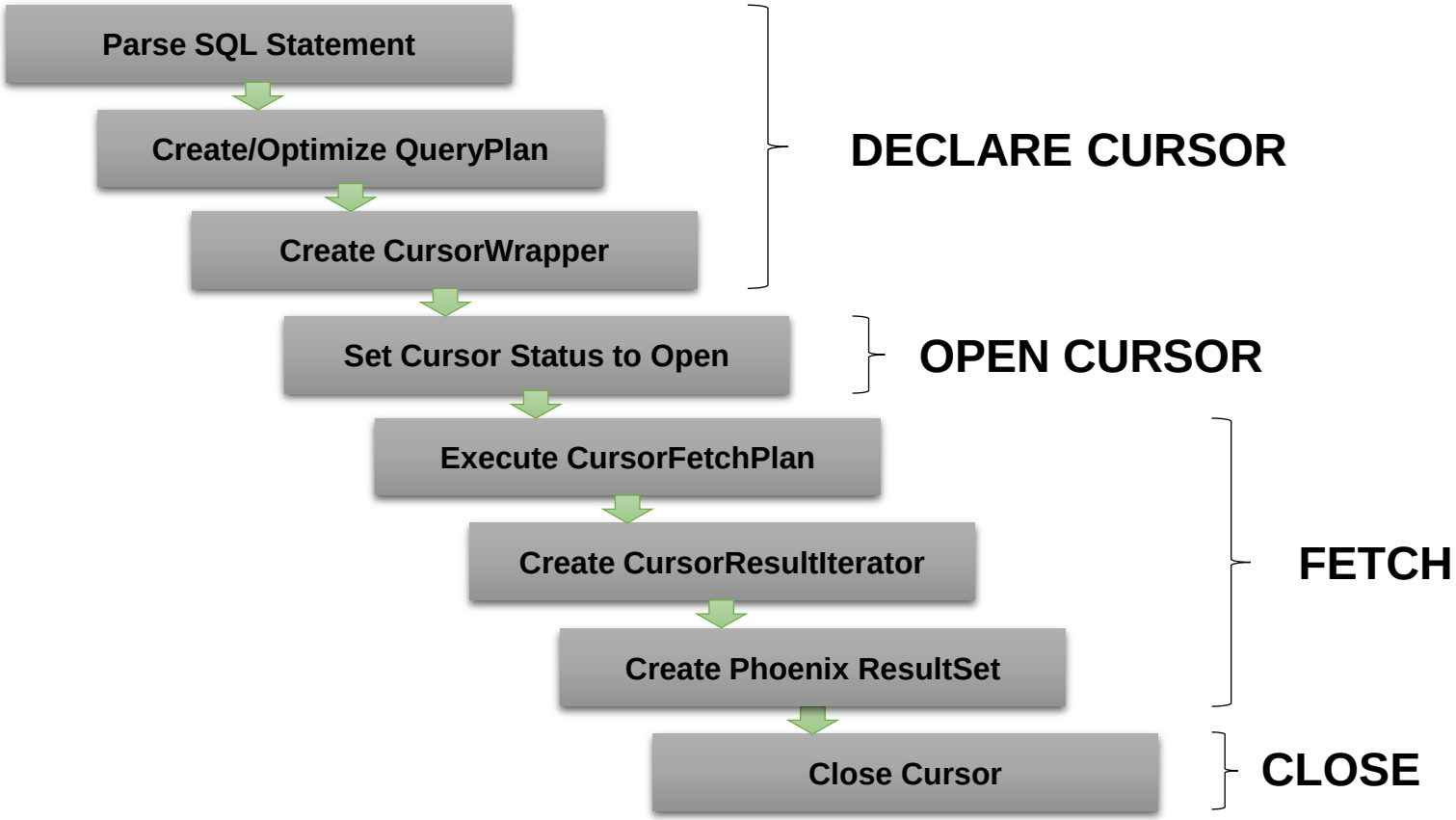
Cursor lifecycle



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Cursor Challenges

- Data Consistency
  - Query start timestamp provides snapshot consistency
- Optimization
  - Use Scan object for non aggregate queries
- Cache sizing
  - Dynamic sizing

Contributors

- Gabriel Jimenez (MIT)
- Anirudha Jadhav (Bloomberg)
- Biju Nair (Bloomberg)
- Ankit Singhal (Hortonworks)

Q&A

Thank You

Hardening Apache Phoenix @PhoenixCon tomorrow 2 PM PT

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