Impala

The best analytic database for Hadoop

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Agenda

• Impala overview
• Most common use cases
• SQL-on-Hadoop perf update
• Milestones
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## Analytic databases require…

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-user Perf &amp; Usability</td>
<td>Meets user experience expectations at standard load (e.g. 100s or 1000s of users)</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Familiar BI tools/SQL interfaces</td>
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</table>

## Hadoop requires…

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
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<tbody>
<tr>
<td>Flexibility</td>
<td>Use SQL to access any type of data, and access any type of data with more than just SQL</td>
</tr>
<tr>
<td>Native Integration</td>
<td>Unified resource management, metadata, security, and management across frameworks</td>
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</table>
Impala: analytic database for Hadoop

Impala delivers the best of both worlds.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Multi-user Perf &amp; Usability</td>
<td>• 10x performance vs. alternatives for BI workloads</td>
</tr>
<tr>
<td>Compatibility</td>
<td>• Provides both ANSI SQL and vendor-specific extensions</td>
</tr>
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<td></td>
<td>• Support for the leading BI tools</td>
</tr>
<tr>
<td>Flexibility</td>
<td>• Supports the common native Hadoop file formats, e.g. Parquet, Avro, text</td>
</tr>
<tr>
<td></td>
<td>• Works together with other Hadoop frameworks</td>
</tr>
<tr>
<td>Native Integration</td>
<td>• Unified with Hadoop metadata, security, governance, and administration</td>
</tr>
</tbody>
</table>
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• Impala overview
• **Most common use cases**
• SQL-on-Hadoop perf update
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Most common use cases

Operational dashboards

**Example:** Healthcare Insurance Company

**Goal:**
- Visualizations of current hospital spending and comparison to peers and historical data
- Integrate 1000s of client hospital purchasing systems

**Key benefits of Impala:**
- Simplification via unification
- Saved license $ over traditional DBMS
- Enabled finer-grain details in source data vs. planned summarized extracts
- 3 nodes of Impala outperformed a rack of the traditional RDBMS on their workload

Data discovery

**Example:** Major Financial Institution

**Goal:**
- Fraud group looking at internal / external fraud
- Captured internal systems and external application/website logs

**Key benefits of Impala:**
- Flexibility to have more data readily available without upfront modeling
- Ability to use existing BI visualization tools
- Better TCO
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September SQL-on-Hadoop benchmark: Impala, Presto, Stinger, Spark SQL

• Benchmarks on latest versions of:
  • Impala (1.4.0)
  • Presto (0.74)
  • Stinger (final) phase 3 => aka Hive 0.13.0
  • Spark SQL (1.1)

• As always, our public benchmarks are:
  • Based on industry standards (TPC)
  • Repeatable (https://github.com/cloudera/impala-tpcds-kit)
  • Methodical testing with multiple runs on same hardware
  • Help competing software put its best foot forward
    • SQL-92 join style for engines without CBO
    • JVM tuning for Presto
    • Run on optimal file formats for each

Impala’s Multi-User over 10x faster with just 10 users: Gap widening compared to May’s update
Faster = more work in less time:
Impala enables over 8.7x throughput
IBM Research validation

• New VLDB academic paper comparing Impala and Hive-based (both MR and Tez) for SQL-on-Hadoop

• Impala’s significantly more efficient than Hive/Tez or Hive/MR
  • “Impala’s database-like architecture provides significant performance gains, compared to Hive’s MapReduce or Tez based runtime”
  • Correctly attributes Impala’s lead to it’s CPU efficiency, IO manager, and overall architecture that resembles a shared-nothing parallel database

• Parquet more efficient than ORC
  • “The Parquet format skips data more efficiently than ORC which tends to prefetch unnecessary data especially when a table contains a large number of columns”

• Note: Paper is single-user only. Multi-user would make the gap even wider
  • Same CPU efficiency, IO manager, and overall architectural reasons

• Additional Notes:
  • Impala 2.0 has disk-based joins and aggregations
  • Impala 1.4 is significantly faster on selective joins than Impala 1.2.2 used in the paper
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Previous milestones

• Impala 1.0 (April 2013)
  • GA availability

• Security: Impala 1.1 (summer 2013)
  • Authentication (already available in 1.0)
  • Authorization via Apache Sentry
  • Auditing

• Usability: Impala 1.2 (fall 2013)
  • Custom language extensibility (UDFs, UDAFs)
  • Cost-based join-order optimization
  • On-par performance compared to traditional MPP query engines while maintaining native Hadoop data flexibility

• Resource management: Impala 1.3 (spring 2014)
  • Resource management

• Compatibility: Impala 1.4 (July 2014)
  • More standard SQL and vendor-specific extensions
  • DECIMAL data type
Impala 2.0 key updates

• Same great multi-user interactive performance

• Removed limits on SQL compatibility
  • SQL:2003 analytic/window functions
  • Subqueries in WHERE clause, EXISTS, and IN
  • Additional data types (CHAR and VARCHAR)
  • GRANT/REVOKE functions via Sentry
  • Additional vendor-specific SQL extensions
Thank you.