Optimize your SQL workloads for greater performance and reduced costs

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Agenda

- The challenges of performance tuning
- DB2 Analytics Accelerator for z/OS Overview
- Optimizing the workload with Optim Query Workload Tuner
  - How to improve accelerated queries/workload
  - Additional Benefits for non-accelerated queries/workload
- Summary
Performance tuning challenges across the organization

"I don’t have time to hone my SQL skills. I need to focus on developing core application functionality.”

"It is very challenging to aggregate performance data across our complex data environment.”

"I don’t understand why our developers aren’t focused on creating better performing SQL.”

"We can’t adequately test for peak workload since we don’t have enough human or IT resources.”

"I need to get my business results fast and accurate. What’s going on?”

“Performance problems seem to appear without warning and deep technical skills are hard to find.”

Application Developer

DBA

IT Manager

QA Manager

LOB Manager
IBM zEnterprise and DB2 Analytics Accelerator

Driving revolutionary change

The hybrid computing platform on zEnterprise

- Supports transaction processing and analytics workloads concurrently, efficiently and cost-effectively
- Delivers industry leading performance for mixed workloads

DB2 Analytics Accelerator and DB2 for z/OS

A self-managing, hybrid workload-optimized database management system that runs query workloads in the most efficient way, so that queries are executed in the optimal environment for greatest performance and cost efficiency
DB2 Analytics Accelerator

What customers are saying...

IBM says queries can run up to 2000x faster with the Accelerator, we had one query run 4800x faster – from 4 hours to 3 seconds

Our users call DB2 Analytics Accelerator the Magic Box

It is unbelievable that there are still DB2 z/OS shops out there without IBM DB2 Analytics Accelerator

Whatever you paid for this, it was well worth it!

Without acceleration, queries would take from several minutes to never returning – with acceleration, queries return in less than 1 minute (usually 15 seconds)
DB2 11 for z/OS and IBM DB2 Analytics Accelerator

- CPU savings benefit DB2 query workloads including short running operational analytics, and reporting

- DB2 Analytics Accelerator benefits data warehouse, OLAP, and complex query workloads
How IBM DB2 tools can maximize Accelerator value

- Customers want to learn more about their investment in the Accelerator and maximize its use in their environment

- Three different areas where DB2 tools can provide value
  - Assessment
    - Do I have a workload that would benefit from the Accelerator?
  - Optimization
    - Can I optimize the workload to take advantage of the Accelerator?
  - Administration
    - Can I manage the Accelerator more effectively?
IBM DB2 Tools: Maximizing your Analytics Accelerator Investment

- Manage and Administer: DB2 Admin/OC
- Analyze and Report: OMEGAMON XE for DB2 PE
- Compare and Tune: Query Workload Tuner for z/OS
- Performance Load with options: DB2 Analytics Accelerator Loader
- Monitor and Identify: Query Monitor for DB2
Value of Tuning for Accelerated Workloads

- Can I determine which queries would benefit from being routed to the Accelerator?

- Which objects are candidates for optimization?
  - Do I have the right set of objects for query consideration?
  - How do I know which objects to add/delete?

- Which queries are eligible or ineligible for Accelerator consideration?
  - How can I improve a query so that it is routed to the Accelerator?
  - Can a query be rewritten to take advantage of the Accelerator?

- If I make changes to the workload:
  - How do I know if there has been improvement?
  - Can I get an estimate of the savings before and after a change without incurring additional costs?
Expert-Enabled Query Tuning Out of the Box

- Identify query candidates from numerous sources
  - DB2 catalog
  - Dynamic statement cache
  - Data Studio hot spots
  - Query or performance monitors

- Facilitate analysis
  - Query formatting
  - Query annotation
  - Access path visualization and annotation

- Get expert tuning advice
  - Improve query design
  - Improve statistics quality
  - Improve database design
  - Improve accelerated queries
Optimizing the Selection, Tuning and Access Plan Analysis of Accelerated Workloads

Workload Analytics Accelerator Advisor

- Identify candidate queries and tables to be routed to the accelerator
- Identify candidate tables to be routed to the accelerator
- Implement advisor-based tuning recommendations for mixed workloads of accelerated and un-accelerated queries
- Diagram accelerated queries in Access Plan Graphs
- Integrates with Query Monitor and OMPE for capturing query workloads for complete analysis
- Enable “what if” analysis

Benefits

- Shorten the process of selecting tables to be accelerated
- Visualize access paths of accelerated queries
- Increase productivity by working with accelerated queries through a unified interface
- Increase overall system capacity

Streamlined Performance Analysis

1. Define or select a workload
   - File
   - SQL or Routine Editor
   - SQL Category
   - XML File
   - Optim Performance Manager Repository

2. Execute Advisors
   - Workload Group 1
   - Workload node 1
   - Single Query
   - Run Workload Advisors

3. Drill Down into advice

4. Validate improvement
   - Recommendation summary
   - Generate reports

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<thead>
<tr>
<th>Recommendation</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics</td>
<td>1</td>
<td>Repair statistics problems for this query, Gather missing statistics...</td>
</tr>
<tr>
<td>Query revision</td>
<td>2</td>
<td>Provide a join predicate based on the referential constraint between...</td>
</tr>
<tr>
<td>Access path</td>
<td>3</td>
<td>Provide a predicate on column WORKDEPT.</td>
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<tr>
<td>Index</td>
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<td>Avoid reading all index keys on an index scan (IQBLOCKNO = 1, P...</td>
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</table>

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Gather Queries and Workloads

DB2
- Plan table
- Statement table
- Catalog plan or package
- Statement cache

QMF and QMF HPO

DB2 Query Monitor

OMEGAMON XE for DB2

File, text, or exported workload

User defined SQL Repository
Customize Query Workloads

Filtering Options

- Accelerate analysis, reduce downtime
### Execute Advisors

<table>
<thead>
<tr>
<th>Category</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statistics</strong></td>
<td>Get recommendations on the best statistics to capture to influence access path selection</td>
</tr>
<tr>
<td><strong>Query</strong></td>
<td>Get recommendations regarding how to rewrite the query for better efficiency</td>
</tr>
<tr>
<td><strong>Index</strong></td>
<td>Get recommendations on indexes changes that can reduce database scans</td>
</tr>
<tr>
<td><strong>Analytics Accelerator</strong></td>
<td>Get recommendations on optimizing and managing accelerated analytic queries and applications</td>
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</tbody>
</table>

![Execute Advisors Image](image-url)
Improve Statistics Quality and Collection

- Integration with the DB2 z/OS 11 SYSSTATFEEDBACK to interprets information and updates statistics profile

- Result display on the result dialog
  Accurate estimated costs
  Better query performance
  Less CPU consumption
  Improved maintenance window throughput

- New Demo Video !!! http://youtu.be/M9wV0oAFgpw

- Generates RUNSTATS control statements
  Include or not include
Drill down to advice for accelerated workload

- Determine tables to be routed to the Accelerator
- Simplify use
  - Consolidate tables, queries to provide a single recommendation
  - Enable what-if analysis
  - Run immediately or save

Estimated CPU savings

Filter recommendations
Drill down to advice for accelerated workload

Show Tables referenced by statement

Rationale

Recommendation and rationale
Test before deployment

- Utilize virtual capabilities built into the DB2 engine run subset of candidate tables
Validate Analytics Acceleration Result

- View analysis summary
- Less CPU savings
- Fewer Eligible Statements
Removing Tables from the Analytics Accelerator

- Analyze tables with existing accelerator as consideration
- Recommendation table to remove from Accelerator
Indexing Advice to Improve Database Design

Obsolete Indexes display "Last Used Time"

• Indexes are decided at design stage
  • Lot of effort is spent making SQL to use the provided indexes
  • But what if the SQL is "right" and it's the indexes that are "wrong"
  • Cost resources to maintain
    – How do you simply test your hypotheses without impacting production?

• Removing Obsolete Indexes Simplify Use
  – Consolidate indexes and provide a single recommendation
  – Enables what-if analysis
  – Provides DDL to create indexes
  – Run immediately or save

Indexes are used to increase performance

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<tr>
<th>Index</th>
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<th>Foreign Key Index</th>
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Summary: Optim Query Workload Tuner provides expert tuning

- Reduces specialized skill requirements for tuning queries
  - Provides actionable recommendations
  - Builds skill with rationale

- Integrates with developer and DBA tools
  - Lifecycle integration with developer and DBA tools

- Improves application performance
  - Improve query design
  - Improve statistics quality
  - Improve index value
  - Improve query acceleration

- Balances costs across workload
  - Considers entire workload

“IBM InfoSphere Optim Query Workload Tuner cuts the DBA’s workload in testing, making them at least 40 to 50 percent more productive.”
— He Yu, Senior Database Administrator

Analyze single queries or entire workloads

Solve problems for all types and size of workloads
Resources

April 8 Webcast  Live on Youtube

IBM DB2 Analytics Accelerator for z/OS & QWT
-  https://www.youtube.com/watch?v=DkcUBL_PC74

DB2 11 Using Statistics Collection Advisor
-  http://youtu.be/M9wV0oAFgpw

IBM DB2 Analytics Accelerator for z/OS and the supporting DB2 and Optim Database tools
-  Demo Video QWT WAAA

- **Database Magazine & Articles**
  -  http://ibmdatamag.com/2013/12/accelerating-analytics-queries/
  -  Developerworks : Accelerate queries with IBM DB2 Analytics Accelerator for z/OS by using InfoSphere Optim Query Workload Tuner

- Pennsylvania Department of Transportation keeps construction costs down using QWT & QM

- **PENN DOT Reference**

- **Proactive Performance Tuning: A Day in the Life of a DBA at ADP**
  -  http://www.youtube.com/watch?v=1aYsZUWsyIg
Resources

- Integrated Data Management Community

- IBM Optim Query Workload Tuner web page
  - https://www-01.ibm.com/software/data/db2imstools/db2tools/opti-expert-zos/

- Tuning SQL with IBM Optim Query Workload Tuner
  - Part 1 Understanding Access Paths
  - Part 2 Tuning Individual Queries
  - Part 3 Workload Capturing and Tuning

- Accelerate queries with IBM Analytics Accelerator using DB2 Query Workload Tuner
Requirements

- Data Studio /OQWT 4.1.0.1
  

- V10 – APAR PM50434 / PTF UK76103
  
  http://www-01.ibm.com/support/docview.wss?uid=swg1PM50434

- V9 - APAR PM53634 / PTF UK76161
  
  http://www-01.ibm.com/support/docview.wss?uid=swg1PM53634

- Set zPARM ACCEL = AUTO / COMMAND

- SYSACCEL.SYSACCELERATEDTABLES

- SYSACCEL.SYSACCELERATORS are created

- INFOLIB-SYSACCELERATED

- Connection user has privilege to start and stop accelerator

- Connection user has EXECUTE and SQLADM privilege to SYSPROC.DSNWZP

- Optional:
  - DB2 PTF UK82772 to support add tables to accelerator
  - IDAA Studio
  - IDAA