Configure a complete query and workload tuning cycle with InfoSphere Optim Performance Manager V5.3.1

Tune DB2 for LUW and DB2 for z/OS data servers from the same web console

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With the InfoSphere® Optim™ Performance Manager V5.3.1 web console, you can configure your monitored databases for a complete tuning cycle for single queries or workloads for DB2® for Linux®, UNIX® and Windows®, and DB2 for z/OS® data servers. You do not have to install Data Studio for single-query or workload tuning. Examples in this tutorial walk you through single-query tuning and workload tuning enhancements.

Introduction

Learn how to use new functions in InfoSphere Optim Performance Manager 5.3.1 to configure a monitored database for tuning enhancements. Explore the access plan graph, ad-hoc single-query tuning, retuning a single query, and persisting and sharing tuning results for single-query and workload results. This tutorial also discusses how to implement recommended actions and manage tuning results from the Optim Performance Manager web console.

Before you start tuning

If you plan to tune workloads or use the priced single-query tuning features, you need license entitlements for InfoSphere Optim Query Workload Tuner for the monitored database. You must also activate the database for query tuning. For Advanced Enterprise Server Edition, the license is automatically applied.

After applying the activation license on the monitored database, you can configure the monitored databases for tuning using the Optim Performance Manager web console V5.3.1, which provides
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a user interface to configure monitored databases for tuning for DB2 Linux, UNIX and Windows, and DB2 z/OS. From the drop-down menus, go to Optim Performance Manager > Databases > Query Tuning and select Configure for Tuning. If the monitored database has been activated with an Optim Query Workload license, you do not have to repeat the license activation process in the Optim Performance Manager web console.

There are shortcuts from the Query Tuning tab that let you select a database and start tuning a new query or review the submitted tuning jobs.

Figure 1. Configure monitored database for tuning

You will be prompted to provide the minimum configuration parameters, such as the tablespace names for storing the tuning results.
Figure 2. Customize tuning configuration for DB2 Linux, UNIX and Windows

For DB2 for Linux, UNIX and Windows, all tuning functions are configured. For DB2 for z/OS, minimum tuning functions are configured to invoke the access plan graph.

You can still use the SQL configuration scripts for DB2 for Linux, UNIX and Windows and JCL configuration files for DB2 for z/OS. These files are in the Optim Performance Manager installation directory. For example, on Windows, the installation directory is C:\program Files (x86)\IBM\OPM\resources\QueryTunerConfig.

Tuning entry points

After a monitored database is configured for tuning, you can generate a display of the access plan graph of a query. You can also tune single queries and workloads. The entry points are shown below.

Table 1. Tuning entry points in Optim Performance Manager

<table>
<thead>
<tr>
<th>Optim Performance Manager web console</th>
<th>Stand-alone Access Plan Graph</th>
<th>Tune with This Web Console (Queries)</th>
<th>Tune All with This Web Console (Workloads)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query Tuning</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Databases</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SQL Statements dashboard</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Extended In-flight dashboard</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Locking dashboard</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Optim Performance Manager reports</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Single-query tuning enhancements

Prior to Optim Performance Manager 5.3, all single-query tuning jobs were run in synchronous mode, and the results were not saved in Optim Performance Manager.

In Optim Performance Manager V5.3.1, all tuning jobs are run asynchronously. You can view and share the tuning results and recommendations even after exiting the Optim Performance Manager session. You can also tune a new query and retune single queries from Optim Performance Manager > Open > Query Tuning, or from the Optim Performance Manager > Databases tab.

Figure 3. Open Query Tuning tab

To tune a new query, click Tune New Query.
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Figure 4. Tune a new query from Query Tuning tab

You will be prompted to select a monitored database to start tuning.

Figure 5. Select a database for tuning

The Select Tuning Activities To Run dialog will open. Enter or paste the SQL statement text you want to tune. Optionally:

- Enter a Query name for the SQL statement and the Result name for the recommendations being generated.
- Use the default names being generated.
• Specify the email addresses to get email notification when the query has finished tuning.

When you click **Run**, a tuning job will be created in the background. You can monitor the progress in the Query Tuning job list.

**Figure 6. Specify a new query for tuning**

![Select Tuning Activities To Run](image)

After the tuning job has been created, you will see the message in Figure 7. If you choose to use the default query name, note the generated query name so you can search for this name in the tuning job list to view the status and results and to retune if necessary.
Figure 7. Query tuning has started

The newly created tuning job is also displayed on the top of the tuning job list.

Figure 8. Most recently run job, listed on top by default

When query tuning is finished, you can select the job from the job list and click on View Results to view the tuning recommendations and log.
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Figure 9. Refresh job list to monitor jobs in progress

When you open the tuning result, the Access Plan Graph appears by default. You can analyze the access plan, review the environment, options, diagnostic messages, and properties of each operation; collapse and expand nodes; and drill down to examine the problem paths.

You can also select the Recommendations tab to review the tuning recommendations.

The recommended actions for repairing or updating statistics are in RUNSTATS Script and the recommended indices are in Index Script. Tuning Options Used, including the SQL statement being tuned, can be used for cross reference.

If the job fails, you can open the Tuning Job Log tab to review the error.

Figure 10. Access plan graph for the SQL statement being tuned

You can use the Advanced Search from the Access Plan Graph page to identify bottlenecks in the query with built-in filters. The search result is listed with the costing information for each matching
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You can sort the costing information and click on the node to go directly to the access plan graph. This provides direct access to the portion of the access plan graph you want to examine.

**Figure 11. Use advanced filters to analyze access plan**

After reviewing the access plan, you can browse the tuning recommendation summary.

If you choose to execute the recommended actions for RUNSTATS or INDEX, you can open the corresponding tabs then edit and run the recommended actions, as in Figure 12.

**Figure 12. Review recommended action script and take action**

After you have updated or repaired the statistics, you might consider retuning the same query by clicking **Retune Query**.
Figure 13. Retune a query

The selected SQL statement and the original Query name will be populated. You rewrite the query before tuning it.

Figure 14. Selections for retuning a query

Select Tuning Activities To Run

InfoSphere Optim Query Workload Tuner for DB2 for Linux, UNIX and Windows is activated on the data server.

Monitored data server: SAMPLE (DB2 for Linux, UNIX and Windows 9.7.6)

Default schema:  

Query name:  

Result name:  

Description:  Re-tune query after recommended RUNSTATS DDLs are run.

- Re-EXPLAIN the SQL statement
- EXPLAIN information will be collected automatically if it does not exist for the SQL statement.
- Format and annotate SQL statement
- Generate access plan graph

Generate recommendations in these categories:
- Statistics
- Indexes

Notify on completion:  

SQL statement text:  

```sql
SELECT empno, firstname, lastname, job, salary, bonus, comm, location, proiname
FROM employee a, dept b, project c
WHERE a.workdept = b.deptno
AND b.deptno = c.deptno
AND a.empno = c.resempno
AND b.location = 'US'
AND a.empno IN (SELECT mgno FROM dept WHERE mgno IS NOT NULL)
ORDER BY 1, 2, 3;
```
After selecting **Run** to retune the SQL statement, you can view the new tuning job at the top of the job list. It has the same query name with a different result name and start timestamp. You can continue the retune process until you have finished tuning this SQL statement.

**Figure 15. View the new tuning job**

![Image of tuning job view](image)

**Workload tuning enhancements**

In Optim Performance Manager V5.3.1, you can run the recommended RUNSTATS and INDEX DDL scripts for the workload you have tuned.

**Figure 16. Run recommended RUNSTATS and INDEX DDL scripts**

![Image of run recommended scripts](image)

**Managing tuning jobs and history**

In a typical week, you might have tuned multiple monitored databases, and multiple queries and workloads against the monitored databases. The default retention period for the generated recommendation is 30 days. You can change the retention period to prune the old recommendations.
All the tuning jobs are stored in the Optim Performance Manager repository database. All Optim Performance Manager users can view the job entries in the Query Tuning job list. Users with Can Manage Job privileges and a connection to the monitored database can open the job results, including tuning jobs run by current users and other users in the same monitored database.

To tune a query and a workload, you need to have Can Monitor privileges against the monitored database and SELECT, UPDATE, DELETE, and INSERT privileges against the Query Tuner tables in the Optim Performance Manager repository database.

To review tuning results, you need to have Can Manage Jobs privileges against the Optim Performance Manager repository database and SELECT, UPDATE, DELETE, and INSERT privileges against the Query Tuner tables in the monitored database.

To manage the tuning results and recommendations, you can use the quick filter or the filter dialog to display the tuning jobs. For example, you can display all Failed jobs using the Status drop-down selection in the quick job filter and remove all the failed jobs when they are not needed.

**Figure 17. Display all failed jobs**

You can also view the results based on certain time periods. For example, to view the results in the last 15 minutes, use the Job started within filter field in the Tuning Job Filter to select a suitable time interval.
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Figure 18. View results based on time periods

- Last 5 minutes
- Last 15 minutes
- Last 30 minutes
- Last 1 hour
- Last 3 hours
- Last 24 hours
- Last 3 days
- Last 31 days
- Last 90 days

The image below shows filters you can use to manage which tuning jobs to display.

Figure 19. Tuning job filter
To persist single-query tuning results and recommendations, the QUERYTUNER tables below are used. They are in the Optim Performance Manager repository database. Users need to have SELECT, INSERT, UPDATE, and DELETE privileges against these tables. The tables are created automatically when they are first referenced in Optim Performance Manager. You may want to monitor the space utilization of these tables.

**Figure 20. QUERYTUNER tables**

<table>
<thead>
<tr>
<th>Name</th>
<th>Schema</th>
<th>Table space</th>
</tr>
</thead>
<tbody>
<tr>
<td>OQWT_GROUP</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_NODE</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_QUERY_RESULT</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_QUERY_RESULT_DETAILS</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_STMT</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_TUNING_PREF</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_TUNING_PREF_PROPERTIES</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
<tr>
<td>OQWT_VERSION</td>
<td>QUERYTUNER</td>
<td>CONTROL</td>
</tr>
</tbody>
</table>

To persist the workload tuning results and recommendations, the Query Tuner workload tables below are used. They reside in the monitored database. Users need to have SELECT, INSERT, UPDATE, and DELETE privileges against these tables.

**Figure 21. Workload tables**

- QT_WAPC_SESSION_EXCEPTIONS
- QT_WAPC_SESSIONS
- QT_WAPC_SESSIONS_RESULT
- QT_WCC_ERROR_MESSAGE
- QT_WCC_EVENT_HISTORY
- QT_WCC_STMT_DEPENDENT_OBJECT
- QT_WCC_STMT_EXPLAIN_INFO
- QT_WCC_STMT_INSTANCE
- QT_WCC_STMT_RUNTIME_METRICS
- QT_WCC_STMT_TEXT
- QT_WCC_TEMP_CAPTURE
- QT_WCC_TEMP_EXPLAIN_HANDLE
- QT_WCC_WORKLOAD
- QT_WCC_WORKLOAD_ADVISOR_INFO
- QT_WCC_WORKLOAD_NAME
- QT_WCC_WORKLOAD_SOURCE
- QT_WCC_WORKLOAD_SOURCE_FILTER
- QT_WCC_WORKLOAD_TASK

**Summary**

This tutorial explained how to use the enhanced tuning functions in Optim Performance Manager V5.3.1. You can configure the database for tuning, and perform the complete life cycle of single-
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query and workload tuning within the Optim Performance Manager web console. You can also manage single-query and workload tuning results the same way in the Query Tuning tab without leaving the Optim Performance Manager web console.
Resources

Learn

• "Tuning queries and workloads from InfoSphere Optim Performance Manager" provides more information about query tuning.
• Visit the IBM Knowledge Center for InfoSphere Optim Performance Manager for product documentation.
• Visit the developerWorks Information Management zone to find more resources for Data Replication.
• Stay current with developerWorks technical events and webcasts focused on a variety of IBM products and IT industry topics.
• Follow developerWorks on Twitter.
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About the authors

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Cheung-Yuk Wu has over 17 years of relational database tooling and Business Intelligence application development experience in DB2, Oracle, Sybase, Microsoft SQL Server, and Informix on Windows and UNIX platforms at IBM. She was the technical lead for SQL Warehousing runtime and Admin Console in DB2 Data Warehouse Edition and the product architect for DB2 Data Warehouse Center and Warehouse Manager. She has additional product architecture and development experience in DB2 Content Manager, Tivoli for DB2, IBM DataHub for UNIX, and QMF. She also has DBA experience in DB2, CICS, and IMS at the IBM San Jose Manufacturing Data Center. She received her Bachelor of Science degree in Computer Science from the California Polytechnic State University, San Luis Obispo.

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