

Tuning poor performing SQL's Using Oracle 10g Enterprise Manager's Automatic SQL Tuning Advisor

Version 1.0

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Query Optimizer Modes

Before we delve in to how to tune poor performing SQL queries automatically, it will be worth understanding two modes in which Oracle query optimization works:

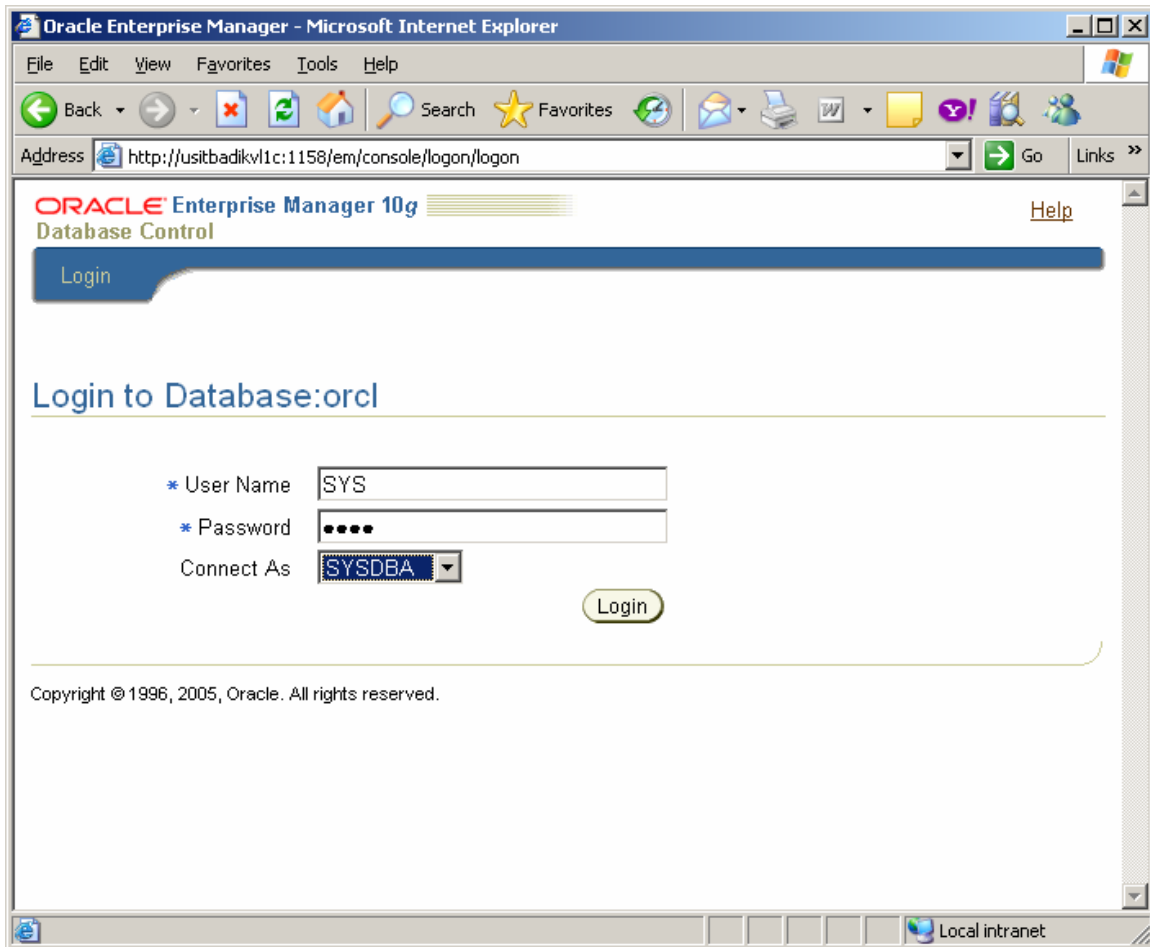
- Normal Mode
This is the default mode in which query is optimized to get execution plan for vast majority of the SQL statements. Under this mode optimizer works in strict time constraints, mostly in fraction of a second and generates execution plan.
- Tuning Mode
When Optimizer is invoked under tuning mode it is referred to as Automatic Tuning Optimizer. Tuning performed by automatic tuning optimizer is called Automatic SQL Tuning. Under this mode optimizer can take several minutes to tune one query.

Navigating SQL Tuning Advisor

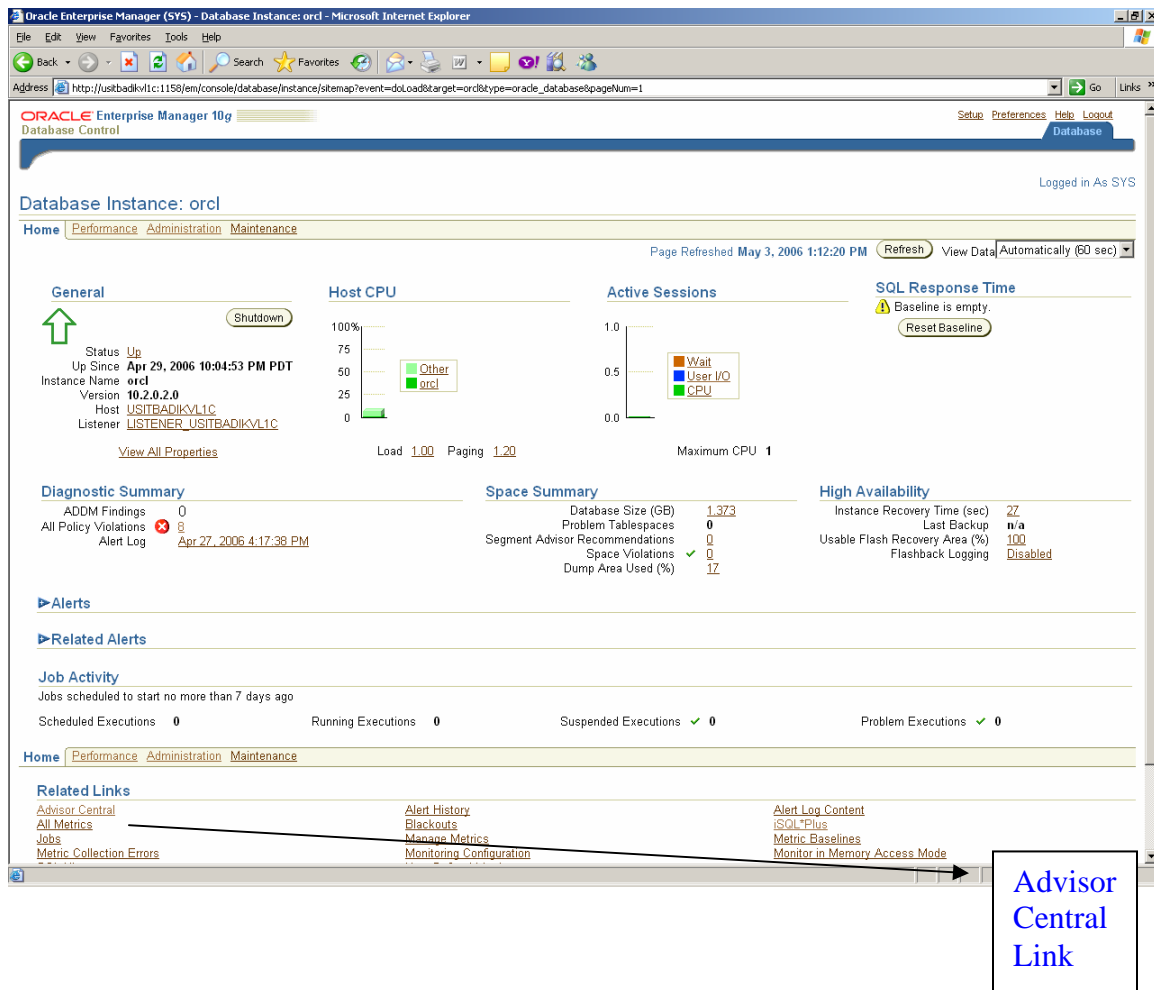
Automatic SQL Tuning can be invoked through a server utility called SQL Tuning Advisor using Oracle Enterprise Manager. The following details step by step instructions on how to get to SQL Tuning Advisor.

Step 1: First logon to Oracle Enterprise Manager 10g by SYS user or equivalent as SYSDBA. By default OEM will be running on 1158 port on the database server unless it was modified at the installation time. To login to OEM use internet explorer and point to your database server as shown in this example:

<http://usitbadikvl1c:1158/em/console/logon/logon>



Step2: Once logged in to OEM you will be presented with a dash board view of your instance. This view is very helpful in understanding the overall performance of the instance.



Step3: In the *Related Links* section below click on *Advisor Central* to navigate to the Advisor Central home page.

Oracle Enterprise Manager (SYS) - Advisor Central - Microsoft Internet Explorer

Address: http://ustbadi.vt.c:1158/em/console/database/instance/advisorTasks?event=doLoad&dbPageNum=1&target=orcl&type=oracle_database

Database Control

Database Instance: orcl > Advisor Central

Logged in As SYS

Page Refreshed May 3, 2006 5:47:39 PM PDT [Refresh]

Advisors

[ADDM](#) [Memory Advisor](#) [MTTR Advisor](#)
[Segment Advisor](#) [SQL Access Advisor](#) [SQL Tuning Advisor](#)
[Undo Management](#)

Advisor Tasks [Change Default Parameters](#)

Search

Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.

Advisory Type: [All Types] Task Name: [Last Run] Status: [All] [Go]

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Results

Select	Advisory Type	Name	Description	User	Status	Start Time	Duration (seconds)	Expires In (days)
<input checked="" type="radio"/>	ADDM	ADDM:1116640033_1_45	ADDM auto run: snapshots [44, 45], instance 1, database id 1116640033	SYS	COMPLETED	May 3, 2006 5:00:43 PM	0	30
<input type="radio"/>	Segment Advisor	SYS_AUTO_SPCADV_405352006	Auto Space Advisor	SYS	COMPLETED	May 2, 2006 10:00:04 PM	0	29
<input type="radio"/>	SQL Tuning Advisor	SQL_TUNING_1146256951823		SYS	COMPLETED	Apr 28, 2006 1:42:37 PM	4	25

Database | Setup | Preferences | Help | Logout

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About Oracle Enterprise Manager 10g Database Control

SQL Tuning Advisor Link

Step4: From the Advisor Central home page, Click on SQL Tuning Advisor link under Advisors to identify all the sources (listed below) that you can use to run SQL Tuning advisor on. There are some more sources that will be discussed later in the document.

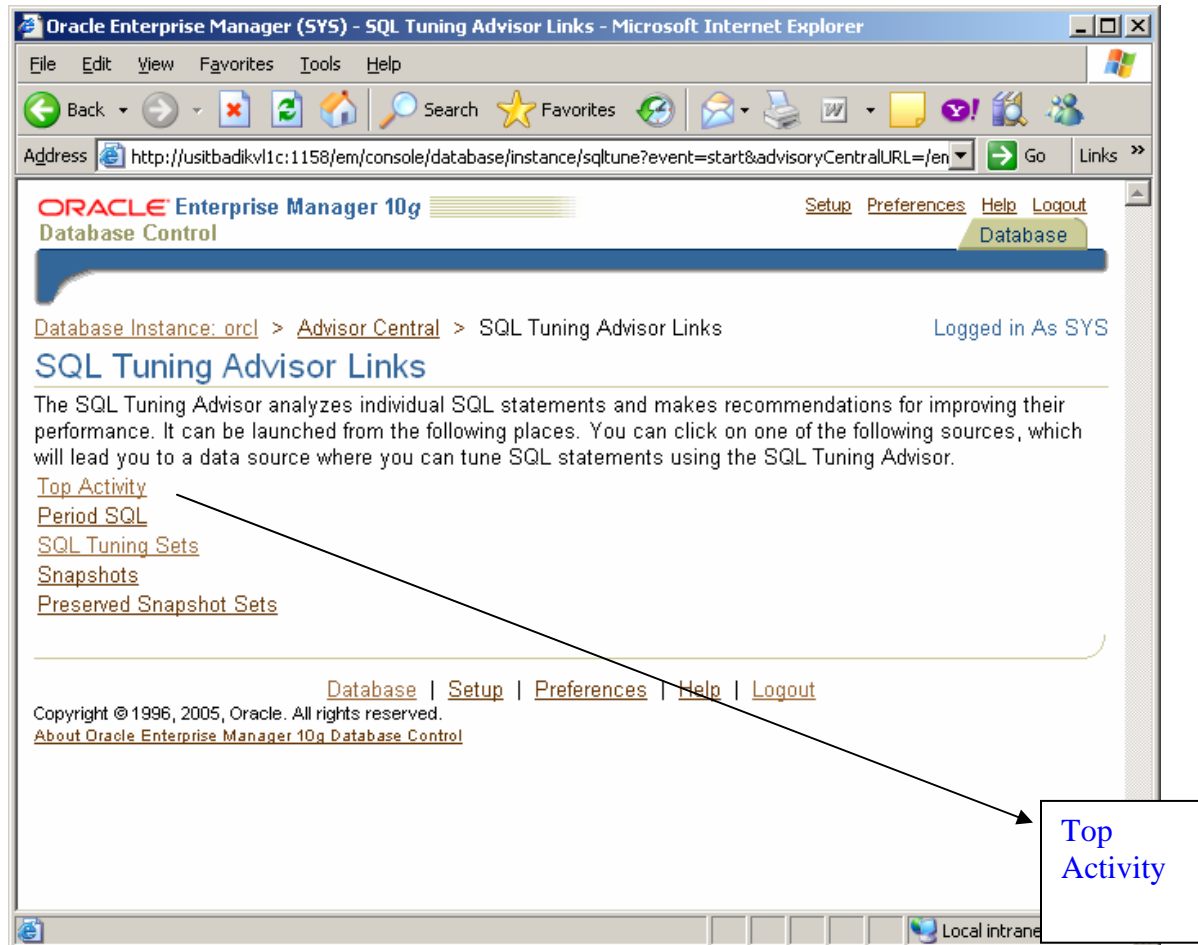
[Top Activity](#)

[Period SQL](#)

[SQL Tuning Sets](#)

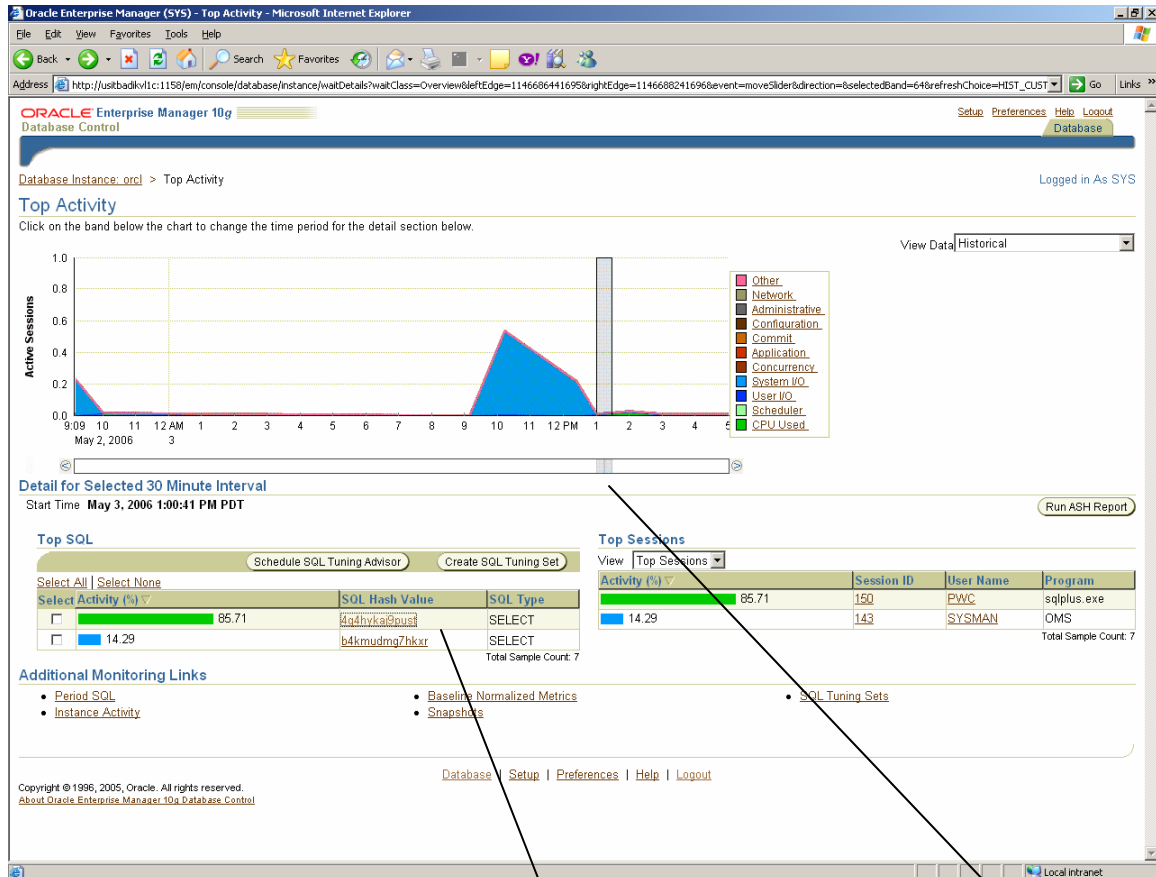
[Snapshots](#)

[Preserved Snapshot Sets](#)



Identifying & Tuning poor performing SQL statements

Step1: Click on Top Activity Link to identify Top SQL and Sessions in a given interval of time.



Top SQL
statements

Scroll
Bar

Step2: From the Top Activity page, set the View Data to Historical so that you can identify your time period that you are interested in analyzing.

You can use the scroll bar located right below the graph to move the cursor so that you can select the period interested in monitoring.

Once you identify the SQL Statement or multiple statements that are poorly performing you can either Schedule SQL Tuning Advisor independently or create a SQL Tuning Set to run SQL Tuning Advisor on it.

The screenshot shows the Oracle Enterprise Manager 10g console in Microsoft Internet Explorer. The browser address bar shows the URL: <http://usitbadikv1c:1158/em/console/database/instance/sqlSet?event=createSTS&target=orcl&type=o>. The page title is "ORACLE Enterprise Manager 10g Database Control". The breadcrumb navigation shows "Database Instance: orcl > SQL Tuning Sets > Create SQL Tuning Set". The user is logged in as SYS.

The "Create SQL Tuning Set" page has the following fields:

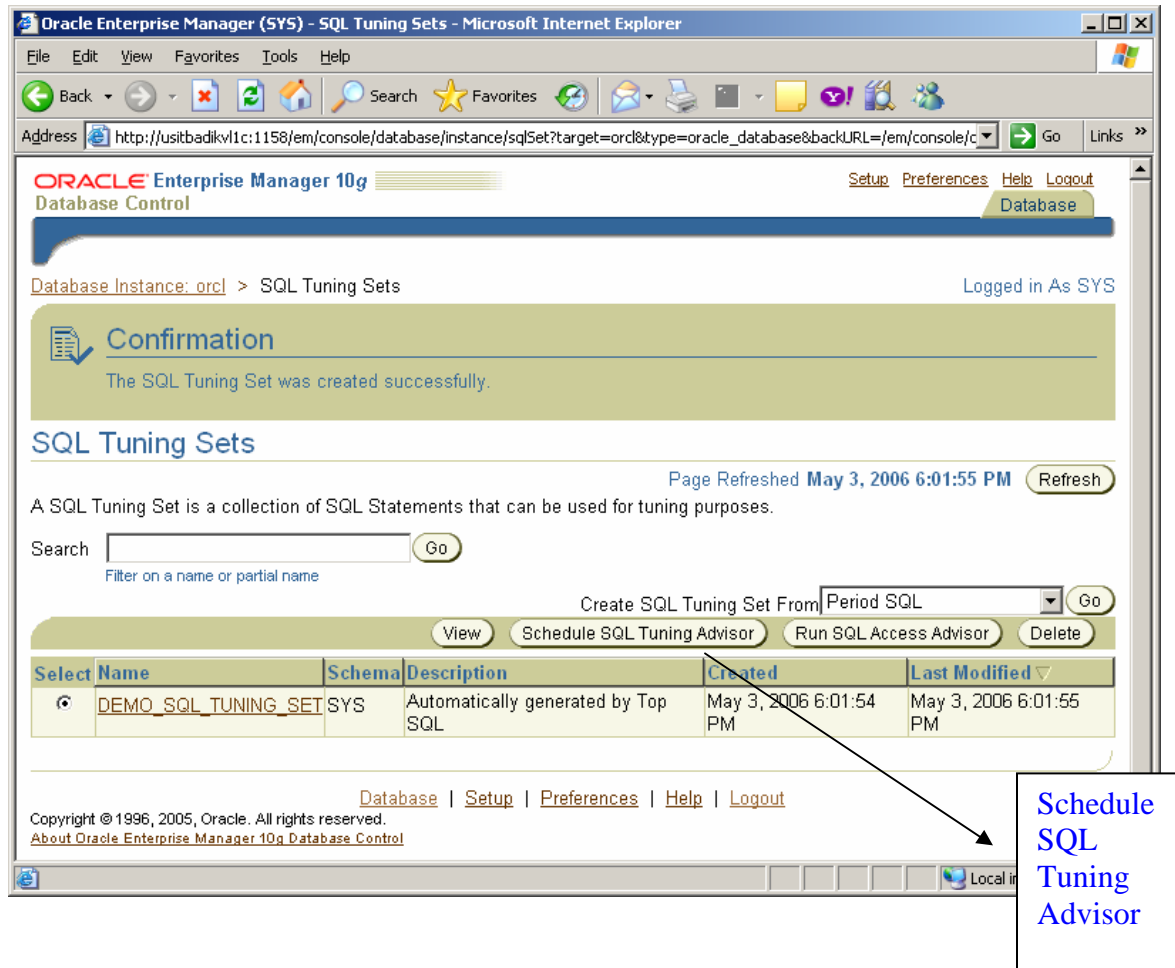
- Name:** DEMO_SQL_TUNING_SET
- Description:** Automatically generated by Top SQL

Below these fields is a table with two columns: "SQL Text" and "Parsing Schema". The table contains two rows of data:

SQL Text	Parsing Schema
select all 1, upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name, dm_folder.r_object_type, dm_folder.r_lock_owner, dm_folder.owner_name, dm_folder.r_link_cnt, dm_folder.r_is_vi...	PWC
SELECT (100 - sum(percent_space_used)) + sum (percent_space_reclaimable) FROM v\$flash_recovery_area_usage	SYSMAN

At the bottom of the page, there are links for "Database", "Setup", "Preferences", "Help", and "Logout". A callout box with the text "SQL Tuning Set Name" points to the "Name" field.

Step3: To create SQL Tuning set click on all the statements that you are interested in analyzing and click on Create SQL Tuning Set that will present you the screen below.



Step4: Once you created SQL Tuning Set you can run SQL Tuning Advisor on it by clicking on “Schedule SQL Tuning Advisor” link.

Step5: If you prefer running SQL Tuning Advisor on single SQL statement then just click the particular SQL and then click Schedule SQL Tuning Advisor to launch the screen below. You can name SQL Tuning session with your custom name or Oracle would create one for you automatically.

Under the Scope, select the scope of tuning you want optimizer to perform.

- Limited will only take 1 second per statement. This is desired if you have lot of SQL statements that you are running SQL Tuning Advisor on. This mode will not recommend SQL Profile.
- Comprehensive as name states will perform thorough analysis of the query to recommend all the suggestions including SQL Profile. In this mode you can also limit the time you want optimizer to spend on a query.

As shown below, you can also schedule the query at a different time if you prefer so that you will not impact the peak time by running the advisor.

The screenshot shows the Oracle Enterprise Manager 10g Schedule Advisor web page. The browser window title is "Oracle Enterprise Manager (SYS) - Schedule Advisor - Microsoft Internet Explorer". The address bar shows a URL starting with "http://usitbadkv11c:1158/em/console/database/instance/sqltune?event=tunesql&target=orcl&type=oracle_database&sql_id=4q4hykaj9pust&backURL=/em/". The page header includes "ORACLE Enterprise Manager 10g Database Control" and "Database Instance: orcl > Schedule Advisor". The "Logged in As SYS" status is shown in the top right. The main content area is titled "Schedule Advisor" and includes a "Cancel" and "OK" button. Below the title, there is a text box for "Name" containing "SQL_TUNING_1146704596708" and an empty "Description" text box. The "SQL Statements" section contains a table with "SQL Text" and "Parsing Schema". The "SQL Text" is "select all 1, upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name, dm_folder.r_object_type, dm_folder.r_lock_owner, dm_folder.owner_name, dm_folder.r_link_cnt, dm_folder.r_is_vi...". The "Parsing Schema" is "PWC". The "Scope" section has two radio buttons: "Limited. Analysis without SQL Profile recommendation. Takes about 1 second per statement." and "Comprehensive. Complete analysis including SQL Profile. May take a long time." The "Total Time Limit (minutes)" is set to "30". The "Schedule" section has a "Time Zone" dropdown set to "GMT-7:00". There are two radio buttons: "Immediately" (selected) and "Later". The "Date" is set to "May 3, 2006" (example: May 3, 2006). The "Time" is set to "6:03:00" with "AM" and "PM" options. Annotations with arrows point to the "Name" field, the "Total Time Limit" field, the "Date" field, and the "Time" field, all labeled "Schedule". An annotation points to the "Parsing Schema" field, labeled "SQL Tuning Advisor Name". An annotation points to the "Scope" section, labeled "Scope".

Oracle Enterprise Manager (SYS) - Schedule Advisor - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://usitbadkv11c:1158/em/console/database/instance/sqltune?event=tunesql&target=orcl&type=oracle_database&sql_id=4q4hykaj9pust&backURL=/em/ Go Links

ORACLE Enterprise Manager 10g Database Control

Database Instance: orcl > Schedule Advisor

Logged in As SYS

Schedule Advisor

Cancel OK

Enter the start date and time for the run of the advisor. A database job will be submitted at the time. You can also limit the amount of time for the run of the advisor. After reaching this limit, the advisor run will be interrupted and return partial results. You can check the status of any advisor run through Advisor Central.

* Name SQL_TUNING_1146704596708

Description

SQL Statements

SQL Text	Parsing Schema
select all 1, upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name, dm_folder.r_object_type, dm_folder.r_lock_owner, dm_folder.owner_name, dm_folder.r_link_cnt, dm_folder.r_is_vi...	PWC

Scope

☐ Limited. Analysis without SQL Profile recommendation. Takes about 1 second per statement.

☒ Comprehensive. Complete analysis including SQL Profile. May take a long time.

Total Time Limit (minutes) 30

Schedule

Time Zone GMT-7:00

☒ Immediately

☐ Later

Date May 3, 2006 (example: May 3, 2006)

Time 6:03:00 AM PM

SQL Tuning Advisor Name

Scope

Schedule

Step6: Once you run the SQL Tuning Advisor it will create a task and give recommendations for the SQL as below. In this case advisor has recommended a SQL Profile and also to restructure the SQL. You can view the recommendations by clicking on View Recommendations link to see them in detail.

Oracle Enterprise Manager (SYS) - SQL Tuning Results:SQL_TUNING_1146704596708 - Microsoft Internet Explorer

Address: http://usitbadikv11c:1158/em/console/database/instance/sqltune?event=view&task_id=558&target=ordc&type=oracle_database

ORACLE Enterprise Manager 10g Database Control

Database Instance: orcl > Advisor Central > SQL Tuning Results:SQL_TUNING_1146704596708

Logged in As SYS

SQL Tuning Results:SQL_TUNING_1146704596708

Status: COMPLETED
SQL ID: 4q4hykaj9pust
Time Limit (seconds): 1800

Page Refreshed: May 3, 2006 6:28:29 PM
Started: May 3, 2006 6:26:50 PM
Completed: May 3, 2006 6:26:55 PM
Running Time (seconds): 5

Recommendations

[View Recommendations](#)

Select SQL Text	Parsing Schema	SQL ID	Statistics	SQL Profile	Index	Restructure SQL	Miscellaneous Error
<input checked="" type="radio"/> select all 1, upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name, dm_folder....		4q4hykaj9pust		✓		✓	

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Local intranet

View Recommendations

Step7: You can review the recommendations and decide what you want to implement. In this case restructure SQL is suggesting Union All instead of Union. Depending on the query this might not be acceptable. But it also recommends a SQL Profile. You can implement the SQL profile by selecting the SQL profile and then click on Implement link above.

SQL Profile allows optimizer to collect auxiliary statistics specific to the statement that will allow query to run with more information as though we are passing hints. SQL Profile also uses execution history and sampling to set optimizer mode for the particular statement.

Oracle Enterprise Manager (SYS) - Recommendations for SQL ID:4q4hykaj9pust - Microsoft Internet Explorer

Address: http://ustbadiv1c11158/em/console/database/instance/sqltune?ovw%3Aselected=0&ovw%3Aoid%3A0=1&ovw%3Alength=1&task_id=55&type=oracle_database&target=oracle&event=view&source=&value=&state=

ORACLE Enterprise Manager 10g Database Control

Database Instance: orcl > Advisor Central > SQL Tuning Results: SQL_TUNING_1146704596708 > Recommendations for SQL ID:4q4hykaj9pust

Logged in As SYS

Recommendations for SQL ID:4q4hykaj9pust

Only one recommendation should be implemented.

SQL Text

```
select all t_upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name, dm_folder.r_object_type, dm_folder.r_lock_owner, dm_folder.owner_name, dm_folder.r_link_cnt, dm_folder.r_is_v...
```

Select Recommendation

Select	Type	Findings	Recommendations	Rationale	Benefit	Explain
<input checked="" type="radio"/>	SQL Profile	A potentially better execution plan was found for this statement.	Consider accepting the recommended SQL profile.		< 10	Explain
<input type="radio"/>	Restructure SQL	An expensive "UNION" operation was found at line ID 1 of the execution plan.	Consider using "UNION ALL" instead of "UNION", if duplicates are allowed or uniqueness is guaranteed.	"UNION" is an expensive and blocking operation because it requires elimination of duplicate rows. "UNION ALL" is a cheaper alternative, assuming that duplicates are allowed or uniqueness is guaranteed.		

Original Explain Plan

Implement

Return

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Implement recommendations

Step8: After implementing the SQL profile you can retest the query to see if it has helped in performance. You can also disable the SQL profile if it did not help performance.

The screenshot shows the Oracle Enterprise Manager 10g interface in a Microsoft Internet Explorer browser. The page title is "SQL Tuning Results:SQL_TUNING_1146256951829". The breadcrumb navigation is "Database Instance: orcl > Advisor Central > SQL Tuning Results:SQL_TUNING_1146256951829". The user is logged in as SYS.

Confirmation
The recommended SQL Profile was created successfully.

Page Refreshed May 3, 2006 8:20:45 PM [Refresh](#)

Status: **COMPLETED**
SQL ID: **4q4hykaj9pust**
Time Limit (seconds): **1800**

Started: **Apr 28, 2006 1:42:37 PM**
Completed: **Apr 28, 2006 1:42:41 PM**
Running Time (seconds): **4**

Recommendations [View Recommendations](#)

Select SQL Text	Parsing Schema	SQL ID	Statistics	SQL Profile	Index	Restructure SQL	Miscellaneous Error
<input checked="" type="radio"/> select all 1, upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name, dm_folder....		4q4hykaj9pust		✓		✓	

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[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

intranet

Two arrows point from the "SQL ID" box to the "SQL ID" column in the table and the "COMPLETED" status. Another arrow points from the "SQL Profile has been applied." box to the "SQL Profile" column in the table, which contains a checkmark.

In the query that was tested in this example after applying the SQL profile it executed in less than 5 sec compared to more than 1 minute that it took before.

Step9: To disable the SQL Profile click on the SQL ID and navigate to Tuning Information tab, click on SQL Profile and then click disable.

Oracle Enterprise Manager (SYS) - SQL Details: 4q4hykaj9pust - Microsoft Internet Explorer

Address: http://usitbadkvl1c1158/em/console/database/instance/sqlDetail?event=doLoad&target=oracle_database&sql_id=4q4hykaj9pust&planHashValue=865293719c

Database Control

Database Instance: orcl > Top Activity > SQL Details: 4q4hykaj9pust

SQL Details: 4q4hykaj9pust

Switch to SQL ID: Go

View Data: Real Time: Manual Refresh Refresh Schedule SQL Tuning Advisor

Text

```
select all 1, upper(dm_folder.object_name), dm_folder.r_object_id, dm_folder.object_name,
dm_folder.r_object_type, dm_folder.r_lock_owner, dm_folder.owner_name, dm_folder.r_link_cnt,
dm_folder.r_is_virtual_doc, dm_folder.r_content_size, dm_folder.a_content_type, dm_folder.i_is_reference,
dm_folder.r_assembled_from_id, dm_folder.r_has_frzn_assembly, dm_folder.a_compound_architecture,
dm_folder.i_is...
```

Details

Select the plan hash value to see the details below. Plan Hash Value: 865293719

Statistics Activity Plan **Tuning Information**

SQL Profiles and Outlines

A SQL Profile contains additional statistics of this SQL statement for the query optimizer to generate a better execution plan. An outline contains hints for this SQL statement for the query optimizer to generate a better execution plan.

Change Category Delete Disable/Enable

Select Name	Type	Category	Status	Created
<input checked="" type="radio"/> SYS_SQLPROF_0142bfa69fd4000	SQL Profile	DEFAULT	ENABLED	May 3, 2006 8:21:00 PM

SQL Tuning History

The following SQL tuning tasks provide the recommendations to tune this SQL statement.

Advisor Task Name	Advisor Task Owner	Task Completion
SQL_TUNING_1146704596708	SYS	May 3, 2006 6:26:55 PM

SQL Profile
Enable / Disable.

Other Input sources for SQL Tuning Advisor

- **ADDM**
ADDM runs every one hour proactively and analyzes statistics generated by AWR report over the last hour to identify performance problems including poor performing SQL statements and advices to run SQL Tuning Advisor.
- **AWR Report**
AWR Report can also be viewed directly to identify poor performing SQL statement and run SQL Tuning Advisor on them.
- **SQL Tuning Set**
SQL Tuning Set can include statements that are yet to be deployed, to identify if they could be potential poor performing SQL statements in them that had to be analyzed before deploying.