

ORACLE TUNING PACK

KEY FEATURES AND BENEFITS:

- Comprehensive solution for application and SQL tuning that eliminates need for manual tuning.
- Provides automatic tuning of SQL statements.
- Enhances system performance and reliability and significantly lowers management costs.

For database administrators and application developers, application tuning is a critically important area and a considerable amount of their time is spent performing this very important function. A poorly tuned business application can potentially affect not just a few users but an entire business operation and for this reason companies invest significant resources to ensure smooth running of applications vital for their businesses. Oracle Tuning Pack, a part of Oracle Database 10g product set, offers an extremely cost effective and easy-to-use solution that automates the entire application tuning process. Automatic SQL tuning is exposed to the user through two new components, SQL Tuning Advisor and SQL Access Advisor, that are seamlessly integrated with the Enterprise Manager Database Control and Grid Control, and together provide a comprehensive solution for automating the complex and time-consuming task of application tuning.

Automatic SQL Tuning

Manual SQL tuning is a complex process that presents many challenges. It requires expertise in several areas, is very time consuming, and requires an intimate knowledge of the schema structures and the data usage model of the application. All these factors make manual SQL tuning a challenging and resource intensive task that is ultimately very expensive for businesses.

Automatic SQL Tuning, a new solution that is part of the Oracle Tuning Pack 10g, is Oracle's answer to all the pitfalls and challenges of manual SQL tuning. It automates the entire SQL tuning process by comprehensively exploring all the possible ways of tuning a SQL statement. It is performed by the database engine's query optimizer, which has been significantly enhanced in Oracle Database 10g. Four types of analyses are performed in Automatic SQL Tuning:

- **Statistics Analysis:** The query optimizer needs up-to-date object statistics to generate good execution plans. In this analysis objects with stale or missing statistics are identified and appropriate recommendations are made to remedy the problem.
- **SQL Profiling:** This is new feature introduced in Oracle Database 10g that revolutionizes the approach to SQL tuning. Traditional SQL tuning involves manual manipulation of application code using optimizer hints. SQL Profiling eliminates the need for this manual process and tunes the SQL

statements without requiring any change to the application code. This ability to tune SQL without changing the application code also helps solve the problem of tuning packaged applications. Packaged application users now no longer need to log a bug with the application vendor and wait for several weeks or months to obtain a code fix for tuning the statement. With SQL profiling tuning is automatic and immediate.

- **Access Path Analysis:** Indexes can tremendously enhance performance of a SQL statement by reducing the need for full table scans. Effective indexing is, therefore, a common tuning technique. In this analysis new indexes that can significantly enhance query performance are identified and recommended.
- **SQL Structure Analysis:** Problems with the structure of SQL statements can lead to poor performance. These could be syntactic, semantic, or design problems with the statement. In this analysis relevant suggestions are made to restructure the SQL statements for improved performance.

Automatic SQL Tuning offers a comprehensive SQL tuning solution that obviates the need for the slow, tedious and expensive manual tuning. It is exposed to the user through the use of two new advisors that are part of the Oracle Tuning Pack 10g, the SQL Tuning Advisor and the SQL Access Advisor.

SQL Tuning Advisor

The Automatic SQL Tuning capabilities are exposed through a new server component called the SQL Tuning Advisor. The SQL Tuning Advisor takes one or more SQL statements as input and invokes the automatic SQL tuning process on it. The output of the SQL Tuning Advisor is in the form of recommendations, along with a rationale for each recommendation and its expected benefit. The recommendation relates to collection of statistics on objects, creation of new indexes, restructuring of the SQL statement, or creation of a SQL Profile. A user can choose to accept the recommendation to complete the tuning of the SQL statements.

The SQL Tuning Advisor is designed to accept input from several SQL sources, such as Automatic Database Diagnostic Monitor (ADDM), Automatic Workload Repository (AWR), cursor cache, and custom SQL as defined by the user. This enables the tuning of practically all SQL statements that would be of interest to a user. SQL statements from these input sources are typically first loaded in a new object called SQL Tuning Set, which is then submitted as input to the advisor.

A SQL Tuning Set (STS) is a new database object used for capturing SQL workload information. It includes:

- One or more SQL statements
- Associated execution context, such as user schema, list of bind values, etc.
- Associated basic execution statistics, such as elapsed time, CPU time, etc.

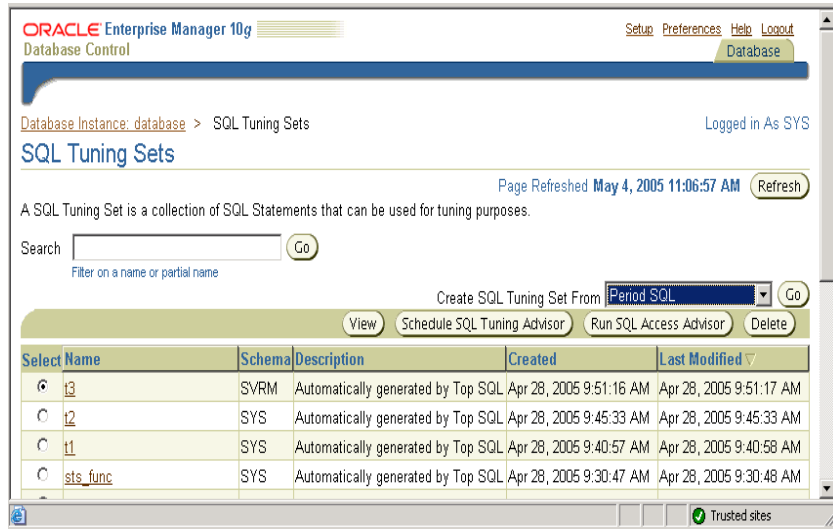


Figure 1: Managing SQL Tuning Sets using Enterprise Manager.

SQL Tuning Sets provide the basic framework for capturing, managing, and tuning SQL workloads. They allow selective, on-demand tuning of system generated and custom (user-defined) workloads and greatly simplify the task of tuning multiple SQL statements. With SQL Tuning Sets, users can capture any SQL statements of interest and store them in an STS for future tuning. They no longer need to manually build and maintain SQL scripts for tuning purposes. Furthermore, information pertaining to execution context and statistics that is captured in an STS allows for more superior and efficient tuning than would be possible from any custom SQL script.

After analyzing the SQL statements, the SQL Tuning Advisor provides advice on improving the performing of the SQL statements(s), the rationale for the proposed advice, estimated performance benefit, and the command to implement the advice. You simply have to choose whether or not to accept the recommendations to optimize the SQL statements. Figure 2 shows the recommendation page of EM.



Figure 2: SQL Tuning Advisor recommendations page.

The SQL Tuning Advisor offers a powerful, intuitive, and user-friendly way for

performing automatic SQL tuning. SQL tuning now no longer has to be the domain of experts. Oracle has built a tuning expert inside the database engine to perform this very important function for the database administrators in a fraction of the time and cost needed to carry out the same task manually.

SQL Access Advisor

The design of the database schema can have a big impact on the overall application performance. SQL Access Advisor is a new solution in the Oracle Database 10g that provides comprehensive advice on how to optimize schema design in order to maximize application performance. SQL Access and SQL Tuning Advisors, together, provide a complete solution for tuning database applications. These two advisors together automate all manual tuning techniques currently practiced and form the core of Oracle’s automatic SQL tuning solution.

The SQL Access Advisor accepts input from all possible sources of interest, such as the cursor cache, the Automatic Workload Repository (AWR), any user-defined workload, and will even generate a hypothetical workload if a schema contains dimensions or primary/foreign key relationships. It comprehensively analyzes the entire workload and provides recommendations to create new indexes if required, drop any unused indexes, create new materialized views and materialized view logs. The analysis considers the cost of insert/update/delete operations in addition to the queries. The recommendation generated by the SQL Access Advisor is accompanied by a quantifiable measure of expected performance gain as well as scripts needed to implement the recommendation.

Figure 3 shows the SQL Access Advisor recommendations page. The recommendations are ordered by the workload improvement factor. User can select one or all of the recommendations and implement them by simply clicking the *Implement* button.



Figure 3: SQL Access Advisor Recommendations page.

ORACLE TUNING PACK 10G**RELATED PRODUCTS
AND SERVICES:**

Oracle Tuning Pack 10g delivers maximum benefits when used with following Oracle products:

- Oracle Diagnostics Pack 10g for Database offers a complete, cost-effective, and easy to use solution for managing the performance of Oracle Database environments by providing unique functionality such as automatic identification of performance bottlenecks, guided problem resolution, comprehensive system monitoring and event management.
- The Oracle Configuration Management Pack tracks and analyzes hardware, OS and software configurations and lowers the cost of complex operations such as applying software patches, enforcing operational policies and cloning systems.
- The Oracle Change Management Pack for Database provides the ability to evaluate, plan for, and implement database schema changes to support new application requirements; eliminates errors/data loss when making changes, minimizes downtime.

The SQL Access Advisor takes the mystery out of access structure design process. It tells the user exactly what the type of indexes and materialized views are required to maximize application performance. By automating this very critical function, SQL Access Advisor obviates the need for the error-prone, lengthy, and expensive manual tuning process. It is fast, precise, easy to use and, together with the SQL Tuning Advisor, offers the most accurate and cost-effective solution for application performance tuning.

Object Reorganization Wizard

Oracle Tuning Pack 10g also provides the ability to reorganize objects. Managing the space usage of your tablespaces efficiently by removing wasted space is not only good space management practice but it also enhances performance by reducing unnecessary disk I/Os. Reorganization is used for:

- Rebuilding indexes and tables that are fragmented
- Relocating objects to another tablespace
- Recreating objects with optimal storage attributes

Oracle Tuning Pack 10g provides a wizard than can perform reorganization at schema and tablespace levels, and gives the option for both online and offline reorganization. The wizard also provides an impact analysis report as well as a review script that contains the exact operations that will be performed. This helps the users to precisely understand the implications of the operation before implementing it. Figure 4 shows the Reorganization wizard EM interface.

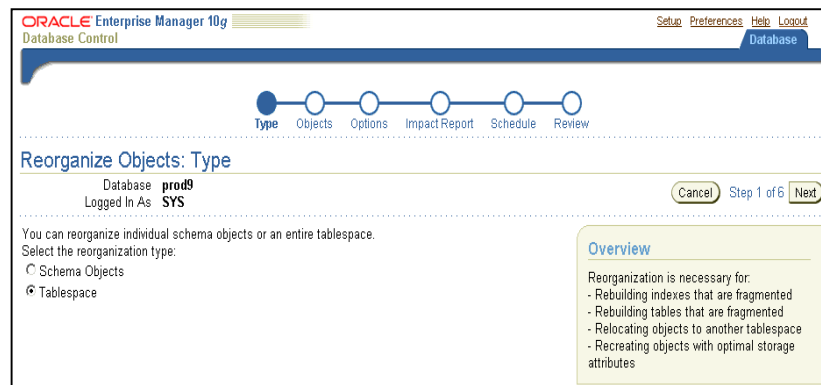


Figure 4: Object Reorganization Wizard