



Tech Notes

Faster SQL Profiling for Better Database Performance

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INTRODUCTION

Before you can get to where you want to be, you have to know where you are. The quicker you can get the big picture of which queries, stored routines, or triggers are bogging your database down, the faster you can solve the problem. All too often a DBA's time is spent tracking down different performance data from disparate sources and tools. Having the big picture is important. It saves you from getting lost in the details and gives you a global perspective of where to look.

Whether or not you are a full-time member of the development team or get pulled in at the last minute to perform "super hero" feats right before an application goes live, you know that the faster you can get your job done with the least amount of resources will lead to the quick path to success.

Often, having the right tools at your disposal is the difference between doing your job well (and enjoying your weekend) or struggling to query reports and disparate performance statistics well into the night.

Embarcadero® DB Optimizer™ is an agent-less, desktop tool that can be installed and configured in minutes, empowering you to discover problematic SQL statements. DB Optimizer helps quickly profile Oracle®, Microsoft® SQL Server, Sybase®, and IBM® DB2 for LUW databases, allowing you to quickly identify and fix SQL that is causing performance bottlenecks. With DB Optimizer, DBAs, developers, and QA Engineers have the flexibility of using a single easy-to-use IDE to test, profile and tune SQL.

DB Optimizer also embeds Rapid SQL Developer Standard Edition as a feature with code completion, real-time error checking, explain plans, and on-the-fly tuning that streamlines coding tasks while producing quality code.

But as most DBAs and developers realize, optimizing database performance begins with an accurate diagnosis of the problem. Database profiling gets you to the diagnosis quickly and allows you to focus your time fixing problems instead of trying to find them.

This paper discusses how DB Optimizer helps you profile your databases to find problematic SQL statements faster and easier.

In short, DB Optimizer prevents you from spinning your "profiling" wheels by providing three time-saving methods to profile your databases:

- Pinpoint SQL causing poor database performance with graphical visualization of wait-time analysis
- Find detailed activity information for an individual SQL statement, including the SQL text, events, sessions, child cursors, and SQL details
- Complete one-stop profiling with an easily installable, agent-less desktop tool that provides support for multiple RDMS platforms

USING WAIT-TIME ANALYSIS SAVES YOU TIME AND MONEY

Embarcadero DB Optimizer provides graphical visualization of wait-time analysis to easily pinpoint the SQL that causes poor database performance.

WAIT-TIME ANALYSIS VERSUS TRACE ANALYSIS

In recent years, wait-time analysis is gaining popularity because it can be more practical and provide a better theater for problem-solving. The intuitive nature of wait-time analysis has given it the nickname “bottleneck analysis”; and finding database bottlenecks is something every DBA needs to do faster and easier.

One of the most common analogies used when describing the benefits of wait-time analysis is shortening your morning commute. If you want to get to work faster, you do not start by counting how many tire rotations take place or by tracking the car’s temperature at different times in your commute. More than likely, you note which traffic lights take the longest and which roads have the highest speed limits. In some cases, you can even find that the longer way to work is the fastest.

Traditional trace analysis is a popular tool which gives you a huge chronological list of exactly what the database is doing with your time. With trace analysis, the information you need is there if you know what you are looking for and have the time and inclination to write custom queries for the trace tables. Trace analysis is a powerful tool, but is usually most helpful when you’ve already isolated your performance problem.

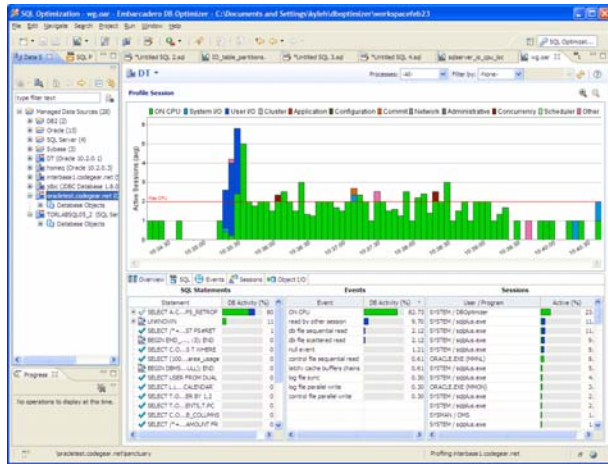
By using wait-time analysis, you find the problem by analyzing a list of the collective time delays that cause end users to wait for the information they need. The best first step to solving most SQL performance problems is to know how long it is taking for your database queries to run and how you can save time and increase performance by optimizing individual queries, explain plans, or stored routines. With wait-time analysis you know where your slow queries and procedures are happening and how often.

HOW DB OPTIMIZER INCORPORATES WAIT-TIME ANALYSIS

DB Optimizer takes advantage of the wait-time analysis methodology and caters its charts and graphical displays to providing this information in an easy-to-navigate (Figure 1) and easy-to-analyze (Figure 2) interface.

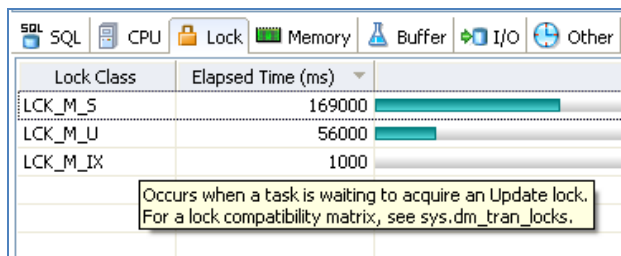
By categorizing the wait events and separating them into an intuitive tab display, DB Optimizer provides a second pair of eyes to spot performance issues. Different entries in the Wait Category tab show the names of wait events and the time spent waiting for that event over the length of the profiling session or the selected time interval.

Figure 1: DB Optimizer SQL Profiling



DB Optimizer uses wait event categories to present wait-time analysis. The wait interface also shows database configuration problems and application architecture problems.

Figure 2: Quick Tooltips



Note how you can get quick tooltips that give a description of the wait and suggest a probable cause.

The following example is from a SQL Server profile.

WAIT EVENT CATEGORIES BY DATABASE PLATFORM

Database Platform:	Oracle	Sybase	DB2	SQL Server
Wait Event Categories:	On CPU	CPU	Other	CPU
	Application	Lock	Fetch	Lock
	User I/O	I/O	Cursor	I/O
	Other	Memory	Execution	Memory
	Commit	Network	Operation	Other
	System I/O	Other	Transaction	Buffer
	Configuration		Connectivity	
	Cluster			

DB Optimizer is an agent-less desktop tool that installs in minutes. Creating a profiling session is as easy as configuring the tool to point to a specific data source and setting the parameters of your profile session. You can choose to use real-time profiling to view the analysis as it occurs or save the session to view later. DB Optimizer is flexible enough to incorporate into your development process too, ensuring an easy handoff between production and development DBAs. Sharing analysis between teams becomes as easy as file-sharing.

Valuable ways to incorporate wait-time analysis information found with DB Optimizer within your workplace include:

- Ad Hoc Testing
- More Productive Code Reviews
- Quickly Identifying Production Slowdowns

AD HOC TESTING THAT YIELDS HUGE EFFICIENCY GAINS

A production DBA's expertise can be invaluable during the testing cycle of an application. Unfortunately, they are usually too busy managing and monitoring; most production DBAs are working hard to ensure production databases are always running efficiently. But it is their exact expertise that can ensure that an application's performance issues are found before it hits production.

It is rare to have the time to make contributions to application development. Having a desktop tool at your fingertips to quickly profile and analyze database issues helps you take advantage of any time you are given. Increased productivity means the little time you have for projects does not go to waste.

Whether it is a three-minute profile or a lengthy analysis during a load test, production DBAs, developers and QA Engineers can make the most of their collaboration during testing cycles by enlisting the help of DB Optimizer.

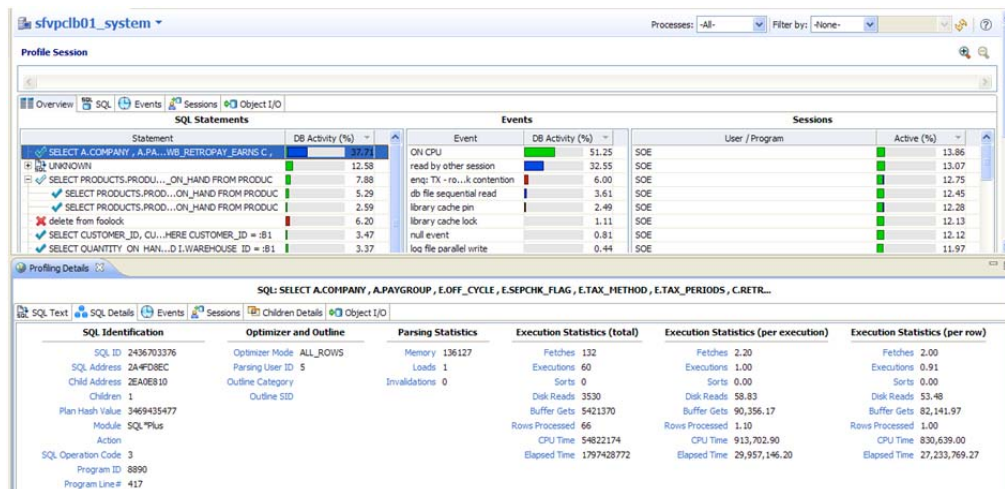
PROFILING DURING THE QA CYCLE

Profiling the database while the application is going through acceptance testing allows you to do low-impact analysis during realistic scenarios. Profiling while QA engineers are walking through test cases provides a great opportunity for the prepared DBA to profile the database during real-world scenarios. With DB Optimizer, there is no setup, no impact on other teams, and feedback can quickly get back to the development team members who need it.

During the QA cycle and as defects are being fixed, application churn usually ensures that last-minute fixes need to be verified and tested. DB Optimizer can help you ensure that any bug fixes that take place during the final testing phase of a project do not adversely affect database performance.

For example, with just a 15-minute profiling session, it is easy to spot the profiling session's slowest SQL statements in the SQL tab of DB Optimizer.

Figure 3: Profiling Statements



For each SQL statement, you see detailed statistics including:

- The number of executions
- The total elapsed time
- Wait-time analysis (breakdown of where the time was spent)

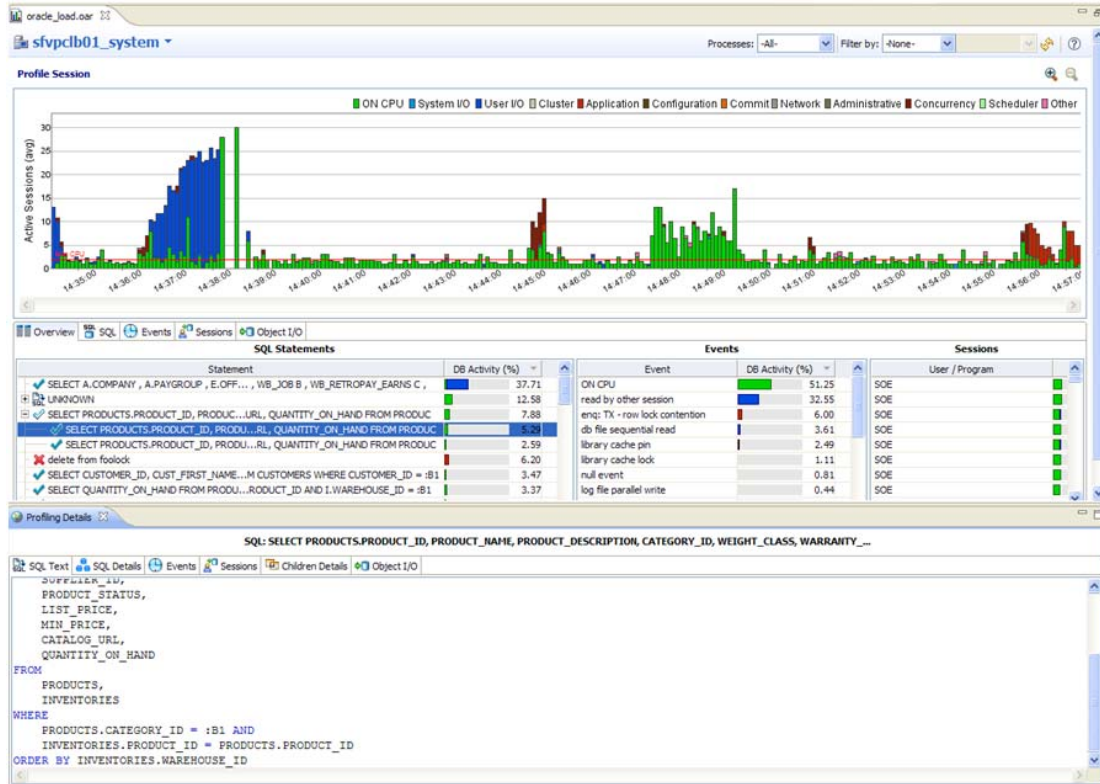
MORE PRODUCTIVE CODE REVIEWS

In some organizations, production DBAs can be called upon to do code reviews. These reviews often focus on review of SQL statements and verifying the efficiency of explain plans for stored procedures. Because code reviews are often informal and may not be on the official schedule, it is important for a production DBA to be able to utilize the little time they are given.

Different developers often have different SQL coding styles which reinforce the adage, “50 different ways to ask the same question.” Within SQL statements, it is important to ensure that only the necessary data are being processed within a query. Addressing bulky JOINS and complicated WHERE clauses often improve database performance. Performance problems are often associated with a handful of SQL statement types, and if those “problem” statements are re-used multiple times, performance issues rise as well.

One of the key advantages of DB Optimizer is how it presents predicate analysis information. Predicate analysis is the practice of analyzing queries according to predicate use and presenting them in a way that allows you to quickly see how many times similar queries are run. If an inefficient query or join is made multiple times, DB Optimizer graphically shows you how many times and how long each is taking. It is especially helpful when providing feedback on consistent data retrieval to the development team.

Figure 4: Predicate Analysis



QUICKLY IDENTIFYING SLOWDOWNS IN YOUR PRODUCTION ENVIRONMENT

Once an application is live, you often see performance problems that were nearly impossible to predict in a test environment. It is often difficult to have a test environment that exactly matches your production environment. Whether it is a shortage of hardware or not enough software licenses, the test environment can easily come up short and make identifying performance issues while in production a common occurrence.

Profiling your database while it is in production is often the best way to catch the toughest performance problems, including issues that only occur in complex interactions on loaded systems. For example, dynamic SQL and stored procedures can be more accurately profiled and analyzed while the application is in real-time use.

In some cases, heterogeneous production environments can leave the production DBA jumping from one tool to the next to profile individual databases in a clustered or distributed environment. Being able to see consistently profile each database with the same tool and view different database profile sessions at once gives you needed focus.

After running and saving a profiling session in DB Optimizer, you can view each simultaneously to compare issues. You can customize and manage your data source profiling sessions in the Profile Launch Configuration Dialog, which can be accessed from the toolbar.

DB Optimizer profiling sessions are easily saved and shared. Production fixes no longer take weeks to implement. Production DBAs can take profiling snapshots, diagnose, and then send the same snapshot to development for the diagnosis and suggested fixes to be validated and applied. Developers can use DB Optimizer to re-profile the database in a testing environment using the same parameters used in the production profile.

DB OPTIMIZER'S ROLE

Embarcadero DB Optimizer maximizes database and application performance by enabling DBAs and developers to quickly discover, diagnose, and optimize poor-performing SQL. DB Optimizer eliminates performance bottlenecks by identifying data intensive or frequently executed queries, focusing on specific SQL statements through query statistics (CPU, I/O, wait times), and fine-tuning problematic statements.

- Optimize SQL performance throughout the development lifecycle
- Eliminate performance bottlenecks in production databases and applications
- Develop, test, profile, and tune SQL in a single, easy-to-use IDE

DB Optimizer offers:

- Graphical visualization of wait-time analysis to easily pinpoint the SQL causing poor database performance
- Continuous profiling monitors an entire data source within a configurable span of time
- Batch tuning of DML statements, stored routines, entire SQL files
- Explain plans for a better understanding of how SQL will be executed and the performance costs
- SQL editor with real-time quick fixes to flag and correct inefficient SQL automatically

DB OPTIMIZER'S ROI

Incorporate DB Optimizer's profiling and tuning capabilities into the development process and you get optimized code that is faster in QA and production, enabling you to meet SLAs from the very first implementation. Or test other changes and fixes to ensure they will not cause performance problems before they are placed in to production.

You can measure the ROI for DB Optimizer using the following:

- Reduced time it takes to identify and correct poor-performing SQL.
- Improved database performance, improving end user productivity and satisfaction.
- Shorter QA cycles.



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