



Viewpoint

Performance Optimization: Extending the IT Infrastructure

Optimizing System Performance Using Prevent, Find, and Fix Methodologies

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Corporate Headquarters
100 California Street, 12th Floor
San Francisco, California 94111

EMEA Headquarters
York House
18 York Road
Maidenhead, Berkshire
SL6 1SF, United Kingdom

Asia-Pacific Headquarters
L7. 313 La Trobe Street
Melbourne VIC 3000
Australia

In today's economy it is imperative that application and database developers work smarter, not harder, to meet the demands put on them by line of business owners, senior management, and the company as a whole. Due to time, money, and resource limitations it is often no longer feasible to rewrite, re-architect, or even replace applications and databases that are core to running a business as a means of achieving better performance or scalability. Likewise, simply throwing additional computing resources at the problem in an attempt to extend the life of an application or system is often no longer feasible due to capital costs. The only option is to get more out of existing systems with as little effort as possible.

" Poor performance costs the software industry millions of dollars annually in lost revenue, decreased productivity, increased development and hardware costs, and damaged customer relations. "

It all circles back to optimization. Performance optimization is a key ingredient in the struggle to stretch an invested IT dollar to its absolute limit. From a productivity perspective, application and database performance is becoming more critical in everyday business transactions. There is no time to waste as a query drags on. Performance optimization problems can occur at any stage of the development lifecycle, so organizations need to take a three step approach to this problem: prevent, find, fix.

PREVENT, FIND, FIX

Embarcadero offers database and code optimization tools for application developers, database developers, and database administrators to prevent, find, and fix problems that impact performance throughout the system development lifecycle. Embarcadero performance optimization tools help:

- Data architects deliver performance-oriented schema to development
- Developers and QA Engineers build high performing applications and databases, and keep poor-performing (and costly) code from reaching production
- Database administrators address performance issues in production. 24x7 monitoring and alerts to catch fires early and fix them quickly before outages occur

Database and code optimization tools detect problems earlier, address issues faster, minimize the chance of deploying poor-performing Java™ or SQL code, and ultimately deliver higher quality solutions. Continuous monitoring of database performance allows DBAs to quickly find and correct problematic SQL statements and ensure faster response times for better end-user experience. Performance optimization tools can also minimize IT spend on additional hardware to handle peak-load requirements by insuring the applications and databases are optimized to fully utilize existing IT resources.

JAVA PERFORMANCE OPTIMIZATION

While it is unlikely that anyone would disagree with the statement that "faster is better", nor would they disagree with the idea that poor code quality is costly on numerous levels, here are a few points to drive this home:

- According to IDC Research¹ over 46% of the companies surveyed indicated that it takes an average developer an average of 2-5 days to correct a field defect. Even worse, 67% of the respondents indicated that it took 2-10 days. This not only means a significant amount of time and money is spent fixing defects, but there is also the lost opportunity costs that need to be considered since a developer fixing bugs, isn't implementing new solutions or applications which may be critical to the business.
- According to Lloyd G. Williams, Ph.D. and Connie U. Smith, Ph.D. in their paper titled Five Steps to Solving Software Performance Problems, "Poor performance costs the software industry millions of dollars annually in lost revenue, decreased productivity, increased development and hardware costs, and damaged customer relations".
- From a report by LKP Group, according to the CTO of one software development organization, a bug that costs \$1 to fix on the programmer's desktop costs \$100 to fix once it is incorporated into a complete program, and many thousands of dollars if it identified after the software has been deployed in the field.²
- From the same report, Barry Boehm, one of the industry's leading experts on software quality, has published several studies over nearly three decades that demonstrate how the cost of removing a software defect grows exponentially for each downstream phase of the development lifecycle in which it remains undiscovered.³
- According to a study commissioned by the US Department of Commerce's National Institute of Standards and Technology (NIST), software bugs, or errors, are so prevalent and so detrimental that they cost the U.S. economy an estimated \$59.5 billion annually, or about 0.6 percent of the gross domestic product.⁴

Even in a good economy these figures are staggering. In today's economy the ability to significantly reduce these costs could mean the success or failure of a business.

EMBARCADERO® J OPTIMIZER™

J Optimizer is a Java optimization tool designed to aid developers in finding and fixing problems in their code earlier in the development process. J Optimizer's audits perform a static code analysis, identifying coding problems like potential race conditions, unchecked exceptions and more. Advanced code metrics allow developers to easily determine the quality and complexity of the code structure, helping them pinpoint potential problem areas quickly.

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¹ Debugging and Business Value Survey IDC April 2008

² <http://www.lkpgroup.com/Cost%20of%20Software%20Defects.pdf>

³ <http://www.perfeng.com/papers/step5.pdf>

⁴ http://www.nist.gov/public_affairs/releases/n02-10.htm

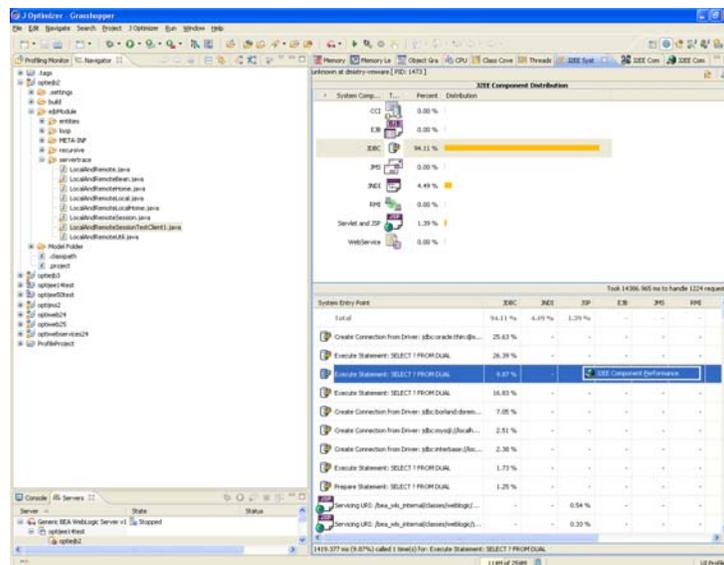


Figure 1: J Optimizer Request Analyzer shows precise drill-down information about performance bottlenecks in Java EE applications.

Java developers can use J Optimizer to profile memory and CPU usage, display real-time threading information, and determine which parts of the code are executed, all down to the line-level detail. Once the offending line(s) of code are identified, the developer can go begin to modify the code in J Optimizer and address the issue.

J Optimizer supports profiling of Java applications running on today's most popular commercial and open source application servers including BEA WebLogic Application Server, IBM WebSphere, JBoss, Oracle Application Server, Apache Geronimo, Apache Tomcat, and Sun GlassFish.

RESOURCES

- http://www.embarcadero.com/products/j_optimizer/index.php
- You can view the videos at:
<http://www.embarcadero.com/resources/demos/joptimizer.php>.

DATABASE PERFORMANCE OPTIMIZATION

“Poor performance costs the software industry millions of dollars annually in lost revenue, decreased productivity, increased development and hardware costs, and damaged customer relations.”

Database Administrators (DBAs), developers, and QA engineers are under increasing pressure to maintain the highest levels of database and application performance. They must balance customer satisfaction and productivity with rising costs and shrinking budgets. Throwing more hardware or resources at the problem is no longer an option. Neither are outages or delays. Optimization tools such are needed to ensure that poor-performing code never reaches the production environment - where it is significantly more costly to correct bad SQL code.

There are a number of places in the development lifecycle that can potentially create performance optimization challenges for the DBA: at the database design stage, during database development and QA cycle, and ultimately in the production environment as well.

DATABASE DESIGN

It starts at the database design phase of the development lifecycle. It is critical that the database designs conform to relational standards. Embarcadero® Schema Examiner™ is a design or architecture validation tool that looks at the structure of the database to find improper indexing, normalization problems and other relational modeling errors that impact database performance.

By reverse-engineering the schema of existing databases or read SQL scripts directly, design changes can be simulated before implementation to reduce risk and allow users to check and validate design alterations as a result of maintenance or new inclusions to the database structure.

Schema Examiner recommends changes to database schema and can automatically generate scripts to fix problems. This efficient and consistent approach to improving database design helps avoid costly data errors and performance problems during all phases of the database lifecycle.

DEVELOPMENT AND QA

It is the developer's responsibility to prevent poor-performing SQL code from reaching production in the first place. Embarcadero® DB Optimizer™ is a SQL profiling and validation tool that examines SQL queries to uncover inefficiencies and offers alternatives to improve SQL performance and prevent poor-performing SQL from ever reaching the production environment.

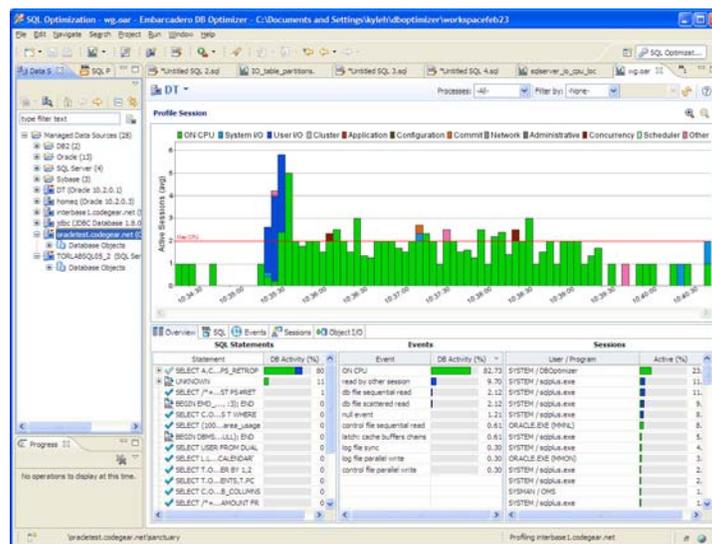


Figure 2: DB Optimizer graphical profiling with details on SQL statements, events, and sessions make it easy to find the SQL that most impacts performance.

Starting with profiling, DB Optimizer can analyze a single SQL statement or an entire database to determine which queries should be focused on for improvement. In some cases these may be long-running queries. In other cases they may be queries that execute repetitively. Both are worth the effort to try and improve overall performance.

Once the problem statements have been identified, DB Optimizer can begin tuning. Tuning is the process of actually making changes: studying a number of different options (known as cases), the "costs" of each option, and implementing the case that provides the best execution plan. DB Optimizer also provides batch tuning of DML statements, stored routines, and entire SQL files, producing a number of execution plans, displayed on a grid, with detailed statistics for each case. The best case can easily be selected to automatically replace the existing poor-performing SQL statement.

PRODUCTION

Continuous monitoring of database performance allows DBAs to quickly find and correct problematic SQL statements and ensure faster response times for better end-user experience. Embarcadero® Performance Center™ helps spot performance issues impacting an organization's bottom line. In real-time, DBAs can observe their enterprise databases in a single view to see how they are performing at any point in time. DBAs can then quickly drill down into every detail of a database's performance to determine the root cause of any response problems. Configurable SQL capture offers a pro-active approach by automatically triggering profiling sessions when a threshold has been violated.

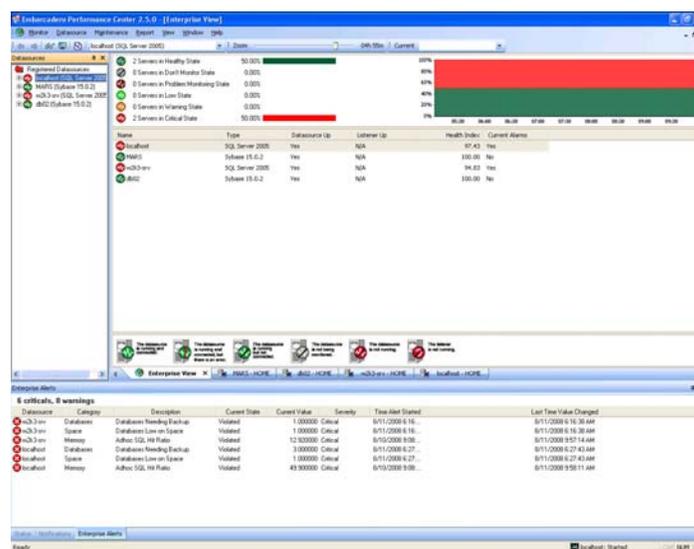


Figure 3: Performance Center Enterprise View displays DB2 LUW, Microsoft SQL Server, Oracle, and Sybase databases in a single view and drill down into every detail of a database's performance to determine root cause of each problem.

With 24x7 coverage performance issues are detected in real-time – before they threaten a database's health. DBAs can initiate an unattended, "lights out" monitoring schedule for early problem detection and notification. Customizable alarm thresholds, notifications, and escalation paths let DBAs control how far in advance they want to be notified of problems, how they want to be notified, as well as who receives notification under specific conditions.

Performance Center can also respond to database alarms by invoking a command line or SQL job to automatically fix the problem before database performance is adversely affected. Once they have located the problem, DB Optimizer can quickly tune the problematic SQL code and restore optimum performance.

RESOURCES

Embarcadero provides additional whitepapers and resources that delve deeper into the specifics of database performance. For information about data warehousing, SQL profiling or managing SLAs, see the following:

- http://www.embarcadero.com/resources/technical_papers/Why-Data-Warehouse-Projects-Fail.pdf
- http://www.embarcadero.com/resources/technical_papers/Faster-SQL-Profiling-for-Better-Database-Performance.pdf
- http://www.embarcadero.com/resources/technical_papers/Using-Database-Monitoring-Tools-to-Measure-Manage-and-Prove-SLA-Compliance.pdf
- View videos for DB Optimizer here:
<http://www.embarcadero.com/resources/demos/dboptimizer.php>
- View a video that highlights Performance Center:
http://www.embarcadero.com/resources/demos/performance_center.php

OPTIMIZATION GIVES YOU MORE FOR LESS

Embarcadero's industry-leading Java™ and SQL optimization tools let you detect performance problems earlier, correct them faster, and minimize the risk of ever deploying poor-performing code into production. Top-performing systems helps minimize IT spend by ensuring that applications and databases fully optimized to utilize existing IT resources.

EMBARCADERO OPTIMIZATION TOOLS

- **J Optimizer** is a Java profiling tool designed to find and fix code problems earlier in the development process. Dynamic code analysis tools identify performance problems such as potential race conditions and unchecked exceptions, and memory and CPU bottlenecks. Advanced code metrics reveal the quality and complexity of the code structure to quickly pinpoint potential problem areas.
- **DB Optimizer** is a SQL profiling and validation tool that offers graphic visualization of wait-time analysis and examines SQL queries to uncover inefficiencies and offers alternatives to improve SQL performance and prevent poor-performing SQL from ever reaching the production environment.
- **Performance Center** is a 24x7 database monitoring tool that lets you access both historical performance analysis data as well as identify and diagnose problems occurring in real-time. It tracks and reports on all aspects of database activity like memory, I/O, contention, space, network, objects, users, and SQL code to pinpoint performance problems.
- **Schema Examiner** is a design or architecture validation tool that looks at the structure of the database to find improper indexing, normalization problems and other relational modeling errors that impact database performance.



Embarcadero Technologies, Inc. is a leading provider of award-winning tools for application developers and database professionals so they can design systems right, build them faster and run them better, regardless of their platform or programming language. Ninety of the Fortune 100 and an active community of more than three million users worldwide rely on Embarcadero products to increase productivity, reduce costs, simplify change management and compliance and accelerate innovation. The company's flagship tools include: Embarcadero® Change Manager™, CodeGear™ RAD Studio, DBArtisan®, Delphi®, ER/Studio®, JBuilder® and Rapid SQL®. Founded in 1993, Embarcadero is headquartered in San Francisco, with offices located around the world. Embarcadero is online at www.embarcadero.com.