



**Achieving High-Performing PeopleSoft Applications
Using Sybase SQL Expert**

A Technical White Paper

expert



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Achieving High-Performing PeopleSoft Applications Using Sybase SQL Expert

1. Introduction

The purpose of this paper is to explain how DBAs, Consultants, QA engineers and Developers can maximize the performance of PeopleSoft applications, ensure a successful and timely installation and/or upgrade of PeopleSoft applications, and learn a methodology for optimal performance with Sybase SQL Expert.

By addressing the performance challenges faced in PeopleSoft application development, we break down and explore the process of performance tuning for different PeopleSoft components. Also, by demonstrating the process of performance tuning for PeopleSoft applications we show how to “unlock” one’s business potential through the adoption of Sybase SQL Expert technology. Finally, we address the full lifecycle of PeopleSoft applications and provide the solution for maintaining performance throughout the life of your application.

2. Performance Challenges

Designed for enterprises, PeopleSoft business applications achieve productivity and efficiency gains by automating business processes such as Human Resources, Finance, Supply Chain, Student Administration and others.

The main goal of a PeopleSoft implementation is to improve workflow, reduce costs, and ensure the reliable and timely management of the data that drives customer’s business. Although PeopleSoft delivers superior functionality to the end users, the application’s platform independent architecture can cause performance degradation when deployed. Often, implementations and upgrades can overrun allocated budgets and timelines as well as decrease end user efficiency due to poor performing applications.

PeopleSoft’s applications are developed in a generic fashion to work on a number of different vendor’s databases such as Sybase ASE, Oracle, Microsoft SQL Server, DB2 and Informix. Data retrieval and data modification from PeopleSoft to the database is done through generic SQL statements that are compatible across all RDBMS.

Every RDBMS has a unique architecture and processes SQL statements in different ways. Therefore, generic SQL statements do not take advantage of any RDBMS architecture and specific platform characteristics, which results in performance inefficiencies. Another performance challenge that PeopleSoft applications have is that every implementation resides in a different database environment with different data volumes, transaction rates, hardware and configurations. This means that no two PeopleSoft implementations are alike, resulting in unique performance characteristics. For these reasons, *PeopleSoft applications are not tuned for maximum performance for every implementation right out of the box.*

SQL tuning offers the best opportunity to improve database and application performance, resulting in considerable savings by delaying expensive hardware



upgrades, avoiding time-consuming database redesigns, and avoiding lost business opportunities due to data unavailability.

Poor performing SQL statements are responsible for 60 to 90 percent of applications' performance problems. According to industry experts, SQL activities typically consume as much as 70% of the system resources in a database server. In many cases, resource consumption by SQL activity can be as high as 80-90%

The primary problem with database applications is that databases are dynamic environments: data volumes and user populations grow, new versions of applications and databases are implemented, and server configurations change. All of these database and application changes make performance unpredictable and uncertain.

Sybase SQL Expert maximizes PeopleSoft performance by focusing on the factor that contributes up to 90% of the performance problems: SQL statements. Sybase SQL Expert allows for the management of performance changes and improvement; therefore decisions to alter the database environment can be made with the highest level of confidence.

Using the Sybase SQL Expert solution and methodology for optimal performance in your PeopleSoft implementations and upgrades will:

- Maximize performance
- Shorten application development lifecycle
- Predict where performance problems will occur before production
- Improve group productivity
- Lower hardware and consulting costs
- Ensure that your PeopleSoft projects are successful
- Provide a superior method to achieving performance gains

Therefore, there are numerous business benefits of adopting the Sybase SQL Expert option for ASE throughout your PeopleSoft application lifecycle. Sybase SQL Expert comprehensive solution is the only guaranteed method to achieve total PeopleSoft and Sybase ASE performance assurance.

3. Optimizing PeopleSoft's Performance

Before addressing how to maximize PeopleSoft's application performance, let's review PeopleSoft's architecture and its tunable components.

PeopleSoft 7.0 and 7.5 support the following connection modes: two tier architecture or three-tier architecture. In a two-tier architecture the client connects directly with the database server. In a three-tier architecture the client connects to the Application Server (BEA/Tuxedo) and the Application Server establishes the connection with the database server. The user can choose the connection mode to PeopleSoft. Figure 3.1 shows the two and three-tier architecture of PeopleSoft as well as the different components that contain SQL which will be referenced later in this paper.

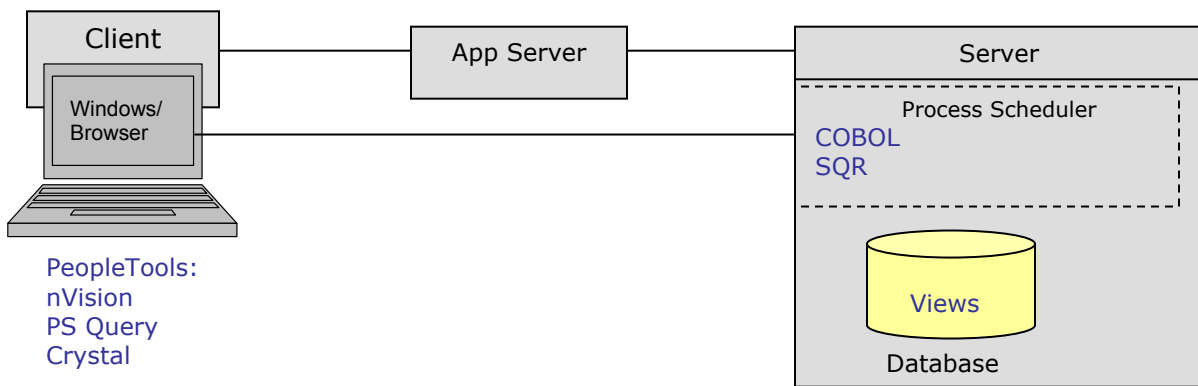


Figure 3.1: PeopleSoft's 7.0 and 7.5 architecture

PeopleSoft version 8 introduced a new Internet Architecture where the client can be any internet device that uses HTTP, HTML or XML. The client is typically a web browser that connects to a web server, then it connects to the Application Server and in turn the Application Server connects to the database server. For batch processing, PeopleSoft introduced an Application Engine that is responsible for creating batch programs. PeopleSoft's internal code is mainly built in COBOL and SQR, but PeopleSoft plans for later versions to move all COBOL and SQR to the Application Engine. Figure 3.2 shows the multi-tier architecture of PeopleSoft version 8.

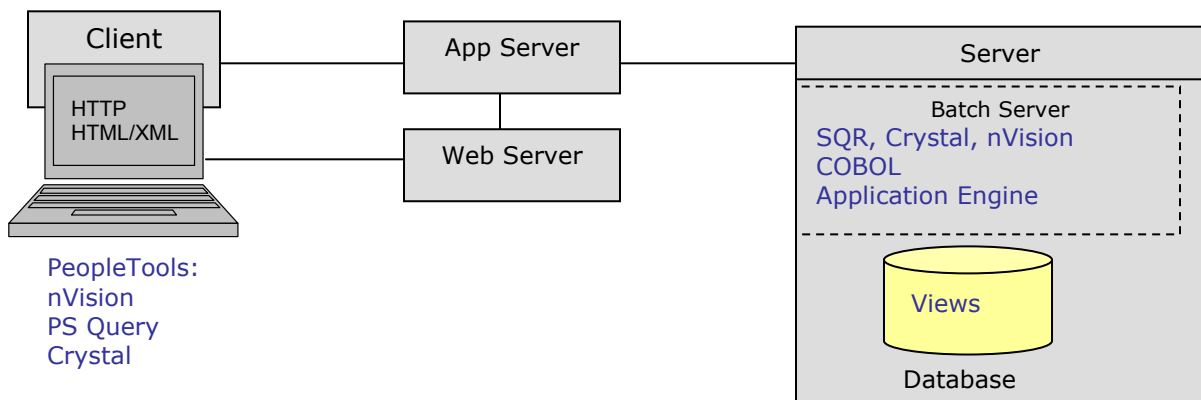


Figure 3.2: PeopleSoft's v8 architecture



Because PeopleSoft uses ANSI standard SQL that is platform independent, Peoplesoft customer's will need to tune those SQL statements specific for their RDBMS platform in order to take maximum advantage of the database architecture and maximize performance. Therefore, the first step to increasing the performance of your PeopleSoft application is to tune the SQL statements. Typically, SQL tuning is the last thing considered in a performance-tuning project. This is because without the right tools, SQL tuning is very difficult to do. In order to tune a SQL statement, extensive knowledge of the database structure, data and database optimizer is required. With Sybase SQL Expert you can easily tune the SQL statements and go beyond just simple tuning; with the *Syntactical SQL Optimizer* one can obtain the best performing SQL.

Optimizing SQL statements from PeopleSoft means that once the best possible SQL has been identified with the *Syntactical SQL Optimizer*, the original SQL statement must be replaced with the optimized SQL in the source code. Because Sybase SQL Expert's SQL optimization technology guarantees semantic equivalence (same result set) between the source and alternative SQL statements, there is no risk of changing the meaning of the SQL statement.

PeopleSoft applications contain several components that generate SQL statements; SQR, COBOL, Crystal, PS Query, nVision, Application Engine, PeopleCode, and database views. For the components that allow code modifications and have embedded SQL statements, performance can be improved through rewriting SQL statements to find the most efficient query plan. This is especially the case with the customized reports such as SQR and Crystal. Optimizing SQL statements from the PeopleSoft views is also possible. Please note however, that views are part of the PeopleSoft's internal code and PeopleSoft suggests not changing it since the logic of the application can be altered. Since Sybase SQL Expert guarantees semantic equivalence, you do not have to worry about the meaning of the SQL statements being changed. However, any customization of PeopleSoft code might be lost when you apply a patch or upgrade to a new PeopleSoft version. Furthermore, if you are going to modify any of the PeopleSoft views, use Sybase SQL Expert's *Database Explorer* to keep the view's DDL before and after the change. This way, you know which views you have modified.

Not all PeopleSoft components are modifiable, making other performance-enhancing database changes necessary. Lacking the permission to change or modify the code of these components does not allow for performance gains through applying SQL changes. The SQL statements from the Application Engine, COBOL, PS Query, nVision and PeopleCode are primarily dynamic SQL statements that are generated at run time. While many of these statements access the PeopleSoft views, which can be optimized, they need to be optimized through other means. The alternative for performance improvement when the SQL statements cannot be modified is to tune by using Abstract Plans in ASE available from version 12 on.

Abstracts Plans were introduced in ASE version 12. Abstract Plans enable you to influence the optimization of a SQL statement without having to modify the SQL statement syntax. If you cannot change the source code that contains the SQL statement, you can use the Abstract Plan to force Sybase ASE to use a specific query plan for a SQL statement. Another use of Abstract Plans is to protect the performance from changes to the database. When changes are made to a database, ASE may choose a different query plan for a SQL statement as a result of the changes. The abstract plans provide a means for protecting the overall performance of a SQL



statement from these changes since the Abstract Plan will cause ASE to always choose the same query plan.

Sybase SQL Expert's Syntactical SQL Optimizer can optimize a SQL statement by using Abstract Plans to locate the most efficient query plan. The best query plan can be saved for the original SQL statement as an Abstract Plan. If the Abstract Plan is enabled, then ASE will use the saved query plan which is the best performing one. Sybase SQL Expert and ASE Abstract Plans allow the optimization of any SQL statement, without changing source code. This offers a solution for improving the performance of any SQL statement in PeopleSoft.

For more information about Abstract Plans, refer to the Adaptive Server Enterprise 12.5 Performance and Tuning Guide ¹, Chapter 29 Introduction to Abstract Plans.

3.1 Tuning PeopleSoft through SQL Optimization

Since SQL is the primary bottleneck for PeopleSoft applications, it is important to recognize the individual components containing and executing SQL.

We can categorize the PeopleSoft components in two different groups according to the nature of the SQL statements and if they allow for SQL changes.

These two groups of components are:

a) Components that allow SQL changes

Customizations such as reports belong to this category. Since the reports were created by developers or DBAs, SQL changes are possible. SQR and Crystal reports belong to this category. Views in the ASE also can be modified since the DBA has access to them. In order to improve the performance of these components, the user can optimize the SQL statement with Sybase' SQL Expert SQL transformation technology to find an alternative SQL statement that offers the best performance. Once a SQL statement has been optimized with the *Syntactical SQL Optimizer* the best SQL statement needs to be copied and pasted back into the source code. Let's review in more details how to optimize these components.

SQR

SQR (Structured Query Report) is a SQL-based programming language designed for reporting and database program development. Since Brio's SQR came packaged with PeopleSoft applications, SQR programming has been a major component of PeopleSoft development. Sybase SQL Expert is able to optimize the SQL represented in the SQR source code for optimal performance.

¹ ASE Performance and Tuning Guide
<http://manuals.sybase.com/onlinebooks/group-as/asg1250e/ptallbk>



In SQR, the SQL statement may be stored in the following format:

```
Begin-select  
Emp_id  
Emp_name  
From employee  
End-select
```

Note that the comma between the column names is not included in this format. Since this is not a correctly formatted SQL Statement, Sybase SQL Expert's *SQL Scanner* cannot accurately extract all SQL statements directly from the SQR source code file. But it can extract all the SQL statements from the SQR log file. To generate the SQR log file, you can use the SQRW executable in Windows, or SQR executable in UNIX. Running the following command from the command line creates a log file containing the actual SQL being performed by the SQR.

```
C:\> SQRW <SQR filename.sqr> -s <sqlfilename.ext>
```

Alternatively to generate the log, you can use the SQR properties window (Figure 3.3) adding to the SQL report arguments a "-s" (dash S) switch.

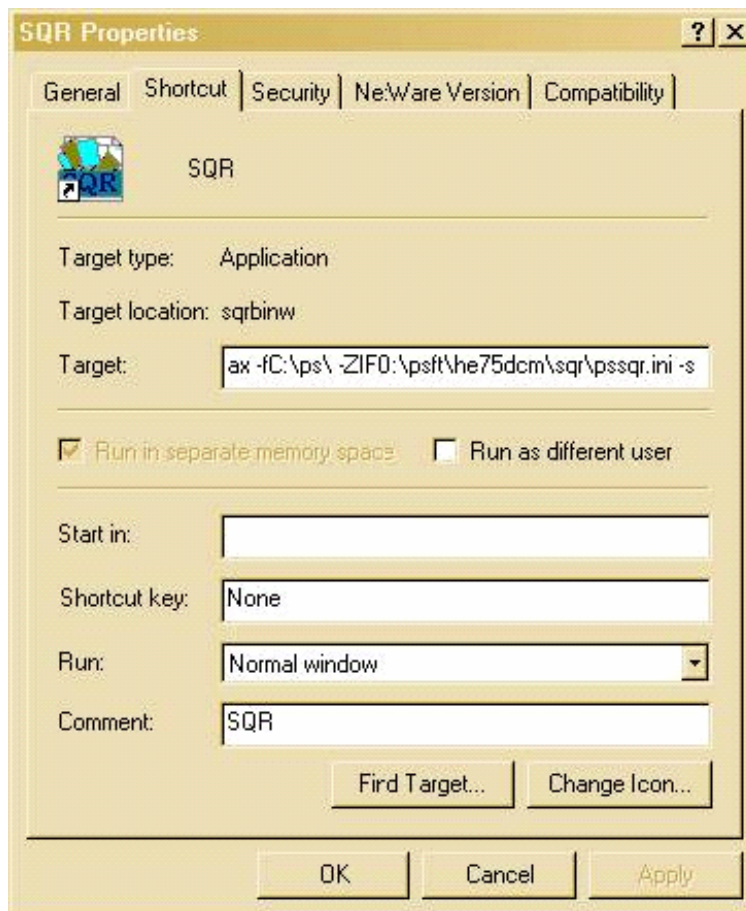
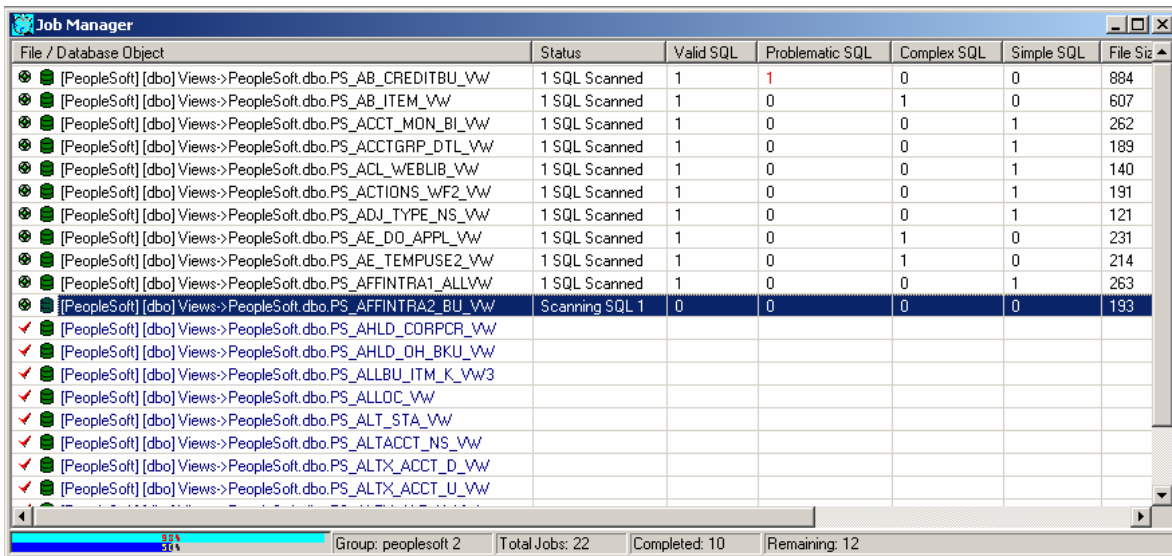


Figure 3.3: SQR properties. Adding switch -s to generate SQL log

Views

PeopleSoft is highly dependent on database views. As a result, application performance is dependent on the performance of PeopleSoft views. Sybase SQL Expert has the functionality to scan and optimize all views used by PeopleSoft.

Using the Sybase SQL Expert's *SQL Scanner*, users can scan database objects (in this case PeopleSoft's views) to identify where problematic SQL statements lie within their database (Figure 3.4). Once the view's SQL statements have been classified as problematic, complex or simple, the user can then use the *Syntactical SQL Optimizer* to generate and deploy the best performing SQL alternative to the scanned view.



File / Database Object	Status	Valid SQL	Problematic SQL	Complex SQL	Simple SQL	File Size
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AB_CREDITBU_VW	1 SQL Scanned	1	1	0	0	884
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AB_ITEM_VW	1 SQL Scanned	1	0	1	0	607
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ACCT_MON_BI_VW	1 SQL Scanned	1	0	0	1	262
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ACCTGRP_DTL_VW	1 SQL Scanned	1	0	0	1	189
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ACL_WEBLIB_VW	1 SQL Scanned	1	0	0	1	140
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ACTIONS_WF2_VW	1 SQL Scanned	1	0	0	1	191
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ADJ_TYPE_NS_VW	1 SQL Scanned	1	0	0	1	121
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AE_DD_APPL_VW	1 SQL Scanned	1	0	1	0	231
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AE_TEMPUSE2_VW	1 SQL Scanned	1	0	1	0	214
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AFFINTRA1_ALLVW	1 SQL Scanned	1	0	0	1	263
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AFFINTRA2_BU_VW	Scanning SQL 1	0	0	0	0	193
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AHLD_CORPCR_VW						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_AHLD_OH_BKU_VW						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ALLBU_ITM_K_VW3						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ALLOC_VW						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ALT_STA_VW						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ALTACCT_NS_VW						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ALTACCT_D_VW						
[PeopleSoft] [dbo] Views->PeopleSoft.dbo.PS_ALTACCT_U_VW						

Group: peoplesoft 2 | Total Jobs: 22 | Completed: 10 | Remaining: 12

Figure 3.4: SQL Scanner. Scanning views

Reports

Developers involved in reporting development are creating SQL that will require extensive optimization to assure maximum performance. Depending on the reporting software used there are two ways to ensure performance standards throughout development.

Many reporting packages, for example, Crystal Reports and Actuate, allow developers to create SQL by using a GUI application to create relationships and conditions for the desired result set. These "visual query builders" then store their SQL in a file (query file) that the reporting application uses to query for data. In order to optimize the performance of the reports the developer can scan through the query file to extract the SQL using the *SQL Scanner* module. Once the SQL is extracted and identified, it then can be optimized with the *Syntactical SQL Optimizer* and inserted back into the query file for better performance.

It is also common to write SQL manually for the creation of reports. A developer writing SQL for reporting will be able to write the desired query in the *SQL Editor* window in Sybase SQL Expert, optimize the SQL statement with the *Syntactical SQL Optimizer*, and then use the best performing SQL statement in the report.

b) Components that do not allow SQL changes

PeopleSoft's pre-packaged application code is written primarily in COBOL and SQR, which has been proven to contain some of the most difficult SQL to optimize. This pre-packaged code is unchangeable. PeopleSoft also includes ad-hoc querying tools such as nVision and PS Query that generate SQL statements and submits them for execution in the database. Since the SQL statements are actually submitted from the ad-hoc query tool, the code cannot be modified.

Since the SQL within the PeopleSoft's pre-packed code and from ad-hoc querying tools does not allow for SQL changes, one might easily believe that there is nothing that can be done to increase its performance, however this is not true.

PeopleSoft's unchangeable SQL can be managed and improved by optimize a SQL statement with the use of ASE's Abstract Plans. Sybase SQL Expert's *Syntactical SQL Optimizer* identifies every possible Abstract Plan alternative for a SQL statement (Figure 3.5). Once the most efficient Abstract Plan is identified, it can be saved in ASE for the source SQL statement. If the use of Abstract Plans is enabled in ASE, then every time the source SQL is run, the best performing query plan from an Abstract Plan will be used.

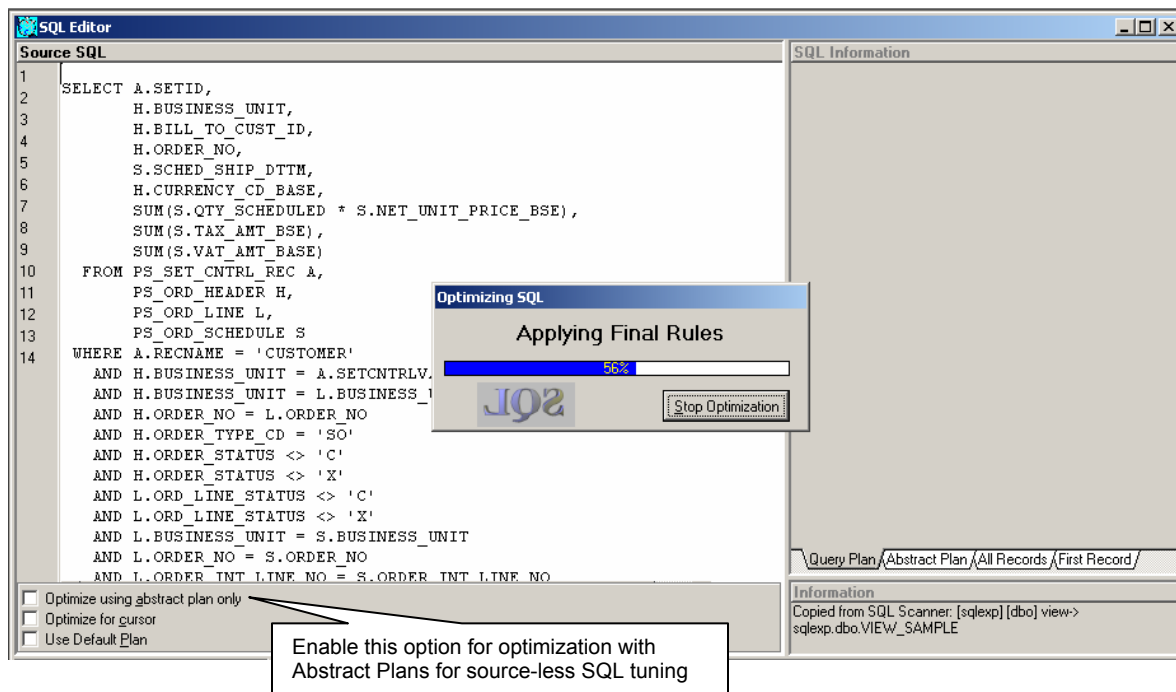


Figure 3.5: Syntactical SQL Optimizer

In PeopleSoft v8, batch programs are created with the Application Engine. The Application Engine allows users to "turn on" a trace feature and capture the processed SQL from batch programs. COBOL, SQR, nVision, Crystal and other programs can be run in batch mode with the Application Engine. The Application Engine trace file will then contain all the SQL statements from different programs. Remember, SQR can also



be run outside the Application Engine, and it is possible to create a log file with the SQRW run time environment that contains its SQL statements.

Once the SQL from the Application Engine and SQR has been captured in trace/log files, the SQL can be analyzed with the *SQL Scanner* module and then each SQL statement can be optimized in the *Syntactical SQL Optimizer* module enabling optimization for Abstract Plans.

If it is not possible for you to enable tracing for the Application Engine and SQR, you can use the *SQL Monitor* module (Figure 3.6) to directly capture the SQL statements that are currently running from the Sybase Monitor Server. When capturing SQL from the Sybase Monitor Server you should keep in mind that if you are using PeopleSoft with a three or multi-tier architecture you will not be able to identify from which report, application, or user the SQL statements are being generated, but you will have all the SQL statements required to for analysis and optimization using Abstract Plans.

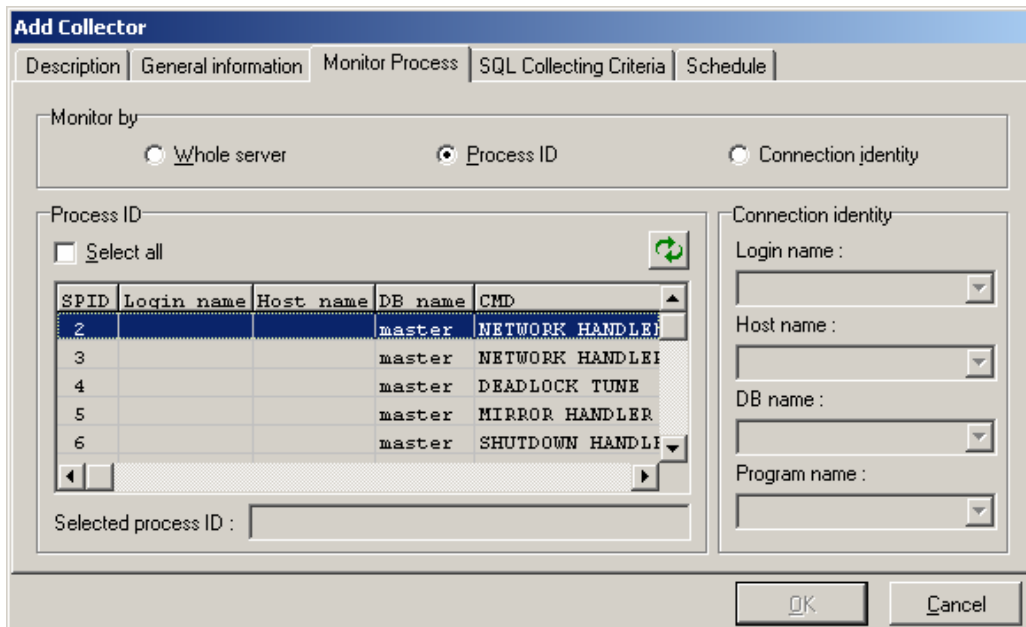


Figure 3.6: SQL Monitor. Collecting SQL statements

The *Abstract Plan Group Manager* (Figure 3.7) will then allow you to manage the Abstract Plans you have saved for those dynamic or irreplaceable SQL statements. You can also use Abstract Plans to prevent performance changes (due to statistic updates, new indexes, data volume changes, etc.)

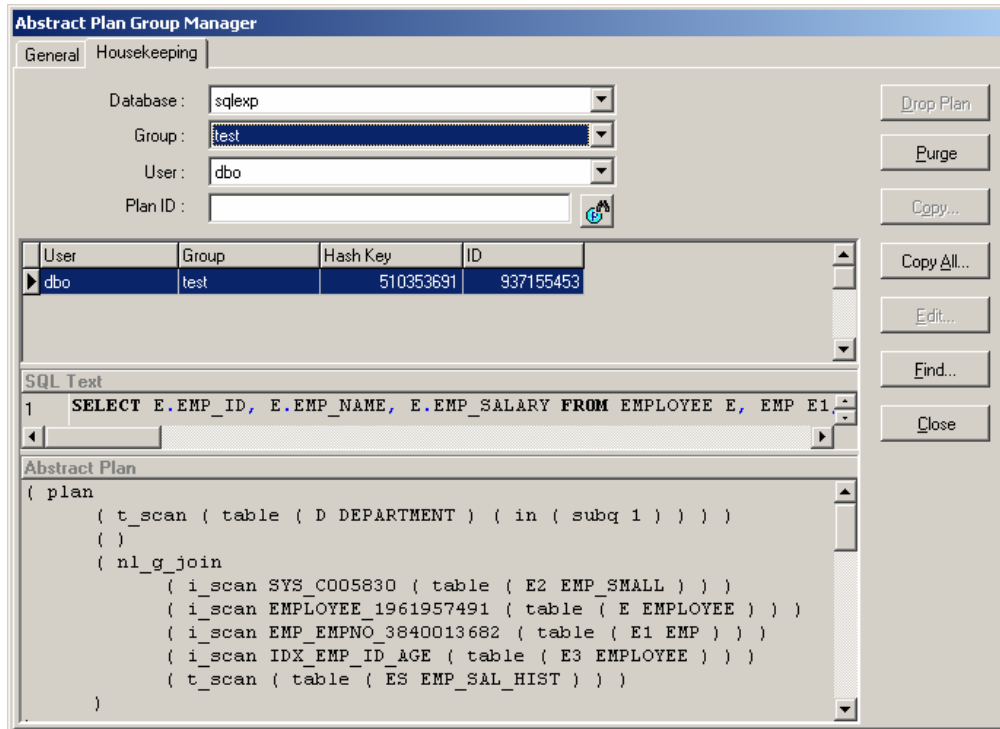


Figure 3.7: Abstract Plan Group Manager

4. Maintaining Optimal Performance

Because PeopleSoft databases are not static, SQL performance will change over time. DBAs will continually be changing database parameters, updating statistics on tables and indexes, while data volume grows. All of these factors contribute to the changing performance of SQL. The PeopleSoft DBA must periodically check for performance degradation due to database changes. Using Sybase SQL Expert's *SQL Scanner* allows DBAs to proactively maintain high performance levels in a production environment. The DBAs can also maintain Abstract Plans for the most important SQL statement before performing a database environment change that could potential result in performance changes. Abstract Plans can be saved and managed in Sybase SQL Expert with the *Abstract Plan Group Manager* module.

Statistic Updates

In order for ASE's internal optimizer to work properly it is important to update the statistics for all tables and indexes periodically. This is because the optimizer makes decisions based on these statistics. When the statistics change, SQL performance changes. The *SQL Scanner* allows Peoplesoft DBAs to periodically scan and assess query plan changes after statistics updates. SQL statements that get classified as "problematic" should then be optimized to maintain a high level of performance.

PeopleSoft Upgrade - Version 7 to Version 8

One of the biggest additions to PeopleSoft in version 8 is the Internet Architecture that is multi-tier, enabling the client to access the database by going through a web server and an application server. PeopleSoft's internal code is composed of logic that cannot

be modified by a developer or DBA. The Application Engine makes it possible to capture these SQL statements processed in batch programs. Also, PeopleSoft's v8 SQL statements are more complex than in version 7 making SQL tuning imperative.

During the implementation of a PeopleSoft upgrade or installation it is necessary to address performance to avoid problems when the application goes live. Using Sybase SQL Expert's *SQL Scanner* you can identify problematic SQL from different PeopleSoft components and then improve performance with the *Syntactical SQL Optimizer*.

5. Best Practices for the PeopleSoft Application's Lifecycle

To assure that a PeopleSoft implementation will achieve exceptional performance, it is essential to maintain performance standards throughout the application lifecycle. While performance should be maintained within the production application, each phase of a PeopleSoft implementation should require performance standards. To meet these standards and assure optimal performance, Sybase SQL Expert should be adopted throughout the entire PeopleSoft application lifecycle. Figure 5.1 shows a typical PeopleSoft application's life cycle.

Sybase SQL Expert allows PeopleSoft developers to develop their reports and customizations for maximum performance; in QA, Sybase SQL Expert allows the benchmarking of SQL statement performance to preempt performance degradation in production; in production, Sybase SQL Expert allows DBAs to maintain high-performance.

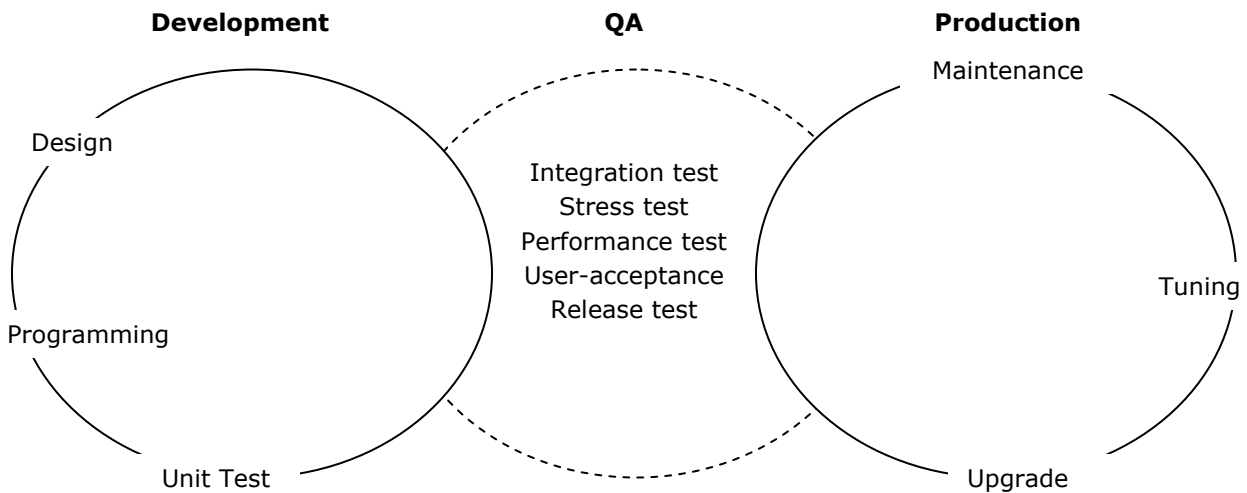


Figure 5.1: Typical PeopleSoft's Application Lifecycle



5.1 Development

The core functionality of a PeopleSoft implementation is created during the development phase of the project. It is at this point when all developers and DBAs should begin focusing not only on developing for functionality, but for performance as well. Developers will receive immediate performance improvement in their reports and customizations by optimizing SQL statements with the *Syntactical SQL Optimizer*. It is essential to optimize SQL before considering other alternate ways of improving performance such as adding indexes.

At the end of development the PeopleSoft Developer or DBA should have collected as much PeopleSoft SQL as possible and all of the custom SQL developed. The collected SQL then can be placed into the *SQL Scanner* for use throughout the application lifecycle.

5.2 Quality Assurance (QA)

Before going live with a new PeopleSoft application, it is important to test it in a **production-like environment**. As there may be crucial production applications currently in place, the need to be non-intrusive during the testing is high. By using Sybase SQL Expert a DBA will be able to predict the performance of the PeopleSoft applications before going live.

The *SQL Scanner* allows a PeopleSoft DBA to analyze the query plans of all PeopleSoft SQL statements in production without actually running them. The PeopleSoft DBA can retrieve the query plans and costs of the SQL for the production environment. Once that is done, the PeopleSoft DBA can analyze that information and identify which SQL statements need to be optimized for production.

5.3 Production

The PeopleSoft DBA is responsible of maintaining optimal performance even though the database environment is constantly changing. Here are some best practices you can take with Sybase SQL Expert to maintain high-performance in production.

- Create and maintain a collection in the *SQL Scanner* with as many SQL statements as possible. Enable the tracing for the application engine to capture all the SQL statements from PeopleSoft's internal code and ad-hoc queries for a long period (perhaps 1 or 2 days). Also, turn on the tracing on the SQR reports that run directly in the server. Add the trace file from the application engine, log files from SQR, and all the views from the database's data dictionary to the *SQL Scanner* module to scan. This allows you to keep a repository of SQL statement and you can use bookmarks in the *SQL Scanner* to mark the most critical SQL statements.
- Perform a scan periodically to determine if the query plan of a SQL statement has degraded due to database environment changes.
- Before performing a physical change of the database environment such as adding/removing indexes, running stats, upgrading ASE version, changing sp_configure parameters that can affect query plans, save Abstract Plans for the most important SQL statements in the *SQL Scanner*. If after performing the



physical change you experience performance degradation, you can enable the use of the saved Abstract Plan to recover the past performance.

- If performance has degraded, you can feed the SQL statement back through the *Syntactical SQL Optimizer* to ensure optimal performance in the production environment.

6. Conclusion

The performance issues with PeopleSoft applications are not just PeopleSoft specific problems. The core to almost any database application's performance is impacted by the quality of SQL developed and used to perform specific database application tasks. SQL embedded in source application code (COBOL, Java, Views, Transact-SQL objects, SQR, etc.) dictates how timely information is retrieved, inserted, updated or deleted and ultimately drives almost every aspect of your business applications. Statistically speaking, this equates to 60% - 90% of your application performance bottlenecks.

PeopleSoft is unique however, in the way they develop their applications using platform independent ANSI SQL. This means that out-of-the-box, PeopleSoft applications are not built specific to a customer's unique database environment, unique data volumes or transaction loads.

Sybase SQL Expert protects your investment in PeopleSoft applications by assuring optimal performance. By maximizing application performance we ensure that end users are satisfied, data availability is reliable, and application adoption is successful. Through Sybase SQL Expert's truly unique automated approach to performance management and optimization, productivity increases significantly.

In conclusion by implementing Sybase SQL Expert throughout your PeopleSoft development and production teams you will increase productivity, performance and skill level while decreasing costs and maximizing return on your PeopleSoft and hardware investment.



Appendix 1. Sybase SQL Expert's Modules

Sybase SQL Expert is a comprehensive performance assurance solution that integrates the following tools:

- **SQL Monitor:** Monitors and captures SQL statements from the Sybase Monitor Server.
- **SQL Scanner:** Scans database objects, abstract plan groups, files and application source code for a non-intrusive analysis of potential SQL performance bottlenecks.
- **Syntactical SQL Optimizer:** Transforms a SQL statement using the AI-based *Feedback-Searching Engine* to generate every possible semantically equivalent SQL alternative and unique query plan. Optimizes a SQL statement for Abstract Plans, thus proving a solution for source-less SQL tuning. Batch tests each alternative SQL and compares run time results to the original.
- **Abstract Plan Group Manager:** Allows you to easily manage abstract plans within groups in different databases. You can search for abstract plans and import/export groups of abstract plans to other databases and users.
- **SQL Comparer:** Compares the syntax of the alternative SQL statements to the original. If a faster statement is found, you learn how to write better SQL.
- **Database Explorer:** Provides a comprehensive GUI that allows users to view and manage database objects.
- **SQL Formatter:** Provides consistent indenting and formatting of SQL statements.

For more information on SQL Expert, consult the on-line User Guide for SQL Expert.
<http://manuals.sybase.com/onlinebooks/group-as/asg1250e/sqx>