Migrating PL/SQL to Java Stored Procedure

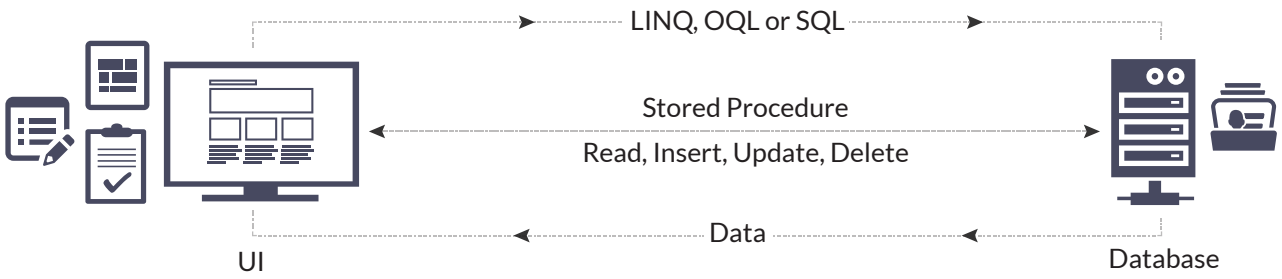
This white paper is intended to provide IT decision makers with the relevant information and considerations regarding the migration of PL/SQL code to Java stored procedures

PL/SQL

PL/SQL is Oracle's procedural extension to SQL. From its inception, PL/SQL has been designed and optimized for stored procedures and functions. It is well suited for encapsulating SQL operations with procedural logic and for manipulating all database object types.

Stored Procedures

Stored Procedures allow the processing of a set of database operations in one call. All database access must go across the network, which, in some cases can result in poor performance. For each SQL statement, an application must initiate a separate communication with the database. By processing data locally within the database and returning just the results, stored procedures enhance the performance of data-intensive operations. A stored procedure is invoked through an SQL interface, which hides their implementation from the requestor. A client application can then simply use the interface and call the stored procedure to obtain results of the SQL statements that are contained in the procedure. In addition, stored procedures can help to centralize business logic. If you make changes to a stored procedure, the changes are immediately available to all client applications that use it.



Limitations of PL/SQL

- As PL/SQL is proprietary to Oracle, code written in PLSQL is not portable across databases
- PL/SQL is a procedural language and not object oriented
- Requires a paid subscription or license to use
- PL/SQL has limited or no functionality for interacting with the network or operating systems. For example: sending mails, transferring data through FTP, file reading and writing operations, zipping and executing host command line functions

Java Stored Procedure

Application development is simpler

Java offers support for networking, multi-threading and automated storage management techniques such as garbage collection that makes application development easy and less error prone.

Applications are platform independent

Java uses the motto "write once, run anywhere". This means Java code and libraries can run on any platform that supports a Java virtual machine. This reduces the task of porting applications

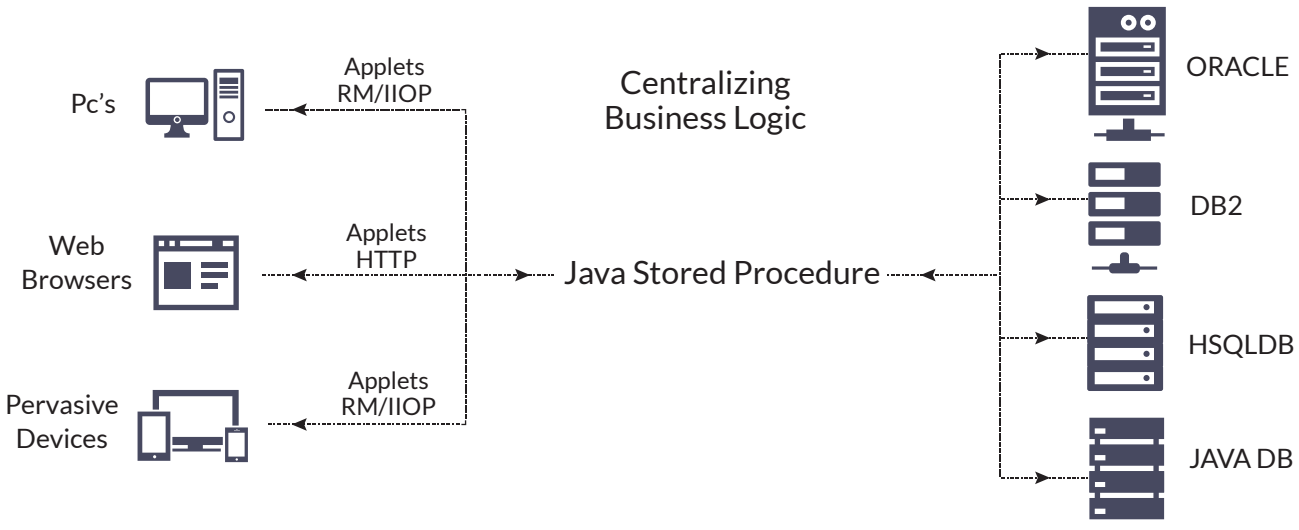
Works across multiple platforms

Applications can be developed as components

Java offers a component model, JavaBeans that allows application developers to design and package components that can be assembled with components written by other application developers. Enterprise JavaBeans enable application developers to develop business logic and package it as a component that can be assembled into applications. This application development model enables rapid assembly of applications that can be customized and deployed on any platform and adopted as and when the business needs change.

Java Based Procedures

Java code invoked and residing within a database is known as a Java Stored Procedure or in short JSP's. They represent an open, database-independent alternative to PL/SQL. Furthermore, Java stored procedures bring the power, richness and object-orientation of the Java language. The procedure code is defined in a Java class method and can contain multiple SQL statements or business logic that run within the database and are invoked in one call, thereby avoiding multiple network round trips. By centralizing business logic inside the database, Java stored procedures enables any type of database client (web and client/server) to access and use the same processes and significantly reduces code duplication, complexity and time to deploy. Java stored procedures take advantage of existing Java solutions to add functionality to applications and integrate business processes. Stored procedures written in Java have a significant chance of being portable to different platforms without a complete re-write.



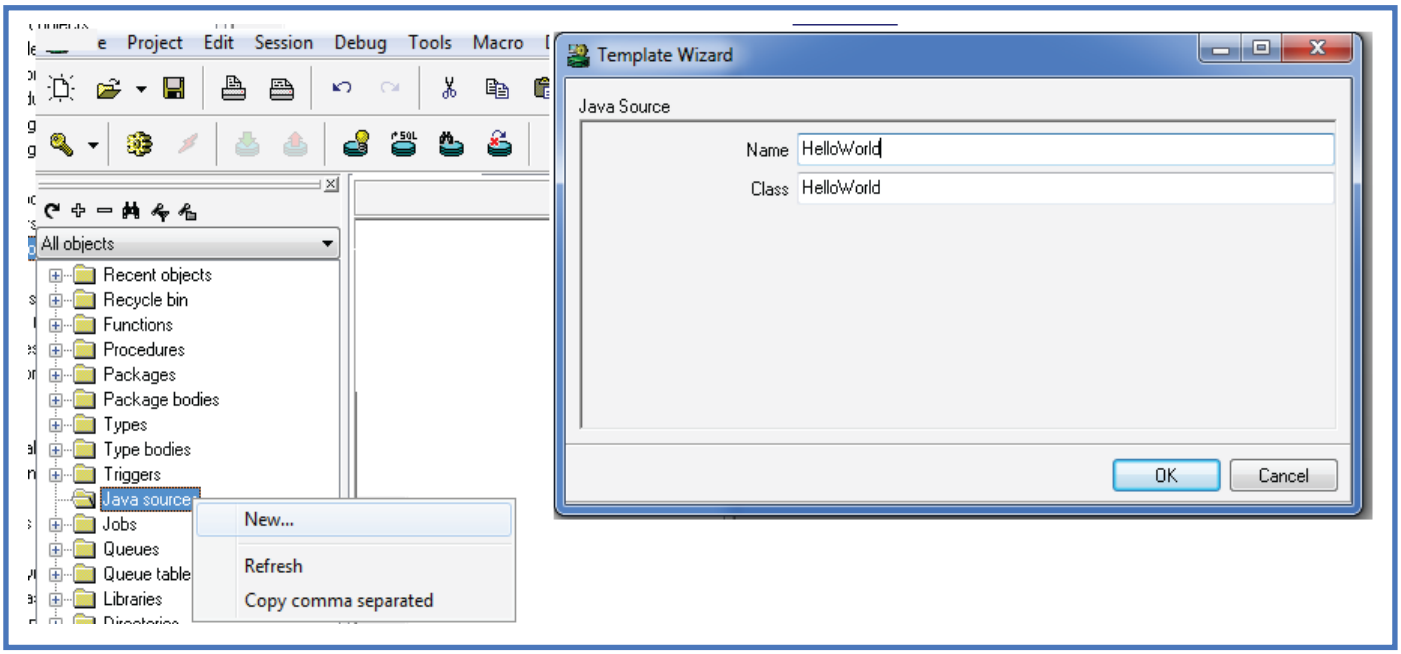
How to write a Java Stored Procedure ?

Prerequisite

- JVM (Java Virtual Machine) enabled database server
- Basics of PL/SQL and knowledge in Java

Creating Java Stored Procedure

A Java Stored Procedure is .jsp file that contains the compiled code necessary to perform a task and return a result to the client. Each Java SP files must respond to a series of methods which gives the calling program information about the IN and OUT parameters of the procedure represented by the class. The following example demonstrates the execution of a Java program loaded into Oracle 10G using PL/SQL client developer tool.




```
create or replace and compile java source named HelloWorld as
public class HelloWorld
{
  public static String getMessage()
  {
     return "Hello World";
  }
}
```

The above program creates a Java source and a Java class object

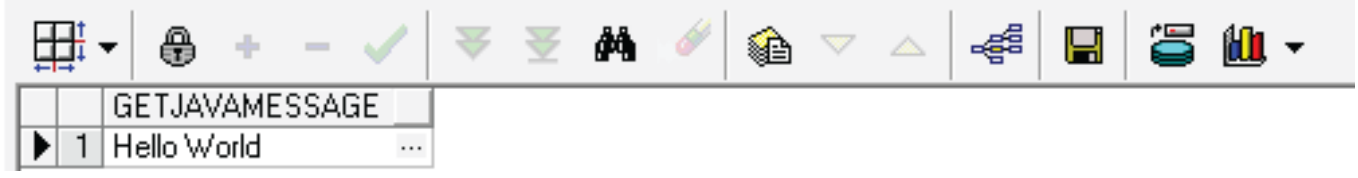
Running Java Stored Procedure

- Create a wrapper function to call the Java stored procedure

```
create or replace function getJavaMessage return varchar2 as
  language Java name 'HelloWorld.getMessage() return java.lang.String';
```

- The wrapper can be called as a normal DB function

```
select getJavaMessage from dual;
```



Supported DBs for Java stored procedures

Java Stored Procedures can be used on any database server that has an inbuilt JVM (Java Virtual Machine). Major Enterprise database systems like ORACLE, DB2, HSQLDB and JAVA DB (included in Java SE 7 SDK) supports JSP.

Migrating PL/SQL to Java Stored Procedures

With Oracle and other major database vendors supporting Java based procedures, it is worthwhile to move the PLSQL code completely to a Java environment. With the advantages of portability and distributed multi-tier architecture, it is always good to have the flexibility of deploying the core business logic of enterprise applications either in the middle-tier or database tier. 100% percent of Java based implementation supports Windows, Solaris, Linux and other OS's with java virtual machine.

PLSQL code can be migrated to Java based procedures as almost all PLSQL types have their Java counterpart. Below is a table illustrating the most commonly used ones.

PLSAQL	PLSQL	JAVA
Data types	VARCHAR 2 NUBMER BLOB TIMESTAMP	Java.lang.String int,long,float,double Oracle.sql.BLOB Oracle.sql.TIMESTAMP
Conditional Statements	IF-THEN-ELSE IF-THEN-ELSEIF	if-elseif-else
Control Statements	FOR loops WHILE loops	FOR loops WHILE loops
SQL Statements	SELECT INSERT UPDATE DELETE	Prepared Statements
Cursors	Implicit Cursors Explicit Cursors	Java.sql.ResultSet
Exceptions	Oracle Exceptions	try-catch-finally blocks
Collections	Collections and Records	Java.util.List Java.util.Map

As with the above table, PL/SQL named blocks like Stored Procedures, Functions, Triggers and Packages can also be converted to Java code. The converted java code can be deployed in a standalone or a J2EE environment as a business component. As Java based procedures uses JDBC API for initiating connections there is no need of any third party API.

Need for migrating from PL/SQL to Java Stored Procedure

- PL/SQL is a procedural language; Java is an object oriented one
- A single language at every tier (Java on the app server, java in the database)
- Robust exception handling mechanism
- JSP are much faster than PL/SQL
- Cross-vendor and cross-platform portability-in other words, database independence
- Application Partitioning – Java support in the database allows well-scoped Java code to be moved from client-side or middle-tier into the database, or the opposite
- Interaction with Java, J2EE, XML and web-services world
- JSP lets you use large library of existing Java code & 3rd party libraries
- No overhead on DB connections like in Java, since Java Stored procedures runs inside DB itself

Conclusion

A JVM integrated database that complies with the J2SE standards allows extending database features and programmability through java stored procedures. This paper highlights the simplicity and power of Java stored procedures. As Java is tightly integrated with the database it can seamlessly interoperate with SQL and PL/SQL. Java based procedures offers a variety of benefits to application developers including high application throughput, less network traffic and seamless interoperability among java, SQL and PL/SQL. In addition, because Java Stored Procedures are based on open standards, they allow portability across several database vendors.

References

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