WHITE PAPER

Enterprise Database Development in Sybase® WorkSpace

SAMIR NIGAM, SOFTWARE ARCHITECT, SYBASE, INC.
SNIGAM@SYBASE.COM

SYBASE®

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INTRODUCTION

Sybase WorkSpace is the first unified development environment that is capable of delivering any of the application types in demand today-services-oriented, mobile, Java, composite, event-driven, or data-driven. Sybase WorkSpace is built upon the Eclipse open source framework, making it easier and faster for developers to develop complex applications that link heterogeneous infrastructures like databases, messaging systems, and enterprise applications.

Sybase WorkSpace fills a void which otherwise requires the use of developer tools from multiple vendors which don't offer the ability to interact between or cross-pollinate development tasks. No other IDE offers a similar breadth and depth of functionality.

Sybase WorkSpace comprises five major components; Enterprise Modeling, Service Frameworks, Integration and Orchestration, Database Development, and Mobile & Portal Development. This paper focuses on the end-to-end features for Enterprise Database Development available within Sybase WorkSpace. A use-case scenario illustrates a typical order entry and shipping application implemented using Sybase WorkSpace.

SYBASE WORKSPACE AND DATABASE DEVELOPMENT

Sybase WorkSpace supports development across Sybase's core data management platform, including Sybase Adapter Server Enterprise (ASE), Sybase Adaptive Server Anywhere (ASA), and Sybase IQ; and Sybase's core data movement platforms including with Sybase Replication Server, Sybase RepConnector, and Sybase Mobile Link Server.

DATA MANAGEMENT: OVERVIEW

Sybase WorkSpace's data management capabilities cover the full spectrum of required features: database modelling; database navigation, SQL development, SQL tuning, service generation and consumption, and debugging and testing. Each of these features is summarized below.

Database Modelling

Sybase WorkSpace supports gathering database requirements, converting to a conceptual and later to a physical database model, generating database schemas, and downstream development activities such as browsing schemas, tables, views, stored procedures, triggers, indexes, and data types, and using wizards to create, delete, or change database objects.

The developer benefits from the ultimate flexibility of Sybase WorkSpace to launch into development from any stage, without preset requirements or the need to stereotype development style. Database developers may introduce advanced aspects of Model Driven Architecture (MDA) and Model Driven Development (MDD) into their development cycle, or they may start using more common direct database development methodologies.

An important feature is that an existing database can be reverse-engineered into a model for capturing new requirements into the existing database schema, or for migrating a schema to another server. In addition, the database can be pre-populated with sample data for quick testing, thereby eliminating the additional coding typically required to generate such data.

SQL Development Features

Sybase WorkSpace maintains connection profiles to supported database servers, and allows the creation of multiple concurrent connections to multiple database servers simultaneously. It comes with a full-featured Database Navigator for fast graphical browsing of tables, views, stored procedures, triggers, user-defined functions and event handlers, data types, indexes, Web Services, and other database elements.

Sybase WorkSpace provides vigorous support for editing and handling SQL code (in stored procedures, triggers, and SQL files) with features such as Visual SQL development, keyword highlighting, syntax validation, content assistance, auto-completion, and full-featured debugging. To further assist with repetitive code snippets, the SQL editor is capable of storing oft-repeated code blocks as templates in customisable, parameterised form, in order to easily substitute varying portions of code-a major productivity boost. These templates can also be shared with other developers.

Sybase WorkSpace supports execution of a single SQL statement, multiple SQL statements, or the whole content (whether in SQL script or database SQL object). The SQL file can be edited using all advanced editing features without requiring a database connection (except for database level content assistance). It allows switching the database connection context, so that a SQL file can be run against another database's connection profiles.

To help developers with SQL code tuning, Query Execution Plan generation (which is graphical for Sybase ASA) is integrated in Sybase WorkSpace. Developers are able to export table definitions, database SQL objects source code, and query result sets. Table definitions can be saved to a clipboard or as an SQL file. Result sets can be saved in various formats (including .csv, .html, and XML).

Developers benefit from visual execution, testing, and debugging of database SQL objects. Visual execution supports parameter handling, including default value introspection, saving previous passed-in parameters, and detecting parameters in a SQL query. For advanced needs, a custom 'execution environment', the Eclipse Launch Configuration, is provided to help developers define special execution settings to perform functions such as creation of proxy tables, prior execution of certain DML statements and commands, and so forth. The command execution history and results are saved for easy browsing and export as needed.

Service-Centric Development

Sybase WorkSpace enables transformation of applications to services-centric architectures. There are two faces to service-centric development: the service provider and the service consumer. Sybase WorkSpace meets Service provider requirements by helping developers provision database stored procedures and SQL commands as services, without writing a single extra line of code or requiring any knowledge of the service technology and infrastructure. These services are hosted in Sybase Unwired Orchestrator, which is seamlessly integrated in Sybase WorkSpace for service development, testing, packaging and deployment.

(The service consumer side is specific to Sybase ASE only, and is therefore covered in the section on ASE features.)

Debugging and Testing

The Sybase WorkSpace database debugging environment includes extremely robust support for database developers, covering basic to the most advanced requirements. This support includes breakpoints management and verification; variable handling such as display and setting at debug time; debugging multiple connections; attaching to external clients; debugging without writing any client code and creating an external session; and the ability to watch trigger row data (applies to ASA only).

Sybase ASE

Sybase ASE is a versatile, enterprise-class RDBMS, and Sybase's flagship data management platform. Sybase ASE provides enterprises with a high performance system for data and transaction processing- for the lowest total cost of ownership. Sybase ASE focuses on the core factors that affect total cost of ownership-operational requirements, system performance, and application development.

Sybase ASE comes with XML and web services support, and real-time messaging. Sybase WorkSpace makes assimilating XML in database logic easier, by providing a visual XML SQL query builder, XML data transformation, and XML schema development features.

Real-time messaging is simplified with help from messaging SQL creation wizards, which streamline development for even experienced developers who may not remember special XML and message-handling SQL constructs and dialects.

Service consumer requirements are supported in Sybase WorkSpace by allowing quick creation of proxy tables for available Web Services from Web Services Description Language (WSDL). WSDL is an open standard for describing Web Services to clients. Once a proxy table is generated, the corresponding Web Service can be accessed by performing a SQL (SELECT) query on the proxy table with the input parameter passed in the 'WHERE' clause.

Sybase ASA

Sybase ASA, part of SQL Anywhere Studio, is the industry leader in mobile and embedded database management. This powerful database server is optimised for use on SMB servers, laptops, and handheld devices and supports both single- and multi-user implementations. SQL Anywhere Studio also includes UltraLite, a database designed to minimise memory and system requirements of data-driven applications targeting small devices, such as hand-held computers.

Sybase WorkSpace addresses the ASA developer's needs by supporting the generation of an UltraLite database from a consolidated database. Sybase WorkSpace supports creation, execution, and debugging of ASA-only database objects, including event handlers and user-defined functions. In addition, all features supported for ASE SQL for XML development are supported for ASA.

Since ASA supports both Transact SQL (ASE) and Watcom SQL syntax, the database editor's built-in syntax validation and auto-completion features provide informational messages appropriate in either context (including a mixed context).

To reduce development-time errors for developers working on both ASA and ASE, the SQL editing environment includes a SQL portability check feature. This feature highlights those SQL commands in the current logic object (stored procedure, triggers, etc.) that are not compatible with ASE, and vice-versa.

Sybase WorkSpace also supports provisioning of the SQL queries, stored procedures and user-defined functions as Web Services hosted in the ASA database server itself. This feature will soon be available for ASE as well.

Sybase IQ

Sybase IQ is a highly optimised analytic engine, designed specifically to deliver dramatically faster results for mission-critical business intelligence, analytic, and reporting solutions. Sybase IQ delivers unsurpassed query performance and storage efficiency for structured and unstructured data, making it ideal for specialty data stores.

Sybase WorkSpace supports visual data warehouse development at various levels. It is capable of handling routine database development tasks such as creating Sybase IQ database warehouse models, reverse-engineering warehouse models from existing Sybase IQ database, browsing Sybase IQ databases and manipulating database objects such as tables, stored procedures, indexes.

Sybase WorkSpace gives developers the ability to create multi-dimensional models comprising tables, partitions (horizontal and vertical), join indexes, and cubes using cube elements (facts, dimensions, hierarchies, and attributes). To help with advanced level testing, cube data can be automatically generated for a test cube. In addition, the database editor syntax validation feature supports Sybase IQ's extended SQL grammar syntax, data types, and warehouse special indexing schemes.

DATA MOVEMENT

Sybase WorkSpace Data Movement features are geared toward database administrators and developers concerned with setting up database system recovery plans and ensuring data availability across multiple geographies.

Sybase Replication Server

Sybase Replication Server simplifies data movement and synchronisation across the enterprise. It allows DBAs to quickly set up redundant disaster recovery sites, and synchronise data across heterogeneous database platforms including Sybase ASE, Oracle, IBM DB2 and Microsoft.

Sybase WorkSpace support for Replication Server (version 12.5 and 12.6) consists of 100% code generation for all elements of the replication environment, which includes generating and deploying connections and Sybase Replication Server Definitions (Refdefs); reverse-engineering those definitions from existing installations; defining multi-route and multi-site replication; creating or changing subscriptions, publications, articles, and function strings; and creating the database extensions needed to support replication to the Refdef commands themselves.

Sybase WorkSpace extensions into UML make it possible to share all metadata about the replication with business and IT professionals throughout the infrastructure. This capability allows developers to design replication schemes in context with the corporate architecture. Sybase WorkSpace includes features for creating remote databases from publications and articles, Sybase Replication Server definition for RepConnector (see below), set up of RepAgent, and Sybase Mirror Activator.

Sybase Replication Connector

Sybase Replication Connector is a component of Sybase Real-time Data Services. It allows developers to capture business events from any database, transform them into formats used by other applications, and deliver them to any JMS-compliant messaging infrastructure. Sybase RepServer and Sybase RepConnector combine to form a unique real-time data services solution providing passive non-intrusive database events extraction and handling without impacting the performance of the online transaction system.

Sybase WorkSpace can be used to define the RepServer set up necessary when using RepConnector in the replication schema. Sybase WorkSpace generates the necessary configuration details, such as publication, replication definition, subscription, and connection for RepConnector.

Sybase MobiLink Server

Sybase MobiLink is a proven, robust, flexible synchronisation server supporting wired, wireless and cradle-based integration between databases. Sybase MobiLink offers bidirectional exchange of information between remote Sybase ASA or UltraLite databases, and a variety of enterprise data sources including Sybase ASA or Sybase ASE.

Developers working with Sybase MobiLink (version 9.0) servers have the capability to design, generate, and reverse-engineer MobiLink definitions. In addition, developers benefit from Sybase MobiLink's support for timestamp columns, shadow tables, stored procedures and triggers for consolidated databases; creation of MobiLink publication and subscription scripts; creation of remote databases from publication and articles; registration of MobiLink users; generation of MobiLink synchronisation scripts; and conversion of remote ASA databases to UltraLite.

DATABASE DEVELOPMENT USE CASE

In this scenario, the application is a typical order entry and shipping application. The customer orders are captured in an order entry database, which is being replicated to a stand-by database for recovery and availability in the case of unforeseen system problems. Orders are captured in Order Entry database and specific Ordering data is replicated to Shipping database. Once shipping is complete, a confirmation email is sent to the customer.

The diagram below shows the system architecture for this application. Note that the main focus here is on the database back-end side of the application architecture and design.

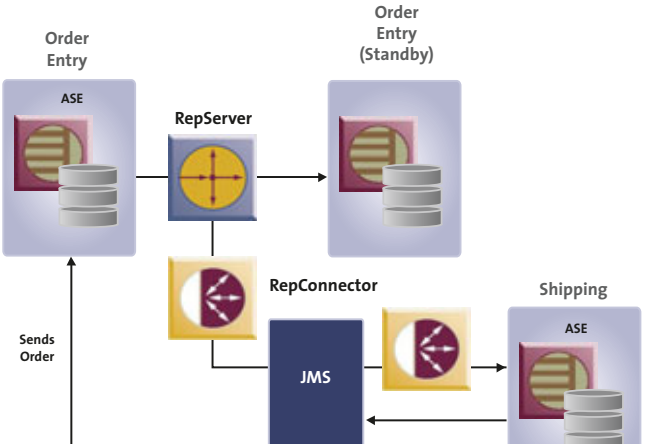

Figure 1. System Architecture

The back-office shipping application is cleanly separated from the online customer-facing order processing application by having two separate domains in the application-ordering and shipping. These domain boundaries, and data integration between the domains, can be achieved by using Sybase Real Time Data Services, which enables non-intrusive propagation and routing of the necessary ordering data to the shipping domain without impacting the performance of the online order entry application, and without any adverse data latency impact on the standby system. The confirmation processing is separated by the use of ASE Real-time Messaging feature to send shipping confirmation data.

IMPLEMENTATION

The following screenshots illustrate how Sybase WorkSpace simplifies and speeds up the back-end development for this application scenario. The content is intentionally provided at a high level due to length constraints, but amply demonstrates development integration brought forward to perform all necessary actions from within Sybase WorkSpace. Database deployment, debugging and testing features integrated in Sybase WorkSpace are not included here.

Define database objects from application database models:

Developers using Sybase WorkSpace can build conceptual and physical data model of the application databases. The following screenshot shows the database model created for the Order Entry database. Once model is finalized, corresponding schema can be generated and browsed on the server from within Sybase WorkSpace.

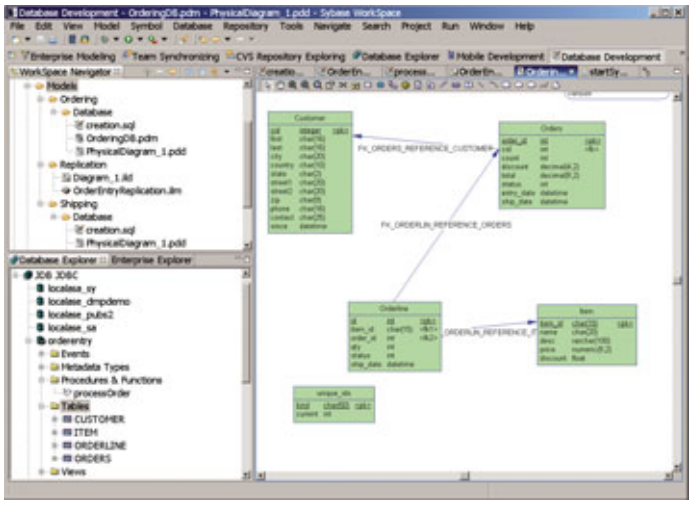

Figure 2. Database Model Created for the Order Entry Database

Create replication definition for database recovery and disaster planning:

Sybase WorkSpace helps in creating model for database disaster recovery planning using Information Liquidity Model (ILM). The following screenshot shows the ILM model to define replication from the primary database to standby using Replication Server, and also propagate appropriate primary database activity to Shipping database using RepConnector. SQL code (foreground picture) generated from the model is executed on database and replication servers to set up desired replication.

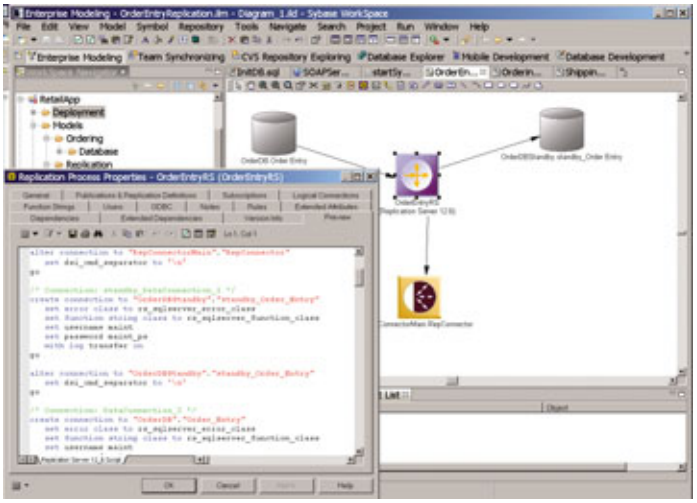

Figure 3. Information Liquidity Model (ILM)

Create RepConnector data movement definitions (database to JMS, and JMS to database):

Sybase WorkSpace integration with RepConnector allows developers to complete all RepConnector configuration and setup steps. Following Sybase WorkSpace screenshots show the launch of RepConnector configuration wizard to forward application's business events.

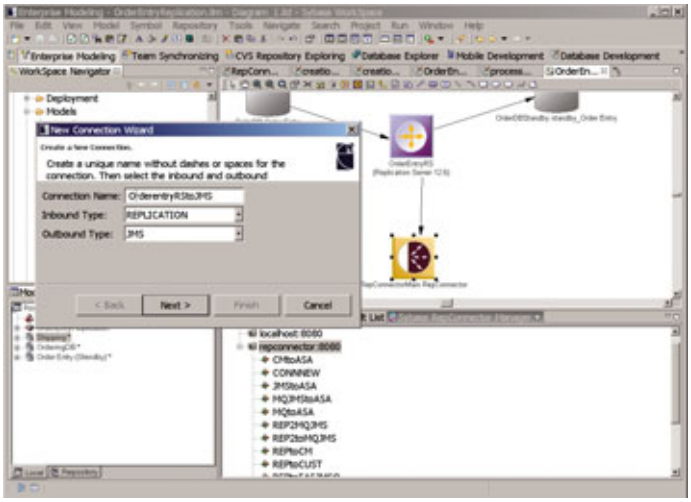

Figure 4. From RepServer to JMS endpoint

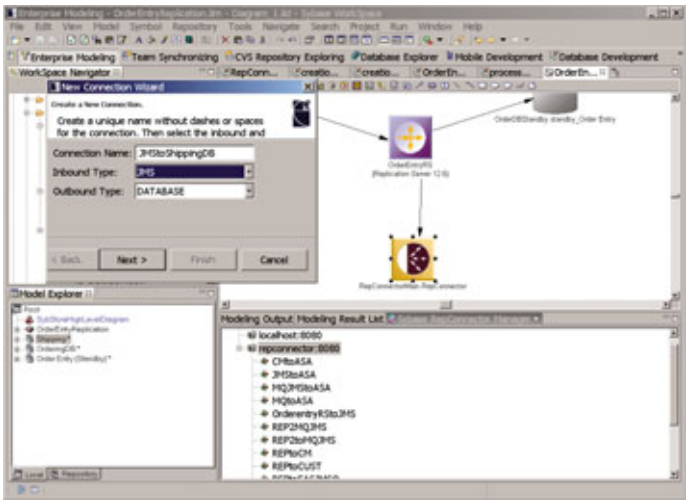

Figure 5. From JMS endpoint to Shipping Database

Create database stored procedures and triggers to implement order processing and shipping:

Sybase WorkSpace SQL development environment offers powerful editing and debugging environment for database objects. The following Sybase WorkSpace screenshot shows a stored procedure object under development in the Order Entry application database.

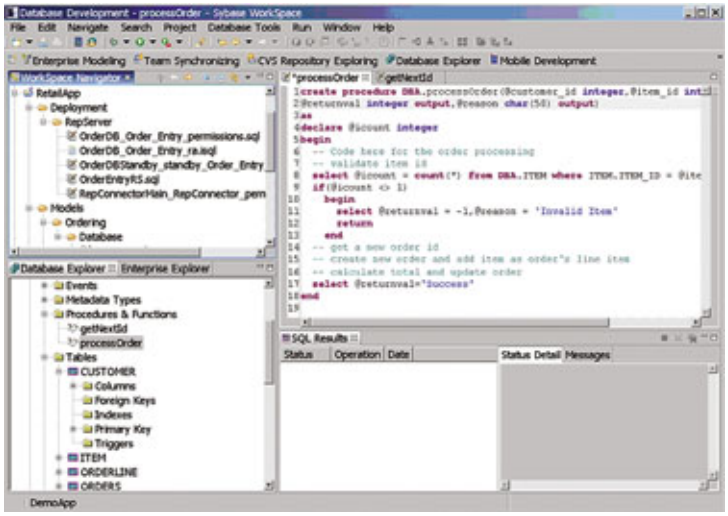

Figure 6. Stored Procedure Object Under Development

Build and execute complex query using Visual SQL feature in the database editor:

SQL code development in Sybase WorkSpace is complemented by several creation wizards such as Visual SQL where developers can build, preview, and execute the query before being brought into the stored procedure, trigger, SQL script, etc. The following Sybase WorkSpace screenshot shows the Visual SQL Builder showing database tables, columns, and the query being built for the stored procedure.

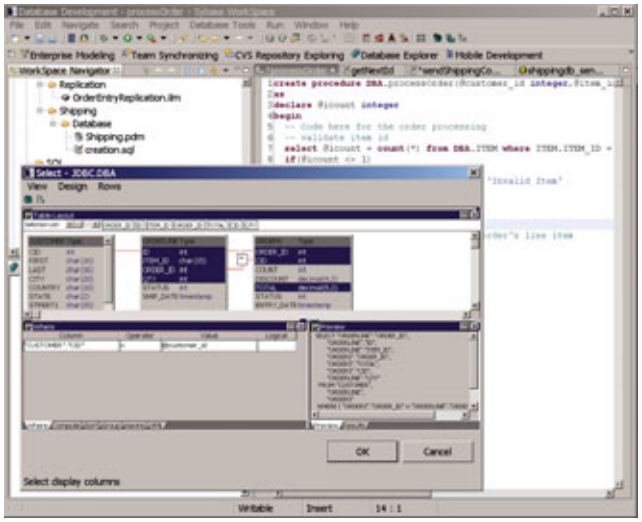

Figure 7. Visual SQL Builder

Create proxy table to invoke Currency Conversion Web Service from database SQL code:

Sybase WorkSpace takes the complexity out of creating proxy tables for invoking external Web Services. Sybase WorkSpace facilitates all required actions from discovering the Web Service from any UDDI repositories, bringing the details (WSDL), and then creating proxy tables all with simple point and click. The following Sybase WorkSpace screenshot shows Currency Conversion Public Web Service being invoked from a stored procedure.

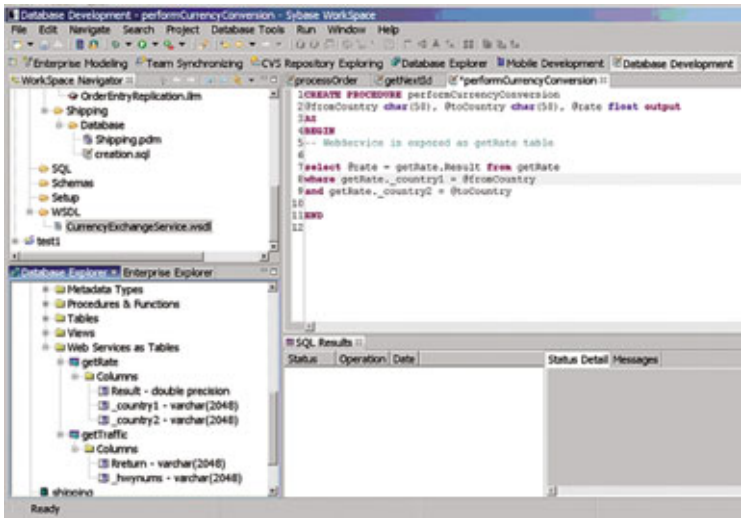

Figure 8. Currency Conversion Public Web Service

Build Complex JMS SQL Query for sending shipping confirmation data (XML) to the Email Notification Application:

Developers using Sybase ASE real-time messaging features and XML would find generating messaging SQL a simple and easy task with Sybase WorkSpace Real-time Messaging Wizard. This wizard presents appropriate information about the messaging endpoints and enables creating appropriate message and supported system and user-defined properties. The following screenshot shows the confirmation message being created to send from Shipping Database to JMS endpoint.

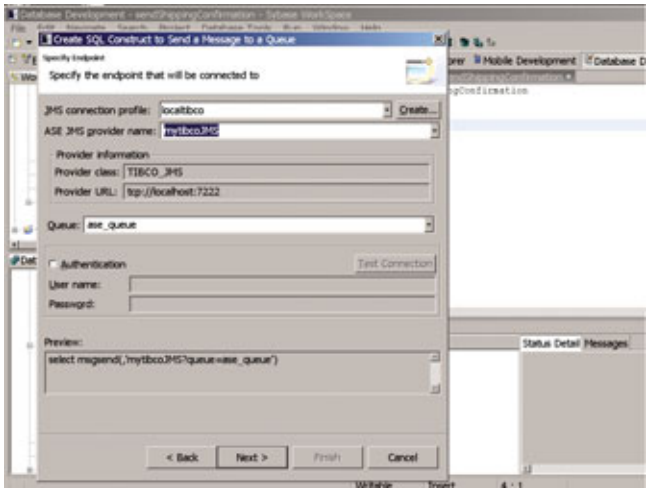

Figure 9. Confirmation Message

Expose Database Services based on existing logic such as stored procedures and SQL commands:

For developers writing code for interaction with database servers, Sybase WorkSpace eliminates the API complexities and abstracts developers from their gory details by providing Database Service. Database service can be expose stored procedures and SQL commands that need to be consumed outside of Database in other parts of application such as Business Process, Web Application, etc. Following Screenshot shows a database service built from the stored procedure for sending Shipping confirmation message.

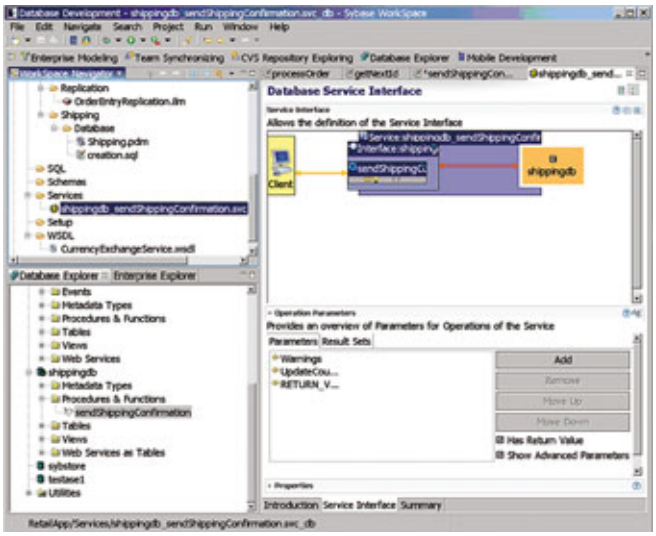

Figure 10. Shipping Confirmation Message

SUMMARY

Sybase WorkSpace represents the next generation in development technology designed to maximize the efficiency of creating new applications of all types. This paper highlights the end-to-end database development capabilities in Sybase WorkSpace, and its support for varied database-related infrastructures such as Sybase ASE, Sybase ASA, Sybase IQ, Replication Server, RepConnector, and MobiLink. Sybase WorkSpace delivers a unified environment to simplify database development and optimise associated development activities with features such as powerful database editing and debugging, code generation, support for Web Services, and setting up data movement between databases.

SYBASE, INC. WORLDWIDE HEADQUARTERS, ONE SYBASE DRIVE, DUBLIN, CA 94568 USA 1 800 8 SYBASE **L02710** 08-05

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