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USING ORACLE TO AUGMENT THE DATABASE CURRICULUM

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Abstract

Oracle Corporation makes its software products available to educational institutions. This tutorial describes how using Oracle products can enhance information systems education. It explores options for procuring, installing, and administering an Oracle client/server database in an academic setting. It also summarizes the advantages and challenges of using Oracle to enhance the database curriculum.

Keywords: Oracle, database education, client-server databases

Introduction: Motivation for Using Oracle

Database management is an integral topic in today's information systems curriculum. The expanding use of the Internet for information exchange ensures that the concepts underlying the movement of data over communications networks using client/server architectures will become an increasingly important part of future IS curricula. Courses addressing database management and client/server architectures often include a strong programming component so students can apply concepts to real problems. In the past, many schools used personal database management applications such as Microsoft Access for the programming component in these courses. During the past decade, Oracle Corporation made its software products available to educational institutions through special programs or bundled with textbooks.

Obtaining Software from Oracle

Oracle Corporation makes DBMS and software development products available to educational institutions at a nominal charge through the Oracle Academic Initiative (OAI). Once an institution is accepted as an OAI member, they must select the Oracle software products they wish to use. A participating institution is eligible to receive one or more database servers on a variety of available operating system platforms, including Windows NT, UNIX, and IBM RS/6000. Oracle offers a variety of database servers from which to select. The database options available are shown in Table 1.

The basic Oracle database server is called the Oracle8i Workgroup Server, and it is satisfactory for most instructional purposes. Other popular servers include the Oracle8i Enterprise Edition, which is optimized for very large installations that require high transaction throughput, and the Oracle 8i Server, which is optimized for databases that interact with internet-based client applications. Another possible option is Oracle8i Personal Edition servers, which are personal databases that can be installed on individual user workstations. This approach is useful for commuter students who want to work at home and do not need to share database tables and other objects. From a user standpoint, all of these database servers work the same.

OAI participants must also select the products that will be installed on the client workstations. The SQL command-line environment (SQL*Plus) is included with every database server, along with most of the other client utilities, and can be used for command-line SQL instruction. The database administration utilities (Enterprise Manager) are included with the all of the database servers except the Oracle8 Personal Edition. Other useful educational products include Oracle Designer, which is a CASE tool for developing system models and generating the associated database tables and user application forms and reports, and Oracle Developer, which is used to develop Windows-based user applications (forms, reports, and graphical charts). Oracle Developer includes a utility named Procedure Builder, which is used to develop and debug procedural programs that manipulate database data in Oracle's procedural programming language, which is named PL/SQL. Table 2 lists the utilities.

Table 1. Oracle Database Server Options

Server	Description
Oracle8 Workgroup Server	Basic Client/Server DBMS
Oracle8 Enterprise Edition	Client/Server DBMS for large numbers of users and high transaction throughput
Oracle8i Server	Client/Server DBMS optimized for Web-based client applications
Oracle Personal Edition	Personal database that can be installed on user workstation; emulates an Oracle client/server DMBS

Table 2 - Commonly-used Oracle Client Utilities

Utility	Description
SQL*Plus	Command-line SQL
Oracle Enterprise Manager	Database administrations tools for creating databases, user accounts, and other database objects
Oracle Designer	CASE tools for developing system models and generating associated database tables
Oracle Developer	Tools for creating user application forms, reports, graphic charts, queries, and stored database procedures and libraries

Oracle made some of its software available to students and academic institutions by bundling CDs containing Oracle products with Oracle-related textbooks. For example, CDs providing the Oracle personal DBMS and the Designer and Developer utilities can be purchased for a minimal amount when students purchase a specific systems analysis and design textbook [Hoffer, George & Valacich, 1999]. An Oracle systems development textbook [Morrison & Morrison, 2000] enables students to obtain the Oracle Personal DBMS and the Developer utility. The advantage of obtaining software using this approach is that students can then install and use the software on their home computers, and installation and configuration instructions are included with the textbook instructor kits.

Classroom Administration

Database Setup

A client/server database is a set of user accounts and their associated database objects, which can be tables, views, stored programs, etc. When the Oracle DBMS is installed on an NT or Windows 2000 database server, a starter database is automatically created. In a classroom environment, the instructor or technical support person can create all of the student accounts in the starter database, or they can create different databases to partition student accounts into different databases according to different courses or course sections. Since a client/server database is designed to handle a large number of users, both configurations work equally well.

User Accounts

Each student should have an individual user account. The easiest way to create the user accounts is to write an SQL script, which is a text file of SQL commands that can be run from SQL*Plus, the Oracle SQL-command line utility. For classes with team projects, the best approach is to assign every project team a common database account with a common username and password that is provided to each team member – this enables team members to access all of the team’s database objects easily. It is helpful to give the course instructor database administration privileges for the database so she can easily add or modify user accounts.

System Permissions on Client Workstations

Like most complex Windows applications, Oracle client software utilities write many temporary files in a variety of places on the local hard drive. As a result, the client workstations must be configured so that users and applications can perform all file

operations (read, write, execute, delete, create) on all of the files in the folder where Oracle is installed, as well as on some files in the Windows system folder. This configuration might pose a problem in computer laboratories with highly restrictive file and folder configuration policies. Initially, we tried to run the Oracle client software in computer laboratories with restrictive policies, but our experience was that the software was very unstable and in some cases would not work at all. When computer laboratory management personnel adopted a philosophy of creating regular disk images that enabled fast workstation recoveries rather than excessive restrictions, the Oracle client software worked very well. It is also important for the client software to be installed on each individual workstation, because it will not run reliably from a file server.

Managing Student Assignments and Team Project Files

Since students can easily modify SQL query outputs and Developer form and report printouts to create outputs that appear to be correct, we always collect electronic copies of class assignments and perform grading online. This can be done by collecting floppy diskettes, by students submitting assignments via FTP, or by students copying files into individual network server folders where permissions for reading and modifying files are only granted to the individual student and to the instructor. Since some Oracle files can be over 1 MB in size, floppy diskettes might not work for complex assignments. We successfully administered team projects by providing each project team with an individual folder on a network server for which each team member has full access privileges.

Conclusions

Oracle provides a rich environment for illustrating that the database is a central data resource that is independent of the user applications. Personal database systems such as Access provide a tightly integrated development environment, where database table creation and maintenance, query creation, and user application development all appear to the user as a single application. Conversely, Oracle presents the student database developer with an array of loosely integrated applications that interact with the database in very different ways.

The Oracle environment can also be used to illustrate database transactions effectively: a student can update a database record in the command-line SQL environment, and then observe that the change is not reflected in her end-user form until she commits the change to the database in SQL. Finally, Oracle also provides a rich set of utilities for teaching database administration concepts. In an introductory course, student accounts can be structured so that students can examine DBA utilities for creating new databases and user accounts without having DBA privileges that could be potentially destructive. An advanced database course can be structured so that students can be assigned DBA privileges on a dedicated database server, and they can actually perform the DBA functions.

Along with market-driven incentives, Oracle provides a valuable tool to illustrate multi-user and transaction processing issues effectively within a challenging, production-quality software environment. It also provides instructors with added professionalism and external marketability. However, Oracle also has some daunting challenges: it requires high-end hardware for the database server and client workstations, the software is difficult to install and configure, and few high-quality instructional materials exist.

References

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