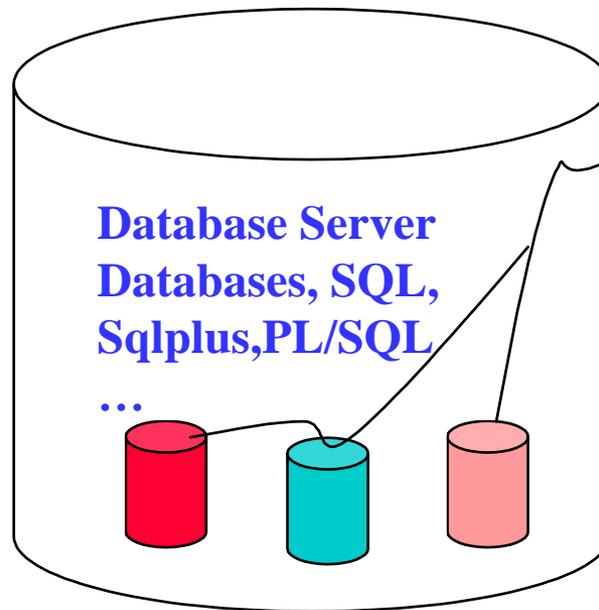


Comp-4150: Advanced and Practical Database Systems (Part C: DB Application Front-End Tools)

:DB APPLICATION BUILDING

Database client Application
Query database, triggers, PL/SQL,...



Dr. C.I. Ezeife
School of Computer Science,
University of Windsor, Canada.
Email: cezeife@uwindsor.ca

Course Part C: DB Application Front-End Tools)

Objectives

- **Broad Course Objective**
- - Components of a database management system
- - Acquire database development skills necessary for building real life database applications with Oracle DBMS.
- **Reference Materials**
 - **C.I Ezeife, *Custom Course Ware, Course Notes for Comp 4150, Project Using Selected Tools: Advanced and Practical Database Systems (with Oracle PL/SQL and Front End Tools)*, University of Windsor, Fall 2024.**
 - **Main Course Book is Elmasri & Navathe, 7th edition, 2016**
 - **Benjamin Resenzweig and Elena Rakhimov, “Oracle PL/SQL by Example”, Pearson, edition 5, 2015, ISBN 978-0-13-379678-0**
 - **Ben Forta, SQL in 10 Minutes a Day, Sams Teach Yourself, 2020, 5th edition, Print ISBN: 9780135182796, 0135182794, eText ISBN: 9780135182864, 0135182867**

Part C: Course Objectives

- **Discuss Front-End Tools for creating database application programs in the following 5 categories.**
 - **1. Embedded SQL with C/C++ or SQLJ**
 - **2. Connecting to database through ODBC or JDBC connectivity**
 - **3. Using Database programming language, Oracle PL/SQL for stored procedures with Sqlplus**
 - **4. Connecting to database server through a DBMS client desktop software (E.g., SQL developer or with use of MS Access Tool).**
 - **5. Building a Web database application program for access through a web browser (e.g., with PHP scripting front end with MySQL backend through PHP Admin).**

Part C: 1. Embedded SQL with C/C++ or SQLJ

- As introduced in Chapter 10 of the Elmasri and Navathe book, one option for building database applications is by using an embedded SQL in a host language like C/C++ (that is a Pro*C program) or Java (SQLJ) where the C/C++ program will be retrieving query results from a back-end database with SQL query statements embedded correctly in these programs.
- An example simple problem to be addressed is given below.
- **Example 10.1:** Given the Company Database example table Employee already in your database, write an embedded SQL program in C/C++ that will accept as input a social security number of an employee and prints some information from the Employee record.
- Methods for compiling, connecting to the database and running these programs are summarized in the book and in sample files in the database tools materials left for class in blackboard for practice.
- This method is not discussed in further detail in class.

Part C: 2. Connecting to database through ODBC or JDBC connectivity

- **How to connect to oracle using java JDBC connectivity is described in the help link below.**
<https://help.cs.uwindsor.ca/mediawiki/index.php/Oracle>
- **1. you must install GlobalProtect VPN. Steps on how to do so can be found in the following link.**
<https://www.uwindsor.ca/itservices/talks/installing-globalprotect-vpn>
- **2. You need to install ojdbc8.jar. The java file and the ojdbc8.jar file must be in the same directory.**
- **To download the ojdbc8.jar file from Oracle. Use this link.**
<https://www.oracle.com/database/technologies/appdev/jdbc-ucp-19c-downloads.html>

Part C: 2. Connecting to database through ODBC or JDBC connectivity

- In the code for connecting to SQL all you must do is change the uwinID and password with your own credentials
- You need to do is to run the following commands in the terminal.
- `javac -classpath ojdbc8.jar jdbc.java`
- `java -classpath ojdbc8.jar:. jdbc`
-
- To execute an SQL query all you must do is write `stmt.executeQuery("Write the query here");`

Part C: 2. Connecting to database through ODBC or JDBC connectivity: A sample Java program with JDBC

```
▪ import oracle.jdbc.*;
▪ import oracle.jdbc.pool.OracleDataSource;
▪ class jdbc
▪ {
▪     public static void main (String args[]) throws SQLException
▪     {
▪         OracleDataSource ods = new OracleDataSource();
▪         ods.setURL("jdbc:oracle:thin:uwinID/password@oracle.cs.uwindsor.ca:1521:cs01");
▪         Connection conn = ods.getConnection();
▪         Statement stmt = conn.createStatement();
▪         stmt.executeQuery("CREATE TABLE school(SNAME VARCHAR2(20))");
▪         stmt.executeQuery("INSERT INTO school VALUES('UWindsor')");
▪         ResultSet rs = stmt.executeQuery("SELECT SNAME FROM school");
▪         while(rs.next())
▪             System.out.println(rs.getString("SNAME"));
▪         stmt.executeQuery("DROP TABLE school");
▪     }
▪ }
```

Part C. 3. Using Database programming language, Oracle PL/SQL for stored procedures with Sqlplus

- **The Part B of course slides named 415notes_PLSQL has many examples of how the stored procedures written in PL/SQL language for Oracle databases are written for adding programming constructs to SQL querying.**

4. Connecting to database server through a DBMS client desktop software (E.g., SQL developer or with use of MS Access Tool).

- **SQL Developer and SQL*Plus are two Oracle-provided tools that can be used to run PL/SQL scripts.**
- **SQL Developer is a free graphical tool used for database development and administration.**
- **It is a new addition to the Oracle tool set.**
- **It is a much easier tool to use than SQL*Plus as it allows you to browse database objects, run SQL statements, create, debug and run PL/SQL statements.**
- **Apart from the GUI format, its functionality is similar to that of the SQL*Plus discussed next.**

4. Connecting to database server through a DBMS client desktop software (E.g., SQL developer or with use of MS Access Tool).

- **1. To use SQL Developer, download the tool from the Oracle website: www.oracle.com onto your desktop.**
- **2. Also, for this to work on your computer at home you must install GlobalProtect VPN. Steps on how to do so can be found in the following link. (<https://www.uwindsor.ca/itservices/talks/installing-globalprotect-vpn>)**
- **3. To use the SQL Developer to connect to your Oracle database account on our cs server, you need to establish a connection first by launching the SQL Developer and connecting as shown in the figure next with the connection strings shown**
 - **- The username and password are your Uwindsor's that had been synchronized previously. Hostname is: oracle.cs.uwindsor.ca**
 - **- Connection name is: CS01; SID is: CS01; Port is: 1521**

4. Connecting to database server through a DBMS client desktop software (E.g., SQL developer or with use of MS Access Tool).

The screenshot shows the 'New / Select Database Connection' dialog box in SQL Developer. The dialog is divided into several sections:

- Table:** A table with two columns: 'Connection Name' and 'Connection Details'. The first row is selected, showing 'cs01' and 'sys@//orade.cs.uwindsor...'.

| Connection Name | Connection Details |
|-----------------|----------------------------|
| cs01 | sys@//orade.cs.uwindsor... |
- Fields:** 'Connection Name' (cs01), 'Username', 'Password', 'Save Password' (checkbox), 'Connection Color' (dropdown), 'Oracle' section with 'Connection Type' (Basic) and 'Role' (SYSDBA).
'Hostname' (orade.cs.uwindsor.ca), 'Port' (1521), 'SID' (radio selected, cs01), 'Service name' (radio, empty).
'OS Authentication' (checkbox), 'Kerberos Authentication' (checkbox), 'Advanced...' button.
- Status:** A 'Status:' label.
- Buttons:** 'Help', 'Save', 'Clear', 'Test', 'Connect', 'Cancel'.

4. Connecting to database server through a DBMS client desktop software (E.g., SQL developer or with use of MS Access Tool).

- **A tutorial to assist with learning the use of connecting to MS Access with MS Access tool can be found in the blackboard database tool folder.**

5. Building a Web database application program for access through a web browser (e.g., with PHP scripting front end with MySQL backend through PHP Admin).

- **Information on how to connect to our PhP admin.**
- **Once you are a CS student or staff you should be able to log on to the CS myweb page through the following link.**
- **To access a Web site on this server, enter a URL of the form: <http://userid.myweb.cs.uwindsor.ca>.**
- **For example, for my own web site, I substitute the general userid with mine cezeife as: <http://cezeife.myweb.cs.uwindsor.ca>**

5. Building a Web database application program for access through a web browser (e.g., with PHP scripting front end with MySQL backend through PHP Admin).

- **To log on to your web site and use the resources there in, use:**

https://userid.myweb.cs.uwindsor.ca:2222/CMD_SHOW_DOMAIN?domain=userid.myweb.cs.uwindsor.ca

- **For example, for mine, I again substitute cezeife for userid and you should remember to do the same for yours.**
- **Chapter 10 notes and sample PHP application in the blackboard database tool folder provide summary of how to learn and work with PHP to develop a full application.**