

Introduction to Oracle

Database Systems
Presented by Rubi Boim

Agenda

- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to Oracle
- × Comments on homework

Homework #1

- ✗ Submission date is November 17. (No late arrivals will be accepted)
- ✗ Work should be done in pairs
- ✗ Please, please, please, names and ID on the submittals.
- ✗ Submit Hardcopies to Rubi's mailbox
- ✗ USE THE FORMAT DESCRIBED IN THE ASSIGNMENT

Project

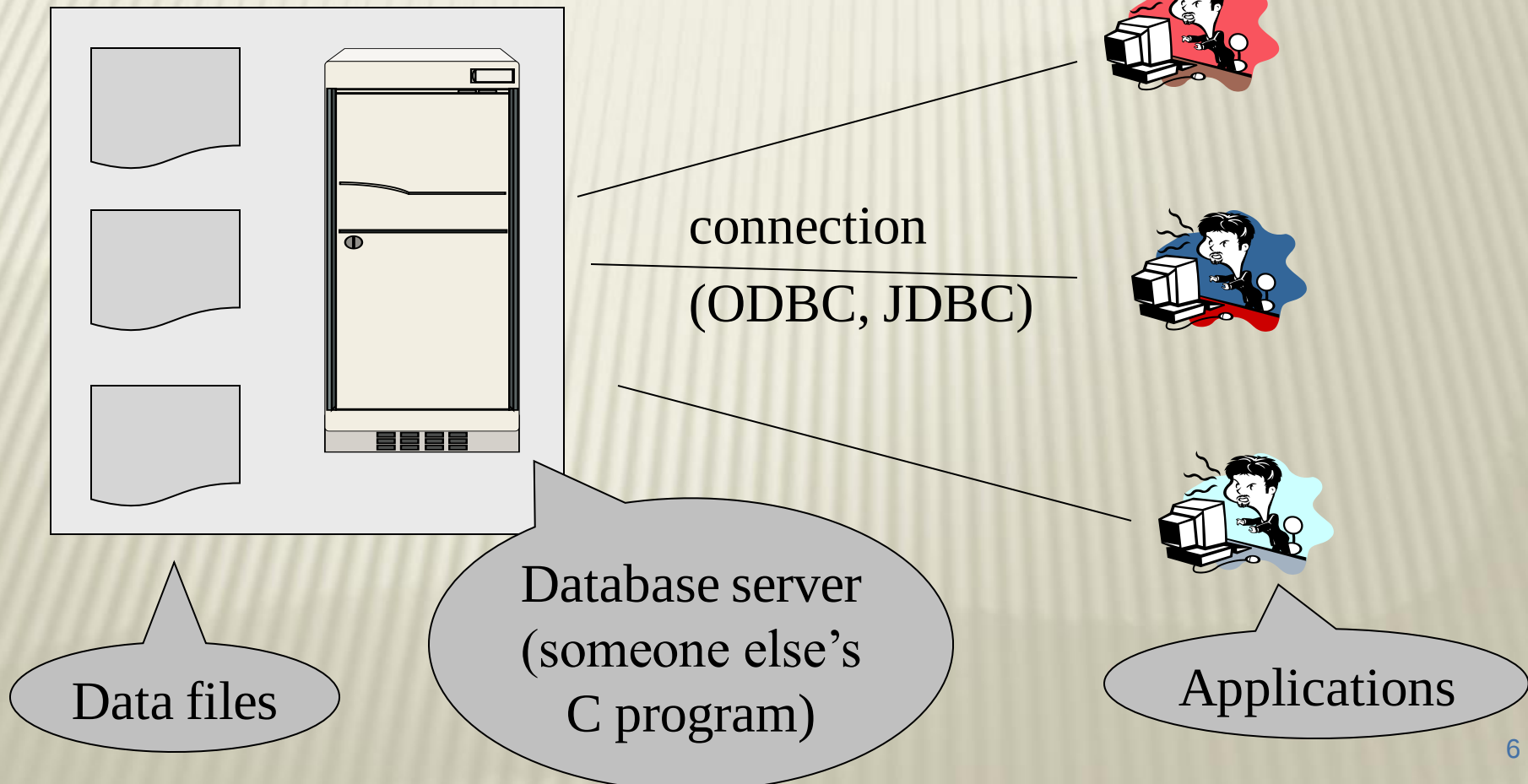
- × Hard work, but real.
- × Work in groups of 4
- × Project goal: to tackle and resolve **real-life** DB related development issues
- × One ~~Two~~ stages.
- × Use JAVA (SWT)
- × Thinking out of the box will be rewarded

Agenda

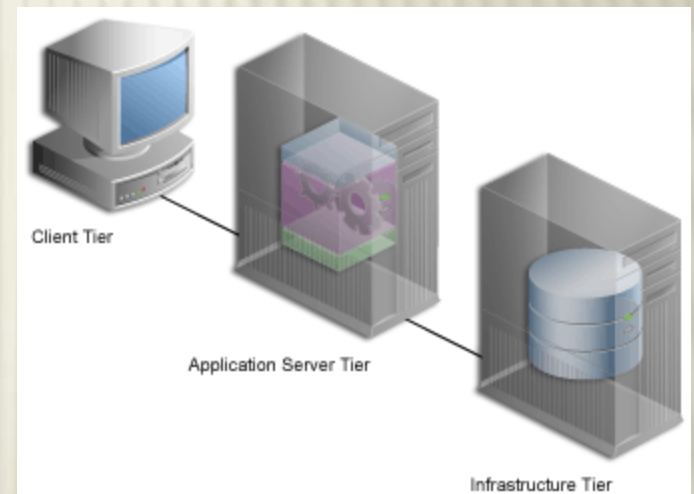
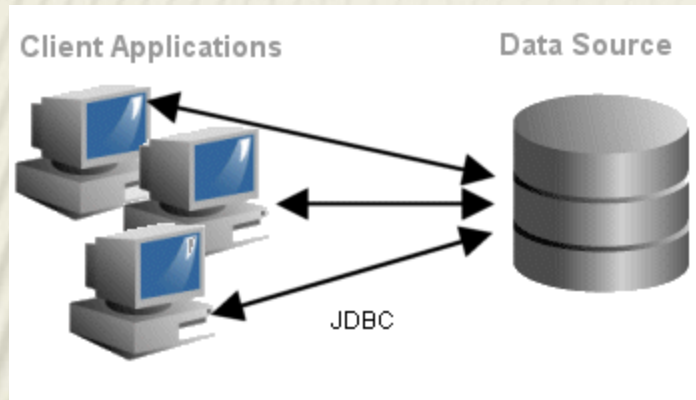
- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to Oracle
- × Comments on homework

DB System from lecture #1

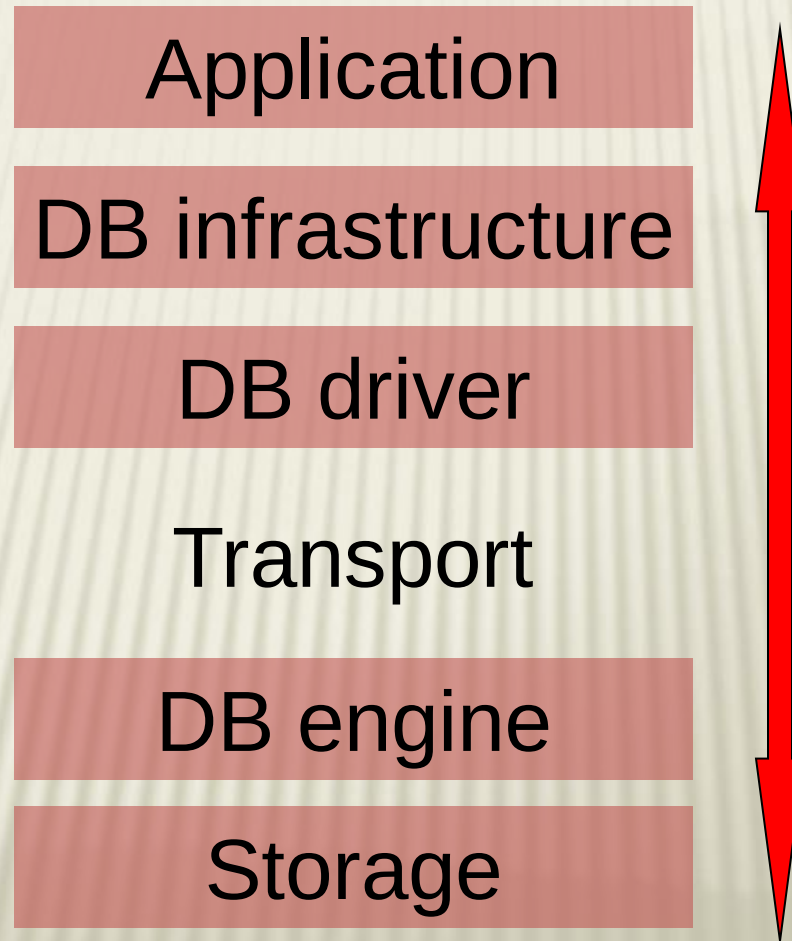
“Two tier database system”



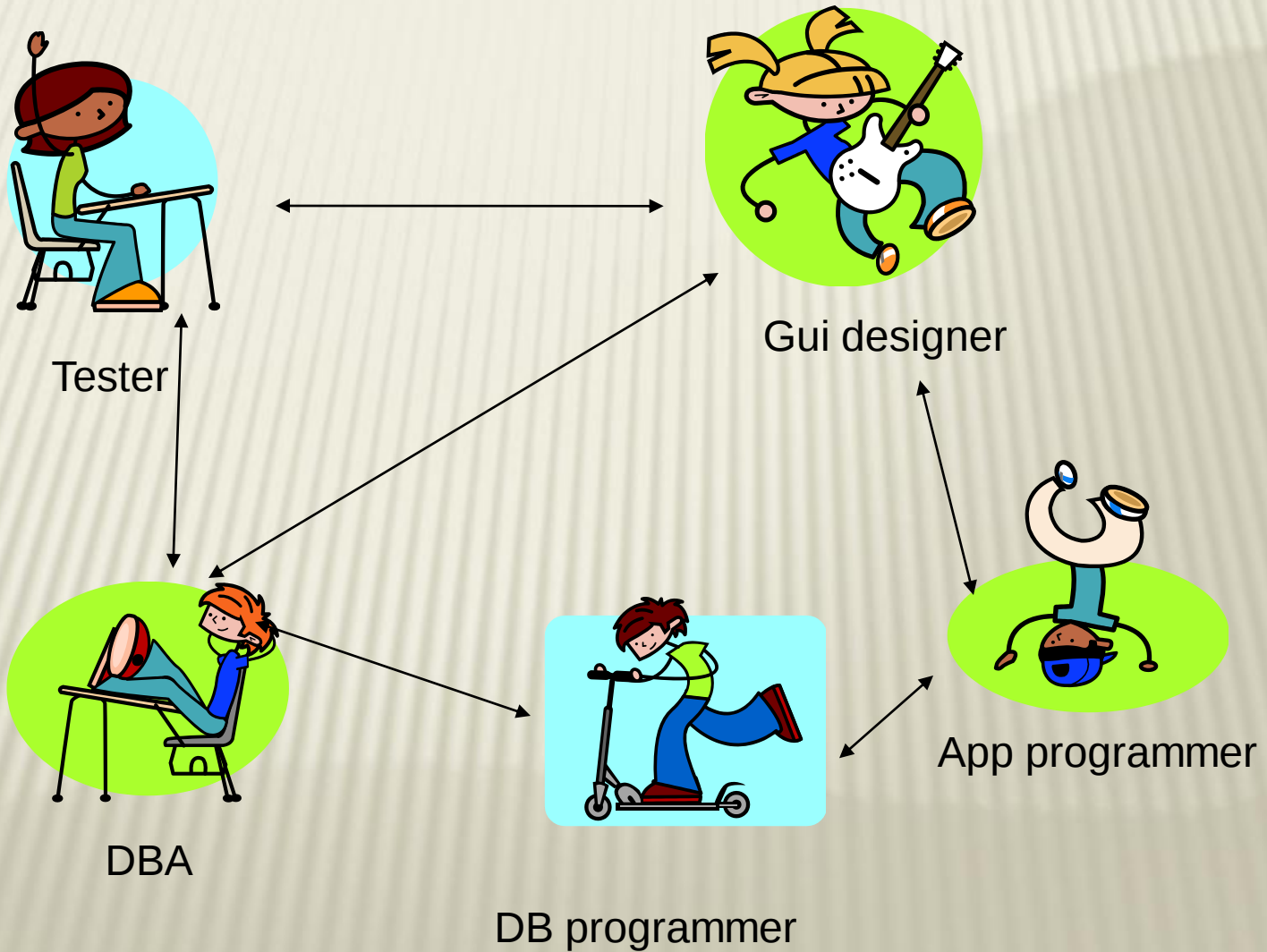
1,2,3 tiers



Abstractly (DB) system layers may include

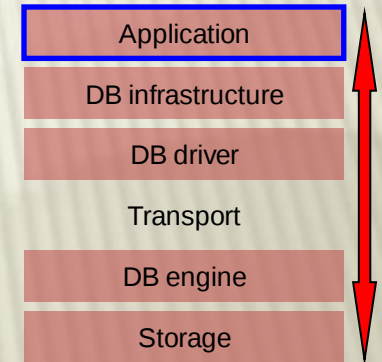


Why?



Application layer

- ✖ Why should it actually use database?
 - + Persistence layer
 - + Access data storage
 - + Interfacing between systems
 - + Large volumes
 - + Scalability
 - + Redundancy

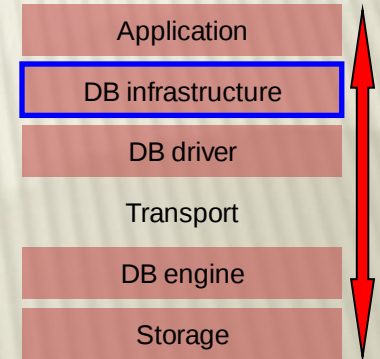


Infrastructure layer

× Goals:

- + Database “hiding”
- + Schema abstraction
- + Encapsulation of db mechanisms

× How: (In two words)



Model Abstraction

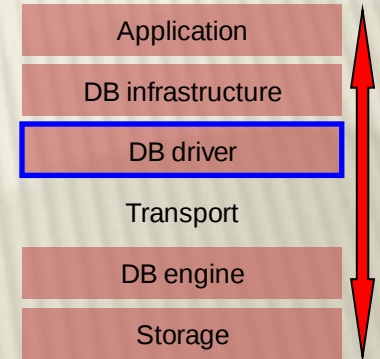
DB driver / bridge

× Used for:

- + API for database connectivity
- + Protocol converter
- + Performance improvements
- + Transaction management

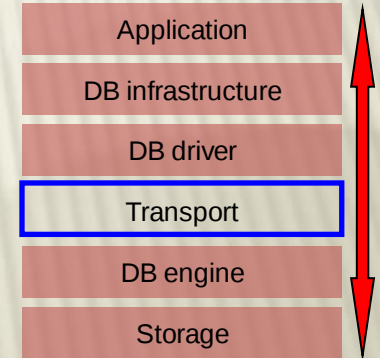
× Examples:

- + In a minute...



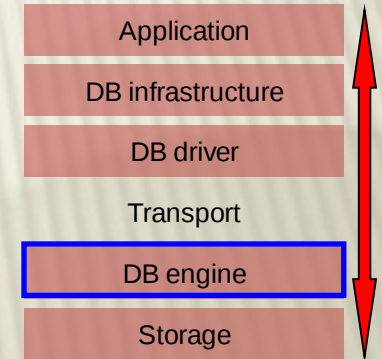
Transport

- ✖ Mainly TCP but not only
- ✖ Secure
- ✖ Efficient
- ✖ Fast but not fast enough



DB engine

- ✖ Total management of the DB environment including
 - + Security
 - + Scalability
 - + Fault tolerant (disaster management)
 - + Monitoring
 - + Services
- ✖ Large DB engines include Microsoft SQL Server, Oracle, SyBase, MySQL, etc.



DB engine (2)

DB engine management includes:

- + Databases/Tables/Fields

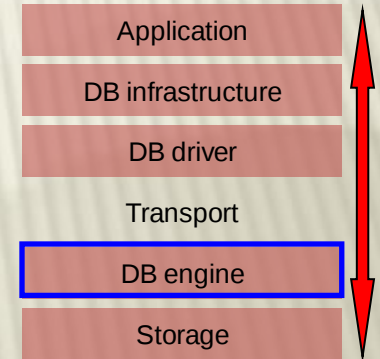
Creation/removal/modification/
optimization

- + Connections/Users/Roles

Security/monitoring/logging

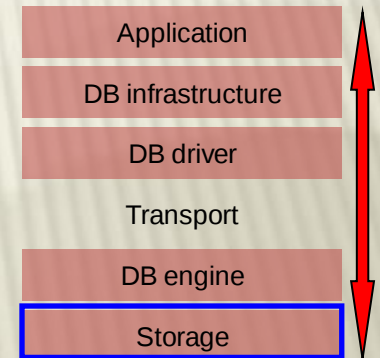
- + Jobs/Processes/Threads

Scheduling/balancing/managing

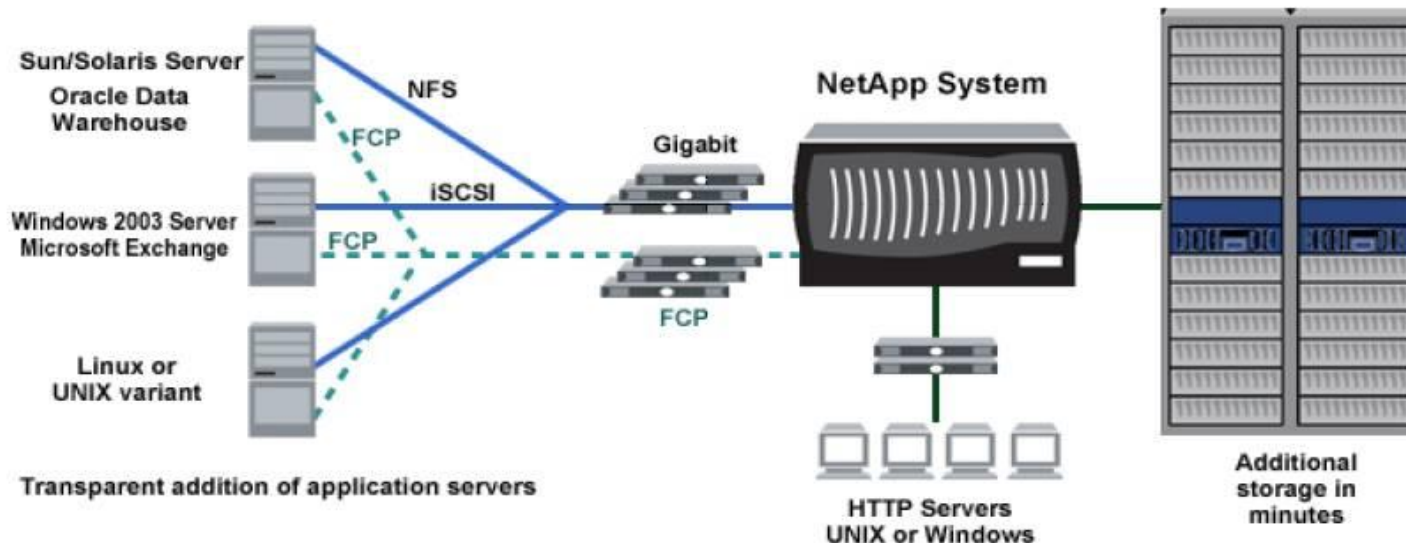


Storage

× NAS/SAN, Raid and other stuff...
(sorry... not in this course)



Industry standard network protocols
Transparent application server OS upgrades



Agenda

- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to Oracle
- × Comments on homework

Terms...

- × ODBC
- × ADO
- × OLE-DB
- × MDAC/UDA
- × JDBC
- × ORM

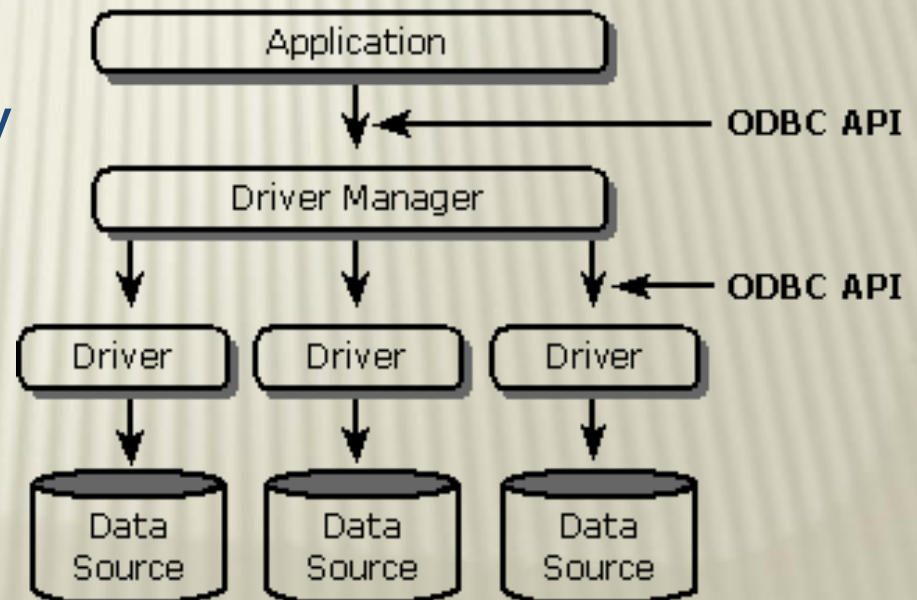
ODBC, OLEDB and ADO

- × Various standards have been developed for accessing database servers.
- × Some of the important standards are
 - + **ODBC** (Open Database Connectivity) is the early standard for relational databases.
 - + **OLE DB** is Microsoft's object-oriented interface for relational and other databases.
 - + **ADO** (Active Data Objects) is Microsoft's standard providing easier access to OLE DB data for the non-object-oriented programmer.

ODBC

- ✧ Open Database Connectivity (ODBC) is a standard software API method for using database management systems (DBMS)

- ✧ Maximum interoperability



ODBC

Examples of common tasks:

- + Selecting a data source and connecting to it.
- + Submitting an SQL statement for execution.
- + Retrieving results (if any).
- + Processing errors.
- + Committing or rolling back the transaction enclosing the SQL statement.
- + Disconnecting from the data source.

MDAC... UDA

- × UDA (Universal Data Access) and/or MDAC (Microsoft Data Access Components) include (ADO), OLE DB, and (ODBC).

JDBC

- × Java DB connectivity API
- × Similar to ODBC
- × Why do you need it:
 - + Pure Java
 - + Simple API
 - + Well....Multi-platform

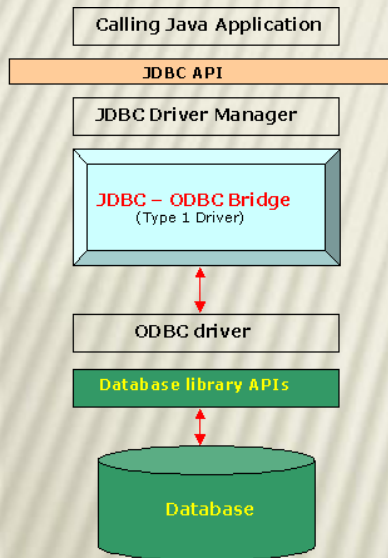
JDBC

- × API includes:
 - + DriverManager, Connection, Statement, PreparedStatement, CallableStatement, ResultSet, SQLException, DataSource

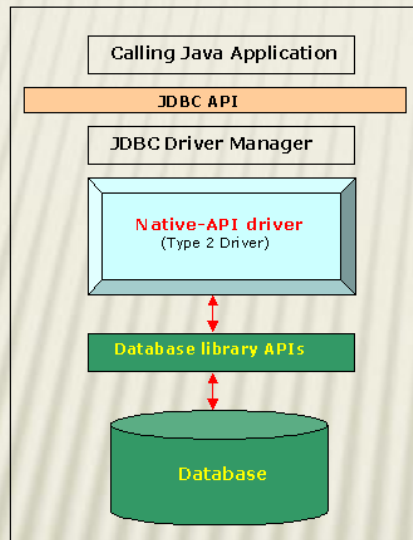
- × JDBC Type Driver:
 - + **Type 1** - (JDBC-ODBC Bridge) drivers.
 - + **Type 2** - native API for data access which provide Java wrapper classes
 - + **Type 3** - 100% Java, makes use of a middle-tier between the calling program and the database..
 - + **Type 4** - They are also written in 100% Java and are the most efficient among all driver types. Calls directly into the vendor-specific database protocol.

JDBC Types

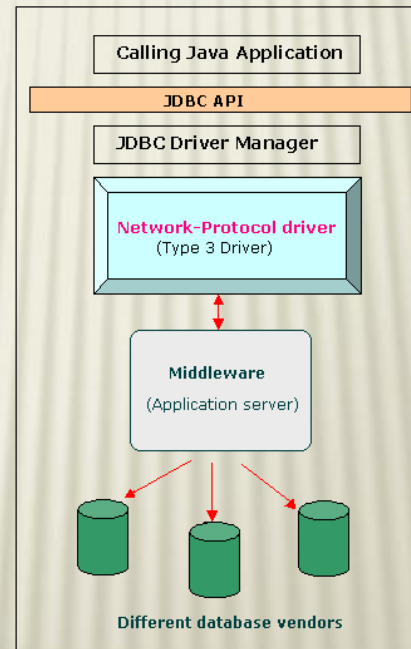
Type 1



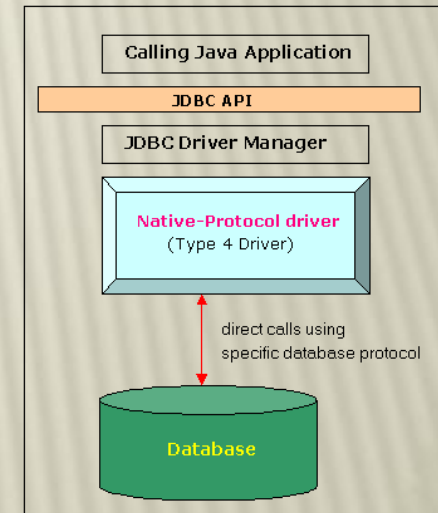
Type 2



Type 3



Type 4



ORM

- × **Object-Relational mapping** is a programming technique for converting data between incompatible type systems in relational databases and object-oriented programming languages.
- × For example: Hibernate, EJB3.0, JDO

Agenda

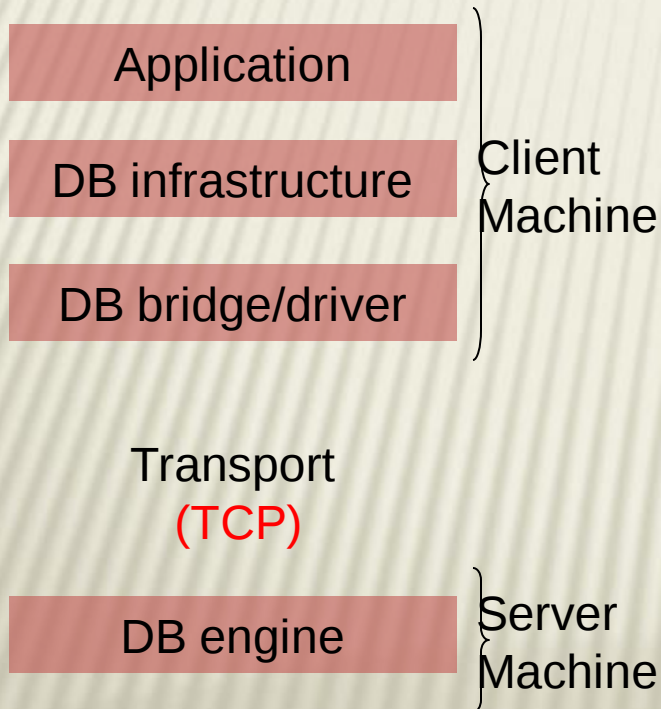
- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to Oracle
- × Comments on homework

Welcome to

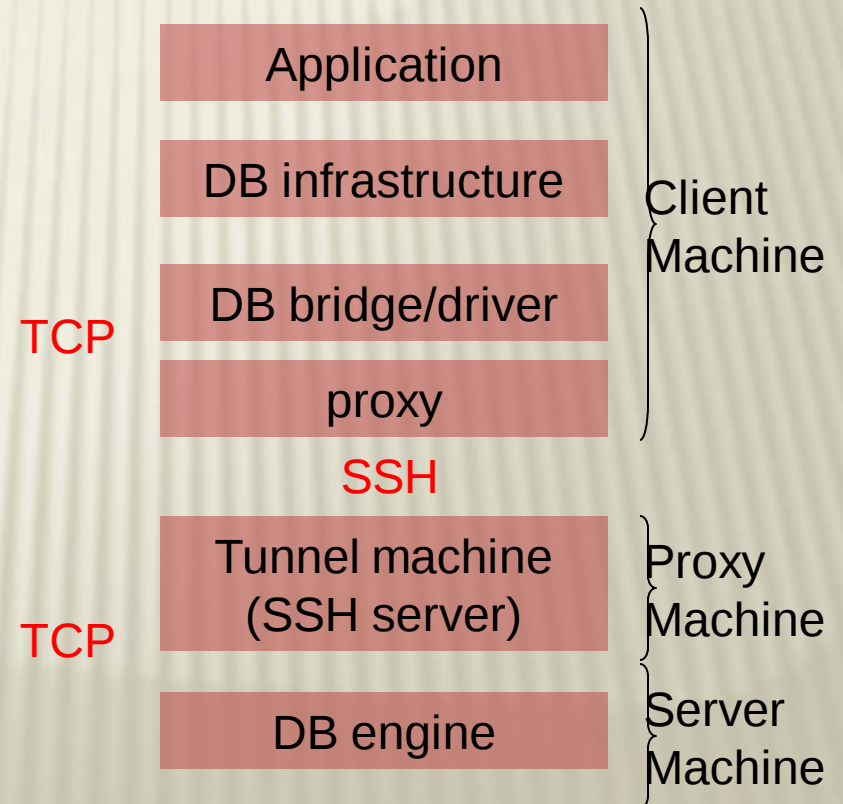
The travels of a queen

SSH

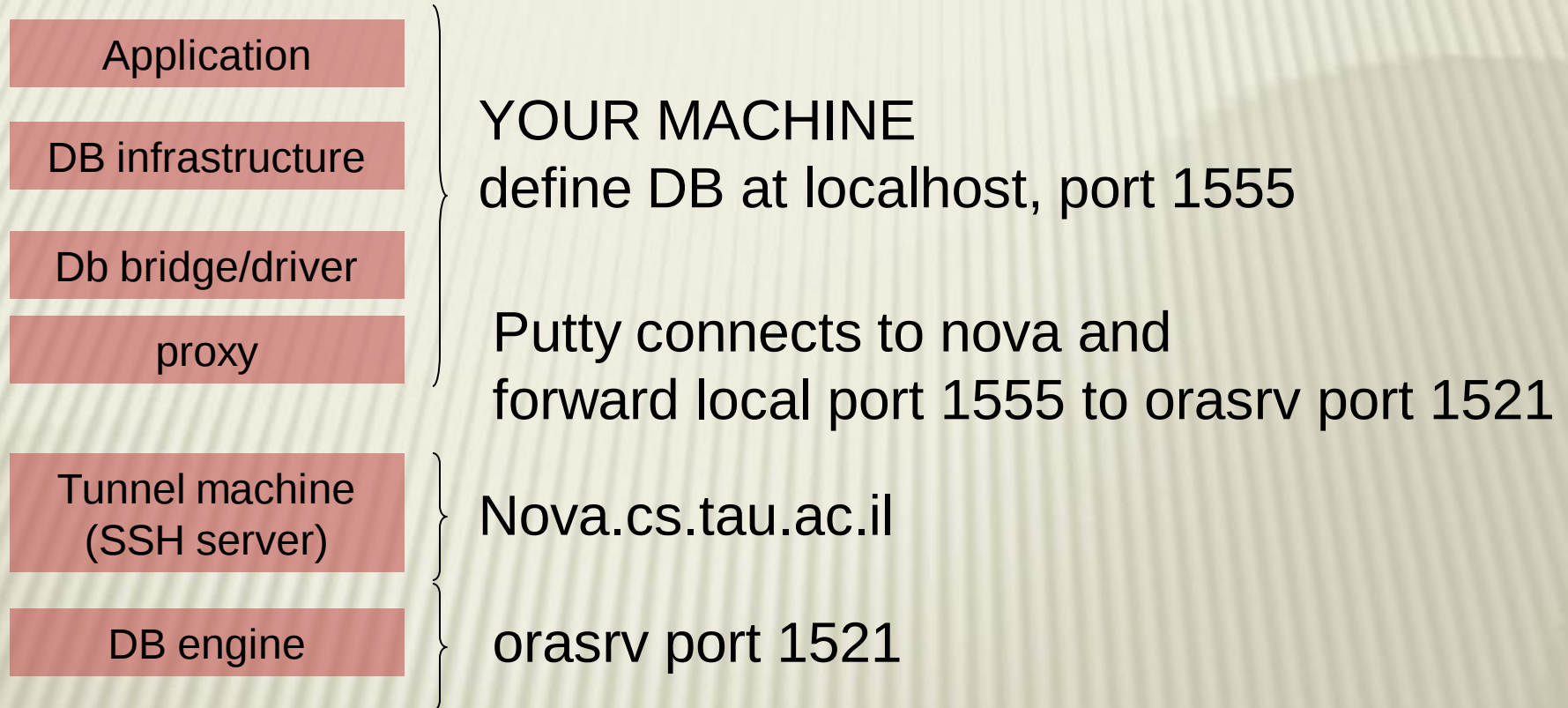
Standard way



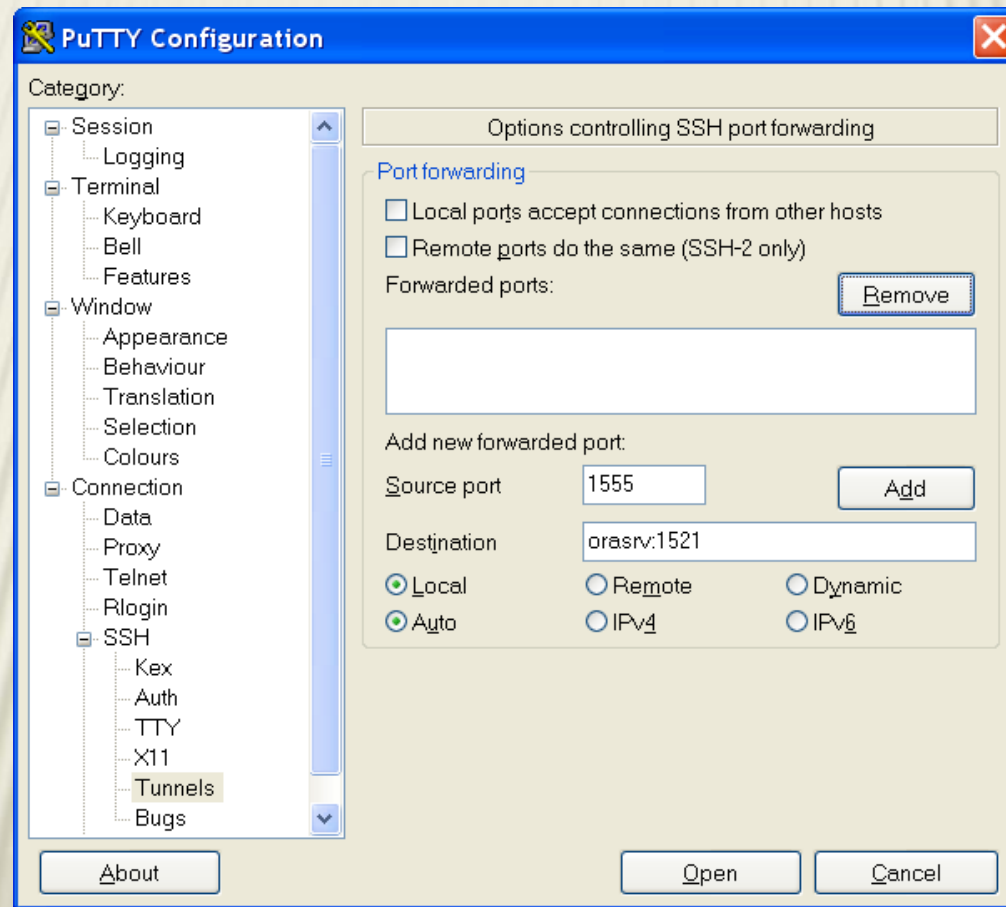
Using Tunnel



SSH in TAU



SSH in TAU



Agenda

- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to Oracle
- × Comments on homework

Products we will be using

- ✖ Oracle database – (at home express edition)
- ✖ SQLDeveloper

Free to download on oracle.com
(required to create an oracle account)

XE – under “Database”

SQLDeveloper – under “Middleware →
Developer Tools”

Server settings..

- × Host: localhost/orasrv
- × Port: 1521
- × SID: xe/csodb/other?
- × Schema system/hr/specificuser/
- × Use the connection guide (link on the course slides page) for instruction on how to create a DB user:
- × TAU HR user / password: hr_readonly / tiger

HR vs HR_ReadOnly

Oracle SQL Developer : TABLE HR.COUNTRIES@ FROM TAU - HR

File Edit View Navigate Run Source Versioning Migration Tools Help

Conn... FROM TAU - HR COUNTRIES

Columns Data Constraints Grants Statistics Triggers Flashback Dependence

Sort... Filter: Actions...

COUNTRY_ID	COUNTRY_NAME	REGION_ID
1AR	Argentina	2
2AU	Australia	3
3BE	Belgium	1
4BR	Brazil	2
5CA	Canada	2
6CH	Switzerland	1
7CN	China	3
8DE	Germany	1
9DK	Denmark	1
10EG	Egypt	4
11FR	France	1
12HK	HongKong	3
13IL	Israel	4
14IN	India	3
15IT	Italy	1
16JP	Japan	3
17KW	Kuwait	4
18MX	Mexico	2
19NG	Nigeria	4
20NL	Netherlands	1
21SG	Singapore	3
22UK	United Kingdom	1
23US	United States of A...	2
24ZM	Zambia	4
25ZW	Zimbabwe	4

SQL History

Editing

Oracle Express Edition (XE)

Installation only at home...

XE Database DEMO

Similar tutorial can be found in

<http://st-curriculum.oracle.com/tutorial/DBXETutorial/index.htm>

- × Installation
- × Create a user
- × Run a script
- × Query
- × Other database objects
- × Administration tasks

Database Homepage Demo

Demo..

SQL*plus Demo

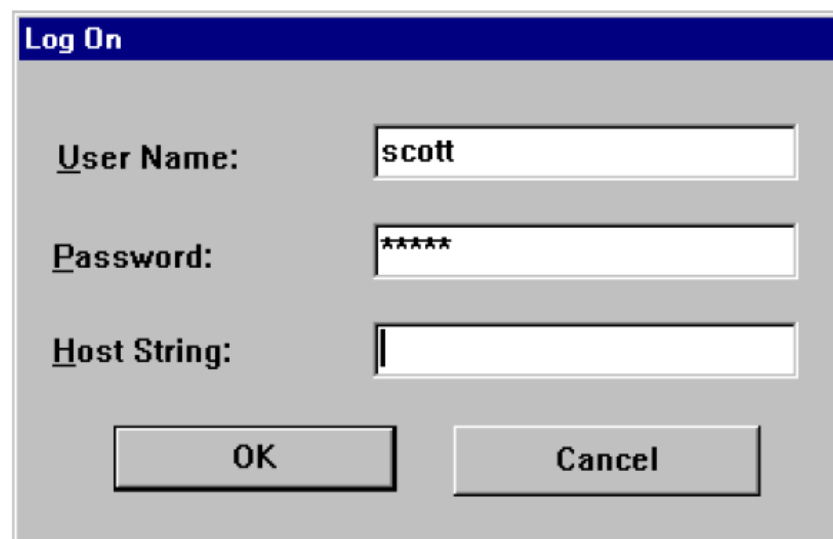
Demo..

Overview of SQL*Plus

- Log in to SQL*Plus
- Describe the table structure
- Edit your SQL statement
- Execute SQL from SQL*Plus
- Save SQL statements to files and append SQL statements to files
- Execute saved files
- Load commands from file to buffer to edit

Logging In to SQL*Plus

- From a Windows environment:



A screenshot of the 'Log On' dialog box from SQL*Plus. The dialog has a blue title bar with the text 'Log On'. It contains three input fields: 'User Name:' with the text 'scott', 'Password:' with six asterisks '*****', and 'Host String:' which is empty. At the bottom, there are two buttons: 'OK' and 'Cancel'.

- From a command line:

```
sqlplus [username[/password  
          [@database]]]
```

Displaying Table Structure

Use the SQL*Plus DESCRIBE command to display the structure of a table:

```
DESC[RIBE] tablename
```

Displaying Table Structure

```
SQL> DESCRIBE departments
```

Name	Null?	Type
-----	-----	-----
DEPARTMENT_ID	NOT NULL	NUMBER(4)
DEPARTMENT_NAME	NOT NULL	VARCHAR2(30)
MANAGER_ID		NUMBER(6)
LOCATION_ID		NUMBER(4)

SQL*Plus Editing Commands

- `A[PPEND] text`
- `C[HANGE] / old / new`
- `C[HANGE] / text /`
- `CL[EAR] BUFF[ER]`
- `DEL`
- `DEL n`
- `DEL m n`

SQL*Plus Editing Commands

- I [NPUT]
- I [NPUT] *text*
- L [IST]
- L [IST] *n*
- L [IST] *m n*
- R [UN]
- *n*
- *n text*
- 0 *text*

Using LIST, n, and APPEND

```
SQL> LIST
```

```
1  SELECT last_name  
2* FROM    employees
```

```
SQL> 1
```

```
1* SELECT last_name
```

```
SQL> A , job_id
```

```
1* SELECT last_name, job_id
```

```
SQL> L
```

```
1  SELECT last_name, job_id  
2* FROM    employees
```

Using the CHANGE Command

```
SQL> L
```

```
1* SELECT * from employees
```

```
SQL> c/employees/departments
```

```
1* SELECT * from departments
```

```
SQL> L
```

```
1* SELECT * from departments
```

SQL*Plus File Commands

- `SAVE filename`
- `GET filename`
- `START filename`
- `@ filename`
- `EDIT filename`
- `SPOOL filename`
- `EXIT`

Using the SAVE and START Commands

```
SQL> L
  1  SELECT last_name, manager_id, department_id
  2* FROM    employees
SQL> SAVE my_query
```

```
Created file my_query
```

```
SQL> START my_query
```

LAST_NAME	MANAGER_ID	DEPARTMENT_ID
King		90
Kochhar	100	90
...		

20 rows selected.

Summary

In this appendix, you should have learned how to use SQL*Plus as an environment to do the following:

- Execute SQL statements
- Edit SQL statements
- Format output
- Interact with script files

SQLDeveloper demo

Invoking (TAU):
sqldeveloper

Using SQL Developer

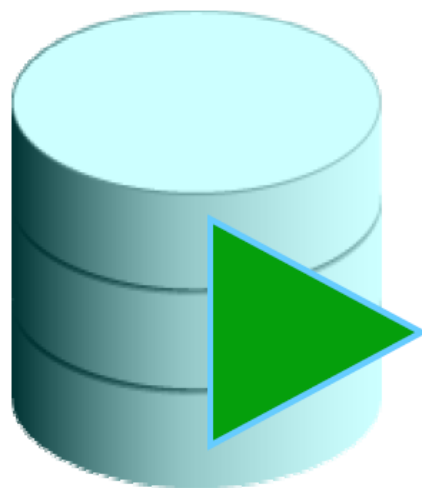
Objectives

After completing this appendix, you should be able to do the following:

- **List the key features of Oracle SQL Developer**
- **Install Oracle SQL Developer**
- **Identify menu items of Oracle SQL Developer**
- **Create a database connection**
- **Manage database objects**
- **Use SQL Worksheet**
- **Execute SQL statements and SQL scripts**
- **Create and save reports**

What Is Oracle SQL Developer?

- Oracle SQL Developer is a graphical tool that enhances productivity and simplifies database development tasks.
- You can connect to any target Oracle database schema using standard Oracle database authentication.

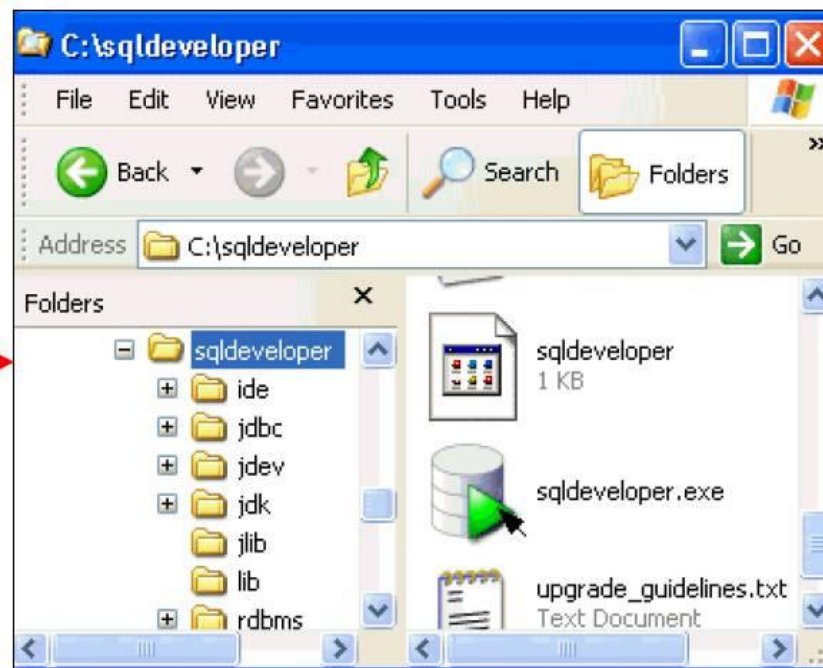


Key Features

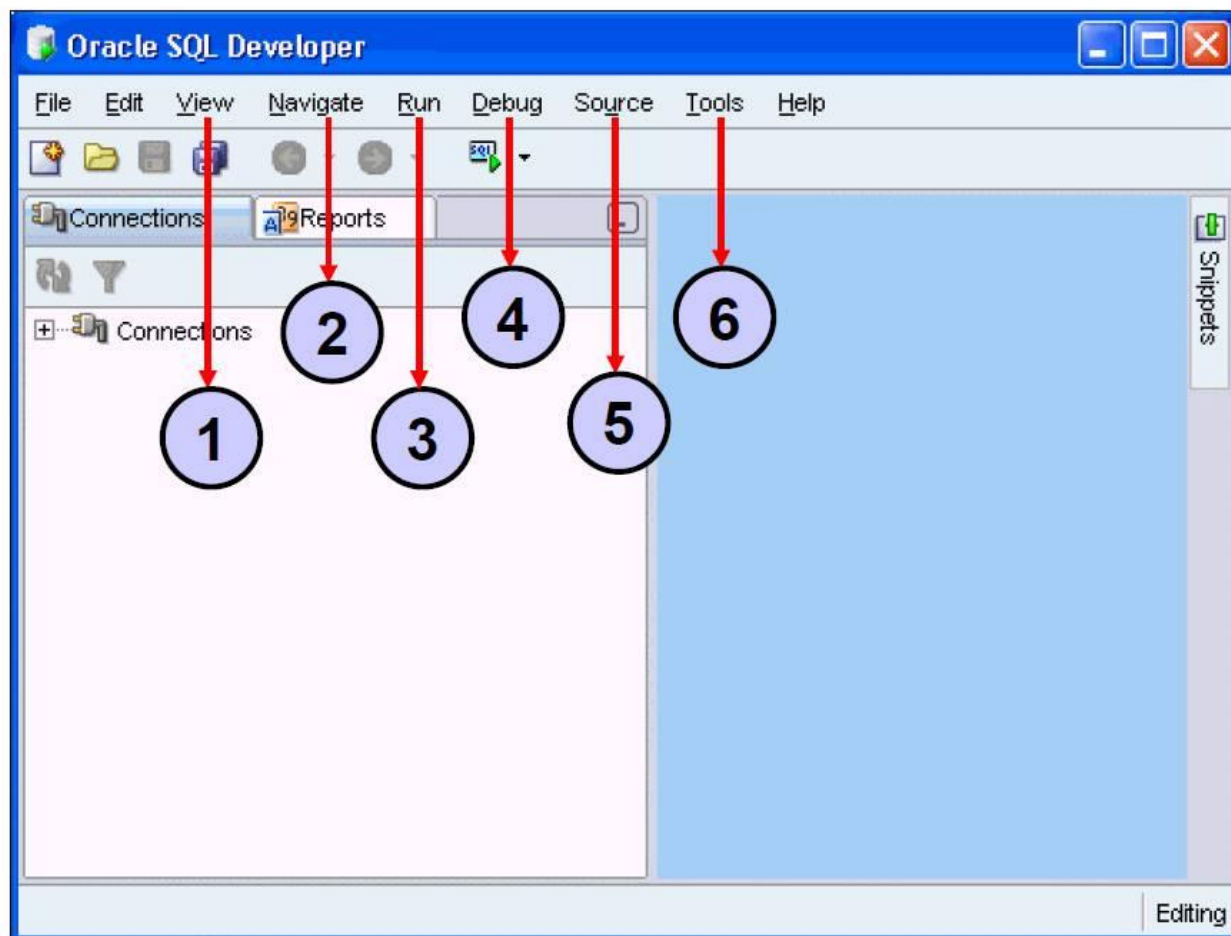
- Developed in Java
- Supports Windows, Linux, and Mac OS X platforms
- Default connectivity by using the JDBC Thin driver
- Does not require an installer
- Connects to any Oracle Database version 9.2.0.1 and later
- Bundled with JRE 1.5

Installing SQL Developer

Download the Oracle SQL Developer kit and unzip into any directory on your machine.



Menus for SQL Developer



Creating a Database Connection

- You must have at least one database connection to use SQL Developer.
- You can create and test connections:
 - For multiple databases
 - For multiple schemas
- SQL Developer automatically imports any connections defined in the `tnsnames.ora` file on your system.
- You can export connections to an XML file.
- Each additional database connection created is listed in the connections navigator hierarchy.

Creating a Database Connection

New / Select Database Connection

Connection Name: DBConnection1

Username: hr

Password: **

☐ Save Password

Role: default

Basic TNS Advanced

Hostname: localhost

Port: 1521

☒ SID: prcl

☐ Service name:

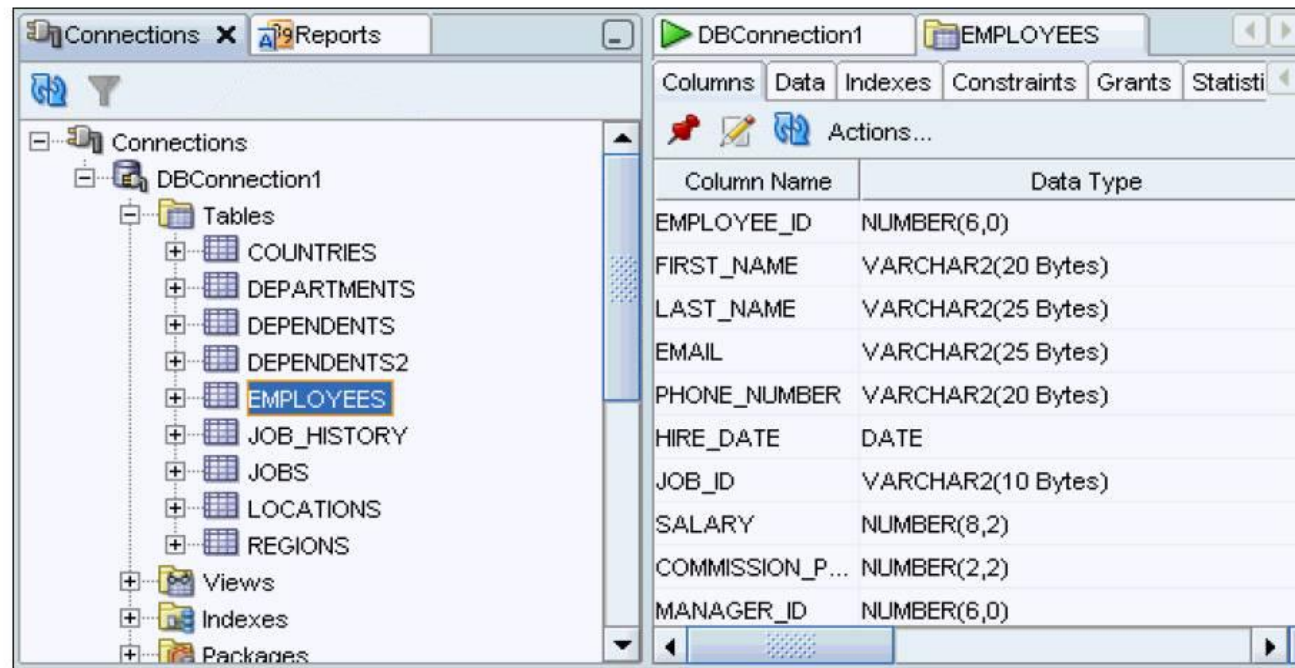
Status :

Help New Test Connect Cancel

Browsing Database Objects

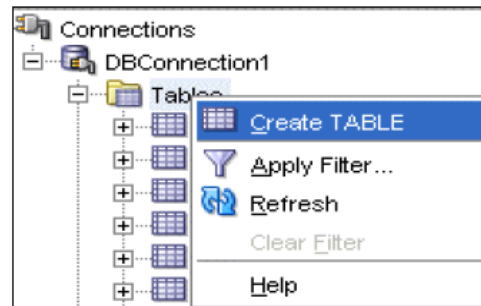
Use the Database Navigator to:

- Browse through many objects in a database schema
- Do a quick review of the definitions of objects



Creating a Schema Object

- SQL Developer supports the creation of any schema object by:
 - Executing a SQL statement in SQL Worksheet
 - Using the context menu
- Edit the objects by using an edit dialog or one of many context-sensitive menus.
- View the DDL for adjustments such as creating a new object or editing an existing schema object.



Creating a New Table: Example

Create Table

Schema: ☒ Show Advanced Options

Name:

Type: ☒ Normal ☐ External ☐ Index Organized ☐ Temporary Table
☐ Transaction ☒ Session

Storage Options Partitioning Subpartition Templates Partition Definitions DDL

Columns Primary Key Unique Constraints Foreign Keys Check Constraints Indexes

Columns:

- ID
- FIRST_NAME
- LAST_NAME
- BIRTHDATE
- RELATION
- GENDER
- RELATIVE_ID

Column Properties

Name:

Datatype: ☒ Simple ☐ Complex

Type:

Precision:

Scale:

Default:

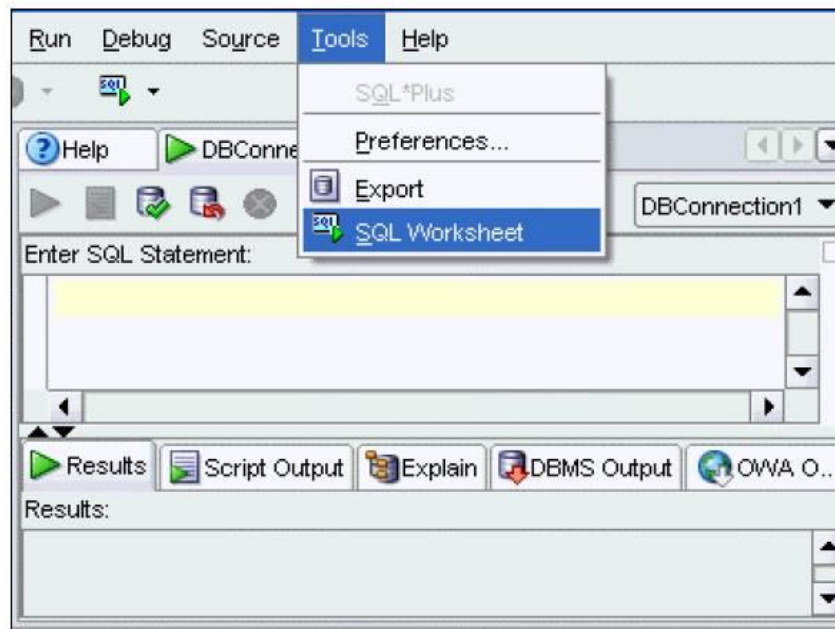
☐ Cannot be NULL

Comment:

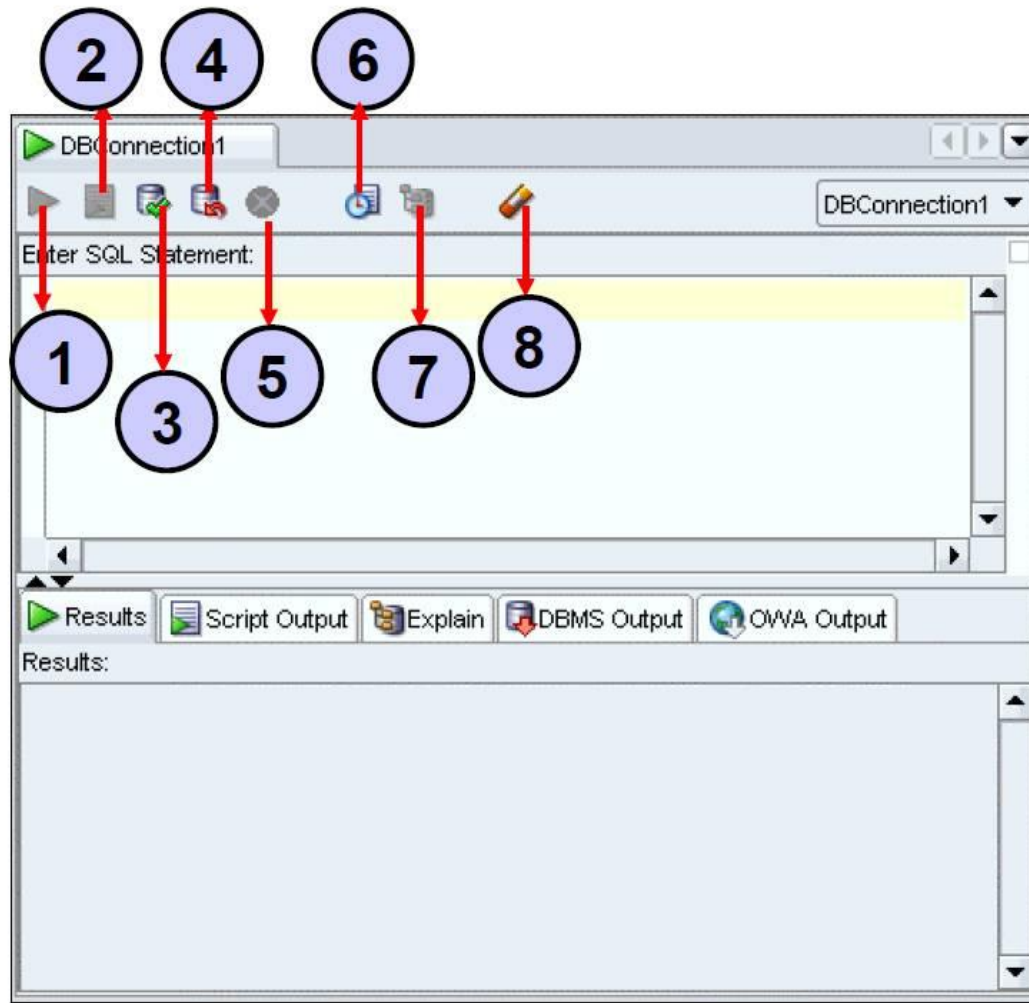
Help OK Cancel

Using SQL Worksheet

- Use SQL Worksheet to enter and execute SQL, PL/SQL, and SQL *Plus statements.
- Specify any actions that can be processed by the database connection associated with the worksheet.

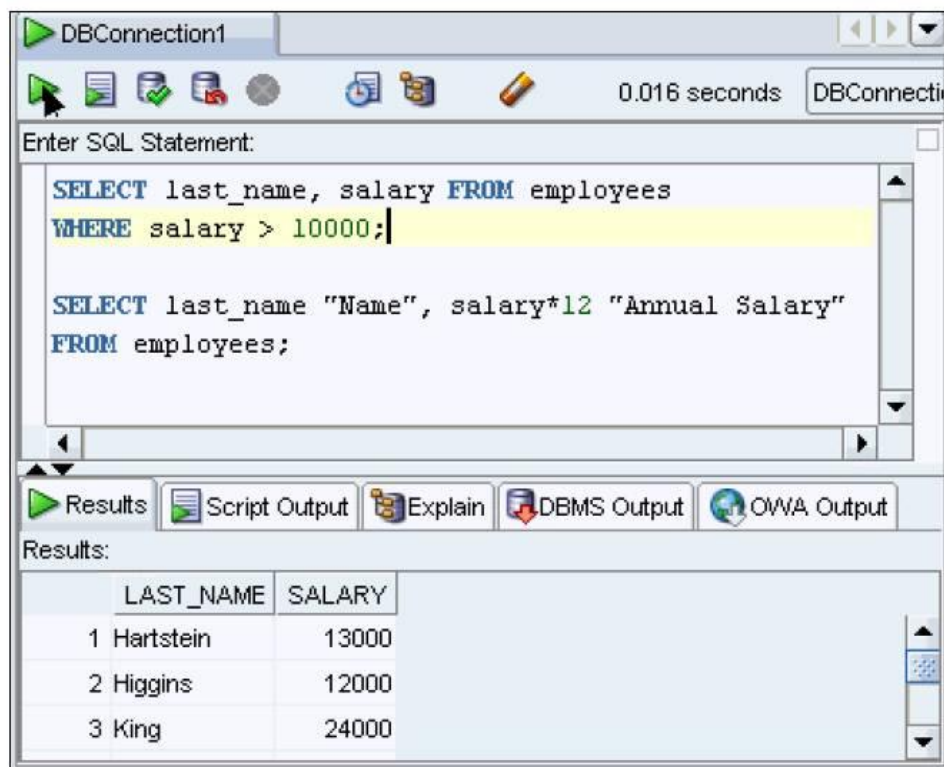


Using SQL Worksheet



Executing SQL Statements

Use the Enter SQL Statement box to enter single or multiple SQL statements.



Viewing the Execution Plan

The screenshot shows the Oracle SQL Developer interface. At the top, there's a toolbar with various icons and a dropdown menu set to 'DBConnection1'. Below the toolbar, the 'Enter SQL Statement:' text box contains the following SQL query:

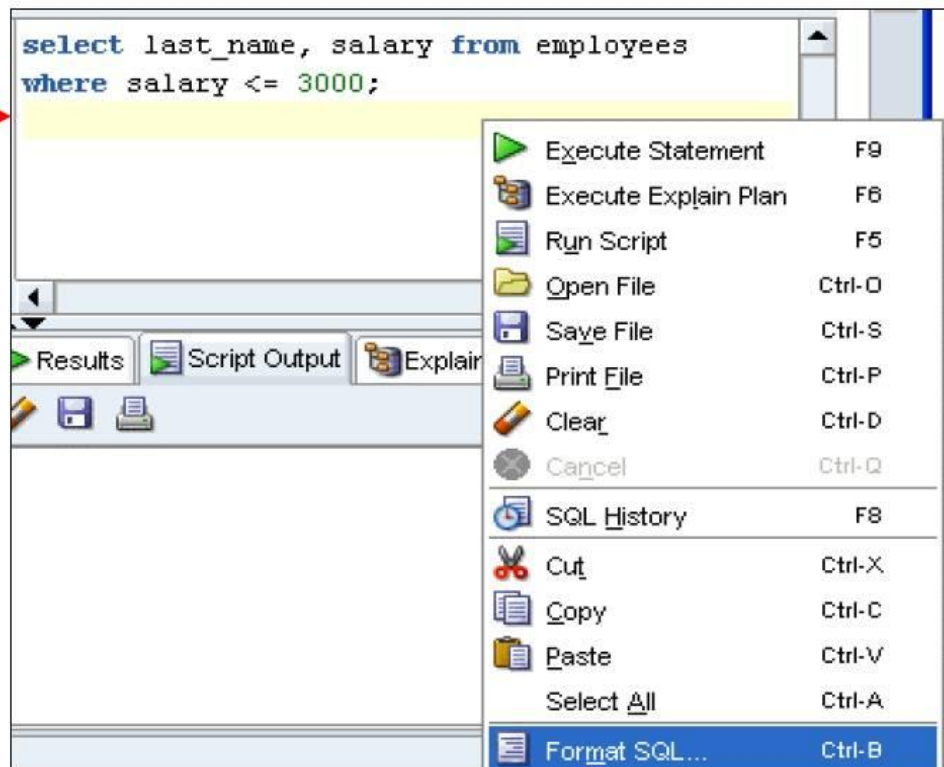
```
SELECT employee_id, last_name, job_id, salary
FROM employees
WHERE salary >= 10000;
```

The query is highlighted in yellow. Below the text box, there's a tabbed interface with five tabs: 'Results', 'Script Output', 'Explain', 'DBMS Output', and 'OWA Output'. The 'Explain' tab is selected, and it displays the execution plan for the query. The execution plan is shown in a table with the following columns: 'Operation', 'Optimizer', 'Cost', 'Cardinality', and 'Bytes'.

Operation	Optimizer	Cost	Cardinality	Bytes
SELECT STATEMENT	ALL_ROWS	3	70	1
TABLE ACCESS(FULL) HR.EMPLOYEES ANALYZED		3	70	1

Formatting the SQL Code

Before
Formatting

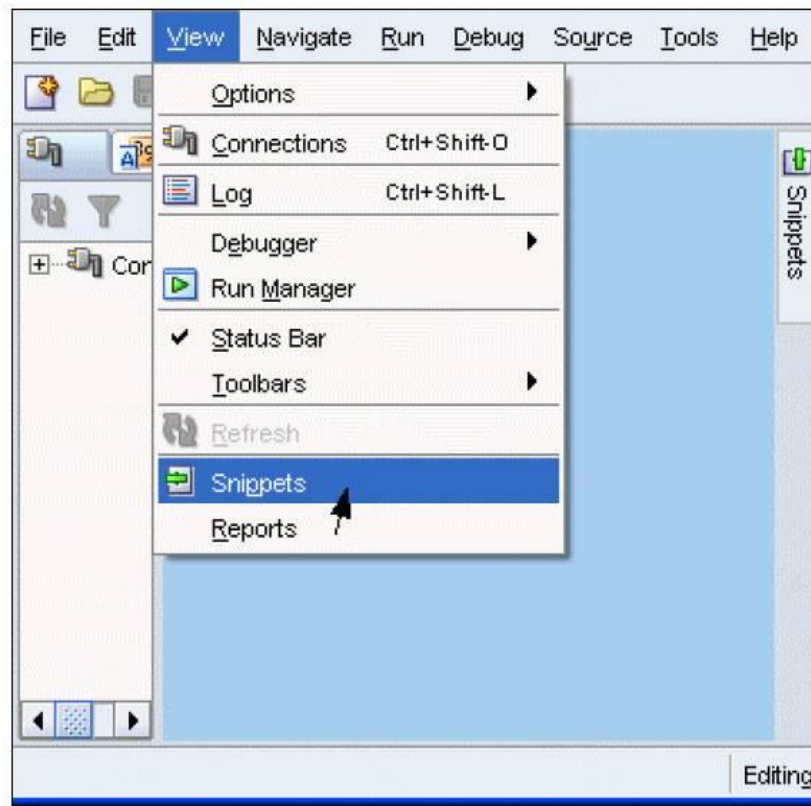


After
Formatting

A screenshot of the SQL Developer interface showing the same SQL code as before, but now formatted. The code is: `SELECT last_name,
salary
FROM employees
WHERE salary <= 3000;`. A red arrow points from the 'After Formatting' box to this text area.

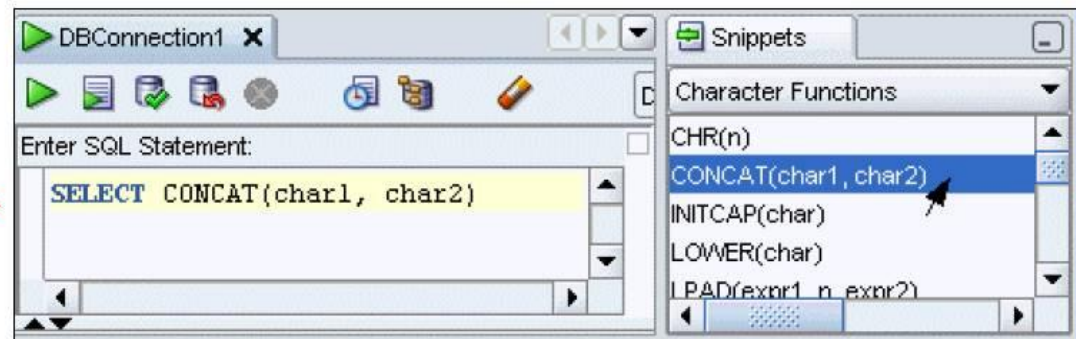
Using Snippets

Snippets are code fragments that may be just syntax or examples.

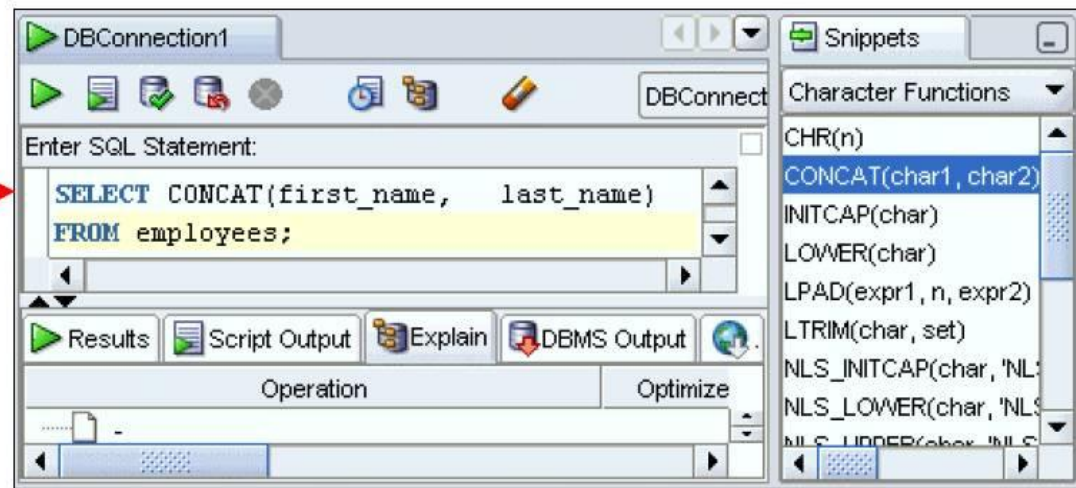


Using Snippets: Example

Inserting a snippet

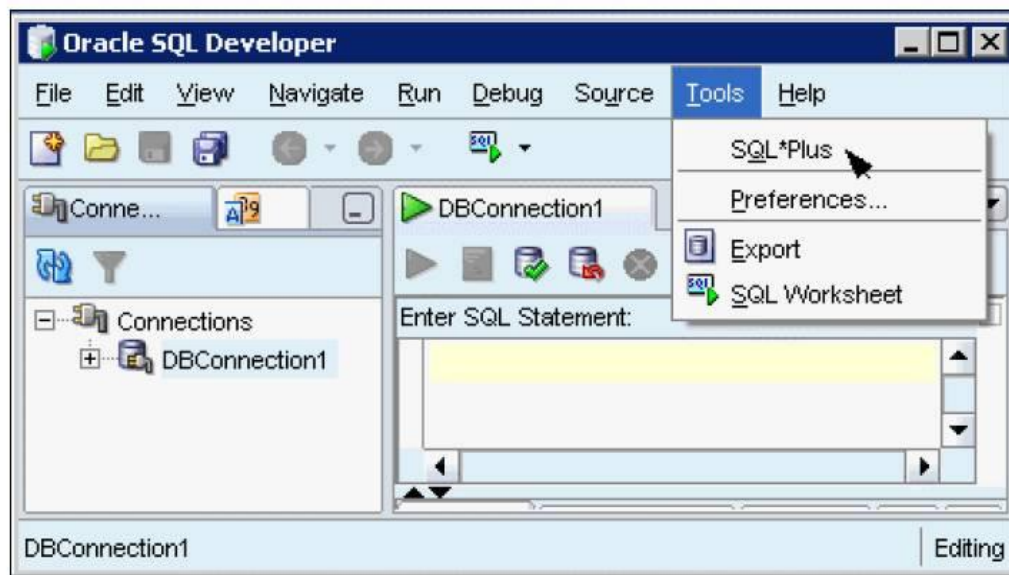


Editing the snippet



Using SQL*Plus

- SQL Worksheet does not support all SQL*Plus statements.
- You can invoke the SQL*Plus command-line interface from SQL Developer.



Summary

In this appendix, you should have learned how to use SQL Developer to do the following:

- **Browse, create, and edit database objects**
- **Execute SQL statements and scripts in SQL Worksheet**
- **Create and save custom reports**

Agenda

- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to Oracle
- × Comments on homework

Homework Notes

- × SQL functions and arithmetic conditions.
- × 'strings'
- × LIKE (%), LOWER
- × Use the Syntax help in Query browser
- × MAX, MIN
- × IN

Thank you 😊