COMP 3311
Database Management Systems

Lab 2

Oracle Database, SQL*Plus and SQL Developer

Lab Topics

- What is Oracle Database; SQL*Plus; SQL*Plus script file.
- How to connect to Oracle Database using Oracle SQL Developer.
- How to create and execute SQL*Plus script files in Oracle SQL Developer.
- How to create, modify and list the contents of an Oracle Database table.

Why Oracle Database?

- Oracle Database is one of the most widely used commercial DBMSs; you are likely to use it at some point in the future.
- Other relational DBMSs are very similar to Oracle Database.
- You should be able to program with any other relational DBMS if you are familiar with Oracle Database.

Oracle Database

- The first commercially available relational DBMS.
- The CSE labs provide Oracle Database 19c.

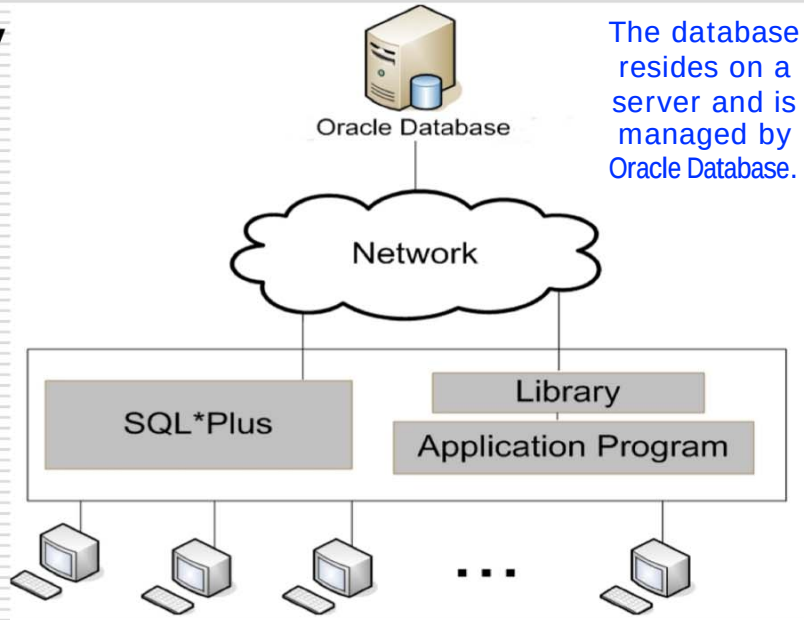
  Earlier versions can also be used for the course.
- You can download the free Oracle Database Express Edition (XE) to install on your own computer from

  https://www.oracle.com/database/technologies/xe-downloads.html
  - Requires registration/login; only Windows, Linux available.

    (Sorry Mac users; you should complain to Oracle.)

The Oracle Client/Server Model

- Clients accept SQL statements/ commands from users and send them to the **Oracle Database** server over a network.
- The **Oracle Database** server executes the queries and returns the results to the clients, which then deliver the results to the user.



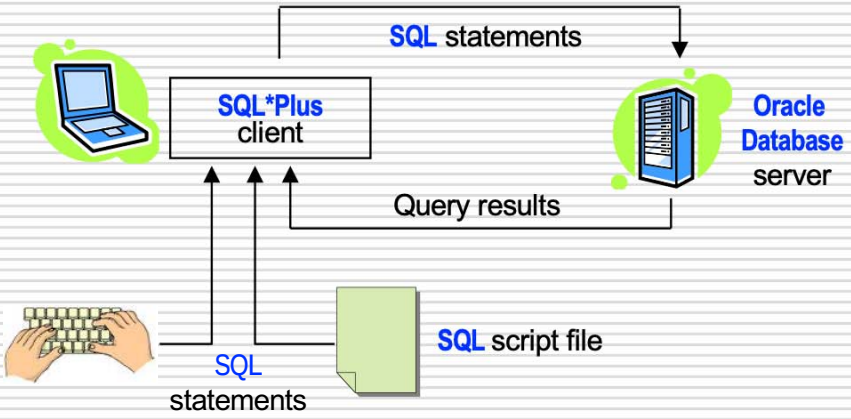
Clients access a database through various interfaces.

- The **Oracle Database** server for this course is dbsvr1.cse.ust.hk.

The **Oracle Database** server can be accessed directly only from the computers in Lab 4 (room 4210). From other computers, including other CSE labs, it needs to be accessed through the HKUST VPN (see http://itsc.ust.hk/apps/vpn/ for how to connect to the HKUST VPN).

SQL*Plus

- **SQL*Plus** is an interactive and batch query tool that enables **SQL**, **PL/SQL**, **SQL*Plus** and operating system commands to be executed.



- **SQL*Plus** allows users to:
  - format, perform calculations on, store and print query results;
  - examine table and object definitions;
  - develop and run batch scripts;
  - perform database administration.

- The **SQL*Plus** client can be run from **SQL Developer** or from an OS command line.

Oracle SQL Developer

- Oracle SQL Developer provides a desktop-like interface to the SQL*Plus client allowing users to:
  - browse, create, edit, and delete tables;
  - run **SQL** statements and scripts;
  - edit and debug **PL/SQL** code;
  - manipulate and export data;
  - view and create reports.
- **Reminder:** Download Oracle SQL Developer from

  https://www.oracle.com/tools/downloads/sqldev-downloads.html

  - Requires registration/login; Windows, Mac, Linux available. Latest version is 20.2 (requires JDK 8 or 11).

Connecting To Oracle Database Using Oracle SQL Developer (1)

1. Run the program "sqldeveloper".

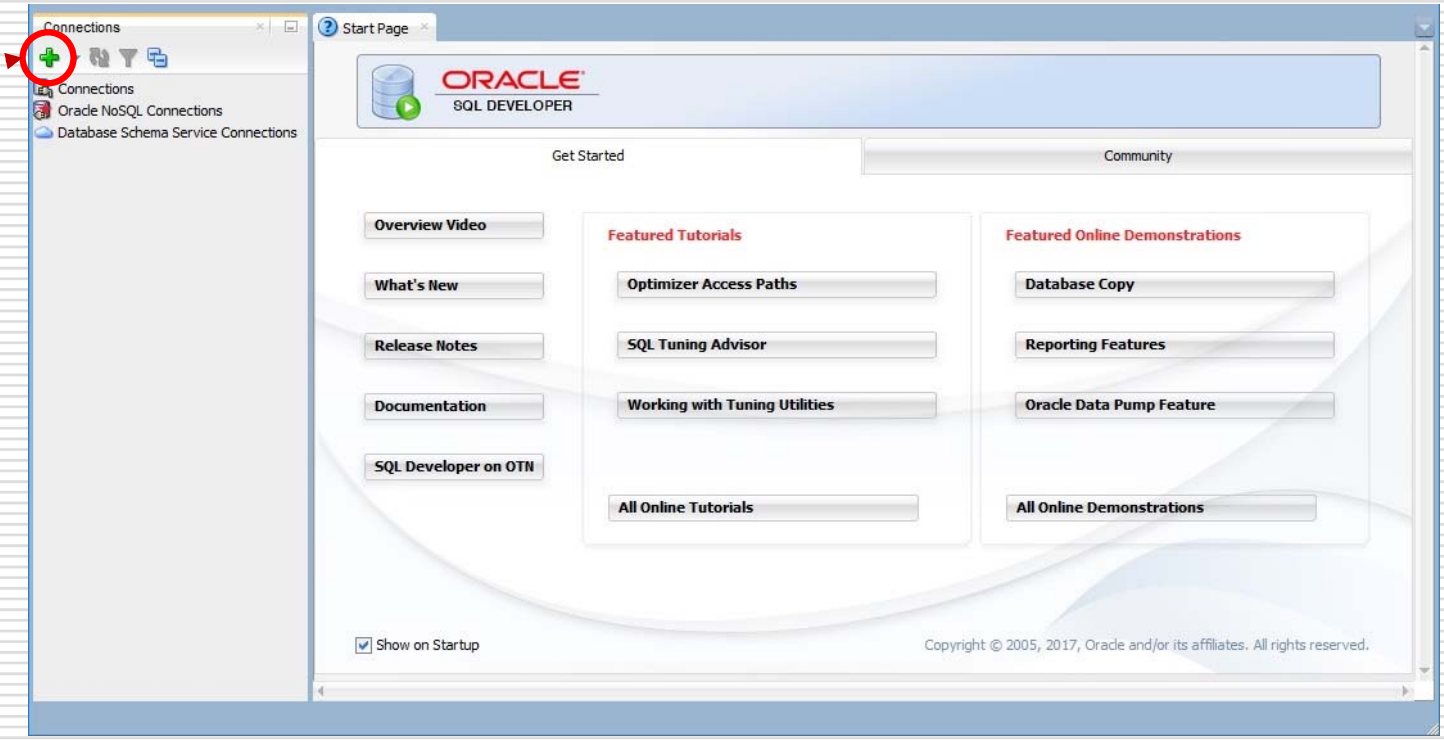
   In Lab 4, search for the app "sql" and double click it.

Oracle SQL Developer opens in the Start Page shown above.

Connecting To Oracle Database Using Oracle SQL Developer (2)

2. Select the green "+" symbol in the Connections navigator (left-side) pane.

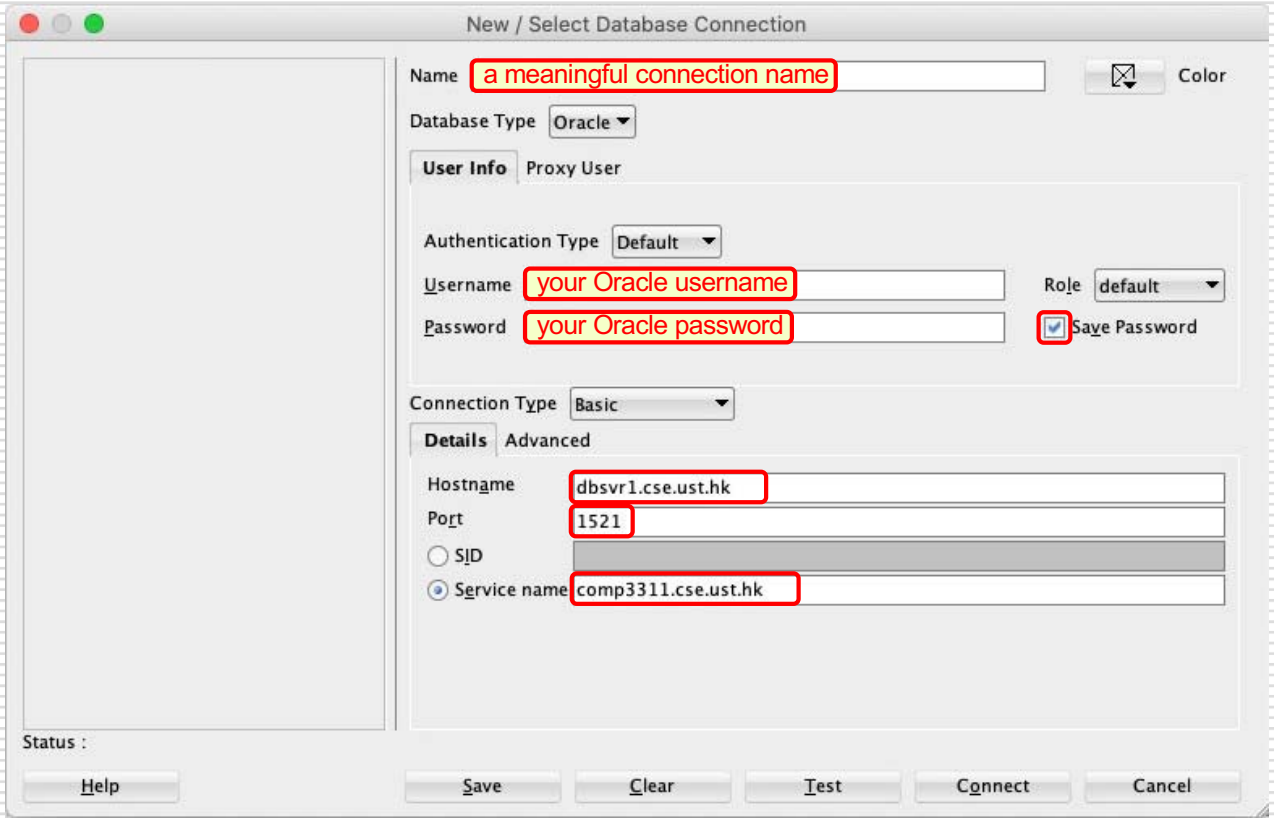
New Connection



The New / Select Database Connection dialog appears as shown on the next slide.

Connecting To Oracle Database Using Oracle SQL Developer (3)

3. Enter/select the information outlined below in red using your Oracle username and password for the Username and Password fields, respectively.



Connecting To Oracle Database Using Oracle SQL Developer (4)

4. Select the **Test** button (bottom middle of the New / Select Database Connection dialog) to check that the information entered is correct.

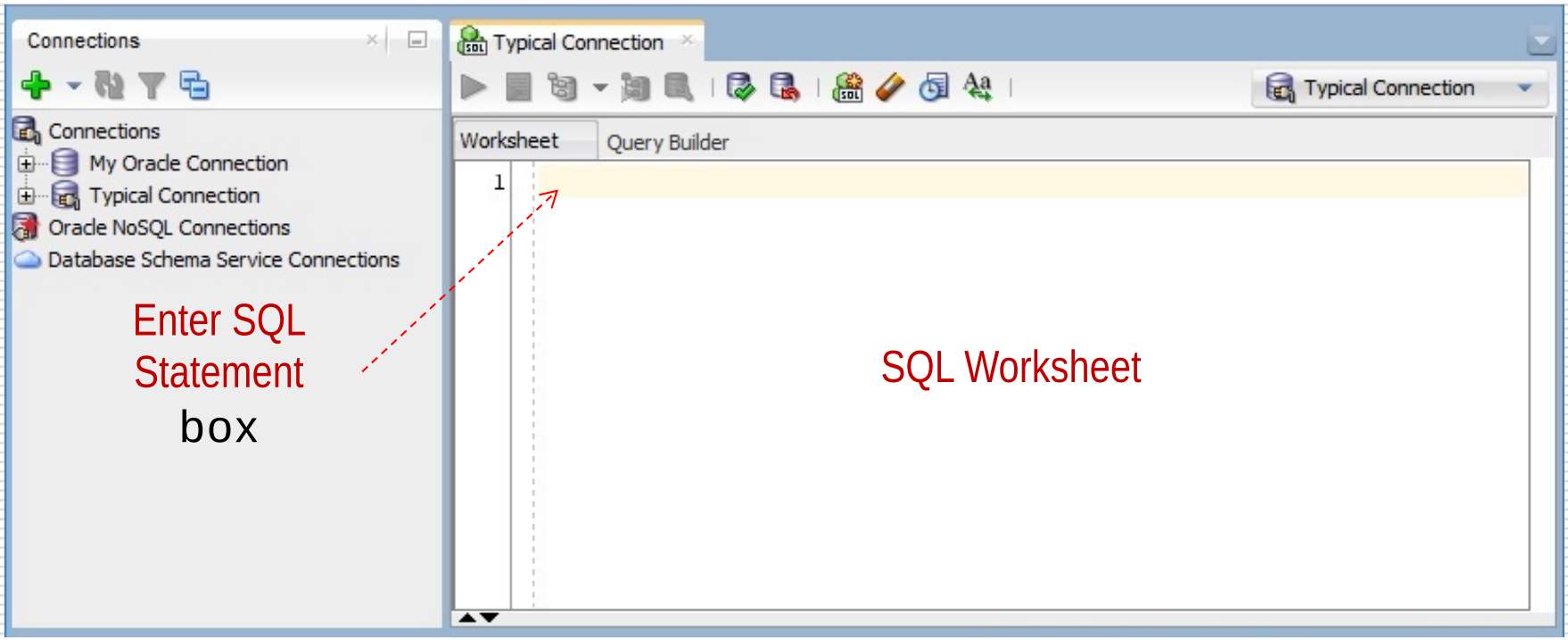
   You should see the message Status: Success in the Status field near the lower left of the New / Select Database Connection dialog just above the Help button. Correct any errors.

5. Select the **Save** button to save the connection information for future use.

6. Select the **Connect** button.

   You should see an SQL Worksheet like that shown on the next slide.

Connecting To Oracle Database Using Oracle SQL Developer (5)



SQL Worksheet

- An SQL Worksheet is used to enter and execute SQL, PL/SQL and SQL*Plus statements.
- There can be multiple worksheets open for a given connection.
- You can create an SQL Worksheet by:
  - right-clicking a connection in the Connections navigator and selecting Open SQL Worksheet,
  - selecting Tools and then SQL Worksheet.

SQL Worksheet Toolbar

- The SQL Worksheet toolbar contains the following buttons (among others).
  - Run Statement executes a *single statement* at the cursor or *several* selected *statements* in the Enter SQL Statement box.
  - Run Script executes *all statements* in the Enter SQL Statement box using the Script Runner.
  - Commit writes any changes to the database, ends the transaction and clears the Query Result and Script Output tabs.
  - Rollback discards any changes without writing them to the database, ends the transaction and clears the Query Result and Script Output tabs.
  - Clear erases the statements in the Enter SQL Statement box.

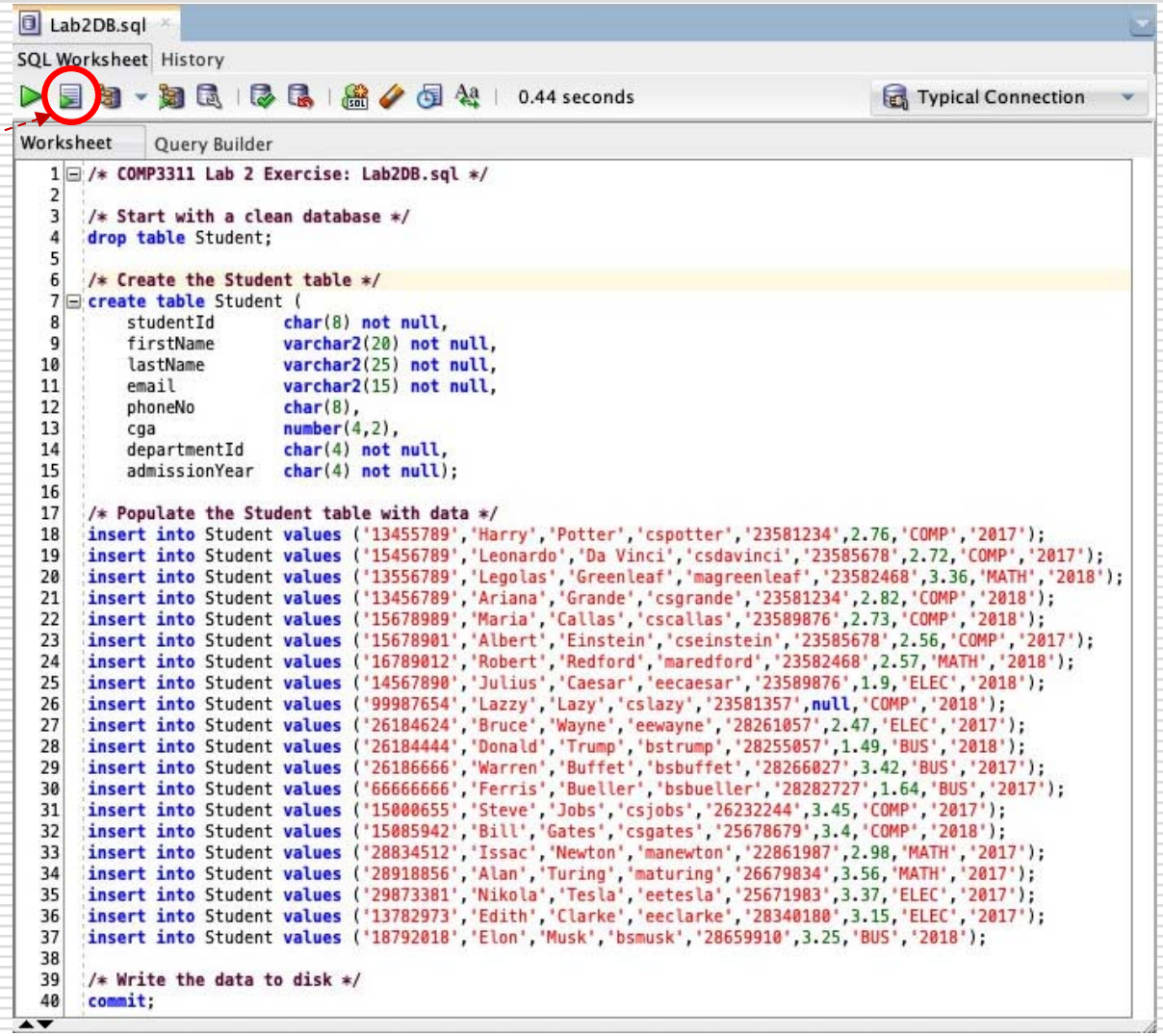
Opening And Executing A Script File

- To open a script file:
  1. select File→Open in the Oracle SQL Developer menu bar or select  (the Open button) in the toolbar;
  2. in the Open dialog, navigate to the script file;
  3. double-click the script file or select it and select the Open button.

  Alternatively, you can drag and drop a script file onto a worksheet in Oracle SQL Developer.

- To execute (run) a script file, select  (the **Run Script** button) shown in the example script on the next slide.

Example Script File



Note: When you run the Lab2DB.sql script the first time you will get the error message:

Error starting at line : 4 in command -
drop table Student
Error report -
ORA-00942: table or view does not exist
00942. 00000 - "table or view does not exist"
*Cause:
*Action:

You may safely ignore this message; it is not an error.

Script Output Tab

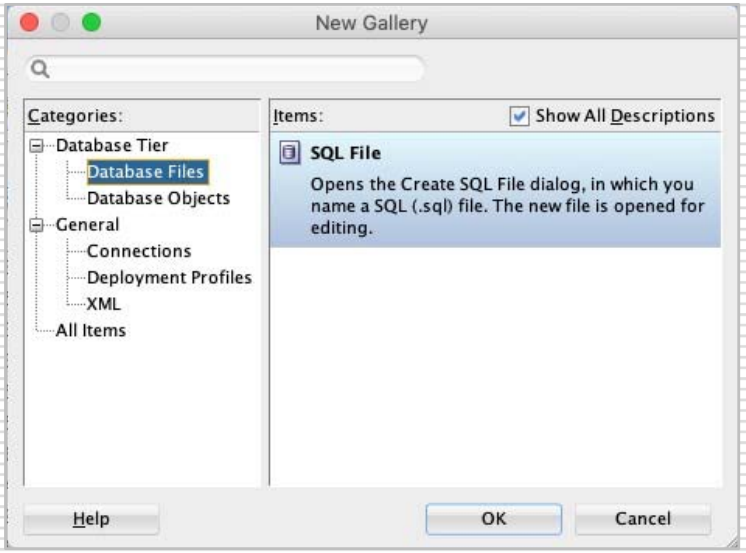
- The Script Output tab displays the result of executing a script file; its toolbar has the following buttons:
  - Pin keeps the tab's contents in the window when another object is selected in the Connections navigator.
  - Clear erases the tab's contents.

    Note: It is strongly recommended to clear a tab's contents before running a script again.
  - Save File saves the tab's contents to a file.
  - Print sends the tab's contents to a printer.
  - Run Script Output as Script executes the tab's contents as a script file.

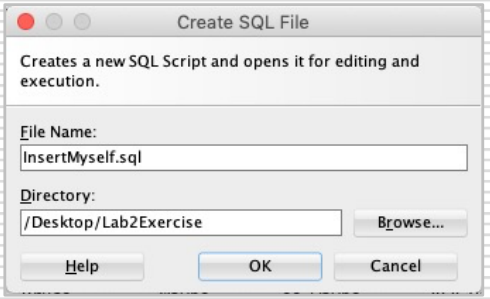
Creating A Script File

1. Select File→New in the Oracle SQL Developer menu bar or select (the New button) in the toolbar.

2. In the New Gallery dialog, select Database Files in the Categories pane; select the OK Button.



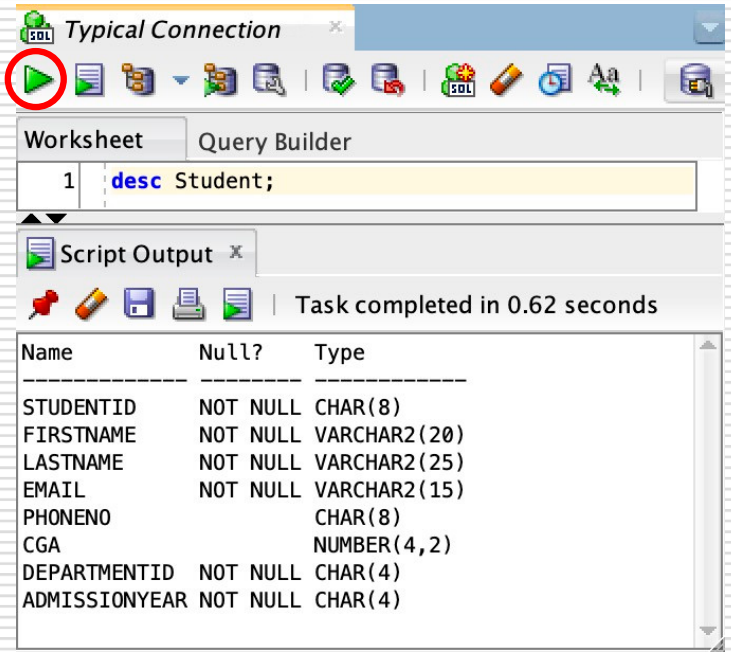
3. In the Create SQL File dialog, enter a name in the File Name text box, navigate to or enter the name of the Directory where the script file should be stored; select the OK button.



Displaying The Structure Of A Table (1)

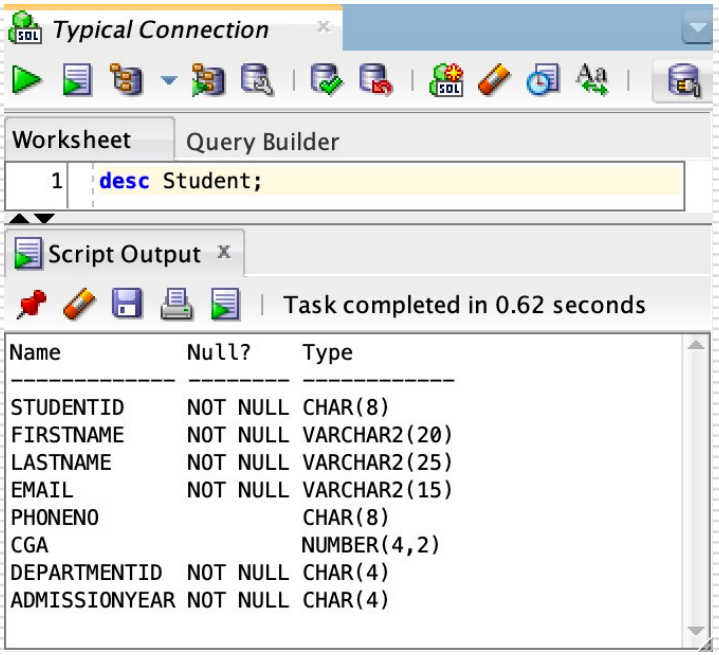
SQL command: desc[ribe] <*tablename*>;

- Open a new SQL Worksheet and connect to Oracle Database using your Oracle connection.
- Type "desc Student;" in the Enter SQL Statement box.
- Select  (the Run Statement button).
- The Script Output tab displays the result as shown in the figure.



Displaying The Structure Of A Table (2)

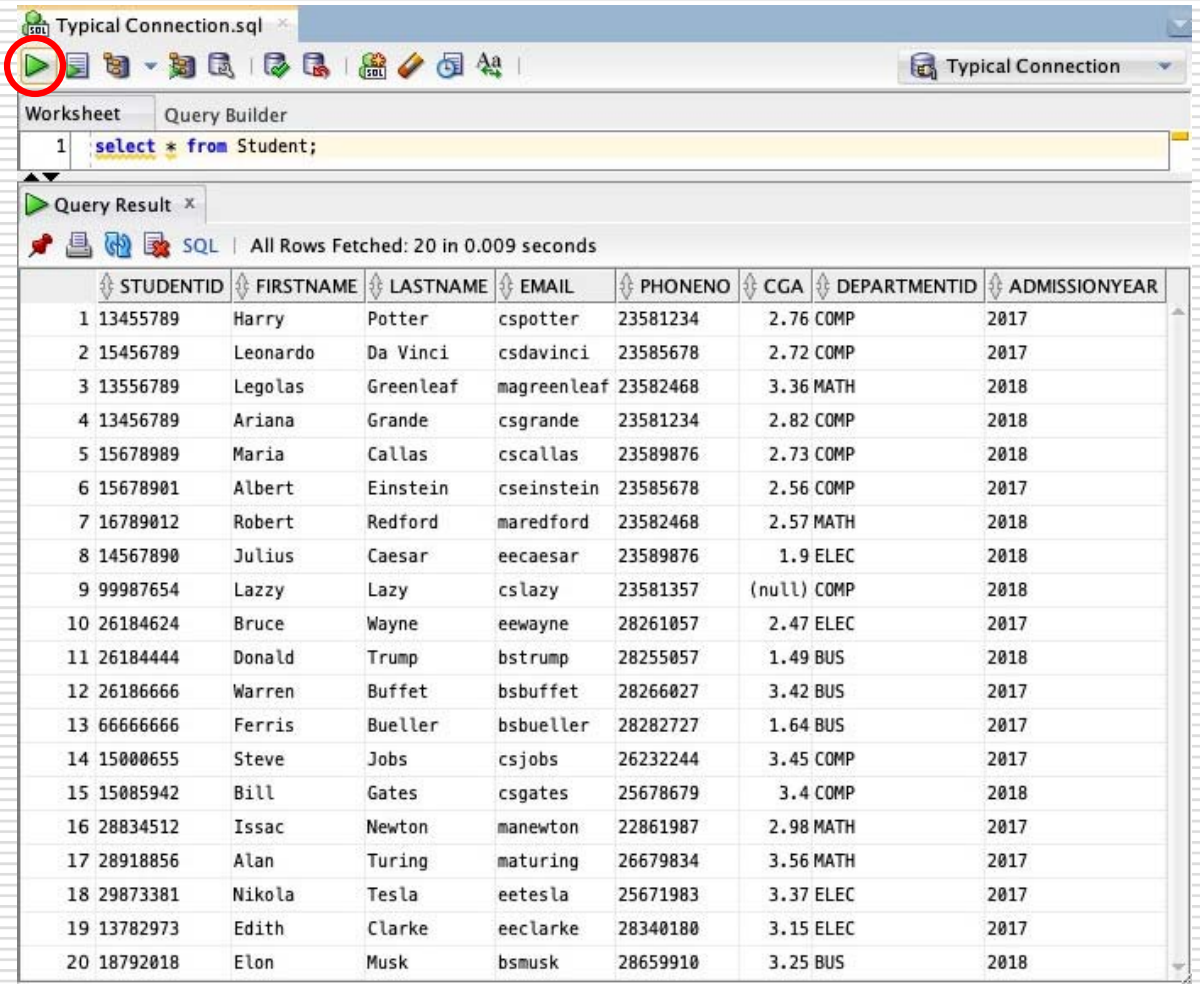
- The Script Output tab shows:
  - Name – The name of the attribute.
  - Null? – Indicates whether a column must contain data.
  - Type – The data type of the column.
    - CHAR(s) – A character string of fixed length s.
    - VARCHAR2(s) – A variable length character string of maximum length s.
    - NUMBER(p, s) – A number with a total of p digits with s digits to the right of the decimal point.



Displaying The Contents Of A Table

SQL command: select * from <*tablename*>;

- In the Enter SQL Statement box, type "select * from Student;" and select  (the **Run Statement** button).
- The Query Result tab displays the **SQL** statement result as shown in the figure.



	STUDENTID	FIRSTNAME	LASTNAME	EMAIL	PHONENO	CGA	DEPARTMENTID	ADMISSIONYEAR
1	13455789	Harry	Potter	cspotter	23581234	2.76	COMP	2017
2	15456789	Leonardo	Da Vinci	csdavinci	23585678	2.72	COMP	2017
3	13556789	Legolas	Greenleaf	magreenleaf	23582468	3.36	MATH	2018
4	13456789	Ariana	Grande	csgrande	23581234	2.82	COMP	2018
5	15678989	Maria	Callas	cscallas	23589876	2.73	COMP	2018
6	15678901	Albert	Einstein	cseinstein	23585678	2.56	COMP	2017
7	16789012	Robert	Redford	maredford	23582468	2.57	MATH	2018
8	14567890	Julius	Caesar	eecaesar	23589876	1.9	ELEC	2018
9	99987654	Lazzy	Lazy	cslazy	23581357	(null)	COMP	2018
10	26184624	Bruce	Wayne	eewayne	28261057	2.47	ELEC	2017
11	26184444	Donald	Trump	bstrump	28255057	1.49	BUS	2018
12	26186666	Warren	Buffet	bsbuffet	28266027	3.42	BUS	2017
13	66666666	Ferris	Bueller	bsbueller	28282727	1.64	BUS	2017
14	15000655	Steve	Jobs	csjobs	26232244	3.45	COMP	2017
15	15085942	Bill	Gates	csgates	25678679	3.4	COMP	2018
16	28834512	Issac	Newton	manewton	22861987	2.98	MATH	2017
17	28918856	Alan	Turing	maturing	26679834	3.56	MATH	2017
18	29873381	Nikola	Tesla	eetesla	25671983	3.37	ELEC	2017
19	13782973	Edith	Clarke	eeclarke	28340180	3.15	ELEC	2017
20	18792018	Elon	Musk	bsmusk	28659910	3.25	BUS	2018

Query Result Tab

- The Query Result tab displays the result of executing a single SQL statement; its toolbar contains the following buttons:


Pin keeps the tab's contents in the window when another object is selected in the Connections navigator.


Print sends the tab's contents to a printer.


Refresh executes the SQL statement again to refresh the result.


Delete Persisted Settings delete persisted settings such as any sort order specifications.


SQL displays the SQL statement that produced the result.

Change Oracle Database Password

- To change your Oracle Database password, type

  alter user <username> identified by "<new_password>";

  in the Enter SQL Statement box and select  (the Run Statement button) where <username> and <new_password> are replaced with your Oracle username and your new password. Remember to add a ";" at the end of the SQL statement, because all SQL statements end with a ";".

  The following example changes the password to 123456:

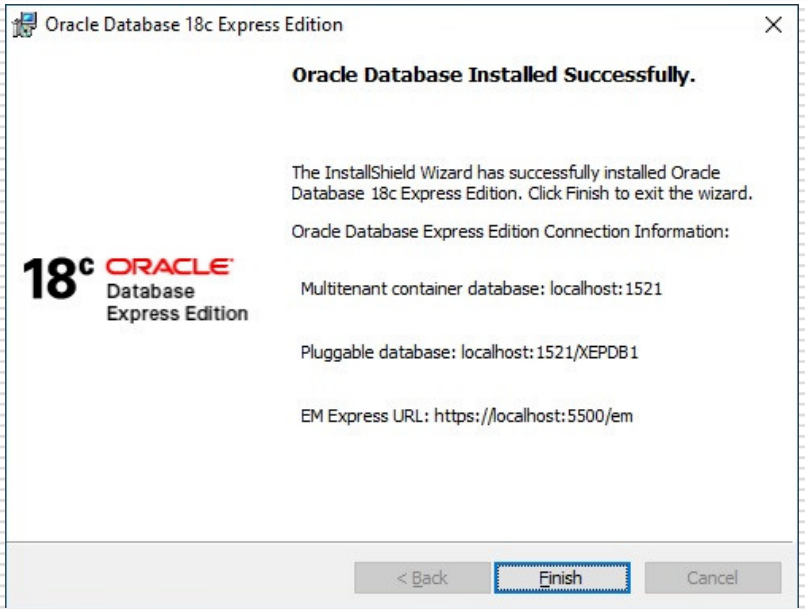
  alter user comp3311stu000 identified by "123456";

NOTE: DO NOT USE SPECIAL CHARACTERS IN YOUR PASSWORD!

Please remember your new password!

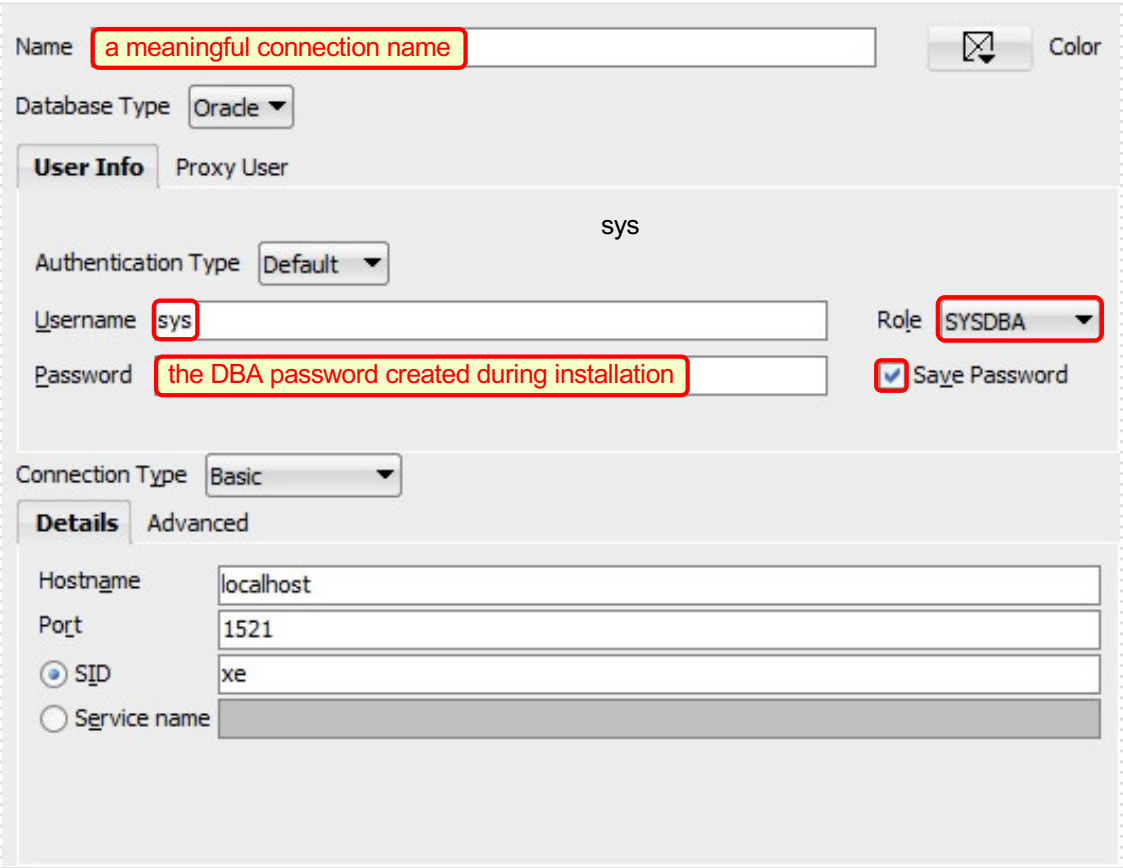
Install Oracle Database Express Edition (XE)

1. Download Oracle Database Express Edition (XE) from https://www.oracle.com/database/technologies/xe-downloads.html
2. Run setup inside the downloaded folder to install Oracle XE. (Note: Run setup again if the installation fails.)
3. When installation completes, note the information shown in the InstallShield Wizard dialog as shown on the right for future reference.
4. In SQL Developer, create a connection to your Oracle XE database as the DBA as shown in the example on the next slide.



Connect To Oracle Database Express Edition (XE) As DBA Using SQL Developer

Enter or select the information outlined below in red.
Leave all other information as shown.



Create User

5. To create a database user, run the script file CreateUser.sql as the DBA where you replace the text *<username>* with the username of the user you want to create and *<password>* with the password you want to assign to the user.

6. Create a connection in SQL Developer for the user created in step 5 to create tables and run queries.