COMP 3311
Database Management Systems

Lab 1

Oracle Database, SQL Developer and SQL*Plus

Before Starting the Lab

- ☐ If you have not already done so, activate your CSD PC account NOW by following the instructions at

http://cssystem.cse.ust.hk/UGuides/activation.html

- ☐ Ask for help if you encounter problems.

Lab Objectives

- After this lab you should:
  - Know more about Oracle Database.
  - Know how to use SQL Developer to connect to Oracle Database.
  - Know what is SQL*Plus.
  - Know what is an SQL*Plus script file.
  - Be able to run SQL*Plus script files in SQL Developer.
  - Be able 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 11g Enterprise Edition.

  Earlier versions can also be used for the course.

- ☐ You can download the free Oracle Express Edition to install on your own computer from

 http://www.oracle.com/technetwork/database/database-technologies/express-edition/downloads/index.html

  - ■ Requires registration; only Windows, Linux available.
    (Sorry Mac users; you should complain to Oracle.)

The Oracle Client/Server Model

The database resides on a server and is managed by Oracle Database System.

Clients access a database through various different interfaces.

Oracle Database System

Network

SQL*Plus

Library

Application Program
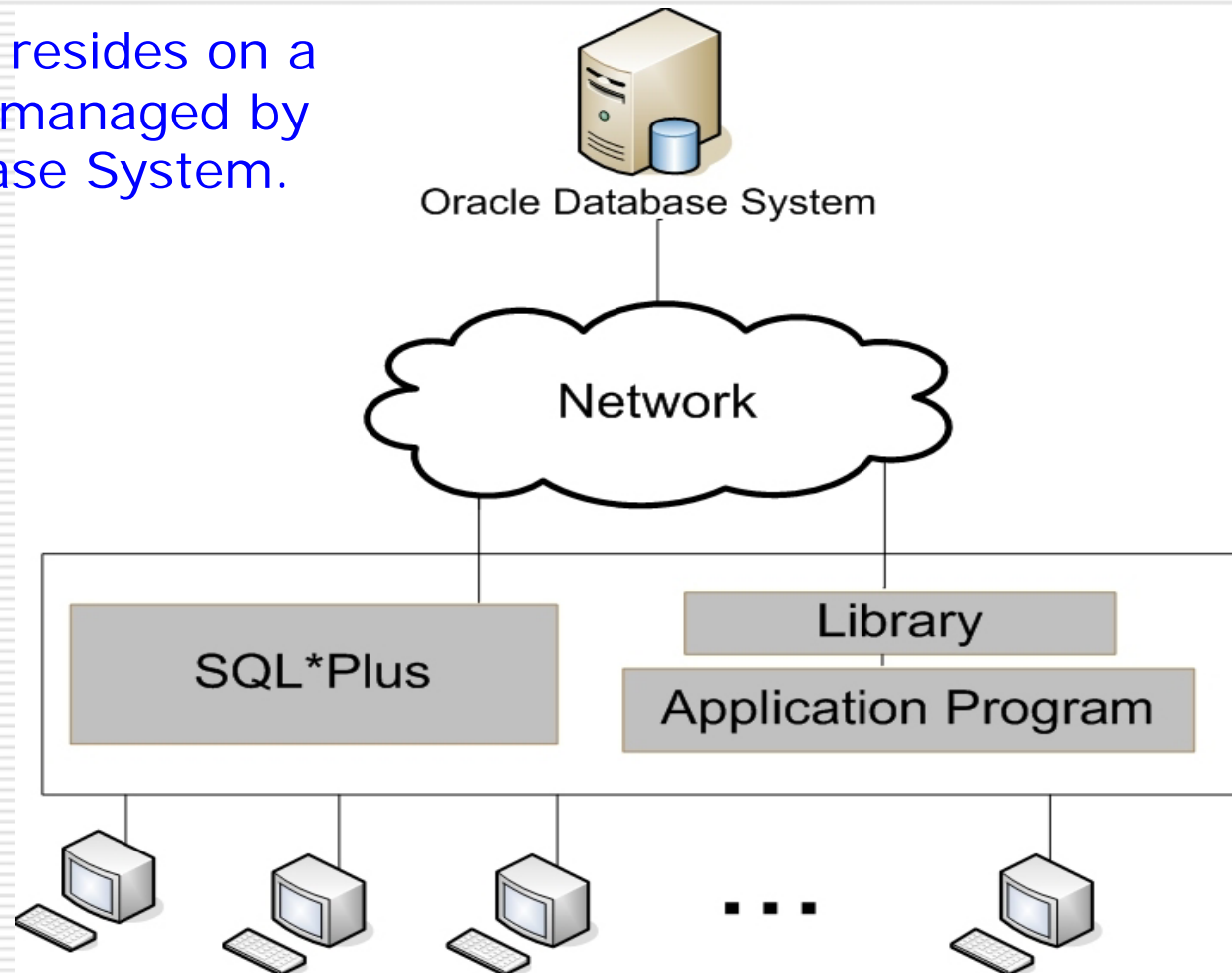
The Oracle Client/Server Model

- ❑ The Oracle client accepts SQL statements or commands from users and sends them to the Oracle Database server over the network.

- ❑ The Oracle Database server executes the queries and returns the results to the client, which then delivers the results to the user.

- ❑ The Oracle Database server for this course runs on a CSE server – dbsvr1.cse.ust.hk.

    The server can be accessed from outside campus using the HKUST VPN (see http://itsc.ust.hk/apps/vpn/ for how to connect to the HKUST VPN).
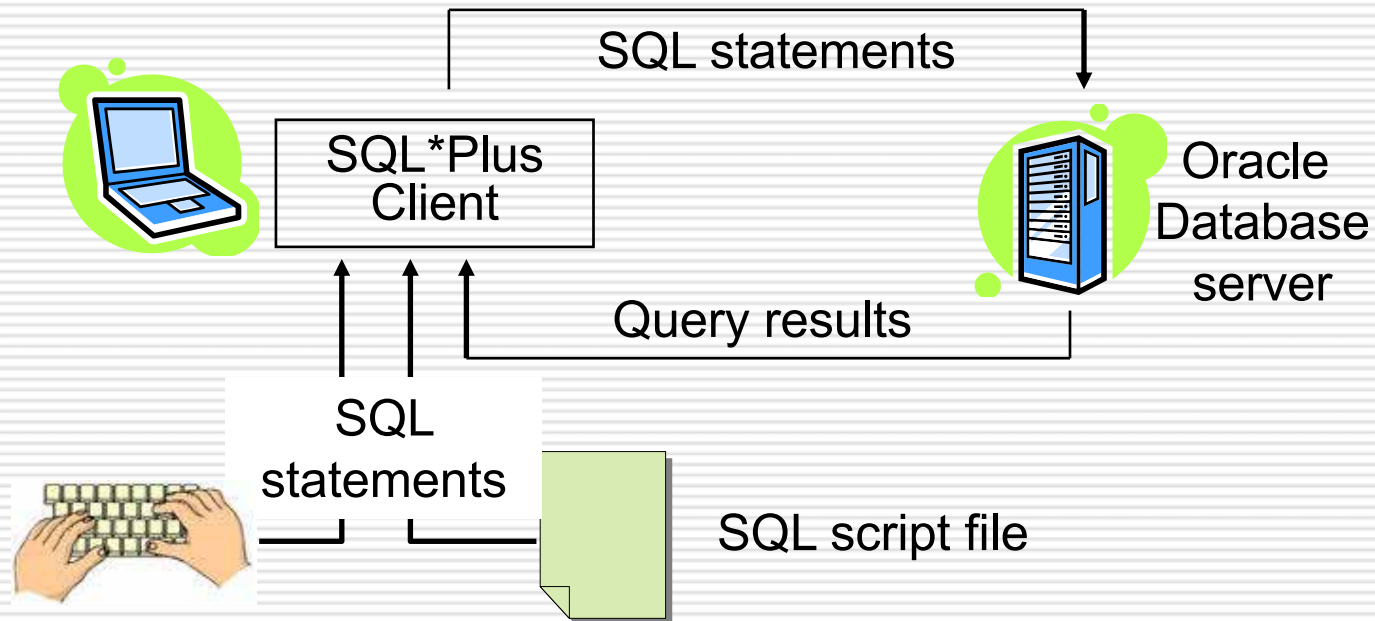
SQL*Plus

- SQL*Plus is an interactive and batch query tool.

- SQL*Plus enables SQL, PL/SQL, SQL*Plus and operating system commands to be entered and executed to:

  - Format, perform calculations on, store, and print query results.

  - Examine table and object definitions.

  - Develop and run batch scripts.

  - Perform database administration.

SQL*Plus Client

SQL statements

SQL*Plus
Client

Oracle
Database
server

Query results

SQL
statements

SQL script file

☐ The SQL*Plus client can be run from SQL Developer or from a command line.

SQL Developer

- Oracle SQL Developer provides a desktop-like interface to SQL*Plus Client that allows you to:
  - browse, create, edit, and delete (drop) tables;
  - run SQL statements and scripts;
  - edit and debug PL/SQL code;
  - manipulate and export (unload) data;
  - view and create reports.

- You can download SQL Developer from

  http://www.oracle.com/technetwork/developer-tools/sql-developer/downloads/index.html

  - Requires registration; Windows, Mac, Linux available. Latest version is 18.1.

Connecting To Oracle Database Using SQL Developer (1)

1. Run the program "sqldeveloper".

   In Lab 4, search for "sql"; it should be the only app found.

   Double click the app.

   SQL Developer opens in the Start Page as shown on the next slide.

Connecting To Oracle Database Using SQL Developer (2)

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

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

Connecting To Oracle Database Using SQL Developer (3)

3. Enter the information outlined below in red using <u>your Oracle username and password</u> for the <u>U</u>sername and <u>P</u>assword fields, respectively.

Connecting To Oracle Database Using SQL Developer (4)

4. Click the **Test** button 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 window just above the **Help** button. Correct any errors.
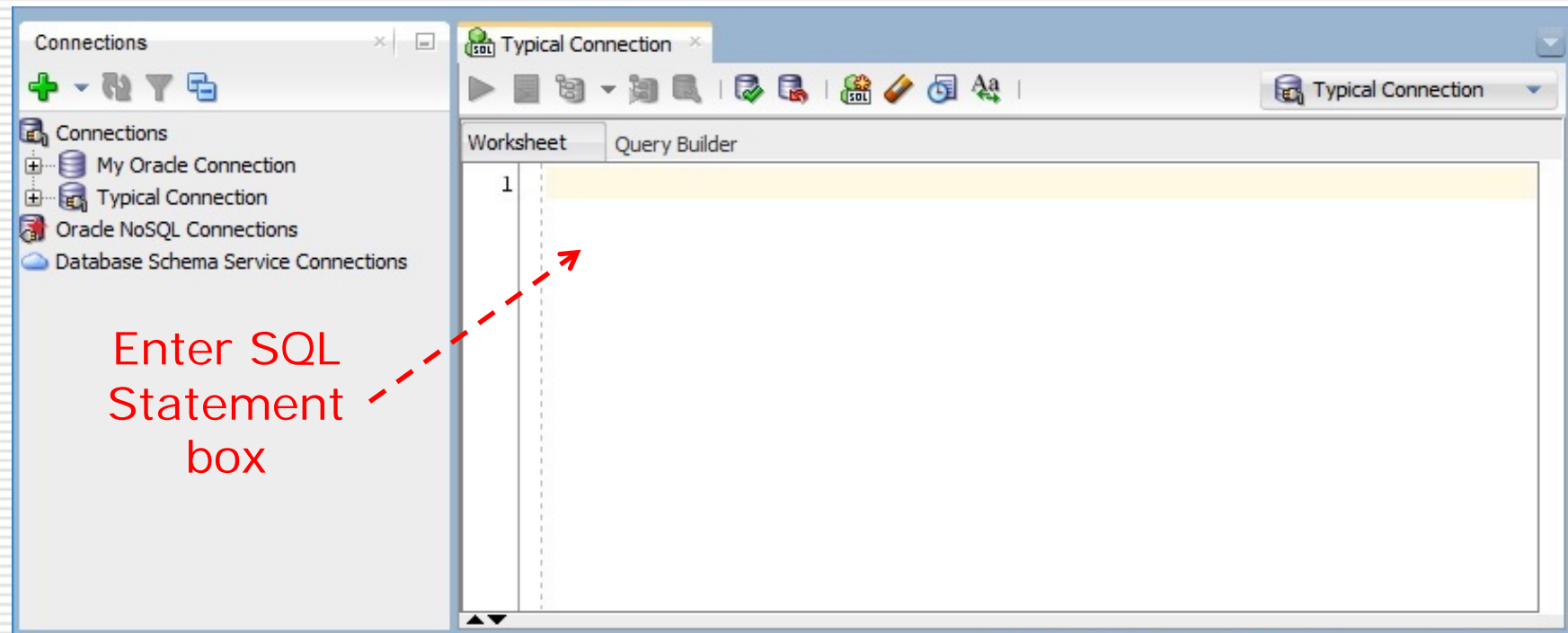
5. Click the **Save** button to save the connection information for future use.

6. Click the **Connect** button.

   You should see a screen similar to that shown on the next slide.

Connecting To Oracle Database Using SQL Developer (5)

Enter SQL Statement box

SQL Worksheet

☐ A SQL Worksheet is used to enter and execute SQL, PL/SQL and SQL*Plus statements.

☐ There can be multiple, different worksheets for a given connection.

☐ You can display a SQL Worksheet by

■ right-clicking a connection in the Connections navigator and selecting **Open SQL Worksheet**,

■ selecting **Tools** and then **SQL Worksheet**, or

■ clicking the **SQL Worksheet** icon in the SQL Developer menu bar.

SQL Worksheet Toolbar

☐ The SQL Worksheet toolbar contains icons for the following operations (among others):

- **Run Statement** executes a *single statement* <u>at the cursor</u> or *several* <u>selected</u> *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 Results and Script Output panes.

- **Rollback** discards any changes without writing them to the database, ends the transaction and clears the Results and Script Output panes.

- **Clear** erases the statements in the Enter SQL Statement box.

Changing Your Oracle Password

☐ Type the following in the Enter SQL Statement box and click the **Run Statement** button:

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

where you replace <username> and <new_password> 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!

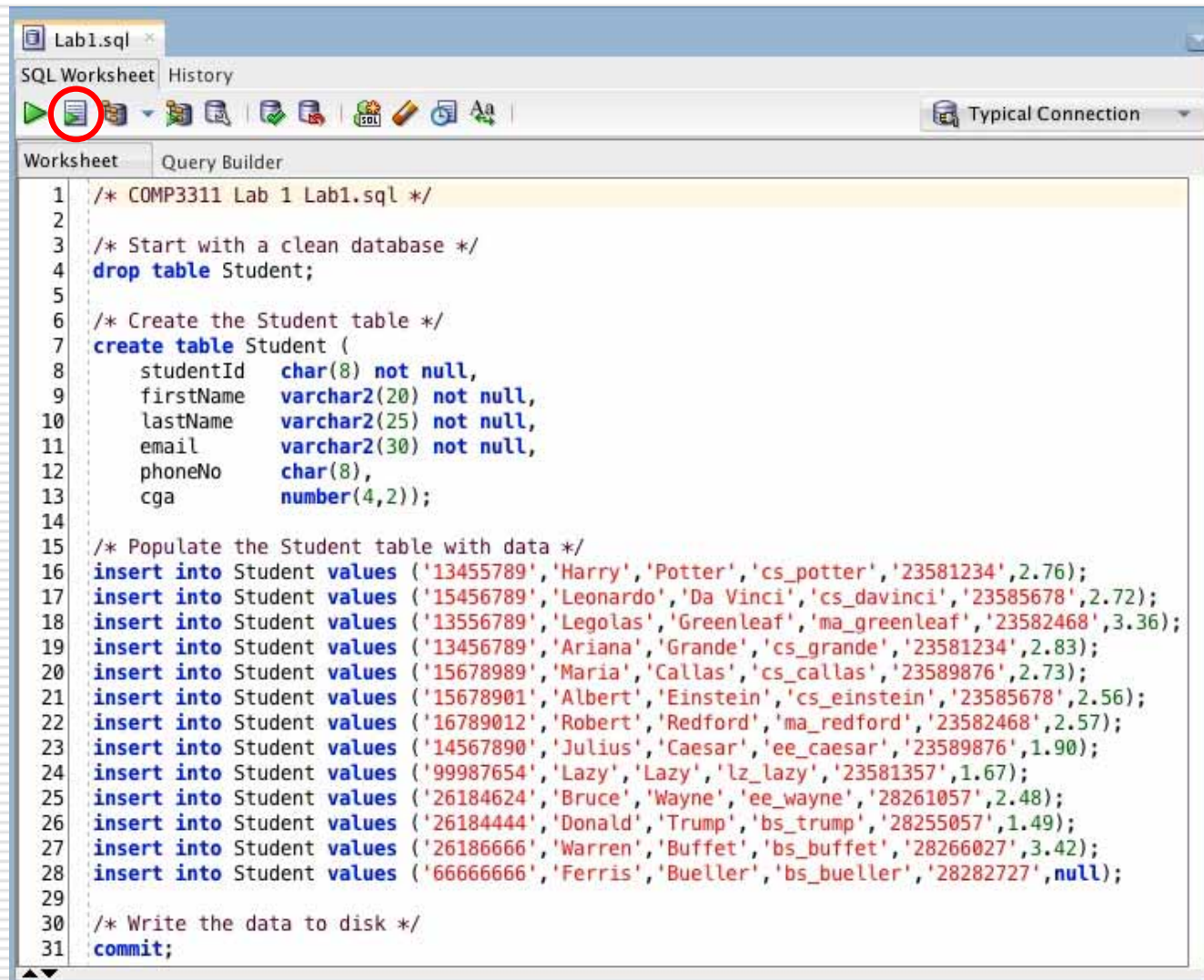# Running A SQL Script In SQL Developer (1)

❑ Download the Lab1.sql script file from the Introduction to Oracle DBMS and Oracle SQL*Plus entry of the Lab Schedule course webpage to the desktop.

❑ Open the Lab1.sql script file in a new Worksheet tab (see next slide) by

1. selecting File→Open in the SQL Developer menu bar or clicking the Open folder icon in the toolbar.

2. navigating to the desktop.

3. selecting the Lab1.sql file.

Alternatively, you can simply drag and drop the Lab1.sql file onto a worksheet in SQL Developer.

Running A SQL Script In SQL Developer (2)


```
Lab1.sql ×

SQL Worksheet  History

Worksheet    Query Builder

 1  /* COMP3311 Lab 1 Lab1.sql */
 2
 3  /* Start with a clean database */
 4  drop table Student;
 5
 6  /* Create the Student table */
 7  create table Student (
 8      studentId    char(8) not null,
 9      firstName    varchar2(20) not null,
10      lastName     varchar2(25) not null,
11      email        varchar2(30) not null,
12      phoneNo      char(8),
13      cga          number(4,2));
14
15  /* Populate the Student table with data */
16  insert into Student values ('13455789','Harry','Potter','cs_potter','23581234',2.76);
17  insert into Student values ('15456789','Leonardo','Da Vinci','cs_davinci','23585678',2.72);
18  insert into Student values ('13556789','Legolas','Greenleaf','ma_greenleaf','23582468',3.36);
19  insert into Student values ('13456789','Ariana','Grande','cs_grande','23581234',2.83);
20  insert into Student values ('15678989','Maria','Callas','cs_callas','23589876',2.73);
21  insert into Student values ('15678901','Albert','Einstein','cs_einstein','23585678',2.56);
22  insert into Student values ('16789012','Robert','Redford','ma_redford','23582468',2.57);
23  insert into Student values ('14567890','Julius','Caesar','ee_caesar','23589876',1.90);
24  insert into Student values ('99987654','Lazy','Lazy','lz_lazy','23581357',1.67);
25  insert into Student values ('26184624','Bruce','Wayne','ee_wayne','28261057',2.48);
26  insert into Student values ('26184444','Donald','Trump','bs_trump','28255057',1.49);
27  insert into Student values ('26186666','Warren','Buffet','bs_buffet','28266027',3.42);
28  insert into Student values ('66666666','Ferris','Bueller','bs_bueller','28282727',null);
29
30  /* Write the data to disk */
31  commit;
```

Typical Connection

Running A SQL Script In SQL Developer (3)

- The Lab1.sql script
    - drops (deletes) a table called Student if it exists.
    - creates a table called Student with 6 attributes.
    - inserts 13 different Student records into the table.

- Don't worry if you do not understand the SQL statements for the time being. We will cover them in detail in future labs.

- Click the **Run Script** button and then the **OK** button in the Select Connection dialog box.

- The result of running the script is shown in the Script Output tab, under the Worksheet tab.

Displaying The Structure Of A Table (1)

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

☐ Open a new SQL Worksheet and connect to Oracle Database using your previously named connection.

☐ Type "desc Student;" in the Enter SQL Statement box and click the **Run Statement** button.

☐ The Script Output tab should show the result in the figure.
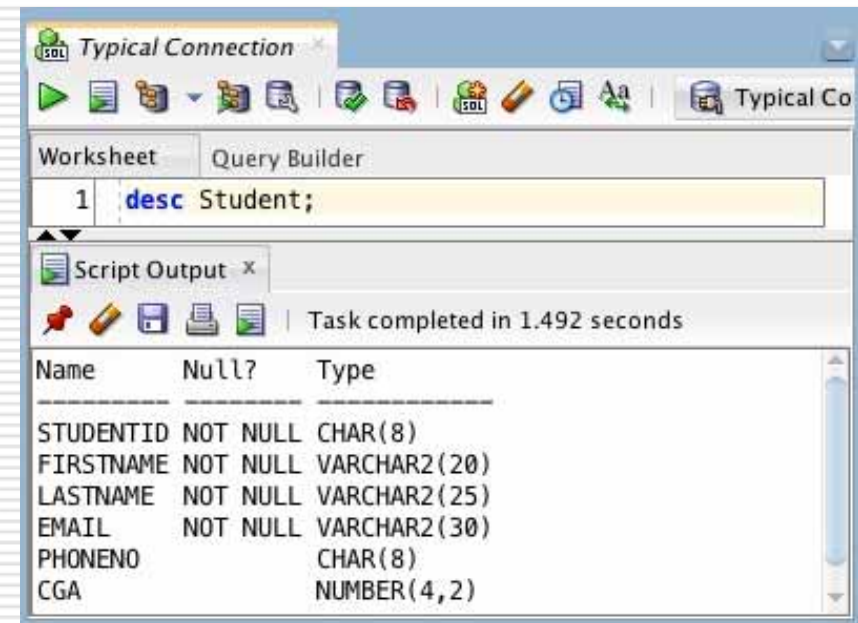
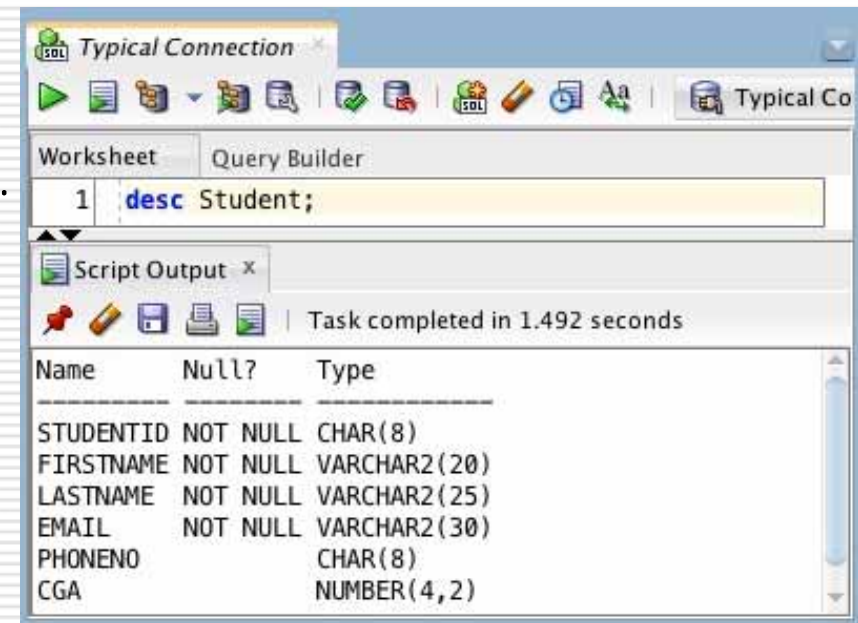# Displaying The Structure Of A Table (2)

- ☐ 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 fixed length character string of length s.
        - ☐ VARCHAR2(s) – A variable length character string of maximum length of s.
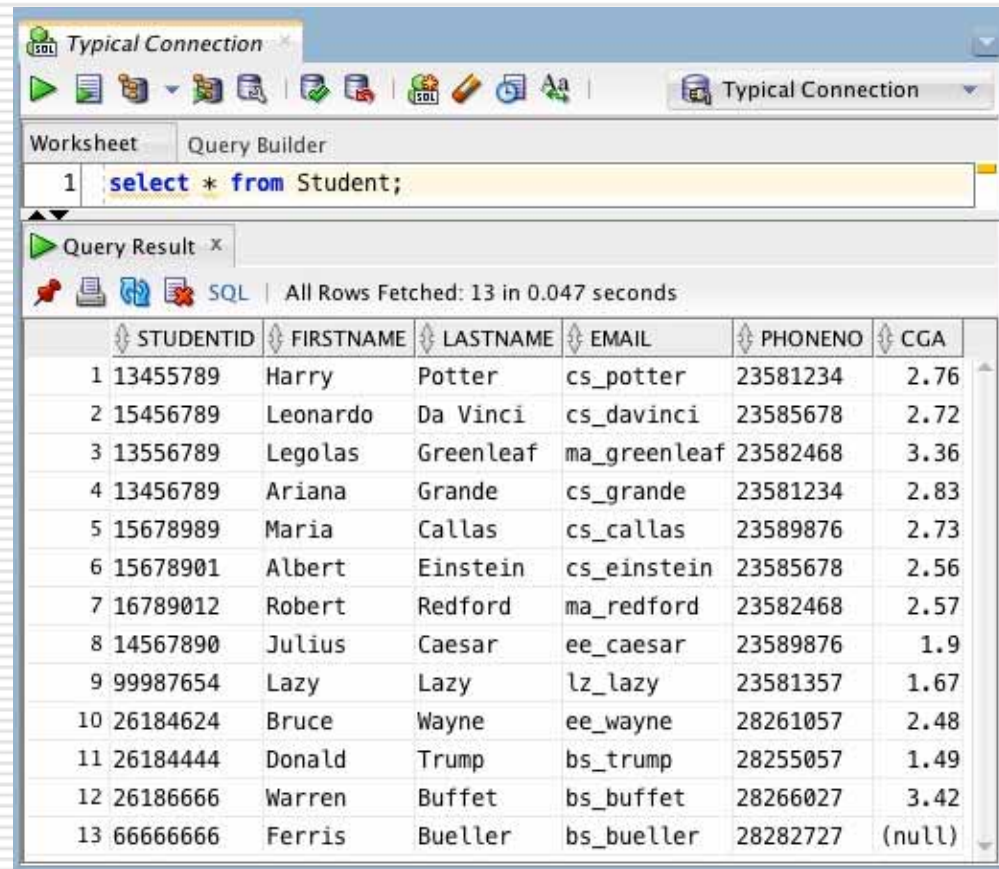   - ☐ NUMBER(p, s) – A number with a total of p digits with s digits to the right of the decimal point.


```
SQL Typical Connection ×

Worksheet   Query Builder
  1  desc Student;

Script Output ×
                          Task completed in 1.492 seconds

Name          Null?        Type
---------     --------     ------------
STUDENTID     NOT NULL     CHAR(8)
FIRSTNAME     NOT NULL     VARCHAR2(20)
LASTNAME      NOT NULL     VARCHAR2(25)
EMAIL         NOT NULL     VARCHAR2(30)
PHONENO                    CHAR(8)
CGA                        NUMBER(4,2)
```

Displaying The Contents Of A Table

SQL command: select * from *<tablename>*

□ Type
"select * from Student;"
in the Enter SQL
Statement box
and click the **Run
Statement** button.

□ The Query Result
tab should display
the result shown
in the figure.

Summary

- We covered the following topics in this lab:

  - Introduction to Oracle Database.

  - Introduction to SQL Developer.

  - Connecting to Oracle Database using SQL Developer.

  - Running a simple SQL*Plus script in SQL Developer.

  - Displaying the structure and contents of a table.

Lab Exercise

□ You must complete the lab exercise and upload the result to Canvas by **11:59 p.m. today**.

Ask for help if you need it!

IMPORTANT NOTES

Save your InsertMyself.sql script file either to the M drive or to a USB drive as any personal files on the lab computers will be automatically deleted periodically.

To access the database server from outside campus you need to use the HKUST VPN. See http://itsc.ust.hk/apps/vpn/ for instructions on how to connect to the HKUST VPN.