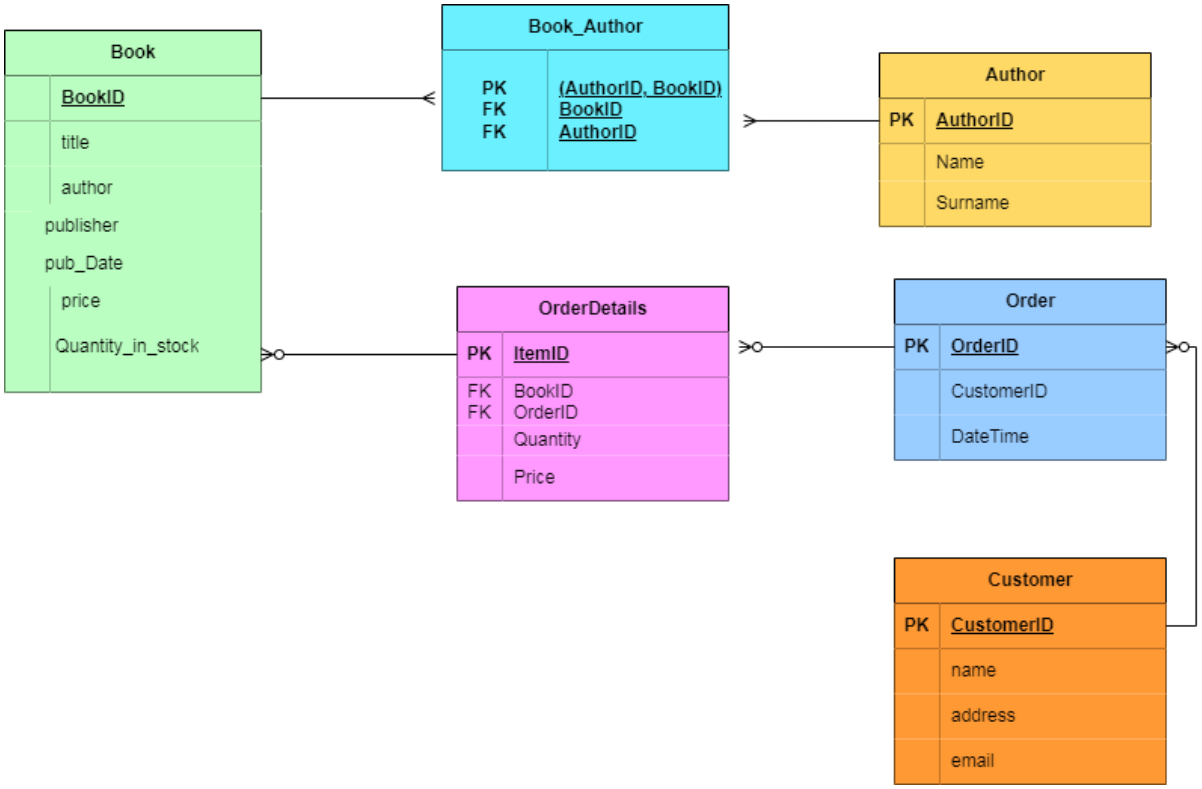
DBA 381
PROJECT

[COMPANY NAME]
Nosipho Precious Donkrag, Katlego Segole, Daniel Adendorff, Pieter Scholtz, Tshepang Mokgosi

Question 1: ERD for the bookstore



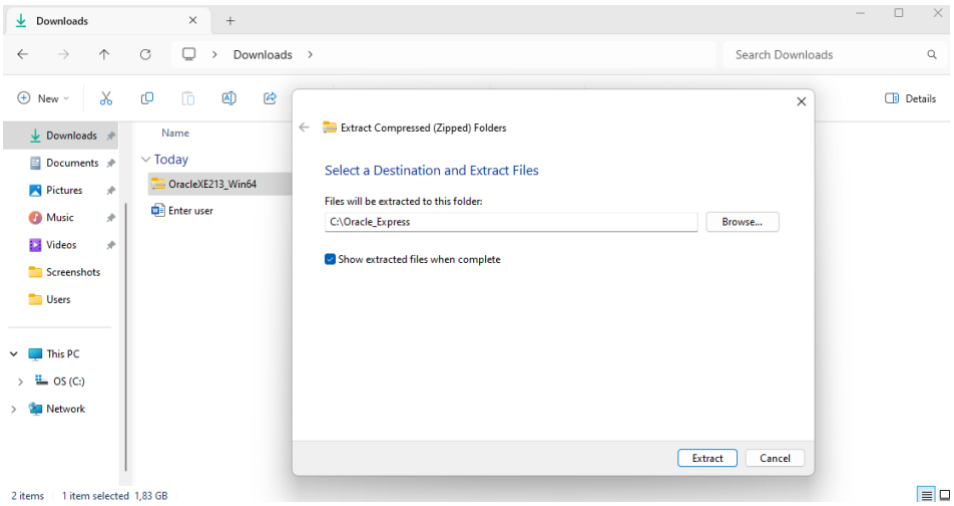
ERD design:

- "A book can have one or more authors and an author can write one or more books", this relationship was created using a bridge entity as it is a many to many relationship. In the bridge entity a composite key that is made up of the two foreign keys from the Order and Book tables was created.
- A book can be included in zero or more order details however an order detail can only belong to 1 book, this similar relationship was enforced between order and order details, and customer and order tables.

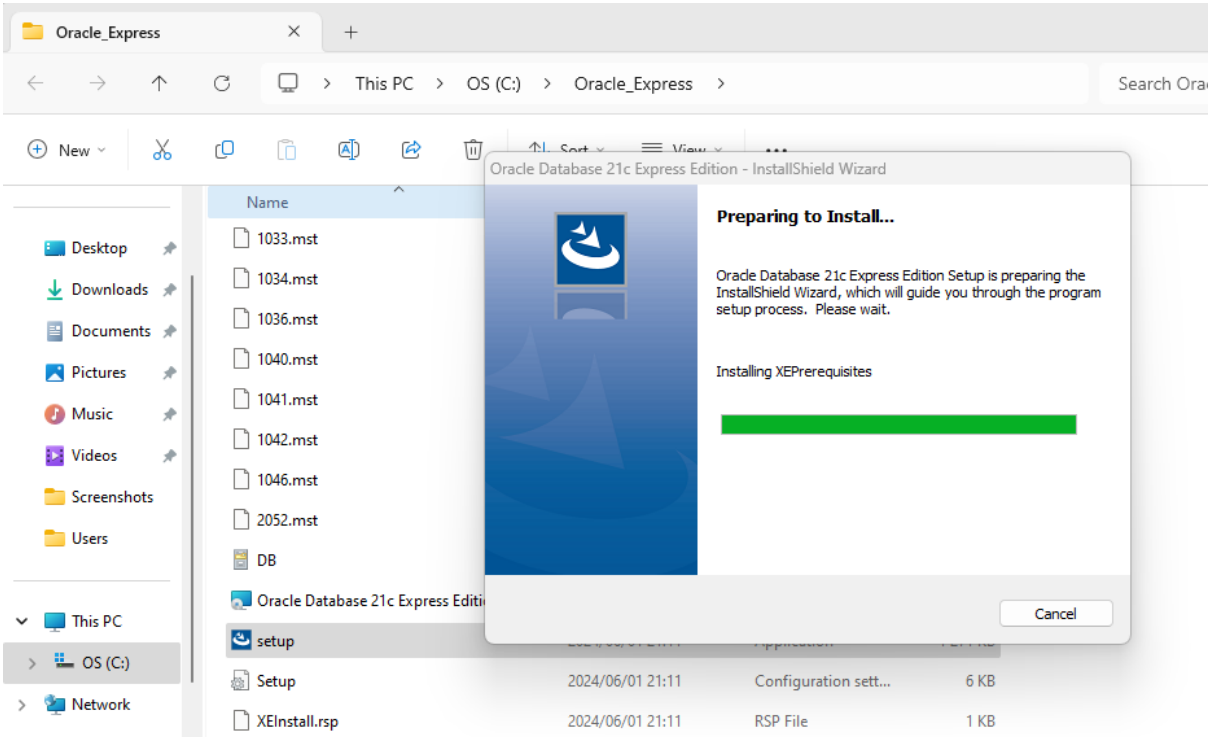
Oracle 21c Express edition installation guide:

1. Download the Oracle database 21c Express Edition from: Oracle Database Express Edition (XE) Downloads
2. Create an empty folder under the OS and name it as you wish. This folder was named Oracle_Express.

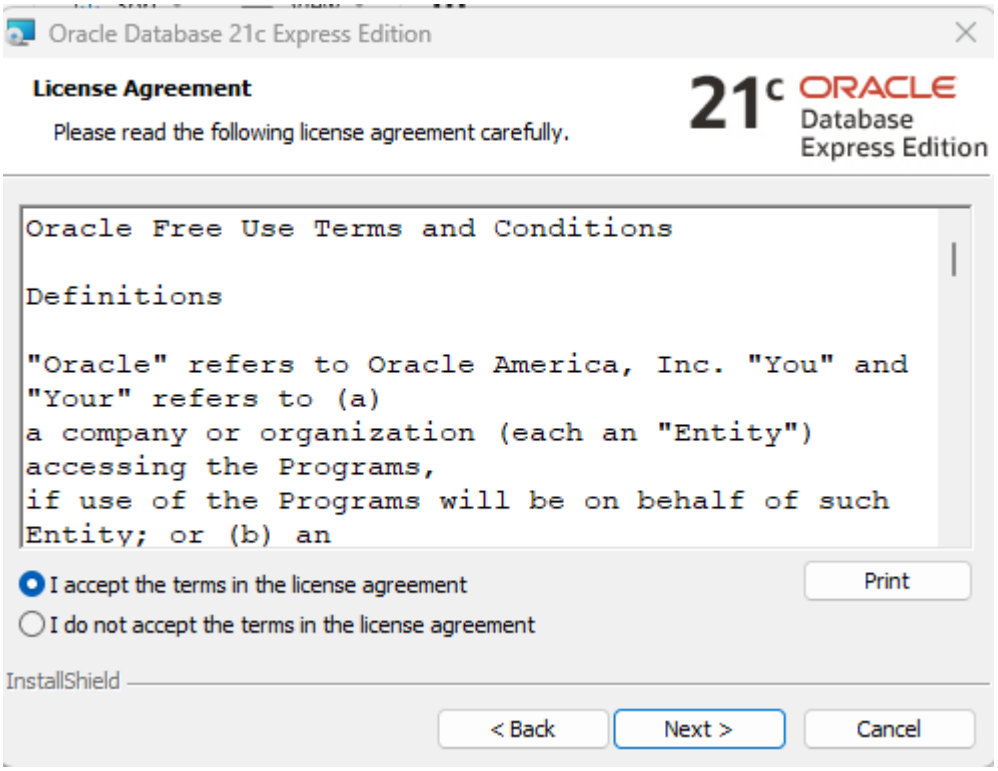
3. Extract the downloaded OracleXE213_Win64 zip folder, into the empty folder called ‘Oracle_Express’ that is under the OS.



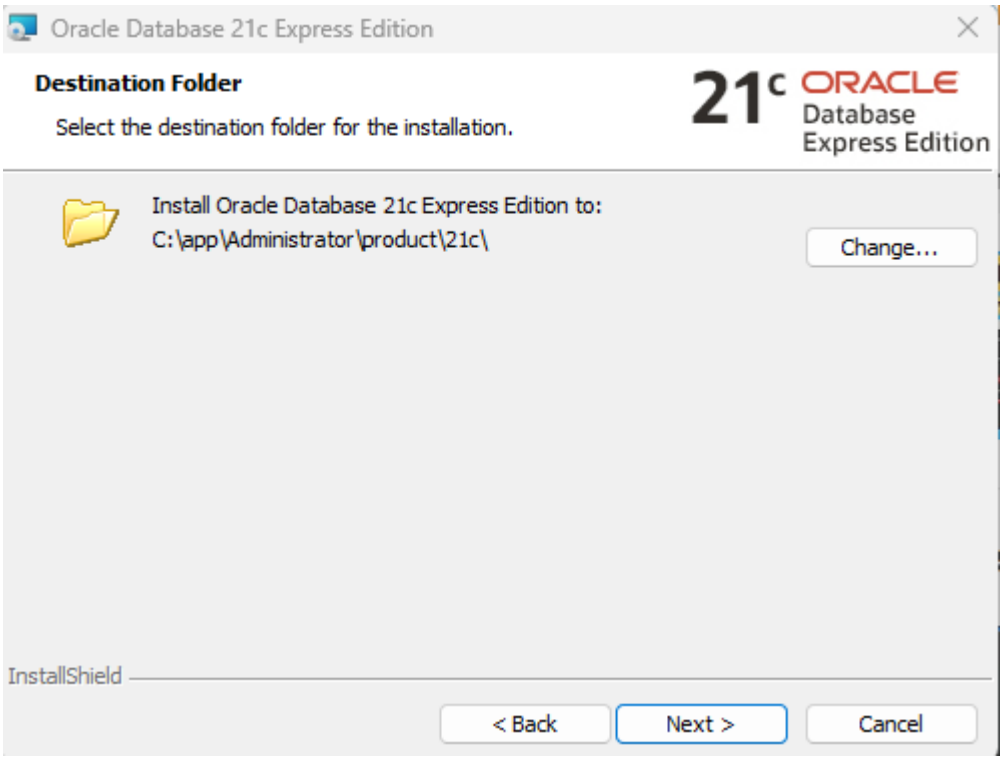
4. Once the extraction is done, open the now populated folder Oracle_Express under the OS, and right click on setup and run as administrator, the following window will pop up where it is preparing to install.



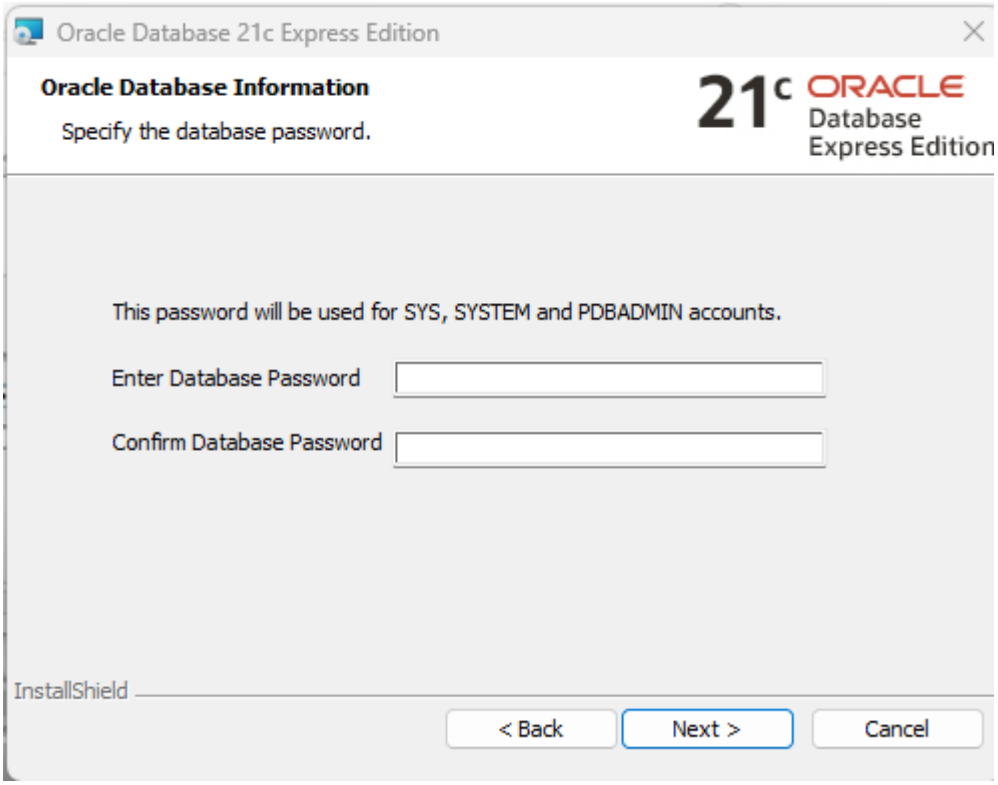
5. Once the window is done loading accept the terms in the license agreement and click on ‘next’.



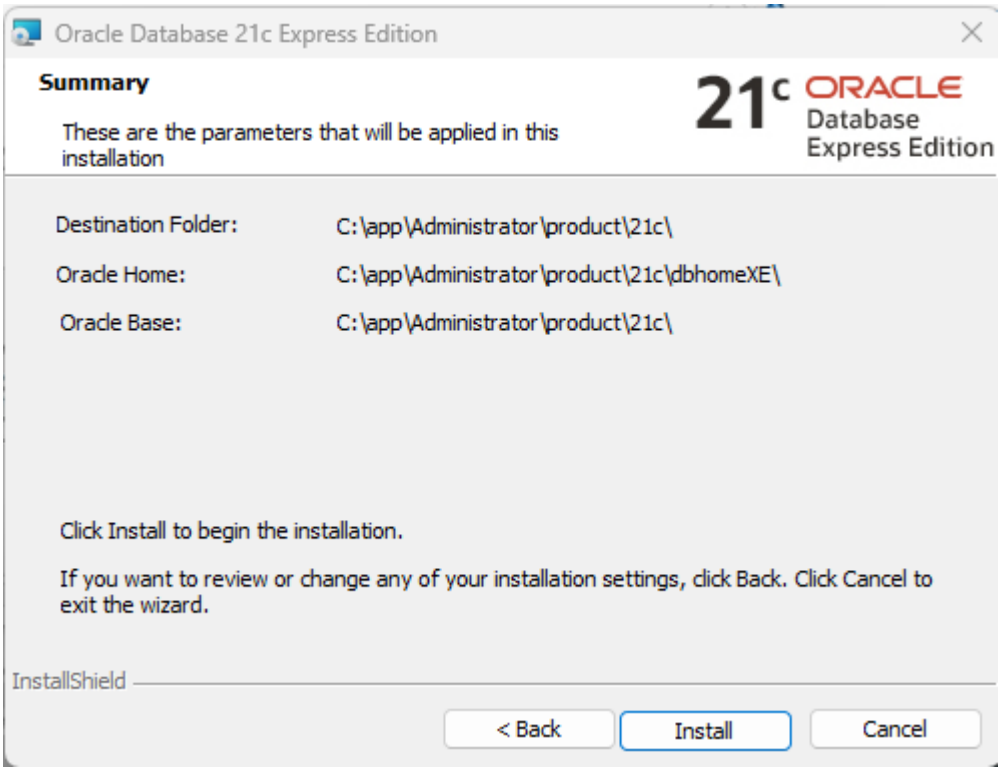
6. The following window will show the destination folder for the installation, the Oracle home. You can change it and tthen click on ‘next’.



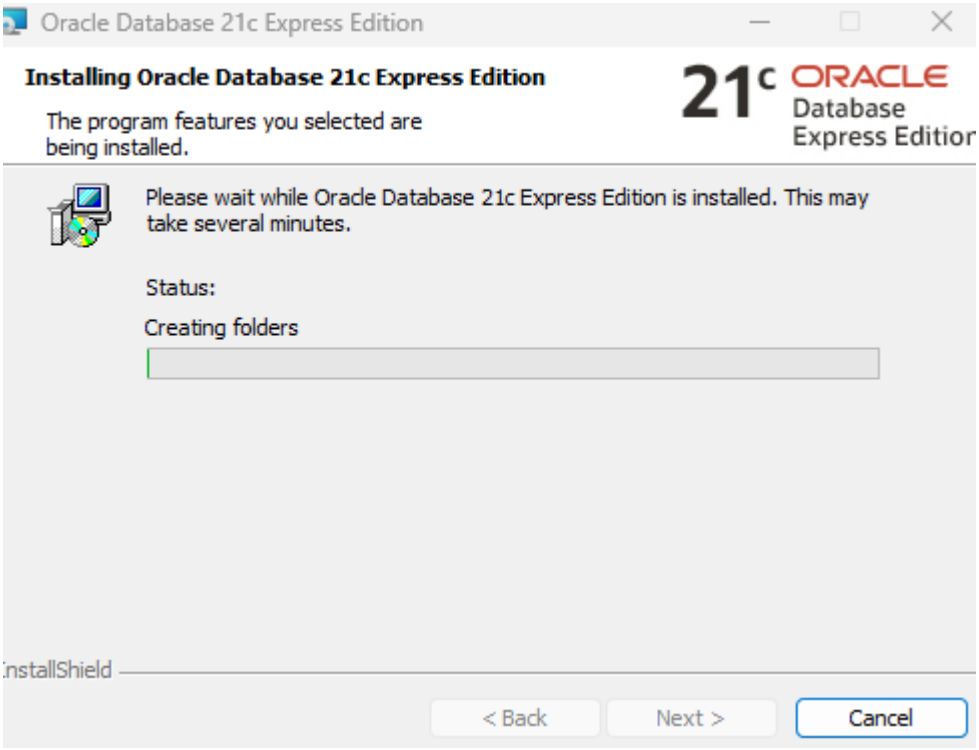
7. The following window will prompt you to enter the password you will be using to connect to the database, its best to choose an easy password when strarting out such as ‘1234’.



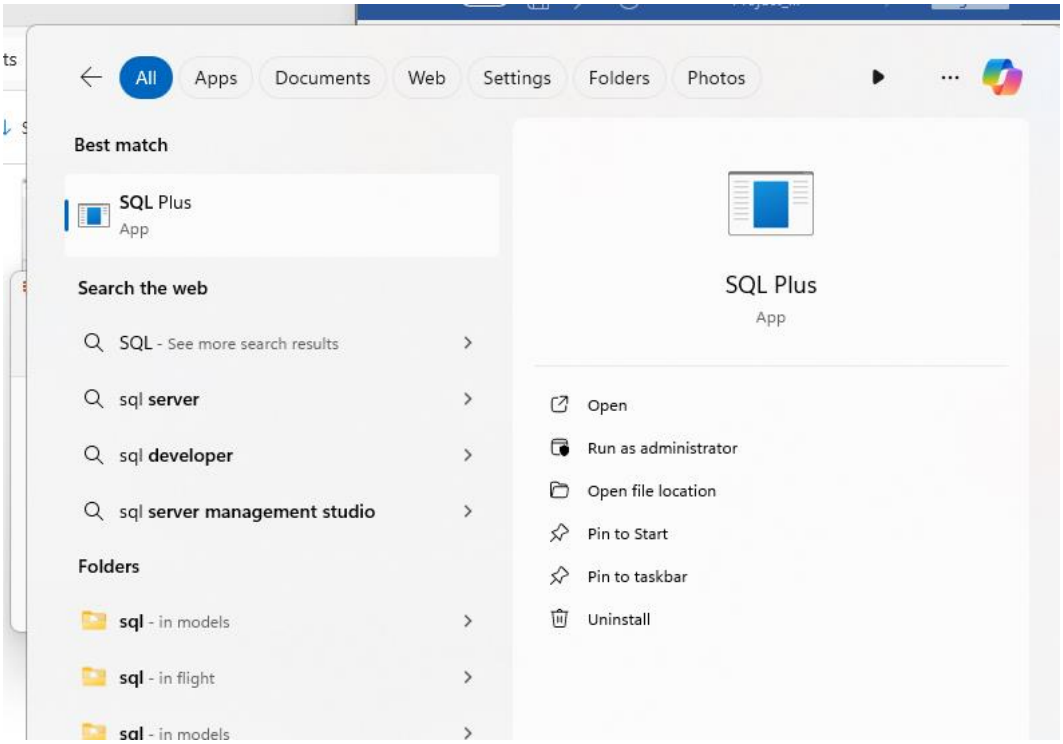
8. The following window will show the destination folder, the Oracle home and the Oracle base. Take a screenshot of this incase you have to uninstall Oracle Express. Then click ‘install’.



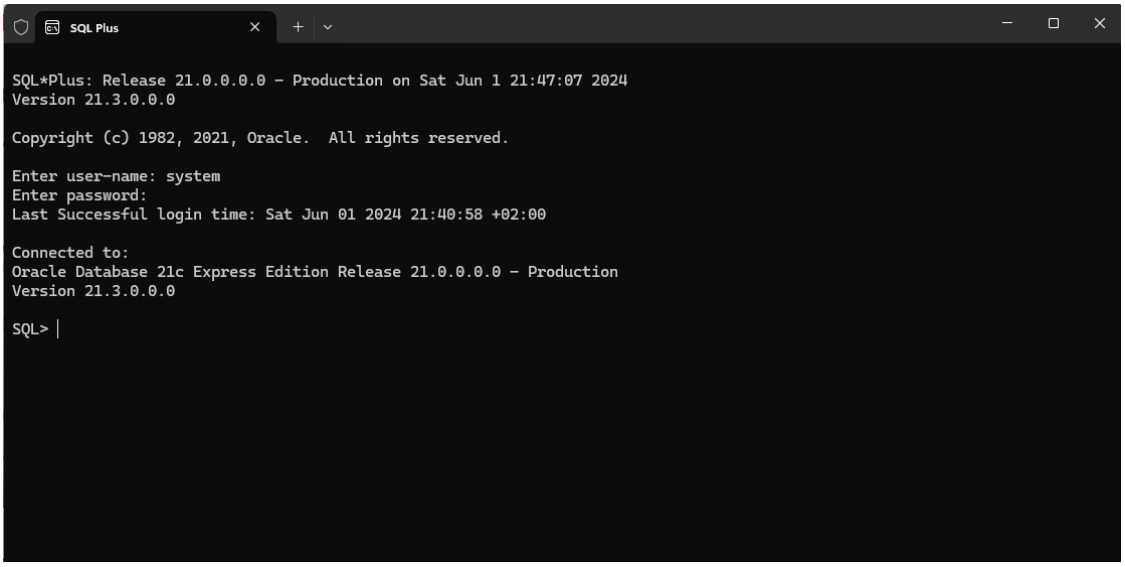
9. The installation will take a while, but once it is done go to your search bar and type sql plus.



10. Right click on the Sql plus app and run it as administrator, a terminal will open.



11. In the terminal use the following login:
    user-name: system
    password: 1234(the password you set earlier in step number 7).



    Now you are all set!

Loading the data using SQL*Loader:

1. Unzip the data folder and take note of the full path of this folder.
   'C:\Users\nosip\Documents\third Year\DBA381\project\data'

2. Open the Command prompt not SQL Plus. But your laptop's command prompt.

3. Copy and paste these commands replacing the path of the control files with your specific path (this is the location where you unzipped the folder).

   Keep the order of the commands so that tables with foreign keys are loaded after their parental tables.
   "1234": This is the password you set when you downloaded Oracle express. Replace "1234" with your password.
   The commands:

```
sqlldr userid=system/1234 control="C:\Users\nosip\Documents\third Year\DBA381\project\data\book.ctl"
sqlldr userid=system/1234 control="C:\Users\nosip\Documents\third Year\DBA381\project\data\author.ctl"
sqlldr userid=system/1234 control="C:\Users\nosip\Documents\third Year\DBA381\project\data\bookauthor.ctl"
sqlldr userid=system/1234 control="C:\Users\nosip\Documents\third Year\DBA381\project\data\customer.ctl"
sqlldr userid=system/1234 control="C:\Users\nosip\Documents\third Year\DBA381\project\data\customerorder.ctl"
sqlldr userid=system/1234 control="C:\Users\nosip\Documents\third Year\DBA381\project\data\orderdetail.ctl"
```

   The data should now be successfully loaded using SQL * Loader. The data loaded has between 50 and 100 entries in each table.

The control files:

The control files control the behaviour of the SQL Loader by specifying the files to be loaded, the format of the files to be loaded, the tables these files will be loaded into and it maps the fields in the datafiles (.dat) to the fields in the tables

The Customer control file (customer.ctl):

Structure of table: **Control file:**

```
CREATE TABLE Customer(
CustomerID Number PRIMARY KEY,
name VARCHAR(20),
address VARCHAR(100),
email VARCHAR (50)
);
```

```
LOAD DATA
INFILE 'C:\Users\nosip\Documents\third Year
\DBA381\project\data\customer.dat'
INTO TABLE Customer
FIELDS TERMINATED BY ','
(CustomerID, name, address, email)
```

Inside the control files:

- **LOAD DATA:** Indicates the start of the data loading process.
- **INFILE:** Specifies the full path and name of the input file that contains the data to be loaded into the specific table (this is the .dat file).
- **INTO TABLE Customer:** Specifies the table we are loading with data.
- **FIELDS TERMINATED BY ‘,’:** specifies that the input data content is separated by ‘,’ between each column. A screenshot of the data is given below:
  Inside ‘**customer.dat’** file

  ```
  1,John Doe,123 Elm St,johndoe@example.com
  2,Jane Smith,456 Oak St,janesmith@example.com
  3,Bob Johnson,789 Pine St,bobjohnson@example.com
  4,Emily Davis,101 Maple St,emilydavis@example.com
  5,Michael Brown,202 Birch St,michaelbrown@example.com
  6,Linda Wilson,303 Cedar St,lindawilson@example.com
  7,David Harris,404 Spruce St,davidharris@example.com
  ```

  It can be seen that each column in each row is separated by a ‘,’.
- **(CustomerID, name, address, email):** specifies the mapping between the columns in the customer.dat file and the table ‘Customer’.

Without the control files SQL Loader would not know how to behave when loading the data, hence they are quite important.

The author control files:

- **LOAD DATA:** Indicates the start of the data loading process.
- **INFILE:** Specifies the full path and name of the input file that contains the data to be loaded into the specific table (this is the .dat file).
- **INTO TABLE Customer:** Specifies the table we are loading with data.
- **FIELDS TERMINATED BY ‘,’:** specifies that the input data content is separated by ‘,’ between each column. A screenshot of the data is given below:

```
LOAD DATA
INFILE 'C:\Users\nosip\Documents\third
Year\DBA381\project\data\author.dat'
INTO TABLE Author
FIELDS TERMINATED BY ','
(AuthorID, name)
```

Inside an author.dat file:

It can be seen that each column in each row is separated by a ‘,’.

- **(CustomerID, name, address, email):** specifies the mapping between the columns in the customer.dat file and the table ‘Customer’.

```
1,George Orwell
2,J.K. Rowling
3,Ernest Hemingway
4,F. Scott Fitzgerald
5,Jane Austen
6,Mark Twain
7,Charles Dickens
8,Leo Tolstoy
9,J.R.R. Tolkien
10,Herman Melville
```

The book control files:

- **LOAD DATA:** Indicates the start of the data loading process.
- **INFILE:** Specifies the full path and name of the input file that contains the data to be loaded into the specific table (this is the .dat file).
- **INTO TABLE Customer:** Specifies the table we are loading with data.
- **FIELDS TERMINATED BY ‘,’:** specifies that the input data content is separated by ‘,’ between each column. A screenshot of the data is given below:

Inside the book.dat file:

```
1,The Great Gatsby,Scribner,1925-04-10,10.99,100
2,To Kill a Mockingbird,J.B. Lippincott & Co.,1960-07-11,7.99,150
3,1984,Secker & Warburg,1949-06-08,6.99,200
4,Pride and Prejudice,T. Egerton,1813-01-28,8.99,80
5,The Catcher in the Rye,Little, Brown and Company,1951-07-16,5.99,120
6,The Hobbit,George Allen & Unwin,1937-09-21,10.99,90
7,Fahrenheit 451,Ballantine Books,1953-10-19,9.99,110
8,Jane Eyre,Smith, Elder & Co.,1847-10-16,7.99,75
9,Animal Farm,Secker & Warburg,1945-08-17,6.99,180
10,Moby-Dick,Harper & Brothers,1851-10-18,11.99,70
11,War and Peace,The Russian Messenger,1869-01-01,12.99,60
12,Crime and Punishment,The Russian Messenger,1866-01-01,9.99,95
13,The Adventures of Huckleberry Finn,Charles L. Webster And
Company,1884-12-10,8.99,130
14,The Iliad,Unknown,762-01-01,14.99,40
15,The Odyssey,Unknown,725-01-01,13.99,50
16,Madame Bovary,Revue de Paris,1856-12-12,8.99,90
17,The Brothers Karamazov,The Russian Messenger,1880-01-01,10.99,85
18,Wuthering Heights,Thomas Cautley Newby,1847-12-01,7.99,100
19,The Divine Comedy,Johannes Numeister and Evangelista Angelini,1472-01-
01,15.99,30
20,One Hundred Years of Solitude,Harper & Row,1967-05-30,12.99,140
21,Les Mis√©rables,A. Lacroix, Verboeckhoven & Cie,1862-01-01,11.99,65
22,The Grapes of Wrath,The Viking Press-James Lloyd,1939-04-14,9.99,125
23,Don Quixote,Francisco de Robles,1605-01-16,13.99,55
24,Ulysses,Shakespeare and Company,1922-02-02,12.99,75
25,The Count of Monte Cristo,Penguin Classics,1844-08-01,10.99,80
26,Brave New World,Chatto & Windus,1932-01-01,9.99,95
27,The Sound and the Fury,Jonathan Cape and Harrison Smith,1929-01-
01,8.99,105
28,Lolita,Olympia Press,1955-09-15,7.99,85
29,Anna Karenina,The Russian Messenger,1877-01-01,11.99,60
30,The Sun Also Rises,Charles Scribner Sons,1926-10-22,9.99,100
31,Frankenstein,Lackington, Hughes, Harding, Mavor & Jones,1818-01-
01,6.99,70
32,Dracula,Archibald Constable and Company,1897-05-26,8.99,110
33,The Picture of Dorian Gray,Ward, Lock and Company,1890-06-20,7.99,100
34,The Metamorphosis,Kurt Wolff Verlag,1915-01-01,6.99,120
35,The Old Man and the Sea,Charles Scribner Sons,1952-09-01,8.99,130
36,Alice Adventures in Wonderland,Macmillan,1865-11-26,5.99,90
37,The Great Divorce,Geoffrey Bles,1945-01-01,7.99,80
38,Lord of the Flies,Faber and Faber,1954-09-17,9.99,110
39,The Catcher in the Rye,Little, Brown and Company,1951-07-16,5.99,120
40,1984,Secker & Warburg,1949-06-08,6.99,200
41,To Kill a Mockingbird,J.B. Lippincott & Co.,1960-07-11,7.99,150
42,The Hobbit,George Allen & Unwin,1937-09-21,10.99,90
43,The Odyssey,Unknown,725-01-01,13.99,50
44,Les Mis√©rables,A. Lacroix, Verboeckhoven & Cie,1862-01-01,11.99,65
45,The Grapes of Wrath,The Viking Press-James Lloyd,1939-04-14,9.99,125
46,Don Quixote,Francisco de Robles,1605-01-16,13.99,55
47,Ulysses,Shakespeare and Company,1922-02-02,12.99,75
48,Brave New World,Chatto & Windus,1932-01-01,9.99,95
49,The Count of Monte Cristo,Penguin Classics,1844-08-01,10.99,80
50,The Divine Comedy,Johannes Numeister and Evangelista Angelini,1472-01-
01,15.99,30
```

The bookauthor control files:

```
LOAD DATA
INFILE 'C:\Users\nosip\Documents\third
Year\DBA381\project\data\bookauthor.dat'
INTO TABLE BookAuthor
FIELDS TERMINATED BY ','
(BookID, AuthorID)
```

Inside the bookauthor.dat file:

It can be seen that each column in each row is separated by a ‘,’.

- **(BookID, AuthorID):** specifies the mapping between the columns in the customer.dat file and the table ‘Customer’.

```
1,1
2,2
3,1
4,5
5,4
6,9
7,3
8,5
9,1
10,10
11,8
12,8
13,6
14,7
15,7
16,7
17,8
18,5
19,7
20,7
21,8
22,7
23,7
24,7
25,8
26,7
27,7
28,7
29,8
30,7
31,7
32,7
33,7
34,7
35,7
36,7
37,7
38,7
39,7
40,7
41,7
42,7
43,7
44,7
45,7
46,7
47,7
```

The bookauthor control files:

```
LOAD DATA
INFILE 'C:\Users\nosip\Documents\third
Year\DBA381\project\data\bookauthor.dat'
INTO TABLE BookAuthor
FIELDS TERMINATED BY ','
(BookID, AuthorID)
```

Inside the bookauthor.dat files:

It can be seen that each column in each row is separated by a ‘,’.

- **(BookID, AuthorID):** specifies the mapping between the columns in the customer.dat file and the table ‘Customer’.

```
1,1
2,2
3,1
4,5
5,4
6,9
7,3
8,5
9,1
10,10
11,8
12,8
13,6
14,7
15,7
16,7
17,8
18,5
19,7
20,7
21,8
22,7
23,7
24,7
25,8
26,7
27,7
28,7
29,8
30,7
31,7
32,7
33,7
34,7
35,7
36,7
37,7
38,7
39,7
40,7
41,7
42,7
43,7
44,7
45,7
46,7
47,7
48,7
49,7
50,7
```

The customerorder.ctl control files:

```
LOAD DATA
INFILE 'C:\Users\nosip\Documents\third
Year\DBA381\project\data\customerorder.dat'
INTO TABLE CustomerOrder
FIELDS TERMINATED BY ','
(OrderID, OrderDateTime TIMESTAMP "YYYY-MM-DD HH24:MI:SS", CustomerID)
```

Inside the customerorder.dat files:

It can be seen that each column in each row is separated by a ‘,’.

- **(OrderID, OrderDateTime):** specifies the mapping between the columns in the customer.dat file and the table ‘Customer’. The timestamp is a special data type in Oracle Database. It is used to store date and time information with a higher precision than the standard data type. The timestamp data type can store fractional seconds and can also include a time zone.

```
1,2023-05-15 10:30:00,1
2,2023-05-15 11:00:00,2
3,2023-05-16 09:30:00,3
4,2023-05-16 10:45:00,4
5,2023-05-17 14:00:00,5
6,2023-05-17 15:15:00,6
7,2023-05-18 11:30:00,7
8,2023-05-18 12:45:00,8
9,2023-05-19 16:00:00,9
10,2023-05-19 17:15:00,10
11,2023-05-20 10:00:00,11
12,2023-05-20 11:15:00,12
13,2023-05-21 12:30:00,13
14,2023-05-21 13:45:00,14
15,2023-05-22 09:00:00,15
16,2023-05-22 10:15:00,16
17,2023-05-23 14:30:00,17
18,2023-05-23 15:45:00,18
19,2023-05-24 11:00:00,19
20,2023-05-24 12:15:00,20
21,2023-05-25 16:30:00,21
22,2023-05-25 17:45:00,22
23,2023-05-26 10:30:00,23
24,2023-05-26 11:45:00,24
25,2023-05-27 13:00:00,25
26,2023-05-27 14:15:00,26
27,2023-05-28 09:30:00,27
28,2023-05-28 10:45:00,28
29,2023-05-29 15:00:00,29
30,2023-05-29 16:15:00,30
31,2023-05-30 11:30:00,31
32,2023-05-30 12:45:00,32
33,2023-05-31 17:00:00,33
34,2023-05-31 18:15:00,34
35,2023-06-01 10:00:00,35
36,2023-06-01 11:15:00,36
37,2023-06-02 12:30:00,37
38,2023-06-02 13:45:00,38
39,2023-06-03 09:00:00,39
40,2023-06-03 10:15:00,40
41,2023-06-04 14:30:00,41
42,2023-06-04 15:45:00,42
43,2023-06-05 11:00:00,43
44,2023-06-05 12:15:00,44
45,2023-06-06 16:30:00,45
46,2023-06-06 17:45:00,46
47,2023-06-07 10:30:00,47
48,2023-06-07 11:45:00,48
49,2023-06-08 13:00:00,49
50,2023-06-08 14:15:00,50
```

The orderdetail.ctl control files:

```
LOAD DATA
INFILE 'C:\Users\nosip\Documents\third
Year\DBA381\project\data\orderdetail.dat'
INTO TABLE OrderDetail
FIELDS TERMINATED BY ','
(OrderDetailID, OrderID, BookID, quantity_ordered, price)
```

Inside the bookauthor.dat files:

It can be seen that each column in each row is separated by a ‘,’.

- **(OrderDetail, OrderID, BookID, quantity_ordered, price):** specifies the mapping between the columns in the customer.dat file and the table ‘Customer’.

```
1,1,1,2,21.98
2,1,2,1,7.99
3,2,3,3,20.97
4,2,4,1,8.99
5,3,5,2,11.98
6,3,6,1,10.99
7,4,7,3,29.97
8,4,8,2,15.98
9,5,9,1,6.99
10,5,10,2,23.98
11,6,11,1,12.99
12,6,12,3,29.97
13,7,13,2,17.98
14,7,14,1,14.99
15,8,15,3,41.97
16,8,16,2,17.98
17,9,17,1,10.99
18,9,18,2,15.98
19,10,19,1,15.99
20,10,20,1,12.99
21,11,21,2,23.98
22,11,22,1,9.99
23,12,23,1,13.99
24,12,24,2,25.98
25,13,25,1,10.99
26,13,26,2,19.98
27,14,27,1,8.99
28,14,28,3,23.97
29,15,29,2,23.98
30,15,30,1,9.99
31,16,31,1,6.99
32,16,32,2,17.98
33,17,33,3,23.97
34,17,34,1,6.99
35,18,35,1,8.99
36,18,36,2,11.98
37,19,37,3,23.97
38,19,38,1,9.99
39,20,39,2,11.98
40,20,40,1,6.99
41,21,41,1,7.99
42,21,42,3,32.97
43,22,43,2,27.98
44,22,44,1,11.99
45,23,45,1,9.99
46,23,46,2,27.98
47,24,47,1,12.99
48,24,48,2,19.98
49,25,49,3,32.97
50,25,50,1,15.99
```

d. Explaining the implemented security measures:

The following users are created:

- admin_user with the password AdminPass123. They are created to handle high-level tasks that require a lot of privileges.

- general_user with the password UserPass123. These users have less permissions and is intended for general use like accessing data and performing standard operations.

The following roles were created for each user:

- db_admin_role. This role allows a user to create tables, manage the current users, and change database settings. This would be useful for the store owner or whoever oversees creating the database structure. This role is also granted all privileges a database administrator can have, using the command “GRANT ALL PRIVILEGES TO DB_ADMIN_ROLE”.

- db_user_role This role is intended for general users. They have permission to access and change data in the database. This can perhaps be given to a store clerk. They are granted the following privileges on all the tables: “GRANT SELECT, INSERT, UPDATE, DELETE ON (___TableName____) TO DB_USER_ROLE”

To enhance security, we have implemented robust password policies:

- Failed Login Attempts: Accounts will be locked after 5 consecutive failed login attempts.
- Password Life Time: Users are required to change their passwords every 90 days.
- Password Reuse Time: Passwords cannot be reused for 365 days.
- Password Reuse Max: A password cannot be reused more than 10 times.
- Password Verify Function: We use the ora12c_verify_function to enforce strong passwords.
- Password Lock Time: Accounts will be locked for 1 day after all the password attempts have been used.

Auditing is enabled to track any and all session creations and all DML operations (SELECT, INSERT, UPDATE, DELETE) on the tables. This can help us to monitor and identify any unauthorized activities. The function in enabled by using the following command for each table: “AUDIT SELECT, INSERT, UPDATE, DELETE ON (___TableName____) BY ACCESS”.

TABLE CREATION

```
CREATE TABLE Customer(
 CustomerID Number PRIMARY KEY,
name VARCHAR(20),
address VARCHAR(100),
email VARCHAR (50)
);

CREATE TABLE CustomerOrder(
 OrderID Number PRIMARY KEY,
 OrderDateTime TIMESTAMP,
 CustomerID Number,
 FOREIGN KEY (CustomerID) REFERENCES Customer(CustomerID)
);

CREATE TABLE Book(
 BookID NUMBER PRIMARY KEY,
 title VARCHAR(100),
 publisher VARCHAR2(100),
 pub_Date DATE,
 Price NUMBER(7,2),
 quantity_in_stock NUMBER
);

CREATE TABLE OrderDetail(
OrderDetailID NUMBER PRIMARY KEY,
OrderID NUMBER,
BookID Number,
quantity_ordered NUMBER,
```

```
price NUMBER(7,2),
FOREIGN KEY (OrderID) REFERENCES CustomerOrder(OrderID),
FOREIGN KEY (BookID) REFERENCES Book(BookID));
CREATE TABLE Author(
AuthorID Number PRIMARY KEY,
name VARCHAR2(100)
 );

CREATE TABLE BookAuthor(
BookID NUMBER,
AuthorID NUMBER,
PRIMARY KEY (BookID, AuthorID), --Composite key
FOREIGN KEY (BookID) REFERENCES Book(BookID),
FOREIGN KEY (AuthorID) REFERENCES Author(AuthorID)
 );
```

Order of dropping tables as to adhere to the referential integrity constraints placed on tables: (do not copy if you don't want to drop tables)

```
DROP TABLE OrderDetail;
DROP TABLE BookAuthor;
DROP TABLE CustomerOrder;
DROP TABLE Book;
DROP TABLE Author;
DROP TABLE Customer;
```

SECURITY IMPLIMENTATION

```
CONNECT sys as sysdba;
SET FEEDBACK OFF;

ALTER SYSTEM SET RESOURCE_LIMIT = true;
```

```
CREATE ROLE db_admin_role;
CREATE ROLE db_user_role;

CREATE USER admin_user IDENTIFIED BY AdminPass123;
CREATE USER general_user IDENTIFIED BY UserPass123;

GRANT UNLIMITED TABLESPACE TO admin_user;

GRANT ALL ON Author TO db_admin_role;
GRANT ALL ON Book TO db_admin_role;
GRANT ALL ON Customer TO db_admin_role;
GRANT ALL ON Orders TO db_admin_role;
GRANT ALL ON OrderDetail TO db_admin_role;

GRANT SELECT ON Author TO db_user_role;
GRANT SELECT ON Book TO db_user_role;
GRANT SELECT ON Customer TO db_user_role;
GRANT SELECT ON Orders TO db_user_role;
GRANT SELECT ON OrderDetail TO db_user_role;

GRANT db_admin_role TO admin_user;
GRANT db_user_role TO general_user;

GRANT QUOTA 500M ON USERS TO general_user;
```