
# AHSANULLAH UNIVERSITY OF SCIENCE & TECHNOLOGY

## Department of Computer Science & Engineering

Course Name: Distributed Database System Lab

Course No: CSE4126

Project Name: MedicAid

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Semester : 1st

Section : C1

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# Introduction

As the population of Bangladesh continues to grow, so too does the need for health care services and options. The current population of Bangladesh is 165.37 million as of Friday, December 1, 2017, based on the latest United Nations estimates and it will increase to 185.10 million by the end of 2020. This, in turn, will result in a swell in the number of patients seeking care at medical facilities, hospitals, wellness centers and physicians' practices.

While patient growth certainly has its benefits, it also creates new challenges for facility administrators and their staff. Processes and procedures that previously were adequate may no longer be effective in handling a rise in new patients, prompting administrators to seek out alternatives and new technology and techniques to assist them and their patients.

# Project Overview

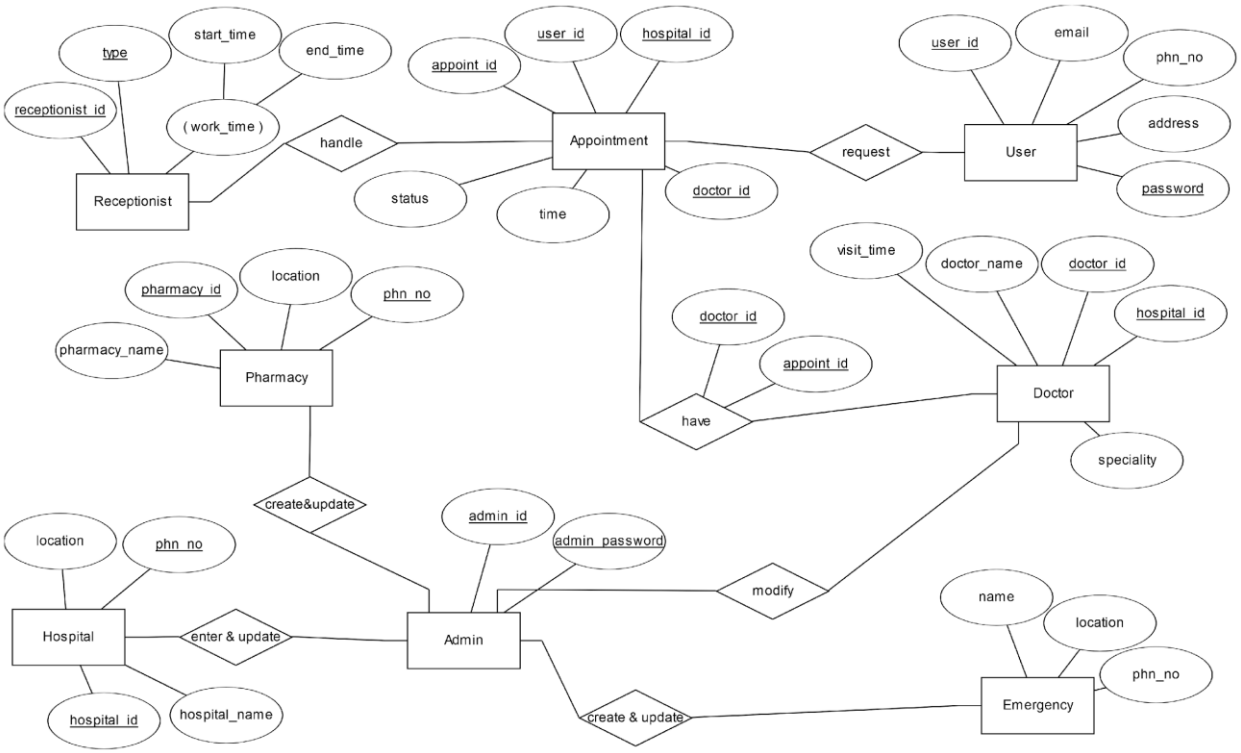
We propose to build a system where we are going to implement a distributed database system of a hospital management system. There will be a global database, and we will save some information from various sites. So that there is a co-current access with various users.

# Features

- Doctor's information is stored in various sites.
- Co-current access from various sites.
- Accessing multiple databases from various sites.
- PL-SQL used from the distributed database.

# Report of Project

## Entity Relationship Diagram




## Database and Table Creation (Global Schema)

We have created a database named hospital_management. There we have created some tables with these attributes.

- USERTABLE (user_id, user_name, email_id)
- HOSPITAL (hospital_id, hospital_name, address, location, phn_no)
- PHARMACY (pharmacy_id, pharmacy_name, address, location, phn_no)
- ADMINTABLE (admin_id, password)
- RECEPTIONIST (recep_id, recep_type, work_start, work_end)
- EMERGENCY (emergency_id, emergency_name, location, phn_no)
- DOCTOR (doc_id, hospital_id, doc_name, qualification, designation, dept, visit_time)
- APPOINTMENT (appoint_id, user_id, doc_id, appoint_time, status)

## Fragmentation Schema

- AdminTable :
    1. Admin1 : SL **id<4** AdminTable
    2. Admin2 : SL **id>=4 and id <7** AdminTable
    3. Admin3 : SL **id>=7** AdminTable
- Hospital :
    1. Hospital1 : SL **location = "Dhanmondi"** Hospital
    2. Hospital2 : SL **location = "Uttara"** Hospital
    3. Hospital3 : SL **location = "Sylhet"** Hospital
- UserTable :
    1. User1: PJ **userid,pass,email** UserTable
    2. User2: PJ **userid,address,phn_no** UserTable
- Pharmacy :
    1. Pharmacy1 : SL **location = "Banani"** Pharmacy
    2. Pharmacy2 : SL **location = "Motijhil"** Pharmacy
    3. Pharmacy3 : SL **location = "Tejgaon"** Pharmacy
- Receptionist :
    1. Receptionist1 : SL **type_work = "full-time"** Receptionist
    2. Receptionist2 : SL **type_work = "part-time"** Receptionist
- Emergency :
    1. Emergency1 : SL **location = "Dhanmondi"** Emergency
    2. Emergency2 : SL **location = "Tejgaon"** Emergency
    3. Emergency3 : SL **location = "Bashundhara"** Emergency
- Doctor :
    1. Doctor1 : Sl **dept = "cardiology"** PJ **docId , hosId , dept , visit** Doctor
    2. Doctor2 : Sl **dept = "Neurology"** PJ **docId , hosId , dept , visit** Doctor
    3. Doctor3 : Sl **dept = "Dermatology"** PJ **docId , hosId , dept , visit** Doctor
    4. Doctor4 : Sl **dept = "Pediatrics"** PJ **docId , hosId , dept , visit** Doctor
    5. Doctor5 : Sl **dept = "Diabetes"** PJ **docId , hosId , dept , visit** Doctor
    6. Doctor6 : PJ **docId ,doc_name,qualification,designation** Doctor
- Appointment :
    1. Appointment1 : SL **stats = "Confirm"** Appointment
    2. Appointment2 : SL **stats = "Pending"** Appointment
    3. Appointment3 : SL **stats = "Cancel"** Appointment

## Insertion of Dummy Data

In all tables, we have inserted some dummy data manually so that we can check the functionality of the system.

## Creating Database Link

1. At site we will first install oracle 10g and notepad++
2. Then we will create the required tables with dummy data.
3. Then we will turn off the firewall of the site
4. From host send a ping to site's IP address
5. After that at site, in this folder we will open the listener.ora on notepad++ C:\oraclexe\app\oracle\product\10.2.0\server\NETWORK\ADMIN\
6. After opening we will add following these two portions.

   Inside SID_LIST_LISTENER

   (SID_DESC =
   (SID_NAME = XE
   (ORACLE_HOME = C:\oraclexe\app\oracle\product\10.2.0\server\)
   )

   And inside LISTENER → DESCRIPTION_LIST → DESCRIPTION

   (ADDRESS = (PROTOCOL = TCP) (HOST = HOST'S IP) (PORT = 1521)
7. Then we will run cmd in administrators mode.
8. In cmd we will stop the listener with this command : lsnrctl stop
9. After the success message we will start the listener with this command : lsnrctl start
10. Create database link using the following command

    drop database link site_link;

    create database link site_link
    connect to system identified by "123"
    using '(DESCRIPTION =
    (ADDRESS_LIST =
    (ADDRESS = (PROTOCOL = TCP)
    (HOST = HOST's IP)
    (PORT = 1521))
    )
    (CONNECT_DATA =(SID = XE)))';

## Procedure

1. Given doctor name, department, qualifications and desigmation, check if doctor already exists, if not then insert new doctor with the details into doctor table. Visit time will be the last visit time of the last doctor in the table + 1.
2. Given doctor id and user id, if doctor avaiable, find the last appintment time of the doctor, then increase it by 1, and insert the new appointment time, user id, doctor id, hospital id into appointment table
3. Given receptionist name and type, get the last receptionist end time of the same type, and insert the receptionist in the table where the start time is the last time of the last receptionist and end time will be start time + 30.

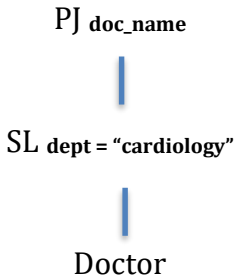
## Functions

1. Given appointment time and doctor id, find out how many patients are left after that time with the user id.
2. Given hospital name and department name, find out the doctors name, visit time of that hospital and that department.
3. Givent appointment id, return user name, doctor name and appointment status. If status is negative, then also return appointment time.

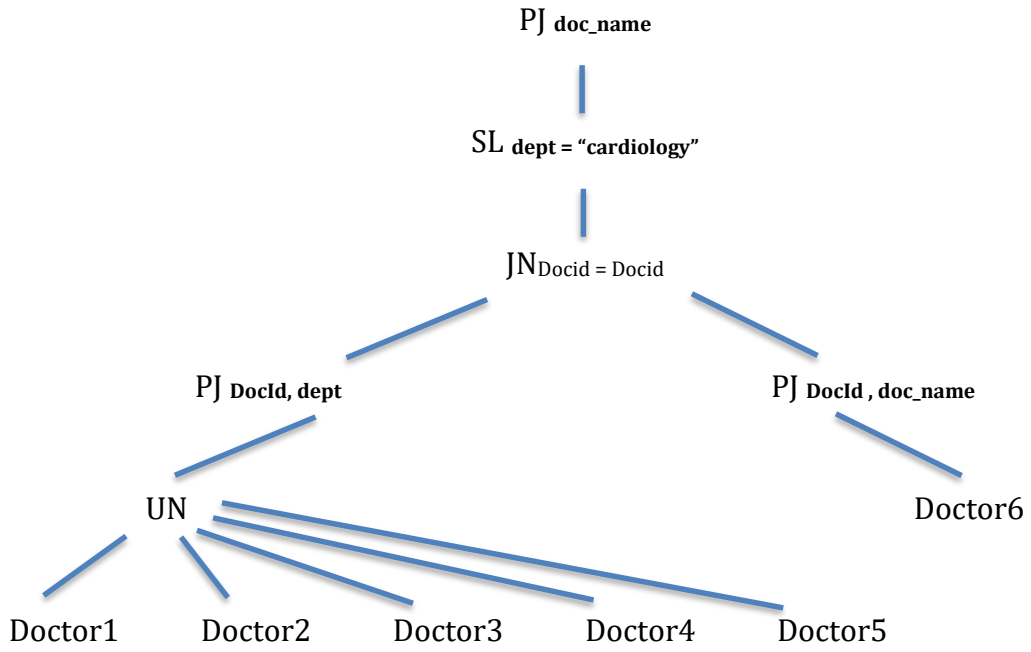
## Operator Tree

### Operator Tree - 1

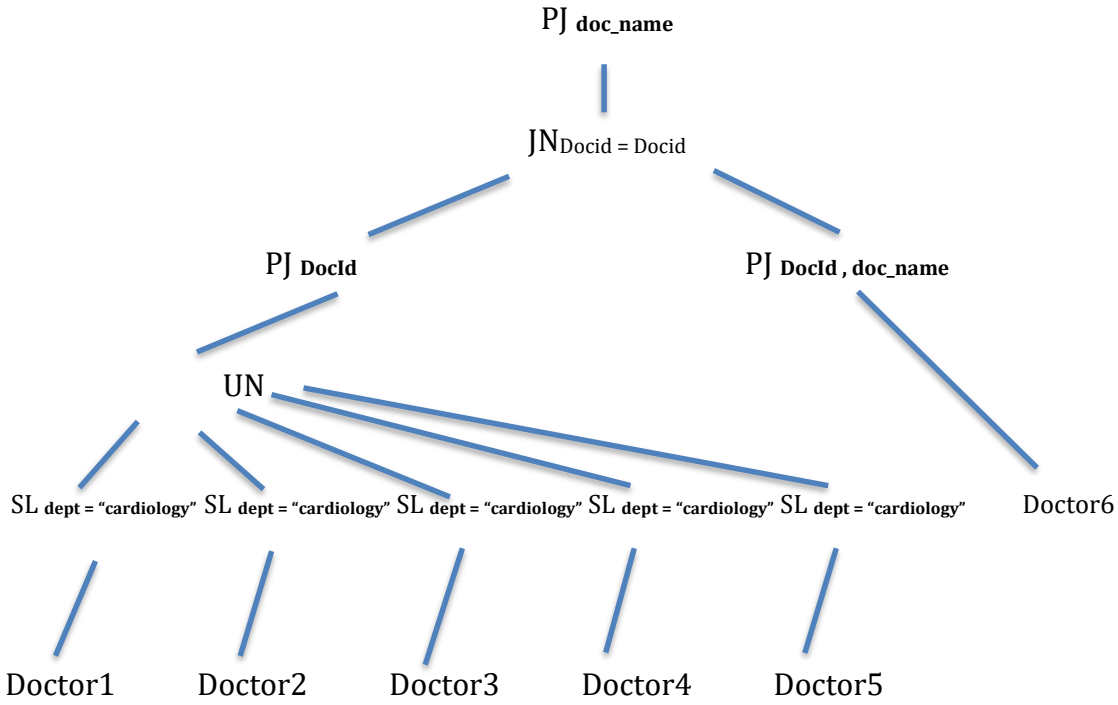
Q : PJ **doc_name** SL **dept = "cardiology"** Doctor



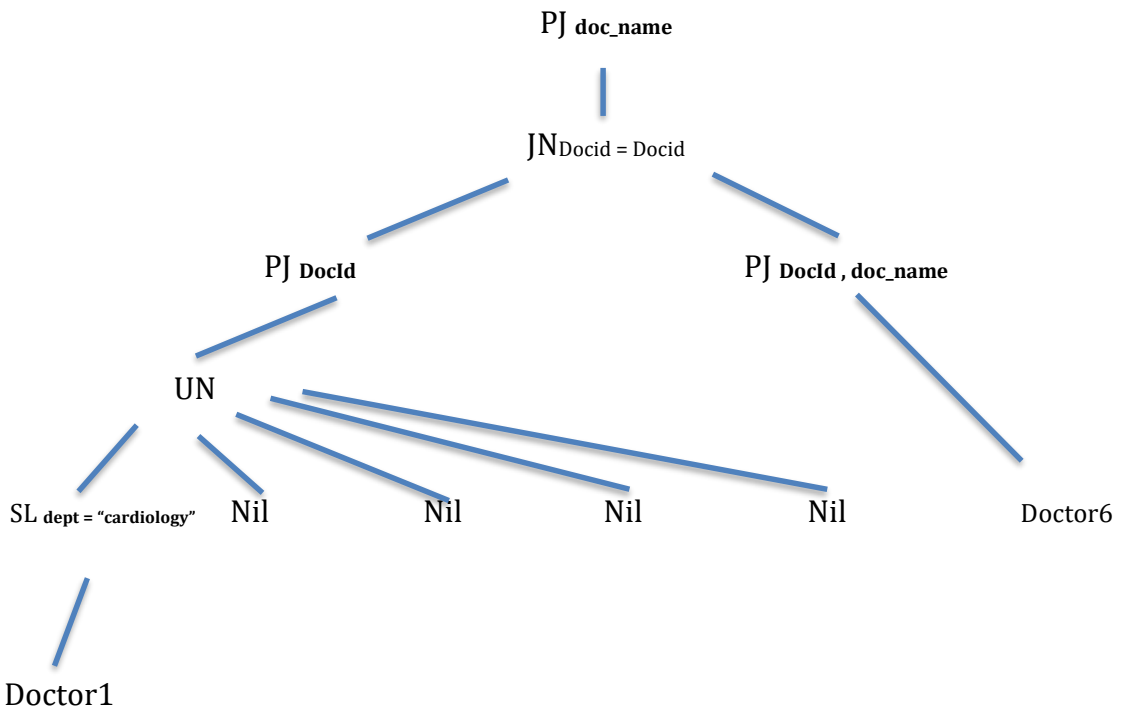
## Using Canonical Expression



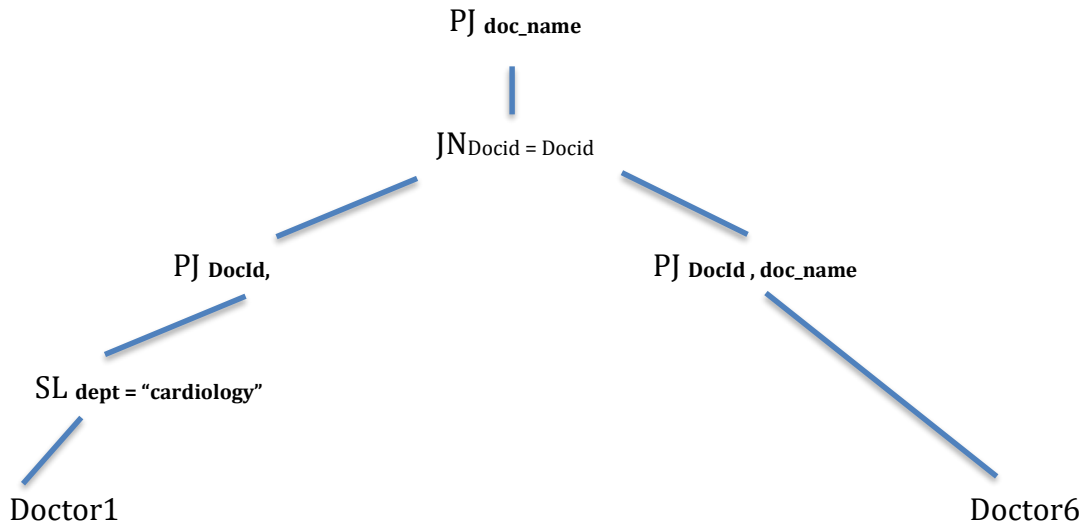

## Applying Cr-1 and Cr-2



## Applying Algebra of Qualified Relation



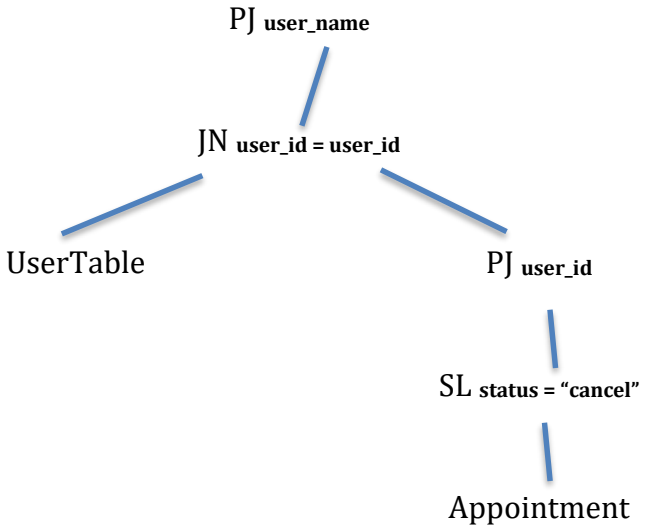

## Applying Cr-3



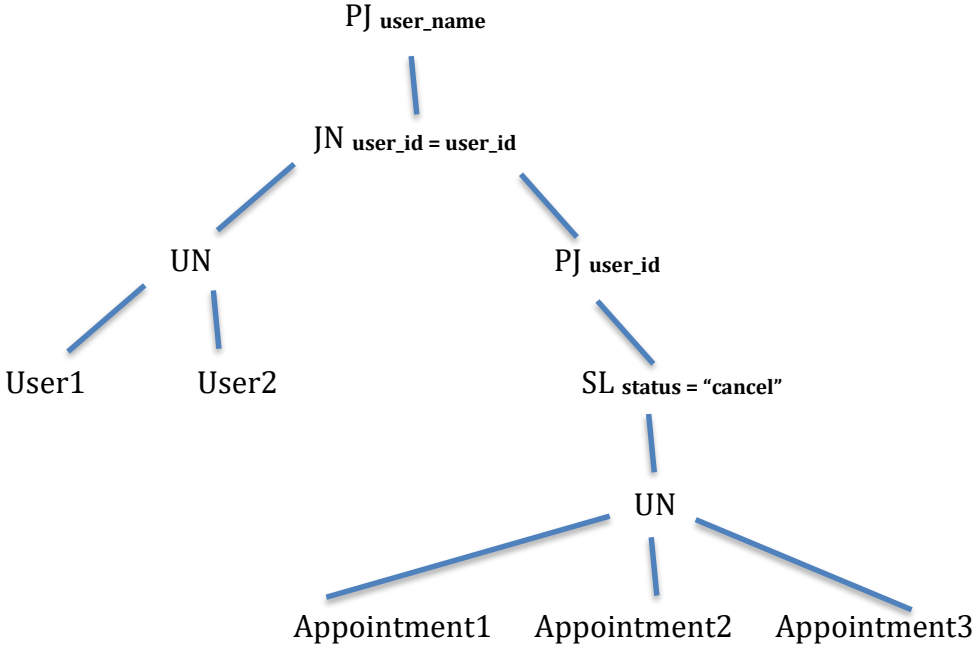

Simplified Q : PJ **doc_name** (PJ **DocId** SL **dept = "cardiology"** JN **DocId = DocId** PJ **DocId , doc_name** Doctor6)

**Operator Tree - 2**

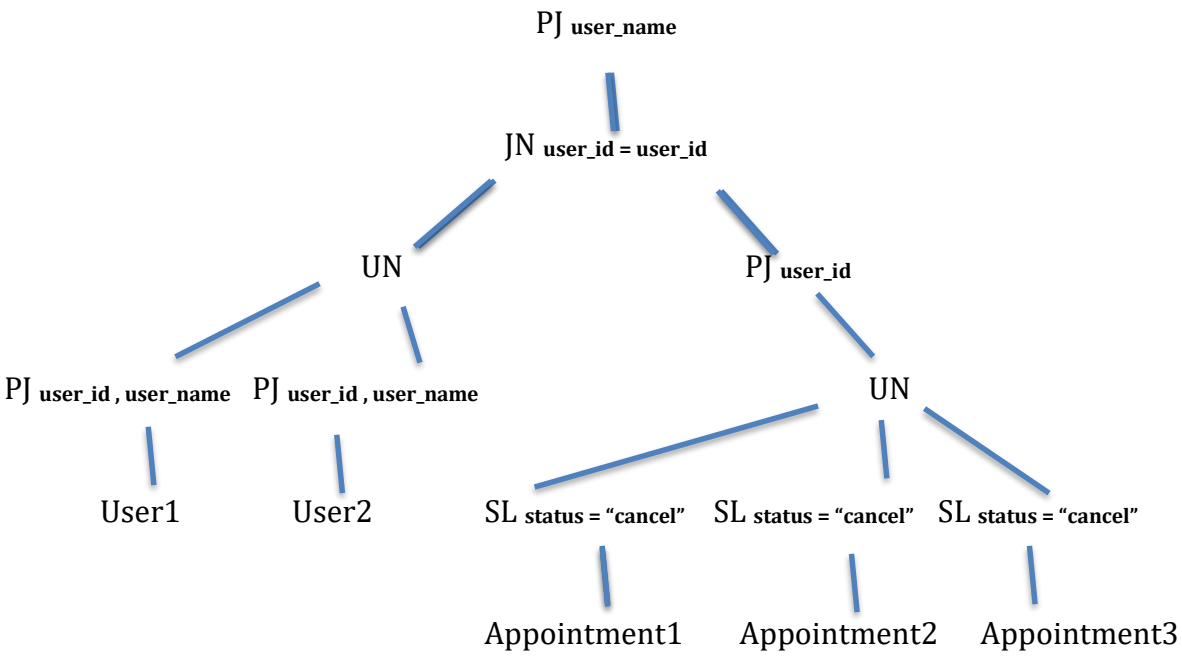
Q: PJ **user_name** UserTable JN **user_id = user_id** PJ **user_id** SL **status = "cancel"** Appointment



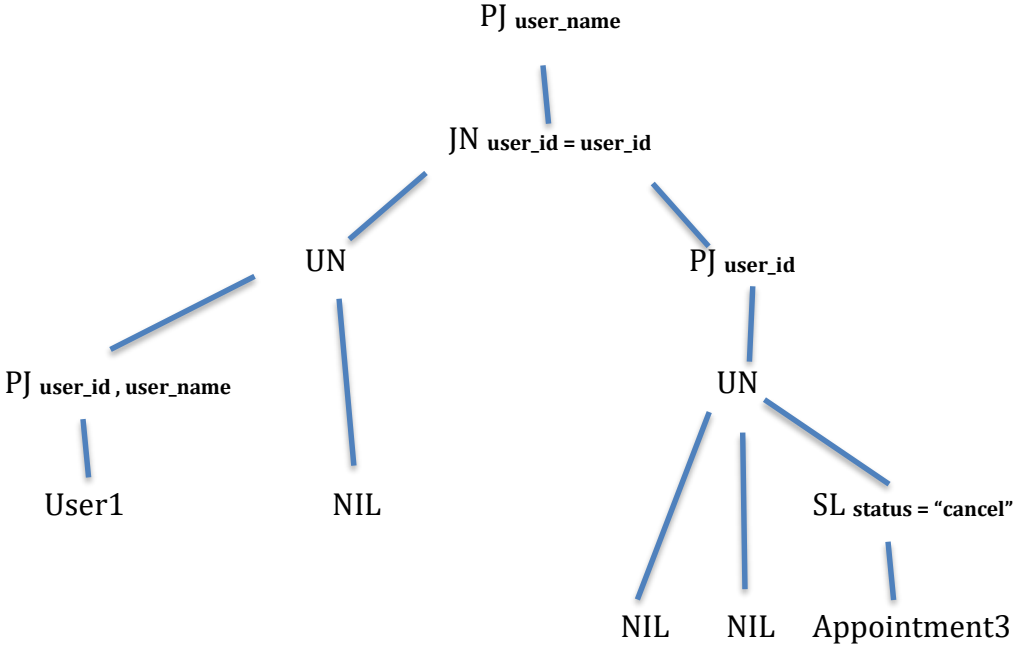

**<u>Using Canonical Expression</u>**



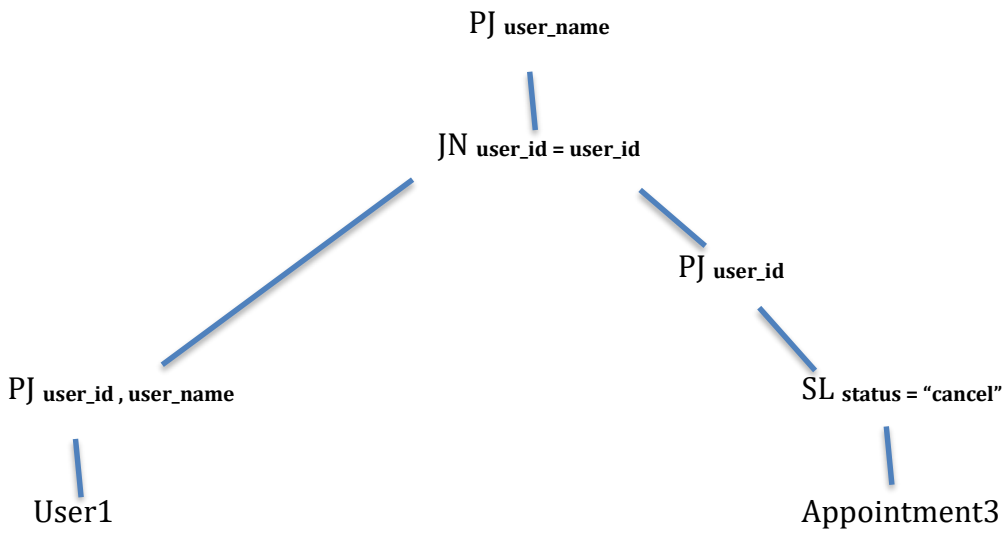
## Applying Cr-1 and Cr-2




## Applying Algebra of Qualified Relation



**Applying Cr-3**




Simplified Q : PJ **user_name** (PJ **user_id,user_name** User1 JN **user_id = user_id** PJ **user_id** SL **status = "cancel"** Appointment3)

## Update Operation

### U1 : Update recep_type to Part Time from Receptionist whose recep_id is 1

The data is in Receptionist1 fragment.

Receptionist1

| recep_id | recep_type | work_start | work_end |
|---|---|---|---|
| 1 | 'full-time' | '09:00:00' | '17:00:00' |

We have to copy this data to Receptionist2 which is horizontally fragmented with Part Time receptionist except the recep_type which will be Pert time then we will delete the data from Receptionist1

Receptionist2

| recep_id | recep_type | work_start | work_end |
|---|---|---|---|
| 1 | 'part-time' | '09:00:00' | '17:00:00' |

**U2 : Update status to confirm from Appointment whose appoint_id is 2**

The data is in Appointment2 fragment.

Appointment2

| appoint_id | user_id | doc_id | appoint_time | status |
|---|---|---|---|---|
| 2 | 3 | 5 | 20:00:00 | pending |

We have to now copy it from Appointment2 to Appointment1 change the status to confirm then delete it from Appointment2

Appointment1

| appoint_id | user_id | doc_id | appoint_time | Status |
|---|---|---|---|---|
| 2 | 3 | 5 | 20:00:00 | Confirm |

## Semi Join

For the semi join application we have made a global join and break it into semi join

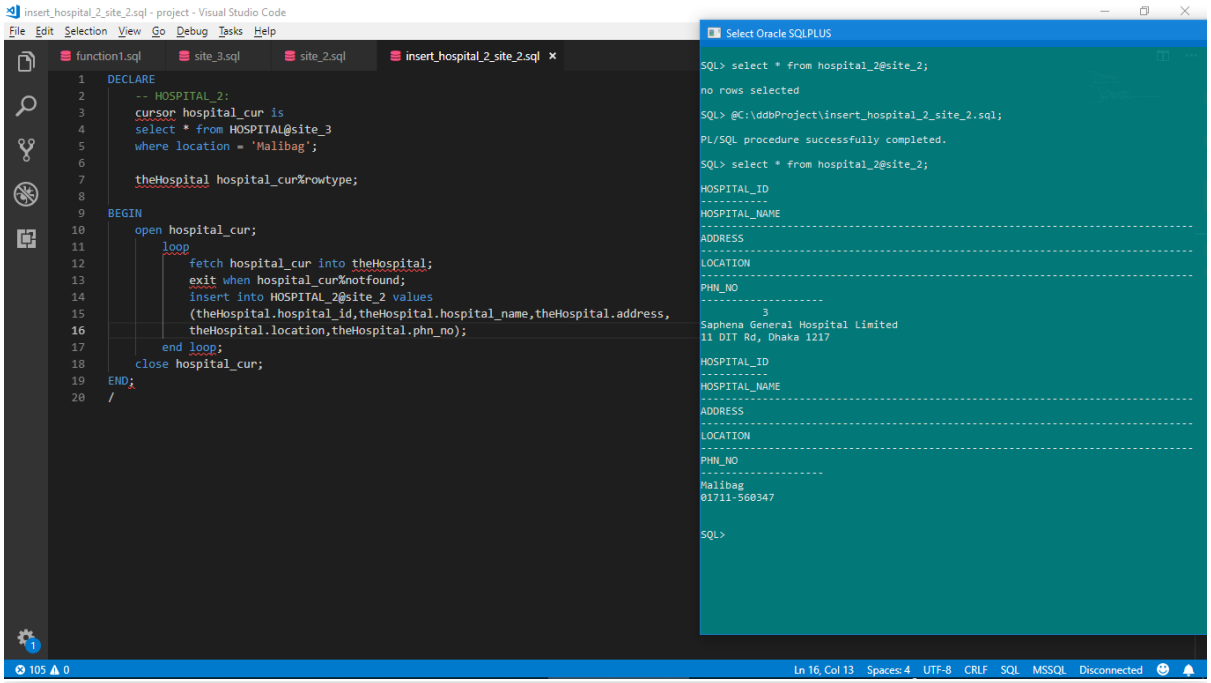
Global Join : PJ **doctor_name** Doctor JN **hos_id = hos_id** Hospital

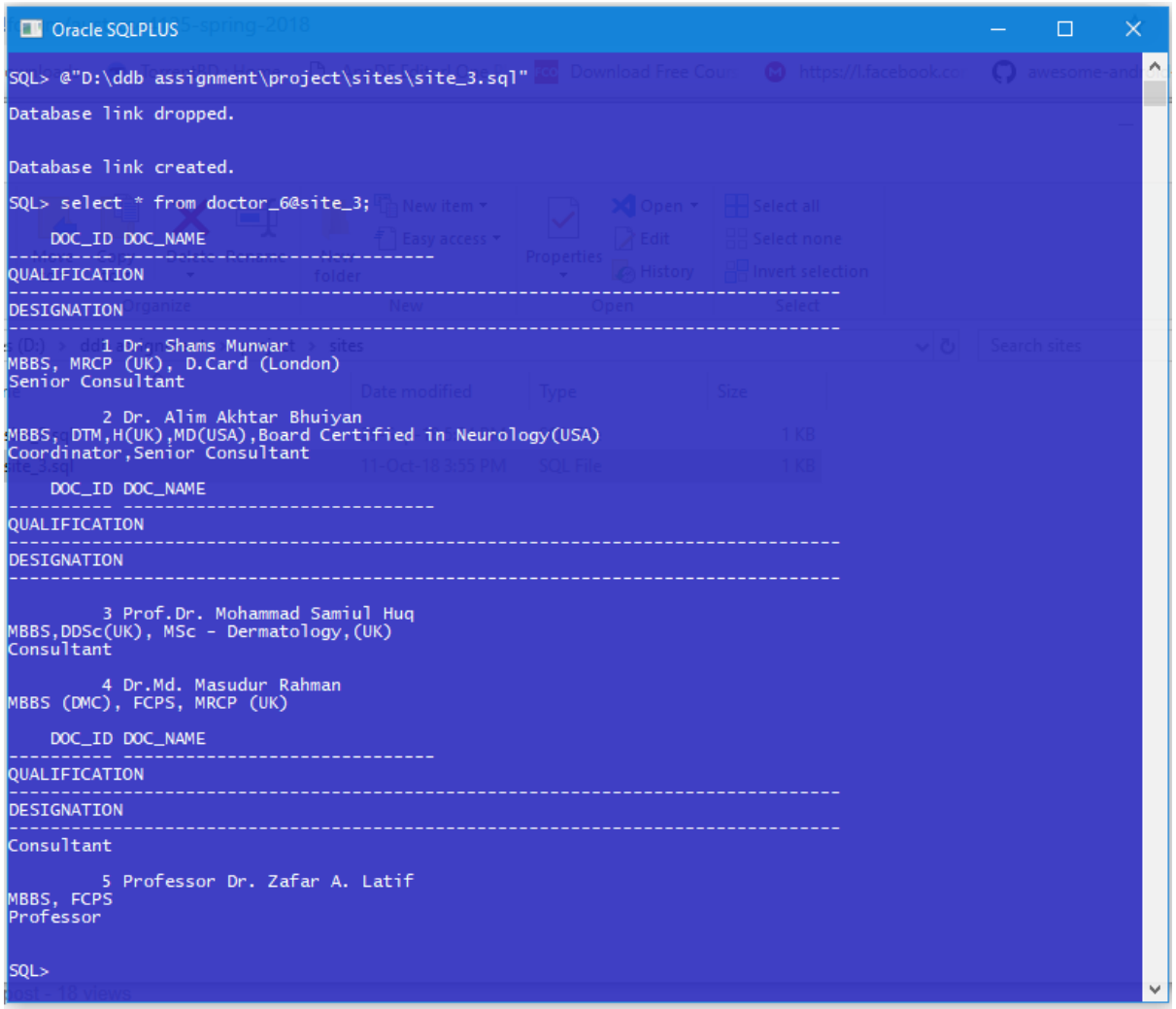
Semi Join : PJ **doc_name** Doctor JN (Hospital SJ **hospital3.hos_id = Doctor3.hos_id** (PJ **hos_id** Doctor)

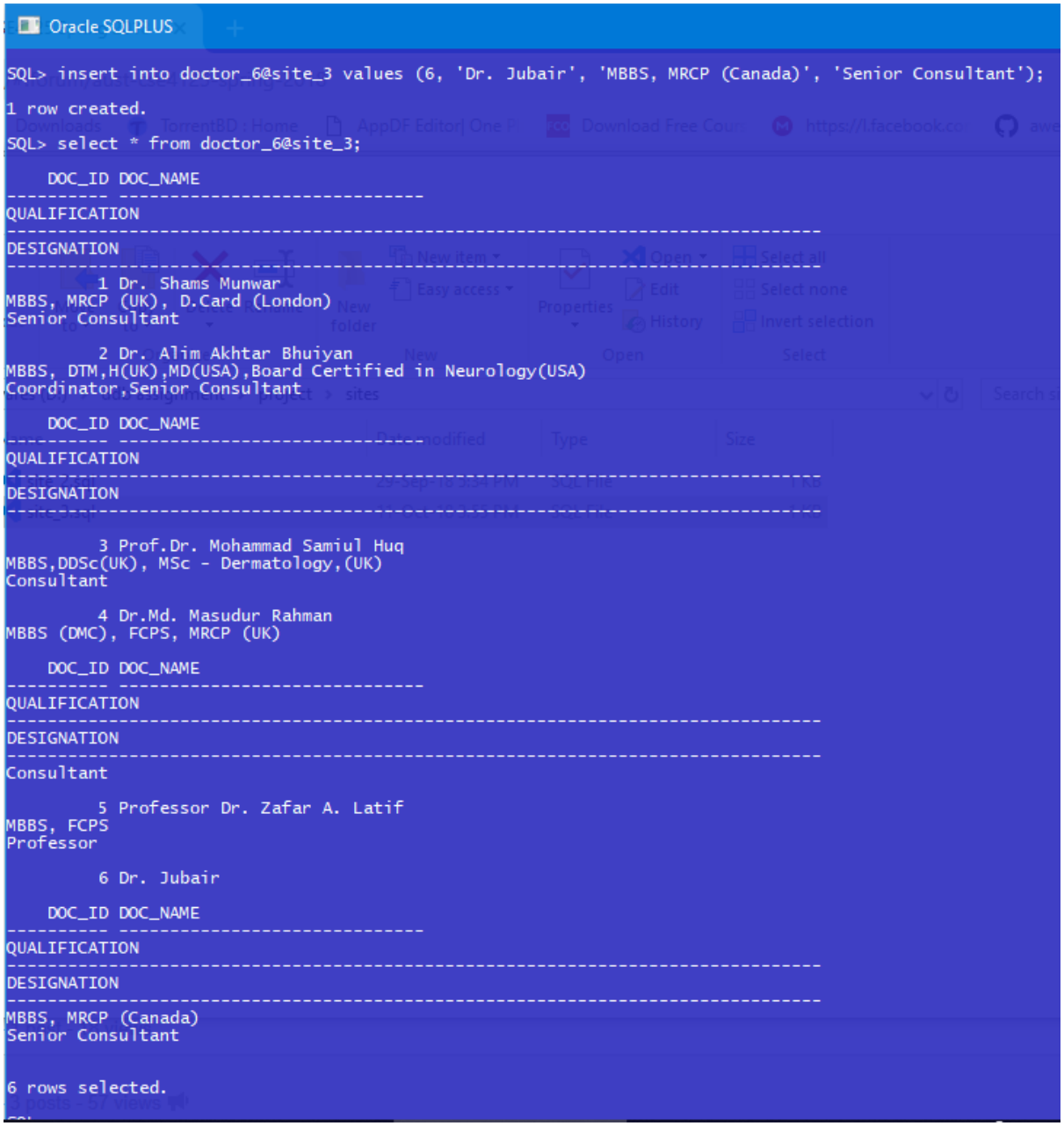
## Database Trigger

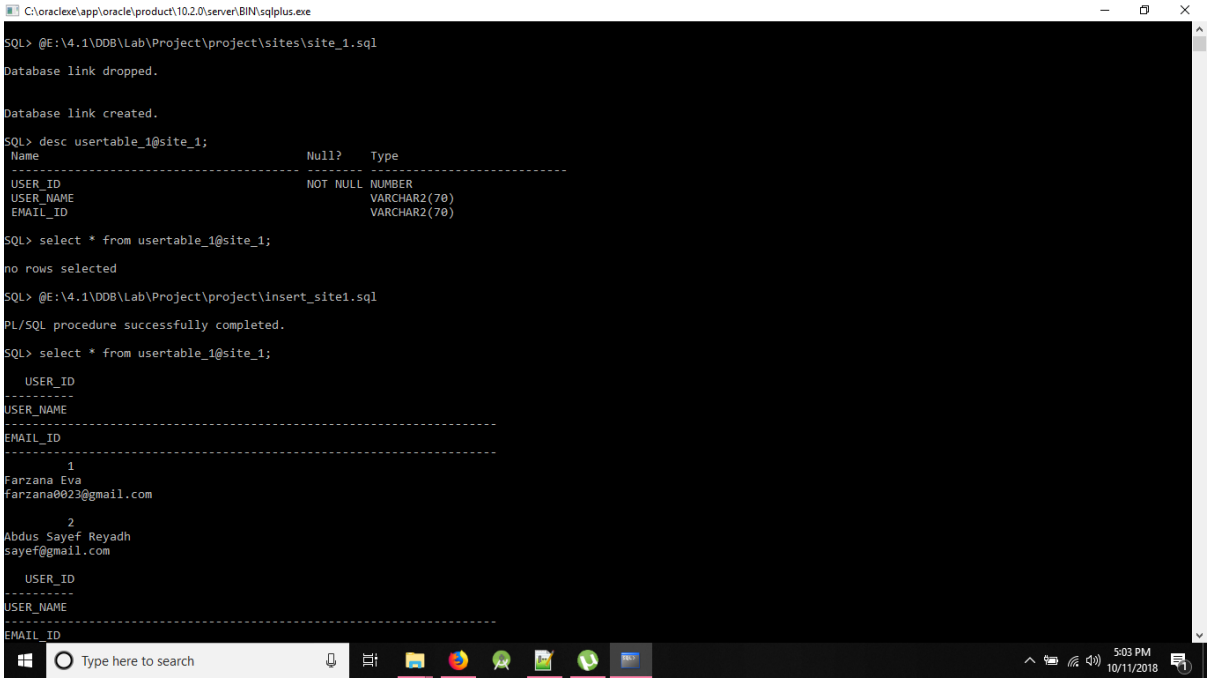
We have made a trigger for receptionist if any receptionist start_time and end_time is invalid format than it will trigger as invalid date and time format.

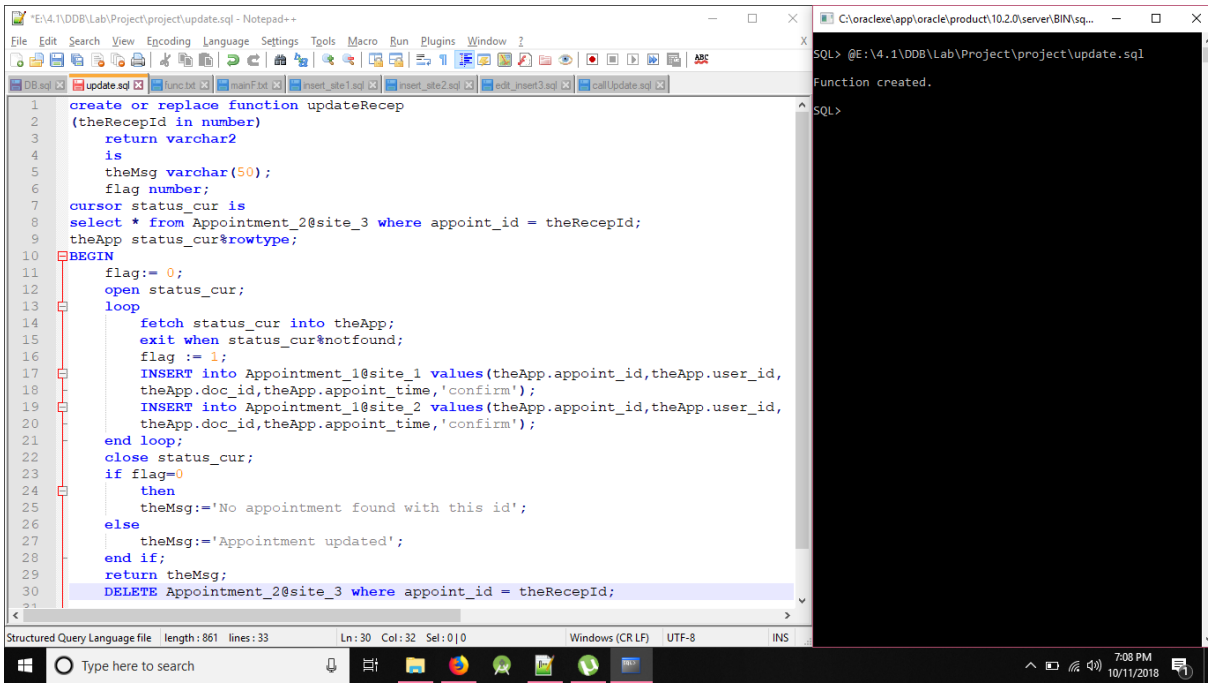
# Screenshots of Project

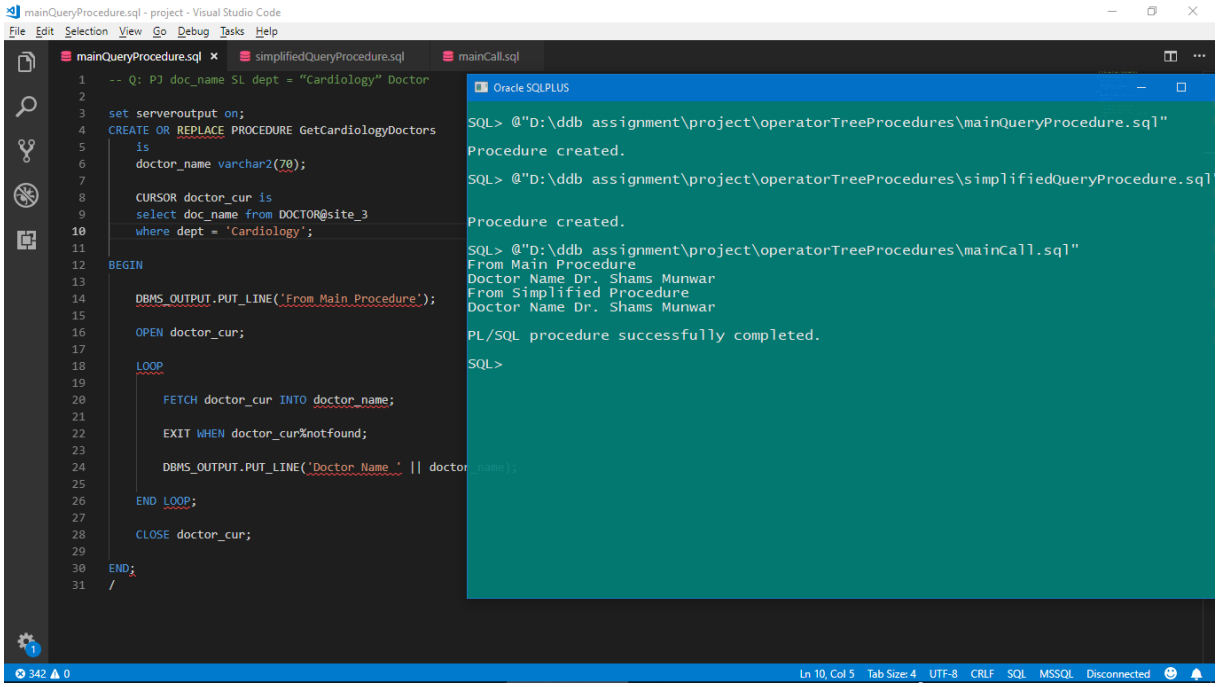

insert_hospital_2_site_2.sql - project - Visual Studio Code
File Edit Selection View Go Debug Tasks Help
function1.sql
site_3.sql
site_2.sql
insert_hospital_2_site_2.sql
DECLARE
-- HOSPITAL_2:
cursor hospital_cur is
select * from HOSPITAL@site_3
where location = 'Malibag';
theHospital hospital_cur%rowtype;
BEGIN
open hospital_cur;
loop
fetch hospital_cur into theHospital;
exit when hospital_cur%notfound;
insert into HOSPITAL_2@site_2 values
(theHospital.hospital_id,theHospital.hospital_name,theHospital.address,
theHospital.location,theHospital.phn_no);
end loop;
close hospital_cur;
END;
/
Select Oracle SQLPLUS
SQL> select * from hospital_2@site_2;
no rows selected
SQL> @C:\ddbProject\insert_hospital_2_site_2.sql;
PL/SQL procedure successfully completed.
SQL> select * from hospital_2@site_2;
HOSPITAL_ID
HOSPITAL_NAME
ADDRESS
LOCATION
PHN_NO
3
Saphena General Hospital Limited
11 DIT Rd, Dhaka 1217
HOSPITAL_ID
HOSPITAL_NAME
ADDRESS
LOCATION
PHN_NO
Malibag
01711-560347
SQL>
105 0
Ln 16, Col 13 Spaces: 4 UTF-8 CRLF SQL MSSQL Disconnected

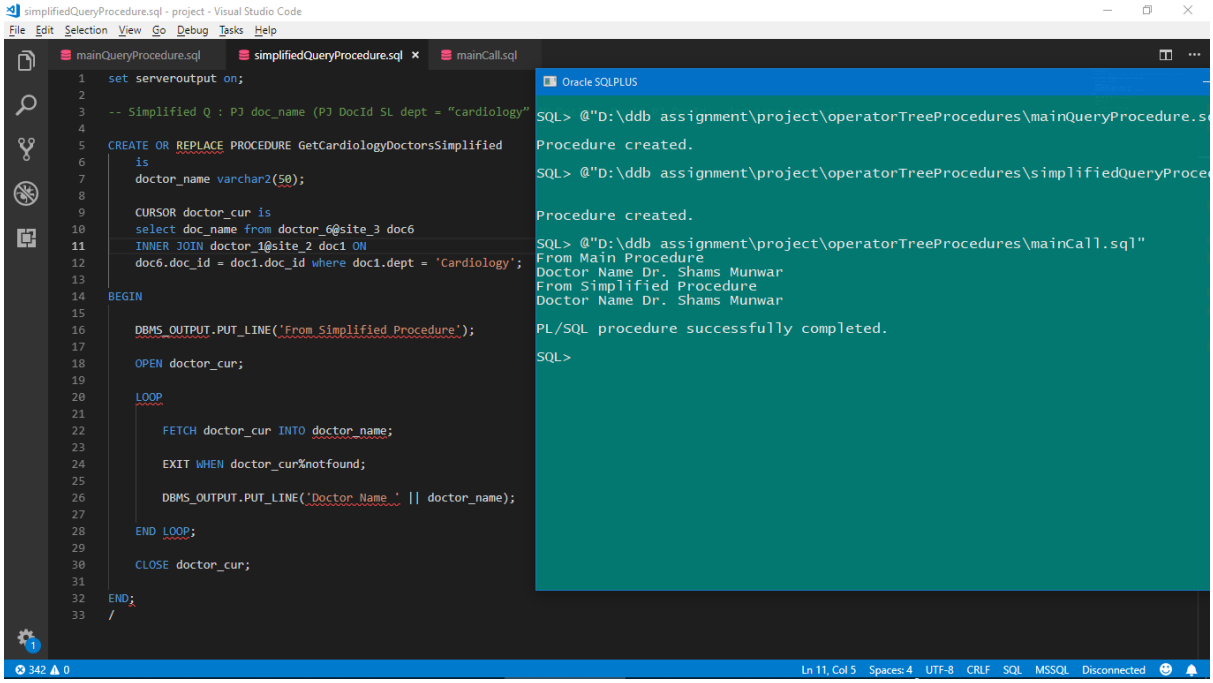

Oracle SQLPLUS
SQL> @"D:\ddb assignment\project\sites\site_3.sql"
Database link dropped.
Database link created.
SQL> select * from doctor_6@site_3;
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
1 Dr. Shams Munwar
MBBS, MRCP (UK), D.Card (London)
Senior Consultant
2 Dr. Alim Akhtar Bhuiyan
MBBS, DTM,H(UK),MD(USA),Board Certified in Neurology(USA)
Coordinator,Senior Consultant
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
3 Prof.Dr. Mohammad Samiul Huq
MBBS,DDSc(UK), MSc - Dermatology,(UK)
Consultant
4 Dr.Md. Masudur Rahman
MBBS (DMC), FCPS, MRCP (UK)
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
Consultant
5 Professor Dr. Zafar A. Latif
MBBS, FCPS
Professor
SQL>

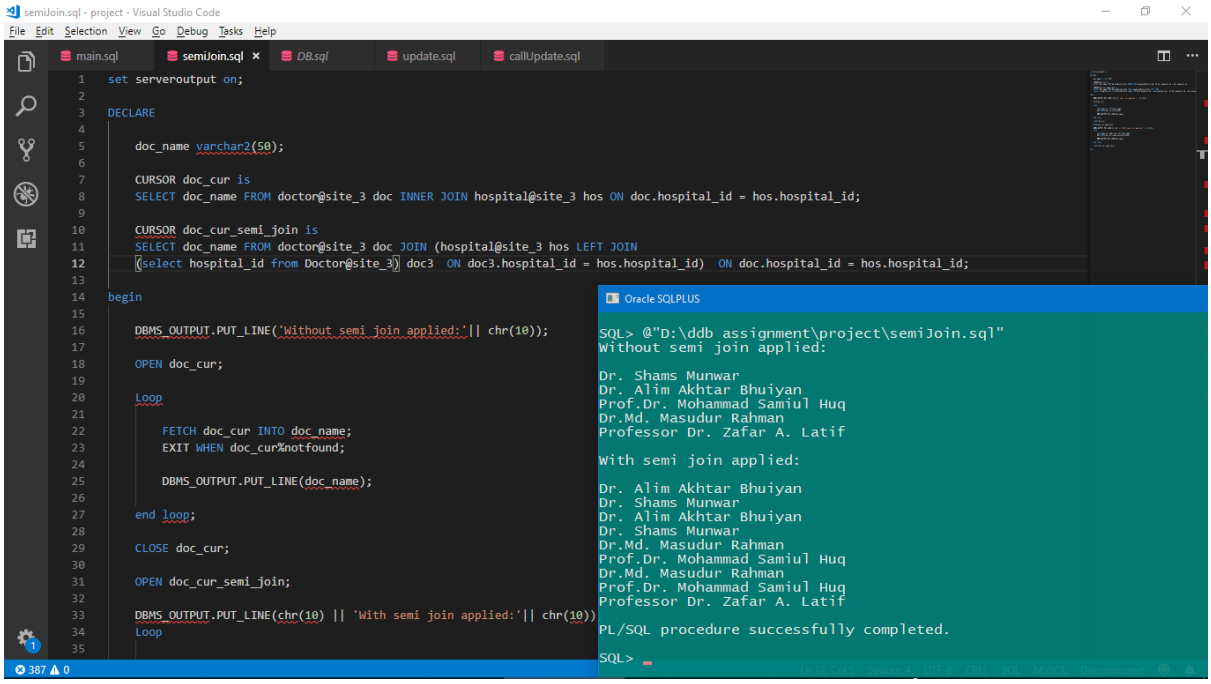

Oracle SQLPLUS
SQL> insert into doctor_6@site_3 values (6, 'Dr. Jubair', 'MBBS, MRCP (Canada)', 'Senior Consultant');
1 row created.
SQL> select * from doctor_6@site_3;
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
1 Dr. Shams Munwar
MBBS, MRCP (UK), D.Card (London)
Senior Consultant
2 Dr. Alim Akhtar Bhuiyan
MBBS, DTM,H(UK),MD(USA),Board Certified in Neurology(USA)
Coordinator,Senior Consultant
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
3 Prof.Dr. Mohammad Samiul Huq
MBBS,DDSc(UK), MSc - Dermatology,(UK)
Consultant
4 Dr.Md. Masudur Rahman
MBBS (DMC), FCPS, MRCP (UK)
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
Consultant
5 Professor Dr. Zafar A. Latif
MBBS, FCPS
Professor
6 Dr. Jubair
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
MBBS, MRCP (Canada)
Senior Consultant
6 rows selected.


C:\oraclexe\app\oracle\product\10.2.0\server\BIN\sqlplus.exe
SQL> @E:\4.1\DDB\Lab\Project\project\sites\site_1.sql
Database link dropped.
Database link created.
SQL> desc usertable_1@site_1;
Name Null? Type
USER_ID NOT NULL NUMBER
USER_NAME VARCHAR2(70)
EMAIL_ID VARCHAR2(70)
SQL> select * from usertable_1@site_1;
no rows selected
SQL> @E:\4.1\DDB\Lab\Project\project\insert_site1.sql
PL/SQL procedure successfully completed.
SQL> select * from usertable_1@site_1;
USER_ID
USER_NAME
EMAIL_ID
1
Farzana Eva
farzana0023@gmail.com
2
Abdus Sayef Reyadh
sayef@gmail.com
Type here to search
5:03 PM
10/11/2018


*E:\4.1\DDB\Lab\Project\project\update.sql - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
DB.sql update.sql func.txt mainF.txt insert_site1.sql insert_site2.sql edit_insert3.sql callUpdate.sql
create or replace function updateRecep
(theRecepId in number)
return varchar2
is
theMsg varchar(50);
flag number;
cursor status_cur is
select * from Appointment_2@site_3 where appoint_id = theRecepId;
theApp status_cur%rowtype;
BEGIN
flag:= 0;
open status_cur;
loop
fetch status_cur into theApp;
exit when status_cur%notfound;
flag := 1;
INSERT into Appointment_1@site_1 values(theApp.appoint_id,theApp.user_id,
theApp.doc_id,theApp.appoint_time,'confirm');
INSERT into Appointment_1@site_2 values(theApp.appoint_id,theApp.user_id,
theApp.doc_id,theApp.appoint_time,'confirm');
end loop;
close status_cur;
if flag=0
then
theMsg:='No appointment found with this id';
else
theMsg:='Appointment updated';
end if;
return theMsg;
DELETE Appointment_2@site_3 where appoint_id = theRecepId;
Structured Query Language file length : 861 lines : 33
Ln : 30 Col : 32 Sel : 0 | 0
Windows (CR LF) UTF-8 INS
C:\oraclexe\app\oracle\product\10.2.0\server\BIN\sq...
SQL> @E:\4.1\DDB\Lab\Project\project\update.sql
Function created.
SQL>
Type here to search
7:08 PM
10/11/2018


mainQueryProcedure.sql - project - Visual Studio Code
File Edit Selection View Go Debug Tasks Help
mainQueryProcedure.sql
simplifiedQueryProcedure.sql
mainCall.sql
-- Q: PJ doc_name SL dept = "Cardiology" Doctor
set serveroutput on;
CREATE OR REPLACE PROCEDURE GetCardiologyDoctors
is
doctor_name varchar2(70);
CURSOR doctor_cur is
select doc_name from DOCTOR@site_3
where dept = 'Cardiology';
BEGIN
DBMS_OUTPUT.PUT_LINE('From Main Procedure');
OPEN doctor_cur;
LOOP
FETCH doctor_cur INTO doctor_name;
EXIT WHEN doctor_cur%notfound;
DBMS_OUTPUT.PUT_LINE('Doctor Name ' || doctor_name);
END LOOP;
CLOSE doctor_cur;
END;
/
Oracle SQLPLUS
SQL> @"D:\ddb assignment\project\operatorTreeProcedures\mainQueryProcedure.sql"
Procedure created.
SQL> @"D:\ddb assignment\project\operatorTreeProcedures\simplifiedQueryProcedure.sql
Procedure created.
SQL> @"D:\ddb assignment\project\operatorTreeProcedures\mainCall.sql"
From Main Procedure
Doctor Name Dr. Shams Munwar
From Simplified Procedure
Doctor Name Dr. Shams Munwar
PL/SQL procedure successfully completed.
SQL>
342 0
Ln 10, Col 5 Tab Size: 4 UTF-8 CRLF SQL MSSQL Disconnected


simplifiedQueryProcedure.sql - project - Visual Studio Code
File Edit Selection View Go Debug Tasks Help
mainQueryProcedure.sql
simplifiedQueryProcedure.sql
mainCall.sql
set serveroutput on;
-- Simplified Q : PJ doc_name (PJ DocId SL dept = "cardiology"
CREATE OR REPLACE PROCEDURE GetCardiologyDoctorsSimplified
is
doctor_name varchar2(50);
CURSOR doctor_cur is
select doc_name from doctor_6@site_3 doc6
INNER JOIN doctor_1@site_2 doc1 ON
doc6.doc_id = doc1.doc_id where doc1.dept = 'Cardiology';
BEGIN
DBMS_OUTPUT.PUT_LINE('From Simplified Procedure');
OPEN doctor_cur;
LOOP
FETCH doctor_cur INTO doctor_name;
EXIT WHEN doctor_cur%notfound;
DBMS_OUTPUT.PUT_LINE('Doctor Name ' || doctor_name);
END LOOP;
CLOSE doctor_cur;
END;
/
Oracle SQLPLUS
SQL> @"D:\ddb assignment\project\operatorTreeProcedures\mainQueryProcedure.s
Procedure created.
SQL> @"D:\ddb assignment\project\operatorTreeProcedures\simplifiedQueryProce
Procedure created.
SQL> @"D:\ddb assignment\project\operatorTreeProcedures\mainCall.sql"
From Main Procedure
Doctor Name Dr. Shams Munwar
From Simplified Procedure
Doctor Name Dr. Shams Munwar
PL/SQL procedure successfully completed.
SQL>
342 0
Ln 11, Col 5 Spaces: 4 UTF-8 CRLF SQL MSSQL Disconnected

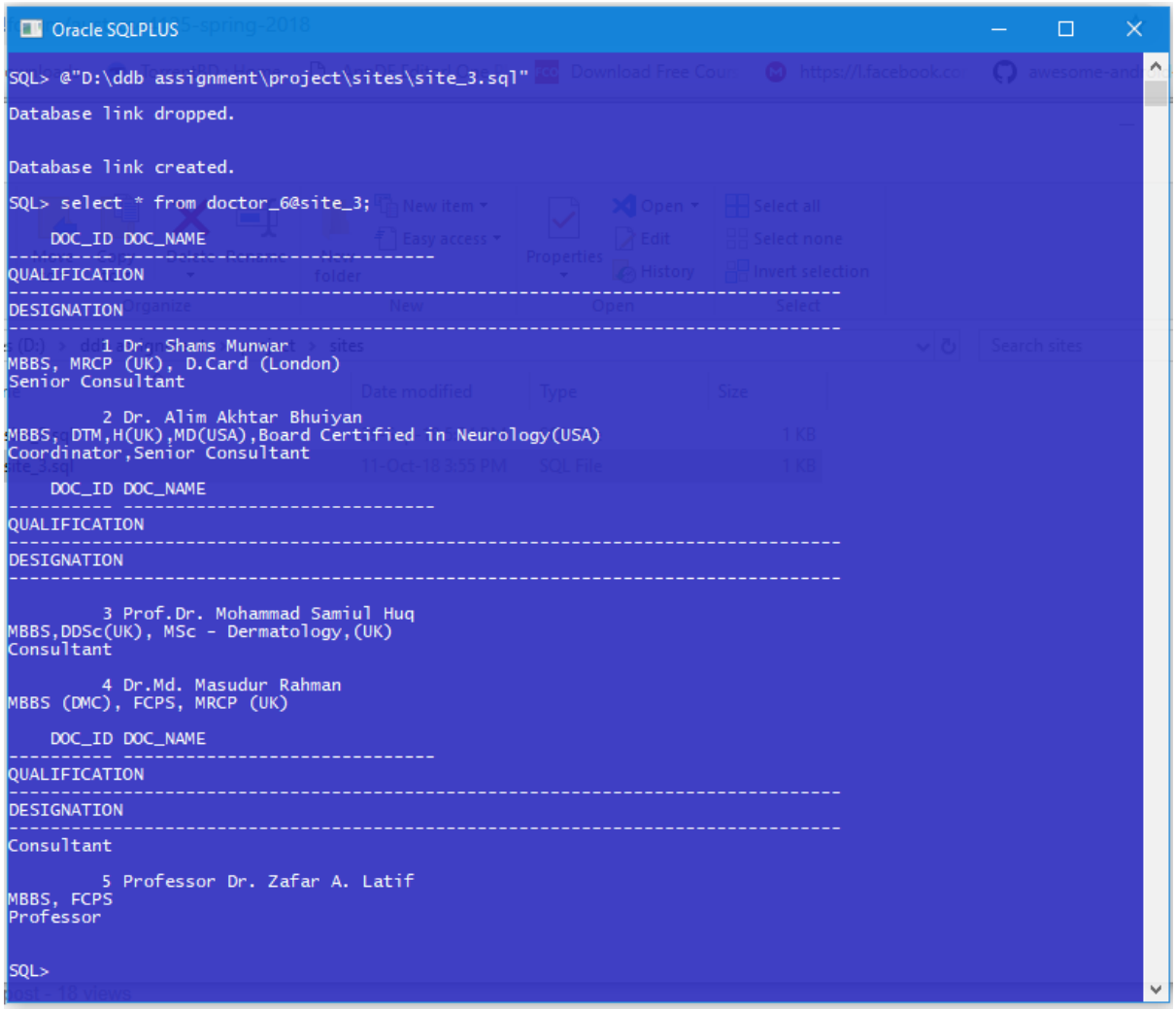


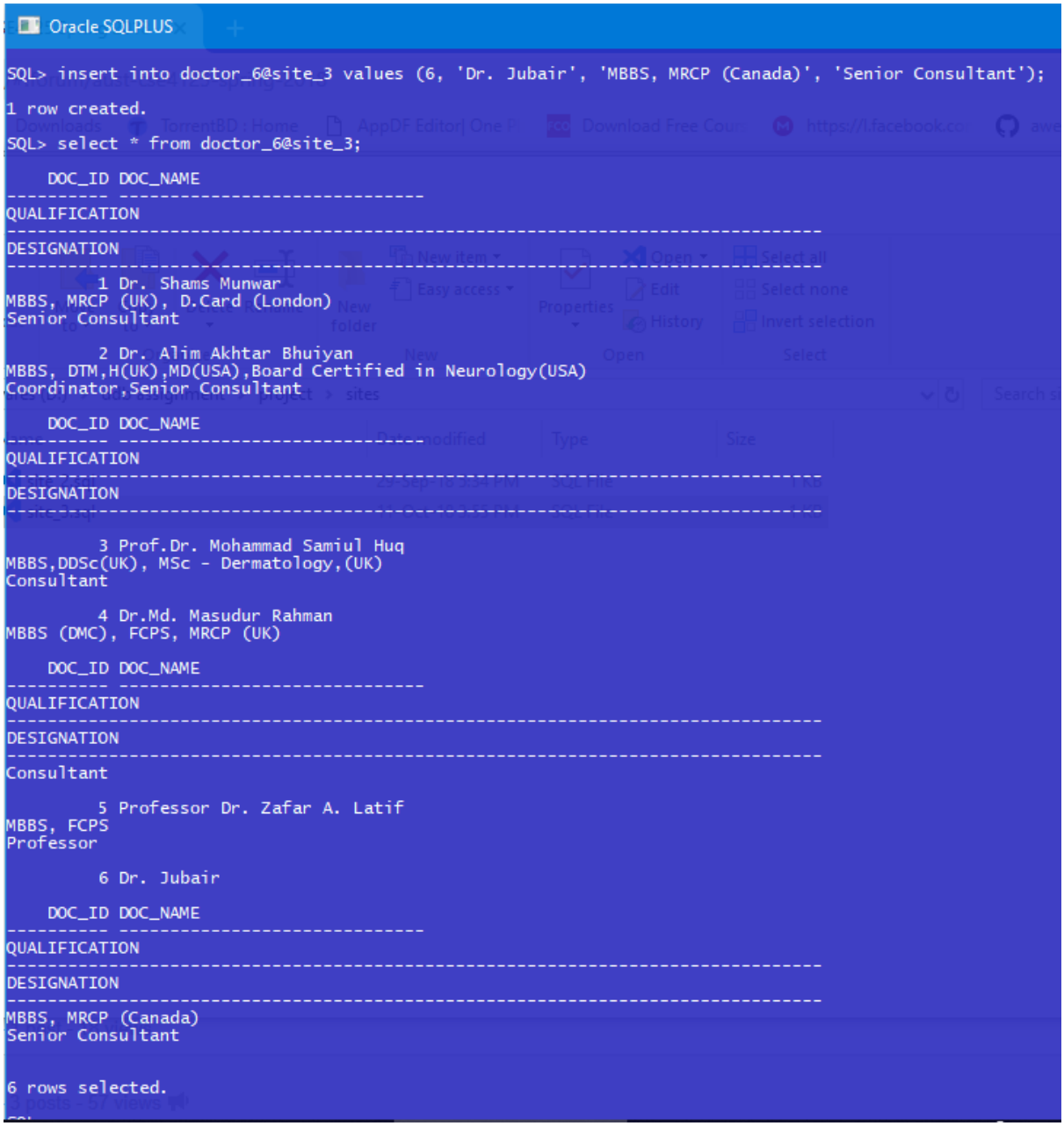

# Contribution and My Thoughts

We tried our best in completing the project as much as possible. We lag behind in some aspects such as good idea for the purpose of creating the project. The main challenge was connecting between multiple sites. We have faced numerous times when a certain part run well on the first run but when we try to run it again it failed with rollback. This may lead to my conclusion we lack some software expertise in this manner. We have tried to implement several distributed concepts in the project. We failed to implement the machine learning aspect in the project. As for my part I contributed in creating the database, making multiple dummy data insert, creating some functions and procedure. Also I have done the below things:

**CREATING SITE_3 Fragment:**

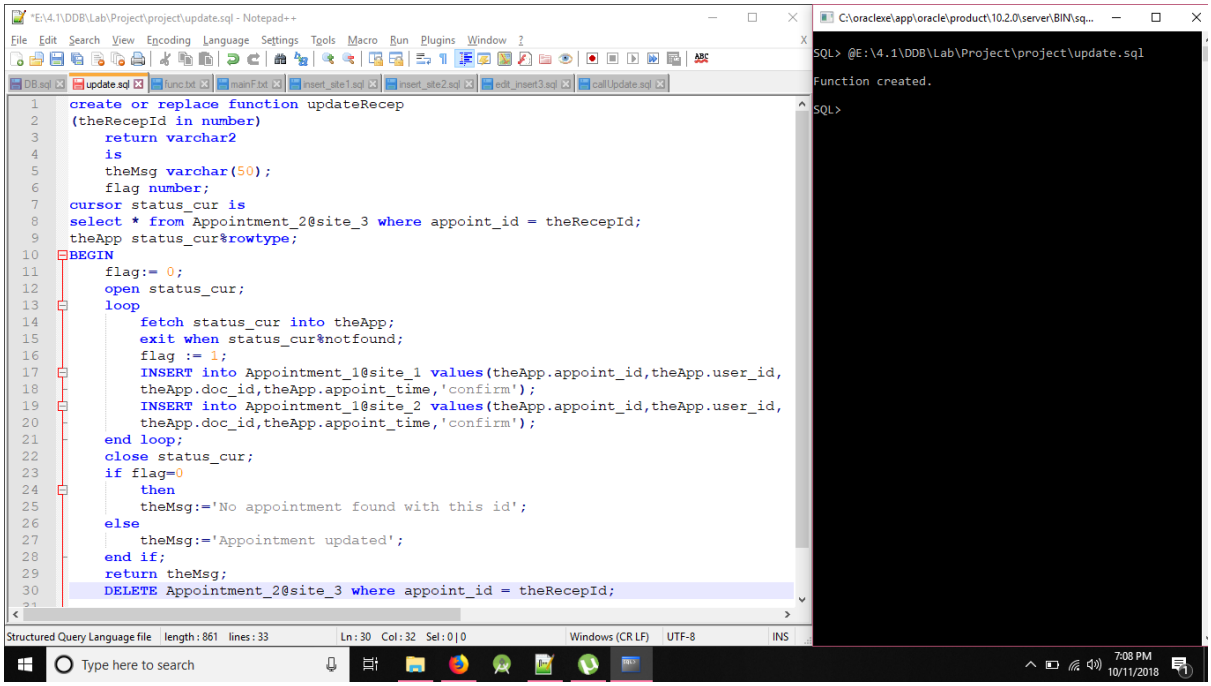
I created all fragments of site_3. Some screenshots are given below of fragments:


Oracle SQLPLUS
SQL> @"D:\ddb assignment\project\sites\site_3.sql"
Database link dropped.
Database link created.
SQL> select * from doctor_6@site_3;
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
1 Dr. Shams Munwar
MBBS, MRCP (UK), D.Card (London)
Senior Consultant
2 Dr. Alim Akhtar Bhuiyan
MBBS, DTM,H(UK),MD(USA),Board Certified in Neurology(USA)
Coordinator,Senior Consultant
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
3 Prof.Dr. Mohammad Samiul Huq
MBBS,DDSc(UK), MSc - Dermatology,(UK)
Consultant
4 Dr.Md. Masudur Rahman
MBBS (DMC), FCPS, MRCP (UK)
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
Consultant
5 Professor Dr. Zafar A. Latif
MBBS, FCPS
Professor
SQL>



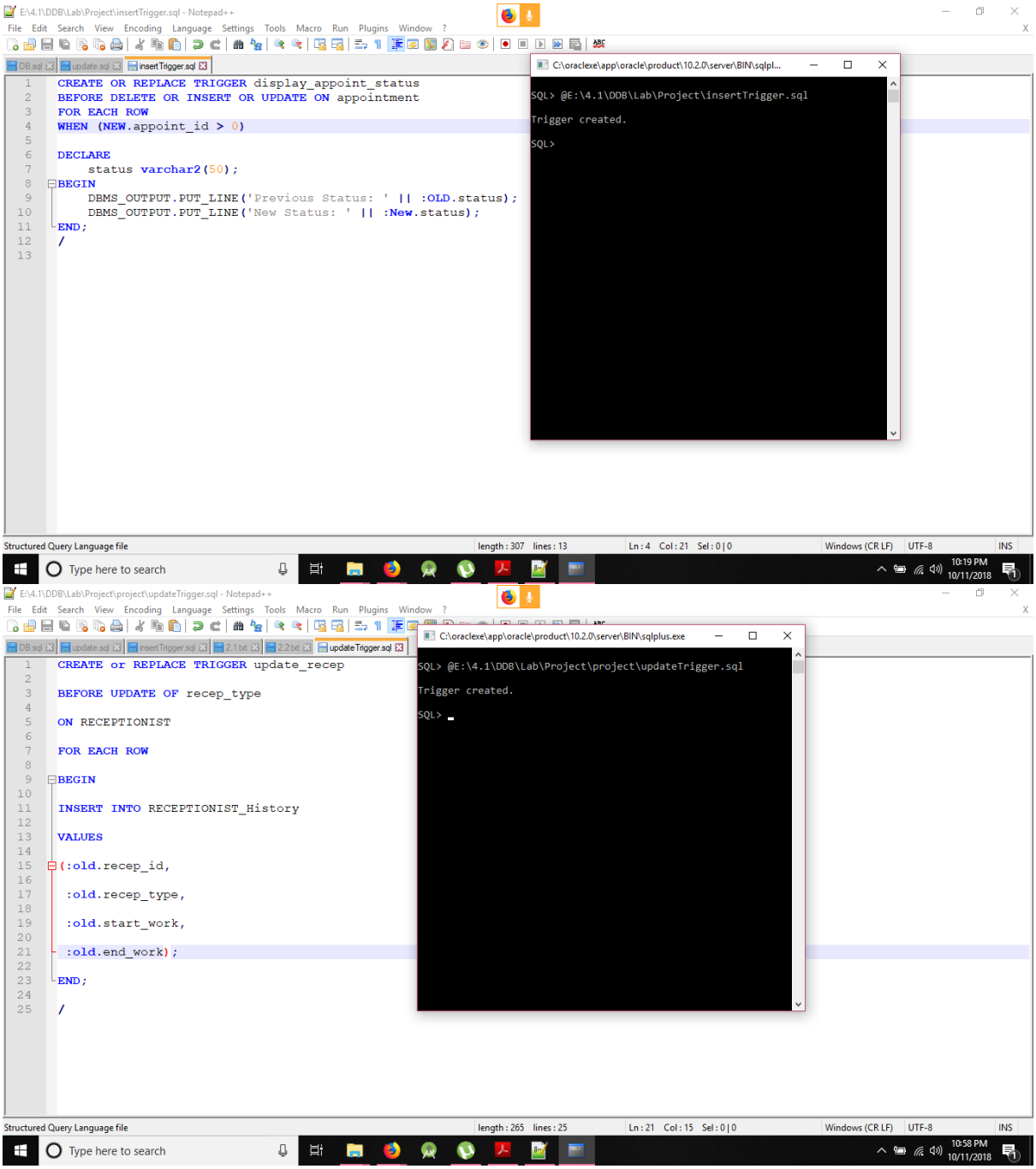

### Level – 3 Distribution Transparency

I have done update effect of our project at level 3 distribution Transparency.




## CREATING TRIGGER

I have created 2 trigger. One for update and other for insert.




# Conclusion

Nowadays information is in the pocket of a user. The number of smartphone users increasing rapidly in Bangladesh. According to the latest reports, there are 106 million active mobile phone subscribers in Bangladesh by 2016. As a rough estimate, we can assume that there are around 10 million smartphone users in Bangladesh. So if we could build a digital system for hospital management. Then users will find it convenient to

search for information on the web rather than traditional means like calling the hospital. We can see a society where a doctor rating system can be introduced and peoples can go to doctors without having to trouble of searching good doctors.