AHSANULLAH UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Computer Science & Engineering

Course Name: Distributed Database System Lab

Course No: CSE4126

Project Name: MedicAid

Submitted By

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Year : 4th

Semester : 1st

Section : C1

Tables of Contents

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

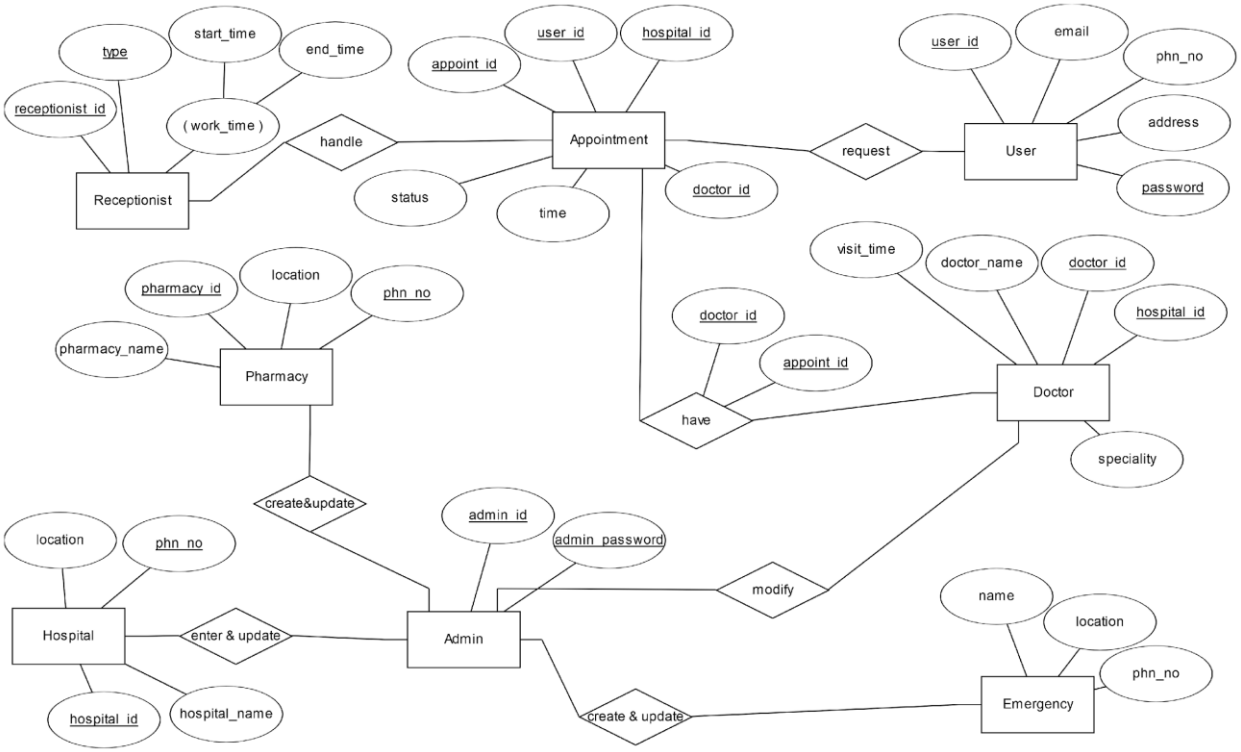
We propose to build a system where we are going to implement a distributed database system of a hospital management system. There will be a global database, and we will save some information from various sites. So that there is a co-current access with various users.

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, address, phn_no)
- 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.

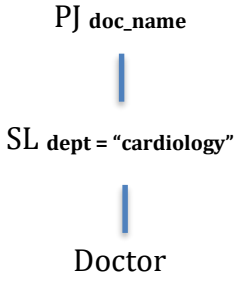
Functions

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.

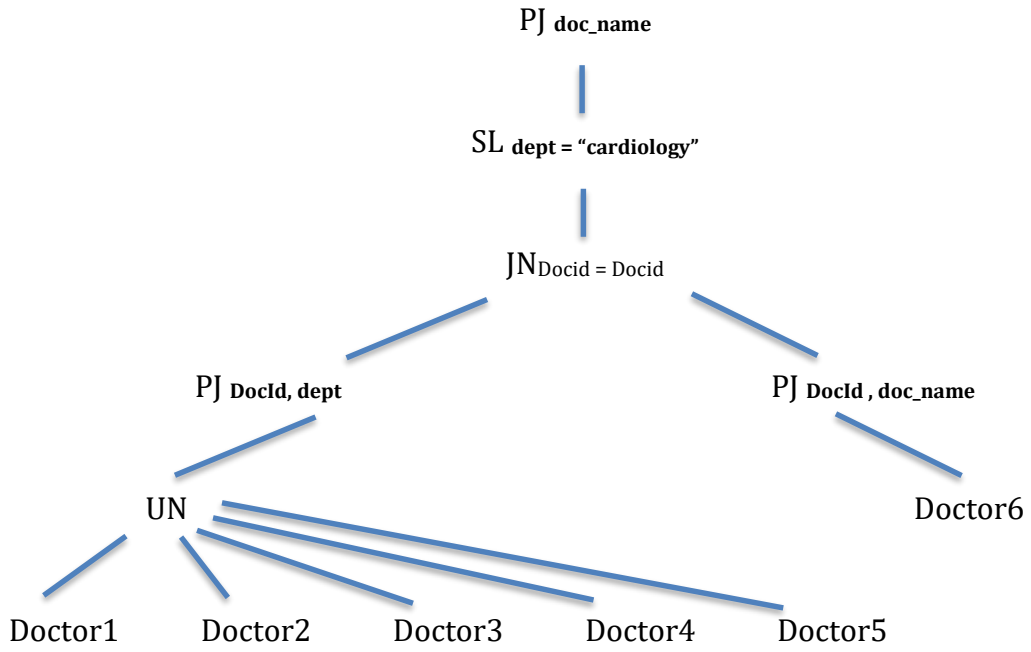
Operator Tree

Operator Tree - 1

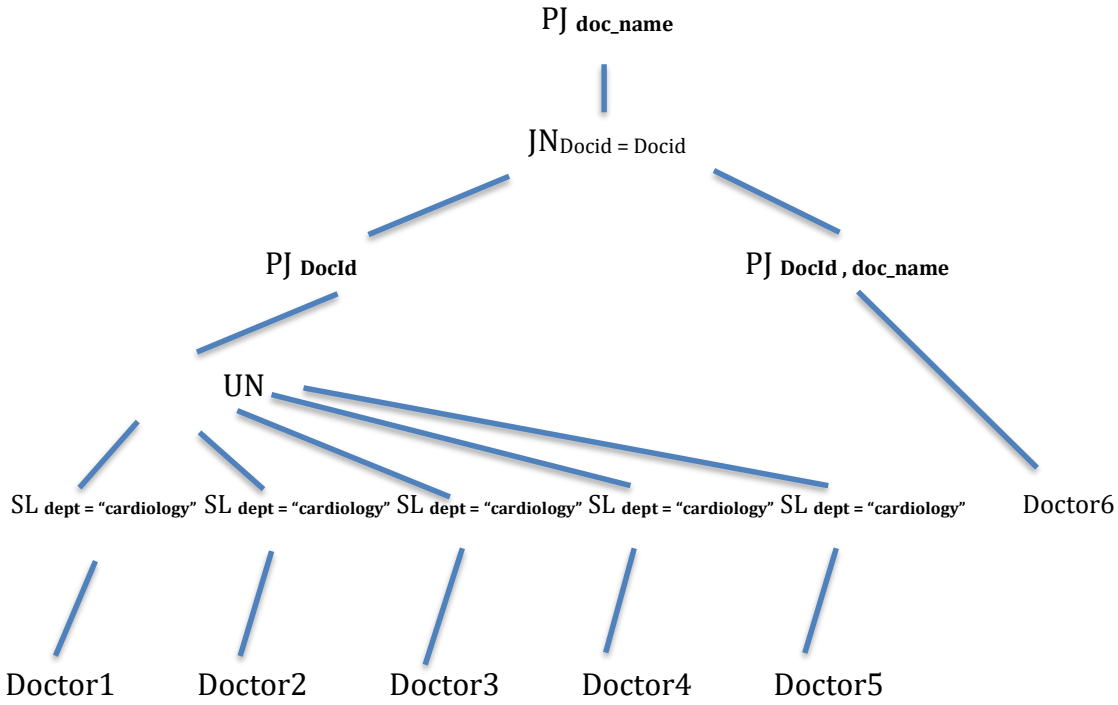
Q : PJ **doc_name** SL **dept = "cardiology"** Doctor



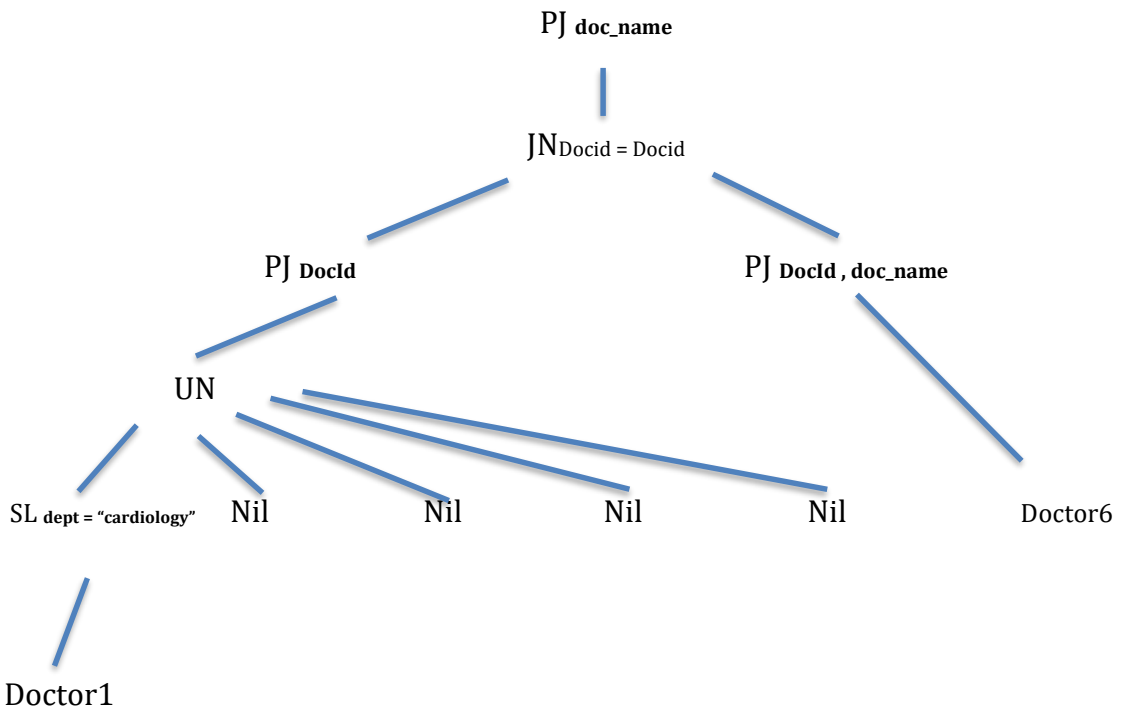
Using Canonical Expression



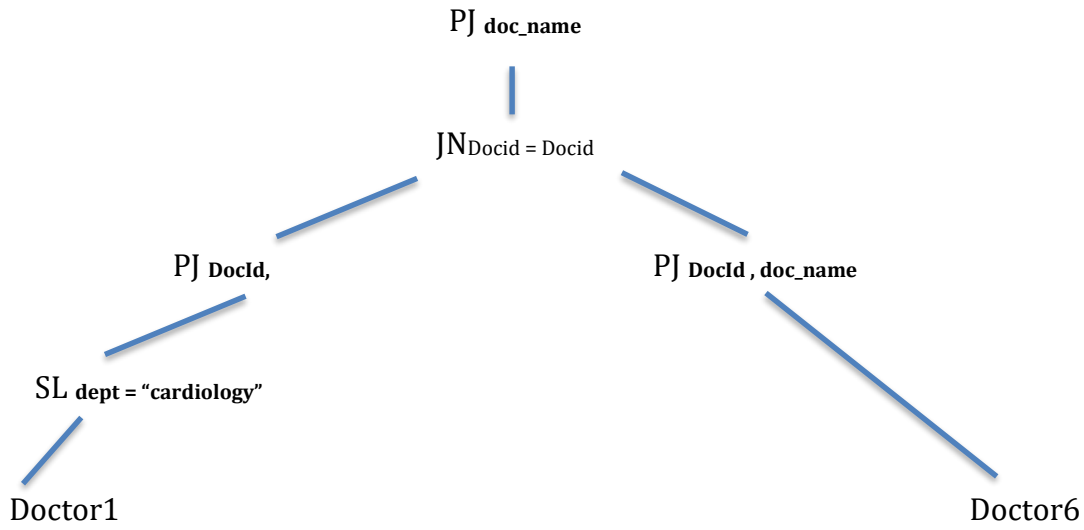
Applying Cr-1 and Cr-2



Applying Algebra of Qualified Relation



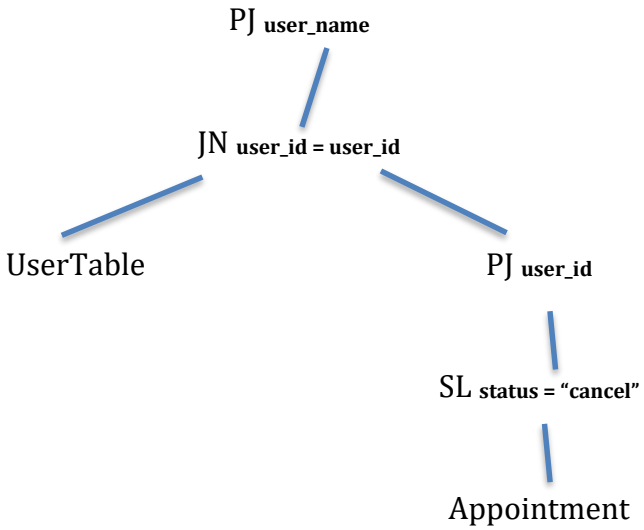
Applying Cr-3



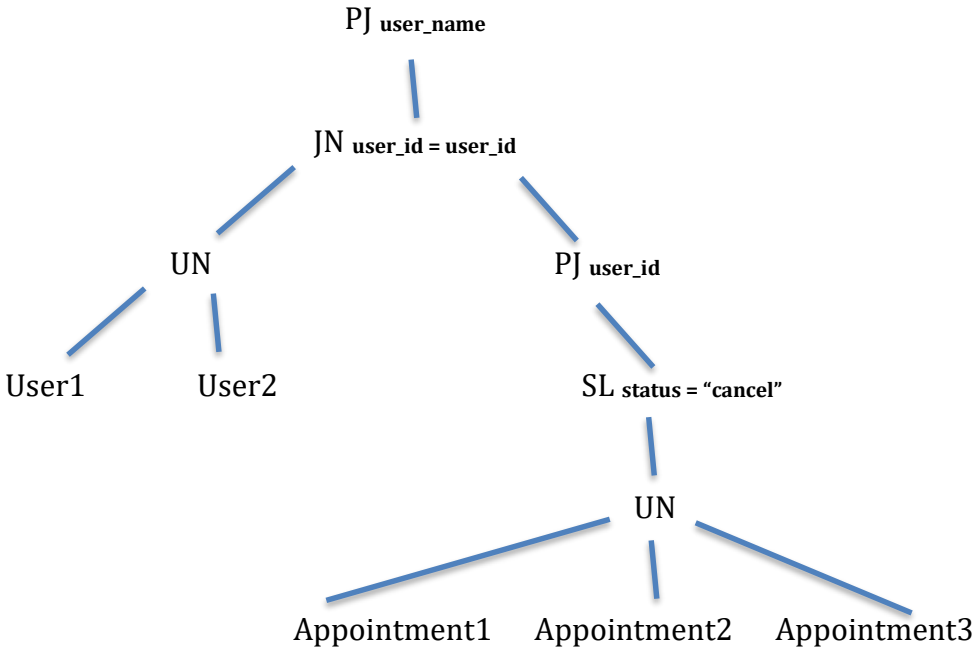
Simplified Q : PJ **doc_name** (PJ **DocId** SL **dept = "cardiology"** JN **DocId = DocId** PJ **DocId , doc_name** Doctor6)

Operator Tree - 2

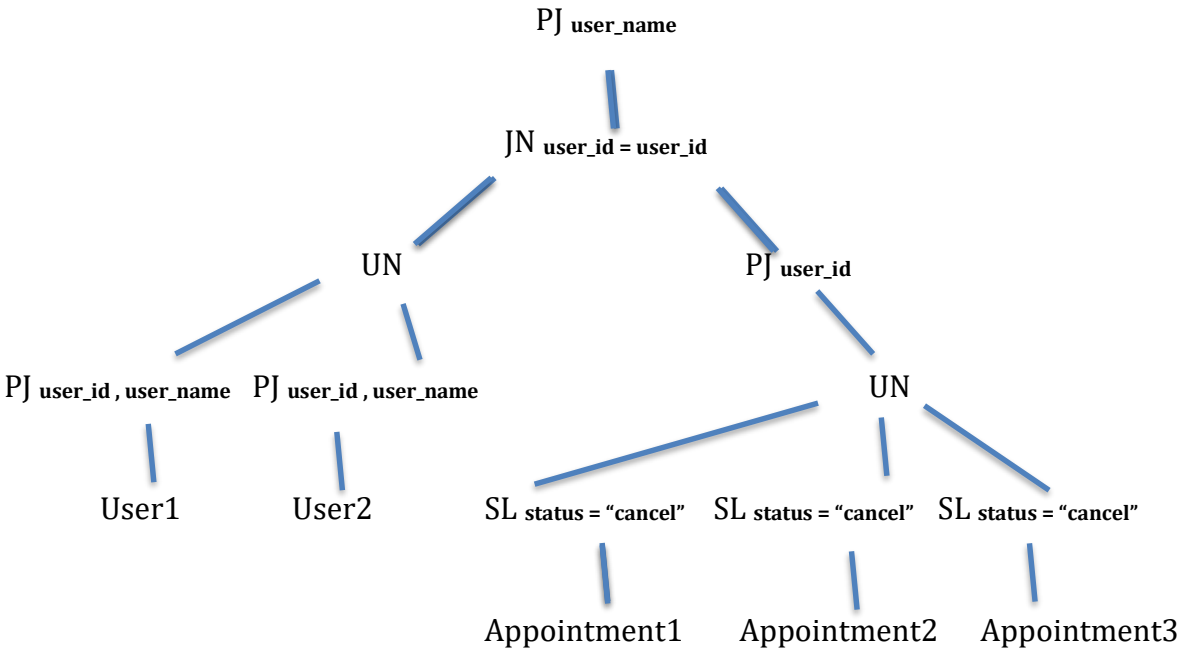
Q: PJ **user_name** UserTable JN **user_id = user_id** PJ **user_id** SL **status = "cancel"** Appointment



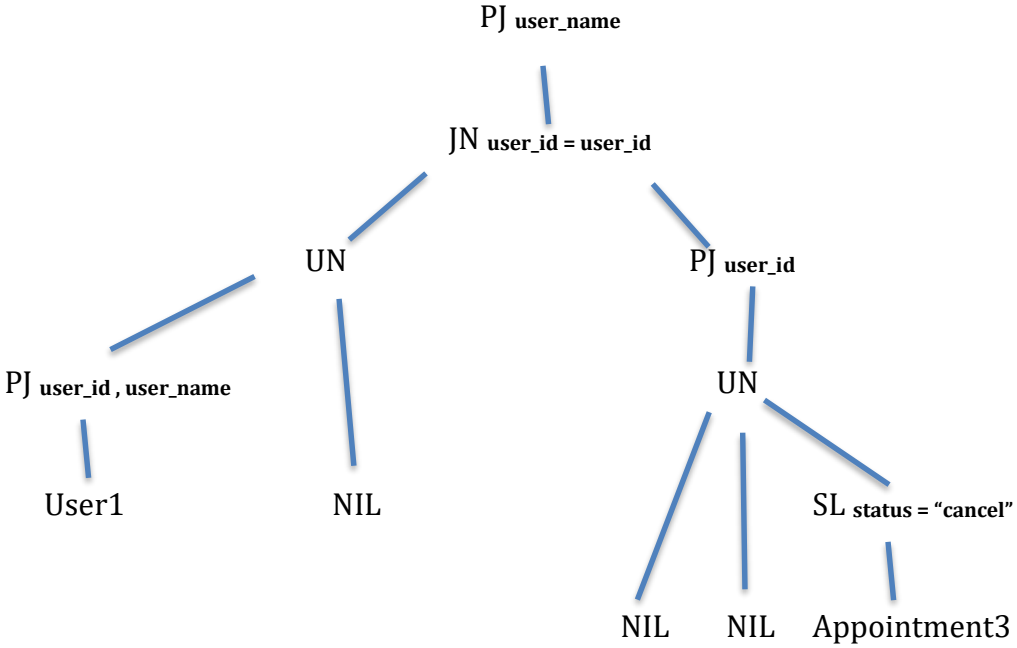
<u>Using Canonical Expression</u>



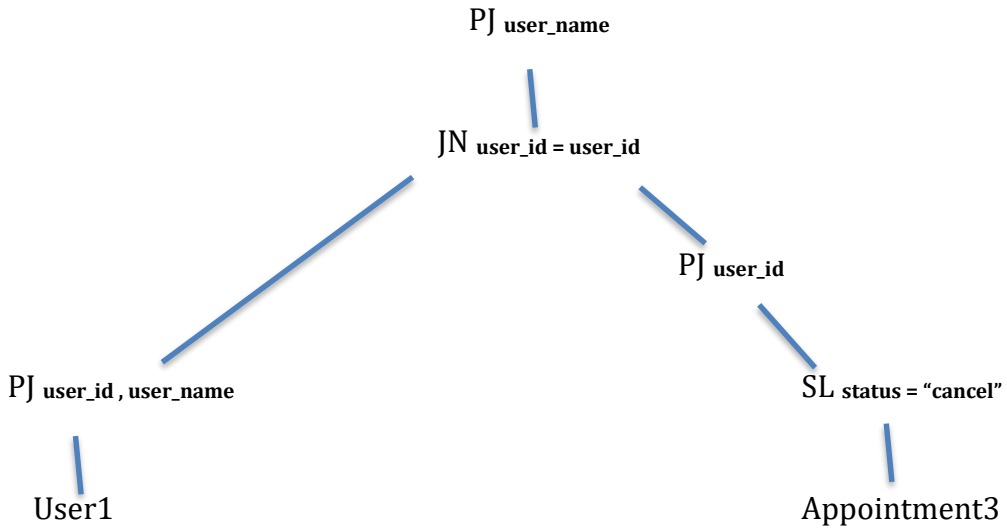
Applying Cr-1 and Cr-2



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

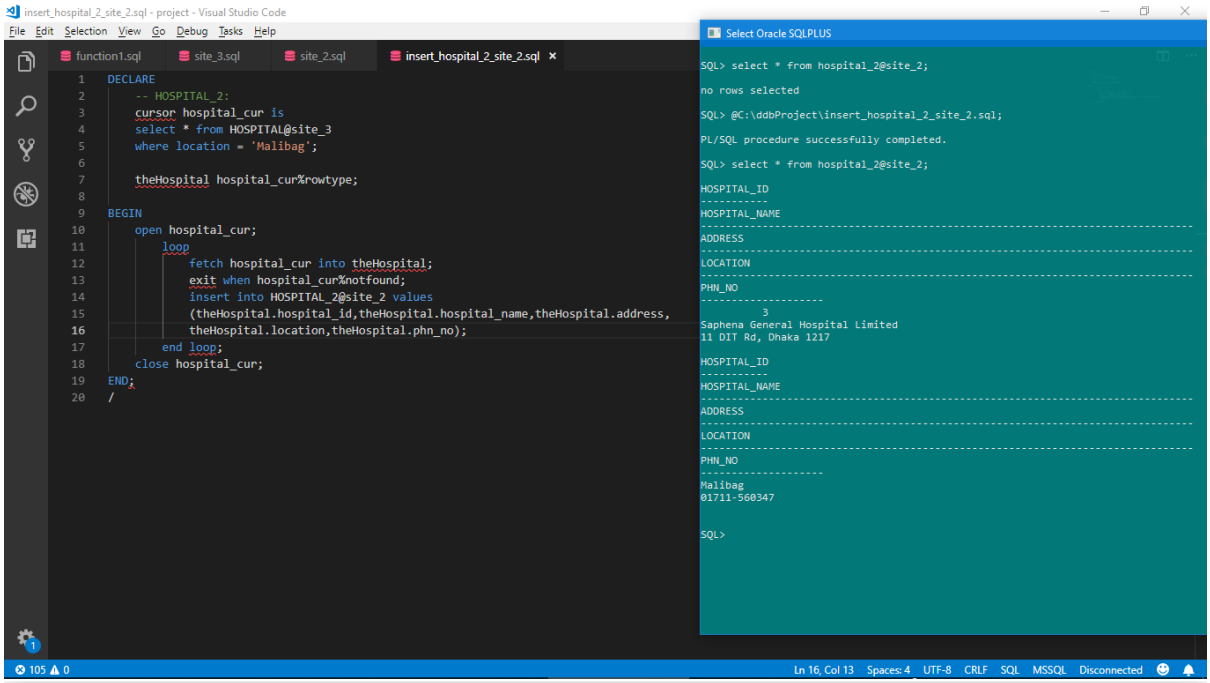
Global Join : PJ **doctor_name** Doctor JN **hos_id = hos_id** Hospital

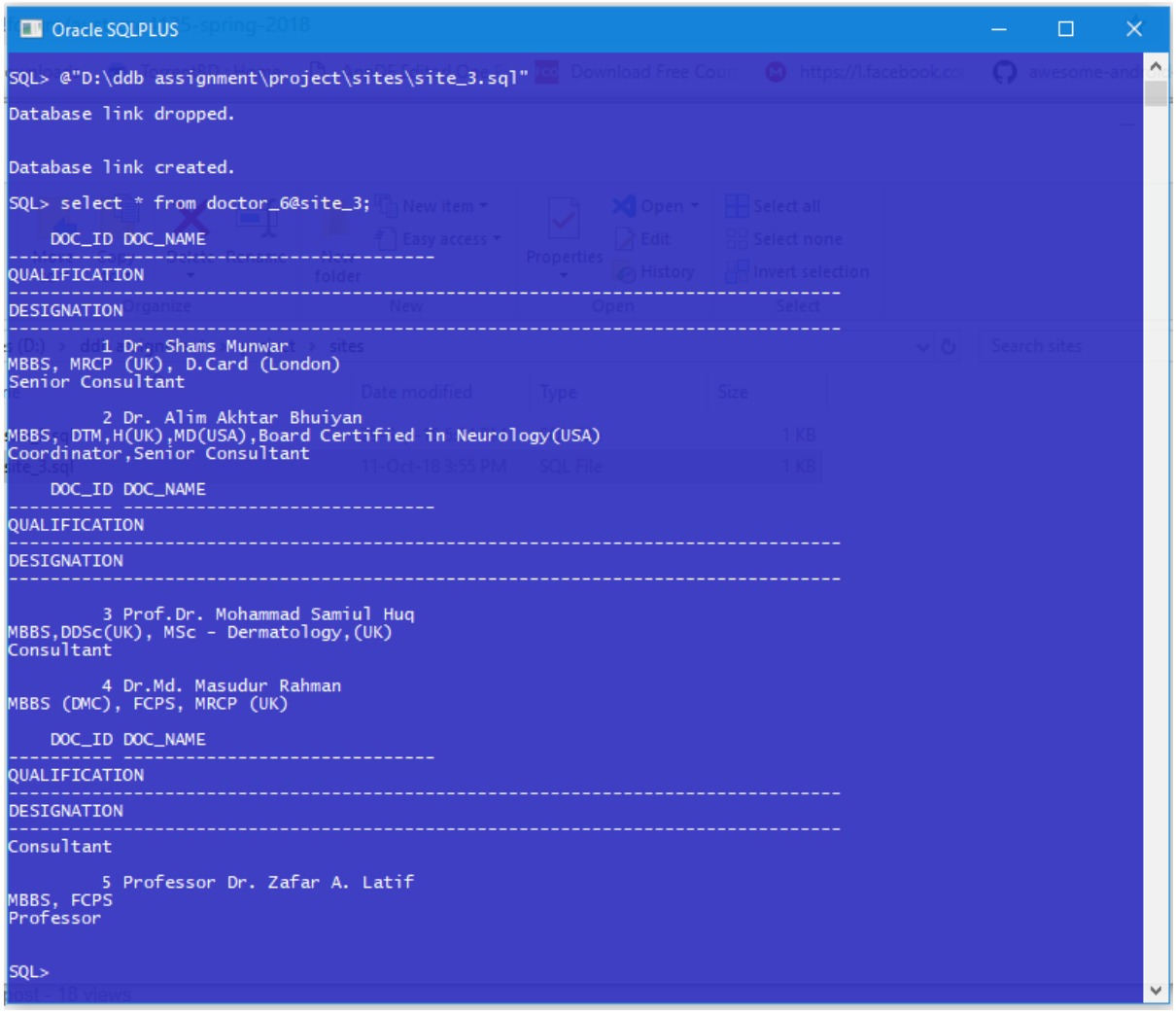
Semi Join : PJ **doc_name** Doctor3 JN (Hospital3 SJ **hospital3.hos_id = Doctor3.hos_id** (PJ **hos_id** Doctor3)

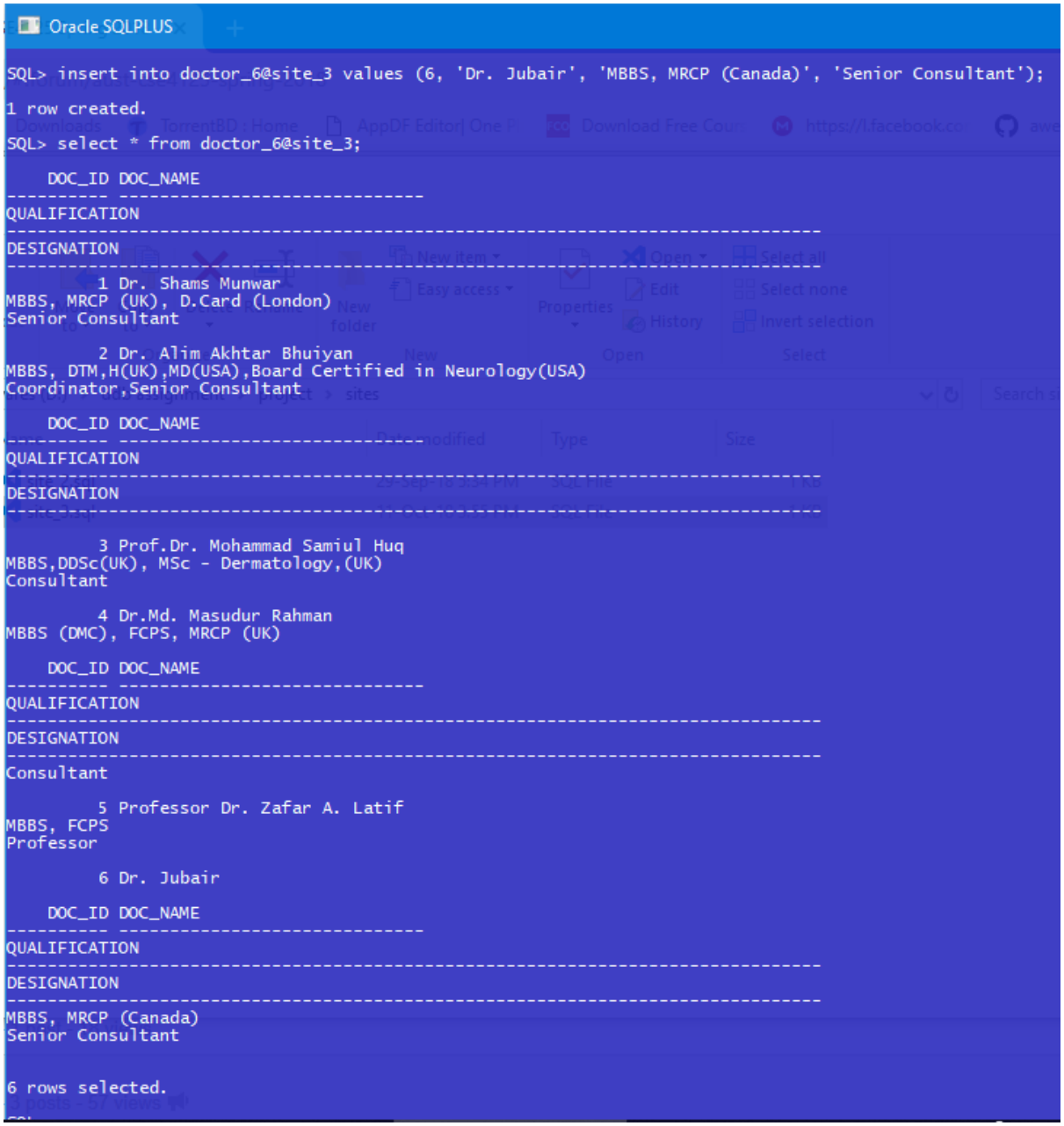
Database Trigger

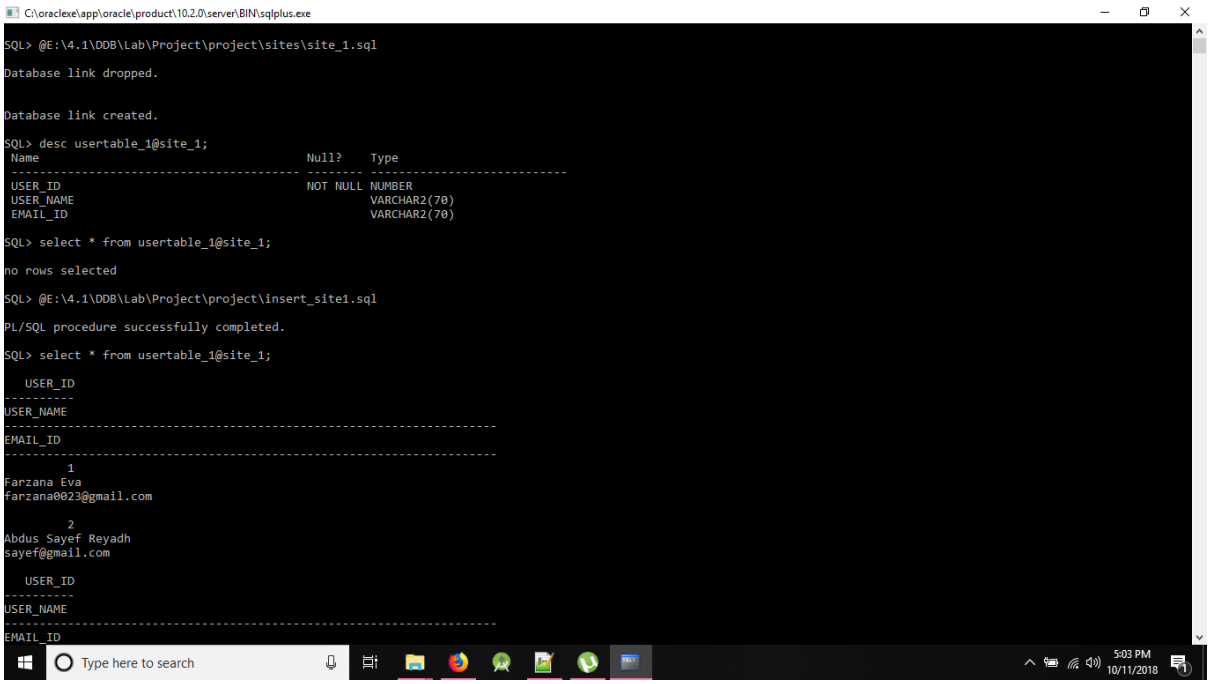
We have made a trigger for receptionist if any receptionist start_time and end_time is invalid format than it will trigger as invalid date and time format.

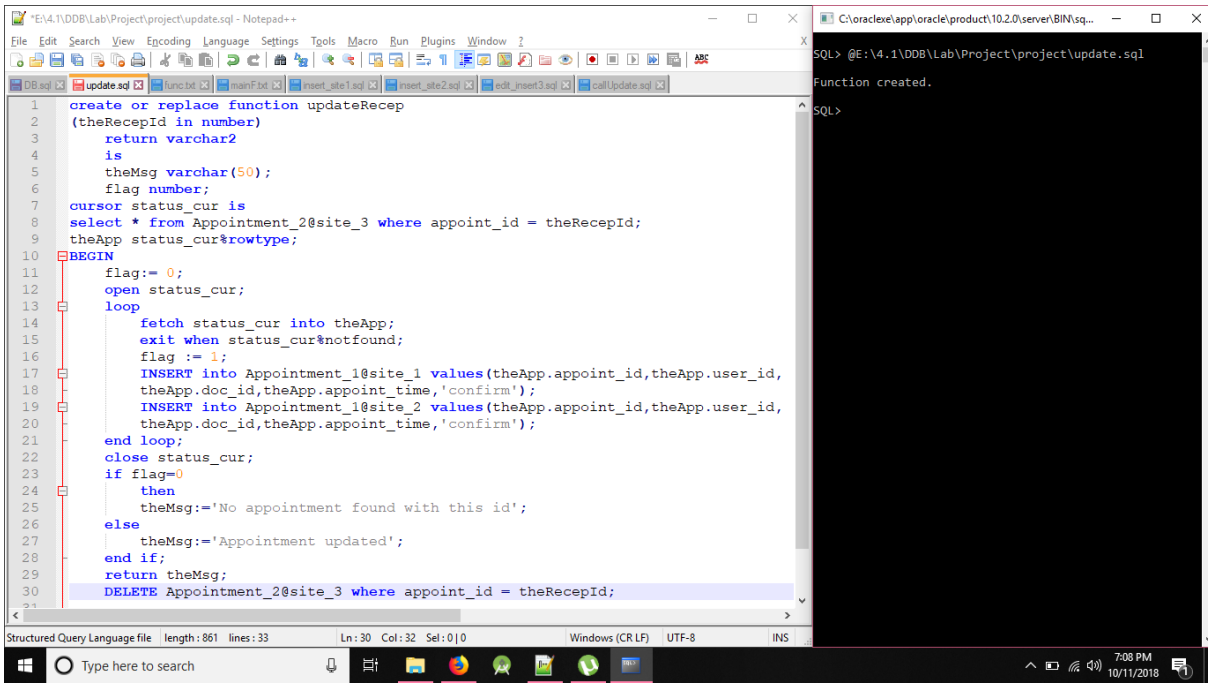
Screenshots of Project

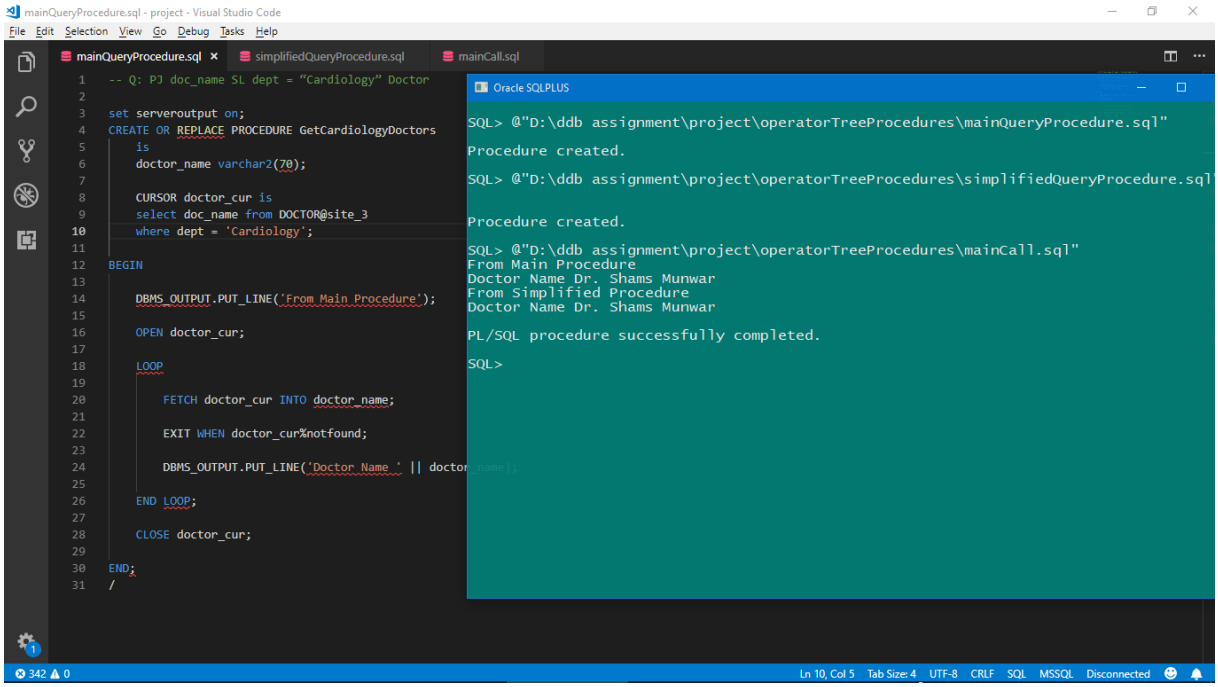


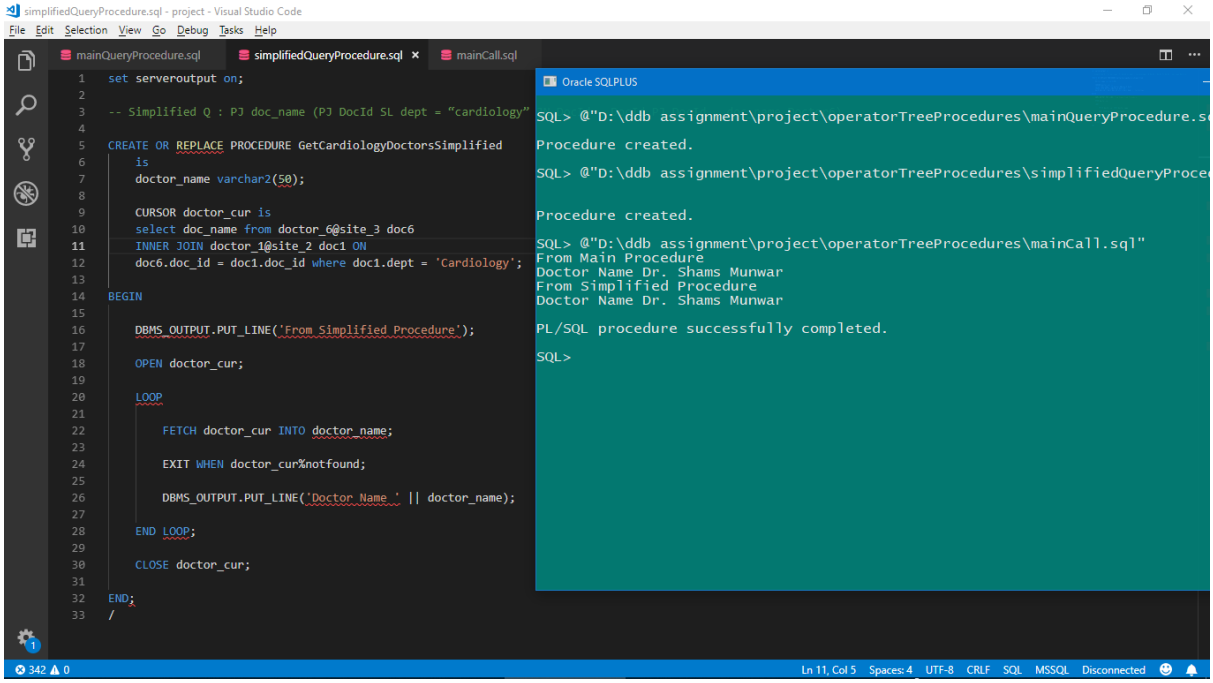


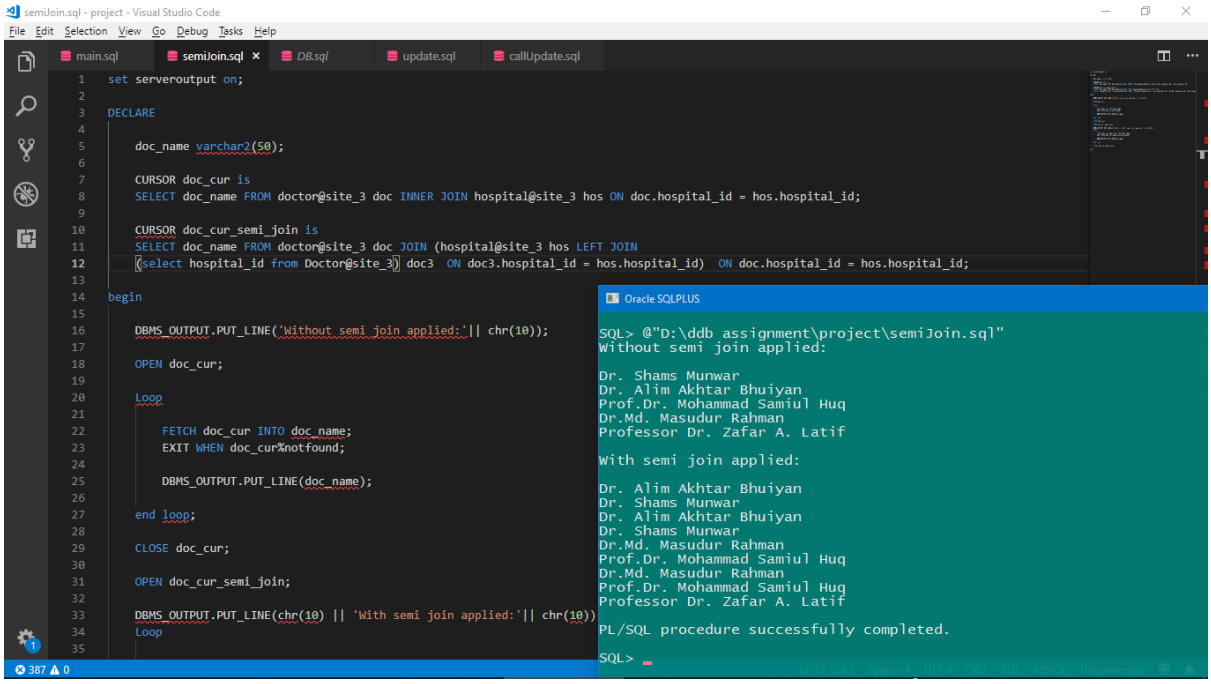

Oracle SQLPLUS
SQL> insert into doctor_6@site_3 values (6, 'Dr. Jubair', 'MBBS, MRCP (Canada)', 'Senior Consultant');
1 row created.
SQL> select * from doctor_6@site_3;
DOC_ID DOC_NAME
QUALIFICATION
DESIGNATION
1 Dr. Shams Munwar
MBBS, MRCP (UK), D.Card (London)
Senior Consultant
2 Dr. Alim Akhtar Bhuiyan
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

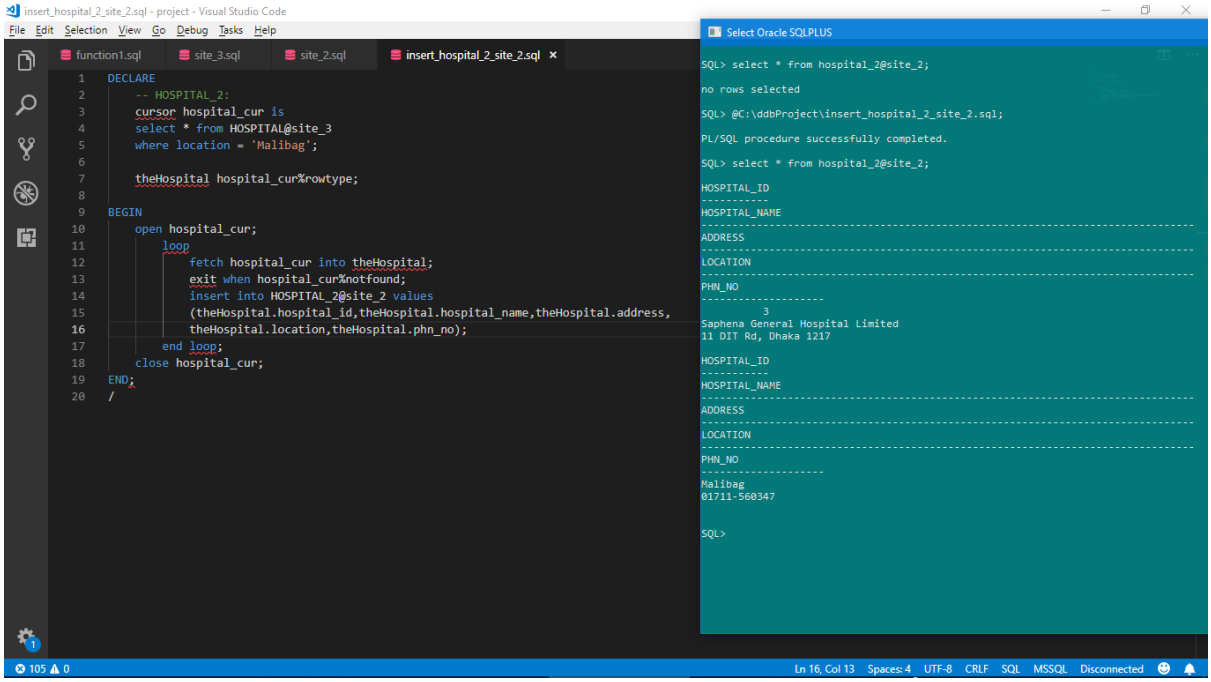

mainQueryProcedure.sql - project - Visual Studio Code
File Edit Selection View Go Debug Tasks Help
mainQueryProcedure.sql
simplifiedQueryProcedure.sql
mainCall.sql
-- Q: PJ doc_name SL dept = "Cardiology" Doctor
set serveroutput on;
CREATE OR REPLACE PROCEDURE GetCardiologyDoctors
is
doctor_name varchar2(70);
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



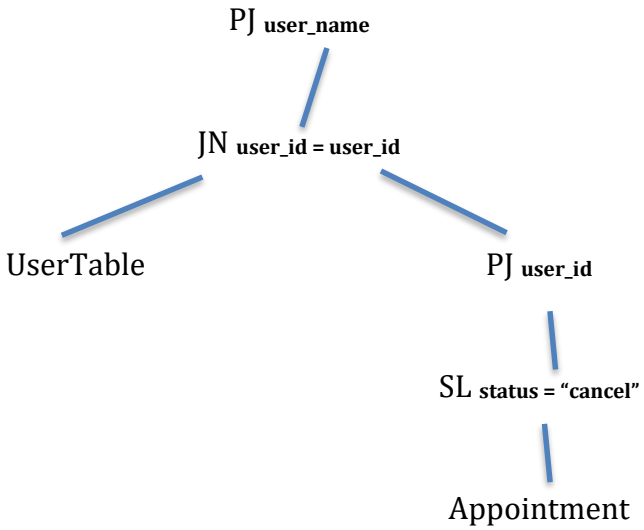
Contribution and My Thoughts

In the short period of time we have tried our best to implement as much features as possible in our projects. We had several drawbacks as lacks of resources in the internet about this topic. Working in the console was pretty tough as most of the errors weren't showing in the console with appropriate reason. We have to use show errors in most of the cases to know what was wrong with the project. As for my contribution, I have worked mostly in site 2 one procedure, operator tree and documenting the project. From my point of view I think our project will be beneficial for the medical sector if it is implemented. If all the hospital is governed by a certain sector we can have more benefits from it.

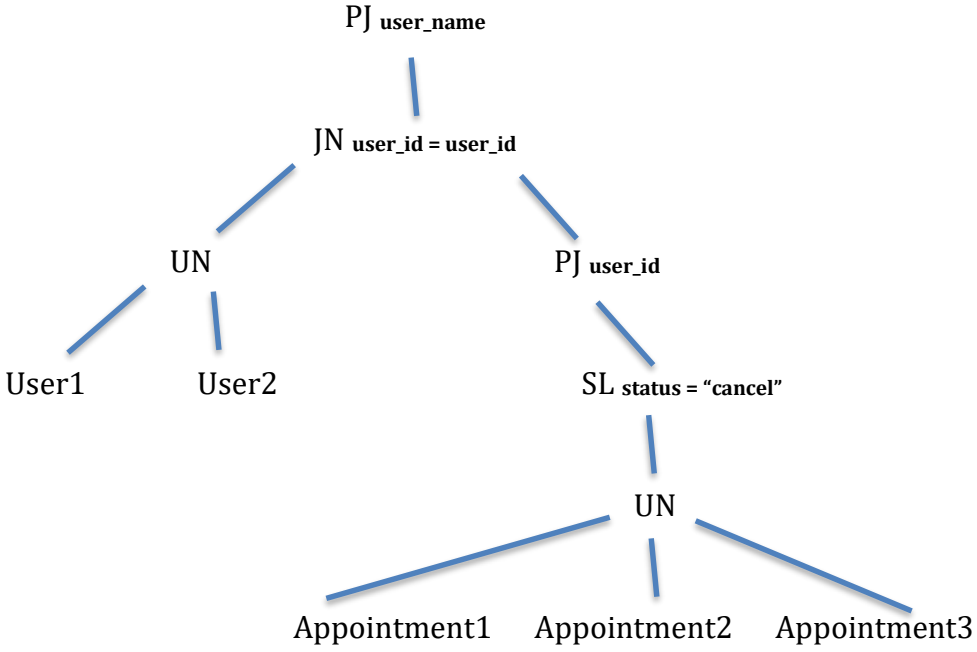


Operator Tree - 2

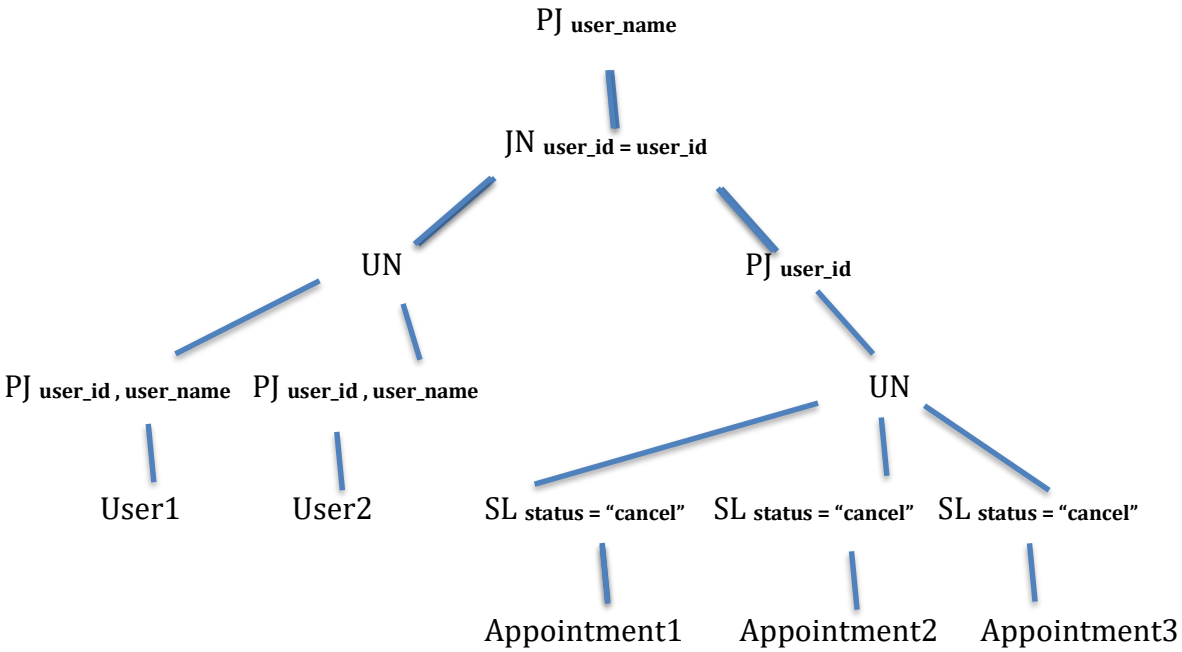
Q: PJ **user_name** UserTable JN **user_id = user_id** PJ **user_id** SL **status = "cancel"** Appointment



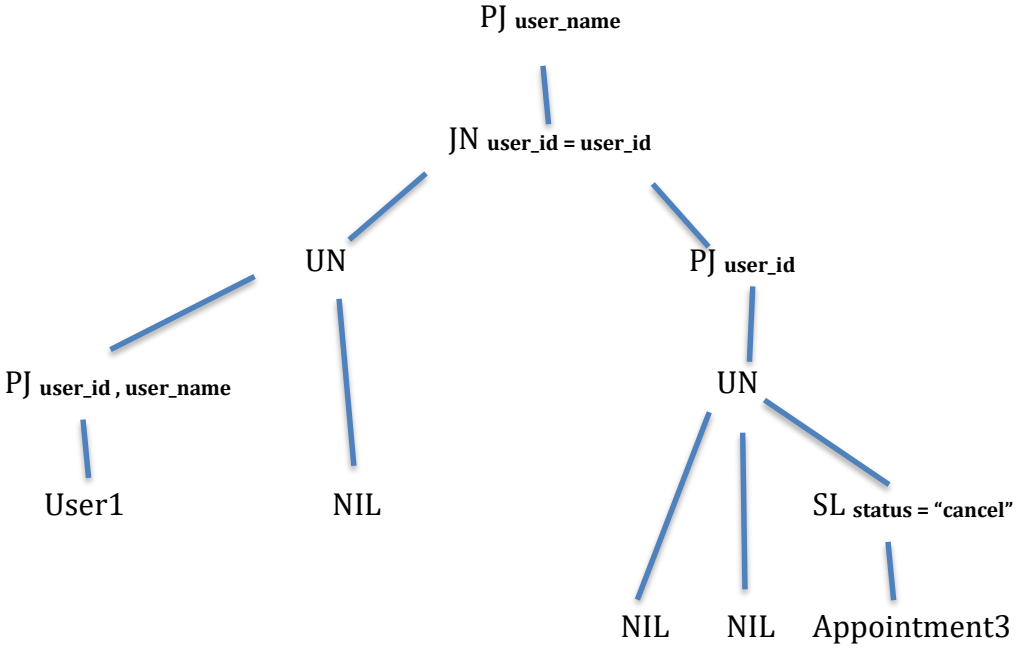
<u>Using Canonical Expression</u>



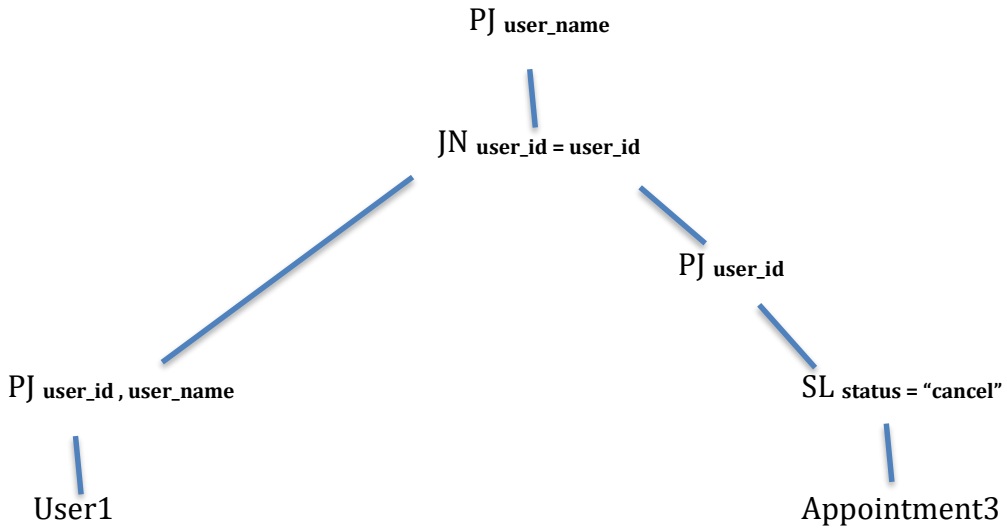
Applying Cr-1 and Cr-2



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)

Conclusion

Making the hospital database distributed can lead to very good hospital output in the future. In all the hospitals have a central database and it is distributed into multiple sites than this will make the doctors to access different information from another sites. In most cases we struggle for a better health care in Bangladesh as most of the treatment is costly and we are never certain of it , are we getting the right treatment? One of the part we didn't implement is the doctor rating system where a doctor can be rated by individuals after a certain treatment.