SQL to SparkQL

Continue the Development of SQL to SPARQL translation on Jyphon

University of Texas at Austin

CS347 - Database Management

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Building Instructions

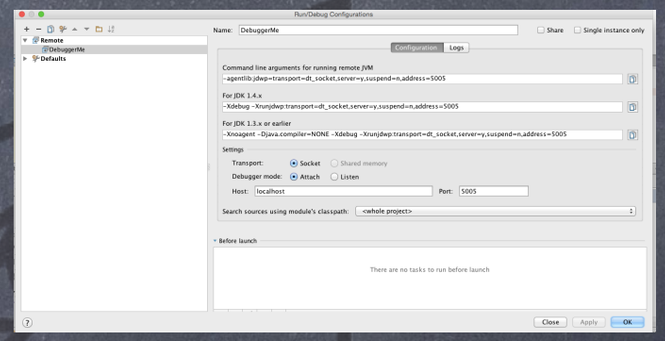
1. ant clean
2. move dist to the trash
3. ant
4. ant
5. sudo dist/bin/jython

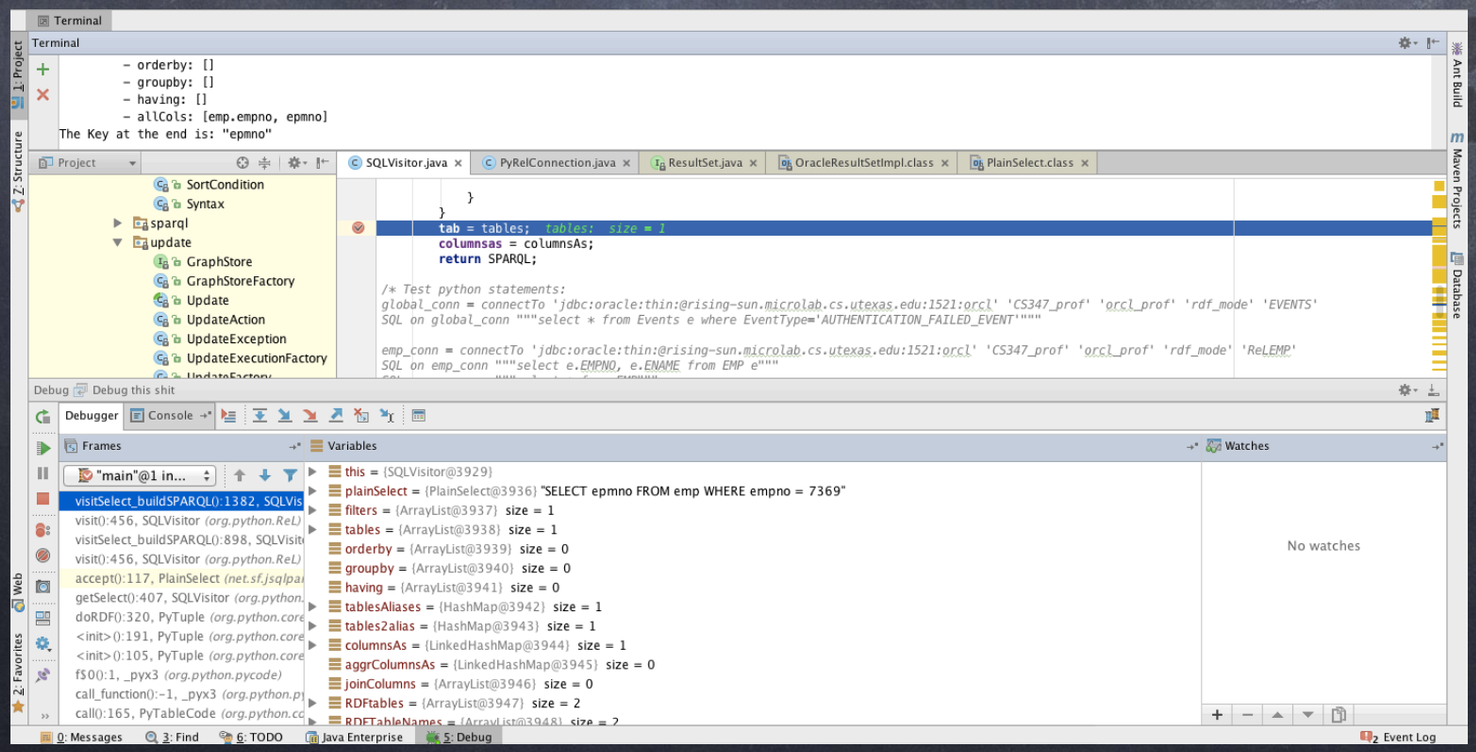
```
>> conn = connectTo 'jdbc:oracle:thin:@129.152.144.84
          /PDB1.usuniversi01134.oraclecloud.internal'
          'cs370_ontologies' 'orcl' 'rdf_mode' 'emp';
>> SQL on conn 'select * from emp'
```

Debugging Instructions

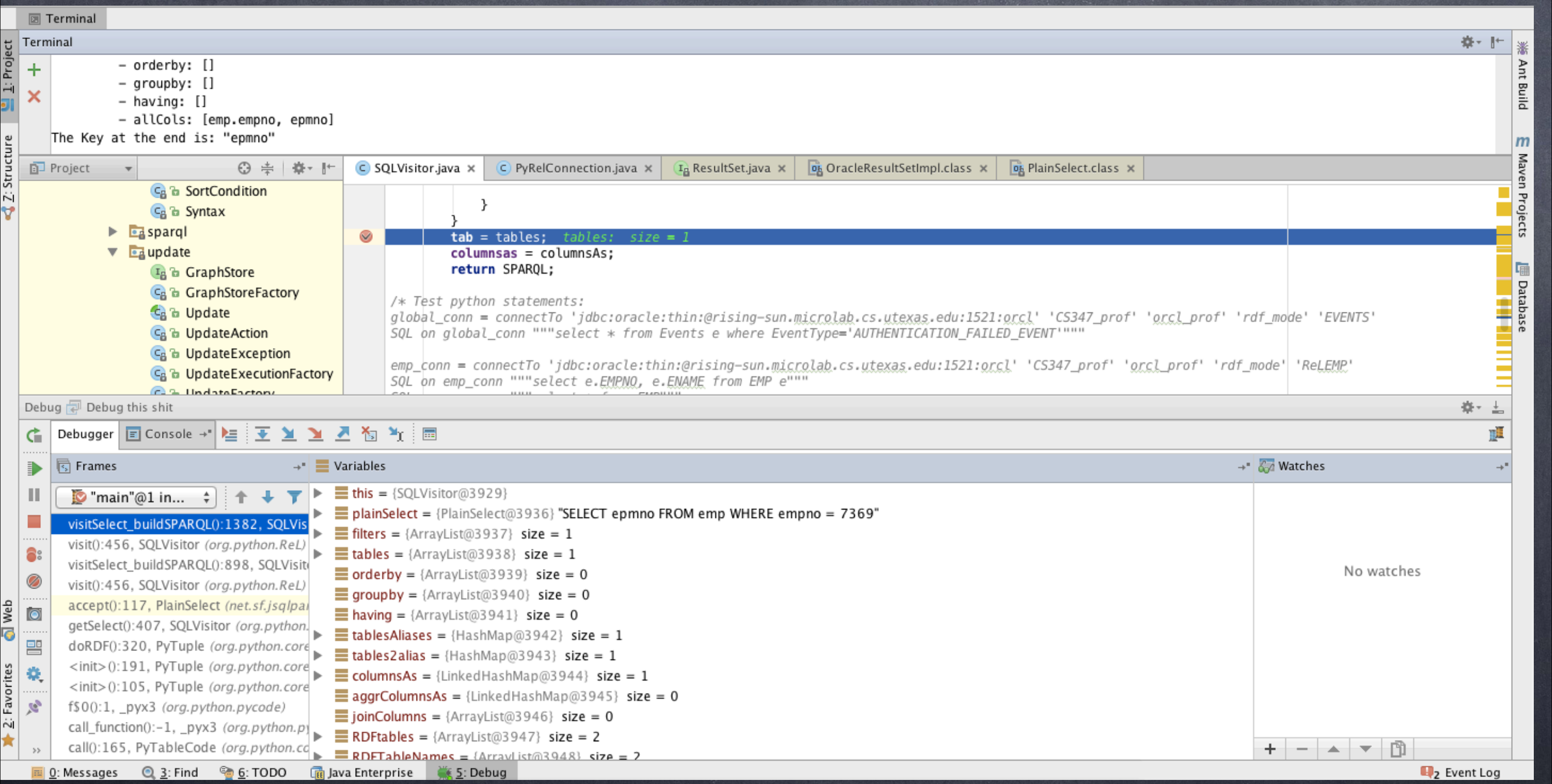
Debugging Instructions

1. export JAVA_OPTS="-agentlib:jdwp=transport=dt_socket,server=y,suspend=n,address=5005"
2. IntelliJ IDEA (IDE) -> Remote Configuration Profile
3. ant
4. dist/bin/jython
5. >> conn = connectTo 'jdbc:oracle:thin:@129.152.144.84:1521/PDB1.usuniversi01134.oraclecloud.internal' 'cs370_ontologies' 'orcl' 'rdf_mode' 'emp';
6. Set breakpoint in IDE
7. >> SQL on conn 'select * from emp'

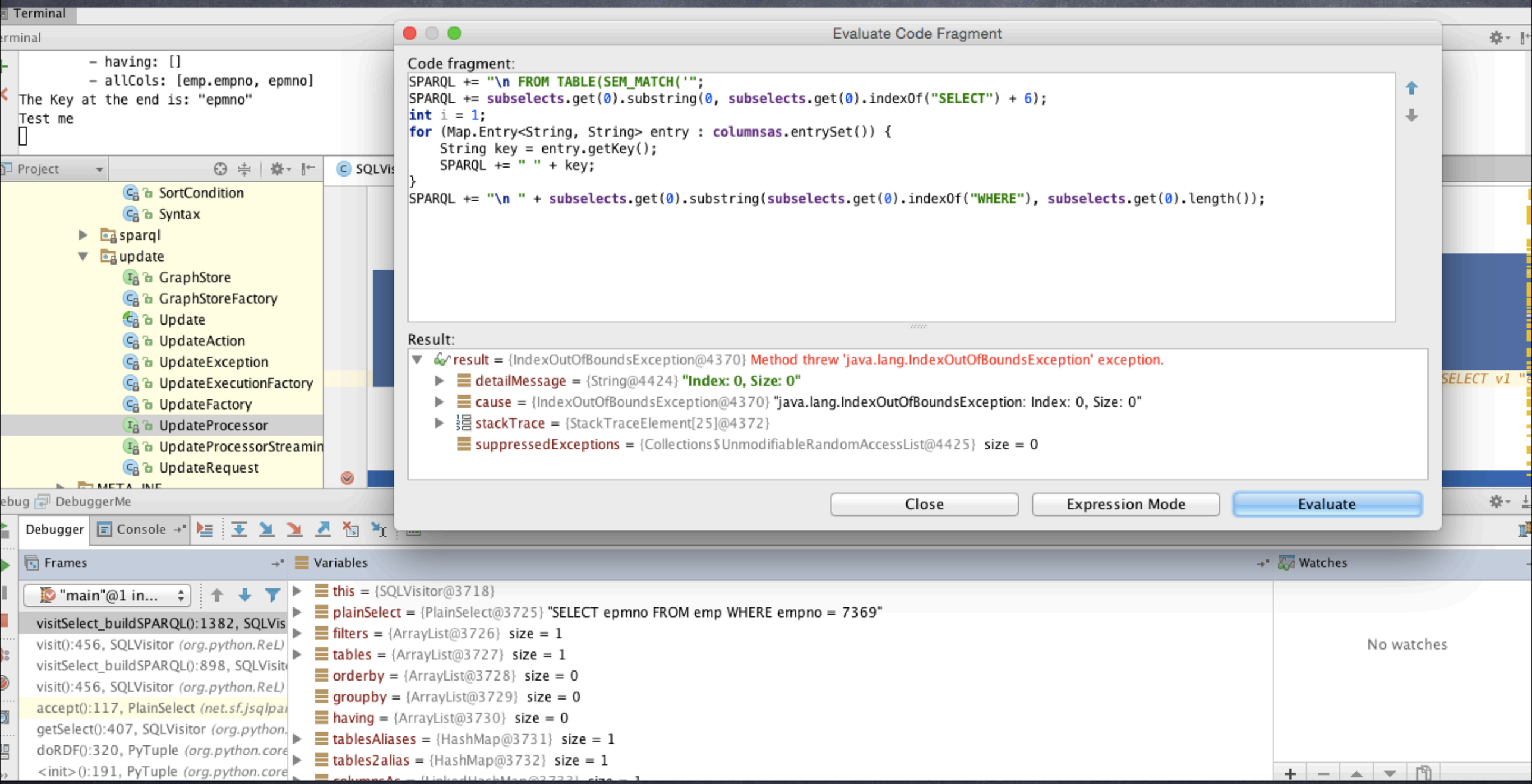




Debugging Instructions



Debugging Instructions



SparQL Executing Instructions

Oracle SQL Developer : cs347_mb39822

Connections

- Connections
  - cs347_mb39822
    - Tables (Filtered)
      - ACTIVE_INVOICES
      - ADDRESSES
      - ADMINISTRATORS
      - CATEGORIES
      - COLOR_SAMPLE
      - CUST_JSON
      - CUSTOMERS
      - DATE_SAMPLE
      - DEPARTMENTS
      - DEPT
      - E3_C##CS347_MB39822_DATA
      - E5_C##CS347_MB39822_DATA
      - EMP
      - EMPLOYEES
      - FLOAT_SAMPLE
      - GENERAL_LEDGER_ACCOUNTS
      - INVOICE_ARCHIVE
      - INVOICE_LINE_ITEMS
      - INVOICES
      - ITEMS
      - NULL_SAMPLE
      - ORDER_DETAILS
      - ORDER_ITEMS
      - ORDERS
      - PAID_INVOICES
      - PRODUCTS

Start Page | hw4.sql | HW8.sql | cs347_mb39822

cs347_mb39822

Worksheet | Query Builder

```
SELECT v1 "ename", v2 "dname"
 FROM TABLE(SEM_MATCH('
SELECT * WHERE {
    GRAPH <emp_SCHEMA> { ?s1 rdf:type :emp }
    GRAPH <dept_SCHEMA> { ?s2 rdf:type :dept }
    OPTIONAL { ?s1 :ename ?v1 }
    OPTIONAL { ?s2 :dname ?v2 }
    ?s1 :deptno ?j1 .
    ?s2 :deptno ?j1 .
}
' ,
SEM_MODELS('EMP_CS370_ONTOLOGIES'), null,
SEM_ALIASES( SEM_ALIAS('', '#')), null) );
```

Query Result

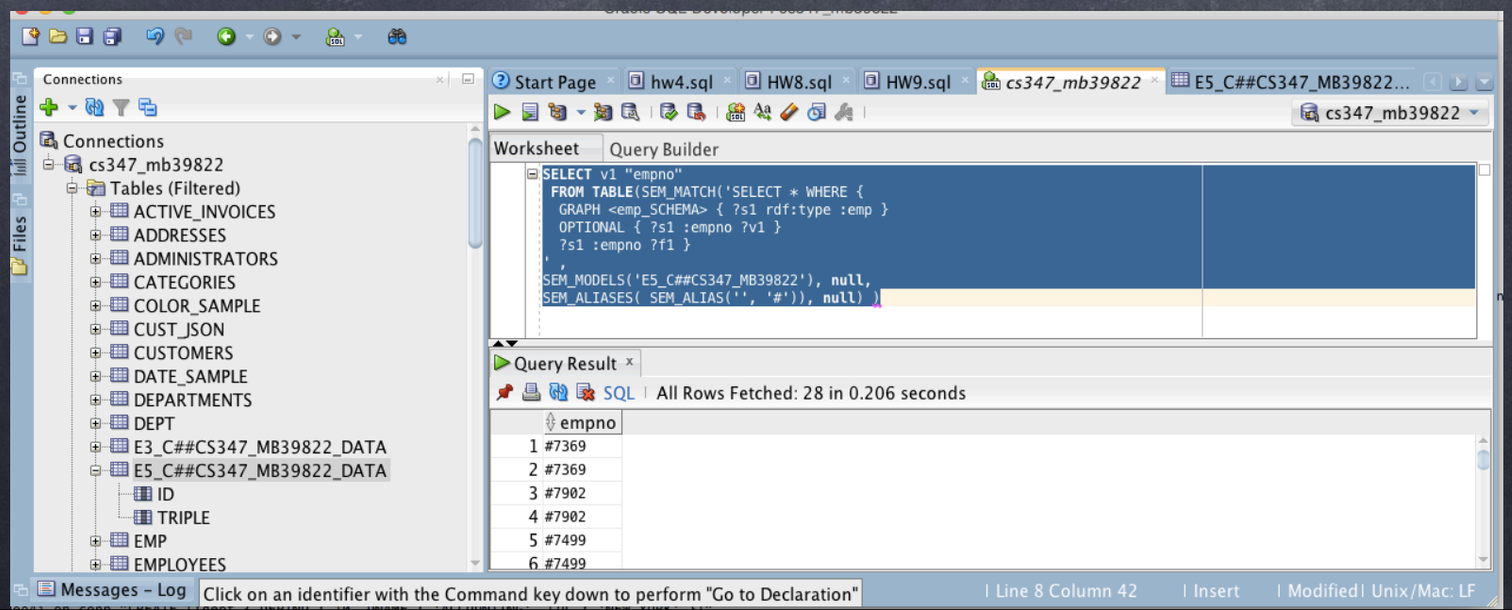
SQL | Executing:SELECT v1 "ename", v2 "dname" FROM TABLE(SEM_MATCH(' SELECT * WHERE { GRAPH <emp_S...

```
ORA-55300: model "EMP_CS370_ONTOLOGIES" does not exist
ORA-06512: at "MDSYS.MD", line 1723
ORA-06512: at "MDSYS.MDERR", line 17
ORA-06512: at "MDSYS.RDF_APIS_INTERNAL", line 1832
ORA-06512: at "MDSYS.RDF_MATCH_IMPL_T", line 381
ORA-06512: at line 1
55300. 0000 -  "model %s does not exist"
*Cause:    The specified model could not be found.
*Action:   Make sure that the model has been created.
```

Messages - Log

SparQL Executing Instructions

1. Login to a CS machine
2. wget https://www.dropbox.com/s/c0gshqi3s1fhx9n/neo4j_emp_db.txt?dl=1 -O emp_dept.neo4j.formatted.txt
3. Change the login credentials
   conn = connectTo 'jdbc:oracle:thin:@sayonara.microlab.cs.utexas.edu:1521:orcl' 'C##cs347_UTEID' 'orcl_UTEID' 'rdf_mode' 'E5';
4. /u/cannata/ReL/dist/bin/jython emp_dept.neo4j.formatted.txt
5. Now open SQL Developer and you should see a table named "E5_C##cs347_UTEID"
6. Now you can run the SparQL queries.



Instructions

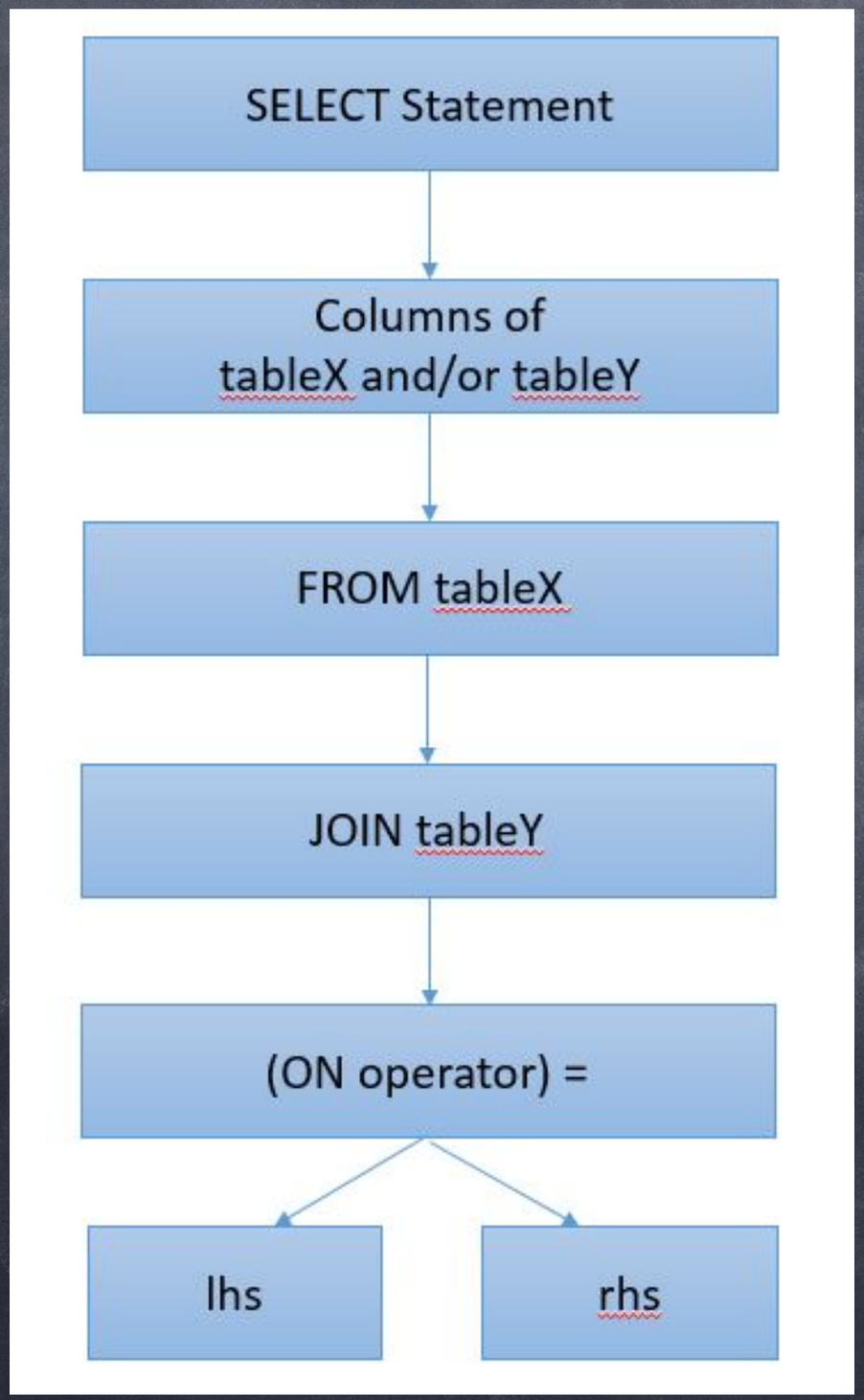
G. Implement the conversion of SQL subqueries to SPARQL subqueries in ReL (ReL Source Code).

- From ✓
- Where ✓
- Select
- JOIN

How it works

- SQL Query
- SQL Server
- IF SELECT
- SQLVisitor.getSelect
- visitSelect_buildSPARQL
- SPARQL

Old design


SELECT Statement
Columns of tableX and/or tableY
FROM tableX
JOIN tableY
(ON operator) =
lhs
rhs

Example without subqueries

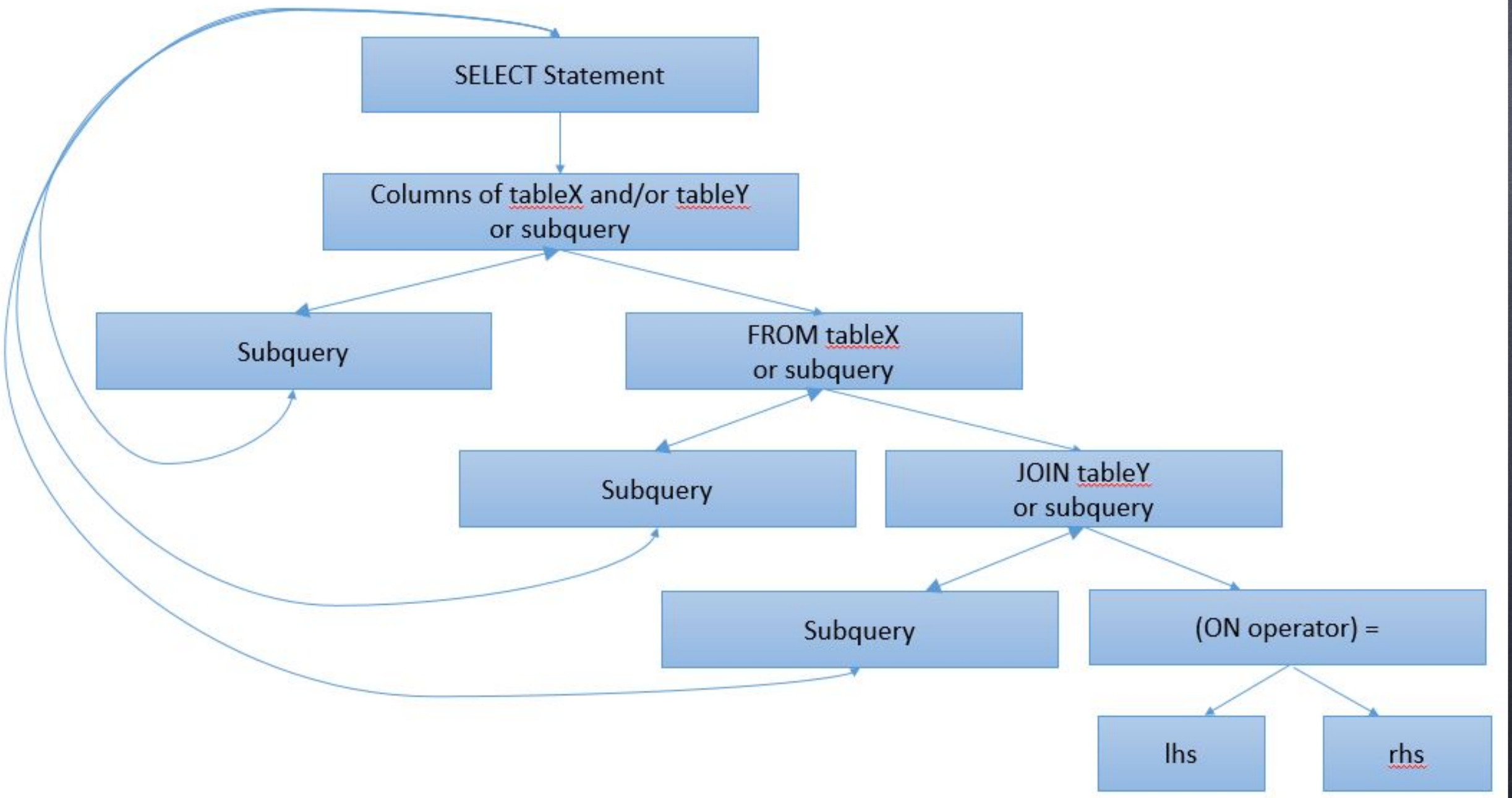
SQL:

```
SELECT  *  FROM   emp;
```

SPARQL:

```
SELECT v1 "empno", v2 "deptno", v3 "comm", v4 "job", v5 "mgr", v6 "ename",
v7 "hiredate", v8 "sal", v9 "dept"
FROM TABLE(SEM_MATCH('SELECT * WHERE {
      GRAPH { ?s1 rdf:type :emp }
      OPTIONAL { ?s1 :empno ?v1 }
      OPTIONAL { ?s1 :deptno ?v2 }
      OPTIONAL { ?s1 :comm ?v3 }
      OPTIONAL { ?s1 :job ?v4 }
      OPTIONAL { ?s1 :mgr ?v5 }
      OPTIONAL { ?s1 :ename ?v6 }
      OPTIONAL { ?s1 :hiredate ?v7 }
      OPTIONAL { ?s1 :sal ?v8 }
      OPTIONAL { ?s1 :dept ?v9 } }
```

New design


SELECT Statement
Columns of tableX and/or tableY
or subquery
Subquery
FROM tableX
or subquery
Subquery
JOIN tableY
or subquery
Subquery
(ON operator) =
lhs
rhs

Code Changes

- Create the List data structure subselects to store a list af all subqueries statements in the query, with size = to subDepth, and it will be filled depending on how many trues are in sq stack
- boolean subSelect will tell us if we processing a query of subquery inside visit(PlaintSelect plaintSelect) and visitSelect_buildSPARQL
- subDepth will tell us how many subqueries there are in the query
- Pass a list as an arg to visitSelect_buildSPARQL method
- Then in visitSelect_buildSPARQL we get the subquery from the SQL FROM OR WHERE statement then we modified the SPARQL FILTER statement to form the translations.

Subquery in WHERE

SQL:

```
SELECT empno FROM emp
WHERE empno=(SELECT epmno FROM emp WHERE empno=7369);
```

SPARQL:

```
SELECT v1 "empno"
 FROM TABLE(SEM_MATCH('SELECT * WHERE {
       GRAPH <emp_SCHEMA> { ?s1 rdf:type :emp }
       OPTIONAL { ?s1 :empno ?v1 }
       {
         SELECT * WHERE {
             GRAPH <emp_SCHEMA> { ?s1 rdf:type :emp }
             OPTIONAL { ?s1 :empno ?v1 }
              ?s1 :empno ?f1 .
             FILTER(?f1 = :7369)}
}}
```

RESULTS: (('empno',), (7369,), (7369,))

Subquery with *

SQL:

```
SELECT * FROM emp
WHERE empno=(SELECT epmno FROM emp WHERE empno=7369);
```

SPARQL:

```
SELECT v1 "empno" v2 "" v3...
FROM TABLE(SEM_MATCH('SELECT v1 WHERE {
      GRAPH { ?s1 rdf:type :emp }
      OPTIONAL { ?s1 :empno ?v1 }
      FILTER( ?v1 = :(SELECT empno FROM emp WHERE epmno=7369) )
}))
```

RESULTS:

Subquery in FROM

SQL:

```
SELECT empno, sal FROM (SELECT empno, dept, sal FROM emp);
```

SPARQL:

```
SELECT v1 "empno", v3 "sal"
 FROM TABLE(SEM_MATCH('SELECT ?v1 ?v2 ?v3
 WHERE {
        GRAPH <emp_SCHEMA> { ?s1 rdf:type :emp }
        OPTIONAL { ?s1 :empno ?v1 }
        OPTIONAL { ?s1 :dept ?v2 }
        OPTIONAL { ?s1 :sal ?v3 }
}
```

RESULTS:

```
(('empno', 'sal'), (7369, 800), (7369, 800), (7369, 800),
```

Additional Resources

SQL Nested Queries in SPARQL http://ceur-ws.org/Vol-619/paper5.pdf

SubQuery Standard http://www.w3.org/TR/sparql11-query/#subqueries

SparQL By Example http://www.cambridgesemantics.com/semantic-university/sparql-by-example

Wiki SubSelect http://www.w3.org/2009/sparql/wiki/Design:SubSelect

https://apex.oracle.com/pls/apex/f?p=91561:3:13860963962818:::::