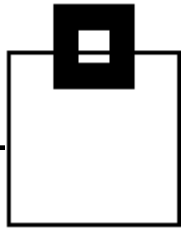
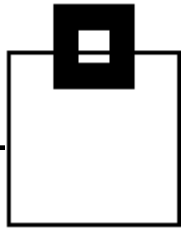


DB2 for z/OS SQL Performance – Plug-in for Rational Developers

Roy Boxwell, 2012-03-20

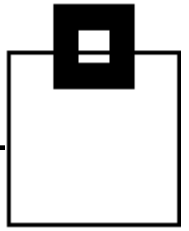
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



AGENDA

- Review of the current topology – The BIG picture
- How a DBA works today – Green Screen and Batch
- How a developer works today – Green Screen and Batch
- How a Rational Developer can work today – GUI/ISPF
- How a Rational Developer can also work today - GUI

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

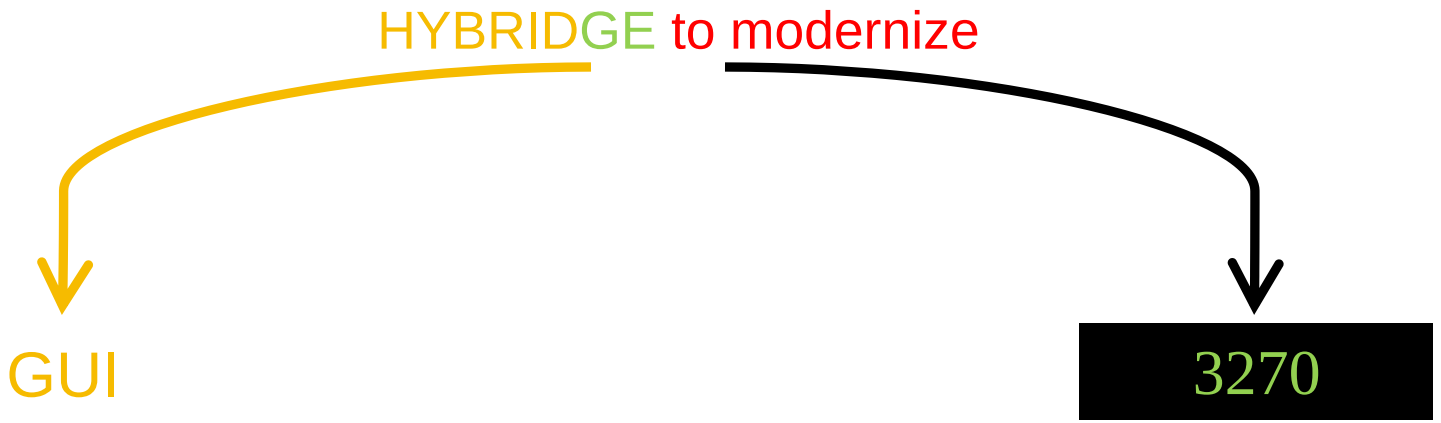


HYBRID

GUI

3270

SQL PerformanceExpert (SPX) in an IBM RATIONAL world



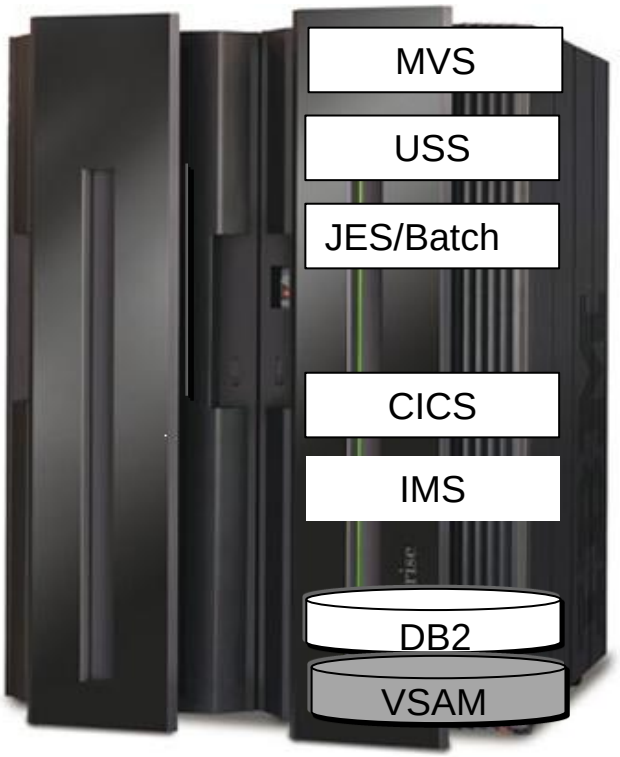
SQL PerformanceExpert (SPX) in an IBM RATIONAL world

HYBRIDGE to modernize

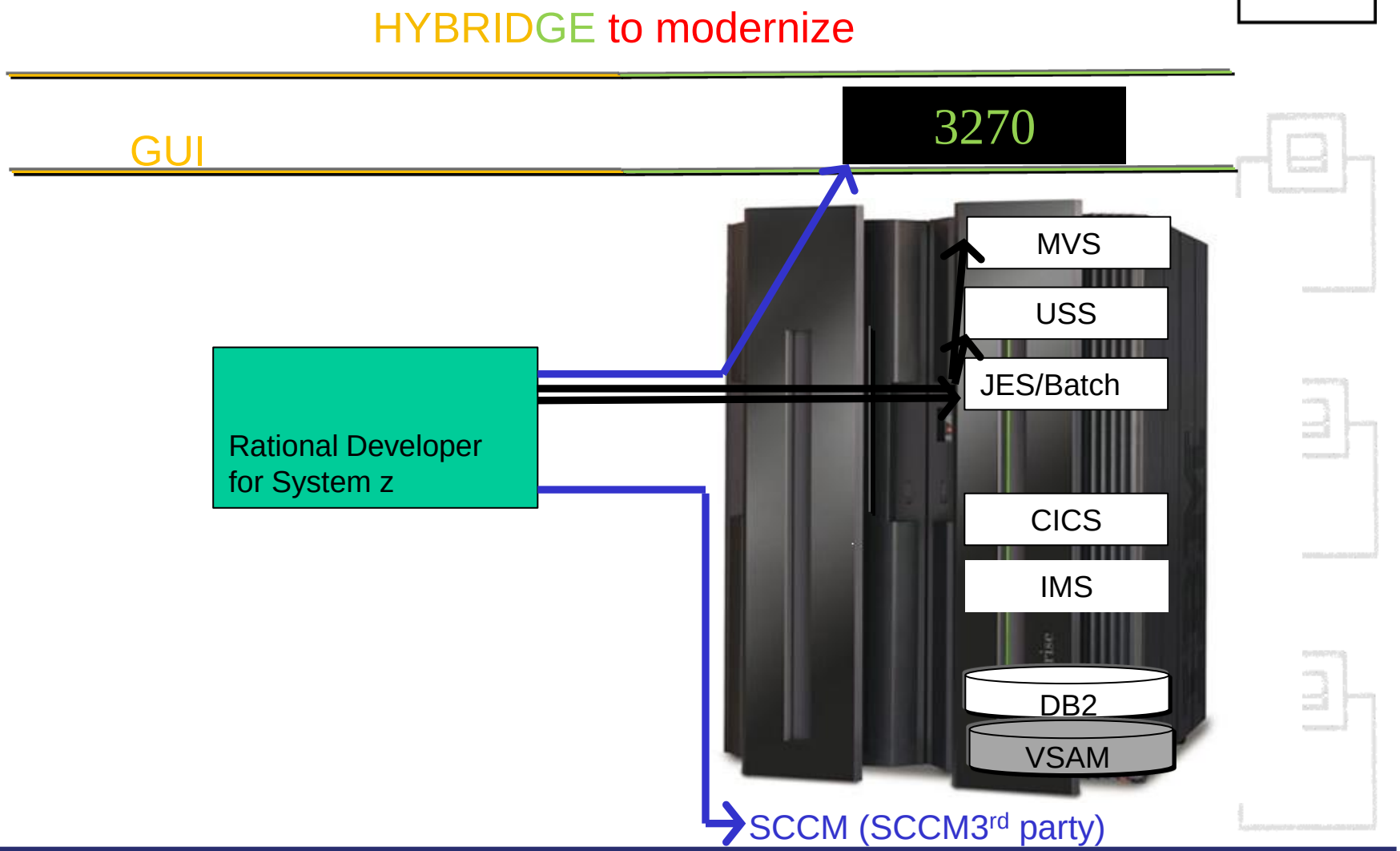
GUI

3270

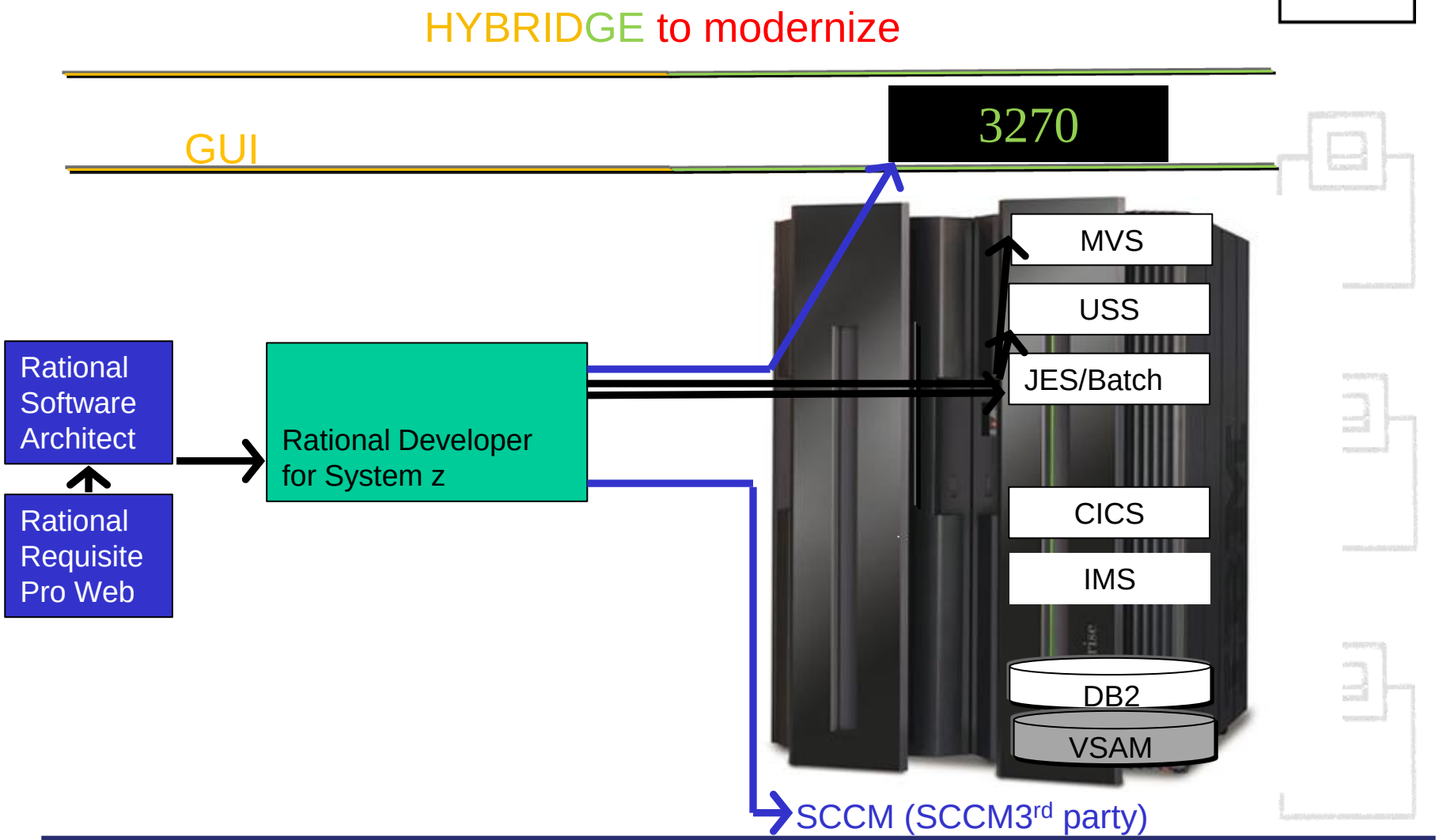
Rational Developer for System z



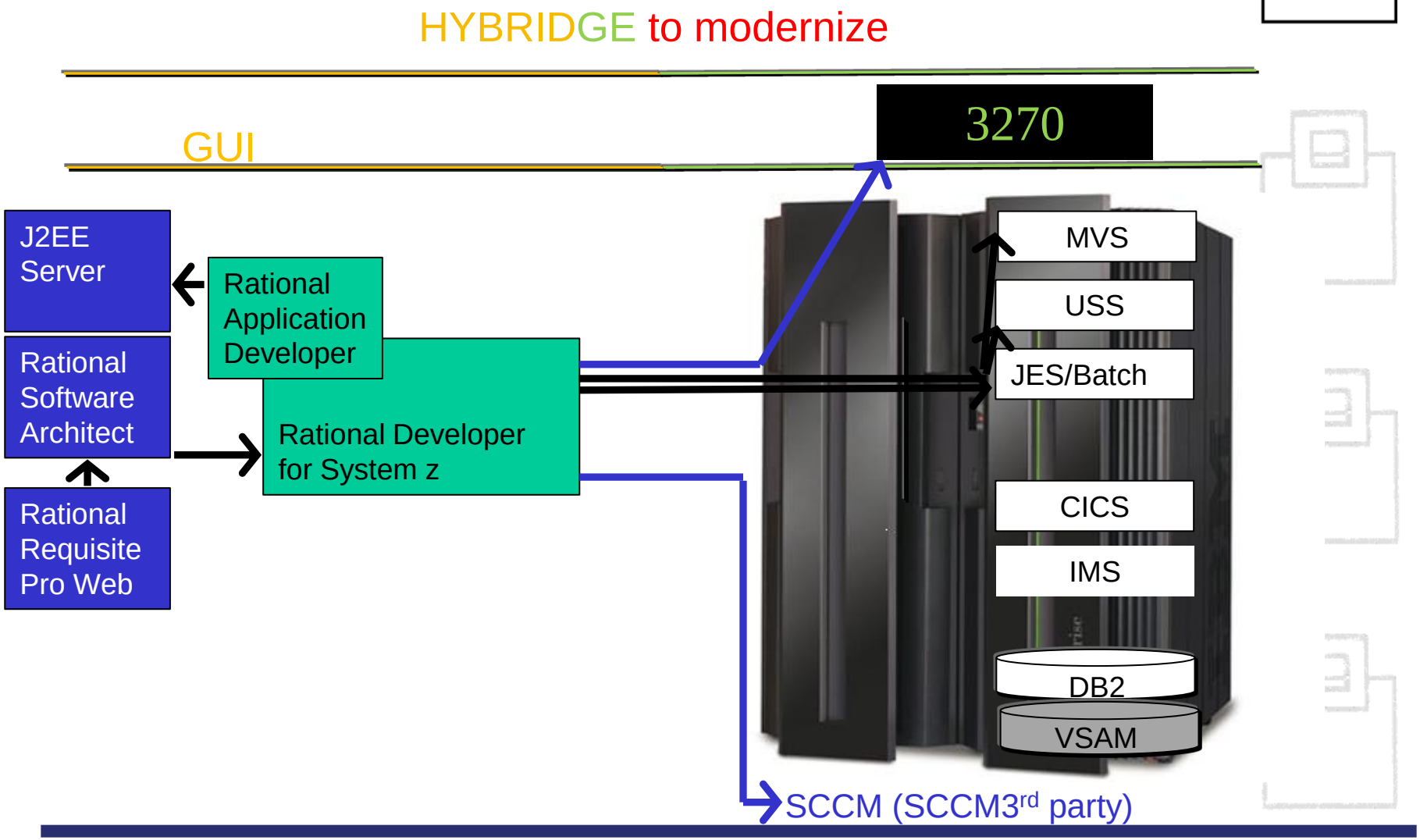
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



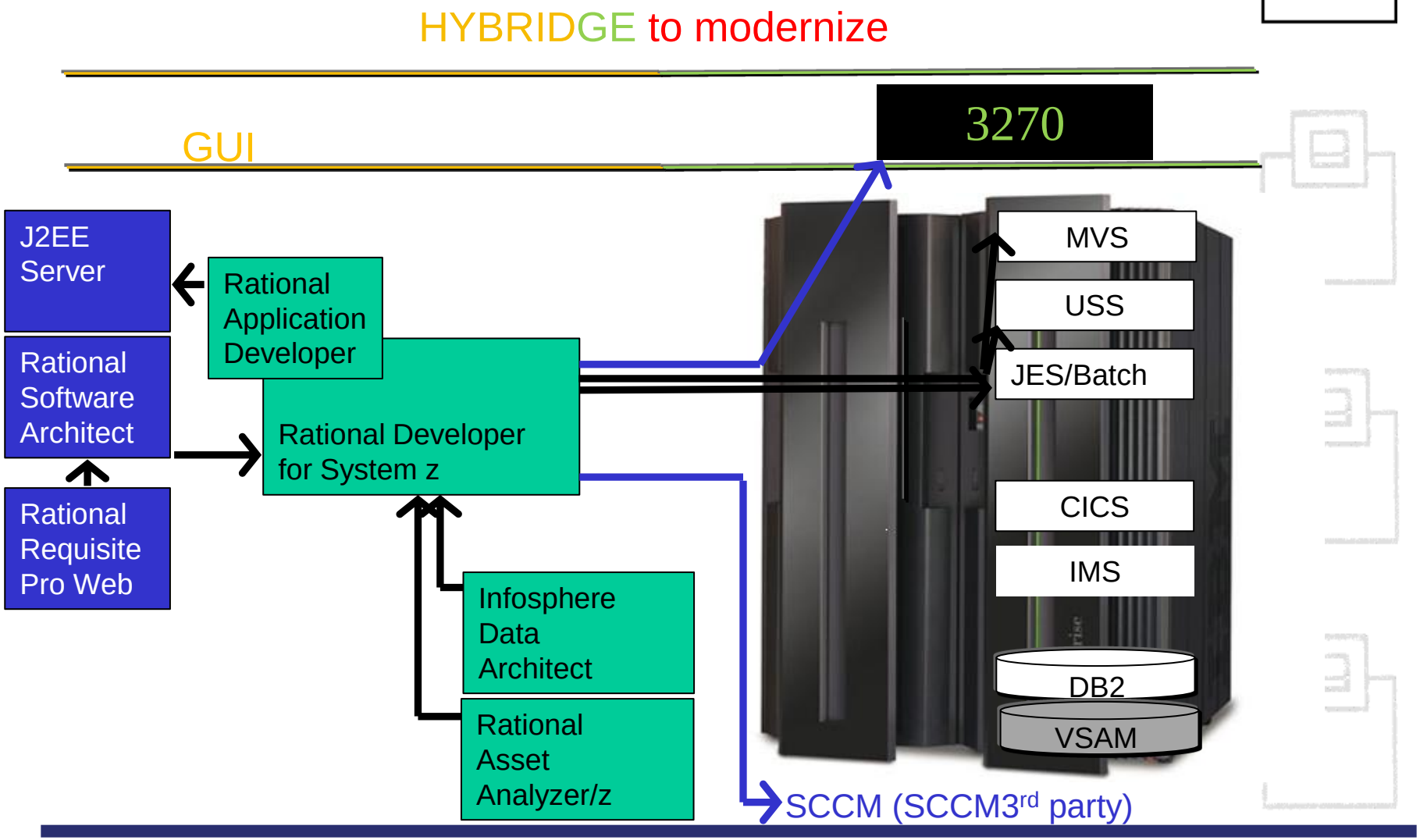
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



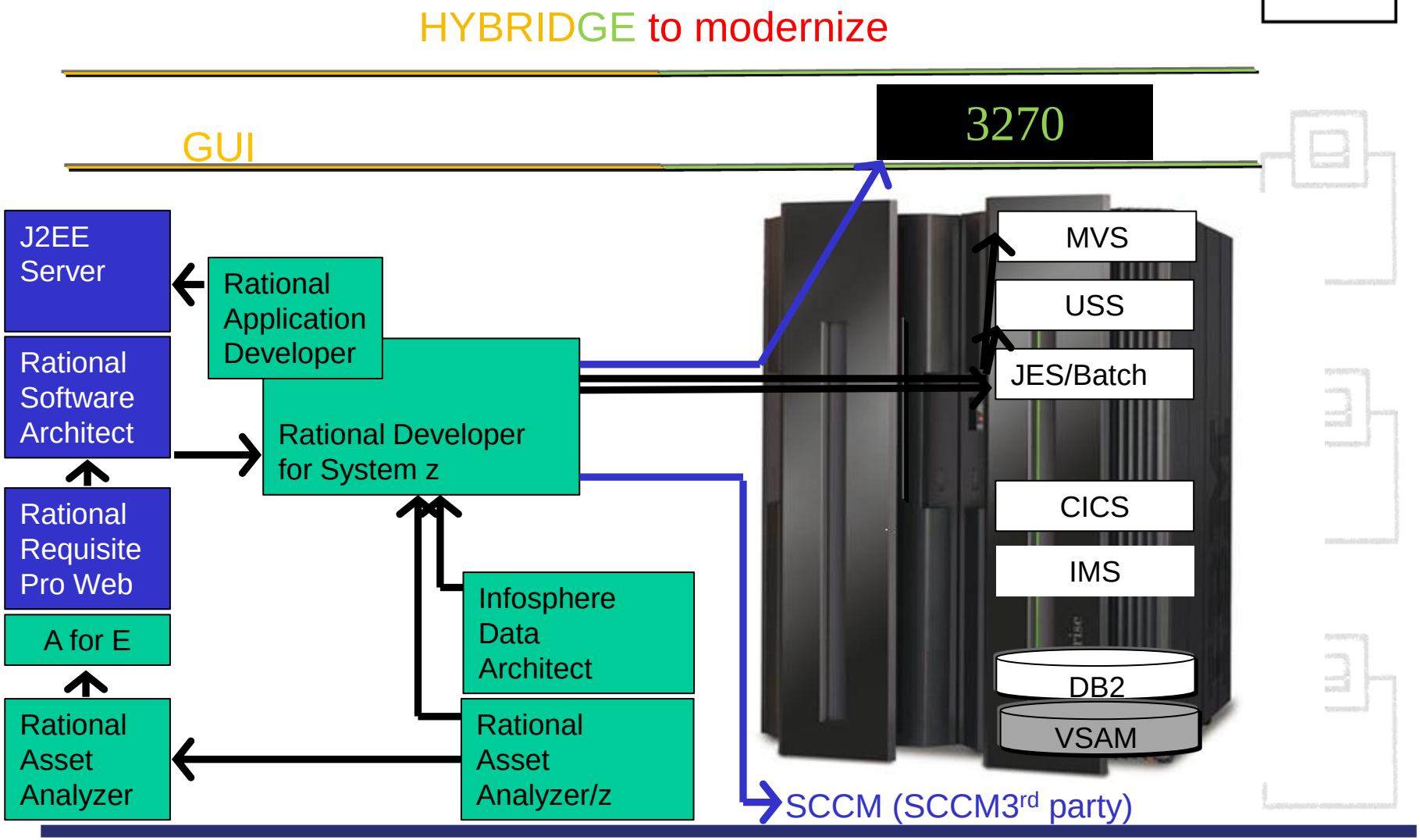
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



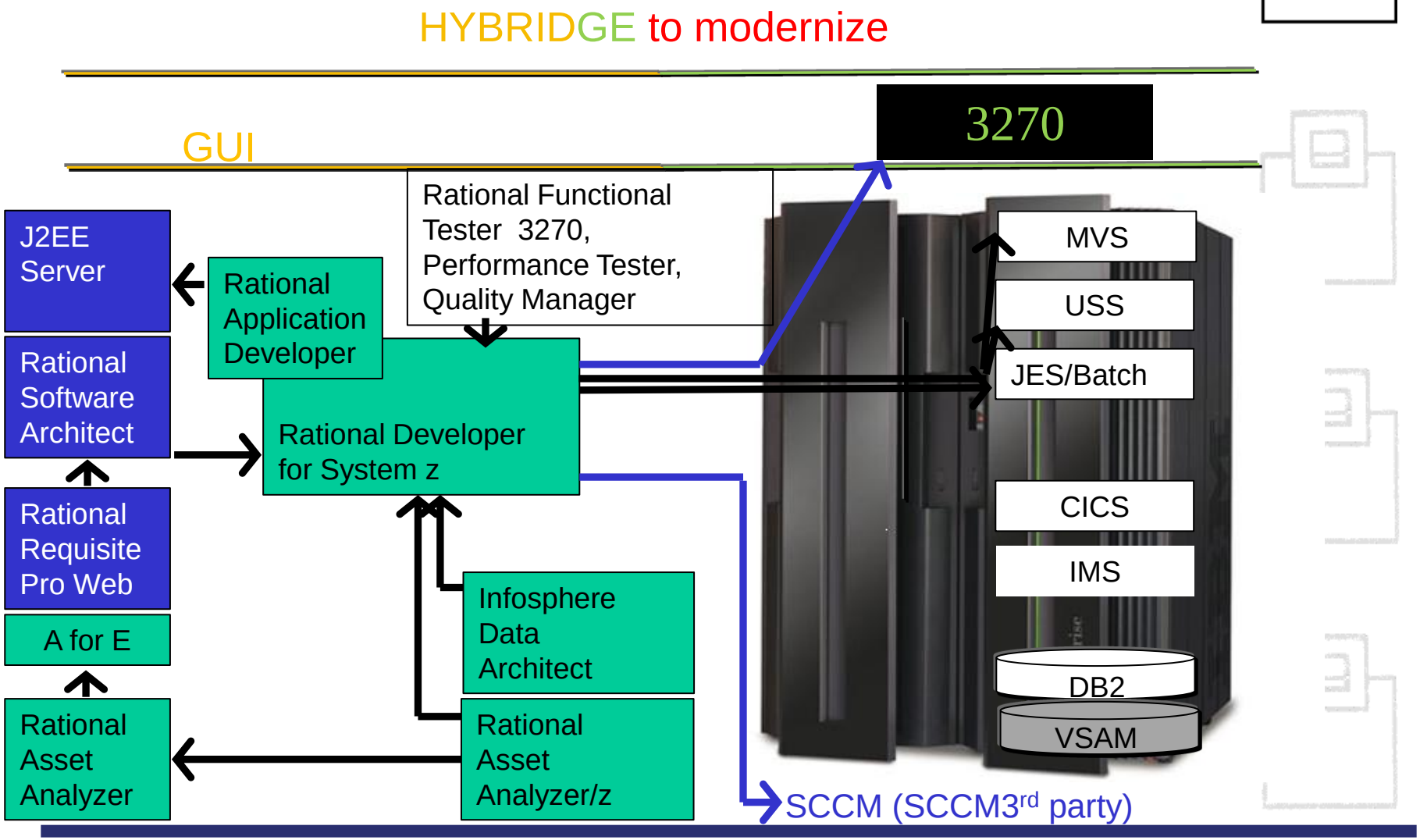
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



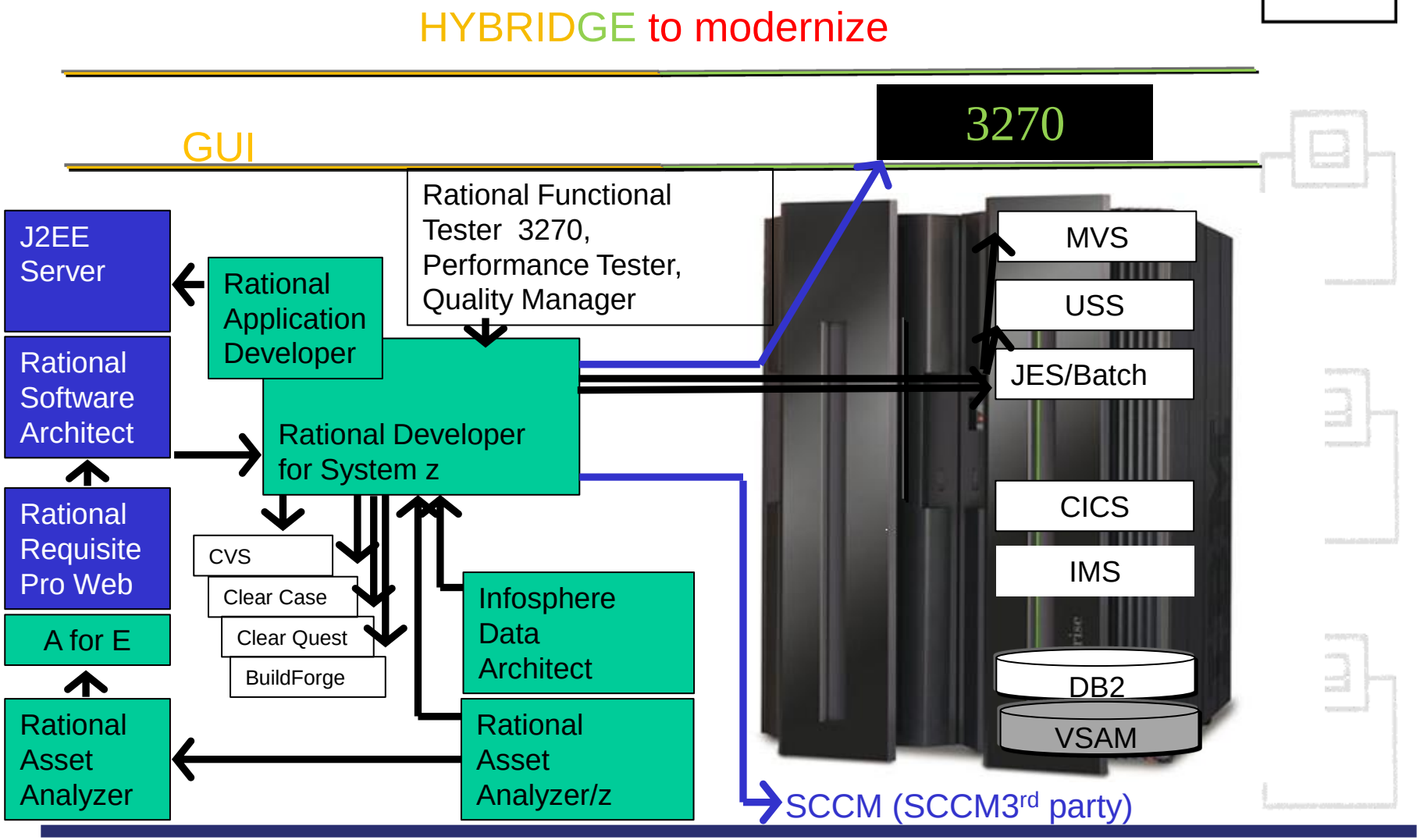
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



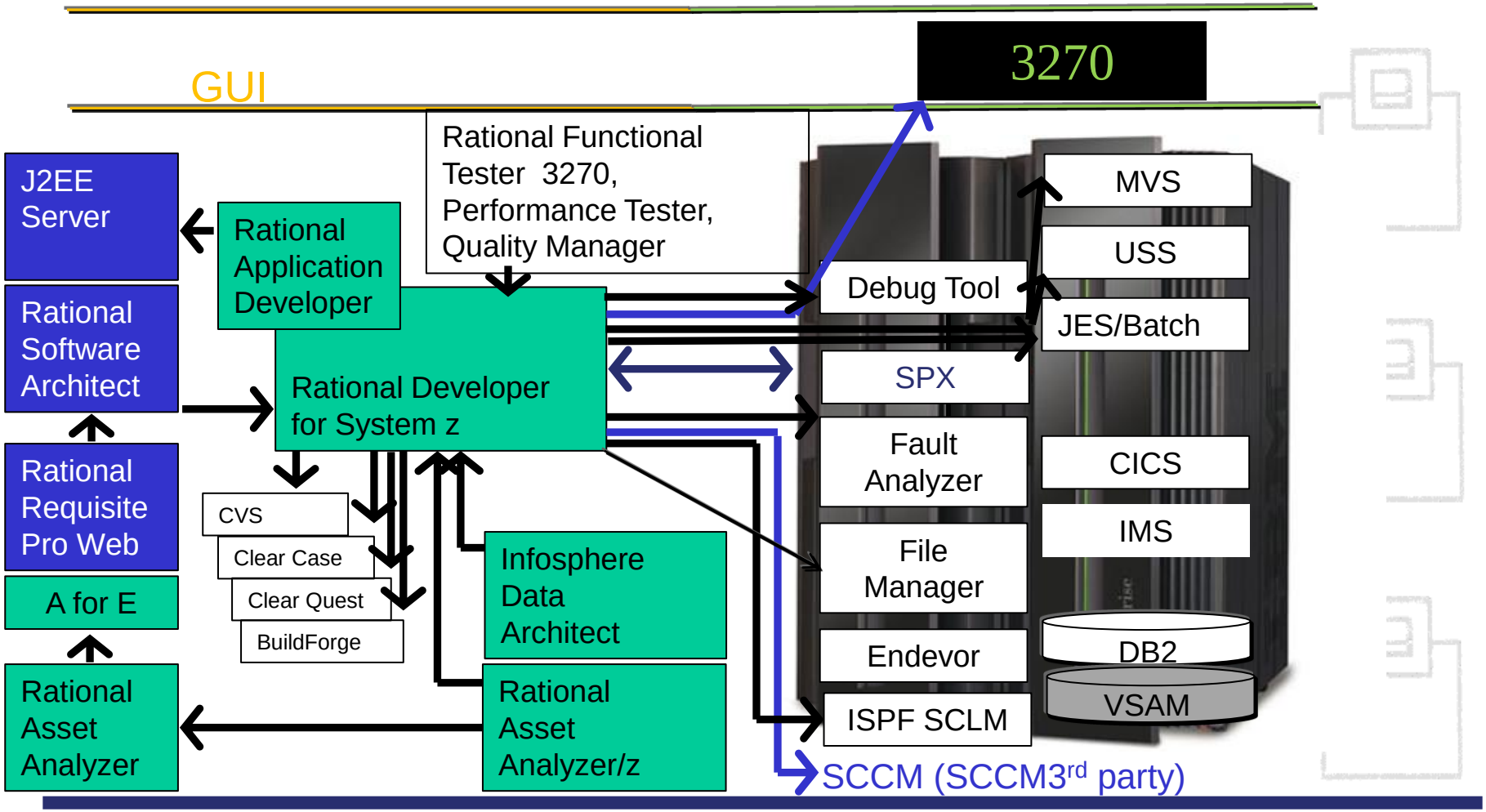
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



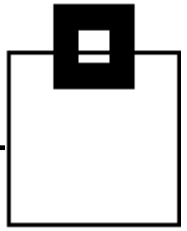
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



SQL PerformanceExpert (SPX) in an IBM RATIONAL world



SQL PerformanceExpert (SPX) in an IBM RATIONAL world



How does a DB2 DBA work today?

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

How does a DB2 DBA work today?

Well it is either Batch or Green screen like this…

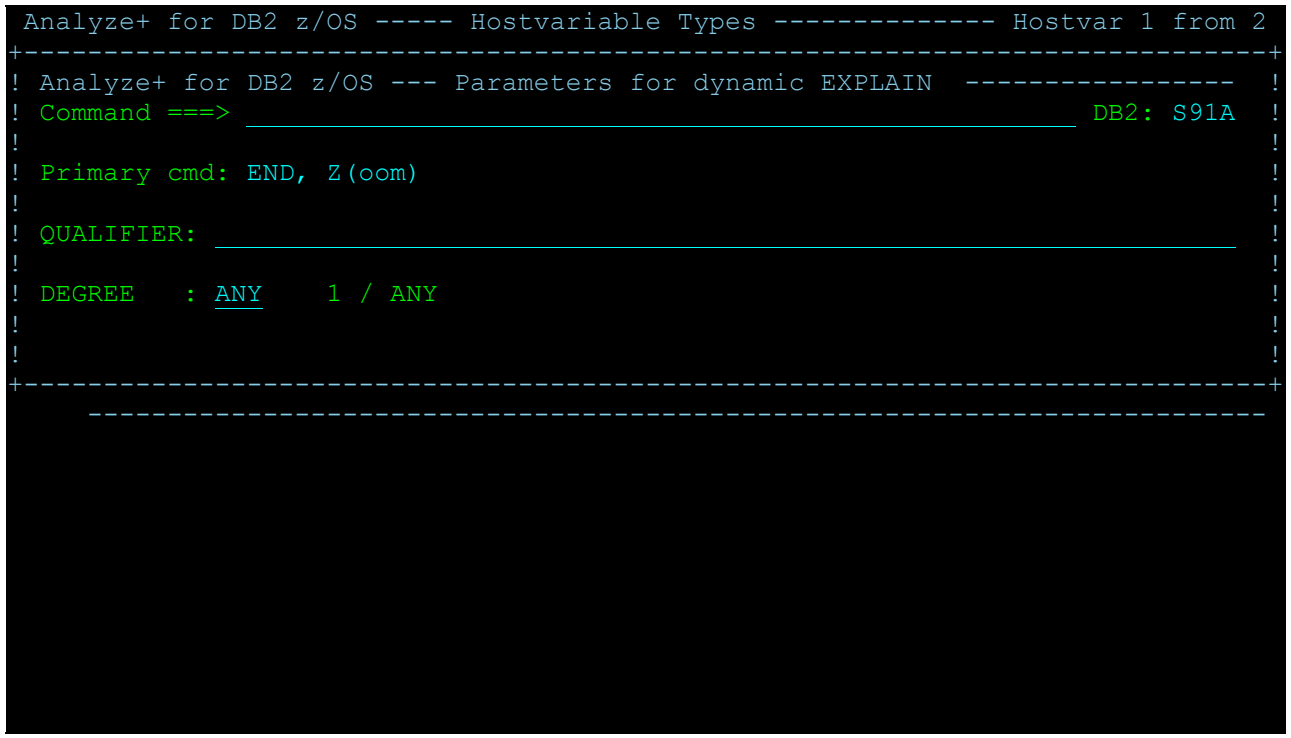
SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
Analyze+ for DB2 z/OS ----- EDIT Statement Text ---------- Columns 00001 00072
Command ===> _____________________________________________ Scroll ===> CSR

Primary cmd: END, CAN(cel), A(nalyze), X(EXecute), SE(tup)
FILE : BOXWELL.SPUFI.IN(RECUR)
****** ***************************** Top of Data ******************************
000001              DECLARE CURS6-VIV2 CURSOR FOR
000002              WITH VIVLIST
000003                     (MAX
000004                     ,BCREATOR
000005                     ,BNAME
000006                     ,BTYPE
000007                     ,DCREATOR
000008                     ,DNAME
000009                     ,DTYPE) AS
000010                (SELECT 1
000011                       ,STRIP(A.BCREATOR)
000012                       ,STRIP(A.BNAME)
000013                       ,A.BTYPE
000014                       ,STRIP(A.DCREATOR)
000015                       ,STRIP(A.DNAME)
000016                       ,A.DTYPE
000017                 FROM SYSIBM.SYSVIEWDEP A
000018                 WHERE A.BTYPE   IN ('M' , 'T' , 'V')
```

Here a developer has written an SQL…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world



The DBA plugs it into his/her Analyze Tool of choice…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
Analyze+ for DB2 z/OS ----- Explain Text ----------- LINE 00000001 COL 001 080
Command ===> _____________________________________________ Scroll ===> CSR
EXPLAIN: DYNAMIC     MODE: CATALOG                                 DB2: S91A
Primary cmd: END, D(Explain Data), V(iolations), R(unstats), P(redicates),
             S(tatement Text), C(atalog Data), M(ode Catalog/History),
             PR(int Reports), SAVExxx, SHOWxxx

DSN : BOXWELL.SPUFI.IN                                  MEMBER : RECUR
STMT :         1
Milliseconds:       117   Service Units:       252   Cost Category: B

PLAN_TABLE Description
------------------------------------------------------------------------------
QBLOCKNO:   1 Type: SELECT
 Outer table: IQAEQB01.VIVLIST Correlation: B
   Access path information:
     Sequential tablespace scan
     Sequential prefetch is done
   Locking strategy:
     UNCOMMITTED READ
 Inner table: SYSIBM.SYSTABLES Correlation: A
     JOIN strategy: NESTED-LOOP-JOIN
     Join type: INNER JOIN
   Access path information:
```

Great data for the DBA to see what is going on…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
Analyze+ for DB2 z/OS ----- Explain Data (1/6) ---------------- Entry 1 from 7
Command ===> _____________________________________________ Scroll ===> CSR
EXPLAIN: DYNAMIC     MODE: CATALOG                                 DB2: S91A
Primary cmd: END, T(Explain Text), V(iolations), R(unstats), P(redicates),
             S(tatement Text), C(atalog Data), M(ode Catalog/History), Z(oom),
             PR(int Reports), SAVExxx, SHOWxxx
Line    cmd: Z(oom), C(osts), I(ndexes of table), S(hort catalog), T(able),
             V(irtual indexes of table), X(IndeX)
DSN : BOXWELL.SPUFI.IN                                  Member : RECUR
Stmt :         1
Milliseconds:        117  Service Units:        252  Cost Category: B

  QBNO QBTYPE CREATOR  TABLE NAME              MTCH IX METH PRNT TABL PRE  MXO
  PLNO TABNO  XCREATOR INDEX NAME         ACTYP COLS ON OD   QBLK TYPE FTCH PSQ
  ---- ------ -------- ------------------ ----- ---- -- ---- ---- ---- ---- ---
_    1 SELECT IQAEQB01 VIVLIST            R        0 N     0    0 C    S      0
     1 5
_    1 SELECT SYSIBM   SYSTABLES          I        2 N     1    0 T           0
     2 1      SYSIBM   DSNDTX01
_    1 SELECT                                      0 N     3    0 -           0
     3 0
_    2 UNIONA                                      0       0    0 -           0
     1 0
```

And the result is nice and clear…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
Analyze+ for DB2 z/OS ----- Violations ------------- LINE 00000007 COL 001 080
Command ===> _____________________________________________ Scroll ===> CSR
EXPLAIN: DYNAMIC     MODE: CATALOG                                 DB2: S91A
Primary cmd: END, D(Explain Data), T(Explain Text), R(unstats), P(redicates),
             S(tatement Text), C(atalog Data), M(ode Catalog/History),
             PR(int Reports), SAVExxx, SHOWxxx

DSN : BOXWELL.SPUFI.IN                                  MEMBER : RECUR
STMT :         1

--------------------------------------------------------------------------------
               ----- RULE-NO.:  9048   (WARNING) -----
External sort because of UNION or DISTINCT. QBLOCKNO: 1, PLANNO: 3
Try to avoid the sort.
               ----- RULE-NO.:  9071   (WARNING) -----
Predicate is stage 1, but not indexable. QBLOCKNO: 4, Access: STAGE1,
Predicate: B.BTYPE<>'T'
Try to rewrite the predicate as indexable or try to add another (indexable)
predicate for this column(s) to the WHERE or ON clause.
               ----- RULE-NO.:  9069   (ERROR) -----
Runstats check found serious rule violations.
Please look into the runstats report.
               ----- RULE-NO.:  9099   (WARNING) -----
The statement costs are category B. DB2 could not determine them exactly.
```

With rule assisted auditing and explanations…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
Analyze+ for DB2 z/OS ----- Runstats ------------- LINE 00000009 COL 001 080
Command ===> _____________________________________________ Scroll ===> CSR
EXPLAIN: DYNAMIC     MODE: CATALOG                                DB2: S91A
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), P(redicates),
             S(tatement Text), C(atalog Data), M(ode Catalog/History),
             PR(int Rep.), SAVExxx, SHOWxxx

DSN : BOXWELL.SPUFI.IN                                  MEMBER : RECUR
STMT :         1

--------------------------------------------------------------------------------

VIOLATION  DSNDB06.SYSDBASE SYSIBM.SYSTABLES
W - OBSOLETE SYSTABLES  . . . . . : 2011-07-05-13.34.18.292116
S - IX DRF < NPAGESF  . . . . . : BOXWELL.SYSTABLES +.0000000000E+00 < +.2672
S - IX DRF < NPAGESF  . . . . . : SYSIBM  .DSNDTX03 +.0000000000E+00 < +.2672

IGNORED    DSNDB06.SYSVIEWS SYSIBM.SYSVIEWDEP

Summary output for SQL Statement

Tables read  . . . . . :        2
Tables ignored . . . . . :        1
Tables checked . . . . . :        1
```

Also going down to check the DB2 Catalog Statistics. Remember that >50% of all performance problems are bad statistics.

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
Analyze+ for DB2 z/OS ----- Catalog Report ----- LINE 00000001 COL 001 080
Command ===> _____________________________________________ Scroll ===> CSR
EXPLAIN: DYNAMIC     MODE: CATALOG                                DB2: S91A
Primary cmd: END, D(Explain Data), T(Explain Text), V(iolations), R(unstats),
             S(tatement Text), P(redicates), M(ode Catalog/History),
             PR(int Reports), SAVExxx, SHOWxxx

-------------------------------------------------------------------------------
Table: SYSIBM.SYSTABLES
Stats: 2011-07-05-13.34.18.292116
  No. of rows (CARDF): 5.351 / 2.672 pages
  RTS data TOTALROWS : 135.423 / 4.541 pages

  Index: BOXWELL.SYSTABLES
  Stats: 2011-07-05-13.34.18.292116     Type: Type-2 index
    Levels: 3 / 125 leaf pages and FULLKEYCARDF 5.351
    CLUSTERRATIO = 76,42%
    RTS data LEVELS: 1 / 129 leaf pages and TOTALENTRIES: 5.512
    Indexcolumn        ! Format          ! Dist. Values ! A/D ! NL ! Stats
    -------------------+-----------------+--------------+-----+----+-----------
    TBCREATOR          ! VARCHAR(128)    !           40 ! ASC ! N  ! OK
    TBNAME             ! VARCHAR(128)    !          784 ! ASC ! N  ! OK
    TYPE               ! CHAR(1)         !            8 ! ASC ! N  ! OK
    CREATOR            ! VARCHAR(128)    !          121 ! ASC ! N  ! OK
```

And detailing all that you need to know about the object(s).

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

All of this also in a Batch job that can check from one to thousands of DBRMs.

Either in the development phase running against a test DB2 or even using DRDA so that the EXPLAIN runs on the actual production machine giving instant feedback of how the SQL will react.

> (Normally DRDA access is not allowed so people use other methods or tools to copy the statistics and the machine environment, e.g. VOX, from production to a system where the EXPLAIN can run giving a 100% reliable outcome)

Or in the QA or Production Staging area.

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

```
VIEW       SE.MDB2VNEX.TCOBOL(SQLDDLD) - 01.01            Columns 00001 00072
Command ===> ANALYZE                                       Scroll ===> CSR
252900            EXEC SQL
2##000               DECLARE CURS6-VIV2 CURSOR FOR
253100               WITH VIVLIST
253200                     (MAX
253300                     ,BCREATOR
253400                     ,BNAME
253500                     ,BTYPE
253600                     ,DCREATOR
253700                     ,DNAME
253800                     ,DTYPE) AS
253900                (SELECT 1
254000                      ,STRIP(A.BCREATOR)
254100                      ,STRIP(A.BNAME)
254200                      ,A.BTYPE
254300                      ,STRIP(A.DCREATOR)
254400                      ,STRIP(A.DNAME)
254500                      ,A.DTYPE
254600                 FROM SYSIBM.SYSVIEWDEP A
254700                 WHERE A.BTYPE   IN ('M' , 'T' , 'V')
254800                   AND A.DTYPE   IN ('M' , 'V')
254900                   AND A.DCREATOR = :WS-CREATOR
```

OK, what about the developer???

Use of an edit macro enables a branch into the same SQL checking directly from the code…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

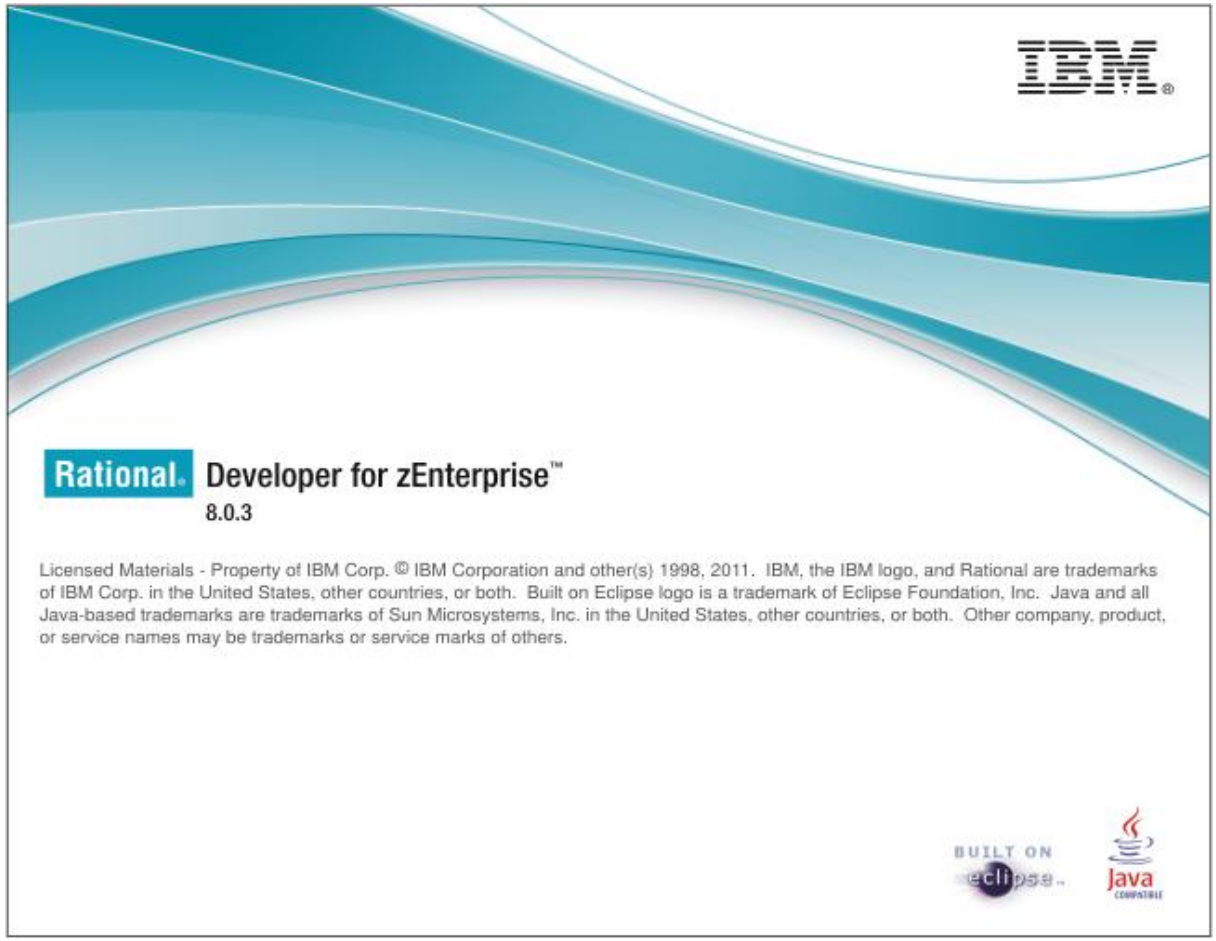
```
Analyze+ for DB2 z/OS ----- Explain Data (1/6) ---------------- Entry 1 from 7
Command ===> _____________________________________________ Scroll ===> CSR
EXPLAIN: DYNAMIC     MODE: CATALOG                                 DB2: S91A
Primary cmd: END, T(Explain Text), V(iolations), R(unstats), P(redicates),
             S(tatement Text), C(atalog Data), M(ode Catalog/History), Z(oom),
             PR(int Reports), SAVExxx, SHOWxxx
Line    cmd: Z(oom), C(osts), I(ndexes of table), S(hort catalog), T(able),
             V(irtual indexes of table), X(IndeX)
DSN : SE.MDB2VNEX.TCOBOL                          Member : SQLDDLD
Stmt :      2530
Milliseconds:        117  Service Units:        252  Cost Category: B

  QBNO QBTYPE CREATOR  TABLE NAME              MTCH IX METH PRNT TABL PRE  MXO
  PLNO TABNO  XCREATOR INDEX NAME         ACTYP COLS ON OD   QBLK TYPE FTCH PSQ
  ---- ------ -------- ------------------ ----- ---- -- ---- ---- ---- ---- ---
_    1 SELECT IQAEQB01 VIVLIST            R        0 N     0    0 C    S      0
     1 5
_    1 SELECT SYSIBM   SYSTABLES          I        2 N     1    0 T           0
     2 1      SYSIBM   DSNDTX01
_    1 SELECT                                      0 N     3    0 -           0
     3 0
     2 UNIONA                                      0       0    0 -           0
     1 0
```

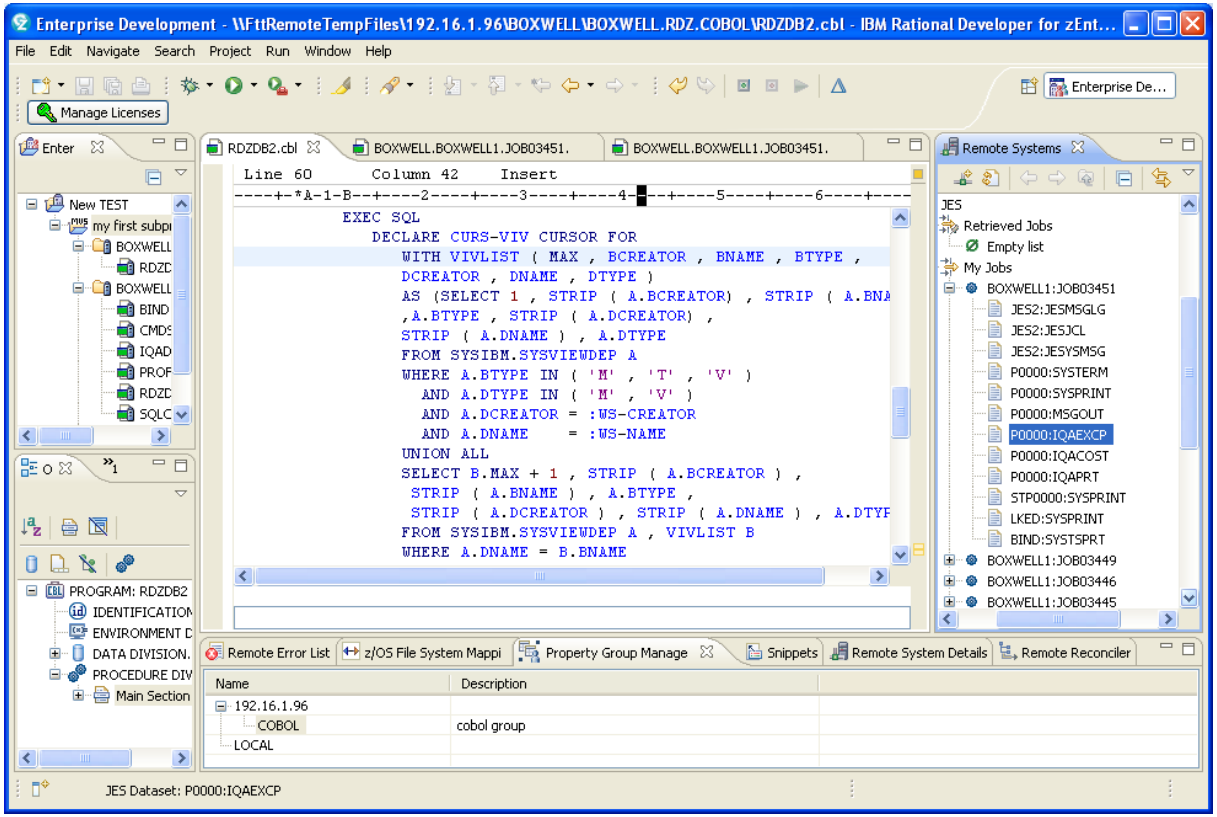
And the result is again nice and clear – Note the slight difference with DSN, Member, and Stmt of course.

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

And now Rational Developer for zEnterprise

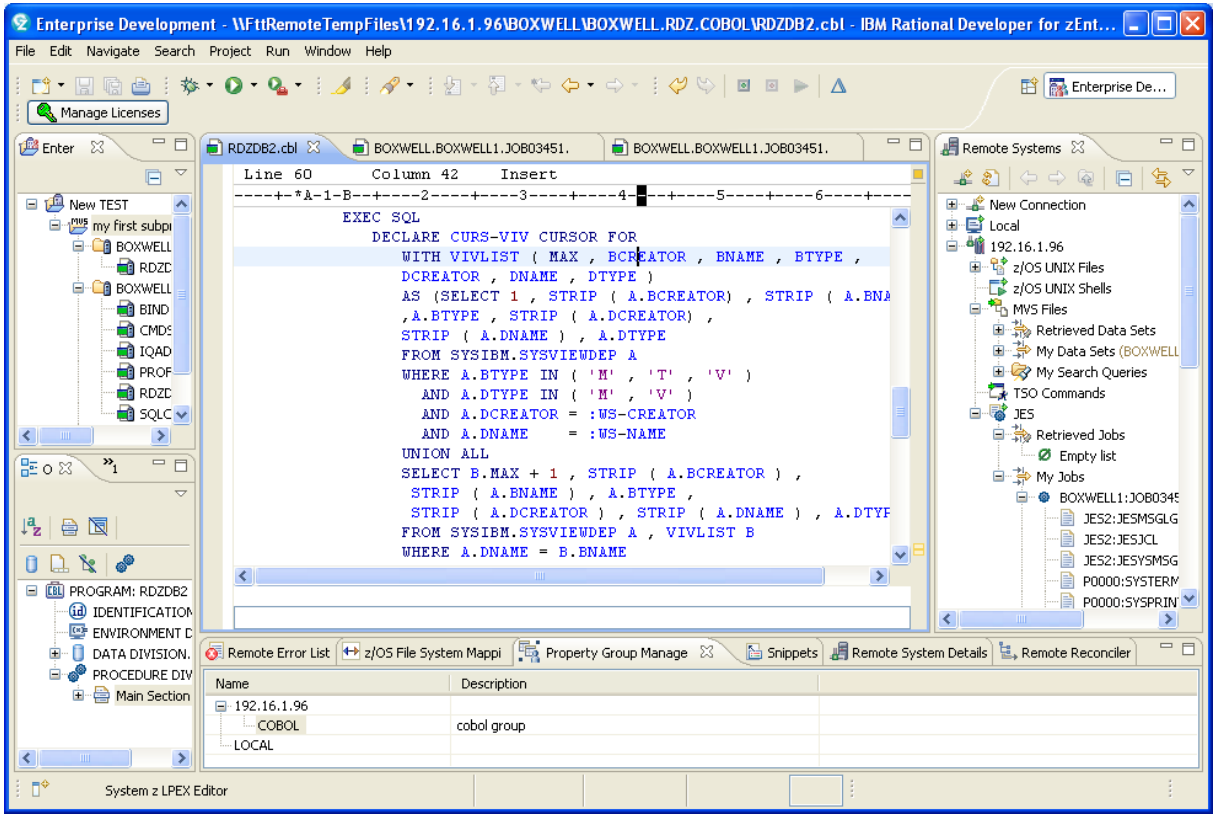


SQL PerformanceExpert (SPX) in an IBM RATIONAL world



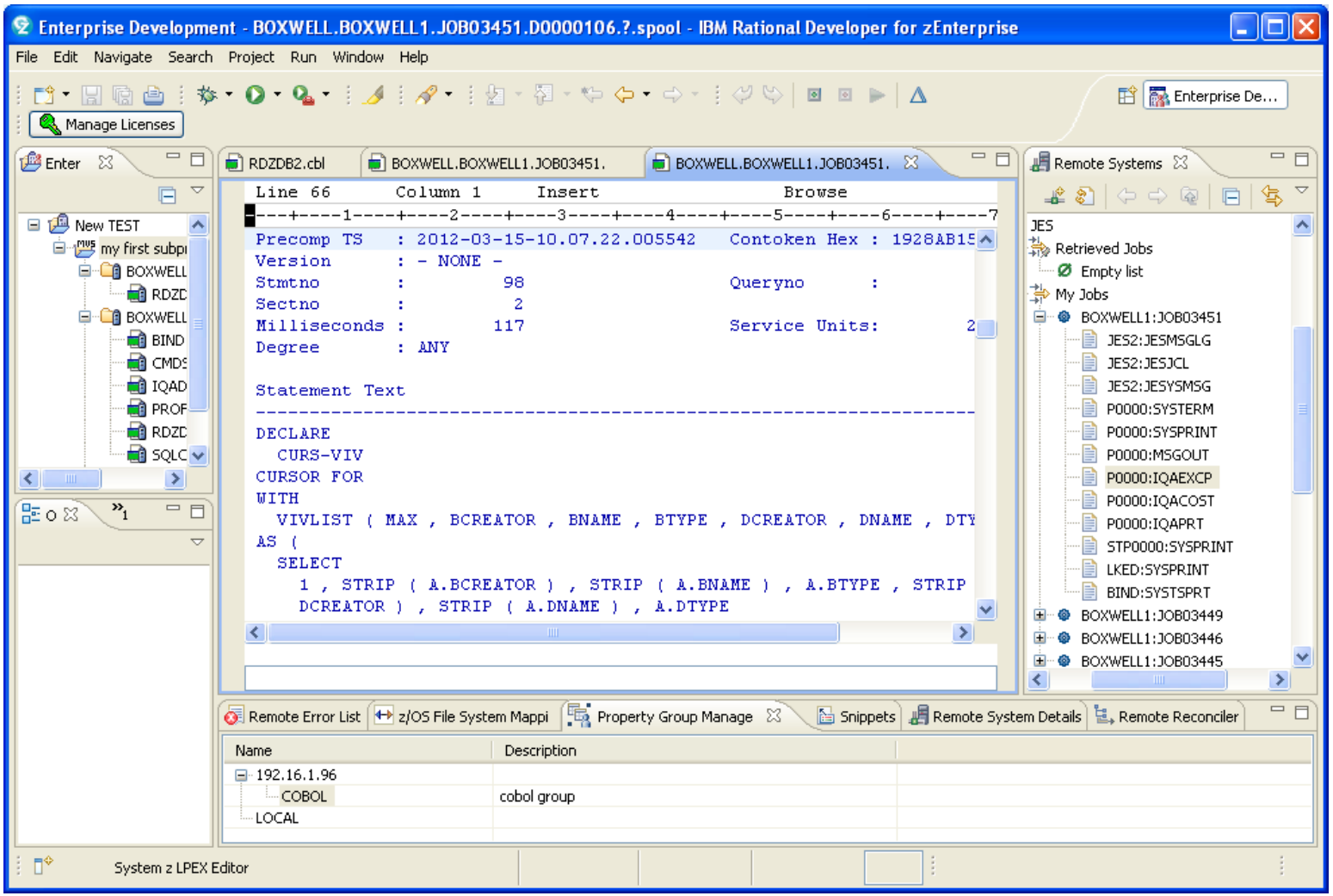
Here is COBOL code with that SQL statement again. The host JCL Procs have been changed to call the SPX SQL Performance Analyzer.

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

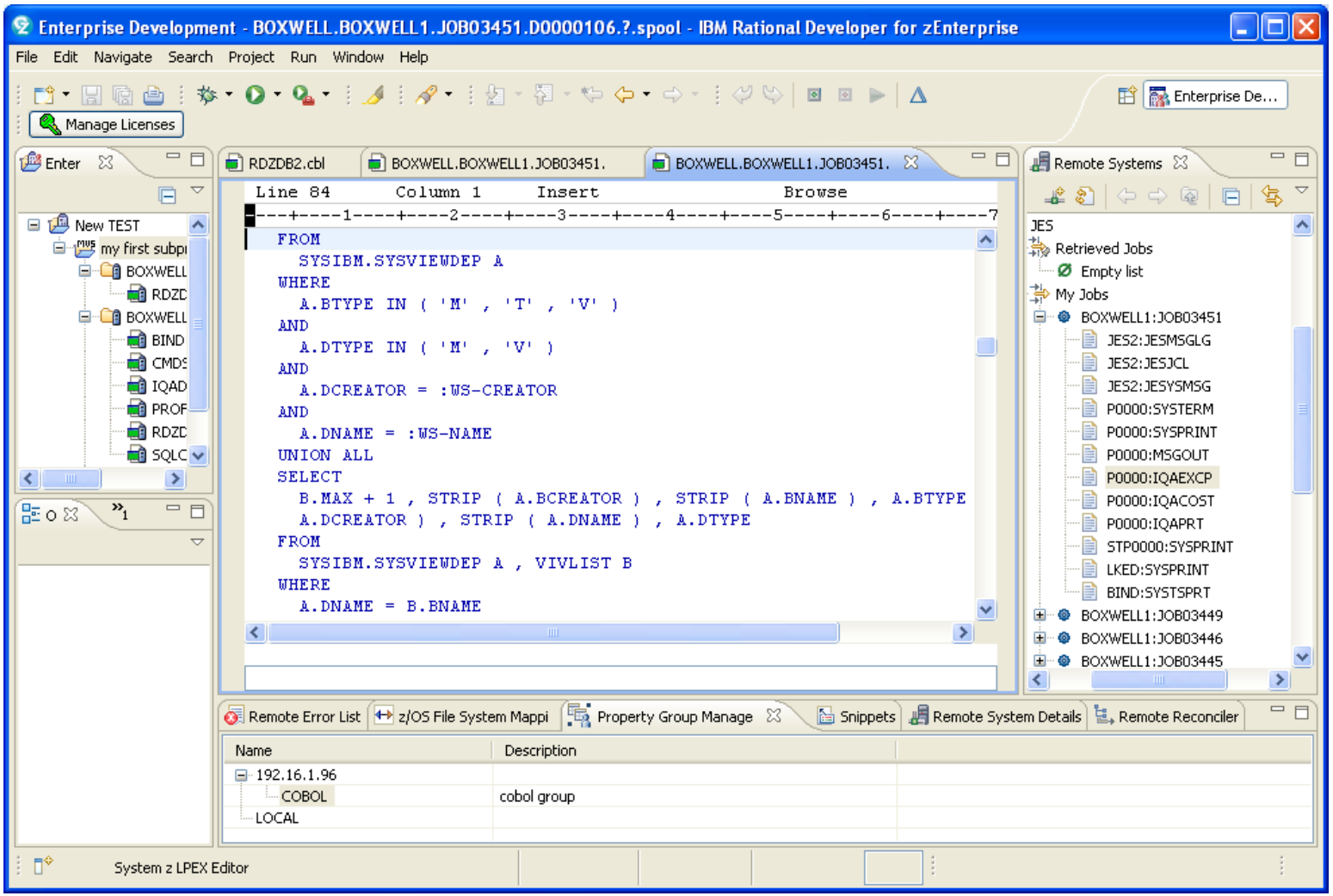


After rebuilding the subproject the view on the right hand side can be refreshed to review the job details.

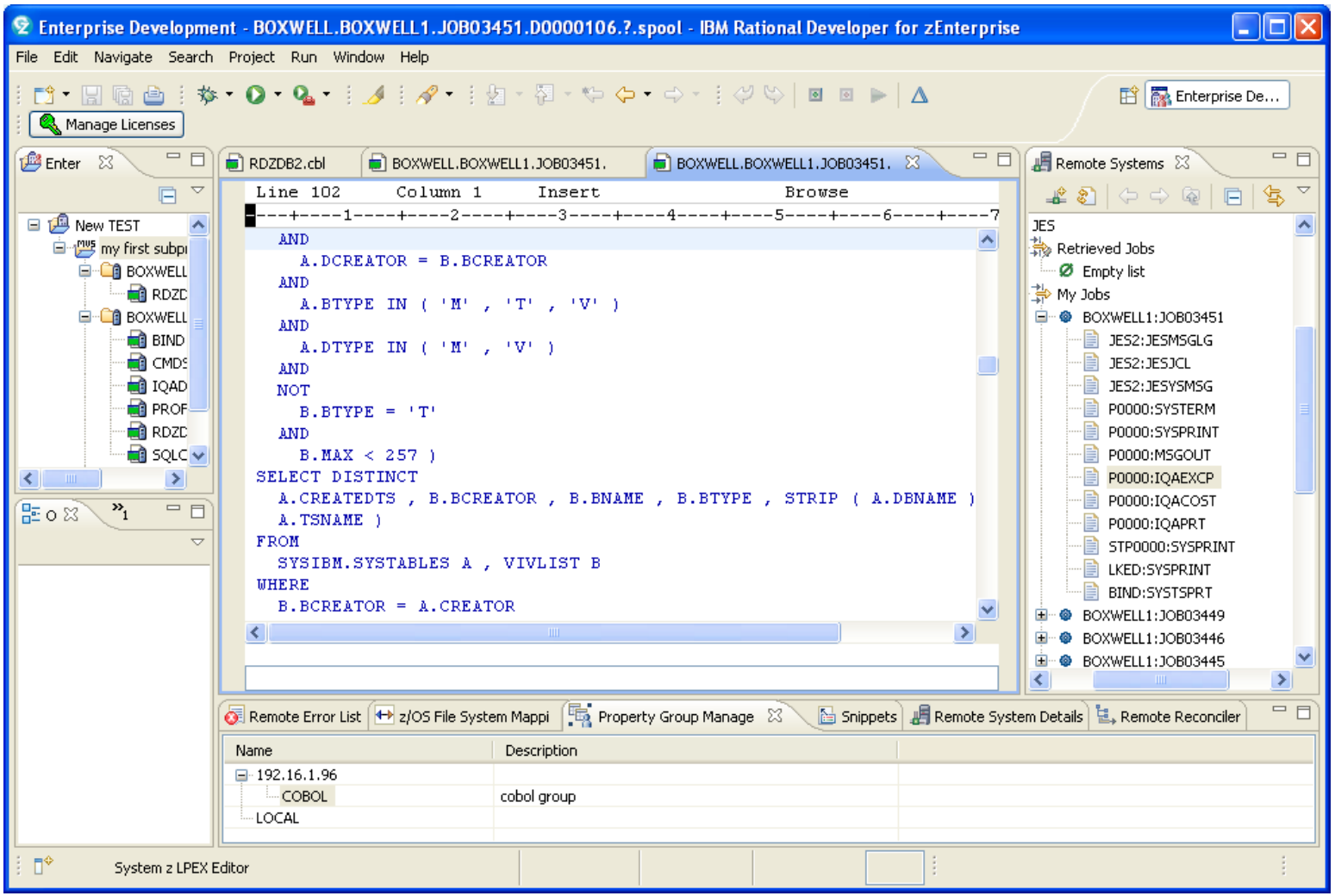
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



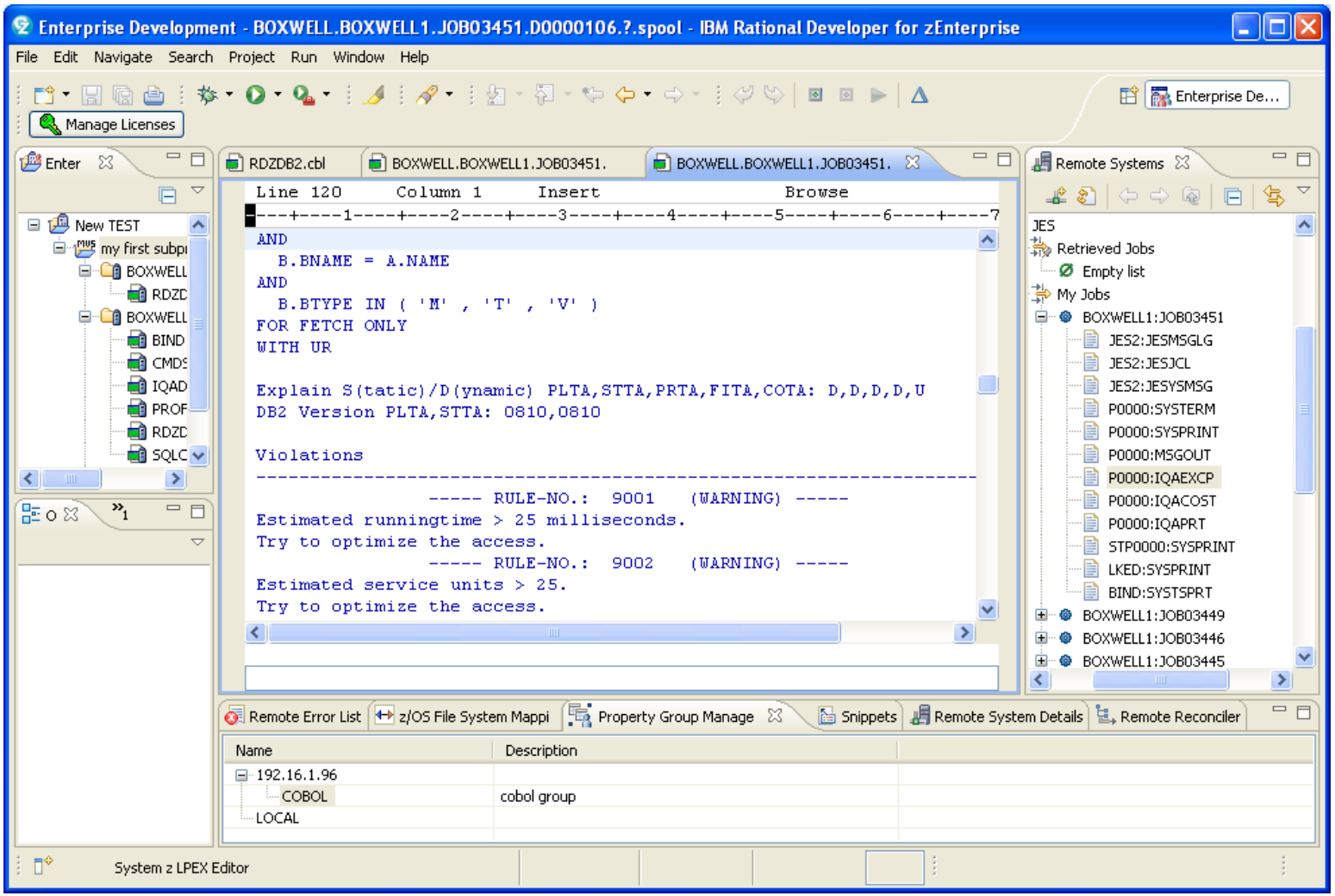
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



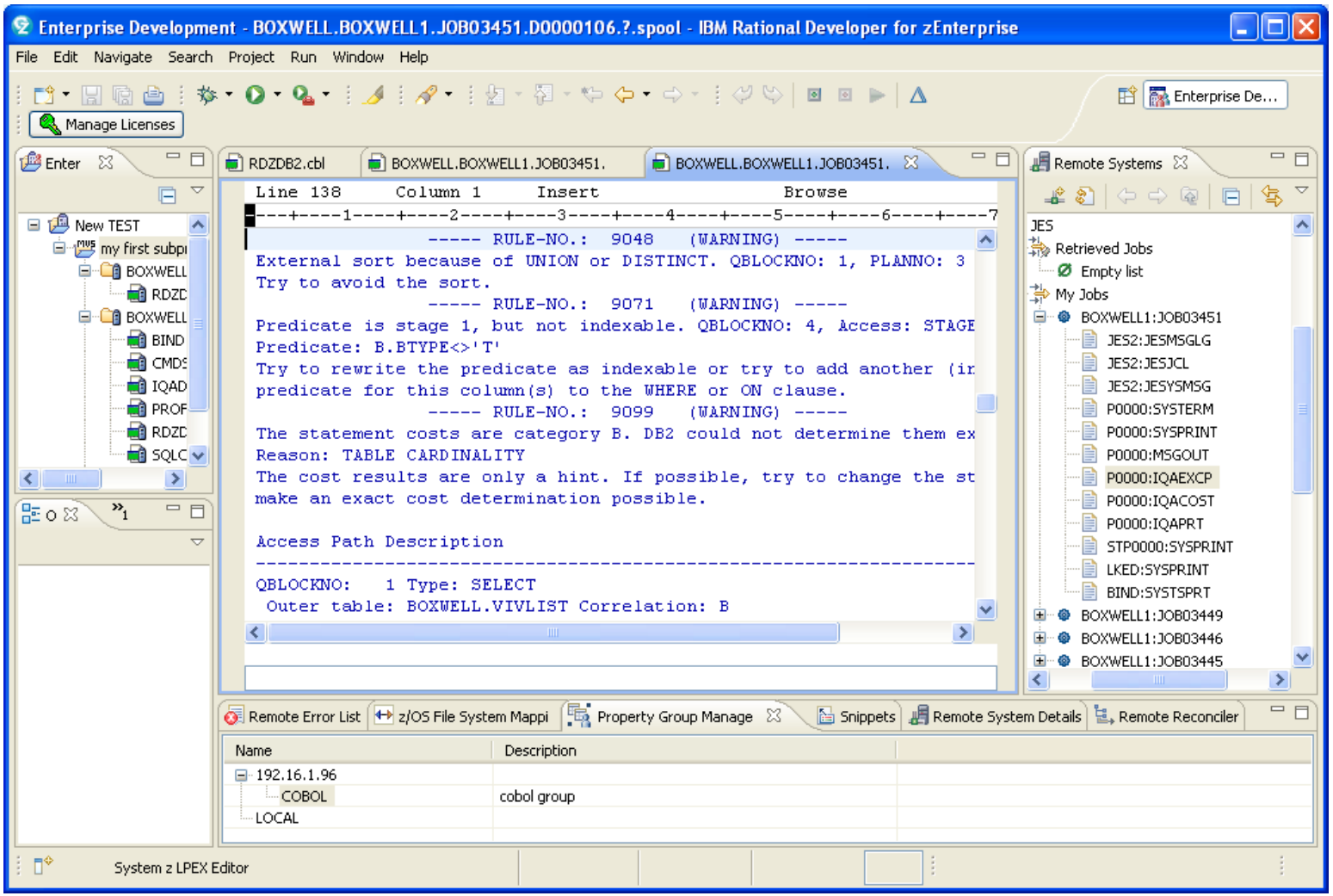
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



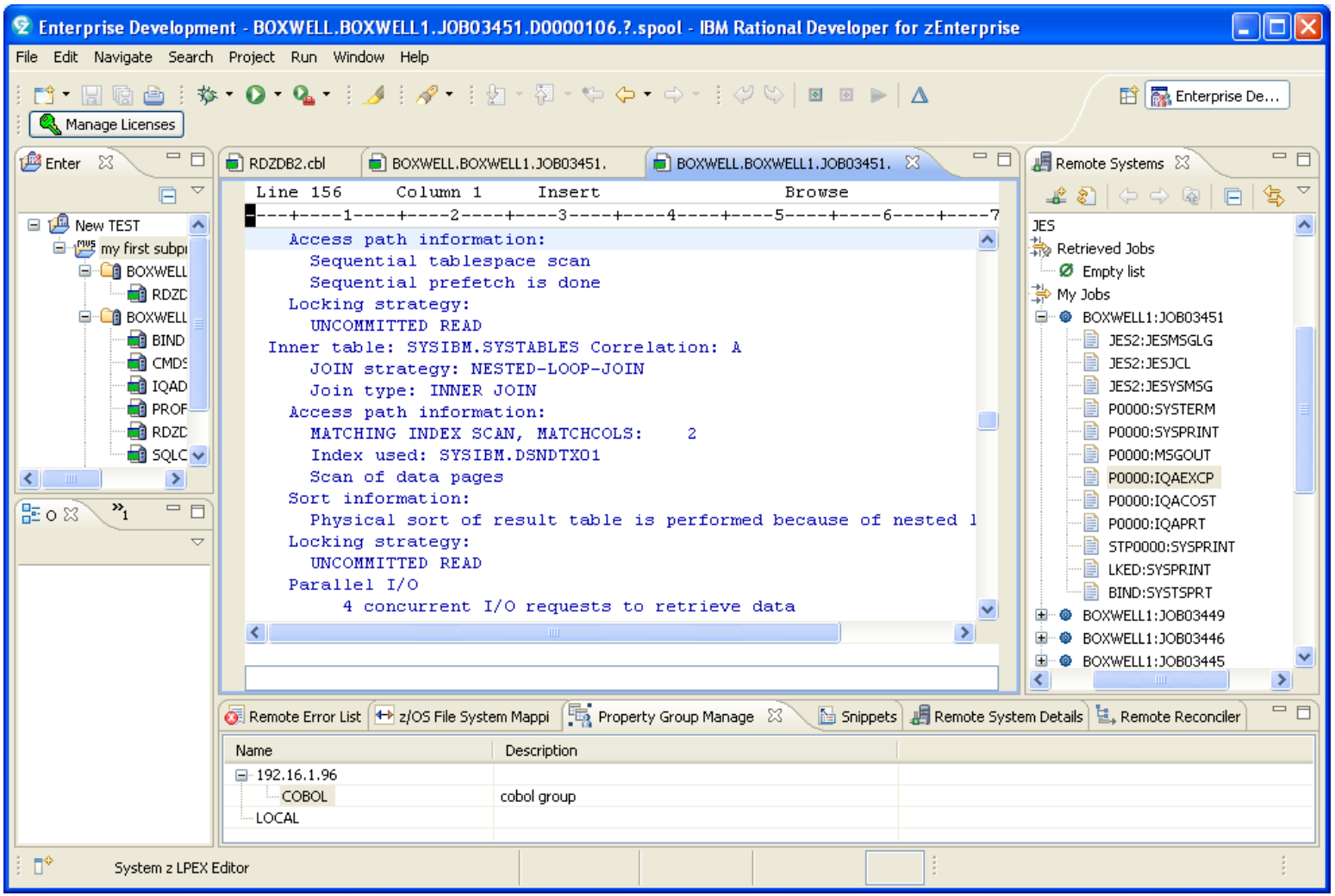
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



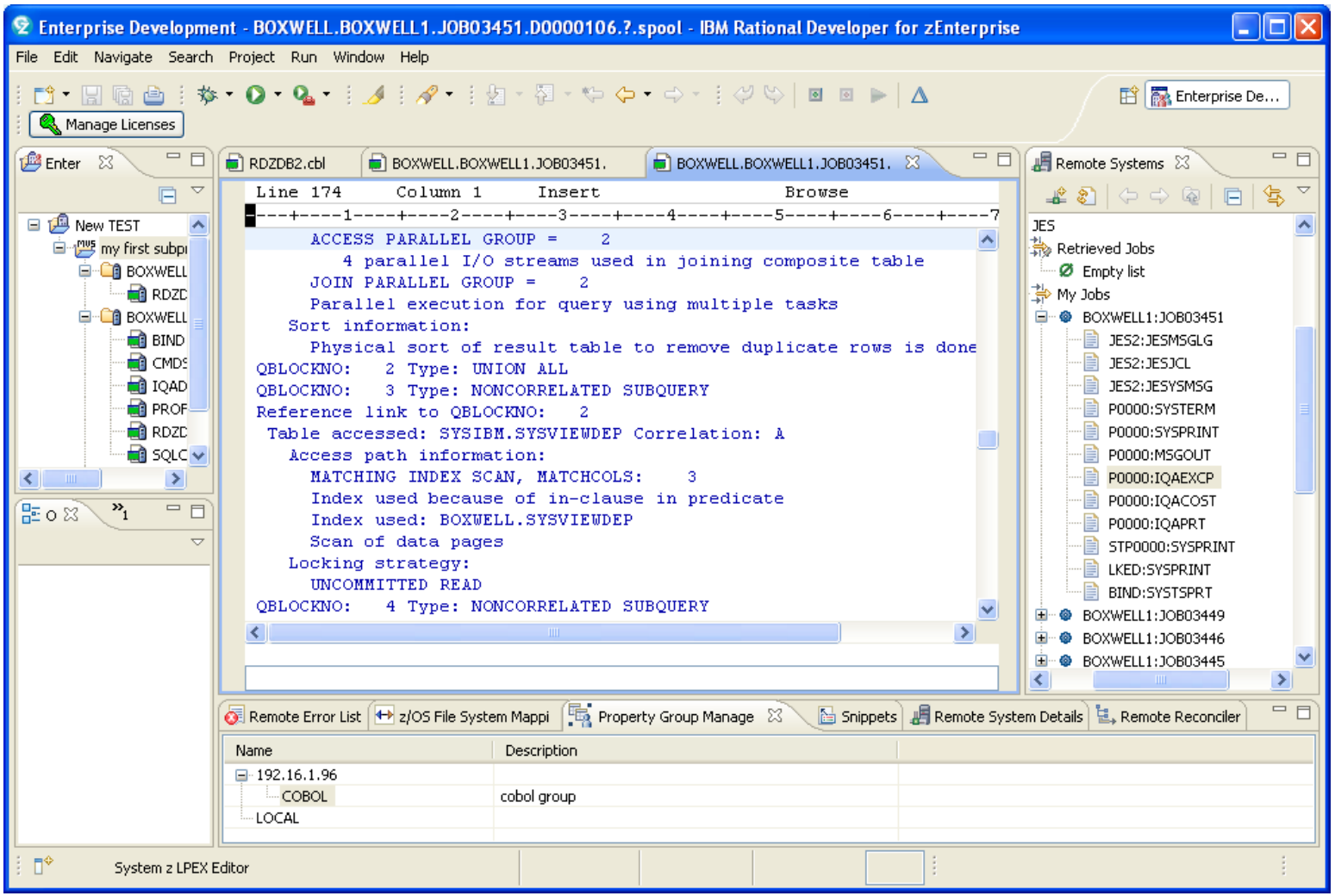
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



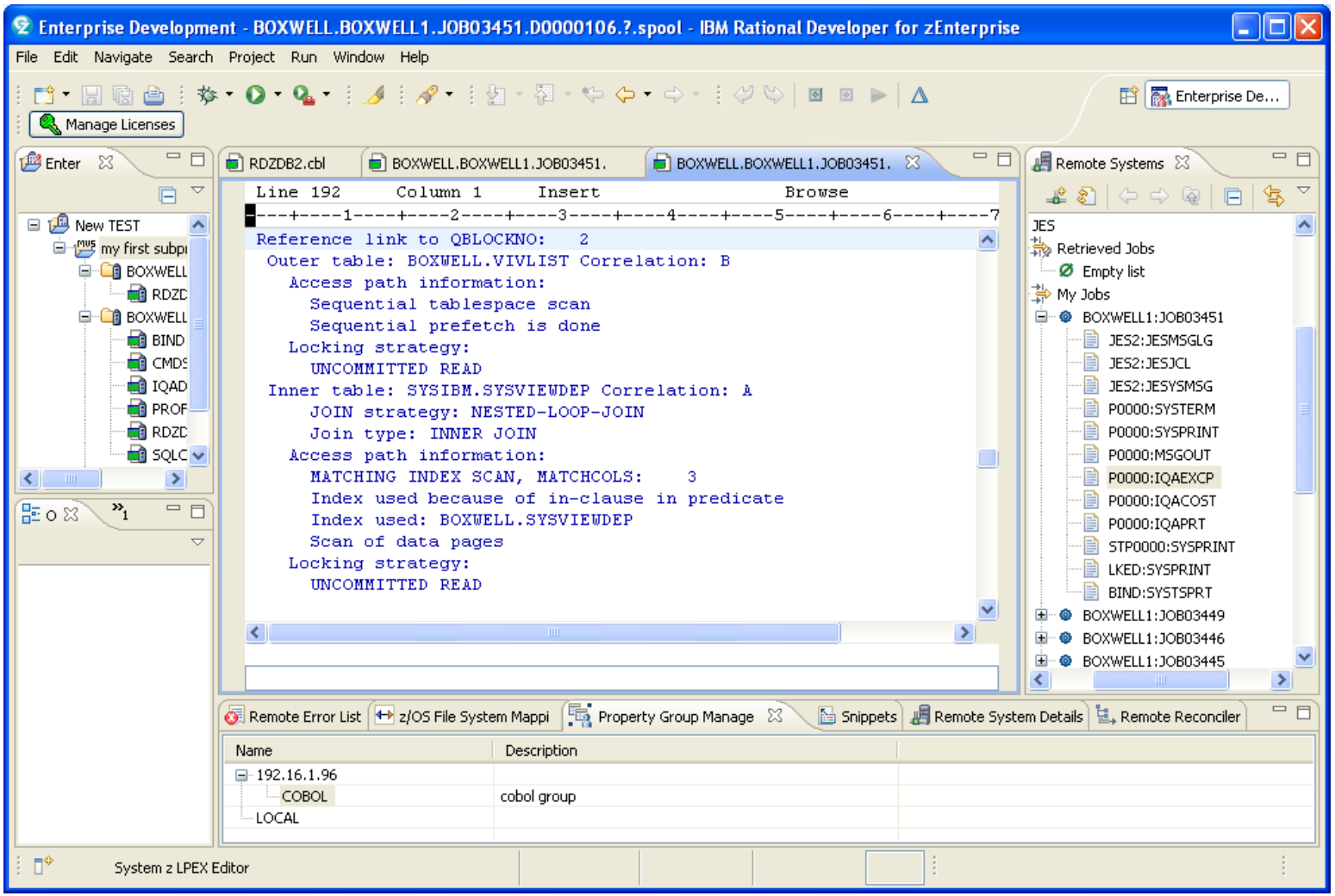
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



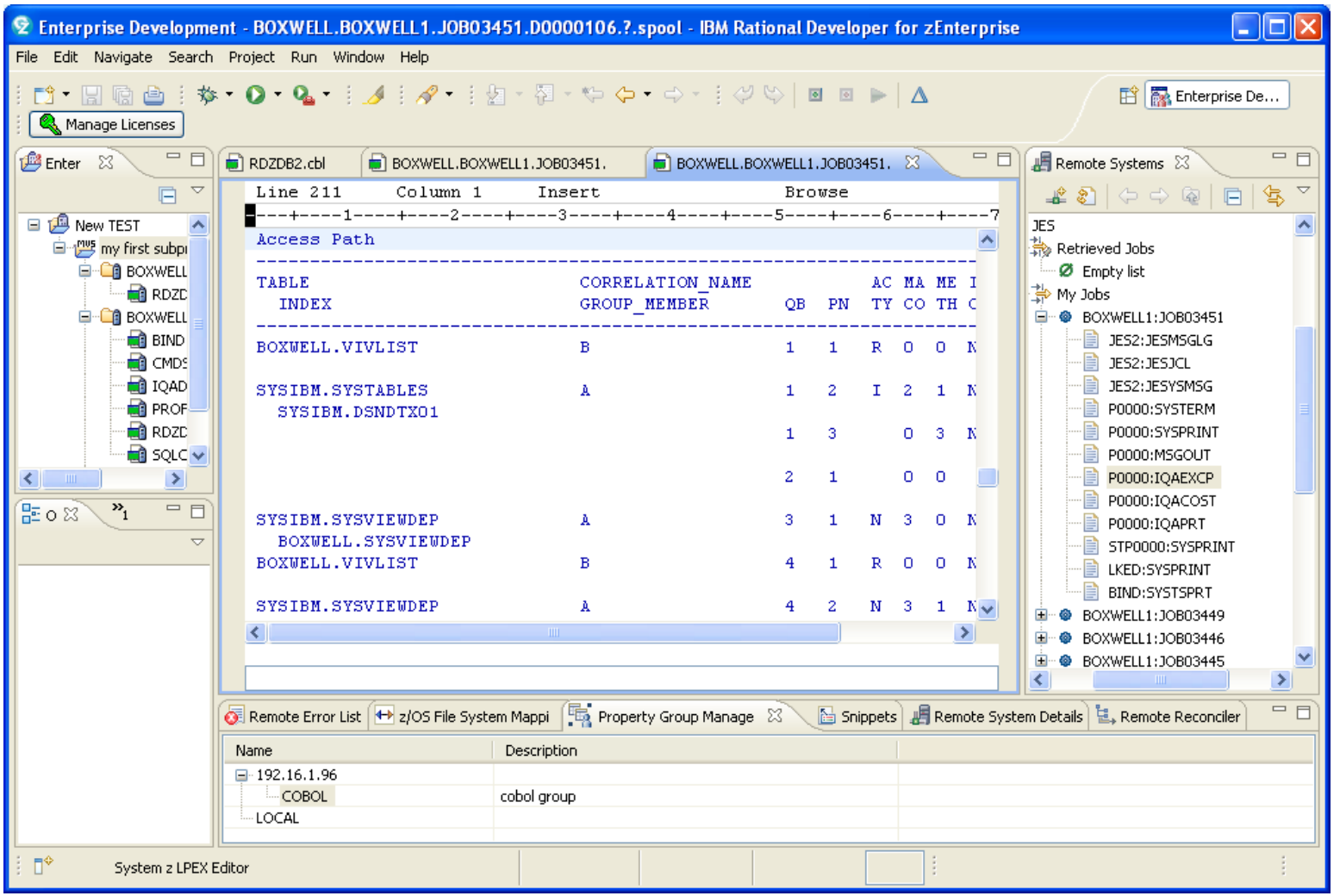
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



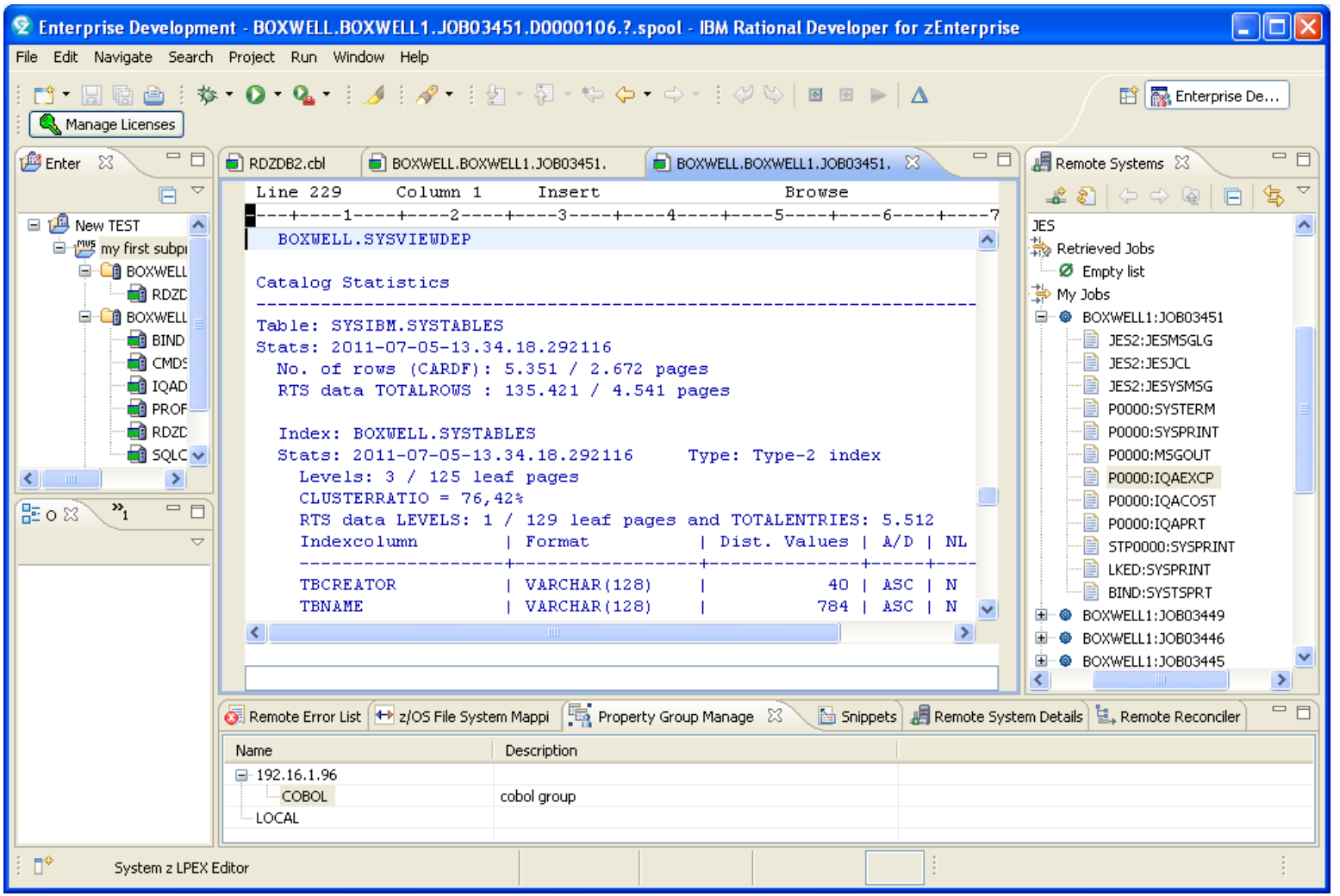
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



SQL PerformanceExpert (SPX) in an IBM RATIONAL world

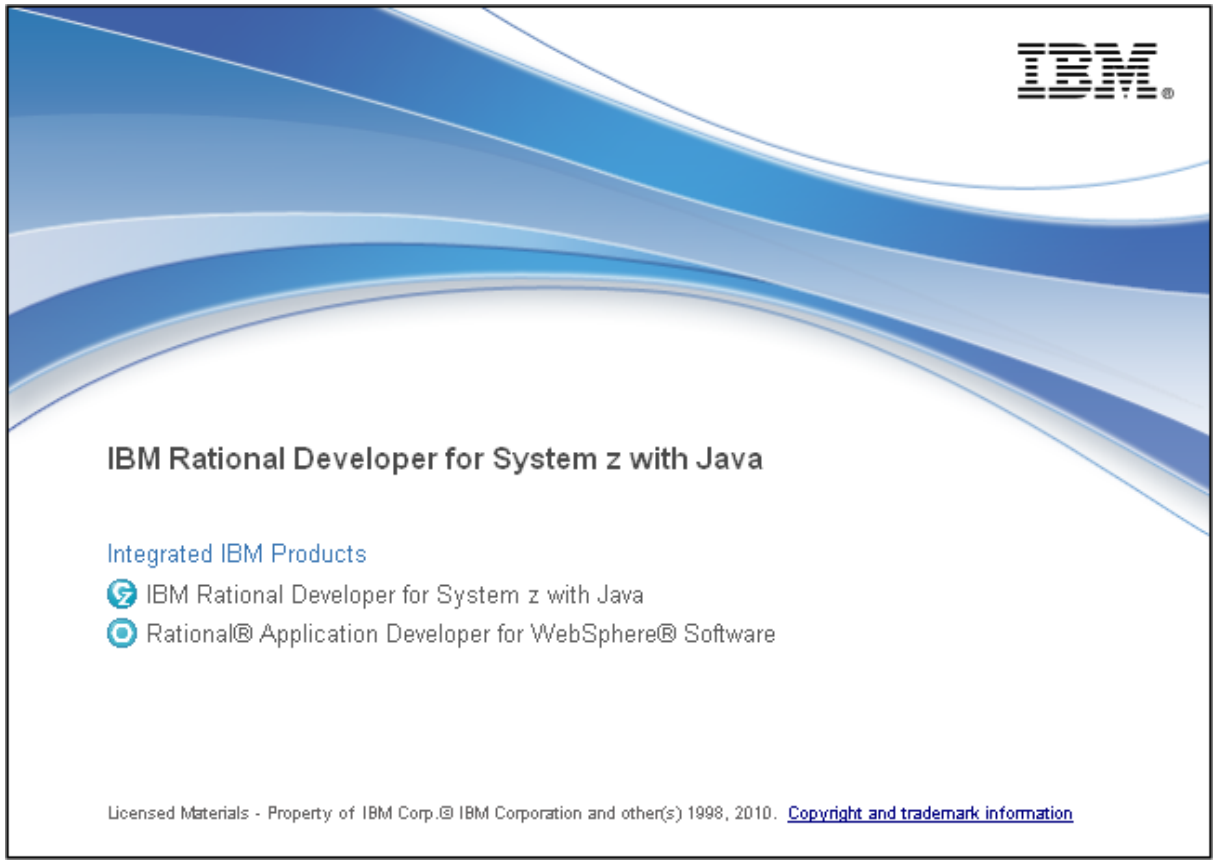


SQL PerformanceExpert (SPX) in an IBM RATIONAL world

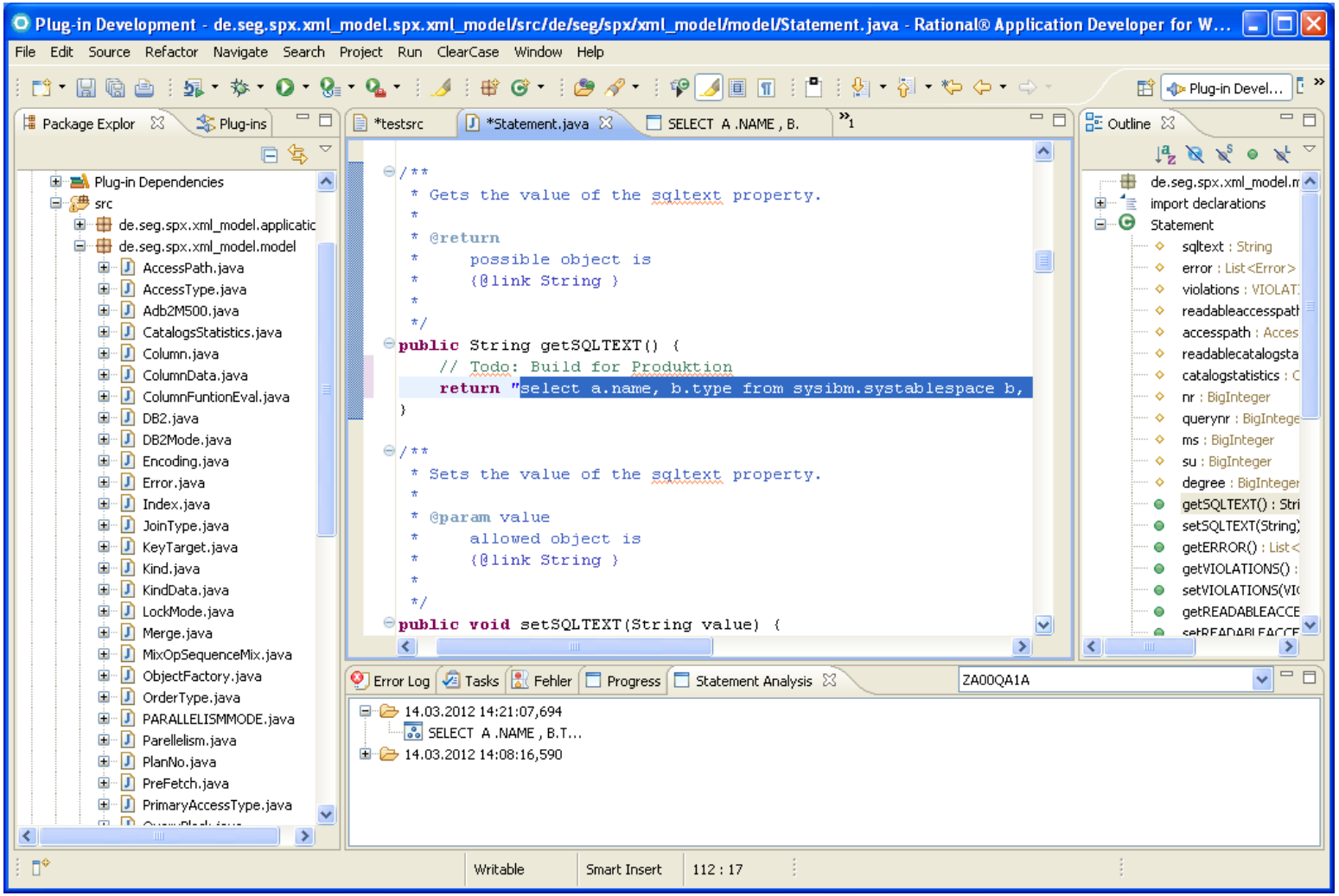


SQL PerformanceExpert (SPX) in an IBM RATIONAL world

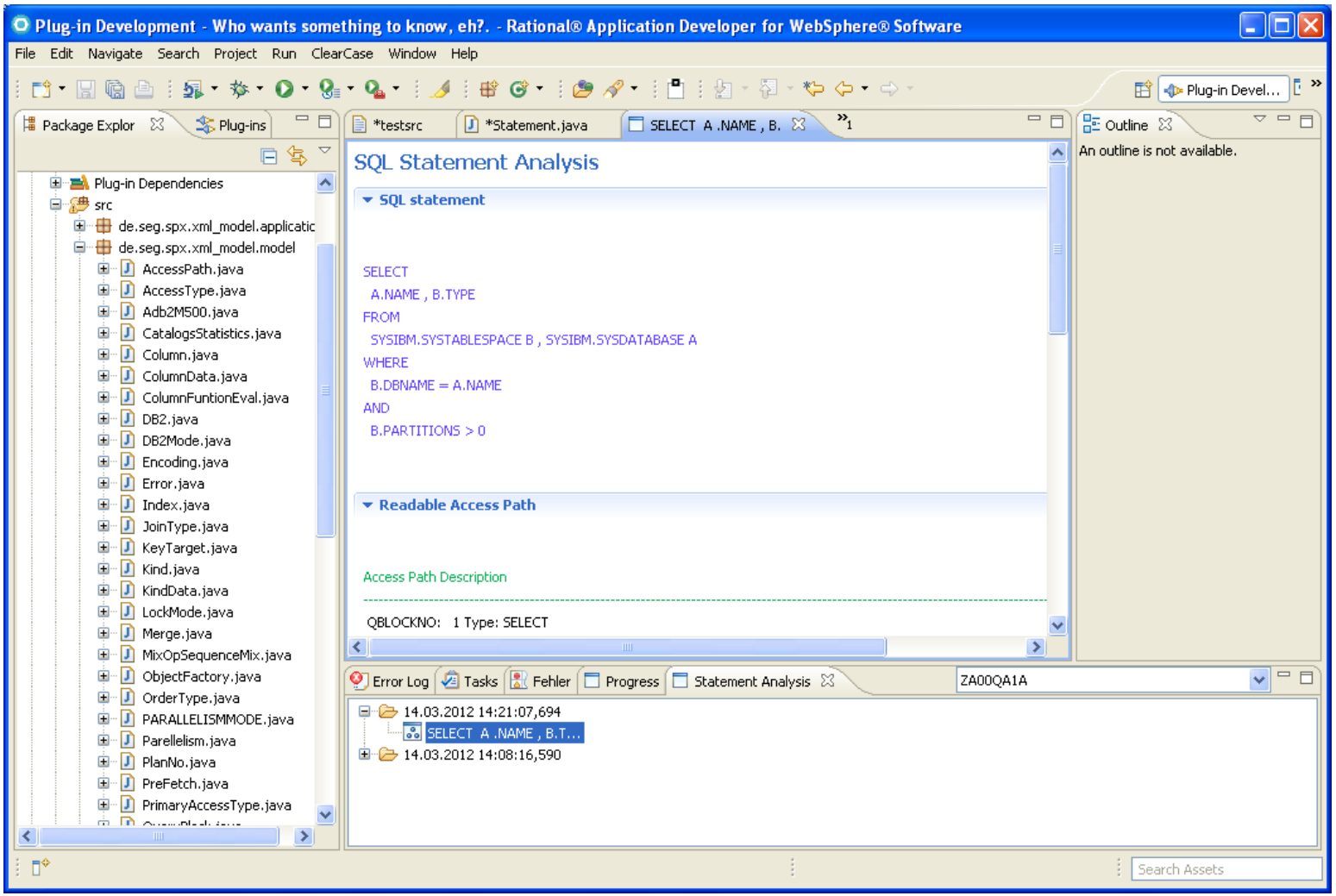
And now Rational Application Developer for WebSphere



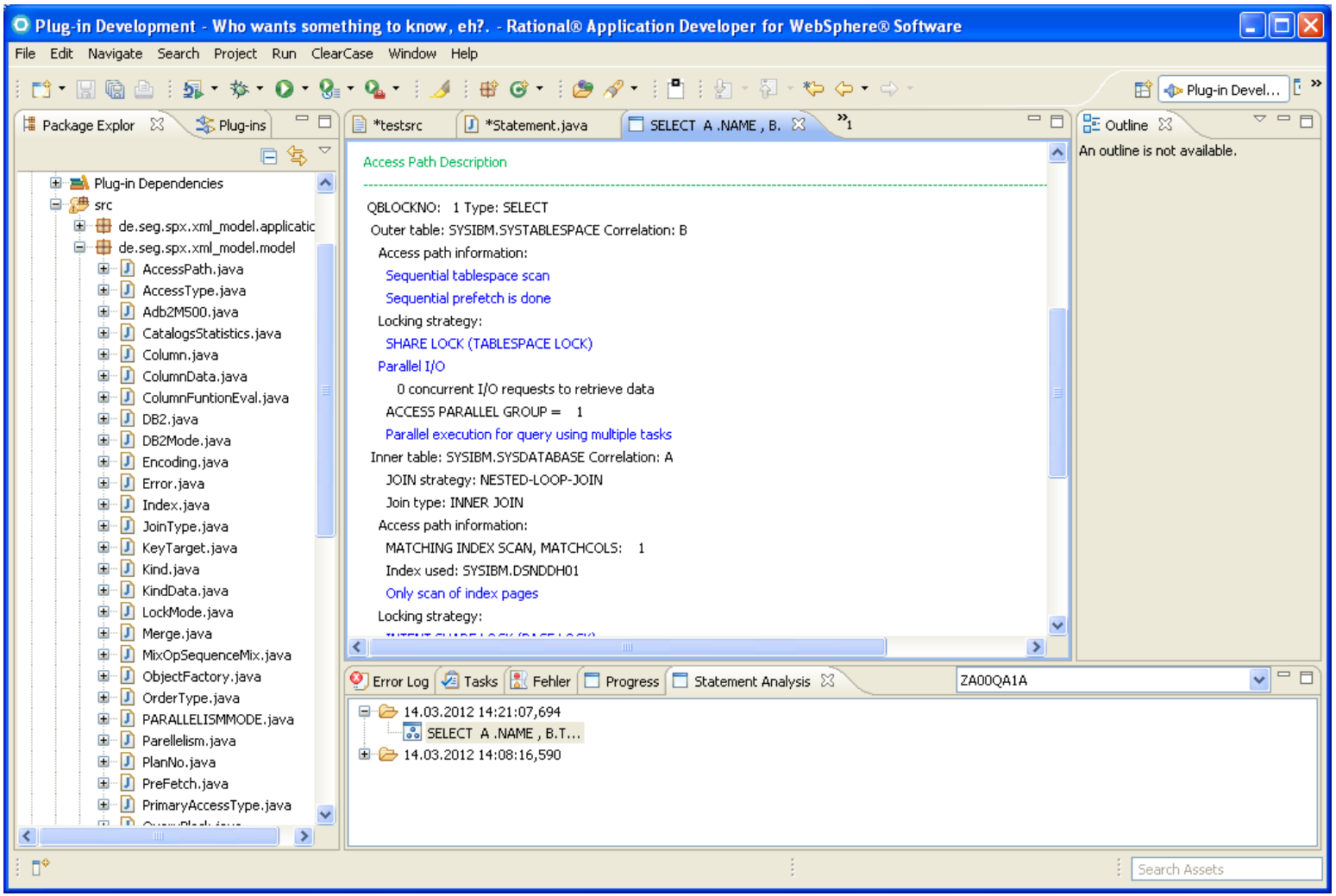
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



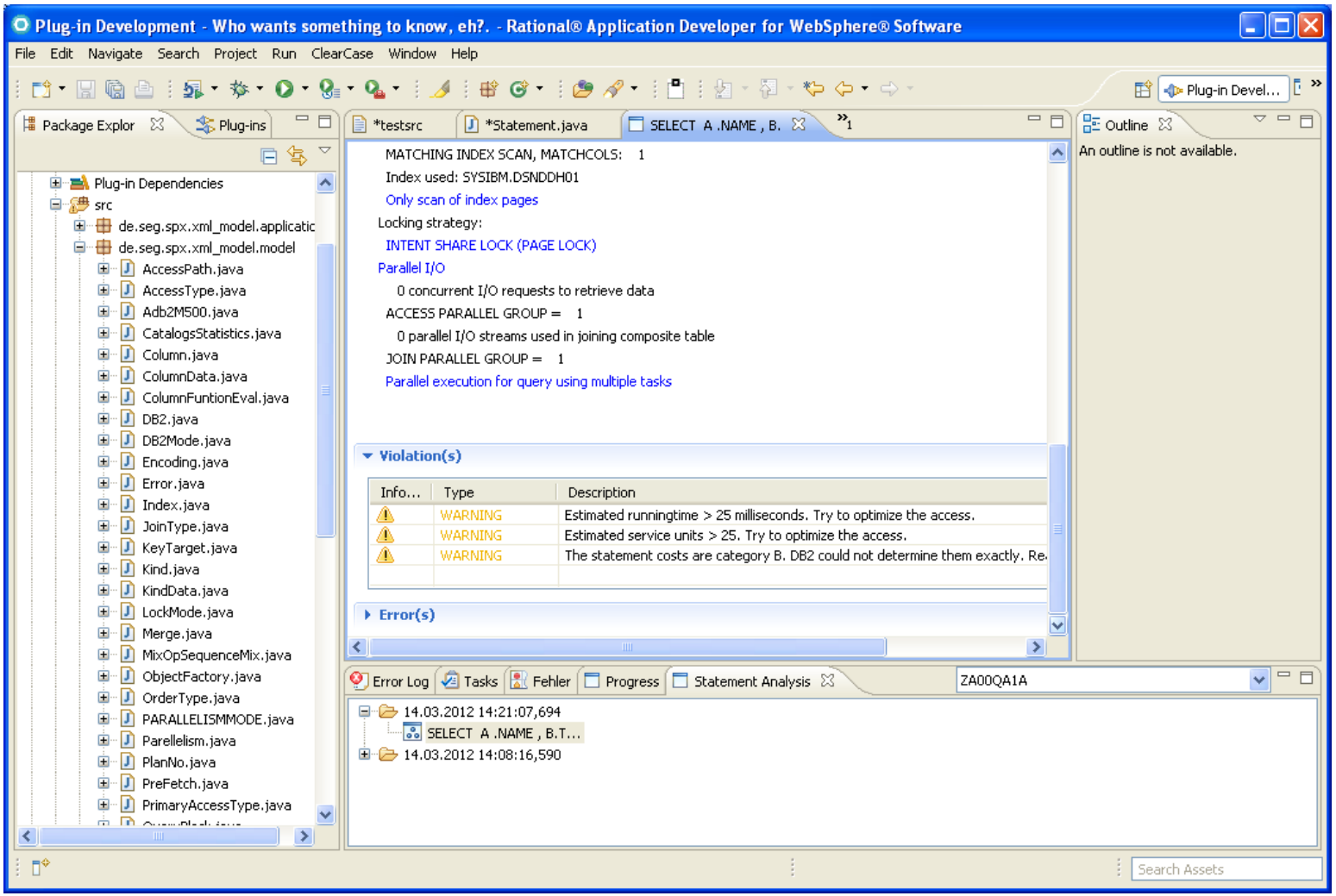
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



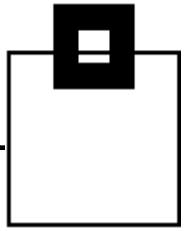
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



SQL PerformanceExpert (SPX) in an IBM RATIONAL world

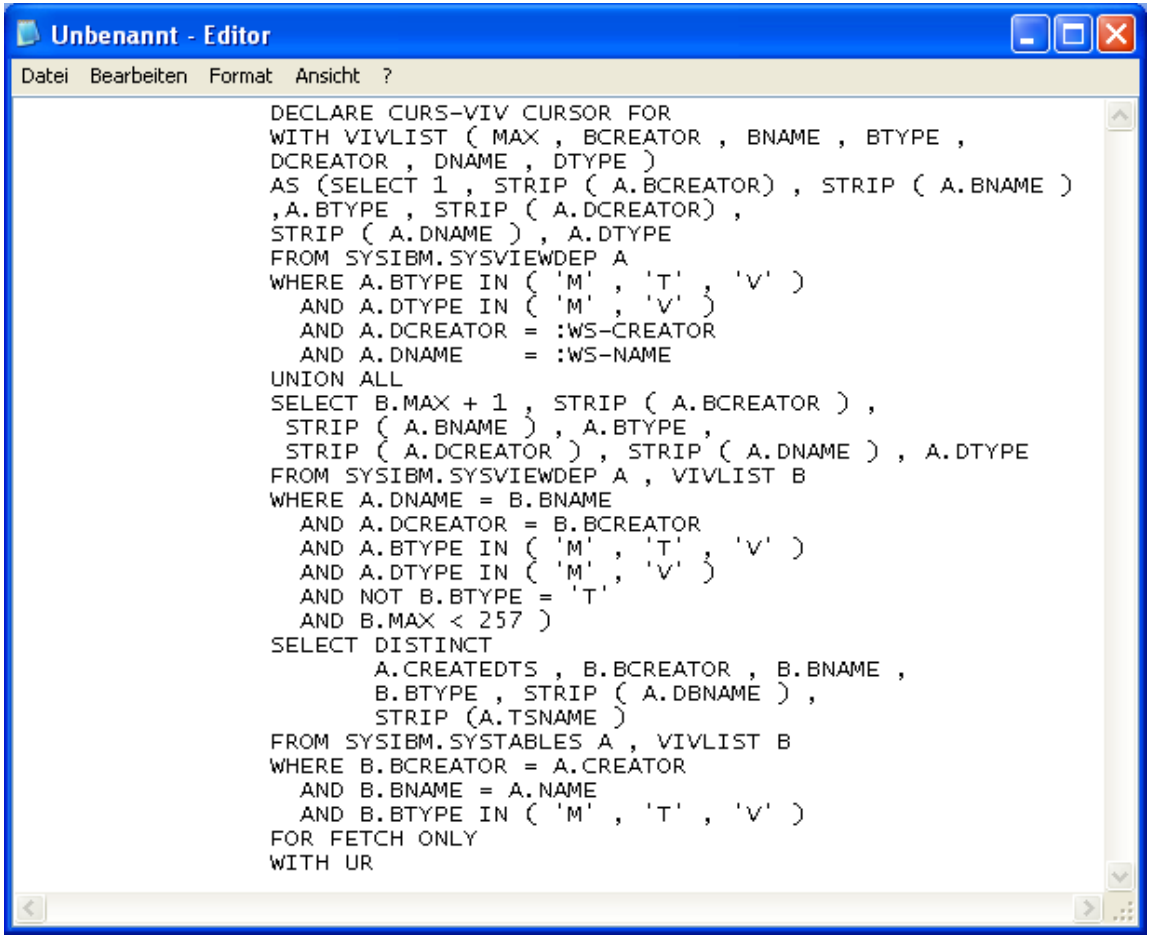


SQL PerformanceExpert (SPX) in an IBM RATIONAL world



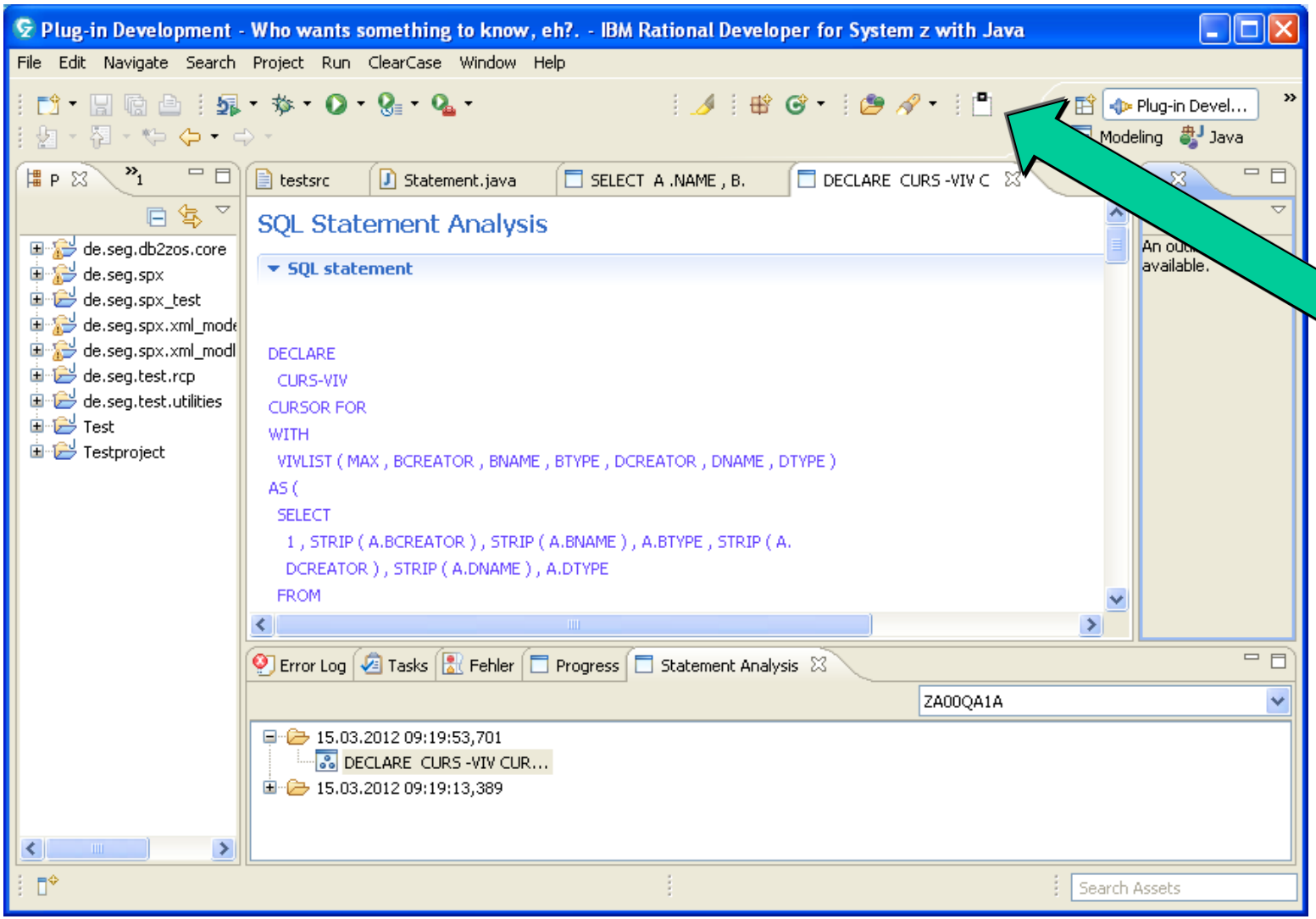
Even if your Rapid SQL development tool is ***not*** integrated into the Rational Worldview it still all connects…

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

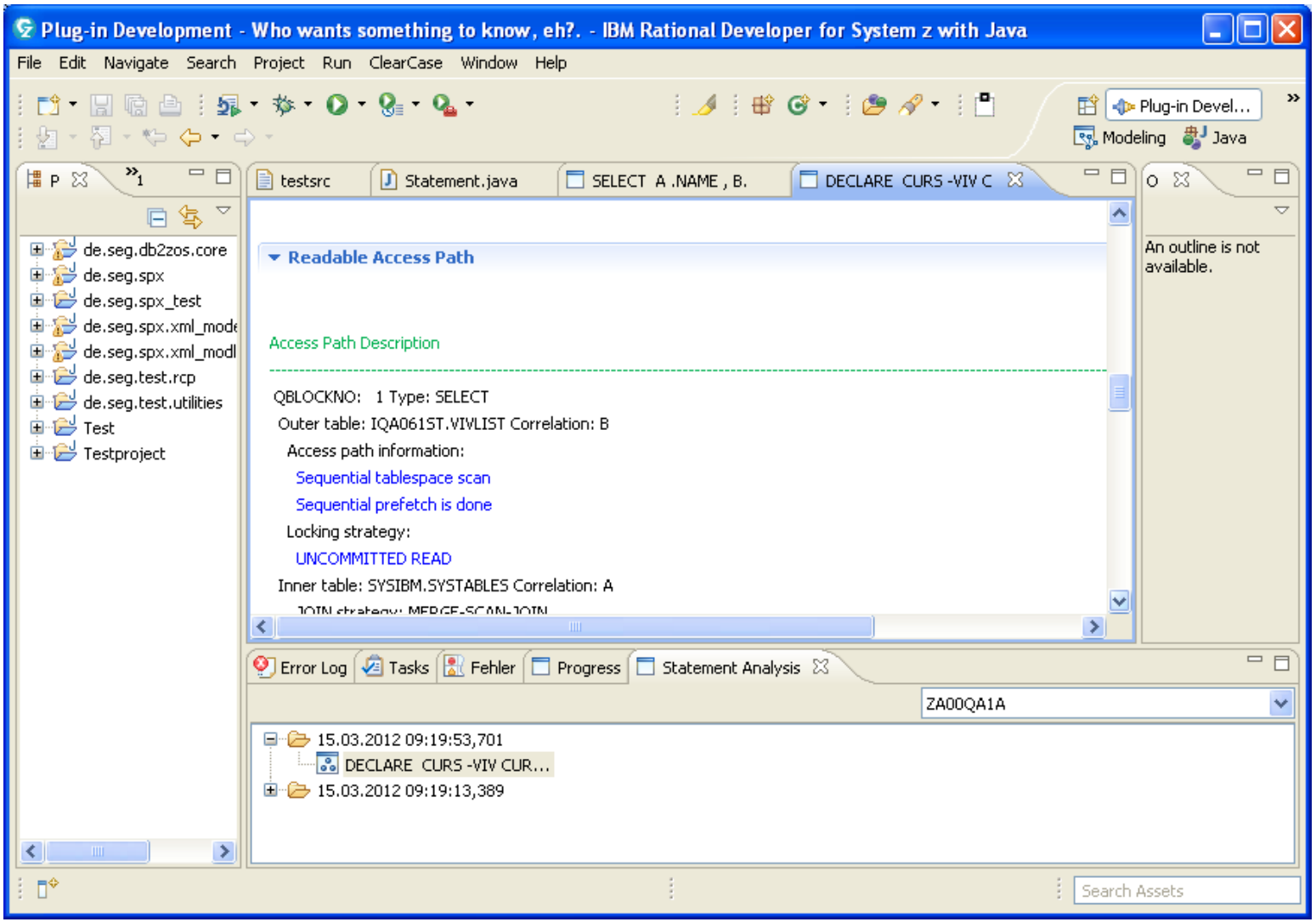


In any tool e.g. Word, Editor, Squirrel etc.
Start up your Rational Tool of choice and then click the SEG icon.

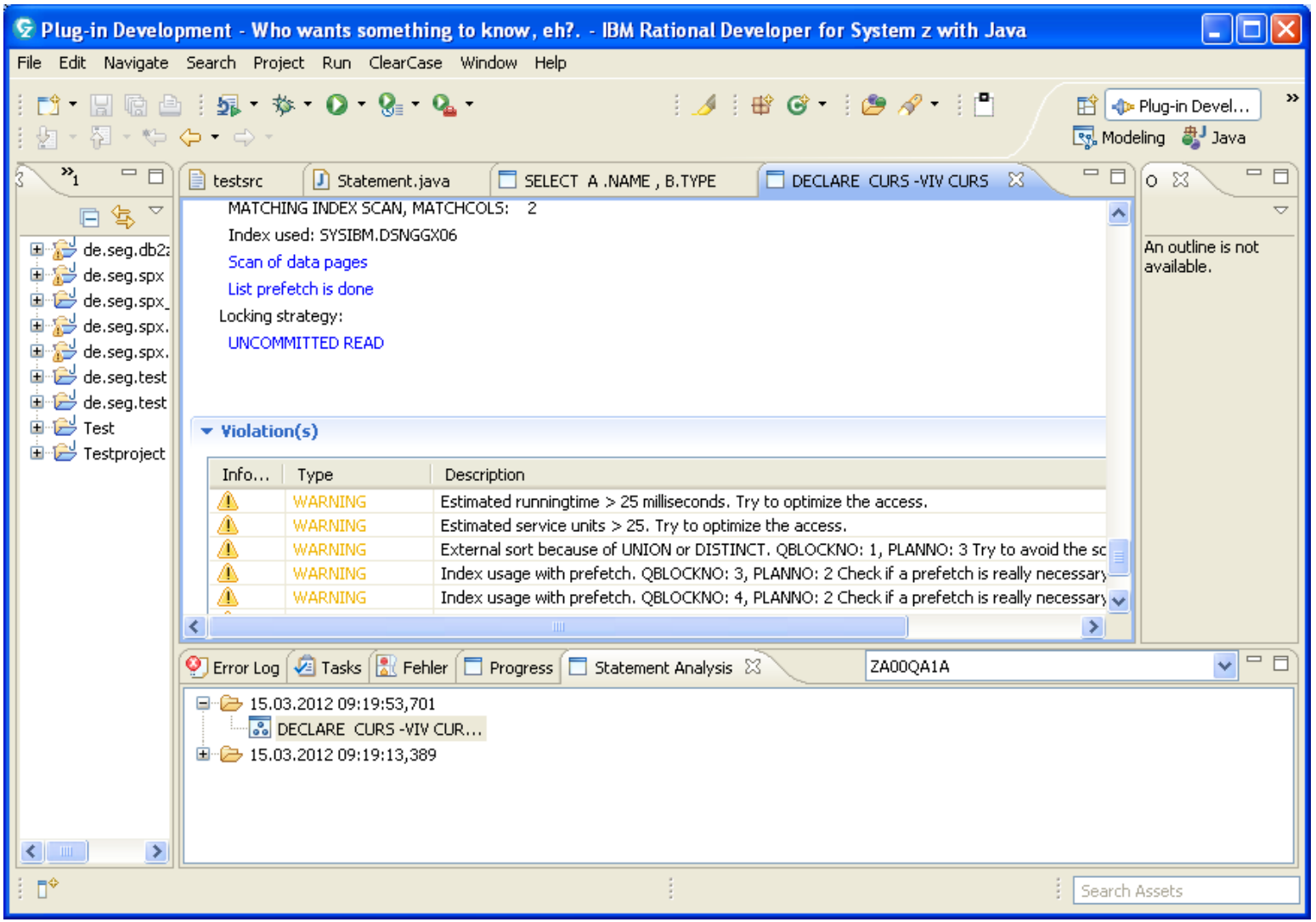
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



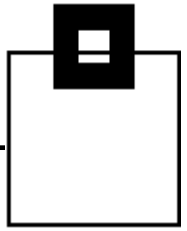
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



SQL PerformanceExpert (SPX) in an IBM RATIONAL world



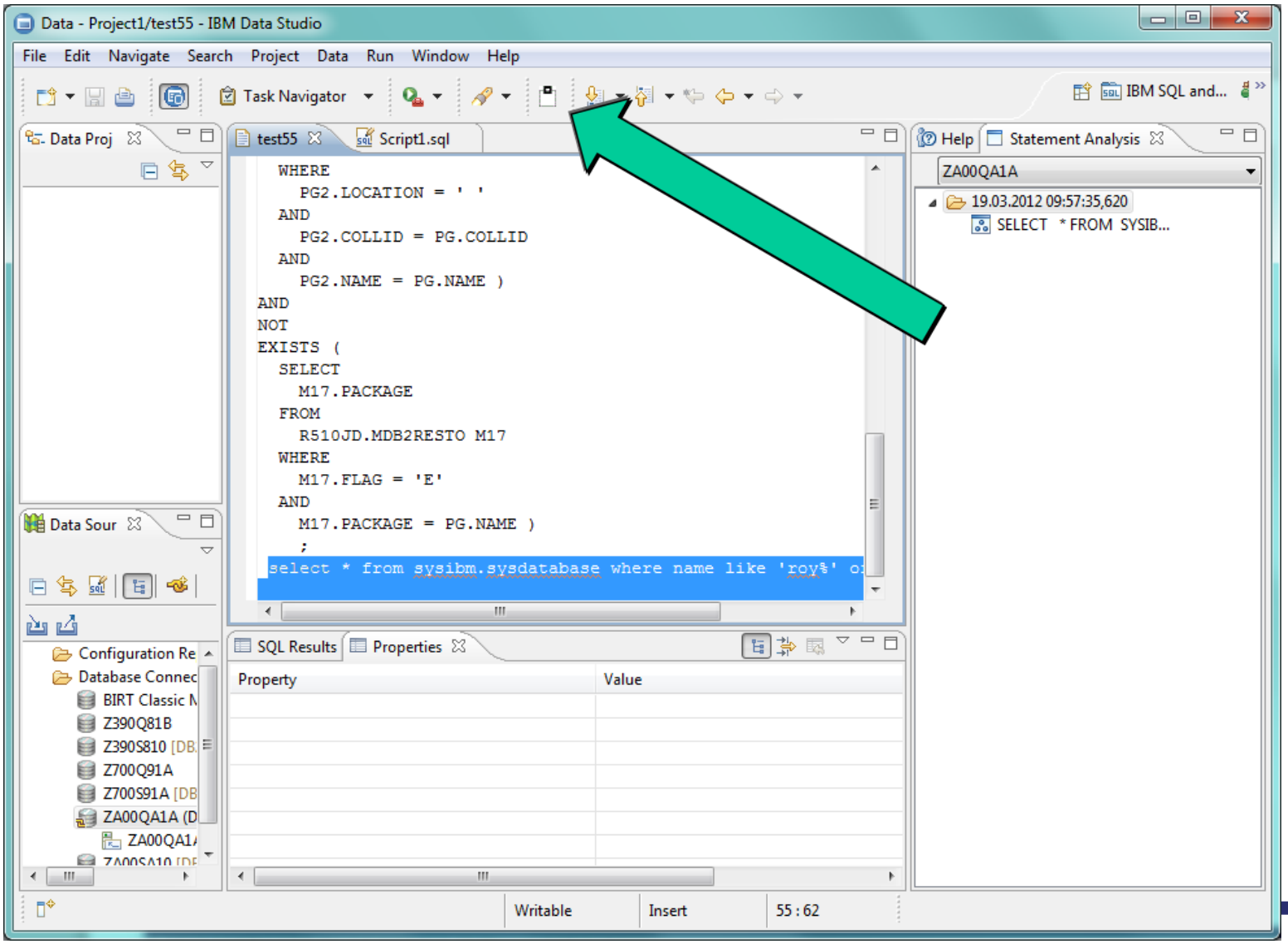
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



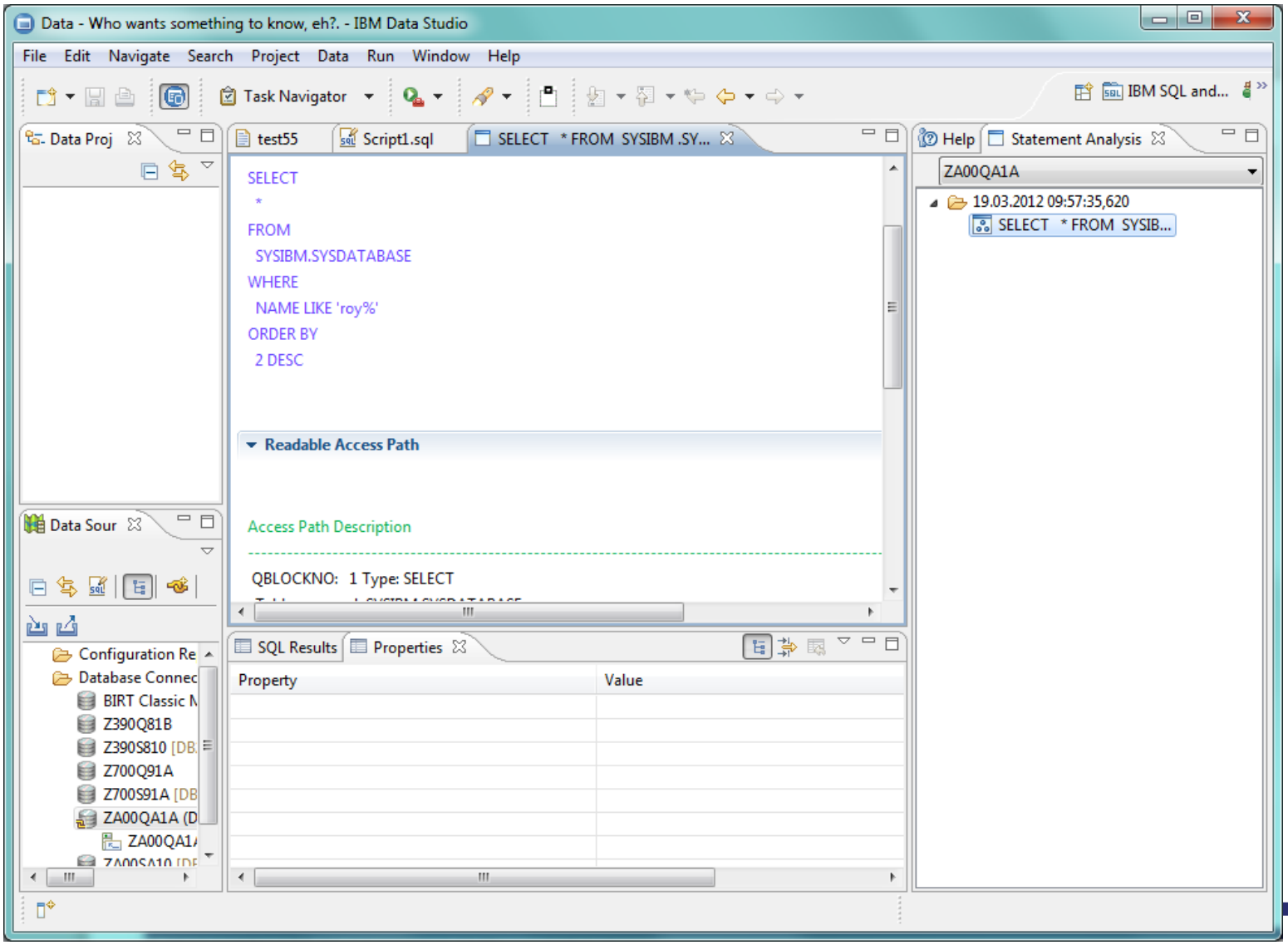
Of course the question is now:

Does it work with DataStudio??

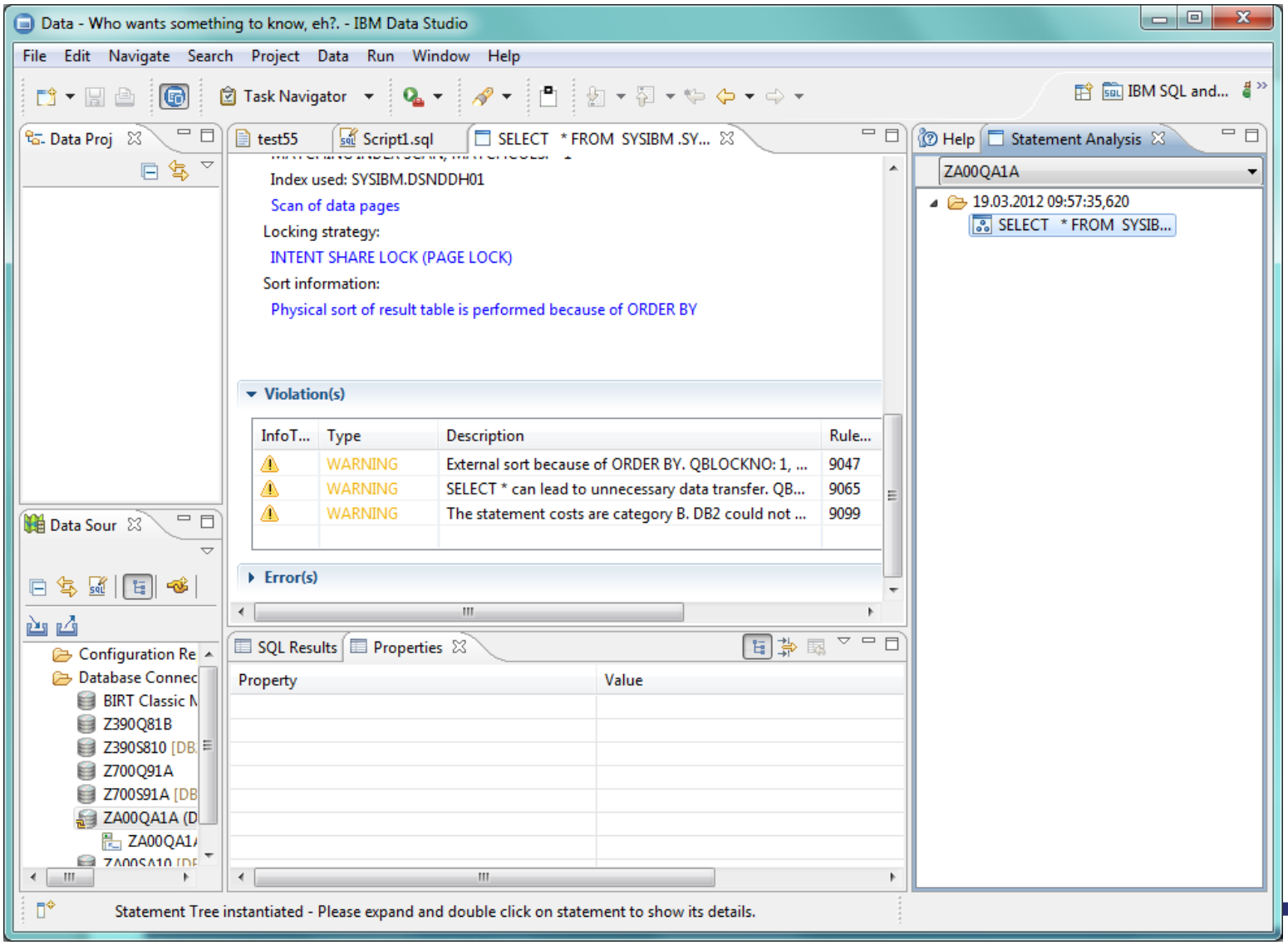
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



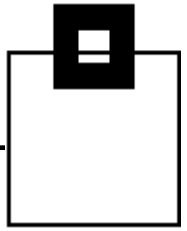
SQL PerformanceExpert (SPX) in an IBM RATIONAL world



SQL PerformanceExpert (SPX) in an IBM RATIONAL world

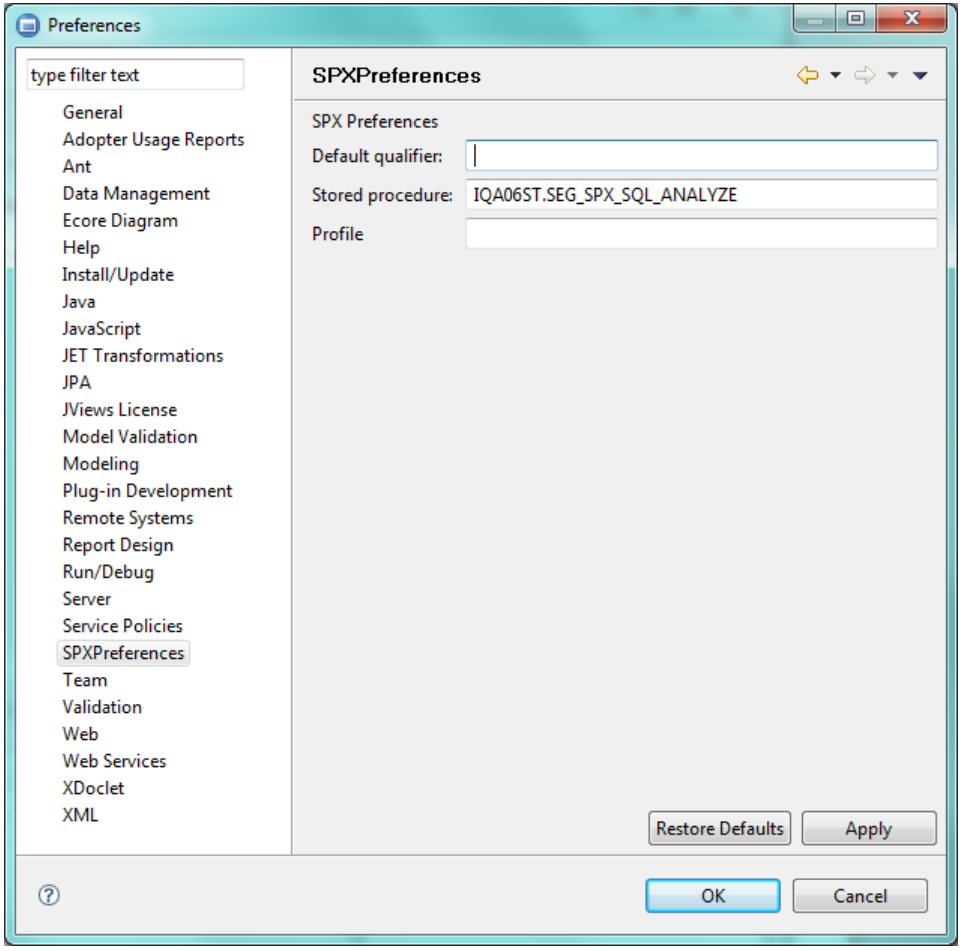


SQL PerformanceExpert (SPX) in an IBM RATIONAL world



Can you tailor it for every developer/DBA?

SQL PerformanceExpert (SPX) in an IBM RATIONAL world



YES!

SQL PerformanceExpert (SPX) in an IBM RATIONAL world

The future is a hybrid world where everthing talks to everything using XML with fully automated messaging

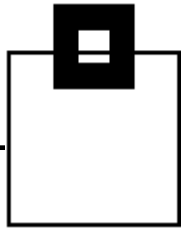
The developer signals the DBA group a „problem“ eg
Bad statistics or a needed index

The DBA group receives the problem through an internal ticket

- Analyze the problem
- Determine the „corrective task“ – If any!
- Do the task

The DBA responsible signals back to the originator that the task is complete

All of this done using either ISPF and/or GUI!



Questions ????