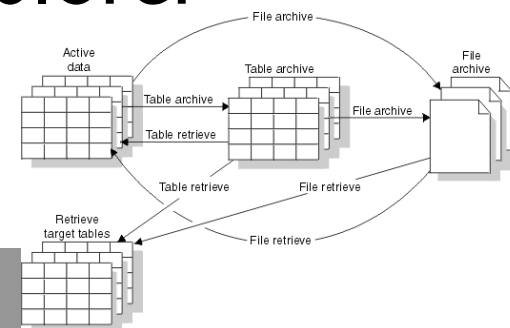




IBM Software Group

IBM Developer for z Systems – for ISPF Developers

Module 8 – Using the Data Source Explorer



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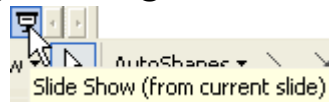
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Learning DB2 and SQL

- Many (in the thousands of) books exist that do an excellent job teaching SQL.
- Additionally, sites exist on the Internet (GOOGLE: “SQL tutorials” – or “Learn SQL”) for online (and typically free) education.
- IBM Also supplies *excellent* SQL and DB2 documentation:
 - ▶ [DB2 Documentation](#)
 - ▶ [SQL Getting Started](#)
 - ▶ [SQL Reference Manual](#)
 - ▶ [Message \(error code\) Reference](#). [Cached pdf version of full guide](#).
 - ▶ [DB2 Application Development Guide with example embedded SQL programs](#).
 - ▶ [Triggers in DB2](#)
 - ▶ [Constraints in DB2](#)
- And there are plenty of non-IBM sites to learn about SQL:
 - ▶ [Http://en.wikipedia.org/wiki/SQL](http://en.wikipedia.org/wiki/SQL)

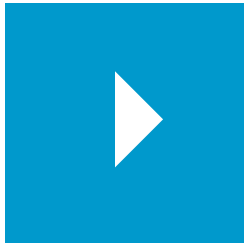
- Note: In order for you to get the above links to work, view the PowerPoint in Slide Show mode.



- Here is an example of COBOL database access:
 - ▶ http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp?topic=/com.ibm.db29.doc.apsg/db2z_samplecobolrdrdathreepartnames.htm

UNIT

The IDz Workbench



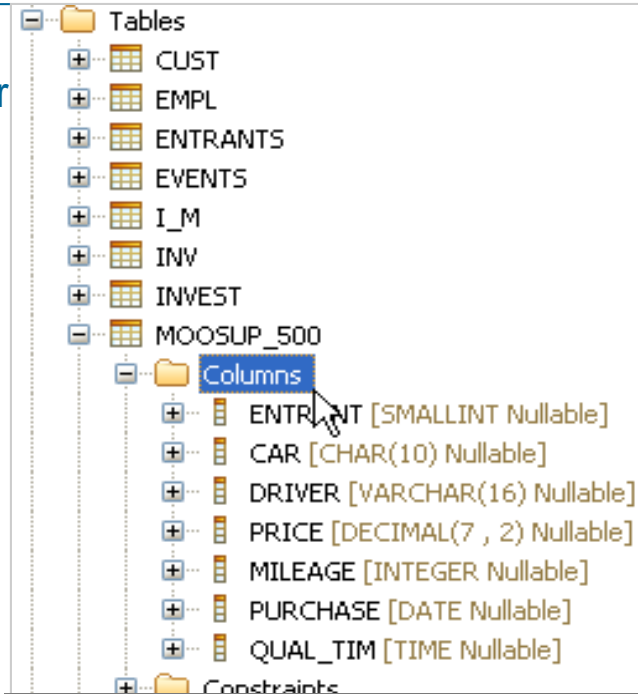
Topics:

- The Data Perspective and connecting to DB2
- Understanding your DB2 objects and dependencies
- **Editing and managing DB2 Table Data**
- Coding and testing SQL
- Extract/Load and Managing Test Data & Decision Support

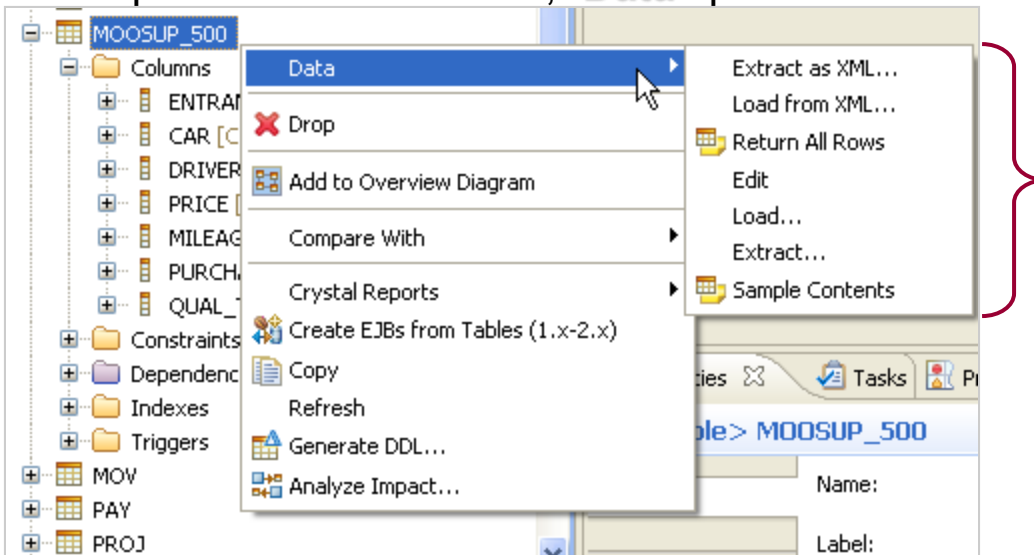
The Data Source Explorer – Data Context Menu

You can work with relational objects:

- ▶ View Schemas, Tables, Table Columns, Referential Integrity Constraints, Indexes, Synonyms, Aliases
- ▶ Re-Create the SQL data definition language statements for the relational objects – from the System Catalog
- ▶ For individual tables:
 - View the table contents
 - View column contents (row cardinality)
 - Edit table values
 - Extract/Load the table using a comma-delimited file
 - Perform a DCLGEN operation



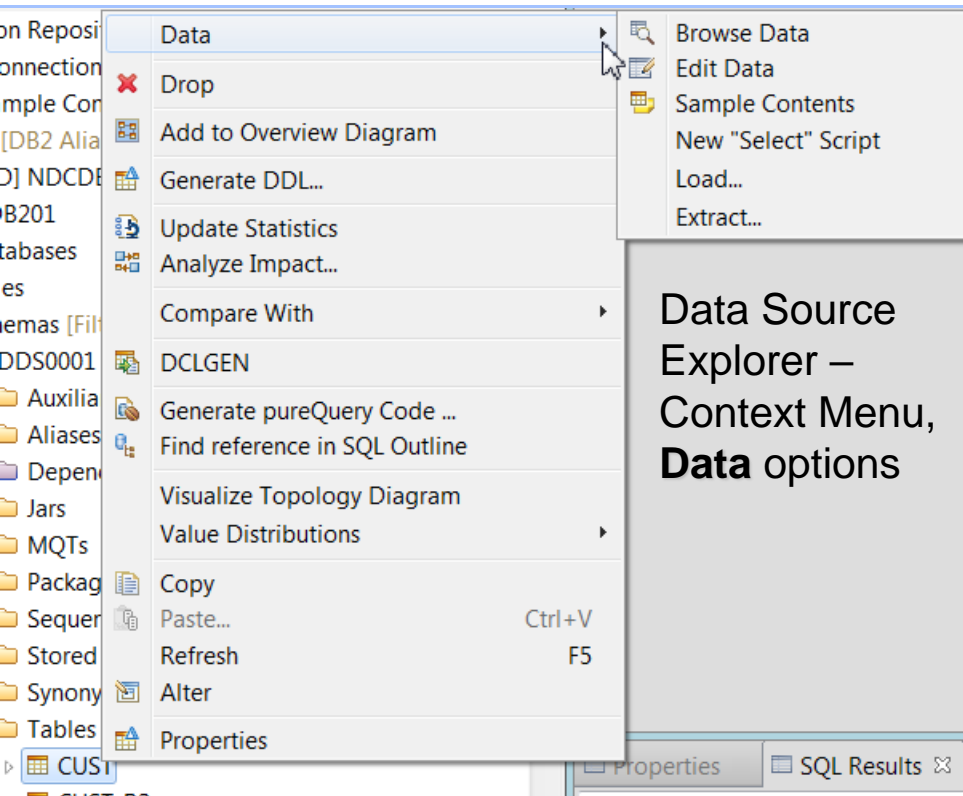
Data Source Explorer - Context Menu, **Data** options



Viewing a table's column definitions

The Data Source Explorer – **Data** Context Menu

- View Schemas, Tables, Table Columns, Referential Integrity Constraints, Indexes, Synonyms, Aliases
- Re-Create the SQL data definition language statements – from the System Catalog
- For individual tables:
 - ▶ View the table contents
 - ▶ View column contents (row cardinality)
 - ▶ Edit table values
 - ▶ Extract/Load the table using a comma-delimited file
 - ▶ Perform a DCLGEN operation



- IDz Data tools provide many additional features. Some of them are traditional DBA functions which you may not be authorized to use (Updating Statistics)

Sample Table Contents – Read/Only View of a Table's Row Values

When you are testing your SQL statements, it can be helpful to view the row/column values in your tables. **Sample Contents** provides this, in a **SQL Results** view.

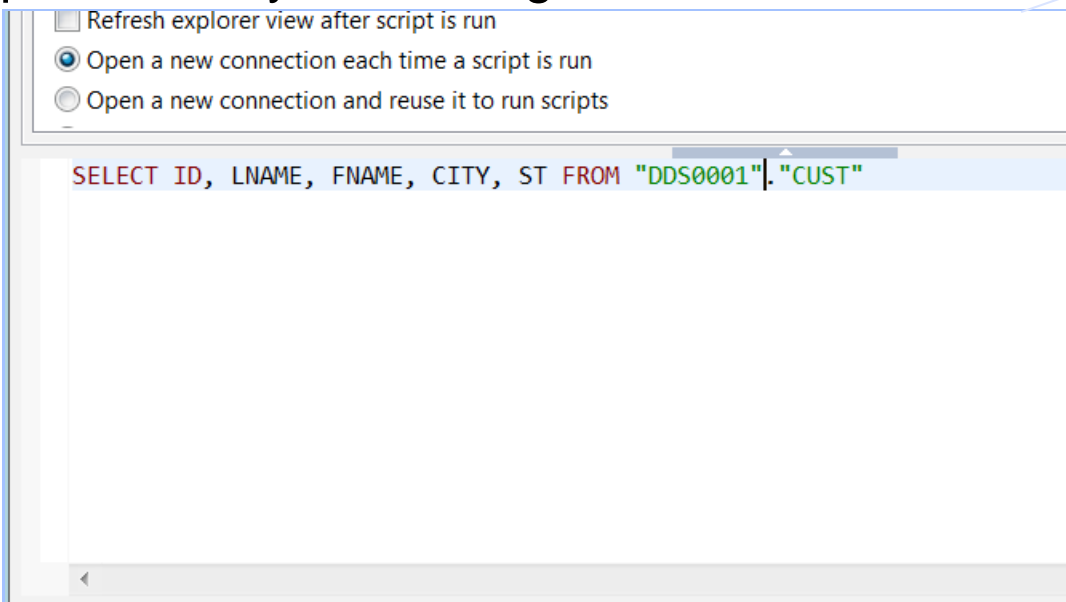
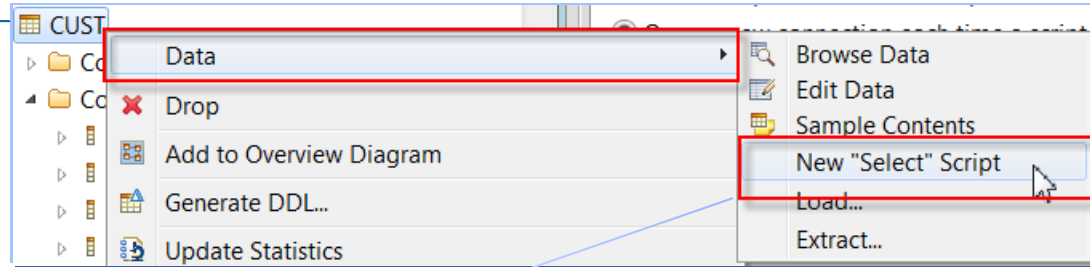
- Note that this is essentially a **Select *** from **<schema.table>**
 - ▶ The # of rows returned is configurable in **Preferences**
 - Consider using SQL Scripts to write statements that filter the result tables

The screenshot displays the IBM Data Studio interface. On the left, the 'Data Project Explorer' and 'Data Source Explorer' are visible. The 'Data Source Explorer' shows a tree structure with 'Tables' expanded, listing various tables including 'CUST'. A context menu is open over the 'CUST' table, with the 'Sample Contents' option highlighted. The main window shows the 'DDS0001.CUST' table with columns: ID [CHAR(2)], LNAME [CHAR(12)], FNAME [CHAR(6)], and CITY [CHAR(15)]. The table contains 17 rows of data, with the first row (ID 01) highlighted. The 'Sample Contents' menu option is highlighted, and a mouse cursor is pointing at it.

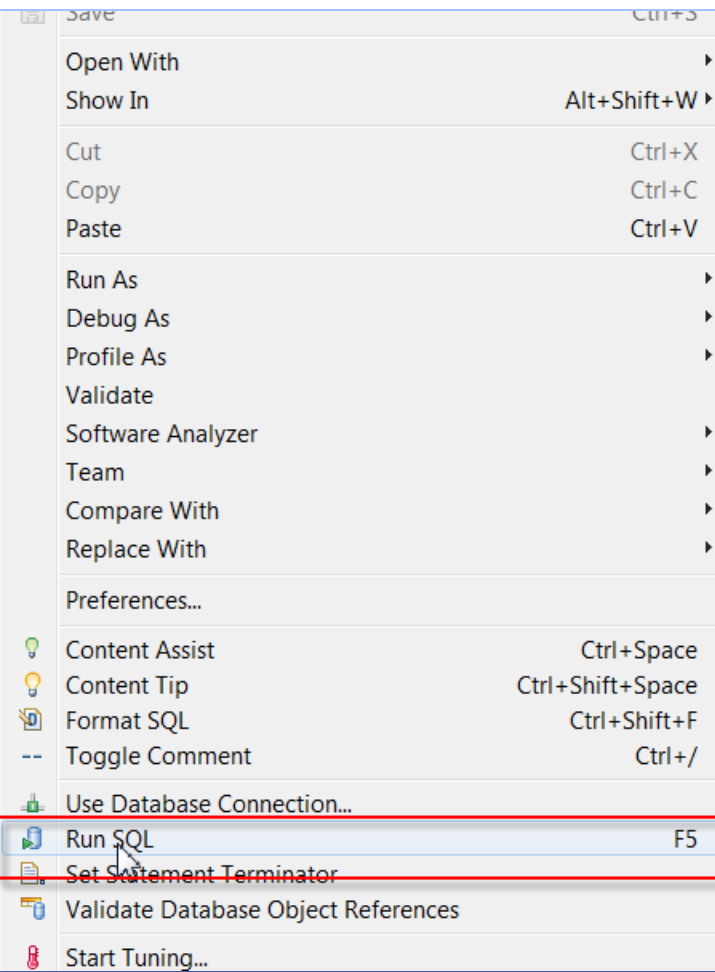
ID [CHAR(2)]	LNAME [CHAR(12)]	FNAME [CHAR(6)]	CITY [CHAR(15)]
01	DANGERFIELD	RODNEY	HARTFORD
02	FIELDS	SALLY	FRANKLIN
03	NICHOLSON	JACK	HARTFORD
04	MURRAY	FRED	BOZRAH
05	Irving	Rich	BRATTLEBORO...
17	Smith	David	Rolesville
			Toronto
			San JOSE
			New York
			Smithfield
			Phoenix
			Glen Rock
			Hampton
			Jim
			Smithfield

Sample Table Contents – “New Select Script”

- Instead of Browse Data or Sample Contents, you can use **New “Select” Script**
- Press F5 to run the SQL produced by the tooling



Properties			SQL Results		Console		
			Status	Result1			
Status	Operation	Date	ID	LNAME	FNAME	CITY	ST
✓	Succes "DDS000...	8/9/	1	01	DANGERFIELD	RODNEY	HARTFORD
✓	Succes SELECT ...	8/9/	2	02	FIELDS	SALLY	FRANKLIN
✓	Succes DROP TA...	8/1/	3	03	NICHOLSON	JACK	HARTFORD
✓	Succes SELECT I...	8/1/	4	04	MURRAY	FRED	BOZRAH
✓	Succes SELECT I...	8/1/	5	05	Irving	Rich	BRATTLEBORO
✓	Succes Sample C...	8/1/	6	17	Smith	David	Rollsville



Data > Sample Contents – Display Table Values in a Single Column

It can be also useful to view the sample contents of individual columns – for various reasons:

► **Applications:**

- Test data coverage
- Testing and debugging values

► **DBA:**

- Candidate indexing
- SQL performance issues related to data volume

Steps:

- Select a table
- Expand Columns, and select a column
- Right-click
- Select:
 - Data
 - Sample Contents

Sample Contents of a table column

1. Discrete column values
2. The number of occurrences found in the table for each value (Cardinality)

			OCCURRENCE
GRAN'	1	AZ	1
GRAN'	2	CA	4
	3	CT	2
"ADPC	4	NY	1
"DDS0	5	PA	1
Sampl	6	TX	1
Sampl	7	VT	1

Export SQL Results

Used to save row values in:

- ▶ HTML
- ▶ XML
- ▶ Plain text
- ▶ XLS (spreadsheet) format

Steps:

- ▶ From the Result window:
 - Right-click
 - Select which rows to export
 - Select the Export Format
 - Browse to the file name
 - Be sure to enter the **.file extension**
 - Click Finish

Note that you can export the results of any SQL statement

- ▶ Reduces the effort to build xml and reports off of DB2 data

Status	Result1			
		DEPTNO	DEPTNAME	MGRNO
1	A00		SPIFFY COMPUTER SERVICE DIV.	000010
2	B01		Copy Row(s)	000020
3	C01		Save	000030
4	D01		Export	
5	D11		Print	
6	D21		Convert Row(s) To Hexadecimal	
7	E01			000050
8	E11		OPERATIONS	000090
9	F21		SOFTWARE SUPPORT	000100

Select Export Format

Choose export format and export location

File name: c:\Dept.html

Browse...

Format

Plain Text (*.txt)
XML (*.xml)
HTML (*.html)
CSV File (*.csv)

DEPTNO	DEPTNAME	MGRNO	ADMIRDEP
A00	SPIFFY COMPUTER SERVICE DIV.	000010	A00
B01	PLANNING	000020	A00
C01	INFORMATION CENTER	000030	A00
D01	DEVELOPMENT CENTER	NULL	A00
D11	MANUFACTURING SYSTEMS	000060	D01
D21	ADMINISTRATION SYSTEMS	000070	D01
E01	SUPPORT SERVICES	000050	A00
E11	OPERATIONS	000090	E01
E21	SOFTWARE SUPPORT	000100	E01
F22	BRANCH OFFICE F2	NULL	E01
G22	BRANCH OFFICE G2	NULL	E01

Table Editing – 1 of 2

Another very common requirement for SQL programming is to customize your test data. Rather than fussing with interactive SQL INSERT/UPDATE/DELETE statements using QMF or SPUFI, try this:

- ▶ From the Data Source Explorer
- ▶ Right-click over a table
- ▶ Select: Data > Edit

The screenshot shows the IBM Data Studio interface. On the left, the 'Data Source Explorer' pane displays a tree view of database objects: Nicknames, Packages, Sequences, Stored Procedures, and Tables. Under 'Tables', the 'EMPL' table is selected. A right-click context menu is open over the 'EMPL' table, with the 'Data' menu item expanded and the 'Edit' option highlighted. The main workspace displays the 'EMPL' table data in a grid view. The table has columns: NBR [CHAR(2)], LNAME [CHAR(10)], FNAME [CHAR(8)], DOB [INTEGER], HIREDTE [INTEGER], and PERF. The data is as follows:

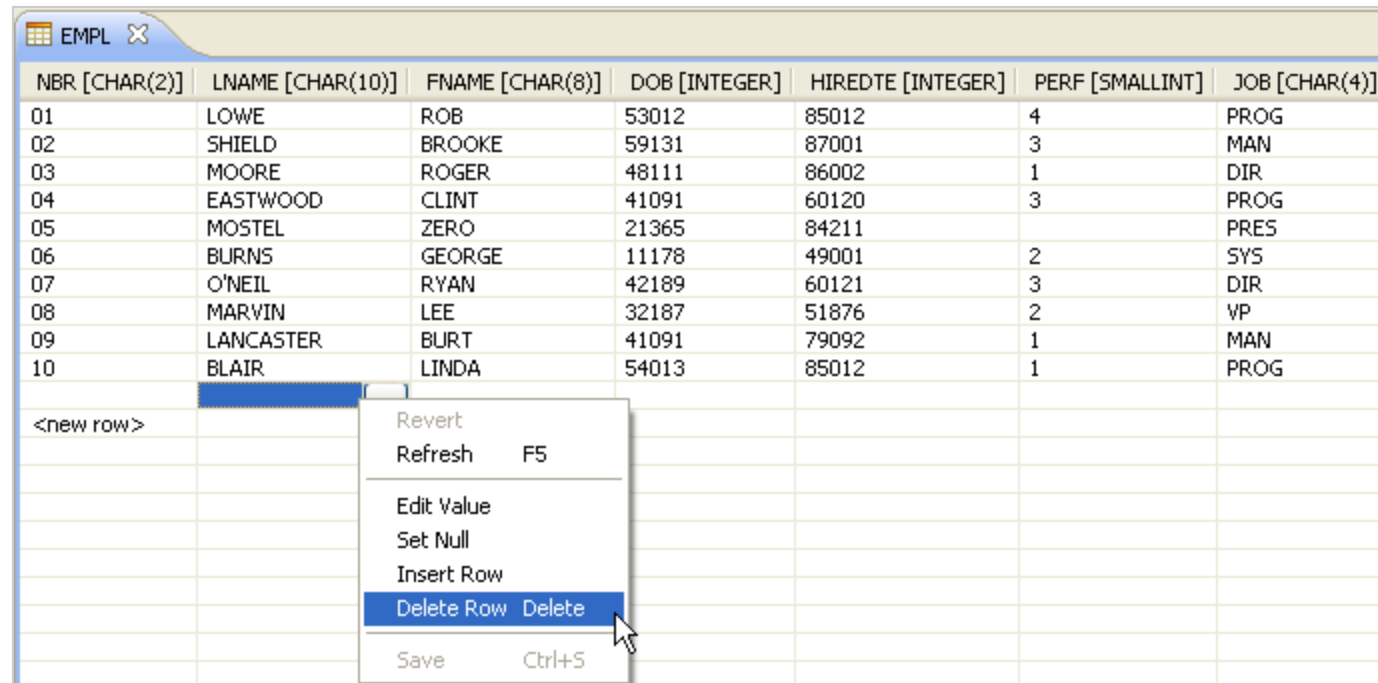
NBR [CHAR(2)]	LNAME [CHAR(10)]	FNAME [CHAR(8)]	DOB [INTEGER]	HIREDTE [INTEGER]	PERF
01	LOWE	ROB	53012	85012	4
02	SHIELD	BROOKE	59131	87001	3
03	MOORE	ROGER	48111	86002	1
04	EASTWOOD	CLINT	41091	60120	3
05	MOSTEL	ZERO	21365	84211	
06	BURNS	GEORGE	11178	49001	2
07	O'NEIL	RYAN	42189	60121	3
08	MARVIN	LEE	32187	51876	2
09	LANCASTER	BURT	41091	79092	1
10	BLAIR	LINDA	54013	85012	1

Table Row Value Edit Options – 2 of 2

The table editor allows you to:

- ▶ **Modify (update) values - Add (insert) new rows - Delete Rows**
- ▶ **Set individual field values to null**
- ▶ **Select image files (for columns of type: Blob/Clob)**

- All values are saved (committed) or not (rolled-back) at once when you press **Ctrl/S**



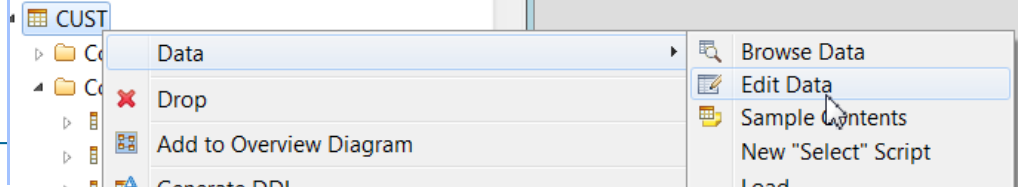
NBR [CHAR(2)]	LNAME [CHAR(10)]	FNAME [CHAR(8)]	DOB [INTEGER]	HIREDTE [INTEGER]	PERF [SMALLINT]	JOB [CHAR(4)]
01	LOWE	ROB	53012	85012	4	PROG
02	SHIELD	BROOKE	59131	87001	3	MAN
03	MOORE	ROGER	48111	86002	1	DIR
04	EASTWOOD	CLINT	41091	60120	3	PROG
05	MOSTEL	ZERO	21365	84211		PRES
06	BURNS	GEORGE	11178	49001	2	SYS
07	O'NEIL	RYAN	42189	60121	3	DIR
08	MARVIN	LEE	32187	51876	2	VP
09	LANCASTER	BURT	41091	79092	1	MAN
10	BLAIR	LINDA	54013	85012	1	PROG
<new row>						

- ✎ Using the Data tools you can: 1. Run a SQL Statement, 2. View the SQL results, 3. Modify table data values in order to test different WHERE clause conditions, 4. Re-run the SQL Statement, etc.

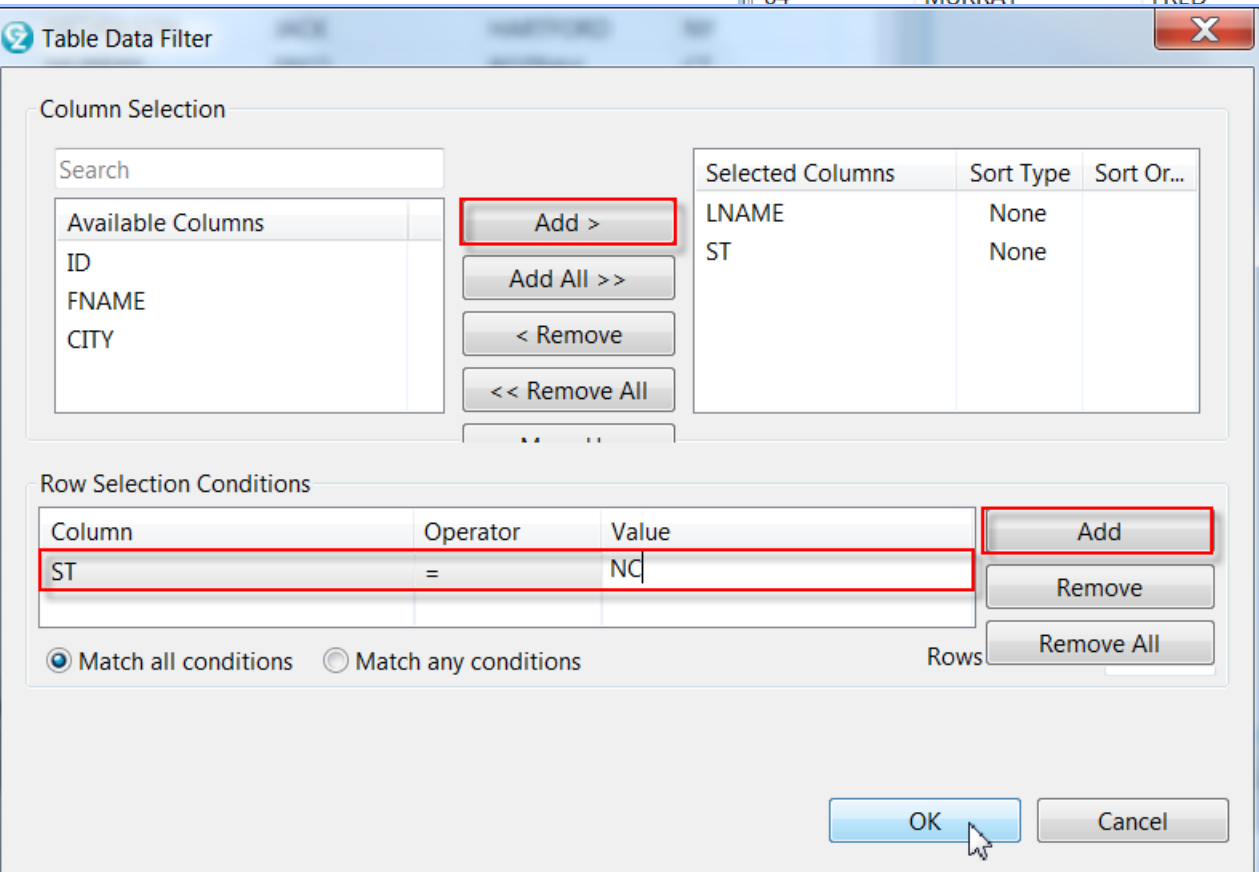
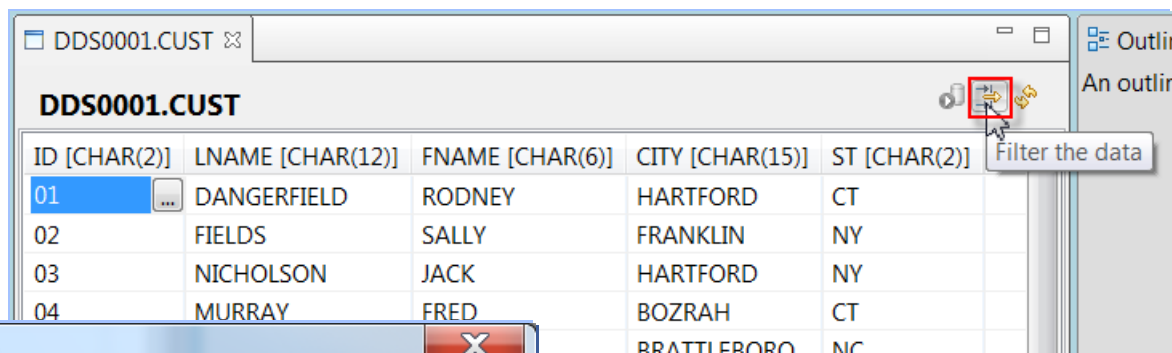
Table Filtering (IDz + Data Studio) – 1 of 3

From the Data Source Explorer

- ▶ Right-click over a table
- ▶ Select: Data > Edit Data
- ▶ Click: Filter the data



This opens the Table Data Filter dialog



Use the dialog to:

- ▶ Add > Columns

- ▶ Add Row Selection
 - ▶ Click Add
 - ▶ Open the Column drop-down
 - ▶ Open the Operator drop-down
 - ▶ Specify a search value



Table Filtering (IDz + Data Studio) – 2 of 3

IBM Data Studio table editor – in data filtering mode allows you to:

- ▶ Modify (update) values - Add (insert) new rows - Delete Rows
 - ▶ Set individual field values to DB2 Null values
 - ▶ Select image files (for columns of type: Blob/Clob)
- All values are saved (committed) or not (rolled-back) at once when you press **Ctrl/S**

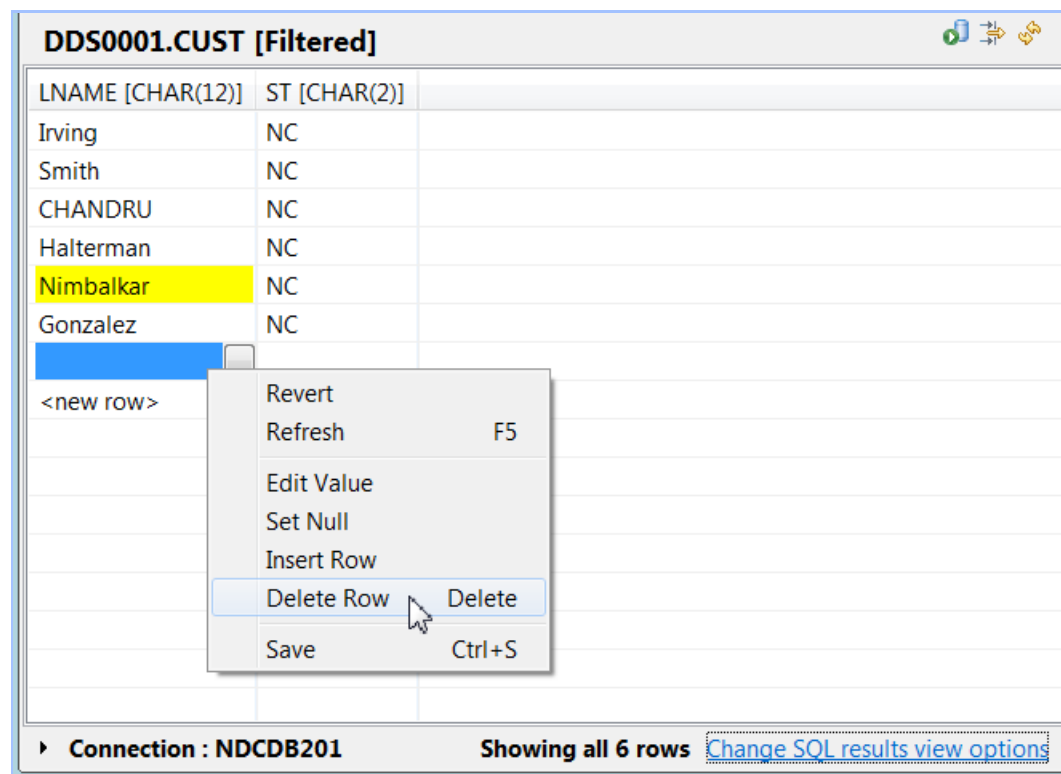


Table Filtering (IDz + Data Studio) – 3 of 3

Filtering options include:

- **Sorting**
- **Sort Order**
- **Move Column Right/Left**
 - Move up/Move down
- **Multiple Row Selection Conditions**
- **Any/All predicate**

Table Data Filter

Column Selection

Search

Available Columns

EMPNO
MIDINIT
PHONENO
HIREDATE
JOB
EDLEVEL
SEX
BIRTHDATE

Add >
Add All >>
< Remove
<< Remove All
Move Up
Move Down

Selected Columns

FIRSTNAME
LASTNAME
WORKDEPT

Sort Type
None
Ascending
Descending

Sort Order
2
1

Row Selection Conditions

Column	Operator	Value
WORKDEPT	=	'E11'
WORKDEPT	=	'D11'

Match all conditions ☒ Match any conditions

Rows To Return: 5000

OK Cancel

DSN81110.EMP

DSN81110.EMP [Filtered]

	FIRSTNAME [VARCHAR(12)]	LASTNAME [VARCHAR(15)]	WORKDEPT [CHAR(3)]
1	PHILIP	GAWRONSKI	E11
2	GEDDY	LEROY	E11
3	RICHARD	LEROY	E11
4	JOHN	PARKER	E11
5	ETHEL	SCHNEIDER	E11
6	EILEEN	SCHWARTZ	E11
7	MAUDE	SETRIGHT	E11
8	MICHELLE	SPRINGER	E11
9	JUSTIN	TIMBERLAKE	E11
1...	SEAN	BURKE	D11
1...	REBA	JOHN	D11
1...	KIYOSHI	MAS	D11

DCLGEN – 1 of 4

DCLGEN – Allows you to create copybooks from table schemas for: COBOL, PL/I, C, and Java

Steps – from the Data Perspective:

- ▶ Highlight the table you want
- ▶ Right-click and select: **DCLGEN**

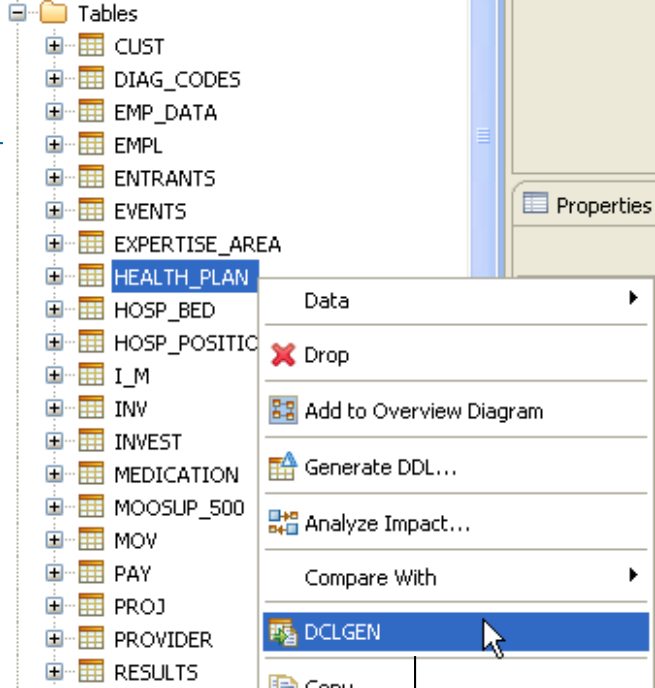
Using the DCLGEN wizard

Connect to the host System

1. Specify the name of your shop's DB2 subsystem
2. Customize the JCL JOB Card, Add **//JOB LIB**

DD card – referencing your shop's DB2 load library)

3. Click: Next >



System

System name: production ▼ Connect

DB2 subsystem: DB15

Procedure: ELAXFDCL

Step: ELAXFDCL

JCL Job Card:

```
//--1-----2-----3-----4-----5-----6-----7-----8
//DDSO001D JOB ,
//MSGCLASS=H,MSGLEVEL=(1,1),TIME=(,4),REGION=144M,COND=(16,LT)
//JOB LIB DD DSN=DB2.V9R1.SDSNLOAD,DISP=SHR
```

- you will need to specify the correct DSN for the DB2 SDSNLOAD runtime library where the DCLGEN CLIST exists

DCLGEN – 2 of 4

Select:

- Language
- Browse to select your DCLGEN output PDS
- Rename the PDS member
- Click **Next >**

Output

Language: IBMCOB

Output data set: DDS0001.TEST.COPYLIB

Member: HEALTHP

Password (if required):

Browse...

Destination Container Selection

Select an existing data set for DCLGEN generated output.

- DDS0001.TEST.COBOL
- DDS0001.TEST.COPYLIB
- DDS0001.TEST.DATA
- DDS0001.TEST.DBRMLIB
- DDS0001.TEST.JCL
- DDS0001.TEST.LISTOUT

OK Cancel

DB2 system

Connection: EOSDB205

Schema and table: DDS0001.HEALTH_PLAN

Data structure

Data structure name: HEALTH-PLAN

PREFIX:

DCLGEN options:

String delimiter:	<input checked="" type="radio"/> APOST	<input type="radio"/> QUOTE
ACTION:	<input checked="" type="radio"/> REPLACE	<input type="radio"/> ADD
LABEL:	<input checked="" type="radio"/> YES	<input type="radio"/> NO
DBCSSYMBOL:	<input checked="" type="radio"/> G	<input type="radio"/> N
DBCSEDELIM:	<input type="radio"/> YES	<input checked="" type="radio"/> NO
COLSUFFIX:	<input checked="" type="radio"/> YES	<input type="radio"/> NO
INDVAR:	<input checked="" type="radio"/> YES	<input type="radio"/> NO

← Customize the DCLGEN-specific options



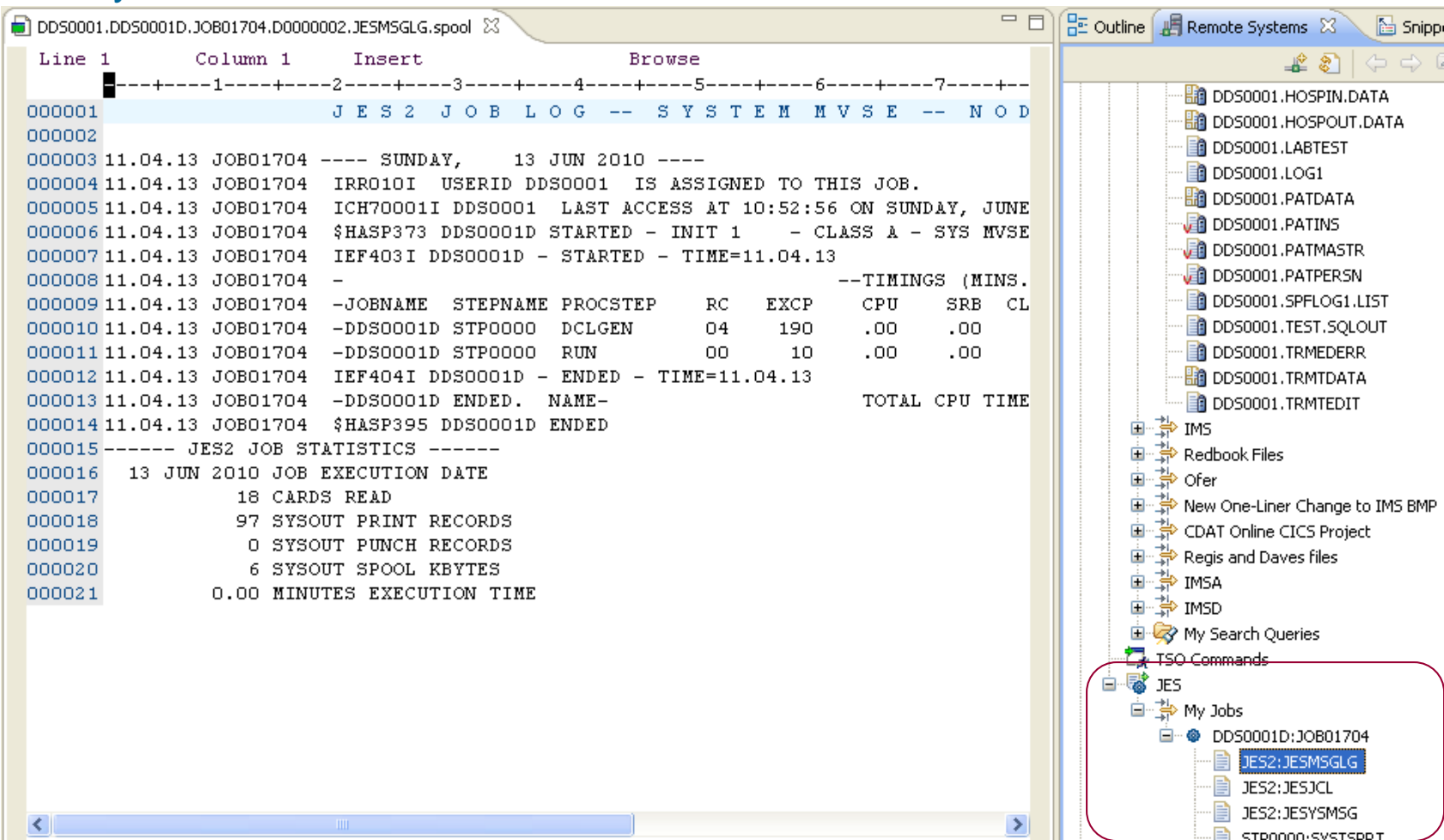
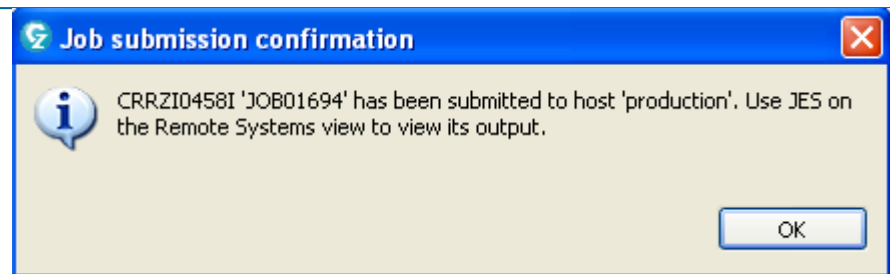
Note that at minimum, you will have to change the Member and Data structure name if your table name contains an underscore

► Click Finish

See Slide Notes

DCLGEN – 3 of 4

- The wizard will submit a job, which you can track in the:
 - z/OS Projects Perspective
 - JES facility



The screenshot shows the z/OS JES2 interface. The main window displays a job log for job DDS0001D.JOB01704.D0000002.JESMSGGLG.spool. The log contains the following text:

```
Line 1      Column 1      Insert      Browse
-----+-----+-----+-----+-----+-----+-----+-----+
000001      J E S 2  J O B  L O G  -- S Y S T E M  M V S E  -- N O D
000002
000003 11.04.13 JOB01704 ---- SUNDAY, 13 JUN 2010 ----
000004 11.04.13 JOB01704 IRRO10I USERID DDS0001 IS ASSIGNED TO THIS JOB.
000005 11.04.13 JOB01704 ICH70001I DDS0001 LAST ACCESS AT 10:52:56 ON SUNDAY, JUNE
000006 11.04.13 JOB01704 $HASP373 DDS0001D STARTED - INIT 1 - CLASS A - SYS MVSE
000007 11.04.13 JOB01704 IEF403I DDS0001D - STARTED - TIME=11.04.13
000008 11.04.13 JOB01704 - --TIMINGS (MINS.
000009 11.04.13 JOB01704 -JOBNAME STEPNAME PROCSTEP RC EXCP CPU SRB CL
000010 11.04.13 JOB01704 -DDS0001D STP0000 DCLGEN 04 190 .00 .00
000011 11.04.13 JOB01704 -DDS0001D STP0000 RUN 00 10 .00 .00
000012 11.04.13 JOB01704 IEF404I DDS0001D - ENDED - TIME=11.04.13
000013 11.04.13 JOB01704 -DDS0001D ENDED. NAME- TOTAL CPU TIME
000014 11.04.13 JOB01704 $HASP395 DDS0001D ENDED
000015 ----- JES2 JOB STATISTICS -----
000016 13 JUN 2010 JOB EXECUTION DATE
000017 18 CARDS READ
000018 97 SYSOUT PRINT RECORDS
000019 0 SYSOUT PUNCH RECORDS
000020 6 SYSOUT SPOOL KBYTES
000021 0.00 MINUTES EXECUTION TIME
```

The right-hand pane shows the "Remote Systems" view with a tree structure of files and folders. A red box highlights the "JES" folder, which contains "My Jobs" and "DDS0001D:JOB01704". The "JES2:JESMSGGLG" file is selected within the "DDS0001D:JOB01704" folder.

DCLGEN – 4 of 4



From Remote
Systems explorer
you can also open
the PDS and look
at your DCLGEN'd
source →

The screenshot displays the IBM Systems Explorer interface. The main window shows the DCLGEN command and its output for the DDS0001.HEALTH_PLAN table. The command is as follows:

```
Line 24      Column 64      Insert
-----+*A-1-B-+-----2-----3-----4-----5-----6-----7-|+
000001      *****
000002      * DCLGEN TABLE(DDS0001.HEALTH_PLAN)
000003      *      LIBRARY(DDS0001.TEST.COPYLIB(HEALTHP))
000004      *      ACTION(REPLACE)
000005      *      LANGUAGE(COBOL)
000006      *      STRUCTURE(HEALTH-PLAN)
000007      *      APOST
000008      *      LABEL(YES)
000009      *      DECSDELIM(NO)
000010      *      COLSUFFIX(YES)
000011      *      INDVAR(YES)
000012      * ... IS THE DCLGEN COMMAND THAT MADE THE FOLLOWING STATEMENTS
000013      *****
000014      EXEC SQL DECLARE DDS0001.HEALTH_PLAN TABLE
000015      ( PLAN_ID
000016      GROUP_ID
000017      PROVIDER
000018      DEDUCTIBLE
000019      COPAYMENT
000020      CO_INSURANCE
000021      COVERAGE_LIMITS
000022      OOP_MAX
000023      IN_NETWORK_REQ
000024      PRIOR_AUTHORIZATION
000025      EXCLUSIONS
000026      PLAN_COMMENTS
000027      ) END-EXEC.
000028      *****
000029      * COBOL DECLARATION FOR TABLE DDS0001.HEALTH_PLAN
000030      *****
000031      O1 HEALTH-PLAN.
000032      *
000033      *****
000034      *      10 PLAN-ID
000035      *
000036      *****
000037      *      10 GROUP-ID
000038      *
000039      *****
000040      *      10 PROVIDER
000041      *
000042      *****
000043      *      10 DEDUCTIBLE
000044      *
000045      *****
000046      *      10 COPAYMENT
000047      *
000048      *****
000049      *      10 CO-INSURANCE
000050      *
000051      *****
000052      *      10 COVERAGE-LIMITS
000053      *
000054      *****
```

The right-hand pane shows the Outline view, listing various files and directories. The file HEALTHP.cpy is highlighted, indicating it is the source file for the DCLGEN command.

Customizing the Data Perspective – Preferences

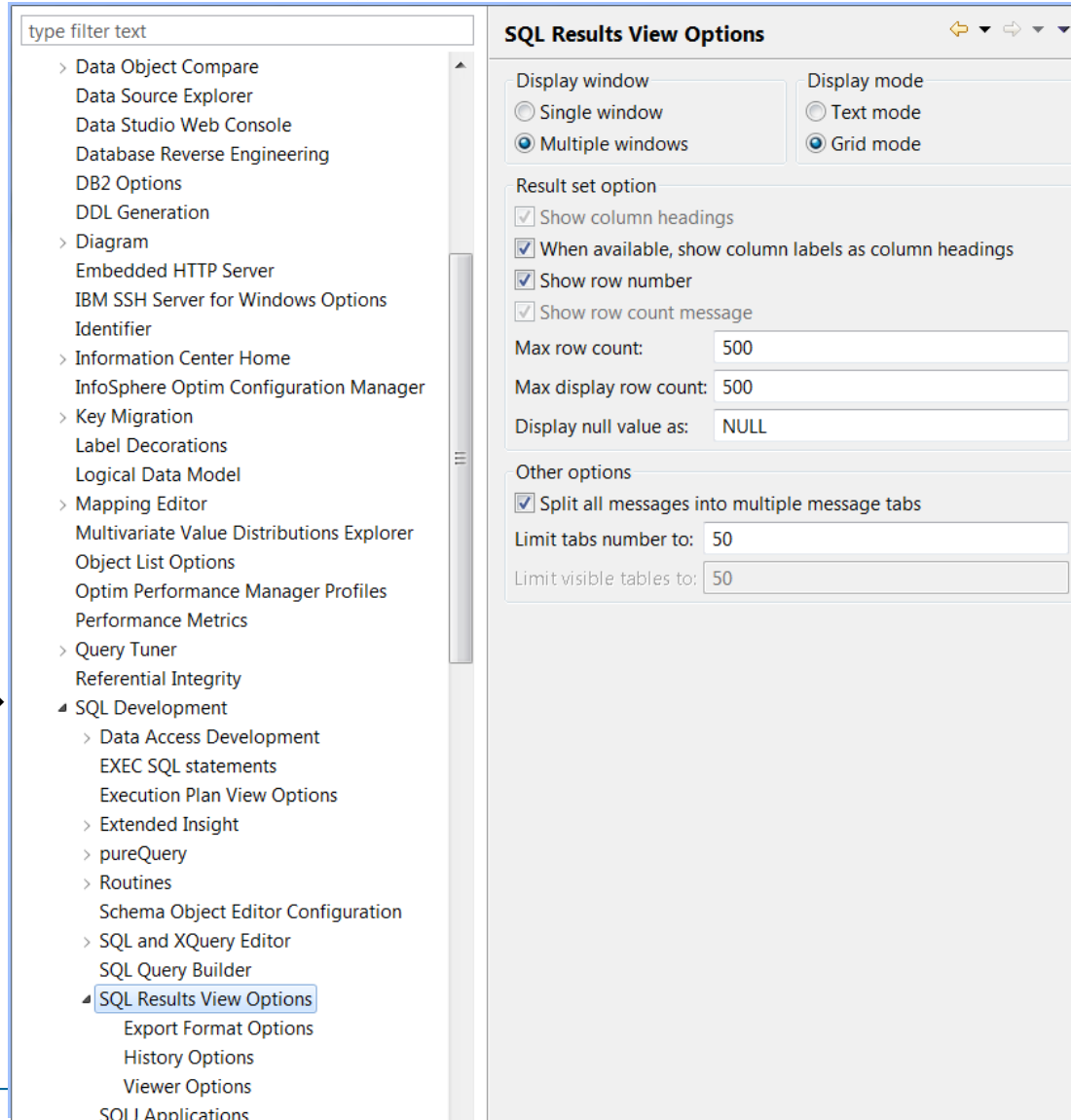
- Data Studio provides a much large set of tools – which brings many more options for setup, configuration , customization, etc.

Preferences for Data Studio Customization

(again) from:

► Window

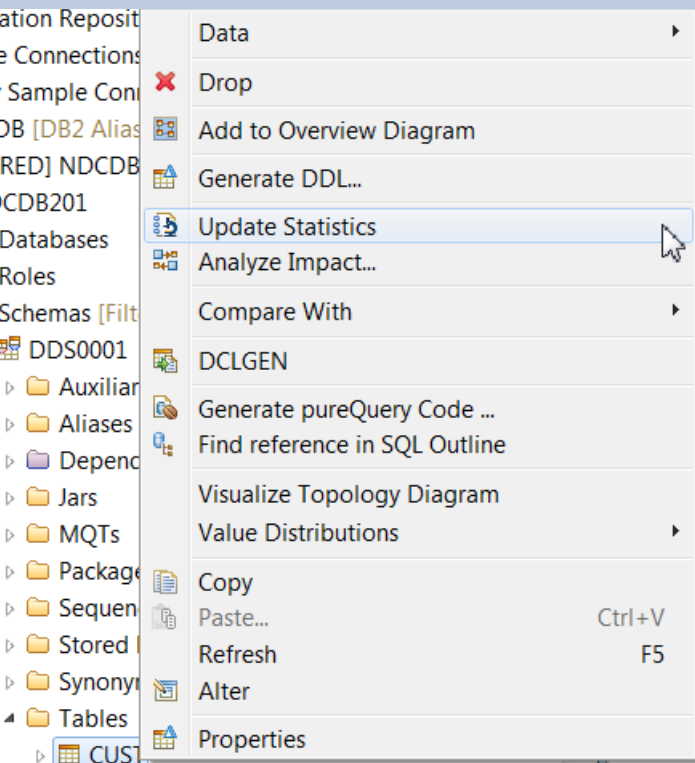
- Preferences
 - Data Management
 - SQL Development ➔



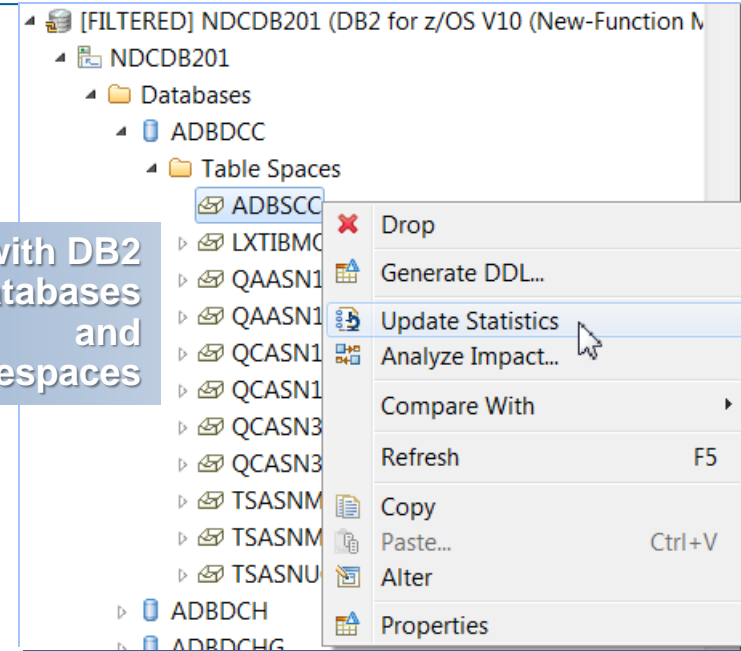
Additional IBM Data Studio Tooling for Working With DB2 Objects – 1 of 3

- Provided you have the necessary level of authority in your DB2 subsystem, you can do the following:

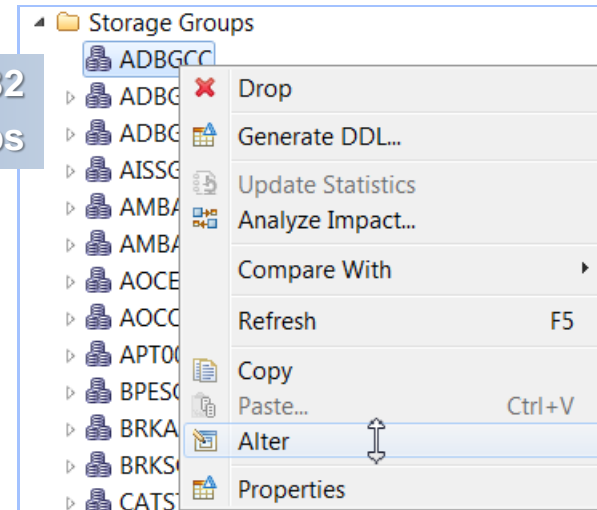
Perform certain traditional DBA functions against Tables, Views and Indexes



Work with DB2 Databases and Tablespaces



Work with DB2 Storage Groups



Additional IBM Data Studio Tooling for Working With DB2 Objects – 2 of 3

Table value statistics reporting

Data Source Explorer

- Configuration Repositories
 - Database Connections
 - Derby Sample Connection
 - DMHDB [DB2 Alias]
 - [FILTERED] NDCDB201 (DB2 for z/OS V10 (New-Function Mod
 - NDCDB201
 - Database
 - Roles
 - Schemas
 - Storage
 - Users
 - XML Schemas
 - SAMPLE [DB2]

Context Menu for NDCDB201

- Add to Overview Diagram
- Find Invalid Packages...
- Update Statistics
- Analyze Impact...
- Analyze Model
- Compare With
- New SQL Script
- Generate DDL...
- Analyze and Tune
 - Start Tuning...
 - Configure for Tuning
 - Change Default SQLID and Schema...
 - Manage Privileges for Tuning...
 - Browse zParms...
 - Refresh Catalog for Tuning
 - Capture Environment
- Visualize Topology Diagram
- Copy
- Paste... (Ctrl+V)
- Refresh (F5)
- Alter
- Properties

SQL Results

Stan...	1st Q...	Medi...
0.507	0	1
1.165	1	2

Console

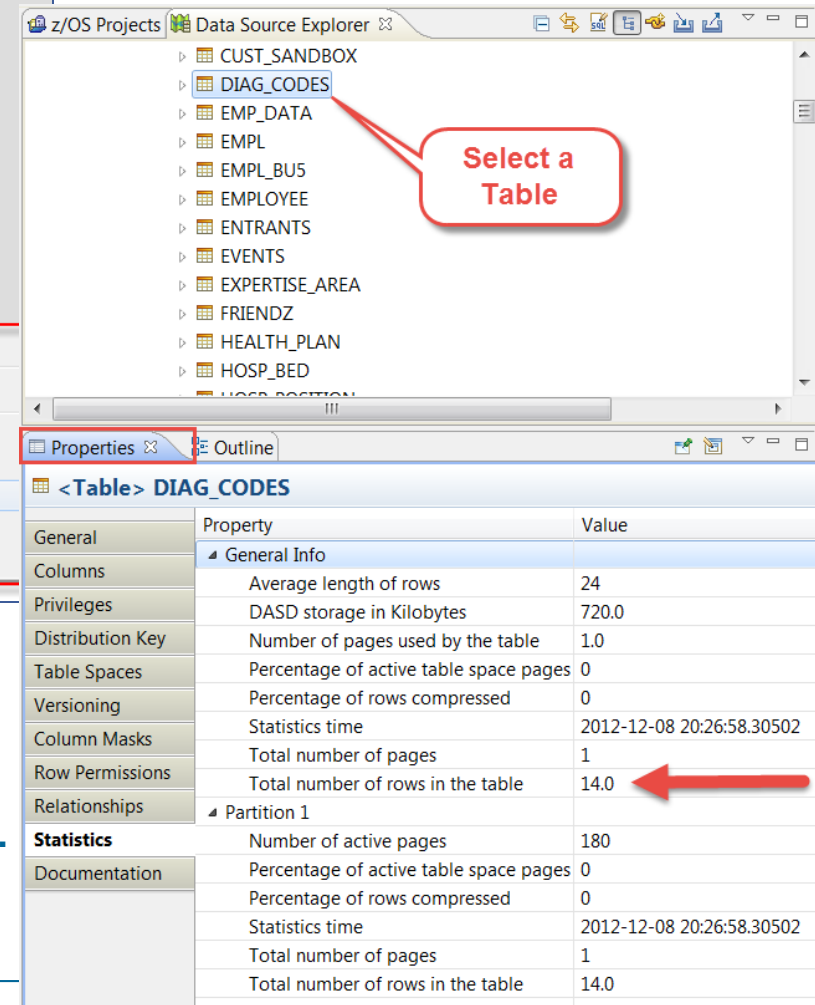
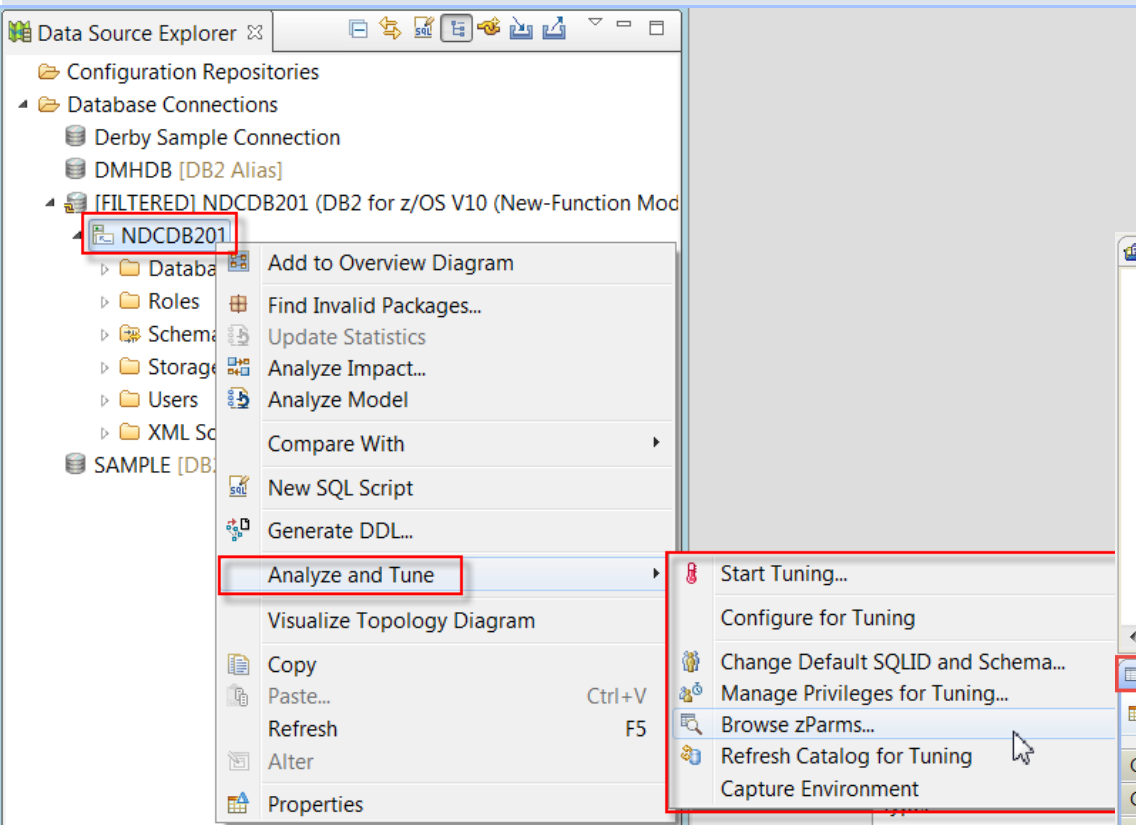
7%

5

Properties are not available.

Additional IBM Data Studio Tooling for Working With DB2 Objects – 3 of 3

DBA, SYSPROG and SQL coding options against the DB2 Subsystem



With a DB2 Table selected
you can find out things like:
Total number of rows, etc.

**Note that Statistics must
have been run prior**