



DB2 Hints: Using the SQL Repository for both Static and Dynamic SQL

**Gerald Hodge
HLS Technologies, Inc.**

Agenda

- What is a DB2 Hint?
- Why may a DB2 Hint be needed?
- How do you know the Hint was used?
- Doing a Static Hint with the tried and true method
- What are the exposures?
- Using the Repository
- What does this gain us?

Agenda

- Taking what we know to Dynamic SQL
 - Dealing with two types of Dynamic SQL
 - Cached SQL
 - Non-cached SQL
- What about APREUSE?
- Now that we know how to do it, how do we know what to do?
- A Static SQL Example
- A Dynamic SQL Example

Agenda

- Our Offer



What is a DB2 Hint?

- A DB2 Hint is a suggestion to the Optimizer to select a specific access path.
- The Optimizer may accept or reject the suggestion.
- For example
 - It will use an access path that it regards as suboptimal
 - It will not use an access path that will not work, e.g., use an index that does not match the SQL requirements

The PREPARE Sets the Hint

- With both Dynamic and Static SQL the Hint is set with the prepare.
- A +394 means the HINT is accepted.
- A +395 means the Hint is reject and is accompanied with a reason code.
- If you are using the Repository a Zero return code means there is no SQL match.

Why may a Hint Be needed?

- Purchased Package software is written for functionality
- Purchased Package software is normally not concerned with performance
- If the same Collection and Package names are use then the Repository's SQL matching can assist in keeping a Hint even if the SQL number changes
- In a heavy transaction environment the STATS may be modified for important transactions

Possible Predicate Issues

- v Host variables
- v Parameter markers
- v Expressions
- v Table self-joins
- v Subqueries

See V11 Option at end of presentation

Begin at the beginning

- Express Hints for DB2
- Option ==>
-
-
- 1 STATIC Express Hints for static SQL
- 2 DYNAMIC Express Hints for dynamic SQL
- 3 USERSTMT Add a freeform SQL statement
- 4 LOADSTMT Read SQL statement from file
- 5 SYSQUERY Display repository hints
- 6 EXPORT Export static hint(s)
- 7 IMPORT Import static hint(s)
- 8 LOAD Move static hint(s) to repository

Select Package

- COMMAND ==>
-
- Select the entity to be processed:
-
- Subsystem ID GTAG
-
- PLAN_TABLE owners
- Source table P390
- Destination table
-
- DBRM/package name TESTDBRM
-

Select Collection

Express Hints - Item Selection

COMMAND ==>

Subsystem : GTAG

Target DBRM : TESTDBRM

Choose an item to process:

Type Collection

- . PKG COLLHW1
- . PKG TESTCOLL9
- s PKG TESTDBRM



Select Statement

Express Hints - Statement Selection Row 1 to 8 of 8

COMMAND ===>

Scroll ===> PAGE

Subsystem: GTAG
Package: TESTDBRM
Collection: TESTDBRM
Version:

Choose a statement to process:

Queryno Statement

```
-----  
s 281 DECLARE SELECT1 CURSOR FOR SELECT NAME , TBNAME , COLNO , COLTYPE  
. 287 DECLARE SELECT1A CURSOR FOR SELECT NAME , TBNAME , COLNO , COLTYP  
. 294 DECLARE SELECT1B CURSOR FOR SELECT NAME , TBNAME , COLNO , COLTYP  
. 301 DECLARE SELECT1C CURSOR FOR SELECT NAME , TBNAME , COLNO , COLTYP  
. 308 DECLARE SELECT2 CURSOR FOR SELECT NAME , CREATOR , TYPE , DBNAME  
. 32767 DECLARE SELECT3 CURSOR FOR SELECT NAME , CREATOR , TYPE , DBNAME  
. 32768 DECLARE SELECT4 CURSOR FOR SELECT NAME , CREATOR , TYPE , DBNAME  
. 650000 DECLARE SELECT5 CURSOR FOR SELECT NAME , CREATOR , TYPE , DBNAME
```



Access Path Control

Express Hints - Access Path Control

COMMAND ==> 1

Subsystem : GTAG

DBRM : TESTDBRM

Collection : TESTDBRM

Version :

Queryno : 281

Select one of the options below:

- 1 MODIFY Change access path
- 2 NAME Assign hint name
- 3 MAKE Create hint



Query Elements

Express Hints - Query Elements
COMMAND ==>

Row 1 to
Scroll ==

Subsystem : GTAG
DBRM : TESTDBRM
Collection : TESTDBRM
Version : 2006-08-14-21.03.31.294254

Queryno : 281

Choose a query element to edit, or specify a different sequence

Sequence Table Accessed

S__ 001 SYSIBM.SYSCOLUMNS



Access Path Settings

Express Hints - Access Path Settings
COMMAND ==>

Subsystem . : GTAG Package . . : TESTDBRM Query No. . : 281

More:

Prefetch mode (PREFETCH)

- 1 1. S Sequential prefetch
2. L List prefetch
3. D Dynamic
4. Blank (no prefetch)

Type of Access (ACCESSTYPE)

- 4 1. I By the index named below
2. I1 1-fetch index scan
3. N Index scan with 'IN' predicate
4. R Table space scan
5. M Multiple index scan
6. Blank Not applicable

Index

Number of index keys (MATCHCOLS) 0

Enter "/" to select option



Change Prefetch Mode

Menu Utilities Options Help

Express Hints - Access Path Settings

COMMAND ==>>

Subsystem . : GTAG Package . . : TESTDBRM Query No. . : 281

More:

Prefetch mode (PREFETCH)

- 4 1. S Sequential prefetch
- 2. L List prefetch
- 3. D Dynamic
- 4. Blank (no prefetch)

Type of Access (ACCESSTYPE)

- 4 1. I By the index named below
- 2. I1 1-fetch index scan
- 3. N Index scan with 'IN' predicate
- 4. R Table space scan
- 5. M Multiple index scan
- 6. Blank Not applicable

Index

Number of index keys (MATCHCOLS) 0

Enter "/" to select option



Back to Access Control

- Express Hints - Access Path Control
- COMMAND ==> 3
-
- Subsystem : GTAG
- DBRM : TESTDBRM
- Collection : COLLHW1
- Version :
-
- Queryno : 281
-
- Select one of the options below:
-
- 1 MODIFY Change access path
- 2 NAME Assign hint name
- 3 MAKE Create hint
-

Select Assign Hint Name

COMMAND ==> 2

Subsystem : GTAG

DBRM : TESTDBRM

Collection : TESTDBRM

Version : 2006-08-14-21.03.31.294254

Queryno : 281

Select one of the options below:

- 1 MODIFY Change access path
- 2 NAME Assign hint name
- 3 MAKE Create hint



Set Name

Express Hints - Hint Name

COMMAND ===>

Current hint name:
(none)

New hint name:
IDUG2014

Make the Hint

Express Hints - Access Path Control
COMMAND ==> 3

Subsystem : GTAG
DBRM : TESTDBRM
Collection : TESTDBRM
Version : 2006-08-14-21.03.31.294254

Queryno : 281

Select one of the options below:

- 1 MODIFY Change access path
- 2 NAME Assign hint name
- 3 MAKE Create hint



Shows the Hint is Valid

Express Hints - Access Path Control

Confirm Hint

COMMAND ==>

This hint has been validated and accepted by DB2. If you wish, the hint can be saved in the plan table so that it may be used to bind with in the future.

Press ENTER to save the hint in the plan table.

Press END to return to the previous panel without saving the hint.

What about APREUSE?

- Not present for Dynamic SQL
- If used for Static SQL binds or rebinds, it is all or nothing in V10. So no new optimization for all SQL.
- If used as a rebind then SYSIBM.SYSPACKSTMT column ACCESSPATH will show a Hint was used.
- If used as bind then all traces of a HINT are removed.
- V11 has other enhancements.

Now that we Have the Hint what else can we do?

- Export the Static Hint to move it to another subsystem
- Import the Static Hint into another subsystem
- Move the Static Hint into the SQL Repository

Select Static Move to Repository

Express Hints for DB2
Option ==> 8

- 1 STATIC Express Hints for static SQL
- 2 DYNAMIC Express Hints for dynamic SQL
- 3 USERSTMT Add a freeform SQL statement
- 4 LOADSTMT Read SQL statement from file
- 5 SYSQUERY Display repository hints
- 6 EXPORT Export static hint(s)
- 7 IMPORT Import static hint(s)
- 8 LOAD Move static hint(s) to repository

Select Package with Hint

Express Hints for DB2

COMMAND ==>

Move Static Hints to Repository

Subsystem GTAG

PLAN_TABLE owner P390

Program name TESTDBRM



Select Hint

COMMAND ==>

Subsystem . . . : GTAG

Plan table . . : P390.PLAN_TABLE

Program : TESTDBRM

Select a hint for the repository

Hint	Collection/ Version
s TESTDBRM	TESTDBRM



Success

COMMAND ==>

Scr

Subsystem . . . : GTAG

Plan table . . . : P390.PLAN_TABLE

Program : TESTDBRM

Select a hint for the repository

Hint Collection/
 Version

. TESTDBRM TESTDBRM

***** Bottom of data *****

HXH4640E Hint TESTDBRM was successfully migrated.



Why use the Repository for Static Hints?

- The Package and Collection must remain the same
- The Hint will match on the SQL Text alone
- The SQL Number can change
- Programmers do not have to Bind with the Hint
- Purchased Packages will retain their Hints

Three Types of Dynamic SQL

- Cached Dynamic SQL
- Non-cached Dynamic SQL
- And Accelerated SQL

Select Dynamic

Express Hints for DB2

Option ==> 2

- 1 STATIC Express Hints for static SQL
- 2 DYNAMIC Express Hints for dynamic SQL
- 3 USERSTMT Add a freeform SQL statement
- 4 LOADSTMT Read SQL statement from file
- 5 SYSQUERY Display repository hints
- 6 EXPORT Export static hint(s)
- 7 IMPORT Import static hint(s)
- 8 LOAD Move static hint(s) to repository

Setup Criteria

* Express Hints for DB2
COMMAND ==>

Select the SQL statement to be tuned

Subsystem ID GTAG

Owner ID for
EXPLAIN tables P390

Owner ID for
History table P390

SQL statement selection (filter) criteria:

Schema *

Collection *

Program *



Select Statement

Subsystem . . . : GTAG
Collection . . . : *
Program : *
Schema : *

Select an SQL statement to process

ID Statement

```
-----  
1 65  
----+----1----+----2----+----3----+----4----+----5----+----6----+  
s 2 Select 'nfm' from SYSIBM.SYSCOLUMNS WHERE TBCREATOR='SYSIBM' and  
. 3 Select distinct creator from SYSIBM.SYSTABLES order by 1 FOR FETC  
. 4 select count(*) from child_temp FOR FETCH ONLY  
. 5 select count(*) from parent FOR FETCH ONLY
```

Same Menu as Before

Select one of the options below:

Queryno . . . : 2

- 1 DISPLAY/MODIFY View or change access path
- 2 NAME Assign hint name
- 3 MAKE Create hint
- 4 COST Estimated cost

Select Statement

Queryno: 2

Choose a query element to edit, or specify a different sequence

QBLOCKNO	PLANNO	Type	Table
----------	--------	------	-------

-----	-----	-----	-----
001	001		SYSIBM.SYSCOLUMNS



Modify for Sequential Prefetch

Prefetch mode (PREFETCH)

1. S Sequential prefetch
2. L List prefetch
3. D Dynamic
4. Blank (no prefetch)

Type of Access (ACCESSTYPE)

1. I By the index named below
2. I1 1-fetch index scan
3. N Index scan with 'IN' predicate
4. R Table space scan
5. M Multiple index scan
6. Blank Not applicable

Set Hint Name

* Express Hints for DB2

COMMAND ==>

Current hint name:
(none)

New hint name:
DYNONE

Name is assigned

Select one of the options below:

Queryno . . . : 2

- 1 DISPLAY/MODIFY View or change access path
- 2 NAME Assign hint name
- 3 MAKE Create hint
- 4 COST Estimated cost

EsxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxN
eHXH887I Hint name DYNONE assigned. e
DxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxM



Hint is Validated

COMMAND ===>

This hint has been validated and accepted by DB2. If you wish, the hint can be saved in the access path repository and made available for use.

Press ENTER to save the hint in the access path repository.

Press END to return to the previous panel without saving the hint.

Hint is Set

HXH3189I Hint DYNONE has been loaded into the repository and is now available for use

Maintaining Repository Hints

- From time to time Hints may have to be removed to be reset
- Hints set with Express Hints are easy to identify and remove

Select SYSQUERY

Express Hints for DB2

Option ==> 5

- 1 STATIC Express Hints for static SQL
- 2 DYNAMIC Express Hints for dynamic SQL
- 3 USERSTMT Add a freeform SQL statement
- 4 LOADSTMT Read SQL statement from file
- 5 SYSQUERY Display repository hints
- 6 EXPORT Export static hint(s)
- 7 IMPORT Import static hint(s)
- 8 LOAD Move static hint(s) to repository

Select Subsystem

* Express Hints for DB2

COMMAND ===>

Specify the subsystem containing the repository

Subsystem IDGTAG

Display Repository Hints

* Express Hints for DB2 Row 1 to 7 of 7
COMMAND ==> Scroll ==> PAGE

Subsystem . . . : GTAG

Hints in System Repository

QUERYID	Hint	SQL
---------	------	-----

523	HINT45	SELECT A . LOCATION , A . COLLID , A . NAME , A . CO
541	TEST001	SELECT NAME , CASE COLTYPE WHEN 'TIMESTMP' THEN 'TIM
542	TEST99	SELECT * FROM SYSIBM . XSROBJECTCOMPONENTS FOR FETCH
546	MIKE2	SELECT * FROM SYSIBM . SYSTABLES
585	SQLPAG	DECLARE X2 CURSOR FOR SELECT PKEY1 , PKEY2 , DATA FR
603	TESTDBRM	DECLARE SELECT1 CURSOR FOR SELECT NAME , TBNAME , CO
604	DYNONE	SELECT 'nfm' FROM SYSIBM . SYSCOLUMNS WHERE TBCREATO

New Optimization with V11

- **Specifying optimization parameters at the statement level**
- **You can now specify Optimization Overrides**
 - REOPT bind option
 - STARJOIN subsystem parameter
 - PARAMDEG subsystem parameter (MAX_PAR_DEGREE column)
 - CDSSRDEF subsystem parameter (DEF_CURR_DEGREE column)
 - SJTABLES subsystem parameter

Our Offer

- This is a yearly Site license. One license and one price for all DB2s, LPARs, and mainframes.
- This includes Support and all fixes and product upgrades.
- License is renewable for up to Three years without a price increase



Our Offer

- Normal 30 day trial. If you say in writing you want to migrate Static Hints to your repository then we give it to you for 60 days
- We are at booth 119 in the Exhibitor's Hall

