BMC Next Generation Technology Stats for DB2 for z/OS Reference Manual

Supporting

Version 11.2 of BMC Next Generation Technology Stats for DB2 for z/OS

May 2015
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<tr>
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<td>1 713 918 8800</td>
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- Operating system and environment information
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  - Operating system type, version, and service pack or other maintenance level such as PUT or PTF
  - System hardware configuration
  - Serial numbers
  - Related software (database, application, and communication) including type, version, and service pack or maintenance level
- Sequence of events leading to the problem
- Commands and options that you used
- Messages received (and the time and date that you received them)
  - Product error messages
  - Messages from the operating system
  - Messages from related software
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Chapter 1

Summary

BMC Next Generation Technology Stats for DB2 for z/OS (NGT Stats) is a utility for collecting and updating run statistics.

<table>
<thead>
<tr>
<th>When To Use It</th>
<th>When you wish to collect or update run statistics for data base objects.</th>
</tr>
</thead>
</table>
| Authorizations Required | **Data Base:** STATS authority.  
**Administrator:** SYSADM, SYSOPR, DBADM, DBCTRL, or DBMAINT authority. |
| Restrictions | The PART keyword is not supported.  
If no partitioning index exists the SPACE statistics in SYSTABLEPART will not be updated.  
DB2 compression statistics are not updated (PCTROWCOMP and PAGESAVE).  
Column and Distributed Column statistics are only gathered for indexed columns.  
Histogram stats are not gathered. |
| Statuses | **DB2 States**  
Table space: RW, non-restricted states only |

NGT Stats gathers and posts statistics about your data to the DB2 Catalog. It also optionally writes to the history tables. You can set the default for what stats are posted and choose reports to be written during the process.

NGT Stats gathers the “standard” statistics for Table spaces, Tables, and Indexes; Columns stats for all indexed columns; and Distributed stats for indexed columns.


NGT Stats has a more simple syntax because it always processes TABLE(ALL) and INDEX(ALL), and column stats is limited to indexed columns.
Chapter 2

**Input: DD Statements, Syntax, Keywords, Parameters**

This chapter covers the DD statements, SYSIN input (statement syntax), keywords and parameters for this utility.

### 2.1 DD Statements

**SYSIN**
The only required DD statement for use with this utility is SYSIN. Specify utility statements as follows:

```
//SYSIN DD *
  (statement)
  (statement)
  (statement)
```

Statement syntax is covered in Sec. 2.2, "SYSIN Syntax Diagram", on the next page.

**RUNSTATS**
Runstats reports are sent to the DD name RUNSTATS. You may specify a SYSOUT class or an associated dataset name.

**CDBEXEC**
If you wish to use this utility with automation exits, specify a CDBEXEC DD statement. This statement should reference a partitioned dataset containing the automation exits you wish to use. An example of how this DD statement might appear in your JCL is shown here:

```
//CDBEXEC DD DISP=SHR,DSN=CDB.AUTOMATN.EXITS
```

For more information on automation exits, please see the manual *BMC Next Generation Technology Automation Reference Guide*. 
2.2 **SYSIN Syntax Diagrams**

**CDBSTATS TABLESPACE**

```
CDBSTATS TABLESPACE
  dbname.spacename
  dbmask.spacemask
  statistics-spec
  reset-spec
```

**statistics-spec**

```
  TABLE(ALL)  COLUMN(ALL)  INDEX(ALL)
  distributed options
  common options
  SAMPLE integer
  EXCLUDE TABLESPACE
  dbname.spacename
  dbmask.spacemask
```

**distributed options**

```
  KEYCARD  FREQVAL NUMCOLS integer
  COUNT integer
  MOST
  LEAST
  BOTH
```

**common options**

```
  UPDATE( ALL ACCESSPATH SPACE NONE )
  HISTORY( ALL ACCESSPATH SPACE NONE )
  REPORT( YES NO )
```

**reset-spec**

```
  RESET ACCESSPATH
  HISTORY ACCESSPATH
```

2.3 **Keywords**

**CDBSTATS TABLESPACE**

Required. Indicates the object for which run statistics will be collected or updated.

**RUNSTATS TABLESPACE**

Identical to CDBSTATS TABLESPACE.

**EXCLUDE TABLESPACE**

Indicates the object to be excluded from processing.

```
dbname.spacename
```
Both the dbname and the spacename must be specified. The dbname may not be DSNDB01, DSNDB06, or DSNDB07 (note that DSNDB04 may be used only when excluding).

**dbmask.spacemask**

The dbmask and spacemask parameters employ DB2 SQL wildcards to reference any number of different objects. DB2 SQL wildcards are used precisely as they are used in a DB2 WHERE clause after the LIKE keyword. Any combination of characters, "%" sign, or "_" sign can be used in either name. An SQL query will be constructed and issued to obtain the names of all table spaces that match the specified dbmask and spacemask. A line will print on SYSPRINT and SUMMARY for each object found.

**TABLE(ALL)**

Optional, statistics will be gathered for all tables of the table space. Only TABLE(ALL) is supported.

**COLUMN(ALL)**

Statistics will be gathered for all indexed columns. Specify COLUMN(ALL) to get column stats for all indexed columns or leave it off to get stats for the first key column only.

**INDEX(ALL)**

Optional, statistics will be gathered for all indexes of the table space. Only INDEX(ALL) is supported.

**KEYCARD FREQVAL NUMCOLS integer COUNT integer MOST / LEAST / BOTH**

Gather and post column group distributed stats for all the intermediate groupings of columns in each index.

Gather and post frequency distributed statistics for the specified number of columns. The count of values specified will be gathered for each index, either the most frequent, least frequent, or both.

Default values for NUMCOLS, COUNT, and MOST / LEAST / BOTH can be set using NGT +parms. See the parameter section below.

**SAMPLE integer**

This keyword controls the sampling rate by specifying the percentage of rows that RUNSTATS is to sample when gathering statistics.

Integer specifies the percentage of rows to sample when gathering stats.

**UPDATE**

This keyword determines whether the DB2 Catalog will be updated with new RUNSTATS values.

One of the following values can be specified for UPDATE.

**NONE**

No Catalog tables will be updated.

**ACCESSPATH**

Only DB2 catalog tables that are used by DB2 for SQL access path determination are updated.

**SPACE**

Only space-related catalog statistics will be updated.

**ALL**

Default. Both access path and space statistics will be gathered.
HISTORY
This keyword determines whether the DB2 Catalog's historic data will be updated with new RUNSTATS values.

One of the following values can be specified for HISTORY:

- **NONE**  No History stats will be written
- **ACCESSPATH** Access path stats will be posted to the history tables
- **SPACE** Space stats will be posted to the history tables.
- **ALL** Both access path and space stats will be posted to the history tables.

REPORT
This keyword determines whether a report of the posted runstats is generated.

One of the following values can be specified for REPORT:

- **NO**  No reports
- **YES** Print Runstats report to RUNSTATS DD.

RESET ACCESSPATH
When specified, resets the accesspath statistics for the tables and indexes. This does not affect Real-Time stats or Space stats.

When RESET ACCESSPATH is specified, the other keywords for collecting specific stats cannot be specified.

HISTORY ACCESSPATH
Inserts rows into SYSTABLES and SYSINDEXES for each object who’s stats were reset by the RESET ACCESSPATH keyword above.
2.4 Parameters

In this section we cover the parameters you can specify for running this utility. These passwords are specified after the STTPARMS DD statement in your NGT job stream.

2.4.1 +COUNT

To specify how many column values to gather stats for.

Syntax

```
+COUNT( number )
```

Description

This is an alternative way to specify part of the runstats syntax. This parm is overridden by specifying it in the SYSIN. This can be set in the NGT Configuration to set the default value for your installation.

The primary reason for this +parm is for specifying distributed runstats options for Load and Reorg.

```
e.g. FREQVAL NUMCOLS integer COUNT integer MOST
```

Operands

- `number` The number of column values to gather stats for. Minimum value 1, maximum value 100.

Example

```
+COUNT(10) 10 column values will have their frequency stats gathered.
```
2.4.2 +FREQ
To specify which column values to collect stats for; Least, Most, or Both

Syntax

```
+FREQ( operand )
```

Description

This is an alternative way to specify part of the runstats syntax. This parm is overridden by specifying it in the SYSIN. This can be set in the NGT Configuration to set the default value for your installation.

The primary reason for this +parm is for specifying distributed runstats options for Load and Reorg.

e.g. FREQVAL NUMCOLS integer COUNT integer MOST

Operands

- **LEAST or L** Collect only the least frequent column values.
- **MOST or M** Collect only the most frequent column values.
- **BOTH or B** Collect both the least and most frequent column values.
- **NONE or N** Don’t collect any Frequency Distributed stats. NONE should be set when Frequency stats are not wanted during BMC Next Generation Technology Reorg for DB2 (NGT Reorg) or BMC Next Generation Technology Load for DB2 (NGT Load).
2.4.3  **+HISTORY** (or **+HIST**)
To specify whether and what stats to write to the History tables.

**Syntax**

```
+HISTORY( operand )
```

**Description**
To specify what type of stats to write to the history tables. You can specify to write only the stats used by the optimizer, only the space related stats, both, or none.

**Operands**

<table>
<thead>
<tr>
<th>Operand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NONE</strong> or <strong>N</strong></td>
<td>Do not write stats to history.</td>
</tr>
<tr>
<td><strong>PATH</strong> or <strong>P</strong></td>
<td>Write only the stats used by the optimizer to history.</td>
</tr>
<tr>
<td><strong>SPACE</strong> or <strong>S</strong></td>
<td>Write only the stats used for space purposes to history.</td>
</tr>
<tr>
<td><strong>ALL</strong> or <strong>A</strong></td>
<td>Write both accesspath and space stats to history.</td>
</tr>
<tr>
<td><strong>DFLT</strong> or <strong>D</strong></td>
<td>Default, get this value from the STATHIST Zparm value.</td>
</tr>
</tbody>
</table>
2.4.4  +NUMCOLS
To specify the number of concatenated columns to collect frequency stats for.

Syntax

```
+NUMCOLS(number)
```

Description

This is an alternative way to specify part of the runstats syntax. This parm is overridden by specifying it in the SYSIN. This can be set in the NGT Configuration to set the default value for your installation.

The primary reason for this +parm is for specifying distributed runstats options for Load and Reorg.

```
e.g. FREQVAL NUMCOLS integer COUNT integer MOST
```

Operands

- **number**: The number of concatenated index columns to gather stats for. Minimum value 1, maximum value 16.

Example

```
+NUMCOLS(10)
```

Gather frequency values for 10 concatenated columns. If there are only 3 columns then frequency stats will be gathered for those three columns.
2.4.5  
+PRINT

To specify whether to print the Runstats report.

Syntax

+PRINT(YES, NO)

Description

Specifies whether to print the Runstats report. Can be used to omit the Runstats report to reduce the job output.

Operands

YES  Default; print the Runstats report to the RUNSTATS DD.
NO   Do not print the Runstats report to the RUNSTATS DD.

Example

+PRINT(YES)

Print the Runstats report.
2.4.6 +ROLLUP
To specify whether to roll up the stats when some parts have no stats.

Syntax

+ROLLUP( [YES DEFAULT NO] )

Description

Specifies whether to roll up statistics when stats are gathered for a subset of the partitions and some other parts have no stats.

Operands

YES Roll up statistics even though some parts may not have stats available.
NO Only roll up statistics if stats are available for all parts.
DEFAULT The default. Use the zparm STATROLL to indicate whether to force the roll up of stats. Message CDBS002 will be issued.

Example

+ROLLUP(YES)

Force the rollup of stats even if some partitions have no stats.
2.4.7  +UPDATE
To specify what statistic to post to the DB2 Catalog.

Syntax

```
+UPDATE ( operand )
```

Description

NGT Stats can write only the accesspath stats, only the space stats, both or neither. This parameter can be set in the NGT Configuration to act as a user specified default for all Runstats jobs. This parameter can be overridden in the SYSIN by the UPDATE keyword.

Operands

- **NONE or N**: Don’t post any stats to the DB2 Catalog.
- **PATH or P**: Post only the accesspath stats to the Catalog
- **SPACE or S**: Post only the space stats to the Catalog
- **ALL or A**: Post both the accesspath and the space stats.
2.4.8  **+PASSWORD**

Password for NGT Stats

**Syntax**

```
+PASSWORD(string)
```

**Description**

Obtain the password `string` value from NGT. The password may be supplied to extend the no-obligation trial or to set the utility as non-expiring after license. The `+PASSWORD` for this and all other products is usually specified at installation time (eliminating the need to specify it in each job).

**Operands**

- `string`  
  A string of characters containing a password for NGT Stats.
Examples

Chapter 3

3.1 Capture Runstats for a Table Space

The simplest form for NGT Stats specifies a single table space name.

```plaintext
//SYSIN DD *
CDBSTATS TABLESPACE dbname.tsname
```

With NGT Stats the TABLE(ALL) and INDEX(ALL) keywords are assumed; Without COLUMN(ALL) only the first key column stats will be gathered for each index. With COLUMN(ALL) columns stats will be gathered for all indexed columns.

3.2 Capture Distributed Runstats for a Table Space

The simplest form for NGT Stats specifies a single table space name.

```plaintext
//SYSIN DD *
CDBSTATS TABLESPACE WORKDB.INVENTRY COLUMN(ALL) KEYCARD
CDBSTATS TABLESPACE dbname.tsname KEYCARD FREQVAL NUMCOLS 2 COUNT 3 BOTH
```

The first example statement above gets columns statistic for all indexed columns and column group distributed stats for all intermediate groupings of columns for each index. The second statement goes on to get frequency distributed stats for each index.

3.3 Control what values are posted to the Catalog

To control which runstats are posted, use the UPDATE keyword with one of the options ACCESSPATH, SPACE, ALL or NONE:

```plaintext
//SYSIN DD *
CDBSTATS TABLESPACE dbmask.tsmask UPDATE(ACCESSPATH)
CDBSTATS TABLESPACE dbmask.tsmask UPDATE(SPACE)
CDBSTATS TABLESPACE dbmask.tsmask UPDATE(ALL)
CDBSTATS TABLESPACE dbmask.tsmask UPDATE(NONE)
```
3.4 **Control what is posted to the History stats tables.**

To control which runstats values are posted to the history tables, use the HISTORY keyword with one of the options ACCESSPATH, SPACE, ALL or NONE:

```
//SYSIN DD *
CDBSTATS TABLESPACE dbmask.tsmask HISTORY(ACCESSPATH)
CDBSTATS TABLESPACE dbmask.tsmask HISTORY(SPACE)
CDBSTATS TABLESPACE dbmask.tsmask HISTORY(ALL)
CDBSTATS TABLESPACE dbmask.tsmask HISTORY(NONE)
CDBSTATS TABLESPACE dbmask.tsmask HISTORY(DFLT)
```

If no HISTORY keyword is specified NGT Stats will use the +HIST NGT parm value. If no +HIST parm is supplied or it is set to DFLT then NGT Stats will use the DB2 zparm STATHIST value.

3.5 **Control whether Runstats reports are written.**

To control whether runstats reports are written to the RUNSTATS DD, use the REPORT keyword with one of the options YES or NO:

```
//SYSIN DD *
CDBSTATS TABLESPACE dbmask.tsmask REPORT(YES)
CDBSTATS TABLESPACE dbmask.tsmask REPORT(NO)
```
Chapter 4

Relevant Automation

NGT Automation exits are integrated into all NGT Utilities and can greatly enhance and expand your processing options – you are limited only by your imagination. In this chapter we present automation exits we recommend incorporating into your processing. (Automation exits are not required, however, for you to use this product.)

The presence of the CDBEXEC DD statement triggers automation exit processing, as in this example:

```plaintext
//CDBEXEC DD DISP=SHR,DSN=CDB.AUTO.EXITS
```

The automation exit dataset will contain one member with each of the exits you choose to use.

In listing the exits below, be aware that these are not the only exits you can use with this product. These should serve only as a basic recommendation for automation. This recommendation should be used to spawn more ideas or give insight into how others are utilizing this powerful facility. You may incorporate the use of any of the automation exits you wish for whatever additional uses you require. Furthermore, where this section lists more than one automation exit, you are not constrained to using all such listed exits as a set; you may exclude as many of the listed exits as you need.

The following standard NGT Automation exits may be used with this utility:

- **XSUTGLOB**: Can be used to set global variables that are then used by other automation points.

- **XSUT0000**: Called before any processing starts. Can be used to abort a run before it starts.

- **XSUTSYIN**: Called before the parser reads SYSIN. It has full access to the SYSIN and can modify it. It may be used to override or disallow some input parameters.

- **XSTAT001**: Called for each index when gathering runstats. Can be used to change what stats are to be gathered for an object. Primary purpose is to prevent stats from being gathered for an object. See example below.

- **XSUTTERM**: Called after processing has finished. It may be used, for example, to insert run statistics into a DB2 table or to e-mail an audit report at the completion of processing, automatically.

Example XSTAT001 logic to skip runstats for a table space

```plaintext
If dbname = YOURDB' & tname = 'YOURTS' Then
  Do
    skipix = 'Y'
    Say 'Skipping Runstats for 'dbname.'tname
  End
```

For further information on the use of automation exits, please see the *BMC Next Generation Technology Automation Reference Guide*. 
Chapter 5  Reports

NGT Stats, based in the REPORT YES/NO keyword, optionally creates Runstats reports and writes them to the RUNSTATS DD.

To direct where the reports go add a RUNSTATS DD to your job, such as:

```
//RUNSTATS DD SYSOUT=*  
```

These reports can get lengthy so after testing consider +REPORT NO and review the stats in the DB2 Catalog. The following shows an example of what is reported. This report is for a two partition TS with three indexes; a partitioning IX, a NPSI, and a DPSI.

### 5.1 RUNSTATS Reports

**First the CDBSTATS OPTIONS in affect are reported**

```
14:26:00.22 B001.ST90OPTS CDBS003 - CDBSTATS OPTIONS - REPORT = YES, UPDATE = ALL, HISTORY = NON
14:26:00.22 B001.ST90OPTS CDBS003 - CDBSTATS OPTIONS - COLUMNS (ALL) KEYPARAM (ONCOLS(3)) MOST + LEAST 2
```

**An OBJECT SPACE REPORT is produced**

```
OBJECT SPACE REPORT

<table>
<thead>
<tr>
<th>DBNAME</th>
<th>SPCNAME</th>
<th>PART</th>
<th>CARD(F)</th>
<th>NACTIVE</th>
<th>ACT</th>
<th>NPAGES</th>
<th>PGS</th>
<th>SPACE(F)</th>
<th>PQTY</th>
<th>SQTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBASE001</td>
<td>TSPART02</td>
<td>1</td>
<td>500</td>
<td>22</td>
<td>61</td>
<td>20</td>
<td>91</td>
<td>144</td>
<td>36</td>
<td>180</td>
</tr>
<tr>
<td>DBASE001</td>
<td>TSPART02</td>
<td>2</td>
<td>500</td>
<td>22</td>
<td>61</td>
<td>20</td>
<td>91</td>
<td>144</td>
<td>36</td>
<td>180</td>
</tr>
</tbody>
</table>

TOTALS   1,000   44   40    91  288
```

**The CDBSTATS TS REPORT is produced providing all the TS stats in a brief report**

```
CDBSTATS TS REPORT

<table>
<thead>
<tr>
<th>DBNAME</th>
<th>SPCNAME</th>
<th>PART</th>
<th>CARD(F)</th>
<th>NACTIVE</th>
<th>ACT</th>
<th>NPAGES</th>
<th>PGS</th>
<th>SPACE(F)</th>
<th>PQTY</th>
<th>SQTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBASE001</td>
<td>TSPART02</td>
<td>1</td>
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<td>22</td>
<td>61</td>
<td>20</td>
<td>91</td>
<td>144</td>
<td>36</td>
<td>180</td>
</tr>
<tr>
<td>DBASE001</td>
<td>TSPART02</td>
<td>2</td>
<td>500</td>
<td>22</td>
<td>61</td>
<td>20</td>
<td>91</td>
<td>144</td>
<td>36</td>
<td>180</td>
</tr>
</tbody>
</table>

TOTALS   1,000   44   40    91  288
An IBM-like report of TS stats is produced

SYSTABLEPART CATALOG STATISTICS FOR DBASE001.TSPART02 PARTITION 1

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARD (F)</td>
<td>500</td>
</tr>
<tr>
<td>PERCACTIVE</td>
<td>61</td>
</tr>
<tr>
<td>SPACE (F)</td>
<td>144</td>
</tr>
<tr>
<td>VSAM PQTY</td>
<td>36</td>
</tr>
<tr>
<td>VSAM SQTY</td>
<td>180</td>
</tr>
<tr>
<td>DSNUM</td>
<td>1</td>
</tr>
<tr>
<td>EXTENTS</td>
<td>1</td>
</tr>
</tbody>
</table>

SYSTABSTATS FOR TABLE - CDBUSER.TEST_TS0040_TBL0 PARTITION 1

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARD (F)</td>
<td>500</td>
</tr>
<tr>
<td>NPAGES</td>
<td>20</td>
</tr>
<tr>
<td>PCTPAGES</td>
<td>91</td>
</tr>
<tr>
<td>NACTIVE</td>
<td>22</td>
</tr>
</tbody>
</table>

SYSTABLEPART CATALOG STATISTICS FOR DBASE001.TSPART02 PARTITION 2

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARD (F)</td>
<td>500</td>
</tr>
<tr>
<td>PERCACTIVE</td>
<td>61</td>
</tr>
<tr>
<td>SPACE (F)</td>
<td>144</td>
</tr>
<tr>
<td>VSAM PQTY</td>
<td>36</td>
</tr>
<tr>
<td>VSAM SQTY</td>
<td>180</td>
</tr>
<tr>
<td>DSNUM</td>
<td>1</td>
</tr>
<tr>
<td>EXTENTS</td>
<td>1</td>
</tr>
</tbody>
</table>

SYSTABSTATS FOR TABLE - CDBUSER.TEST_TS0040_TBL0 PARTITION 2

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARD (F)</td>
<td>500</td>
</tr>
<tr>
<td>NPAGES</td>
<td>20</td>
</tr>
<tr>
<td>PCTPAGES</td>
<td>91</td>
</tr>
<tr>
<td>NACTIVE</td>
<td>22</td>
</tr>
</tbody>
</table>

SYSTABLES STATISTICS FOR TABLE - CDBUSER.TEST_TS0040_TBL0

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARD (F)</td>
<td>1,000</td>
</tr>
<tr>
<td>NPAGES</td>
<td>40</td>
</tr>
<tr>
<td>PCTPAGES</td>
<td>91</td>
</tr>
<tr>
<td>SPACE</td>
<td>288</td>
</tr>
</tbody>
</table>

SYSTABLESPACE CATALOG STATISTICS FOR DBASE001.TSPART02

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NACTIVE</td>
<td>44</td>
</tr>
<tr>
<td>SPACE</td>
<td>288</td>
</tr>
</tbody>
</table>
An index report is produced for each index.

Report columns:

- NL has 'N' if nulls allowed
- AD shows Ascending/Descending, I for Include column
- FV shows Fixed/Variable
- FQ shows the Frequency Numcols
- C# shows the column groups getting Cardinality stats

INDEX = CDBUSER.PARTIX01
IXDSN = BI12V90V.DSMDBC.DBASE001.PARTIX01.I0001.A001   KEYLEN =13           2 KCOLS

Non-Unique, Clustering Partitioned Index -- TS IS PBRANGE --

INDEXSPACE DBASE001.PARTIX01 (1)   2 IX COLUMNS, TS = DBASE001.TSPART02
KEYS = 500 , FIRSTKEYS = 500 , TOTAL RIDS = 500

And the IBM-like report for the index stats

CARD(F) = #ROWS = 500
NEAROFFPOSS = 22
FAROFFPOSS = 0
LEAFDIST = 1
LEAFNEAR = 1
LEAFFAR = 0
SPACE = 48
EXTENTS = 1
DATASETS = 1
VSAM POQTY = 12
VSAM SQTY = 180
AVGKEYLENGTH = 13
**SYSCOLSTATS CATALOG STATISTICS FOR COL01**

<table>
<thead>
<tr>
<th>COLCARDF</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWKEY</td>
<td>80000001</td>
</tr>
<tr>
<td>LOW2KEY</td>
<td>80000002</td>
</tr>
<tr>
<td>HIGH2KEY</td>
<td>800001F3</td>
</tr>
<tr>
<td>HIGHKEY</td>
<td>800001F4</td>
</tr>
</tbody>
</table>

**SYSCOLSTATS CATALOG STATISTICS FOR COL02**

<table>
<thead>
<tr>
<th>COLCARDF</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWKEY</td>
<td>C1D3D7C8C1 40404040</td>
</tr>
<tr>
<td>LOW2KEY</td>
<td>C1D3D7C8C1 40404040</td>
</tr>
<tr>
<td>HIGH2KEY</td>
<td>C1D3D7C8C1 40404040</td>
</tr>
<tr>
<td>HIGHKEY</td>
<td>C1D3D7C8C1 40404040</td>
</tr>
</tbody>
</table>

**SYSCOLDISTSTATS FREQ (1) FOR COL01,COL02**

**TOTAL ROWS = 500 , 2 MOST FREQUENT KEYS**

<table>
<thead>
<tr>
<th>COUNT</th>
<th>PCT</th>
<th>COLVALUE (HEX)</th>
<th>(CHAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.20</td>
<td>80000001C1 D3D7C8C140 404040</td>
<td>Ø ALPHA</td>
</tr>
<tr>
<td>1</td>
<td>0.20</td>
<td>80000002C1 D3D7C8C140 404040</td>
<td>Ø ALPHA</td>
</tr>
</tbody>
</table>

**TOTAL ROWS = 500 , 2 LEAST FREQUENT KEYS**

<table>
<thead>
<tr>
<th>COUNT</th>
<th>PCT</th>
<th>COLVALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.20</td>
<td>80000002C1 D3D7C8C140 404040</td>
</tr>
<tr>
<td>1</td>
<td>0.20</td>
<td>80000001C1 D3D7C8C140 404040</td>
</tr>
</tbody>
</table>

This index reporting occurs for each partition of the index, then a ROLLUP report is produced.

******************************************************************************
*                                   ROLLUP DATA                             *
******************************************************************************

**NON-UNIQUE, CLUSTERING PARTITIONED INDEX -- TS IS PBRANGE --**

INDEXSPACE DBASE001.PARTIX01 (0)  2 IX COLUMNS, TS = DBASE001.TSPART02

KEYS = 1,000 , FIRSTKEYS = 1,000 , TOTAL RIDS = 1,000

**SYSINDEXES CATALOG STATISTICS FOR DBASE001.PARTIX01**

| FULLKEYCARD(F) | 1,000 |
| FIRSTKEYCARD(F) | 1,000 |
| CLUSTERED      | Y     |
| CLUSTERRATIO(F) | 100.0 |
| DATAREPEATFACTOR | 477  |
| AVGKEYLENGTH   | 13    |
NLEAF    = 6
NTREE    = 1
NLEVELS  = 2
SPACE    = 96

SYSCOLUMNS STATS FOR COL01

<table>
<thead>
<tr>
<th>COLCARDG</th>
<th>1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWKEY</td>
<td>80000001 Ø</td>
</tr>
<tr>
<td>LOW2KEY</td>
<td>80000002 Ø</td>
</tr>
<tr>
<td>HIGH2KEY</td>
<td>80000003E7 Ø X</td>
</tr>
<tr>
<td>HIGHKEY</td>
<td>80000003E8 Ø Y</td>
</tr>
</tbody>
</table>

SYSCOLUMNS STATS FOR COL02

<table>
<thead>
<tr>
<th>COLCARDG</th>
<th>66,035,011,955</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWKEY</td>
<td>C1D3D7C8C14040404040 ALPHA</td>
</tr>
<tr>
<td>LOW2KEY</td>
<td>C1D3D7C8C14040404040 ALPHA</td>
</tr>
<tr>
<td>HIGH2KEY</td>
<td>C1D3D7C8C14040404040 ALPHA</td>
</tr>
<tr>
<td>HIGHKEY</td>
<td>C1D3D7C8C14040404040 ALPHA</td>
</tr>
</tbody>
</table>

SYSCOLDIST STATS FOR COL01,COL02

TOTAL ROWS = 1,000, 2 MOST FREQUENT KEYS

<table>
<thead>
<tr>
<th>COUNT</th>
<th>PCT</th>
<th>COLVALUE (HEX)</th>
<th>COLVALUE (CHAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.10</td>
<td>80000001C1D3D7C8C14040404040</td>
<td>Ø ALPHA</td>
</tr>
<tr>
<td>1</td>
<td>0.10</td>
<td>80000002C1D3D7C8C14040404040</td>
<td>Ø ALPHA</td>
</tr>
</tbody>
</table>

TOTAL ROWS = 1,000, 2 LEAST FREQUENT KEYS

<table>
<thead>
<tr>
<th>COUNT</th>
<th>PCT</th>
<th>COLVALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.10</td>
<td>80000002C1D3D7C8C14040404040</td>
</tr>
<tr>
<td>1</td>
<td>0.10</td>
<td>80000001C1D3D7C8C14040404040</td>
</tr>
</tbody>
</table>

These reports are repeated for each index and each partition of partitioned indexes and partitioned table spaces.
Chapter 6  

Technical Details

6.1  

DB2 Catalog Columns Updated

The following columns of the DB2 catalog are updated by NGT Stats depending on the Runstats options chosen.

Only the relevant statistics columns are shown. In many instances we insert a row which includes all columns.

The RTS tables are updated by NGT Stats, and most other utilities. The RTS updates are detailed in the *BMC Next Generation Technology General User Guide*.

**SYSCOLSTATS**

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLCARD</td>
<td>Number of distinct column values in the partition.</td>
</tr>
<tr>
<td>HIGHKEY</td>
<td>Highest column value within the partition</td>
</tr>
<tr>
<td>HIGH2KEY</td>
<td>Second highest column value within the partition</td>
</tr>
<tr>
<td>LOWKEY</td>
<td>Lowest column value within the partition</td>
</tr>
<tr>
<td>LOW2KEY</td>
<td>Second lowest column value within the partition</td>
</tr>
<tr>
<td>STATS_FORMAT</td>
<td>Type of statistics gathered</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
</tbody>
</table>

**NOTE**

NGT Stats does not update SYSCOLSTATS (column by partition) stats for the columns of an NPI. It does update SYSCOLUMNS below for the columns of an NPI.

**SYSCOLUMNNS**

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLCARDF</td>
<td>Number of distinct values in the column</td>
</tr>
<tr>
<td>HIGH2KEY</td>
<td>Second highest column value in the table</td>
</tr>
<tr>
<td>LOW2KEY</td>
<td>Second lowest column value in the table</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
</tbody>
</table>

**SYSCOLDISTSTATS**

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARDF</td>
<td>Number of distinct values in column group or frequency</td>
</tr>
<tr>
<td>COLGROUPCOLNO</td>
<td>Set of columns associated with the stats</td>
</tr>
<tr>
<td>COLVALUE</td>
<td>The data of the frequently occurring value</td>
</tr>
<tr>
<td>TYPE</td>
<td>Type of statistics gathered</td>
</tr>
<tr>
<td>FREQUENCYF</td>
<td>Percentage of rows with COLVALUE when multiplied by 100</td>
</tr>
<tr>
<td>NUMCOLUMNS</td>
<td>Number of columns in the column group</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
</tbody>
</table>

**SYSCOLDIST**

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARDF</td>
<td>Number of distinct values in column group or frequency</td>
</tr>
<tr>
<td>COLGROUPCOLNO</td>
<td>Set of columns associated with the stats</td>
</tr>
<tr>
<td>COLVALUE</td>
<td>The data of the frequently occurring value</td>
</tr>
<tr>
<td>TYPE</td>
<td>Type of statistics gathered</td>
</tr>
<tr>
<td>FREQUENCYF</td>
<td>Percentage of rows with COLVALUE when multiplied by 100</td>
</tr>
<tr>
<td>NUMCOLUMNS</td>
<td>Number of columns in the column group</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
</tbody>
</table>
### Technical Details

#### SYSKEYTARGETS
- **CARDF**: Number of distinct values for the key target.
- **HIGH2KEY**: Second highest column value in the table.
- **LOW2KEY**: Second lowest column value in the table.
- **STATSTIME**: Timestamp of RUNSTATS update.

#### SYSKEYTGTDIST
- **KEYSEQ**: Numeric position of key-target in the index.
- **KEYVALUE**: The data of the frequently occurring key.
- **CARDF**: Number of distinct values in key group.
- **FREQUENCYF**: Percentage of keys with KEYVALUE.
- **STATSTIME**: Timestamp of RUNSTATS update.

#### SYSTABSTATS
- **CARDF**: Rows in partition.
- **NPAGES**: Number of pages with rows.
- **PCTPAGES**: Percentage of active pages with rows.
- **NACTIVE**: Number of active pages.
- **STATSTIME**: Timestamp of RUNSTATS update.

#### SYSTABLES
- **CARDF**: Rows in the table.
- **NPAGESF**: Pages with rows of this table.
- **PCTPAGES**: Percent of active pages with rows.
- **STATSTIME**: Timestamp of RUNSTATS update.

#### SYSTABLESPACE
- **NACTIVEF**: Number of active pages in the table space.
- **SPACEF**: Kilobytes of DASD storage.
- **STATSTIME**: Timestamp of RUNSTATS update.

#### SYSINDEXSTATS
- **FIRSTKEYCARDF**: Number of distinct values of the first key column.
- **FULLKEYCARDF**: Number of distinct values of the key.
- **NLEAF**: Number of leaf pages in the index.
- **NLEVELS**: Number of levels in the index tree.
- **DATAREPEATFACTORF**: The anticipated number of pages touched when following an index key order.
- **KEYCOUNTF**: Total number of rows in the partition.
- **CLUSTERRATIOF**: Percentage of rows in clustering order.
- **STATSTIME**: Timestamp of RUNSTATS update.

#### SYSINDEXES
- **CLUSTERRATIOF**: Percentage of rows in clustering order.
- **CLUSTERED**: Set to "Y" if CLUSTERRATIO exceeds 94.
- **FIRSTKEYCARDF**: Number of distinct values of the first key column.
- **FULLKEYCARDF**: Number of distinct values of the full key.
- **NLEAF**: Number of leaf pages in the index.
- **NLEVELS**: Number of levels in the index tree.
- **DATAREPEATFACTORF**: The anticipated number of pages touched when following an index key order.
- **AVGKEYLEN**: Average length of keys within the index.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACEF</td>
<td>Kilobytes of DASD storage</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
<tr>
<td><strong>SYSTABLEPART</strong></td>
<td></td>
</tr>
<tr>
<td>CARDF</td>
<td>Number of rows in table space or partition</td>
</tr>
<tr>
<td>DSNUM</td>
<td>Number of datasets</td>
</tr>
<tr>
<td>EXTENTS</td>
<td>Number of data set extents</td>
</tr>
<tr>
<td>FARINDREF</td>
<td>Number of rows that have been relocated far from their original page.</td>
</tr>
<tr>
<td>NEARINDREF</td>
<td>Number of rows that have been relocated near their original page.</td>
</tr>
<tr>
<td>PERCACTIVE</td>
<td>Percentage of space occupied by rows of data from active tables.</td>
</tr>
<tr>
<td>SECQTYI</td>
<td>Secondary space allocation</td>
</tr>
<tr>
<td>SPACEF</td>
<td>Kilobytes of DASD storage</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
<tr>
<td><strong>SYSINDEXPART</strong></td>
<td></td>
</tr>
<tr>
<td>AVGKEYLEN</td>
<td>Average length of keys within the index</td>
</tr>
<tr>
<td>CARDF</td>
<td>Number of rows in index or partition</td>
</tr>
<tr>
<td>DSNUM</td>
<td>Number of datasets</td>
</tr>
<tr>
<td>EXTENTS</td>
<td>Number of data set extents</td>
</tr>
<tr>
<td>NEAROFFPOSF</td>
<td>Number of rows near the optimal position</td>
</tr>
<tr>
<td>FAROFFPOSF</td>
<td>Number of rows far from optimal position</td>
</tr>
<tr>
<td>LEAFDIST</td>
<td>A value equal to 100 times the average number of leaf pages between successive active leaf pages of the index.</td>
</tr>
<tr>
<td>LEAFFAR</td>
<td>Number of leaf pages located physically far away from previous leaf pages for successive (active leaf) pages accessed in an index scan.</td>
</tr>
<tr>
<td>LEAFNEAR</td>
<td>Number of leaf pages physically near previous leaf page for successive active leaf pages.</td>
</tr>
<tr>
<td>SECQTYI</td>
<td>Secondary space allocation</td>
</tr>
<tr>
<td>SPACEF</td>
<td>Kilobytes of DASD storage</td>
</tr>
<tr>
<td>STATSTIME</td>
<td>Timestamp of RUNSTATS update</td>
</tr>
</tbody>
</table>
6.2 Runstats Performance

NGT Runstats efficiently gathers statistics by reading the indexes. If you run NGT Runstats on an object that has no indexes, it will be forced to read the entire table space. This can be resource intensive.

If you run NGT Stats on an object that has indexes but no partitioning index; the SPACE statistics in SYSTABLEPART will not be gathered. The ACCESSPATH and other SPACE stats will be gathered.
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