



Hands-Free Statistics Management with DB2 Automation Tool V4.1

**How to reduce your DBA workload
and improve data availability using
DB2 Automation Tool V4.1 for z/OS**

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1 Today's data performance challenges

According to industry experts, the amount of data is exploding in structured data, replicated data and unstructured data – all of which can be stored in a database such as DB2 for z/OS. The amount of data stored in DB2 for z/OS is more than doubling every two years. At the same time, most DB2 for z/OS applications are non-stop global applications, requiring almost 100% accessibility.

In addition to the challenge of exponential data growth and high data availability, the current economic environment is forcing operational budgets of most companies to shrink. Companies are often operating with reduced IT staff dealing with an increased workload, and you need to justify each and every software purchase. These circumstances place heavy demands on the amount of time required to execute critical maintenance that, if not done, directly affects the performance of your business critical applications and your bottom line.

Maintaining optimal performance of your databases is as important to data application availability as ensuring that a network remains online and available for non-stop business use. But more DB2 data means longer times for utilities like REORG to run, while high data availability means your batch windows may be shrinking. Completing database maintenance for all business-critical data is becoming a juggling act. Consider the following questions as they apply to your batch windows:

- Are you able to fit all of your critical maintenance jobs within the batch window?
- Do you struggle to prioritize what maintenance gets run and what doesn't in the event that time runs out? Do you frequently leave out a RUNSTATS job in favor of an image copy job?
- How will the lack of maintenance affect daily business application performance if maintenance isn't run?

2 Autonomic statistics collection is the solution

Creating a strategy that automates collecting routine statistics means that your maintenance batch windows can be utilized for executing priority utilities. For example, performing a REORG during the batch windows is probably more important than statistics collection when it comes to ensuring business-critical application data remains available. As a result, the RUNSTATS utility might often take a back seat to other utilities, such as COPY or REORG.

But if the data in your business critical objects varies significantly over time, then keeping statistics current helps DB2 confirm that the most efficient access path is being used to access application data. On the other hand, chronically checking a busy object's statistics for freshness can be time consuming and can take a DBA away from other job responsibilities.

How do you stay on top of keeping fresh statistics for application data that is accessed frequently? DB2 10 provides a series of stored procedures, called autonomic statistics

stored procedures, to assist you in managing performance and keeping statistics current without running RUNSTATS utility batch jobs.

The DB2-supplied stored procedures automatically monitor the objects within your subsystem and flag those that have stale statistics. Then, using maintenance windows that you define, a RUNSTATS utility is automatically executed to collect statistics for as many objects as it can collect within the given maintenance window. Those objects that do not have statistics collected within the given maintenance window are flagged for collection within the next available maintenance window. You can set it and forget it, knowing that statistics for application objects are being monitored and updated autonomically.

2.1 How does it work?

The DB2 10 stored procedures ADMIN_UTL_EXECUTE and ADMIN_UTL_MONITOR provide the framework for autonomic statistics. Once the stored procedures are configured for your site, DB2 Automation Tool provides an ISPF interface to them to help your DBAs:

- Define when statistics are considered outdated and optionally specify which objects to check. These settings are saved in DB2 Automation Tool statistics monitoring profiles.
- Schedule execution of statistics monitoring profiles at a convenient time for your operations using DB2 Automation Tool's interface to the DB2 administrative task scheduler.
- Define one or more maintenance windows for when the RUNSTATS utility could be executed to update stale statistics.

Once these items are defined, statistics can be verified and updated for your critical application table spaces without manual intervention:

- During execution of the statistics monitoring profile, if the profile settings determine that RUNSTATS needs to be run, an alert is written for the object to the SYSIBM.SYSAUTOALERTS table.
- During the specified maintenance windows, DB2 resolves as many alerts as it can by calling the RUNSTATS utility for each alert.

2.1.1 Create a statistics monitoring profile

DB2 Automation Tool's statistics monitoring profiles enable you to define what objects to monitor and identify the criteria that define out-of-date statistics. The available criteria to select from include items such as the number (or percent) of changes or number of mass deletes made to a table space, as well as thresholds such as specific cardinality values.

In addition, you can limit the scope of the objects to include in the statistics monitoring profile by specifying a table space wild card pattern or a fully qualified table space name.

Similar to other profiles within DB2 Automation Tool, these profiles can be shared with other users and can be easily updated to modify the objects being monitored.

For example: In the screen shot below, a statistics monitoring profile is created that will evaluate only those table spaces whose database matches the given name 'NMHAQA23' and that have changed by 20% or more.

```

AUTOTOOL V4R1 ----- Update Stats Monitor Profile ----- 2012/03/06 11:35:39
Option ==>> _____ scroll ==>> CSR_
-----
Creator: TWDEB          Profile: DEMO          User: TWDEB
-----
Description . . . . .
Share Option . . . . . U (U - Update, V - View, N - No)
-----
Stand Alone . . . . . N (Y - Yes, N - No)
Statistics Scope . . . . B (B - Basic, P - Profile, C - Profile consistency)
Sampling Rate . . . . . ____ (1-100, Blank)
Sampling Threshold . . . . ____ (Integer, Blank)
Number of Changes . . . . ____ (Integer, Blank)
Number of Mass Deletes . . . ____ (Integer, Blank)
Percent Changes . . . . 20 ____ (0.0 - 100.0, Blank)
Update Inconsistency Thresholds N (Y - Yes, N - No)
-----
Restrict Tablespace DBNAME LIKE %NMHAQA23 >
Test Restrict Tablespace N (Y - Yes, N - No)

```

Figure 1 Creating a statistics monitoring profile

With this definition, alerts are written to the SYSIBM.SYSAUTOALERTS table only if the table spaces in the database NMHAQA23 have had insert, update or delete activity that changed more than 20% of their pages since the last time RUNSTATS was collected.

The Stand Alone field allows you to control whether a RUNSTATS utility is executed as a result of alerts generated by this statistic monitoring profile. If you specify Stand Alone = N (the default):

- The specified objects are evaluated for outdated statistics.
- If outdated statistics are discovered, an alert is written to SYSAUTOALERTS.
- If an alert is written, a RUNSTATS utility is executed for the alert during an appropriate maintenance window.

If you specify Stand Alone Y, the objects are evaluated and an alert is written. However, the alert does not call the RUNSTATS utility; therefore, RUNSTATS is not executed. This might be useful if you simply want to see which objects need updated statistics.

Once the statistics monitoring profile has been created, you can either execute it immediately using the X line command, or schedule it to be executed via the DB2 administrative task scheduler using the S line command.

2.1.2 Define maintenance windows

Use one or more RUNSTATS maintenance windows to define when to update statistics on your objects using the RUNSTATS utility. Maintenance windows can be defined for a single subsystem or can include all of your subsystems. The timeframe is flexible, such as monthly, weekly, or a certain day of the week or month, and specific time ranges down to the second. In addition, you can specify how many concurrent tasks can run at one time. This allows you to schedule an appropriate number of tasks if your site has limits on CPU usage during the maintenance window.

In this example, RUNSTATS can be run on Sunday mornings between 1:00 am and 3:00 am, and 15 tasks can be run concurrently during that time period.

```
AUTOTOOL V4R1 ----- Runstats Maintenance window ----- 2012/03/06 15:27:16
Option ==> Scroll ==> CSR
-----
Line Commands: C - Create D - Delete R - Repeat S - Schedule Runstats
               U - Update
-----
DB2 Subsystem: DA1A Row 1 of 2
-----
Update Runstats Execution window
-----
window ID . . . 1170
DB2 Subsystem . . . (SSID, blank)
Month or week . . . W (M - Month, W - week)
Month . . . . . (1-12, blank)
Day . . . . . 7 (1-31, blank)
Time From . . . 01:00:00 (HH:MM:SS)
Time To . . . . 03:00:00 (HH:MM:SS)
Action . . . . . RUNSTATS
Max Tasks . . . 15 (Integer)
```

Figure 2 Defining a maintenance window

2.1.3 You're done.

Once statistics monitoring profiles and maintenance windows have been created, autonomic statistics takes over. DB2 Automation Tool passes the criteria and the objects to the DB2 stored procedure (ADMIN_UTIL_MONITOR) to find objects that match the defined criteria.

- The statistics monitoring profile is executed, either immediately or via the DB2 administrative task scheduler.
- If statistics are deemed to be out of date and need to be collected, an alert is written to the alerts table.
- When a maintenance window timeframe begins, RUNSTATS is run for each alert in the alerts table that requires a RUNSTATS.

2.2 Reviewing alert activity and results

During the maintenance window, alerts are written to the SYSIBM.SYSAUTOALERTS table. A row is written for each alert. You can use DB2 Automation Tool's ISPF interface to view the alerts and the status of the alerts. The figure below shows a sample set of alerts triggered by statistics monitoring profiles:


```

AUTOTOOL V4R1 ----- Statistics Alerts ----- 2012/03/20 16:58:20
Option ==> Scroll ==> CSR
-----
Line Commands: O - Output P - oPTIONS
-----
Target Qualifier *
Target Object *
Alert Status A (A - All, C - Completed, DB2 Subsystem: DA1A
                I - Inprogress, O - Open) Row 1 of 714 +>
-----
Cmd  Alert ID  History ID  Target Qualifier  Target Object  Target Part
---  -
72525 1398      NMHAQA23      TSQA2301        0
72531 1423      NMHAQA23      TSQA2301        0
72541 1441      NMHAQA23      TSQA2301        0
72542 1445      NMHAQA23      TSQA2301        0
72543 1449      NMHAQA23      TSQA2301        0
72544 1452      NMHAQA23      TSQA2301        0
72545 1455      NMHAQA23      TSQA2301        0
72546 1457      NMHAQA23      TSQA2301        0
72547 1462      NMHAQA23      TSQA2301        0
72548 1466      NMHAQA23      TSQA2301        0
72549 1469      NMHAQA23      TSQA2301        0
72550 1472      NMHAQA23      TSQA2301        0
72551 1477      NMHAQA23      TSQA2301        0
72552 1492      NMHAQA23      TSQA2301        0
72561 1506      NMHAQA23      TSQA2301        0
72562 1510      NMHAQA23      TSQA2301        0
72563 1513      NMHAQA23      TSQA2301        0
72564 1516      NMHAQA23      TSQA2301        0
72565 1518      NMHAQA23      TSQA2301        0

```

Figure 3 Panel showing alert activity written to SYSIBM.SYSAUTOALERTS

These results can be filtered by using the Alert Status field. You can customize the list by whether an alert has been completed and RUNSTATS has been run (C); whether the RUNSTATS is in progress (I), or whether the alert is still open and RUNSTATS has yet to be run (O).

Completed alerts are not removed from the SYSAUTOALERTS table, so you can review the output from the statistics collection stored procedures. The following figure shows the output when a completed alert is selected with the O line command from the Statistics Alerts panel:

```

AUTOTOOL V4R1 ----- Auto Alerts Execution Output ----- 2012/03/21 17:32:33
Option ==> Row 1 of 51 Scroll ==> CSR
-----
Error Messages
-----
No Error Messages

Stored Procedure Output

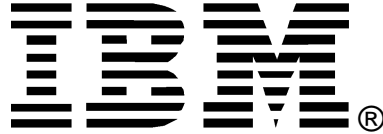
2012-03-18 01:01:15.072845> 1DSNU000I 078 01:01:12.43 DSNUGUTC - OUTPUT STAR
T FOR UTILITY, UTILID = X71X094D01000001
2012-03-18 01:01:15.072863> DSNU1045I 078 01:01:12.55 DSNUGTIS - PROCESSING
SYSIN AS UNICODE UTF-8
2012-03-18 01:01:15.072873> ODSNU050I 078 01:01:12.59 DSNUGUTC - RUNSTATS T
ABLESPACE "NMHAQA23"."TSQA2301" TABLE("HAAQA"."TB23
0101") USE
PROFILE
2012-03-18 01:01:15.072906> DSNU1361I !DA1A 078 01:01:13.02 DSNUGPRF - THE STA
TS PROFILE WITH STATSTIME = 0000-00-00-00.00.00.000
000 FOR TABLE
TB230101 HAS BEEN USED
2012-03-18 01:01:15.072926> DSNU1368I 078 01:01:13.03 DSNUGPRB - PARSING STA
TS PROFILE FOR TABLE TB230101
2012-03-18 01:01:15.072935> DSNU1369I 078 01:01:13.03 DSNUGPRB - PARSING STA
TS PROFILE FOR TABLE TB230101 COMPLETED
2012-03-18 01:01:15.072954> DSNU042I 078 01:01:13.91 DSNUGLSR - SORT PHASE
STATISTICS -
2012-03-18 01:01:15.072967> NUMBER OF RECORDS=20
2012-03-18 01:01:15.072978> ELAPSED TIME=00:00:00

```

Figure 4 Output from alert execution can be viewed using line commands

3 Statistics maintenance really can be painless

Keeping DB2 applications running efficiently in today's high availability environments, maximizing shrinking operational budgets, and balancing your IT staff's workload is a juggling act. With more DB2 data being stored than ever before, but less time and staff to perform database maintenance, you should look to autonomic statistics collection as a simple solution to the challenge of doing more with less. DB2 Automation Tool V4.1's autonomic statistics interface makes statistics maintenance easy to use – just set it up and forget it. Let DB2 Automation Tool reduce the workload in your maintenance windows by moving RUNSTATS to the DB2 autonomic statistics stored procedures.



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