# **IBM System z Technology Summit**



# How to Streamline Your DB2 for z/OS Utility Processing





# Topics

Trends in Database/Utility Management

# IBM's Investment in Utility Management

- New Products
- New Features
- Day 1 support for new releases of DB2 for z/OS
- Combined technology of products

# •Utilities Discussed in Detail

- DB2 10 REORG Support

# Detailed Examples

- Avoid REORGs Using the DB2 10 for z/OS Automation Tool Exceptions
- New DB2 Utilities Enhancement Tool Utility Syntax Monitor feature
- DB2 10 for z/OS Online REORG of LOBs Using DB2 Automation Tool

# Questions





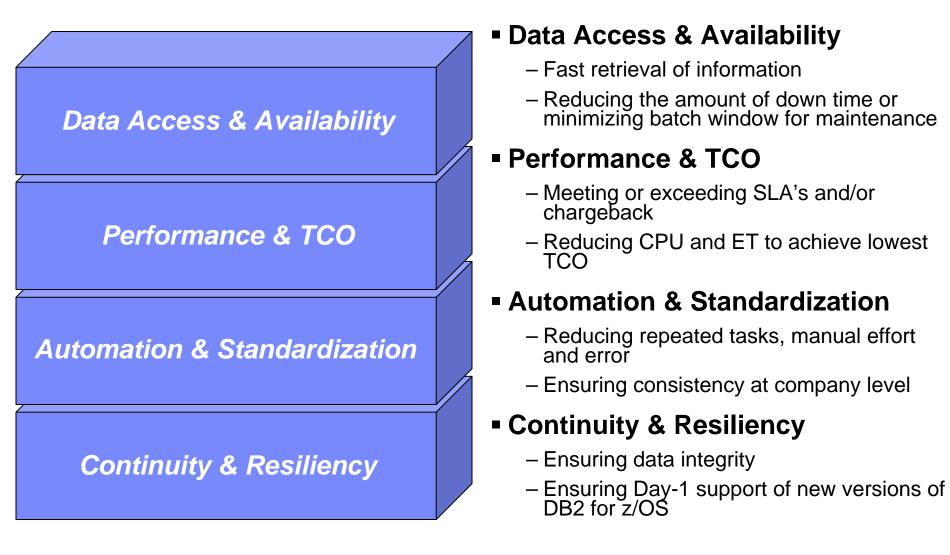
## Trends in Database/Utility Management

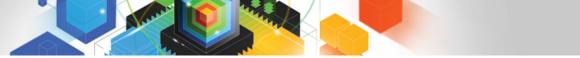
- Data growth puts pressure on IT infrastructure, SLAs, staff, and performance
- According to IDC, the amount of data is exploding. Structured data is growing 32% per year, unstructured data is growing 63% and replicated data is growing 49%. Companies are compelled to take the right steps to protect their valuable data and maintain high database availability
  - Average data growth per year is approximately 30%
  - Large critical application data growth rate is > 50%
- In the last 10 years the number of objects needing performance management has increased:
  - The number of objects that need management has increased 3X
  - the number of objects per DBA has increased 4X
- Focus on reducing CPU and elapsed time
- Running multiple databases on a server has become the norm
- 90% of customers have more than one DBMS → Resource/skill issues, consistent administration efforts, increased cost in administration, greater need to automate routine operations





### **IBM Investment Areas for Managing Utilities**







How is the investment realized by IBM in the Utility Management space?

- New Products that take advantage of existing investment to provide options for those customers with special needs
  - -Ex: DB2 Sort for z/OS
- New features in existing products that address pain points for customers
  - -Ex: Utility Syntax Monitor in DB2 Utilities Enhancement Tool
- Day 1 support for new releases of DB2 for z/OS
  - -Ex: DB2 10 for z/OS
- Combining strengths of existing products to take advantage of new features
  - -Ex: REORG enhancements with Automation Tool
  - -Ex: LOAD Presort with DB2 Utilities Enhancement Tool and DB2 Sort





# DB2 Sort for z/OS v1.1 – GA September 24th, 2010

- DB2 Sort provides high speed utility sort processing for data stored in DB2 for z/OS. It improves sort performance while optimizing overall system efficiency by exploiting the advanced facilities of the z/OS operating system and System z.
- DB2 Sort leverages the strengths of the System z platform, DB2 for z/OS and the DB2 Utilities Suite to drive:
  - Significant savings in elapsed time and CPU during utility sort processing, especially LOAD, REORG and RUNSTATS
  - Relief from application constraints of large volumes of data in highly-transactional workloads performing numerous insert, update and delete operations against DB2 for z/OS databases
  - Continued commitment from IBM to deliver DB2 solutions to provide the highest level of ROI
- DB2 Sort provides an alternative, high performance sort engine that can be utilized by the DB2 Utilities

# Performance

- Customers using DB2 Sort V1.1\* may see:
  - Up to 30% in reduction of elapsed time
  - Up to 50% reduction of CPU
  - Up to 30% zIIP offload of remaining CPU
- IBM DB2 Utilities where you'll see performance benefits
  - LOAD, REORG, RUNSTATS, REBUILD INDEX, CHECK INDEX and CHECK DATA
- Workloads where there is more likely to be a benefit from utility sort processing and DB2 Sort V1.1, such as:
  - Highly-transactional workloads performing lots of insert, update, delete operations requiring RUNSTATS and REORG
  - Applications such as data warehousing applications that are performing frequent or large volumes of loading data requiring LOAD and REBUILD INDEX

\*Customer results may vary. Results based on analysis done at SVL lab







# Benefits of DB2 Sort v1.1

# Will provide relief if you

- Have large amounts of data
- Have utility batch window constraints



- Have to execute utility maintenance during peak business hours that may affect elapsed time and/or CPU
- Have Sort Capacity Exceeded problems running utilities
- Have purchased utilities from ISVs, requiring
  - Paying for multiple sets of utilities
  - Managing multiple sets of utilities
- Once installed and enabled, is used by all utility sorting
- Requires no changes to utility jobs
- Improves/reduces resource consumption for single and parallel sorts
- Can result in higher degree of utility parallelism
- Gives greater resilience with respect to inaccurate sort estimates





# Monitoring Utility Syntax

### DB2 Utilities Enhancement Tool provides new Utility Syntax Monitor

- Can establish and enforce company-wide utility syntax practices
- IT staff can control who executes which IBM DB2 utilities with what parameters on which objects
- -Can also purposely fail utility if rules are violated
- -Supports DB2 V8, DB2 9 and DB2 10 Utility Syntax

### Delivered via PTF

-UK60173 for all versions of DB2 for z/OS





# Support for DB2 10 for z/OS and More!

- All DB2 Utilities and Utility Management tools provided Day 1 DB2 10 for z/OS support
  - -DB2 Utilities Suite
  - -High Performance Unload for DB2
  - DB2 Automation Tool
  - -DB2 Sort
  - DB2 Utilities Enhancement Tool



- Example: DB2 10 support of FlashCopy support in COPY, RECOVER, REORG, LOAD and REBUILD INDEX
  - -Ex: Can now run COPY utility online, create an image copy data set to be transaction-consistent image copy data set w/ NO application outage!
    - Keeps DB2 applications available and reduces CPU



# Did you know?

### Hash support in DB2 10 enhanced by support in Utilities/Utility Management Tool

- -REORG immediately after table converted to/out of hash format
- Maximizing DB2 Sort and DB2 Utilities Enhancement Tool (UET) by using PRESORT option in LOAD utility (via APAR PM22685)
  - Ability to presort data based on hash key
  - Results in much faster LOAD using fewer system resources
  - Improves application availability

# REORG Force Option and DB2 UET

- DB2 UET can add parameter to your utility via the Utility Syntax Monitor to ensure that online REORGs are always run with Force Option
- Enhances online REORG use to increase application availability
- Many customers avoided using online REORG because they could not obtain the necessary drain to process writers in a timely manner. This enhancement in the REORG utility allows the cancellation of the writer just before the switch phase.

# **DB2 10 for z/OS Utilities**









# DB2 10 for z/OS Utility Support

# Topics for discussion

# •Utility support of core DB2 10 for z/OS function:

- -Catalog restructuring
- -Online schema
- Inline LOBs

-Hash access

### REORG - - Lots of new enhancements!

### ALSO significant enhancements (not discussed today)

- -LOAD/UNLOAD
- -COPY
- -RECOVER
- -RUNSTATS
- -CHECK





# Catalog restructuring

- Reduce contention for DDL/BIND/PREPARE
- Eliminate 64Gb limit on SPT01
- Eliminate hash chains & contention on DBD01 hash anchors
- Performed by REORG during ENFM
- Enables REORG SHRLEVEL CHANGE for complete catalog & directory
- Enables row level locking for further concurrency





# Online Schema

### • V9:

- Change of table or index space attributes can require an outage
  - Unload data
  - Drop table space
  - Recreate table space, tables, indexes, views
  - Re-establish authorization & RI
  - Reload data
  - Undo of changes requires same process

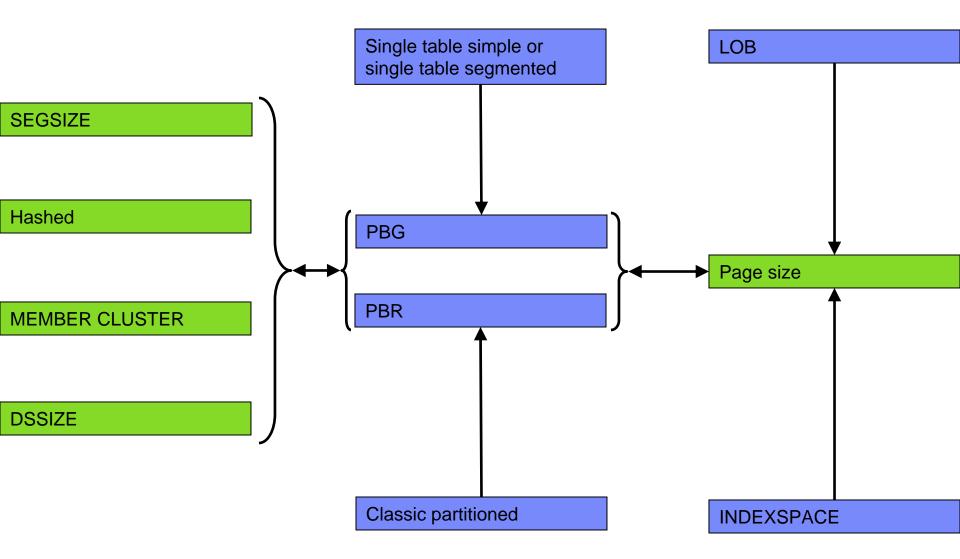
# • V10:

- Execute ALTER statement
- Changes are cached and materialized on next table/index space-level REORG
  - SHRLEVEL REFERENCE or CHANGE
  - LOAD REPLACE will not materialize
- Pending changes can be dropped
- Some restrictions exist
  - Mixing DDL
  - PIT recovery





# Online Schema – V10







# Inline LOBs

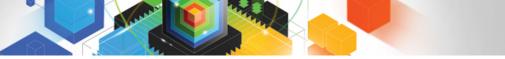
- Inline whole or portion of LOB with base row
- Improved performance for small LOBs
- Enables compression for inlined LOB data

# Immediate ALTER

- -ALTER to increase size of inline portion sets AREO\*
- -ALTER to decrease size of inline portion sets REORP

### Requires REORG to inline existing LOB data

- -SHRLEVEL REFERENCE supported today
- Expect delivery of SHRLEVEL CHANGE via maintenance stream early 2011





REORG – improved availability & removed restrictions

# Reduced need for REORG INDEX

- List prefetch of index leaf pages based on non-leaf information for range scans

- Improved performance for part-level REORG with NPIs & REORG INDEX
  - Index list prefetch results in up to 60% elapsed time reduction
- Reduced need for REORG with compress on insert
- New REORGCLUSTERSENS RTS column
  - If no clustering-sensitive queries then avoid REORG to restore clustering
  - DSNACCOX enhanced
- REORG SHRLEVEL CHANGE for all cat/dir page sets
- REORG SHRLEVEL REFERENCE|CHANGE to remove REORP





REORG – improved availability & removed restrictions

# REORG SHRLEVEL CHANGE for LOBs

- Independent of whether LOBs are LOG NO or LOG YES
- No mapping table required
- Base table space must be LOGGED

# REORG FORCE option to cancel blocking threads

- FORCE ALL or just READERS
- Same process as –CANCEL THREAD so requires thread to be active in DB2 for it to be cancelled
- Threads cancelled on final drain

### Reduced application outage for REORG with inline stats

- Update catalog after dedrain

### REORG support for multiple part ranges

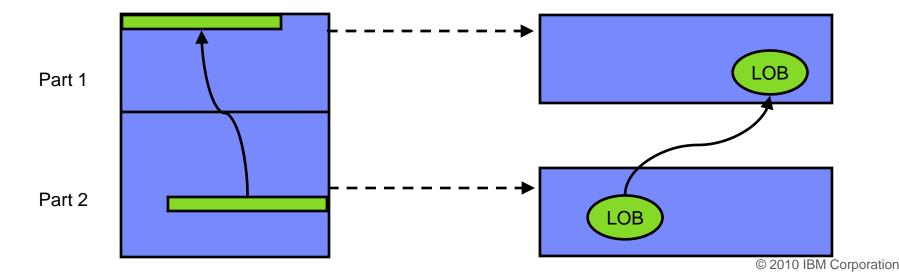
- REORG support retrofitted to V9 in PK87762
  - LISTDEF support is not retrofitted



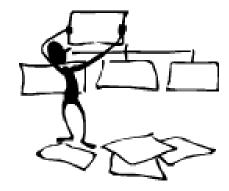


### REORG – improved availability & removed restrictions

- New AUX keyword on REORG of partitioned base for improved LOB handling
  - Permit rows to flow between partitions
  - Allows REORG REBALANCE with LOB columns
  - Allows ALTER of LIMITKEY with LOB columns
  - Permits move of rows between parts on PBG REORG
  - Permits deletion of corresponding LOBs on REORG DISCARD
  - Default is AUX NO unless LOB objects required to complete REORG
  - No XML column support for classic partitioned or PBR
  - No mapping table change







#### **DB2** Automation Tool for z/OS

# **REORG AVOIDANCE WITH DB2 10 for z/OS EXCEPTIONS**





### Avoid REORGs with DB2 10 for z/OS Automation Tool Exceptions

# The best REORG is one you don't have to run!

# Only REORG what needs it

- –Which applications' performance are being impacted?
- –What is the cause of frequent REORGs?

### Re-evaluate thresholds used to determine when REORGs are done

 New Exceptions within DB2 Automation Tool assist DBAs in evaluation process

### Re-evaluate design of database objects

- -Is your index efficient, and is it being used?
- –Would a hash table be better than an IX?





# **RUNSTATS versus REALTIME STATS**

### RUNSTATS was used for two things:

- -To update information for the optimizer
- -To update the DBA on the status of an object
- REALTIMESTATS helps you instantly know the status of an object, eliminating the need to run RUNSTATS
- REALTIMESTATS Exceptions in DB2 Automation Tool include:

- DAYS\_SINCE\_HASH
- DATAISMORETHANHASH
- UNCLUST\_INS
- UNCLUST\_INS\_PCT

- CLUSTERSENS
- HASHACCESS
- SCANACCESS
- INDEXACCESS





# Exception Options to Determine a REORG

### DAYS\_SINCE\_HASH

 Number of days since hash access was used for SELECT|FETCH|UPDATE|DELETE or used to enforce RI constraints.

#### DATAISMORETHANHASH

 Trigger Exception if the DATASIZE is larger than the HASHSPACE for a HASH Organized TS.

#### UNCLUST\_INS

 The number of inserted records since the last REORG or LOAD REPLACE that were placed more than 16 pages from the ideal candidate page with respect to the clustering IX.

### • UNCLUST\_INS\_PCT

 Percentage of Inserted rows placed > 16 pages away from the ideal candidate page with respect to the clustering IX.



# Exception Options to Determine a REORG

#### CLUSTERSENS

 The number of times data has been read by SQL statements sensitive to the clustering sequence of the data since the last REORG or LOAD REPLACE.

#### HASHACCESS

 Number of times data was accessed using hash access since the last CREATE, LOAD REPLACE or REORG.

#### SCANACCESS

 Number of times data was accessed using a TS scan for SELECT, FETCH, searched UPDATE, searched DELETE or used to enforce RI constraints since the last CREATE, LOAD REPLACE or REORG.

#### INDEXACCESS

 The number of times the index was used for SELECT, FETCH, searched UPDATE, searched DELETE, or used to enforce RI constraints.





	00L V:		(	Jpdate Jobs	Brofile Di	splay		16:10:39 ===> CSR
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_	OBJS	1	REORG	AVOIDANCE	OBJS	CSJENN	CSJENN	
	UTIL	1	REORG	AVOIDANCE	UTIL	CSJENN	CSJENN	
	EXCP	1	REORG	AVOIDANCE	EXCP	CSJENN	CSJENN	
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AUTOTOOL V3R1 ----- Update Object Profile Display -----2010/11/19 16:15:05 Option ===> Scroll ===> CSR Commands: Explode - View all objects. End - Return to previous screen. Line Commands: A - Add D - Delete E - Explode U - Update R - Repeat Creator: CSJENN Profile: REORG AVOIDANCE OBJS User: CSJENN Description: \_ Share Option: U (U - Update, V - View, N - No) Row 1 of 2 > Volume / Wild ---- Process --- Inc/ IX DB Name/ IX Crtr/ IX Name/ <u>Cmd Type Card IX RI Clone Util Exc</u> <u>IS Crtr</u> <u>DB Name</u> <u>TS Name</u> TS ABP\* Y. INC \* TS Y INC AU0\* \*\*\*\*\*\*\*\*\* Bottom of Data \*\*\*\*\*\*\*\*\*\*\*\*\*\*\* \*\*\*\*\*





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	JESYSMSG HAAERROR EXCEPTNS	JES2 HAA@BULD HAA@BULD		4 CSJEN 103 CSJEN 105 CSJEN	N 8 LOCAL N 8 LOCAL	192 354 14	12,689 1 38,526 1 860 1
5		HAA@BULD HAA@BULD HAA@BULD		107 CSJEN 110 CSJEN 111 CSJEN	N 8 LOCAL	163 4 42	9,747 1 103 1 3,918 1



#### TBM

Display Eilter View Print Options Search Help
SDSF OUTPUT DISPLAY RTSBATCH J0601323 DSID 107 LINE 0 COLUMNS 02- 133 COMMAND INPUT ===> SCROLL ===> CSR
1IBM Shared Profile Support Print Exception Triggers V03.10 Run Date 2010/11/19 Run Time 16:31:53
26 Triggers created
Statistics Type Column Type- CondException Value REALTIME REORG TS CLUSTERSENS BGINT > 500
DBNAME TSNAME TRIGGER Column TRIGGER Index TBOWNER- IXCRTR PART#TRIGGER Value- AUOVRDB AUOCOPY 0 356030
Statistics Type Column Type- CondException Value REALTIME REORG TS SCANACCESS BGINT > 1000
DBNAME TSNAME TRIGGER Column TRIGGER Index TBOWNER- IXCRTR PART#TRIGGER Value- AUOVRDB AUOCOPY 0 368810
Statistics Type Column Type- CondException Value REALTIME REORG TS CLUSTERSENS BGINT > 500
DBNAME TSNAME TRIGGER Column TRIGGER Index TBOWNER- IXCRTR PART#TRIGGER Value- AUOVRDB AUODBASE 0 3069275
Statistics Type Column Type- CondException Value REALTIME REORG TS SCANACCESS BGINT > 1000
DBNAME TSNAME TRIGGER Column TRIGGER Index TBOWNER- IXCRTR PART#TRIGGER Value- AUOVRDB AUODBASE 0 4792985
Statistics Type Column Type- CondException Value REALTIME REORG TS CLUSTERSENS BOINT > 500
DBNAME TSNAME TRIGGER Column TRIGGER Index TBOWNER- IXCRTR PART#TRIGGER Value- AUOVRDB AUOGPAUT 0 895
Statistics Type Column Type- CondException Value REALTIME REORG TS SCANACCESS BGINT > 1000
DBNAME TSNAME TRIGGER Column TRIGGER Index TBOWNER- IXCRTR PART#TRIGGER Value- AUOVRDB AUOGPAUT 0 35993





<u>D</u>isplay <u>F</u>ilter <u>V</u>iew <u>P</u>rint <u>Options</u> <u>S</u>earch <u>H</u>elp SDSF OUTPUT DISPLAY RTSBATCH J0601323 DSID 107 LINE 0 COLUMNS 02- 133 COMMAND INPUT ===> f in SCROLL ===> 1IBM Shared Profile Support -- Print Exception Triggers -- V03.10 Run Date 2010/11/19 Run Time 16:31:53 26 Triggers created... Statistics Type--- Column------ Type- Cond -----Exception Value------REALTIME REORG TS CLUSTERSENS BGINT > 500 DBNAME-- TSDAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOCOPY 0 356030 Statistics Type--- Column------ Type- Cond -----Exception Value------REALTIME REORG TS SCANACCESS BGINT > 1000 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOCOPY 0 368810 Statistics Type--- Column------ Type- Cond -----Exception Value-----REALTIME REORG TS CLUSTERSENS BGINT > 500 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUODBASE 0 3069275 Statistics Type--- Column------ Type- Cond -----Exception Value------REALTIME REORG TS SCANACCESS BGINT > 1000 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUODBASE 0 4792985 Statistics Type--- Column------ Type- Cond -----Exception Value------REALTIME REORG TS CLUSTERSENS BGINT > 500 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOGPAUT 0 895 Statistics Type--- Column------ Type- Cond -----Exception Value-----REALTIME REORG TS SCANACCESS BGINT > 1000 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOGPAUT 0 35993





Display Filter View Print Options Search Help SDSF OUTPUT DISPLAY RTSBATCH J0601323 DSID 107 LINE NO CHARS 'INDEXACCESS' COMMAND INPUT ===> SCROLL ===> 1IBM Shared Profile Support -- Print Exception Triggers -- 2005.10 Run Date 2010/11/19 Run Time 16:31:53 26 Triggers created... Statistics Type--- Column------ Type- Cond -----Exception Value-----REALTIME REORG TS CLUSTERSENS BGINT > 500 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOCOPY Statistics Type--- Column------ Type- Cond -----Exception Value------REALTIME REORG TS SCANACCESS BGINT > 1000 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOCOPY 0 368810 Statistics Type--- Column------ Type- Cond -----Exception Value------REALTIME REORG TS CLUSTERSENS BGINT > 500 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUODBASE 0 3069275 REALTIME REORG TS SCANACCESS BGINT > 1000 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUODBASE 0 4792985 Statistics Type--- Column------ Type- Cond -----Exception Value-----REALTIME REORG TS CLUSTERSENS BGINT > 500 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index---- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOGPAUT 0 895 Statistics Type--- Column------ Type- Cond -----Exception Value-----REALTIME REORG TS SCANACCESS BGINT > 1000 DBNAME-- TSNAME-- TRIGGER Column---- TRIGGER Index----- TBOWNER- IXCRTR-- PART# -----TRIGGER Value-AUOVRDB AUOGPAUT 0 35993





# Sample object AUOVRDB.AUODBASE needs one of the following:

- -Should the index be changed to be more efficient?
- -Should the index be REORG'd?
- -Should I use a hash table instead?
- Change Exception values and re-build Job Profile
- Select different Exceptions and re-build Job Profile
- Evaluate the objects in TRIGGERS DD in job output to make an intelligent decision on how to avoid REORGs





# Only REORG What Needs It

### Let DB2 Automation Tool intelligently select objects to include in REORG JCL

### •Use DB2 Automation Tool's 180+ Exceptions

- -RTS Exceptions
- -DB2 Catalog Exceptions
- -MVS Catalog Exceptions

Optionally evaluate indexes independently of the tablespace





# DB2 Utilities Enhancement Tool for z/C DB2 Sort for z/OS

Using the Utility Syntax Monitor



# DB2 Utilities Enhancement Tool – New! Utility Monitor

- New with UK60173: Changes utility syntax at run-time based on Policy rules
- Passively enforce company IT policies
- Enables users to:
  - -ADD parameters that are not present in the utility syntax
  - -REMOVE parameters that are present and should not be
  - -SUBSTITUTE given parameters with different parameters
  - -FAIL the utility based on object name, or user ID
- Each action is logged or JOURNALED in UET's tables for future reference
  - -Audit who is doing what
  - -See what syntax was originally specified
  - -See what the original syntax was changed to





# **DB2 Utilities Enhancement Tool**

- New Policy Rules used to change utility syntax
- Optionally monitor utility syntax and/or cancel threads with the same Policy rules
  - -Default action is to cancel active threads
  - -Monitor utility syntax with specific Policy parameters

### Example: Add UET's PRESORT parameter to a LOAD utility and use DB2 Sort

- -Utility Monitor will ADD parameter PRESORT to LOAD syntax
- Use DB2 Sort to sort SYSREC data prior to LOAD utility running
- -Improves elapsed time, and reduces CPU consumption





# **Utility Monitor Policy Rules**

<u> </u>
VIEW CSJENN.ABP1074.SAMPLIB(ABPDB2AP) - 01.11 Columns 00001 00072
Command ===> Scroll ===> <u>CSR</u>
Command ===>
000025 <dsnutilb_intercept></dsnutilb_intercept>
000026 <practice name="LOAD_RULE"></practice>
000027 <utility 7<="" name="LOAD" td=""></utility>
000028 (MONITOR)
000029 (SYNTAX ADD="PRESORT" JOURNAL="YES"/>
000030
000031
000032
000033 000034 <policy></policy>
000035 <pre>CPUTCTP 000035 <pre>CPUTCTP 000035 </pre>CPUTCTP CONTENTS OF CONTENTS OF CONTE</pre>
000036
000037 (INCLUDE)
000038 <rvle utility_command="LOAD"></rvle>
000040
000041
000042 <db2system ssid="DA1A"></db2system>
000043 <exclude></exclude>
000044 <rule tablespace="DB1543%.%"></rule>
000045
000046
000047
000048
000050





# Original Utility Syntax

<u>F</u> ile <u>E</u> dit E <u>d</u> it_Settings <u>M</u> enu <u>U</u> tilities <u>C</u> ompilers <u>T</u> est <u>H</u> elp
EDIT CSJENN.ABP1074.TESTLIB(TC610L8) - 01.03 Columns 00001 00072
Command ===> Scroll ===> <u>CSR</u>
000184 // DD DISP=SHR, DSN=VENDOR. DB2SORT. V110. SCNKLPA
000185 // DD DISP=SHR, DSN=VENDOR. DB2SORT. V110. SCNKLINK
000186 // DD DISP=SHR, DSN=DSN.VA10.SDSNLOAD
000187 //SYSPRINT DD SYSOUT=*
000188 //UTPRINT DD SYSOUT=*
000190 //SYSREC DD DSN=CSJENN.DA1A.JENDBL1.ABPTS2.SYSREC, 000191 // DISP=SHR
000191 // DISP=SHR
000192 //* 000193 //SYSMAP DD DISP=(NEW,DELETE,DELETE),UNIT=SYSDA,
000194 // SPACE=(CYL, (10, 10))
000195 //SYSUT1 DD DISP=(NEW,DELETE,DELETE),UNIT=SYSDA,
000196 // SPACE=(CYL, (10, 10))
000197 //SORTOUT DD DISP=(NEW,DELETE,DELETE),UNIT=SYSDA,
000198 // SPACE=(CYL, (10, 10))
000199 //*
000200 //SYSIN DD *
000201 LOAD DATA INDDN SYSREC LOG NO SHRLEVEL NONE RESUME YES
000202 INTO TABLE "JNABP610". "ABPTB1"
000203 ( "NAME"
000204 POSITION( 00004:00023) CHAR(00020)
000205 , "CABLE"
000206 POSITION( 00025:00044) CHAR(00020)
000207 , "STATE"
000208 POSITION( 00046:00065) CHAR(00020)
000209 )
000210 //*



# **PRESORT** Added to Utility Syntax

<u>D</u> isplay <u>F</u> ilter <u>V</u> iew <u>P</u> rint <u>O</u> ptions <u>S</u> earch <u>H</u> elp
SDSF OUTPUT DISPLAY JENLAB2J0634945DSID135LINE11COLUMNS27-106COMMAND INPUT ===>CSRSCROLL ===>CSRUtility execution started.Step=1Original DSNUTILB syntax follows:COLUMNSCSRCSRLOAD DATA INDDNSYSREC LOG NOSHRLEVEL NONE RESUME YES INTO TABLE "JNABP610".CSR
"ARPTR1" ( "NAME" POSITION( 00004:00023) CHAR(00020)
00044) CHAR(00020), "STATE" POSITION( 00046:00065) CHAR(00020)) PRESORT End of original DSNUTILB syntax listing. 73 DSNUGUTC - OUTPUT START FOR UTILITY, UTILID = LOAD.ABPTB1 80 DSNUGTIS - PROCESSING SYSIN AS EBCDIC 81 DSNUGUTC - LOAD DATA LOG NO SHRLEVEL NONE RESUME YES :40.81 DSNURWI - INTO TABLE "JNABP610"."ABPTB1"
:40.81 DENURUL - ('NAME' POSITION(4:28) CHAR(20),
:40.81 DSNURWI - "CABLE" POSITION(25:44) CHAR(20), :40.81 DSNURWI - "STATE" POSITION(46:65) CHAR(20)) INDDN ABPREC SORTKEYS 18 95 DSNURPIB - NUMBER OF OPTIMAL SORT TASKS = 2, NUMBER OF ACTIVE SORT TASKS = 2 95 DSNURPIB - INDEXES WILL BE BUILT IN PARALLEL, NUMBER OF TASKS = 4 :41.04 DSNURWT - (RE)LOAD PHASE STATISTICS - NUMBER OF RECORDS=9 FOR TABLE JNABP :41.04 DSNURWT - (RE)LOAD PHASE STATISTICS - TOTAL NUMBER OF RECORDS LOADED=9 FO
04 DSNURILD - (RE)LOAD PHASE STATISTICS - NUMBER OF INPUT RECORDS PROCESSED=9 04 DSNURILD - (RE)LOAD PHASE COMPLETE, ELAPSED TIME=00:00:00 :41.17 DSNURBXA - SORTBLD PHASE STATISTICS - NUMBER OF KEYS=9 FOR INDEX JNABP610 :41.17 DSNURBXA - SORTBLD PHASE STATISTICS - NUMBER OF KEYS=9 FOR INDEX JNABP610 18 DSNURPTB - SORTBLD PHASE STATISTICS. NUMBER OF INDEXES = 2 18 DSNURPTB - SORTBLD PHASE COMPLETE, ELAPSED TIME = 00:00:00 :41.18 DSNUGSRX - TABLESPACE JENDBL1.ABPTS2 IS IN COPY PENDING :41.18 DSNUGSRX - INDEX JNABP610.ABPTB1IX1 IS IN INFORMATIONAL COPY PENDING STAT





## DB2 Sort for z/OS Used to Sort Data

<u>D</u> isplay <u>F</u> ilter <u>V</u> iew <u>P</u> rint <u>O</u> ptions <u>S</u> earch <u>H</u> elp
SDSF OUTPUT DISPLAY JENLAB2 J0634945 DSID 130 LINE 0 COLUMNS 02- 81
COMMAND INPUT ===> SCROLL ===> CSR ************************************
DB2 SORT FOR Z/OS V1.1.0.0N PRODUCT ID: 5655-W42 z/OS 1.12.0 DAT
COPYRIGHT IBM CORP. 2010 ALL RIGHTS RESERVED COPYRIGHT SYNCSORT INCORPORATED 2
PARMLIST :
SORT_FIELDS=(5,00022,BI,A),FILSZ=E0000000000
RECORD TYPE=V, LENGTH=(32756,32756,32756,00026,00082)
OPTION MSGDDN=ABPSORT,SORTDD=ABPS,DYNALLOC CNK4361 JNEOUAL MAINTENANCE APPLIED TO GLOBAL DSM AND SYNCSOPT LIBRADIES
CNK4931 ZIIP PROCESSOR USED
CNK055I INSERT 9. DELETE 9
CNK2461 FILESIZE 855 BYTES
CNK072I EQUALS, BALANCE IN EFFECT
CNK052I END DB2 SORT FOR Z/OS - JENLAB2, LOADCBL, , DIAG=CA01, C0D6, E237, 286E, 930
**************************************
**************************************





# LOAD Syntax PRESORT Performance Example

- 1,000 Partition Tablespace
- 10,000 rows of data
- Single SYSREC
- One Reader Task

When using UET's PRESORT parameter and DB2 Sort:

45% Elapsed Time Savings 76% CPU Savings

Partitions	Rows per Part	Elapsed Time	Total CPU	
1,000	10,000	09:41.70	01:07.80	Data in key order without UET
1,000	10,000	20:22.96	06:44.30	Data in random order without UET
1,000	10,000	11:11.08	01:35.17	Data in random order with UET PRESORT





# The Utility Monitor and DB2 Sort

#### New with DB2 Utilities Enhancement Tool's PTF UK60173:

 Utility Monitor changes utility syntax at run-time based on Policy rules

#### Passively enforce company IT policies

- -ADD parameters that are not present in the utility syntax
- -REMOVE parameters that are present and should not be
- -SUBSTITUTE given parameters with different parameters

-FAIL the utility based on object name, or user ID

 DB2 Sort is fully supported in the DB2 Utilities Enhancement Tool





#### DB2 Automation Tool for z/OS v3.1

# Managing complexity made easy – LOBs and REORG





# REORG LOBs Online with DB2 Automation Tool

- What a great convenience!
- Reduce application downtime by reorganizing LOBs online
- Wildcard object names in Object Profiles without the worry of inadvertently including LOB objects
  - -No longer exclude specific LOB objects from Object Profile
  - No longer exclude LOBs using Exceptions Profile to exclude them
- Can REORG SHRLEVEL CHANGE LOB table space:
  - -Independent of whether LOBs are LOG NO or LOG YES
  - -No mapping table required
  - -Base table space must be LOGGED





AUTOTOOL V3R1 Update Option ===>	Object Profile Dis	play 2010/11/19 17:38:07 Scroll ===> CSR
Line Commands: A - Add D - D Creator: CSJENN Profile Description:	elete È - Explode : REORG LOBS	User: CSJENN
Share Option: U (V - Update,	V – View, N – N	lo) Row 1 of 6 →
Wild Process <u>Cmd Type Card IX RI Clone Uti</u> _ TS Y N N N N _ TS N N N N N ****************************	L Exc IS Crtr INC * INC CSKUAN INC CSKUAN INC CSKUAN INC CSKUAN INC CSKUAN INC CSKUAN	Volume / IX Crtr/ IX Name/ <u>DB Name IS Name</u> DBAU* * NMHAQA03 TSQA0301 NMHAQA04 TSQA0401 NMHAQA05 TSQA0501 NMHAQA06 TSQA0601 NMHAQA06 TSQA0602 ***********





AUTOTOOL	V3R1	Utility	Profile	<b>Options</b>	2010/11/19	17:37:11
Option	= = = >					

Commands: END - Return to the previous screen. Creator: CSJENN Profile: REORG LOBS User: CSJENN Description:
Share Option: U (U - Update, V - View, N - No)
Include in ProfileView Utility Options-
Data Page Verification Reporting => N (Y - Yes, N - No) => N (Y - Yes, N - No)
Reallocation => <u>N</u> (Y - Yes, N - No) => <u>N</u> (Y - Yes, N - No)
Recover
Image Copy => <u>N</u> (Y - Yes, N - No) => <u>N</u> (Y - Yes, N - No)
Recovery Expert Image Copy N (Y - Yes, N - No) N (Y - Yes, N - No)
Copy to Copy => <u>N</u> (Y - Yes, N - No) => <u>N</u> (Y - Yes, N - No)
Runstats
TS Reorg => Y (Y - Yes, N - No) => y (Y - Yes, N - No)
IX Reorg Y N (Y - Yes, N - No) => N (Y - Yes, N - No)
Quiesce => <u>N</u> (Y - Yes, N - No) => <u>N</u> (Y - Yes, N - No)
Modify Yes, N - No) => <u>N</u> (Y - Yes, N - No)
Repair => <u>N</u> (Y - Yes, N - No) => <u>N</u> (Y - Yes, N - No)
Rebind





AUTOTOOL V3R1 Reorg Utility Profile Options 2010/11/19 17:53:17 Option ===>
Commands END - Return to the previous screen. Creator: CSJENN Name: REORG LOBS User: CSJENN
More: +
Include
Online reorg ==> Y (Y - Yes, N - No) ==> N (Y - Yes, N - No
Copy options ==> <u>N</u> (Y - Yes, N - No) ==> <u>N</u> (Y - Yes, N - No
Statistics options ==> N (Y - Yes, N - No) ==> N (Y - Yes, N - No
Discard ==> N (Y - Yes, N - No) ==> N (Y - Yes, N - No
Update DSN options ==> <u>N</u> (Y - Yes, N - No
Nopad ==> <u>N</u> (Y - Yes, N - No)
Exception Rule ==> A (A - Accepted, R - Rejected, B - Both)
Utility ID ==> <u>REORGLOB</u> (16 characters)
Reuse
Log ==> N (Y - Yes, N - No)
Fastswitch
Sortdata ==> Y (Y - Yes, N - No)
Scope $=> A$ (A - All, P - Pending)
Rebalance ==> N (Y - Yes, N - No)
Keep Dictionary ==> N (Y - Yes, N - No)
Sort Device Type ==> (CART/DISK/etc.)
Sort Number ==> (Number)
Nosysrec ==> N (Y - Yes, N - No)
Unload Data ==> 🖸 (C - Continue, E - External,
0 - Only, P - Pause)
HAA221E - Uhan the Shanalovel is get to Change an Deference, at least and

HAA331E - When the Sharelevel is set to Change or Reference, at least one image copy must be specified.





AUTOTOOL V3R1 Or Option ===> Commands: END - Return to	nline Reorg options 2 the previous screen.	010/11/19 17:54:18 Scroll ===> <u>CSR</u>
Creator: CSJENN Name:	REORG LOBS	User: CSJENN
Enter the options to asso	ciate with this utility profile	
Drain Wait Retry Retry Delay Timeout Force	<pre> ==&gt; C (R - Reference, C</pre>	conds) conds) erm, N - None) ders, N - None)
	$=> \underline{N}  (Y - Yes, N - No) ==> \underline{N} \\ ==> \underline{Y}  (Y - Yes, N - No) ==> \underline{N}$	(Y - Yes, N - No)





<u>F</u> ile <u>E</u> dit E <u>d</u> it_Settings <u>M</u> enu <u>U</u> tilities <u>C</u> ompilers <u>T</u> est <u>H</u> elp
EDIT CSJENN.HAA310.JCL(LOBREORG) - 01.00 Columns 00001 0007
Command ===> Scroll ===> <u>CSR</u>
000197 //SYSIN DD *
000198 TEMPLATE R1LP0001
000199 UNIT SYSDA
000200 DSN 'CSJENN.&DB&SN&SSID&UNIQ.'
000201 SPACE TRK
000202 MAXPRIME 00066666
000203 UNCNT 5
000204 DISP (NEW, CATLG, CATLG)
000205
000206 LISTDEF RE011003
000207 INCLUDE TABLESPACE DBAUA203.TPAUA203
000208 INCLUDE TABLESPACE DBAUDIT.TSAUDIT
000209 INCLUDE TABLESPACE DBAUDIT2.TSAUDIT2
000210 INCLUDE TABLESPACE DBAUY203.TPAUY203
000211 INCLUDE TABLESPACE NMHAQA03.TSQA0301
000212 INCLUDE TABLESPACE NMHAQA04.TSQA0401
000213 INCLUDE TABLESPACE NMHAQA05.TSQA0501
000214 INCLUDE TABLESPACE NMHAQA06.TSQA0601
000216 REORG TABLESPACE LIST REO11003
000217 SCOPE ALL
000218 LOG NO
000219 SORTDATA YES
000220 COPYDDN (R1LP0001)
000221 SHRLEVEL CHANGE 000222 TIMEOUT TERM
000223 MAPPINGTABLE "RTSBATCH"."REORG_CMP00102"
HHEFINGTHELE RISEHICH . REORA_CHEOTO2





# REORG LOBs Online with DB2 Automation Tool

- Allow DB2 Automation Tool to generate JCL for both LOB and Non-LOB objects
- Wildcard object names in Object Profiles without the worry of inadvertently including LOB objects
  - -No longer exclude specific LOB objects from Object Profile
  - -No longer exclude LOBs using Exceptions Profile to exclude them
- DB2 Automation Tool will generate appropriate JCL for each kind of object
- Some restrictions apply:
  - -LOG NO is required for SHRLEVEL REF
  - -Mapping tables are ignored for LOB tablespaces
  - -SHRLEVEL REF requires inline image copy



# Questions?





