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DB2 11 for z/OS Utilities Update

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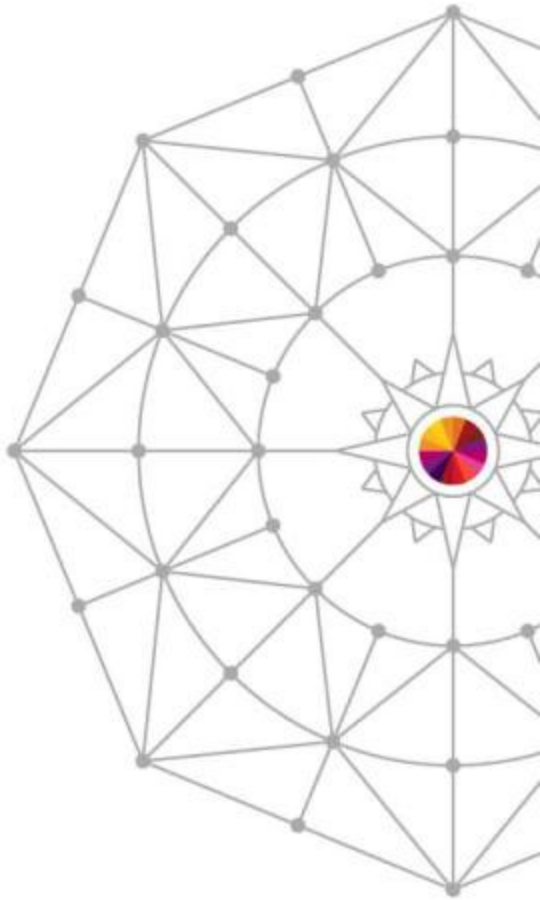
DB2 for z/OS Utilities Development

March 10th, 2014
Session # 15125



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SHARE in Anaheim

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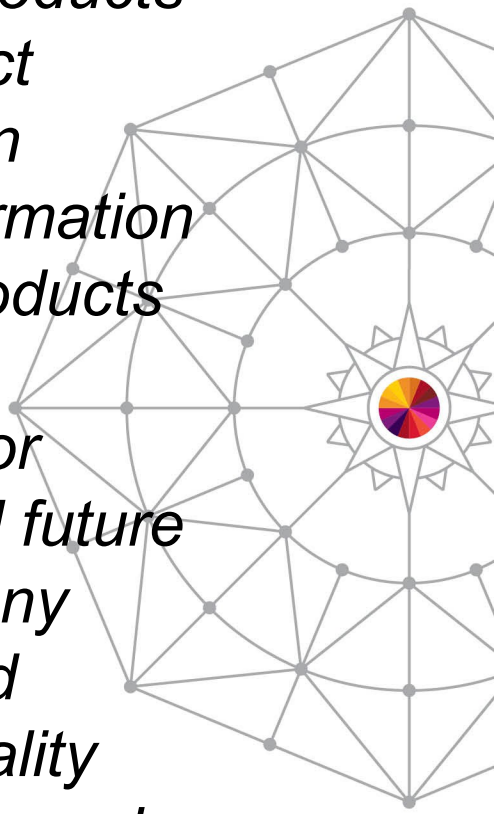
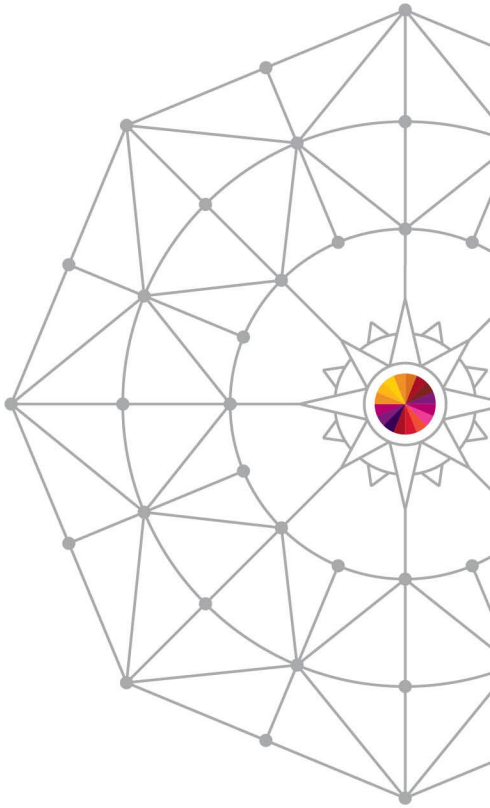


Agenda

- Strategy
- Overview
- REORG
- Statistics
- Backup & Recovery
- UNLOAD & LOAD
- Compression Dictionaries
- General Enhancements
- Deprecation
- Questions & Feedback



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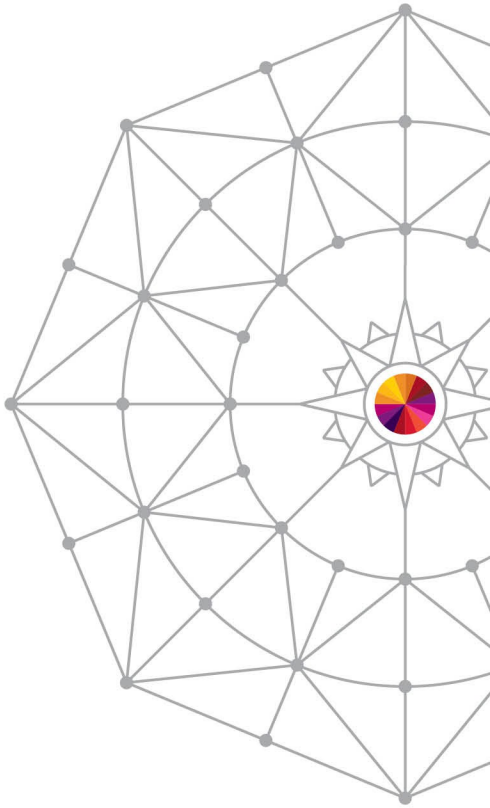
Strategy

- Support core function
- Reduce CPU, ET & resource consumption
- Maximize availability
- Remove constraints & limitations
- Simplify data management



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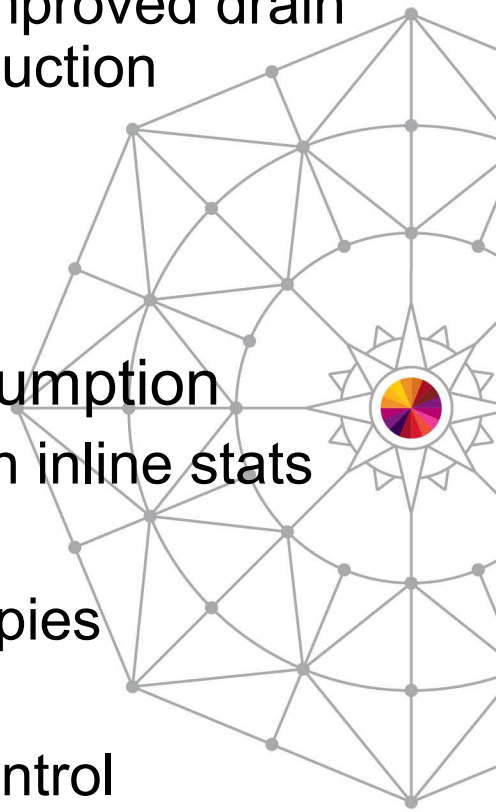
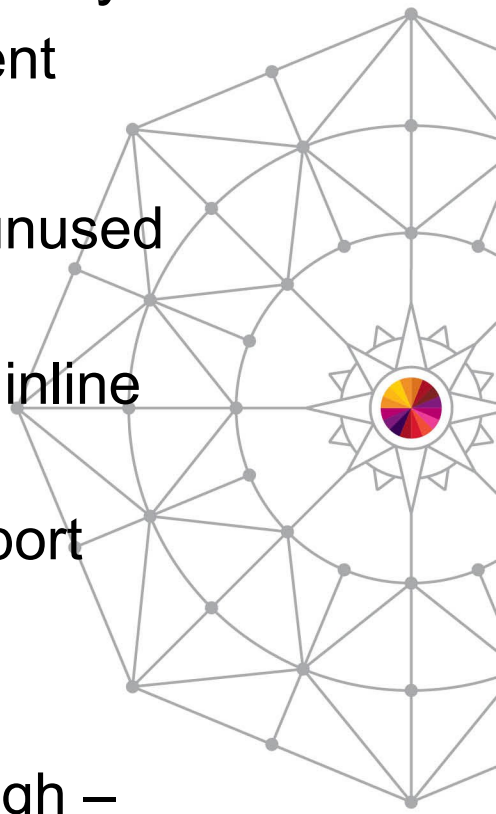
Overview

- Better availability
  - Outage reduction for online REORG through improved drain processing & SWITCH phase elapsed time reduction
  - Better control of SWITCH phase timing
  - Online rebalance of data across partitions
  - Faster LOAD processing
- Better performance & reduced resource consumption
  - Reduce/eliminate need for RUNSTATS through inline stats
  - Faster LOAD processing
  - Faster recovery from part-level inline image copies
  - Faster REORG processing
  - More utility parallelism & greater parallelism control
  - More zIIP exploitation
  - Optimizer input to RUNSTATS



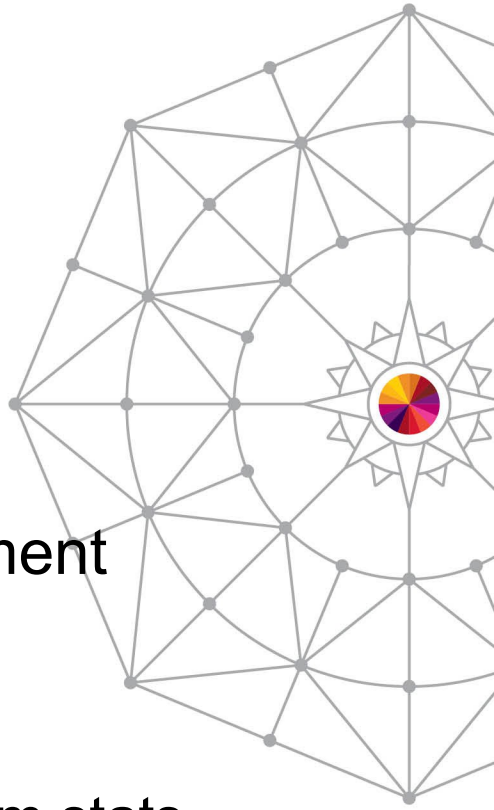
Overview

- Simplified data management & improved usability
  - Automated REORG mapping table management
  - Intelligent default settings for REORG
  - Better PBG management through deletion of unused partitions
  - Improved dataset management with part-level inline image copies
  - Improved XML handling with Crossloader support
  - System cloning improvements
  - Lift point in time recovery restrictions
  - More information & greater transparency through – DISPLAY UTILITY improvements
  - Enhanced statistics profile support



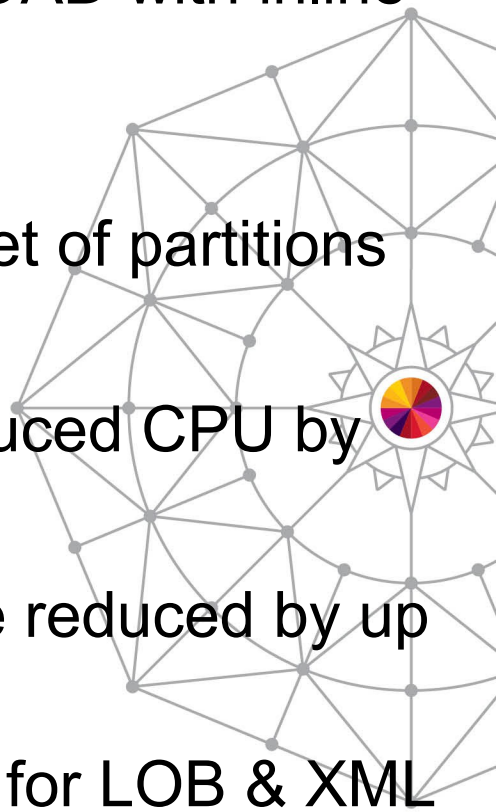
Key performance numbers

- CPU improvement for utilities with EXCLUDE NULL KEYS
  - LOAD 12%
  - REORG 25%
  - REORG INDEX 88%
  - REBUILD INDEX 72%
  - CHECK INDEX 79%
  - RUNSTATS 90%
- Increased parallelism elapsed time improvement
  - REORG 21%
- Inline stats vs. separate RUNSTATS
  - 40% elapsed time reduction for inline histogram stats
  - 28% elapsed time & 19% CPU reduction with inline distribution stats



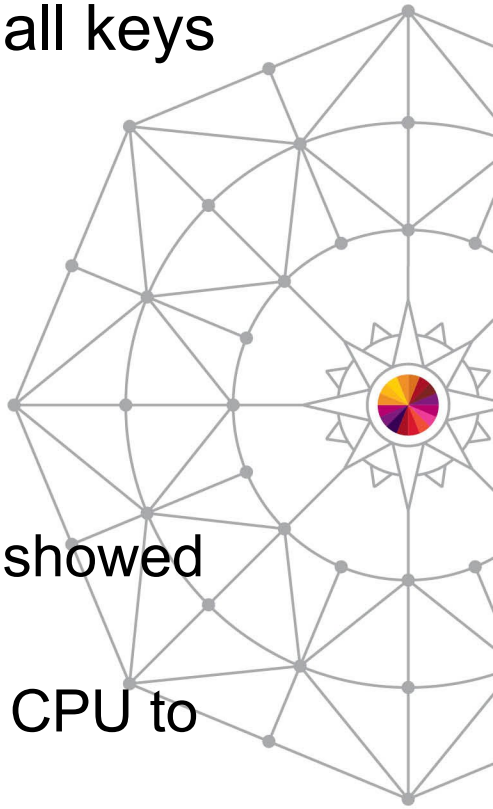
Key performance numbers

- Up to 81% zIIP-eligible CPU with RUNSTATS COLGROUP
- Up to 40% zIIP-eligible CPU in REORG & LOAD with inline distribution stats
- REORG SWITCH phase reduced by 90%
- Up to 71% ET reduction for REORG of subset of partitions
  - SORTNPSI option retrofitted to V9 & V10
- RECOVER from part-level image copies reduced CPU by up to 50%, elapsed by up to 40%
- LOAD from single input dataset elapsed time reduced by up to 70%
- Crossloader support for FETCH CONTINUE for LOB & XML data
  - 28% CPU reduction



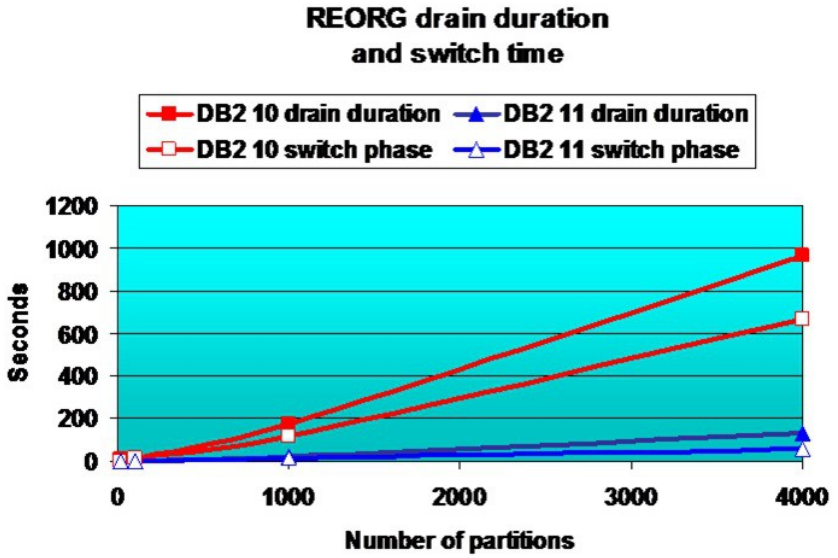
Improve performance of part-level REORG with NPSIs

- New option to defer shadow index build until all keys passed through sort
- New parm & zparm to govern
  - AUTO/YES/NO options
- Retrofit to DB2 9 & 10 in PM55051
- Result:
  - Customer test of REORG of 40% of partitions showed 55% ET reduction & 22% CPU increase
  - DB2 Sort gives additional ET reduction & cuts CPU to less than original starting point



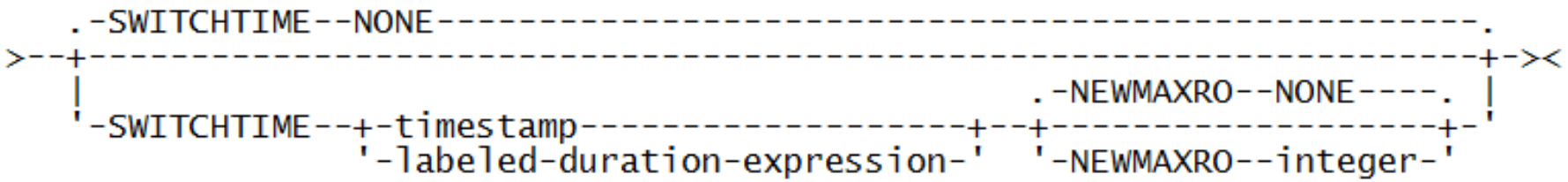
SWITCH phase relief – reduced application impact

- Easier drain acquisition
- Prevent new claims on all target partitions while waiting for drains
  - Faster drain acquisition for part-level REORG
- New DRAIN_ALLPARTS option to momentarily drain all data parts
  - Eliminates claim-drain “deadlocks” for part-level REORG with NPSIs
- Restructure SWITCH phase processing for outage reduction
  - SWITCH phase ET reduction of 91% measured when reorging 20 parts



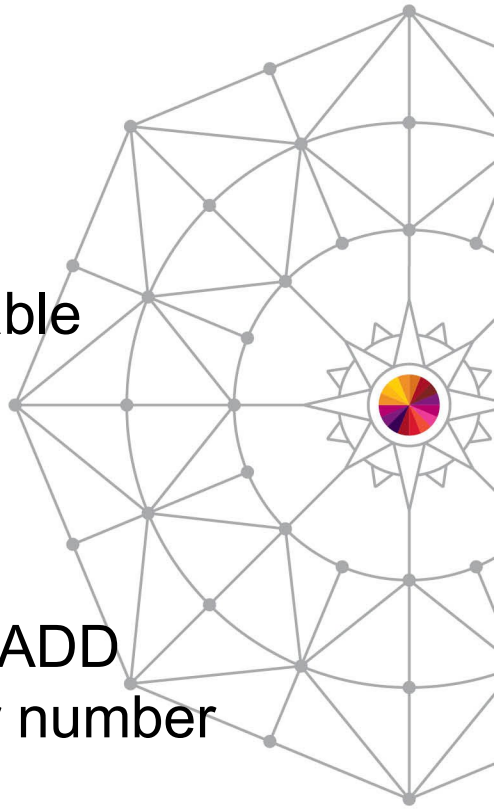
Timing of SWITCH phase with MAXRO DEFER

- Govern timing of drain and switch for long-running REORGs without the need to schedule separate –ALTER UTILITY command
- New SWITCHTIME parameter to determine earliest point at which drain processing will be attempted



Physically delete empty PBG partitions

- Ability for REORG to physically delete empty PBG partitions
- New zparm REORG_DROP_PBG_PARTS
  - DISABLE – keep V10 behavior (default)
  - ENABLE – Delete empty PBG partitions on table space-level REORG
- Considerations:
  - Cannot be specified on REORG statement
  - If PBG created using NUMPARTS or ALTER ADD partition used, REORG may prune to a lesser number of partitions
  - No PIT recovery to prior to a pruning REORG
    - No facility to resurrect deleted partitions



Automated mapping table handling

- Support mapping tables in PBG
  - Increases mapping index limit from 64Gb to 16Tb
  - Retrofitted to V9 in PM58177
- Mapping table DDL must change in 11 due to new RBA/LRSN
- Requirements to automate mapping tables
- So… New automated mapping tables in REORG
  - Automatically create new format mapping table if required
    - If mapping table specified & correct format then honor specification
    - Else if specified but incorrect format then create new in same db as original
    - Else if not specified and zparm DB specified then create in zparm DB
    - Else create in implicitly created DB
    - DROP at end of REORG or end of last REORG if multiple REORGs in job step
  - NFM requires new format mapping table, CM supports both
  - No additional auth requirements necessary for creation of mapping tables

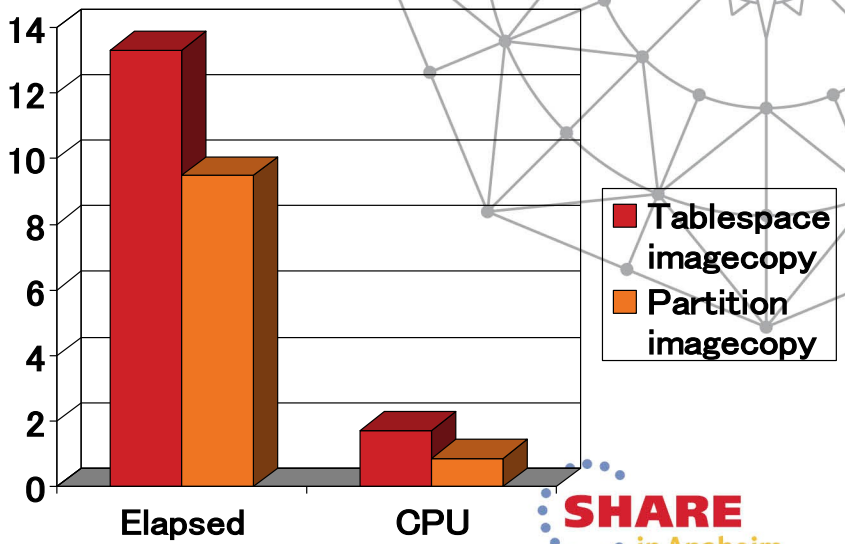
REORG without sorting data

- Increasingly REORGs are performed for reasons other than to regain clustering of data, yet no ability to avoid cost of reclustering
- Prior to DB2 11, REORG SHRLEVEL CHANGE did not support SORTDATA NO
- DB2 11 supports SORTDATA NO with SHRLEVEL CHANGE
- New RECLUSTER YES/NO option on SORTDATA NO
  - RECLUSTER NO – Do not unload data through clustering index and do not sort data records in clustering order

Partition-level inline image copy

- Faster partition-level recovery from inline image copy
- Create partition-level inline image copies if using TEMPLATE with &PA or &PART
  - No new option or keyword on REORG
  - PM93611:
    - Support substring notation with &PA as long as substring ensures uniqueness
    - Support writing to tape as long as STACK YES not specified

- RECOVER of single partition of a 20 partition table space
  - ET reduced by 28%
  - CPU reduced by 49%

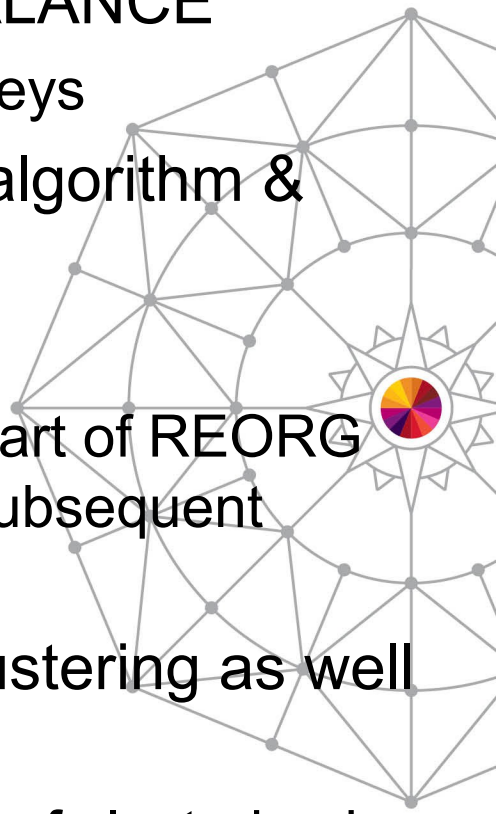


Improved REORG LISTDEF processing

- PARALLEL YES/NO option introduced in APAR in V9
  - NO – Prevent REORG from processing multiple partitions in single REORG when input is partlevel LISTDEF
  - Zparm REORG_LIST_PROCESSING at zparm level
- Need compromise option for customers who want to take advantage of REORG parallelism but cannot afford to shadow many partitions at a time
- New option LISTPARTS n to limit # of partitions to be processed in a single REORG if input is a part-level LISTDEF
- In DB2 11, PARALLEL YES/NO is superseded by LISTPARTS
  - PARALLEL YES/NO IS deprecated but still supported in 11

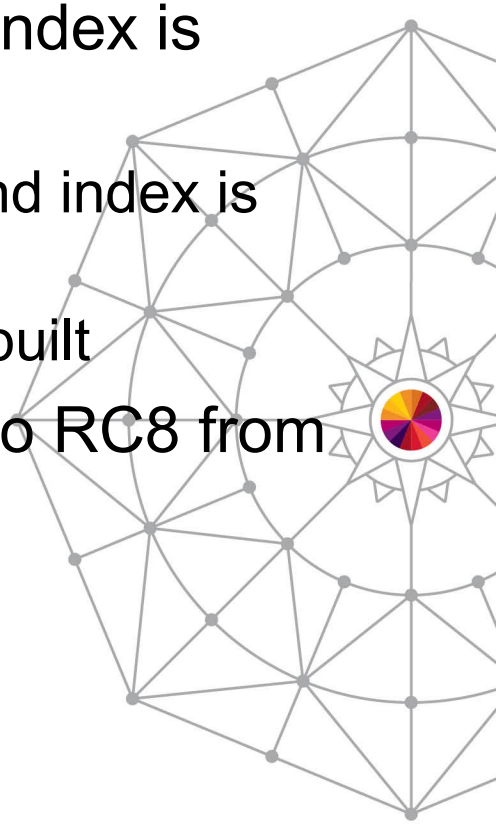
REBALANCE enhancements

- Improved availability & failure prevention
- Support REORG SHRLEVEL CHANGE REBALANCE
  - Complements online ALTER of partition limit keys
- Improve resiliency with enhanced distribution algorithm & improved handling of empty partitions
- Build compression dictionary for all partitions
  - Previously, partitions that were empty at the start of REORG would not have a dictionary built, requiring a subsequent REORG to gain compression
- New SORTCLUSTER option to sort data in clustering as well as partitioning order to avoid AREO*
  - Occurred when partitioning key not a superset of clustering key



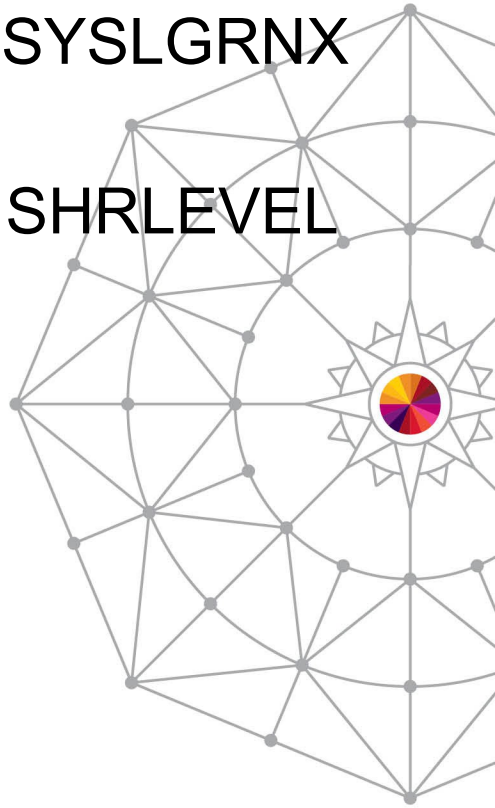
REORG of LOB data

- Support REORG of LOB data even though aux index is unavailable
  - Problem in V10 if LOB table space is REORP and index is RBDP
    - LOBs can’t be reorged and index can’t be rebuilt
- REORG SHRLEVEL NONE for LOBs changed to RC8 from 11 CM onwards
  - Not supported in 10 NFM, but returns RC0 with MSGDSNU126I



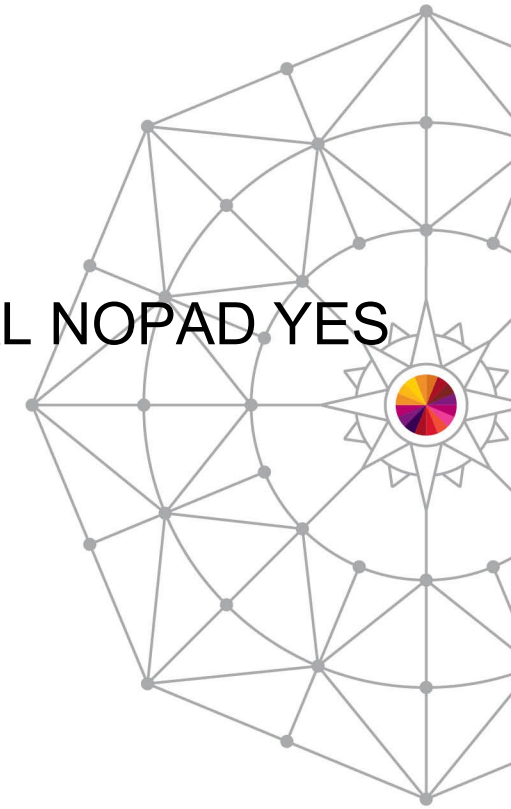
Improved REORG serviceability

- Need ability to use online REORG even when SYSLGRNX cannot be relied upon
- Support LOGRANGES NO option for REORG SHRLEVEL CHANGE



REORG change of defaults to match best practices

- Change default options:
  - DRAIN WRITERS to DRAIN ALL
  - DISCARD to DISCARD NOPAD YES
  - UNLOAD EXTERNAL to UNLOAD EXTERNAL NOPAD YES



Statistics Enhancements

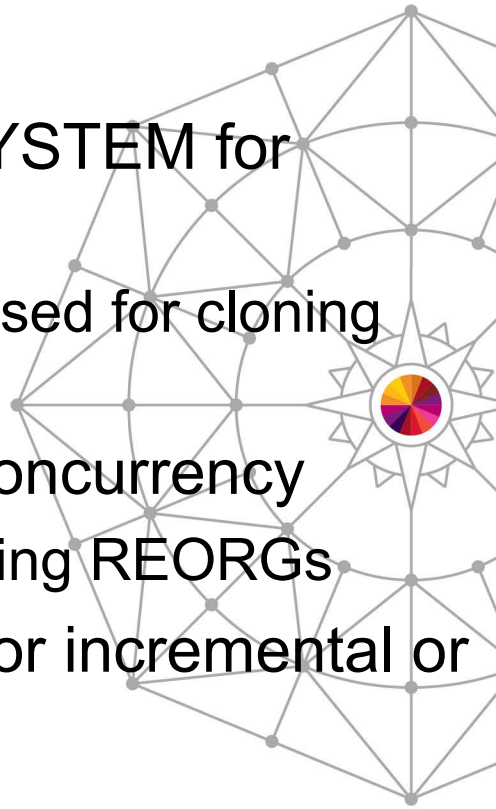
- More zIIP offload for RUNSTATS distribution statistics
  - Up to 80% zIIP-eligible
- zIIP offload for inline statistics
  - Additional 30% offload to zIIP
- Enhance inline statistics for RUNSTATS avoidance
  - Inline statistics collection on NPSIs during REORG with SORTNPSI
  - Inline histogram statistics
  - Inline DSTATS
- New RUNSTATS RESET option to reset existing statistics
- Improved PROFILE usability for LISTDEF processing
  - Gather default statistics if no profile exists for table

Statistics Enhancements

- Optimizer determination of missing statistics
  - Optimizer identifies missing statistics & writes information to new catalog table DSN_STAT_FEEDBACK
  - OQWT modifies statistics profile
  - Automation Tool detects profile change & builds RUNSTATS job
  - DSNACCOX similarly enhanced to recommend RUNSTATS
- -ACCESS DATABASE … MODE(STATS) option to externalize RTS statistics
- RTS overhead reduction

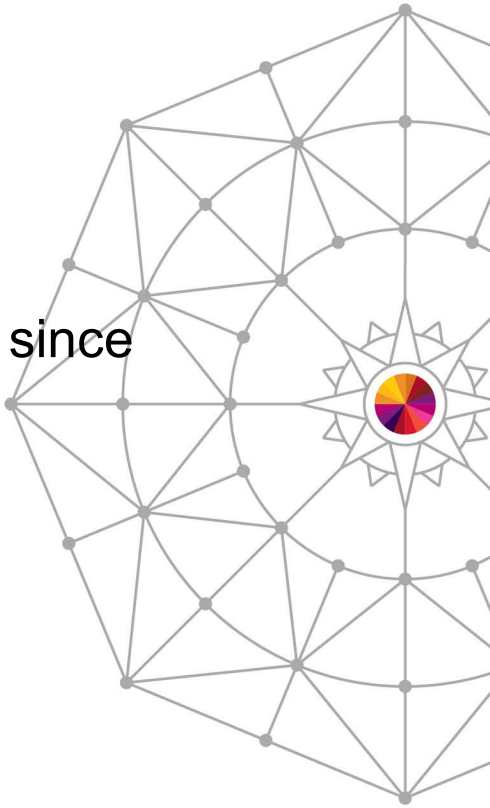
Backup & Recovery Enhancements

- Faster catalog/directory recovery
  - Enhanced SYSLGRNX recording
- New VCAT name translation for RESTORE SYSTEM for system cloning
  - Support logapply when RESTORE SYSTEM used for cloning purposes
- Improved recoverability with COPY-REORG concurrency
  - Permit COPY to run concurrent with long-running REORGs
- Avoid allocating empty image copy data sets for incremental or CHANGELIMIT copies



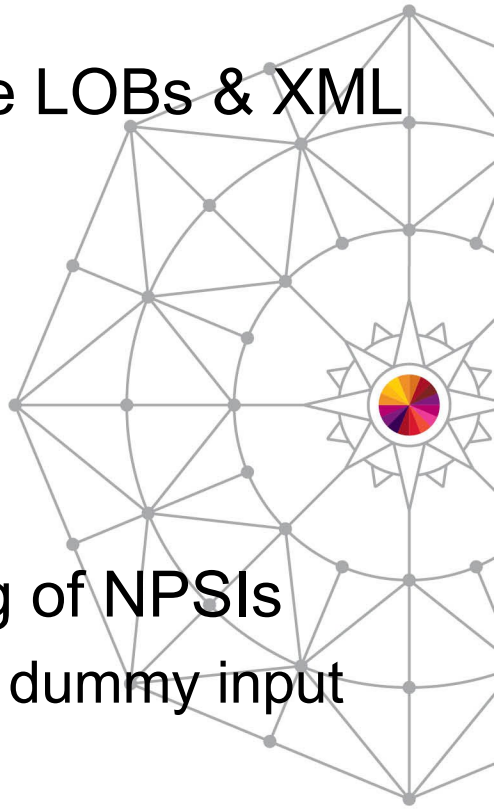
Backup & Recovery Enhancements

- Lifted many restrictions on point-in-time recovery prior to materializing REORG
  - PIT recovery restrictions lifted for
    - LOB table spaces
    - XML table spaces
    - PBR table spaces
    - Including when immediate alters have occurred since materializing REORG
  - PIT recovery restrictions still in place
    - Table space conversion
    - PBG table spaces
    - PBG partition pruning
    - Online DROP COLUMN
- Faster index recovery with FLA support for index log records
  - APAR PI07694 for V9 and above



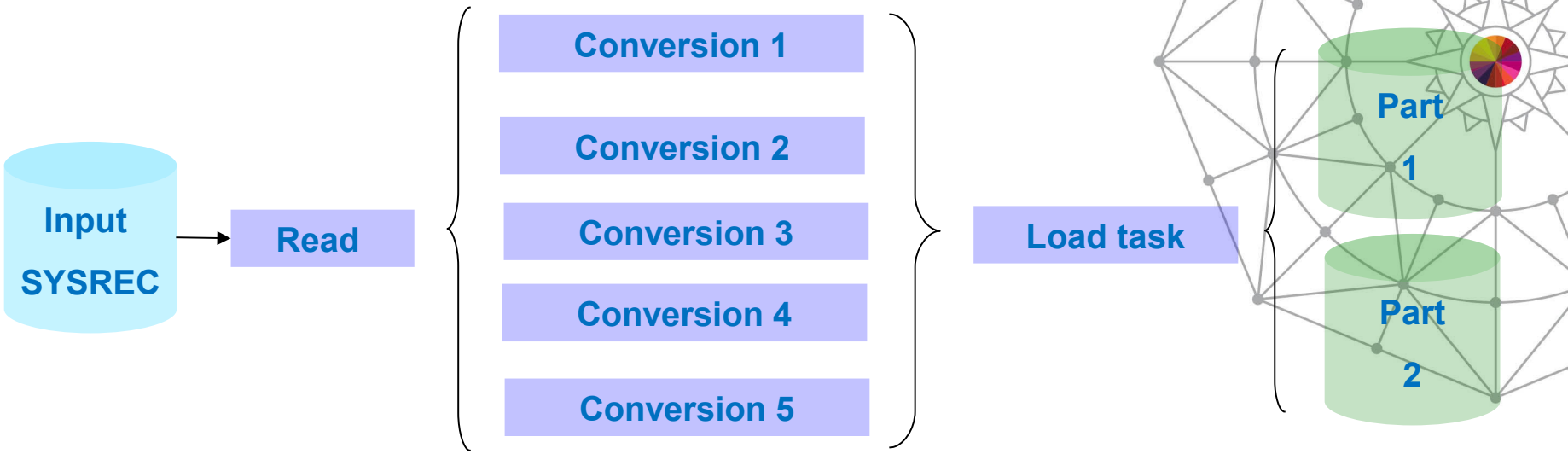
LOAD & UNLOAD Enhancements

- Crossloader support for XML data
- Exploit FETCH CONTINUE for processing large LOBs & XML data in Crossloader
  - Reduce vstor requirement
  - Avoid DSNU1178i errors
  - 28% CPU reduction
    - Load of 1Mb LOBs
- zIIP offload for LOAD REPLACE PART clearing of NPSIs
  - 100% offload to zIIP for LOAD REPLACE with dummy input



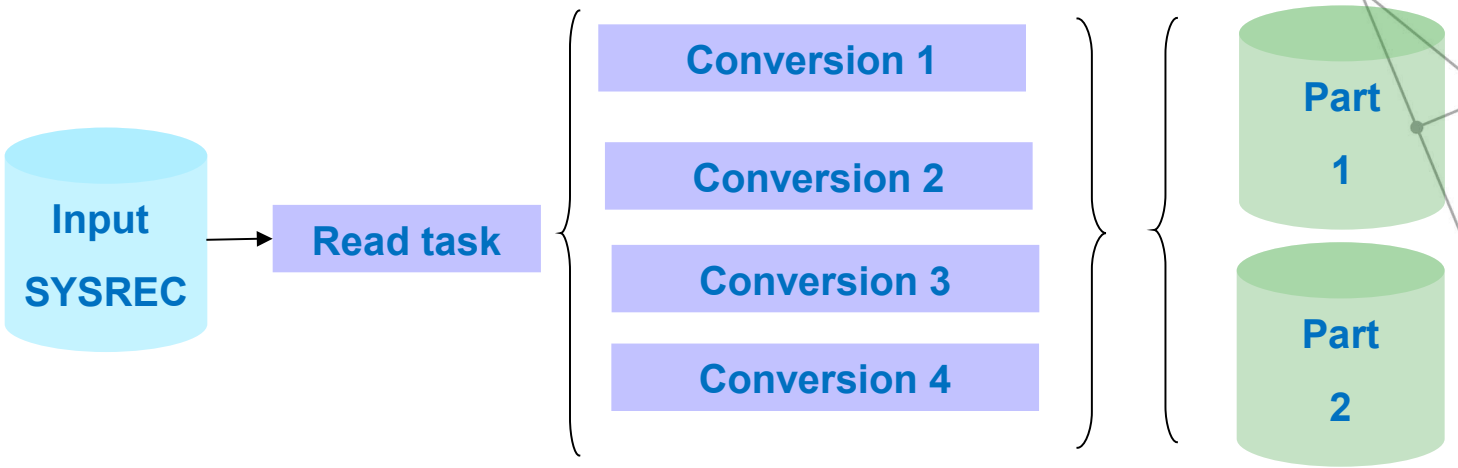
LOAD & UNLOAD Enhancements

- LOAD SHRLEVEL NONE PARALLEL with single input data set
  - Parallel data conversion
  - Not supported for PBGs
  - 50% ET reduction possible on single SYSREC load



LOAD & UNLOAD Enhancements

- LOAD SHRLEVEL CHANGE PARALLEL
  - Supports non-partitioned as well as partitioned
  - Single input data set
  - Not supported for PBGs
  - >80% ET reduction



Compression Dictionaries

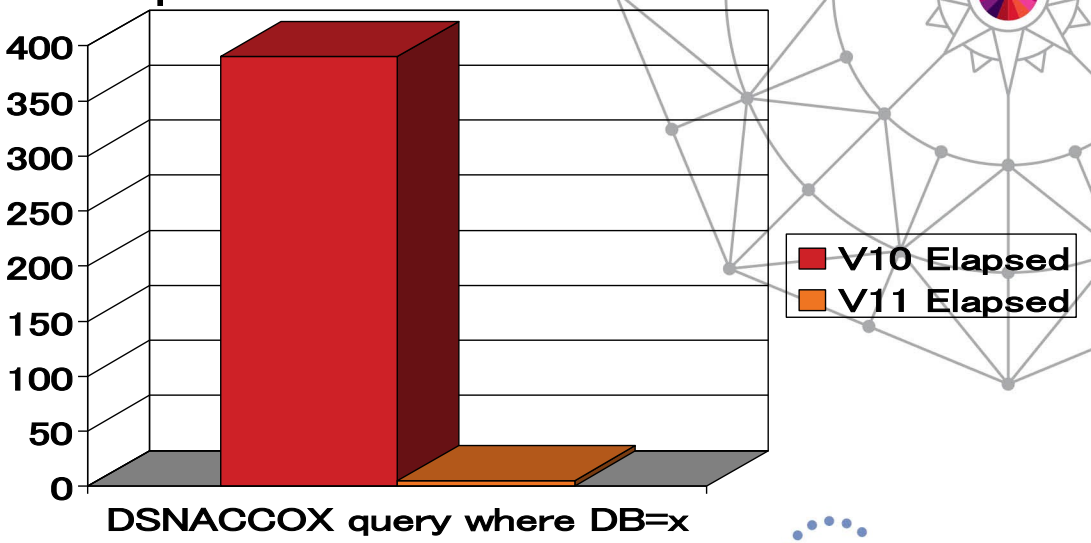
- Avoid decompression failures for IFI 306 readers when new compression dictionary built by REORG/LOAD
- Old compression dictionary stored on log
- New SYSCOPY record written pointing to old compression dictionary for CDC tables
- IFI 306 read automatically retrieves old compression dictionary if necessary
- Avoid need for replication target refresh when dictionary changes

General Enhancements

- Greater parallelism for faster utilities
  - 11% elapsed time reduction for REORG, LOAD, REBUILD
  - PARALLEL option for parallelism control for LOAD, REORG, REBUILD INDEX, UNLOAD, CHECK INDEX
- -DISPLAY UTILITY enhancements
  - Remove serialization between –DIS UTIL and –TERM UTIL
  - Jobname, start timestamp
  - Late addition: SWITCHTIME and NEWMAXRO
- Utility impact reduction on bufferpools
  - Extend MRU for UNLOAD, REORG TABLESPACE, RUNSTATS TABLESPACE, RUNSTATS INDEX, REBUILD INDEX, CHECK
- Improved data set cleanup in utility stored procedures
  - Previously, data sets remained allocated on utility failure, preventing cleanup

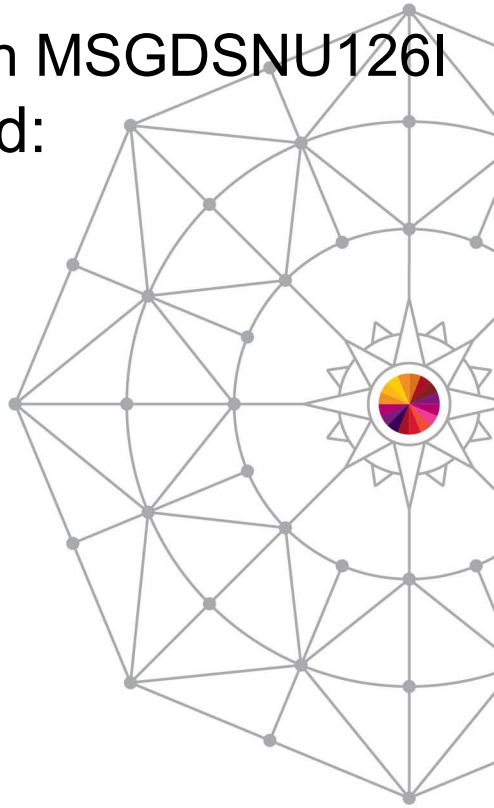
General Enhancements

- Improved TEMPLATE support for large / EF data sets and local time values
  - DSNTYPE LARGE, EXTREQ, EXTPREF
  - New EATTR option on TEMPLATE to request extended attributes
  - New TIME LOCAL|UTC option
- Enforce NUMTCB=1 for stored procedures
- DSNACCOX performance



Deprecation

- REORG SHRLEVEL NONE for LOBs changed to RC8 from 11 CM onwards
  - Not supported in 10 NFM, but returns RC0 with MSGDSNU126I
- Still supported in 11, but no longer documented:
  - REORG
    - PARALLEL YES|NO
      - *Superseded by LISTPARTS*
    - INDREFLIMIT
    - OFFPOSLIMIT
    - LEAFDISTLIMIT
    - UNLOAD ONLY
    - UNLOAD PAUSE
    - UNLOAD EXTERNAL
  - COPY
    - CHANGELIMIT



Thank
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