DB2 for z/OS Utilities Update

Terri Kemmer
kemmert@us.ibm.com
Agenda

• Strategy
• REORG
• Statistics
• Backup & Recovery
• UNLOAD & LOAD
• Compression Dictionaries
• General Enhancements
• Recent News
• Summary
Strategy

- Support core function
- Reduce CPU, ET & resource consumption
- Maximize availability
- Remove constraints & limitations
- Simplify data management
SWITCH phase impact relief – reduced application impact

- Easier drain acquisition
- Prevent new claims on all target partitions whilst 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

```
|--SWITCHTIME-NONE---------------------------------------------------------------|
--|---------------------------------------------------------------------------|
   |--SWITCHTIME-|timestamp---------------------------------|--NEWMAXRO-NONE----|
   |   |labeled-duration-expression--|---------------------------------|--NEWMAXRO-integer----|
```
Physically delete empty PBG partitions

- Ability for REORG to physically delete empty PBG partitions
- New zparm REORG_DROP_PBG_PARTS
  - DISABLE – keep V10 behaviour (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 RBA/LRSN change
- Requirements to automate mapping tables
- So… New automated mapping tables in REORG
  - Automatically create new format mapping table if required
  - Rules govern placement of mapping table
  - NFM requires new format mapping table, CM supports both old and new
  - No additional auth requirements
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 RECLUSTER NO 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
  ▪ SORTCLUSTER YES – sort in partitioning and clustering order, avoid AREO*
  ▪ No specification – keep existing behaviour, set AREO*
  ▪ SORTCLUSTER NO – keep existing behaviour, but do not set AREO*
REORG of LOB data

- Support REORG of LOB data even though aux index is unavailable
  - Problem in V10 if LOB tablespace 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 datasets 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
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 dataset
  - Parallel data conversion
  - Not supported for PBGs
  - 50% ET reduction possible on single SYSREC load

![Diagram showing data flow from Input SYSREC to Load task through various conversions to Part 1 and Part 2.]

Conversion 1
Conversion 2
Conversion 3
Conversion 4
Conversion 5
Load task
Part 1
Part 2
LOAD & UNLOAD Enhancements

- LOAD SHRLEVEL CHANGE PARALLEL
  - Supports non-partitioned as well as partitioned
  - Single input dataset
  - 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 measured for REORG, LOAD, REBUILD INDEX

• 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 INDEX, CHECK DATA

• Improved dataset cleanup in utility stored procedures
  ▪ Previously, datasets remained allocated on utility failure, preventing cleanup
General Enhancements

- Improved TEMPLATE support for large / EF datasets 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
Recent News

• Part-level REORG NPSI insert performance improvement
  ▪ PM87403 (V9)
  ▪ LOAD RESUME – 66% CPU reduction, 30% ET reduction
  ▪ REORG PART 9 – 45% CPU reduction, 26% ET reduction
• Fast log apply for faster index recovery
  ▪ PI07694 (V9)
• Retrofit REORG SWITCH phase performance to V10
  ▪ PI09303 (V10)
• Retrofit REORG REBALANCE SHRLEVEL CHANGE to V10
  ▪ PI11839 (V10)
Recent News

- LOB REORG performance improvement
  - PI17945 (V10)
- Easy-tier storage support in REORG
  - PI35321, OA46482 required for DFSMS support
  - REORG shadows inherit temperature of original pagesets
- Retrofit TEMPLATE LOCALTIME option to V10
  - PI29707
Recent News

• Prevent lock escalation on DB2 catalog tables
  ▪ MODIFY RECOVERY – PK01751
  ▪ COPY – PM71848
  ▪ RUNSTATS – PI29519
  ▪ RECOVER – PI30747
  ▪ REORG – PI32588
  ▪ QUIESCE, COPYTOCOPY, REPORT RECOVERY – PI38443

• REORG LOG phase performance improvement
  ▪ PI32491
Recent Maintenance Stream Enhancements

• LOAD REPLACE SHRLEVEL REFERENCE
• LOAD RESUME SHRLEVEL REFERENCE
• LOAD utility pre-validation
  • Including CHECK constraints
• Utilities Solution Pack APAR PI04864
Summary

• Unparalleled investment in utilities
• IBM Utilities Suite is essential for exploitation of major DB2 enhancements
• Support of core DB2 function from day 1 of GA
• Expect continued delivery of enhancements on release boundary, and in maintenance stream when prudent
• Continued focus on:
  ▪ Elimination of application impact from utilities
  ▪ Elapsed time & CPU consumption reduction
  ▪ Resource consumption reduction
  ▪ Reduction in complexity & automation improvements
  ▪ Solutions through DB2, Utilities & Tools
Notices and Disclaimers

Copyright © 2015 by International Business Machines Corporation (IBM). No part of this document may be reproduced or transmitted in any form without written permission from IBM.

U.S. Government Users Restricted Rights - Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM.

Information in these presentations (including information relating to products that have not yet been announced by IBM) has been reviewed for accuracy as of the date of initial publication and could include unintentional technical or typographical errors. IBM shall have no responsibility to update this information. THIS DOCUMENT IS DISTRIBUTED "AS IS" WITHOUT ANY WARRANTY, EITHER EXPRESS OR IMPLIED. IN NO EVENT SHALL IBM BE LIABLE FOR ANY DAMAGE ARISING FROM THE USE OF THIS INFORMATION, INCLUDING BUT NOT LIMITED TO, LOSS OF DATA, BUSINESS INTERRUPTION, LOSS OF PROFIT OR LOSS OF OPPORTUNITY. IBM products and services are warranted according to the terms and conditions of the agreements under which they are provided.

Any statements regarding IBM’s future direction, intent or product plans are subject to change or withdrawal without notice.

Performance data contained herein was generally obtained in a controlled, isolated environments. Customer examples are presented as illustrations of how those customers have used IBM products and the results they may have achieved. Actual performance, cost, savings or other results in other operating environments may vary.

References in this document to IBM products, programs, or services does not imply that IBM intends to make such products, programs or services available in all countries in which IBM operates or does business.

Workshops, sessions and associated materials may have been prepared by independent session speakers, and do not necessarily reflect the views of IBM. All materials and discussions are provided for informational purposes only, and are neither intended to, nor shall constitute legal or other guidance or advice to any individual participant or their specific situation.

It is the customer’s responsibility to insure its own compliance with legal requirements and to obtain advice of competent legal counsel as to the identification and interpretation of any relevant laws and regulatory requirements that may affect the customer’s business and any actions the customer may need to take to comply with such laws. IBM does not provide legal advice or represent or warrant that its services or products will ensure that the customer is in compliance with any law.
Notices and Disclaimers (con’t)

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products in connection with this publication and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. IBM does not warrant the quality of any third-party products, or the ability of any such third-party products to interoperate with IBM’s products. IBM EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The provision of the information contained herein is not intended to, and does not, grant any right or license under any IBM patents, copyrights, trademarks or other intellectual property right.

- IBM, the IBM logo, ibm.com, Aspera®, Bluemix, Blueworks Live, CICS, Clearcase, Cognos®, DOORS®, Emptoris®, Enterprise Document Management System™, FASP®, FileNet®, Global Business Services ®, Global Technology Services ®, IBM ExperienceOne™, IBM SmartCloud®, IBM Social Business®, Information on Demand, ILOG, Maximo®, MQIntegrator®, MQSeries®, Netcool®, OMEGAMON, OpenPower, PureAnalytics™, PureApplication®, pureCluster™, PureCoverage®, PureData®, PureExperience®, PureFlex®, pureQuery®, pureScale®, PureSystems®, QRadar®, Rational®, Rhapsody®, Smarter Commerce®, SoDA, SPSS, Sterling Commerce®, StoredIQ, Tealeaf®, Tivoli®, Trusteer®, Unica®, urban{code}®, Watson, WebSphere®, Worklight®, X-Force® and System z® Z/OS, are trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at “Copyright and trademark information” at: www.ibm.com/legal/copytrade.shtml.
Thank You