DB2 10 for z/OS - John Deere's Beta Experience

Session Number 3138

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IBM Software
Information On Demand 2011

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Any apars mentioned in this presentation were current at the time this presentation was written. You should check the current maintenance recommendations for new apars, pe's and pre-req's.

Agenda

- Line Items
- Migration
- Catalog
- Performance
- Plan Stability
- Online Schema
- Utilities
- Enhanced System Level Monitoring
- DB2 10 John Deere Marketing Campaign

DB2 10 Line Items Evaluated

- Access Currently Committed Data
- Add Active Log*
- Additional non-key Columns in Index
- Aggressive View Merge In-List
- Auto Stats*
- Autonomic Checkpoint Interval*
- Buffer Pool Enhancements*
- Catalog Restructure*
- Fewer Explicit REORGS

* Items will be discussed in further detail during this presentation.

DB2 10 Line Items Evaluated

- FlashCopy Enhancements*
- Full 64 Bit Runtime (virtual storage)*
- Enhanced monitoring for threads (DSN_PROFILE)*
- Long Running Reader Warning Messages*
- Online Reorg Enhancements*
- Online Schema Evolution*
- Plan Stability*
- Migration, Fallback and Re-migration testing*

* Items will be discussed in further detail during this presentation.

DB2 10 Line Items Not Evaluated

- Bi-Temporal Tables
  - System Time
  - Business Time
- Hash Access
- Performance – Regression testing
- Skip Level migration
- XML features
- SQL features
- Security

John Deere anticipated DB2 Migration

- DB2 Classic
- De-installed Beta code.
- Expected migration April 2012 – 2013.

- DB2 SAP
- SAP certified May 2011.
- Will migrate for virtual storage relief beginning in 2011.
- Very interested in online schema exploitation.

DB2 Migration

- IDUG EMEA 2011 – ‘Migrating to DB2 10 for z/OS’ (Wed, 8:30am)
- IDUG EMEA 2011 – ‘DB2 10 for z/OS – In Depth’ (Friday ed sem)

- Fallback SPE PK56922, PK69411, PK61766, PK85956, PM04680, PK87280, PK87281, PM08102, PM08105 and PM10227.
- Info Apars
  - DB2 V8 – II14474
  - DB2 9 – II14477

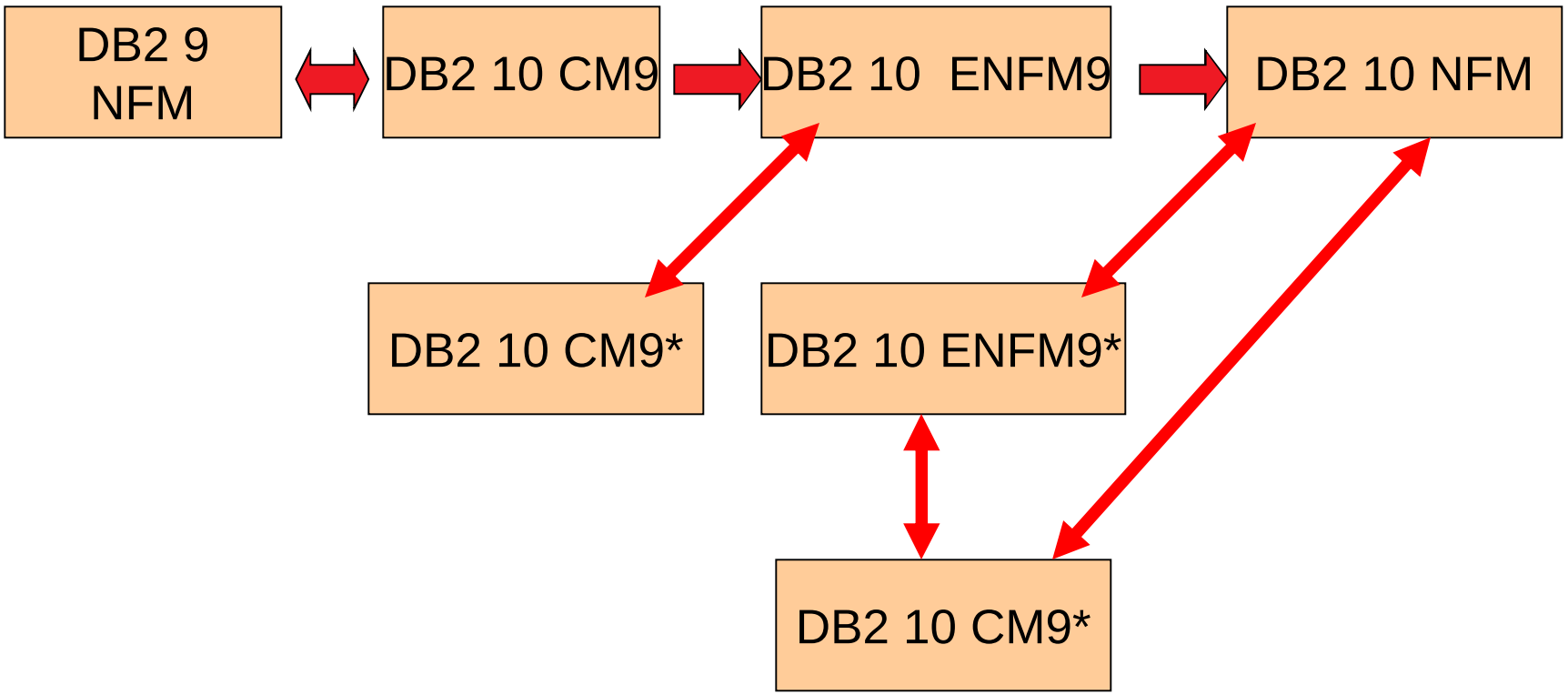
- DB2 Catalog and Directory SMS controlled with extended addressability (EA) attributes.
  - DSNTIJSS – provides SMS classes

- Pre-migration check, PM04968 (DSNTIJPA) for DB2 9 or DB2 V8.

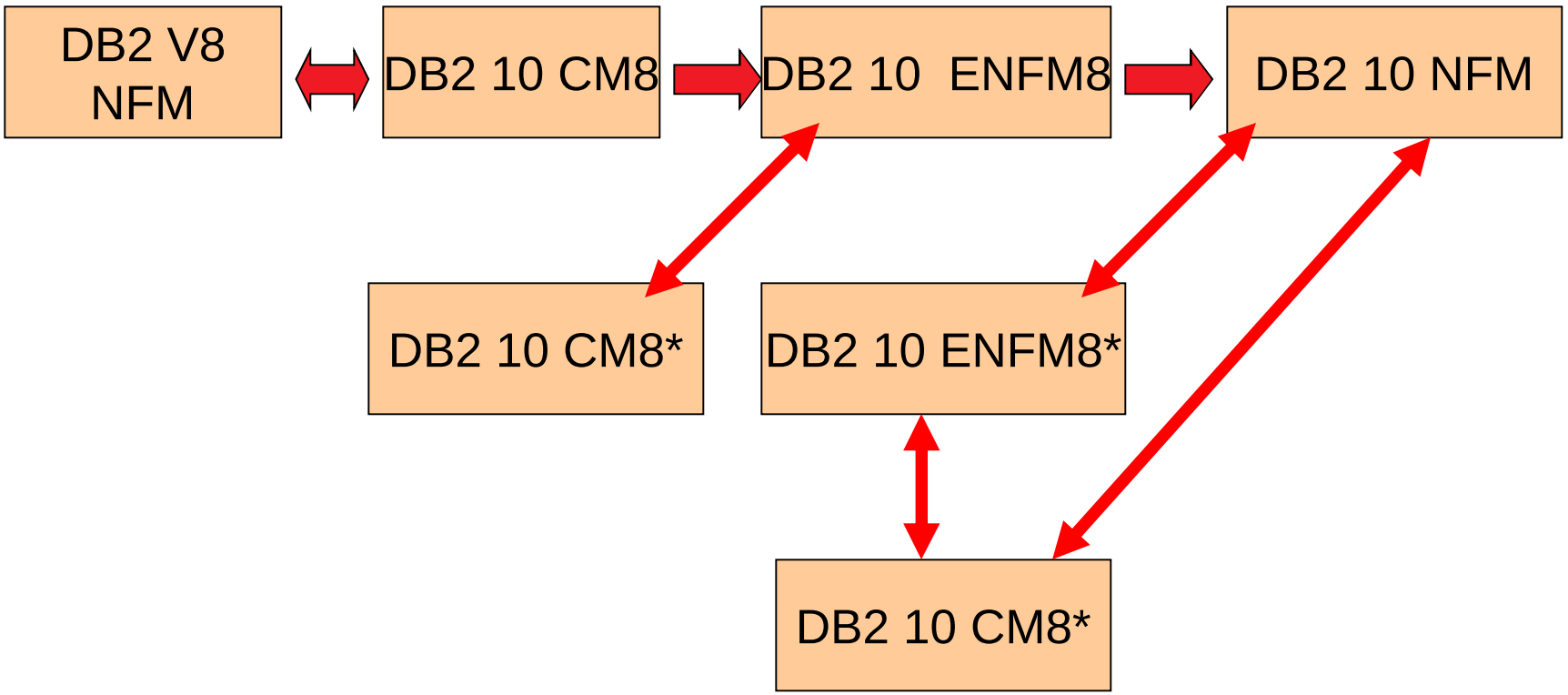
DB2 Migration

- DSNTIJTC – Migrate to Conversion Mode
- DSNTEJEN - Enabling New Function Mode
  - Catalog restructure
    - SMS
    - Row level locking
    - Removal of links (SYSDBASE, SYSPLAN, SYSDBAUT, SYSGROUP, DBD01)
    - PBG tablespaces
- DSNTIJNF - New Function Mode

Migration & Fallback Paths from DB2 9



Migration & Fallback Paths from DB2 V8



Migration and Fallback Testing

- DB2 9 NFM to DB2 10 CM9
- Fallback to DB2 9 NFM from DB2 10 CM9
- Remigration to DB2 10 CM9
- Migration to DB2 10 ENFM9
- Migration to DB2 10 NFM
- Fallback to DB2 10 ENFM9*
- Fallback to DB2 10 CM9*
- Remigration to DB2 10 NFM

Private Protocol is gone

- With DB2 Version 10, private protocol is eliminated.
- The system default is DRDA.
- No longer possible to bind with an override of Private Protocol or to run plans and packages bound with Private Protocol.
- All packages and plans currently bound with private protocol must be converted to DRDA by doing a bind or rebind.
- Remove all occurrences of the DBPROTOCOL parameter from your jcl.

Private Protocol

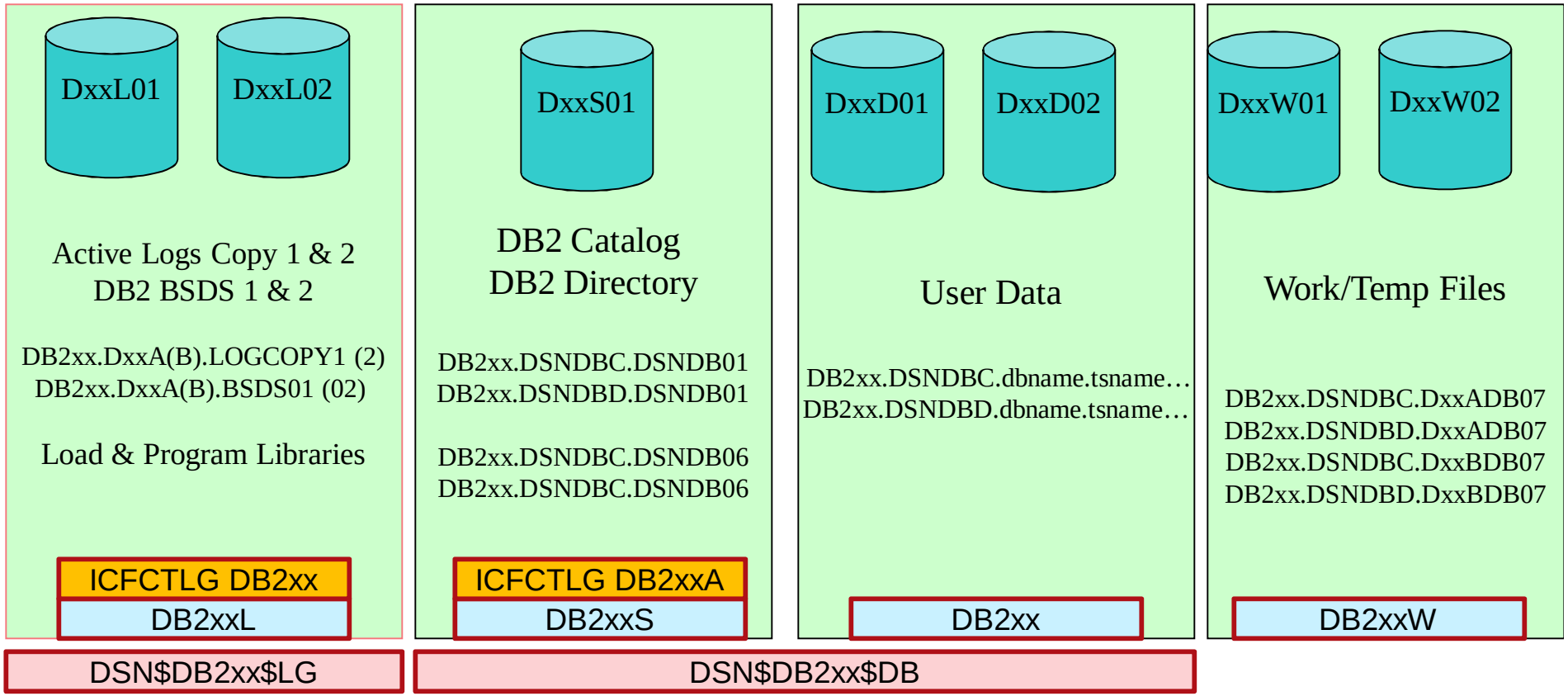
- Apar PK64045
  - Enhanced tooling to identify plans and packages requiring conversion.
  - DSNTP2DP – reports on applications using Private Protocol

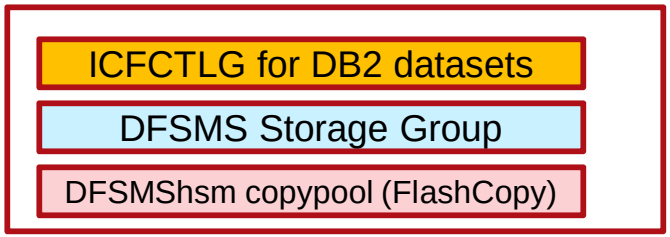
- Apar PK92339
  - Ability to Enable or Disable Private Protocol via ZPARM PRIVATE_PROTOCOL on DSN6FAC macro.
  - Set to ‘NO’ to disable private protocol.
  - Enables testing for elimination of Private Protocol.
    - Rejects inbound private protocol requests
    - Fails outbound private protocol requests
    - Fail BIND, REBIND, BIND PACKAGE COPY

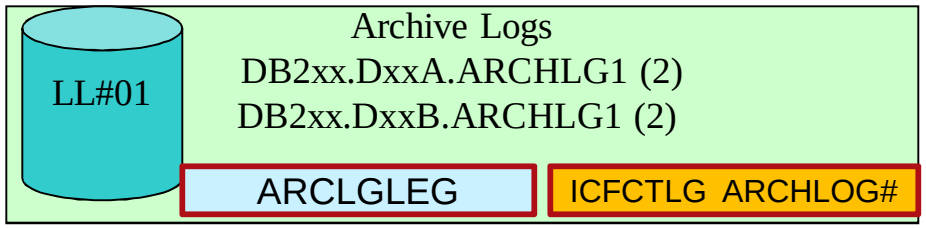
DBRMS

- The ability to bind DBRMs directly into plans is removed.
- DBRMs bound directly into plans must be first bound into packages and then the packages bound into plans.
- DB2 9 APARs PK62876, PK85833 and PM01821 to help prepare for DB2 10.
- DB2 V8 APARs PK79925 and PM01821.
- See ‘Packages Revisited’, SG24-7688, Chapter 4.

DB2 SMS Environment Setup (for Data Sharing)







Catalog Changes

- Reduce contention for DDL, BIND and PREPAREs
- Eliminate 64GB limit on SPT01 (using LOBs)
- DB2 Catalog structures:
  - SMS management
  - LOBs in DB2 Catalog
  - SYSDBASE and other tables to their own tablespace
  - Use row level locking
  - More tablespaces using PBG (partition by growth)

APARs of Interest

- PM08223 – Avoid contention on SYSUTILX. Switches SYSUTILX to MAXROWS 1.
- PM28796 – Improve DB2 catalog performance for GRANT stored procedures
- Compression, BIND performance, Inline LOBs for SPT01
  - PM24721
  - PM27073
  - PM27973
  - PM27811

Performance

- Did not do regression testing.
- Other companies reporting 5 – 15% improvement.
- Improvements in CM after REBIND.
- Probably will increase real storage for a comparable workload. Possibly by as much as 10%. More if adding additional threads.

64 Bit Run Time (Virtual Storage Relief)

- Promising from tests with minimal size SQL with up to 3000 DBAT's.
  - Today we run with MAXDBAT ~ 450 in SAP
- Some concern over ECSA consumed per thread as we scale out DBAT's.
  - We have 2 to 5 active DB2's per LPAR.
- Major benefit to John Deere is currently in the SAP environment.
  - Currently scaling wide due to virtual storage constraints.

Buffer Pool Enhancement - 1 MB Page Size z/OS Frame Support

- DB2 page size is still 4K.
- Exercised this on both Classic and SAP DB2.
- Defined enough 1 MB pages to back one pool.
- Confirmed pool backed via RMF.
- MVS configuration implications still to be worked out.
  - How many pages to set aside as 1MB and keep up with BP size changes, etc.
  - Warning messages and thresholds.

DB2 Plan Stability

- Available in DB2 for z/OS Version 9
- Applies to packages (not plans)
- Also includes non-native SQL procedures, trigger packages, external procedures

DB2 Plan Stability

- Function created for situations where query access path performance degrades when:
  - Migrating to a new release of DB2
  - Applications are rebound after maintenance is applied to DB2
  - Changes in data distribution are reflected in the DB2 Catalog by updated statistics values
  - There are schema changes to the application database objects

DB2 Plan Stabilty

- Controlled at two levels:

  - Subsystem level parameter:

  – turns feature on for all packages

- - REBIND PACKAGE PLANMGMT() option

  PLANMGMT option is not valid with the BIND command (REBIND only).

- Will be activated at the system level as EXTENDED

- Can override system level with REBIND parameters

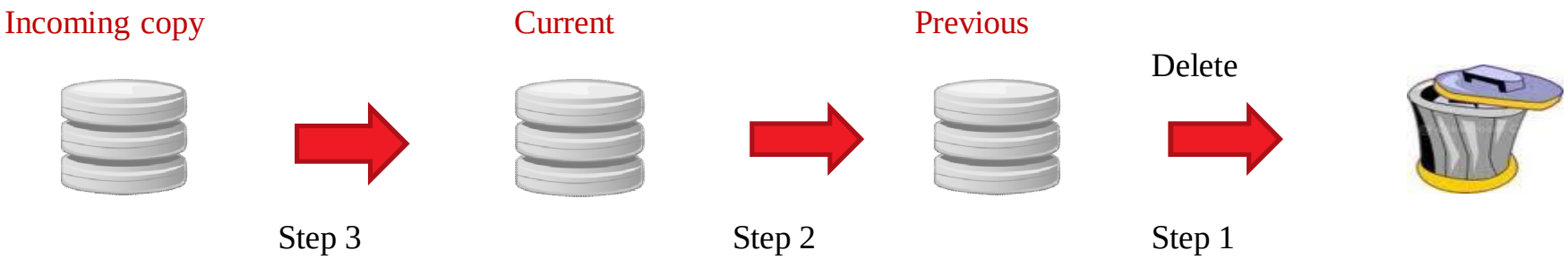
DB2 Plan Stability - Rebind Options

- **REBIND PACKAGE PLANMGMT(BASIC):**
  - one active (“current”) copy, and one additional (“previous”) copy is preserved.

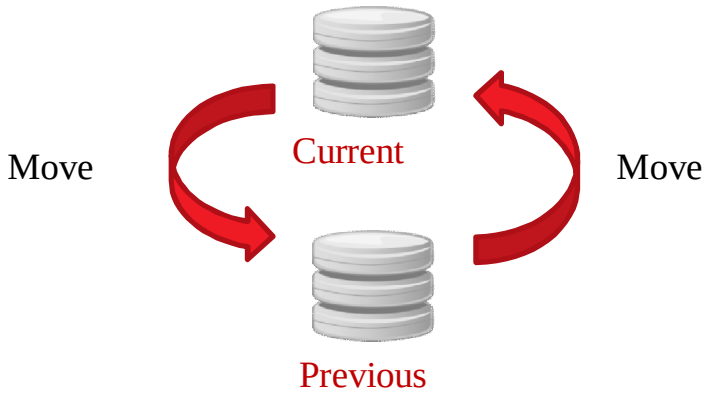
    At Rebind:
    – Any previous copy is discarded.
- - The current copy becomes the previous copy.
- – The incoming copy becomes the current copy.

DB2 Plan Stability

Rebind …. PLANMGMT(BASIC)



Rebind …. SWITCH(PREVIOUS)



DB2 Plan Stability – REBIND Options

- **REBIND PACKAGE PLANMGMT(EXTENDED):**
- retains up to three copies of a package: one active copy and two additional old copies(PREVIOUS and ORIGINAL) are preserved.

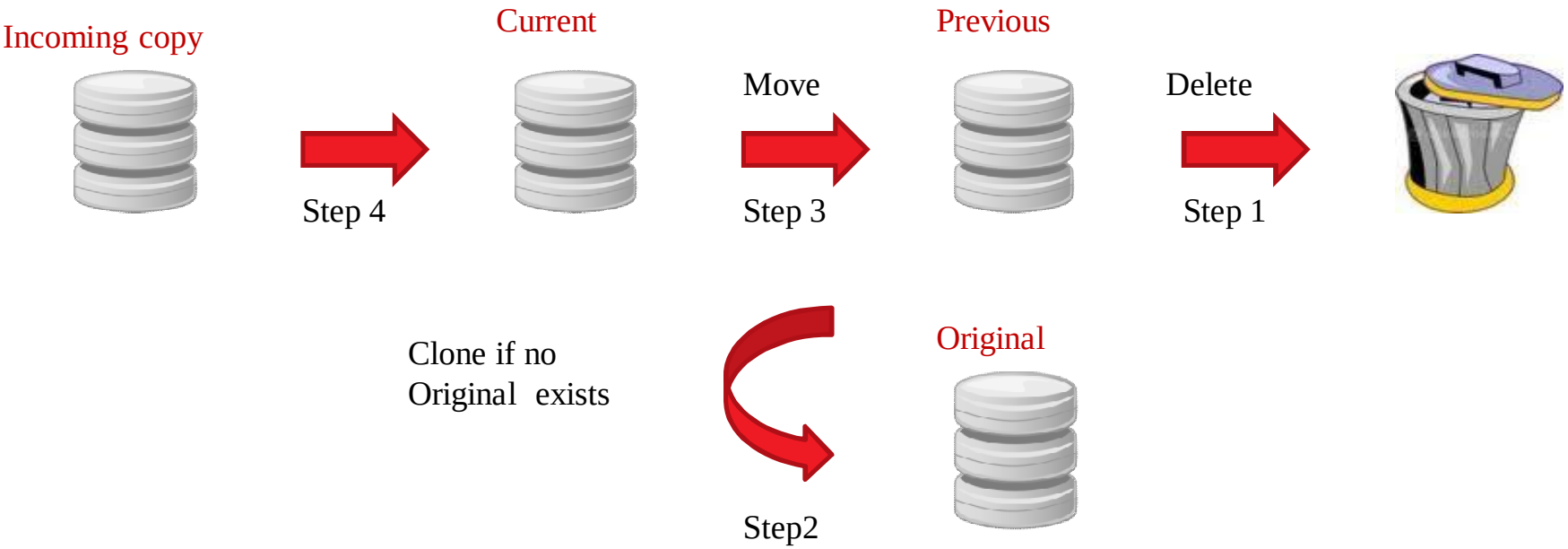
At Rebind:

– Any previous copy is discarded

- – If there is no original copy, the current copy is saved as the original copy
- – The current copy becomes the previous copy
- – The incoming copy becomes the current copy

DB2 Plan Stability

Rebind …. PLANMGMT(EXTENDED)



DB2 Plan Stability – REBIND Options

- If regression occurs, issue REBIND PACKAGE with SWITCH options to restore an old access path.

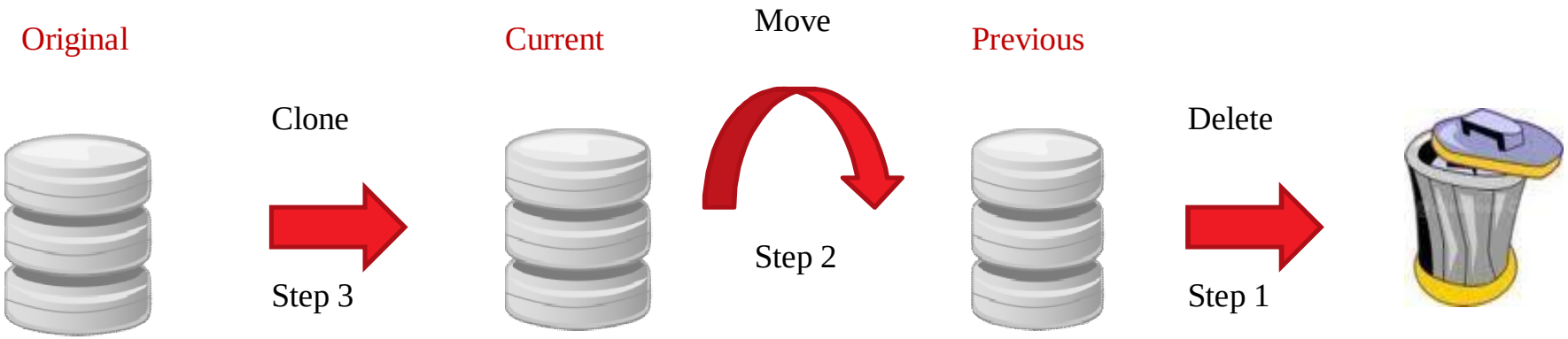
- REBIND PACKAGE SWITCH (PREVIOUS)
  - Switches to last used copy.

- REBIND PACKAGE SWITCH(ORIGINAL)
  - Switches to the oldest copy; the original copy.

DB2 Plan Stability

Rebind …. PLANMGMT(EXTENDED)

Rebind …. SWITCH(ORIGINAL)



DB2 Plan Stability – REBIND Options

- **REBIND PACKAGE PLANMGMT(OFF):**

- This is the default behavior.
- There is no change to the existing behavior.
- A package continues to have one active copy.

DB2 Plan Stability – Deleting Old Packages

- FREE PACKAGE ….. PLANMGMTSCOPE(ALL) –
  frees the entire package including all copies. This is the default.

- FREE PACKAGE ….. PLANMGMTSCOPE(INACTIVE) –
  frees all old copies only (that is, original and previous, if any).

DB2 Plan Stability

- DB2 stores all of the details about a package in the DB2 Directory, but only the active copy is externalized in the Catalog. If an index or other database object is dropped that causes VALID='N' on the original or previous copy of the package, this is not visible in the Catalog until a REBIND with the SWITCH option activates that copy of the package.

  - Issuing a BIND command on a package turns package stability off and only the current access path is retained.

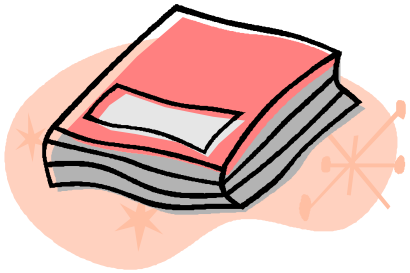
DB2 Plan Stability – DB2 10 Enhancements

- New table, SYSIBM.SYSPACKCOPY: easier tracking of package copies.

- APCOMPARE (future enhancement): can prevent a REBIND or issue warnings at REBIND if the access path is projected to change. APAR PM25679

- APREUSE (future enhancement): can be used with APCOMPARE to issue warning and retain the current access path at REBIND. APAR PM25679.

DB2 Plan Stability Reference



- **DB2 Redbook:**

  DB2 9 for z/OS: Packages Revisited

  http://www.redbooks.ibm.com/abstracts/sg247688.html?Open

  Chapter 10 – Access Path Management
  Section 10.13 – Package Stability

DB2 Plan Stability Testing

- PLANMGMTSCOPE (BASIC) and (EXTENDED)
- FREE PACKAGE… PLANMGMTSCOPE(ALL) and (INACTIVE)
- SWITCH(PREVIOUS) and SWITCH(ORIGINAL)
- Preliminary testing with APCOMPARE and APREUSE
  - Not available at GA
- Tested with DYNAMIC SQL
  - Not available at GA

DB2 Plan Stability

- Currently rolling out this feature (EXTENDED)
- DB2 10 enhancements make this feature more robust and easier to track and manage new vs. old access paths as compared to DB2 9.
- Compressing SPT01 because of the rapid growth of our SPT01 coupled with activating this feature.
- DB2 10 uses LOBs in SPT01.

Online Schema Changes

- Deferred SQL ALTER
  - ALTER changes put on to-do list .
  - Tablespace AREOR status (non-restrictive).
  - SYSIBM.SYSPENDINGDDL – new catalog table.
  - REORG SHRLEVEL REFERENCE or CHANGE materializes pending ALTER.

- ALTER:
  - UTS – page size, buffer pool, DSSIZE, SEGSIZE, MEMBER CLUSTER
  - Single table segmented to UTS PBG.
  - Classic partitioned table to UTS PBR.
  - (Can not convert classic tablespace or UTS PBR to UTS PGB.)

Online Schema Changes

- Successful functional tests.
  - Alter to PBG and DSSIZE 16 GB
  - Alter index from BP3 to BP8K0
  - Alter tablespace from BP2 to BP16K0
  - Alter DSSIZE 4G to 64G and SEGSIZE 32 to 48.

Online Schema Changes

- AREOR status not reset on ALTER TABLESPACE ... DROP PENDING CHANGES
  - Run REPAIR SET to clear the advisory state.
  - Entered an enhancement request.
- Alter indexes to COMPRESS YES
  - Test put index in PSRBD state.
  - Had to rebuild index.

Online Schema Changes

- High importance for our SAP DB2 systems.
- Functionality worked in testing.
- Failure occurred with workload on tablespace.
  - Workload with SHRLEVEL(CHANGE) reorg.
  - SAP transactions started getting -913 timeout with reason code 00C900BA or -904 unavailable resource with reason code 00C90082.
  - Reorg failed in SWITCH phase with S04E and reason code 00E70081.
- APAR PM25648 opened.
- APAR PM25648 suped by PM27940.
  - APAR PM27940 text is not indicative of the problem.
  - UK69816 is available.

DB2 10 Online REORG Enhancements

- Reorg of non-consecutive partitions worked.
  - Ported to DB2 9 with APARS:
    - PK87762
    - PK13259
    - PK25525
    - PK37293
- Reorg of PBG still leaves empty partitions allocated.

Online REORG Enhancements

- REORG SHRLEVEL CHANGE for LOB tablespace worked.
- REORG SHRLEVEL CHANGE with AUX YES on base table worked.
  - AUX YES ignored if not UTS
    - » DSNU124I -X97A 258 06:57:36.59 DSNURFIT - AUX YES SPECIFICATION IS IGNORED AND AUX NO IS IN EFFECT FOR CURRENT UTILITY EXECUTION
  - After base table converted to PBG, AUX YES reorged base table and its LOB tablespaces
    - » DSNU1155I -X97A 258 14:53:56.79 DSNURFIT - AUXILIARY TABLESPACE LX60XAAA.LREPODVF WILL BE REORGANIZED IN PARALLEL WITH BASE TABLESPACE

Dynamic Logcopy Allocation

1. Created and intialized (DSNJLOGF) two new logcopy datsets (dual logging)

2. Issued:

-SET LOG NEWLOG(DB299.LOGCOPY1.DS04) COPY(1)
-SET LOG NEWLOG(DB299.LOGCOPY2.DS04) COPY(2)

DSNJ363I -DB99 DSNJW106 COPY1 LOG DATA SET DB299.LOGCOPY1.DS04 ADDED TO THE ACTIVE LOG INVENTORY

DSNJ363I -DB99 DSNJW106 COPY2 LOG DATA SET DB299.LOGCOPY2.DS04 ADDED TO THE ACTIVE LOG INVENTORY

3. BSDS:

2010.201 9:44 DSN=DB299.LOGCOPY1.DS04
PASSWORD=(NULL) STATUS=NEW, REUSABLE
2010.147 10:00 DSN=DB299.LOGCOPY1.DS01
PASSWORD=(NULL) STATUS=TRUNCATED, REUSABLE
2010.147 10:00 DSN=DB299.LOGCOPY1.DS02
PASSWORD=(NULL) STATUS=TRUNCATED, REUSABLE
2010.147 10:00 DSN=DB299.LOGCOPY1.DS03
PASSWORD=(NULL) STATUS=NOTREUSABLE

Dynamic Logcopy Allocation

- Multiple logs added with “-SET LOG” commands.
  - SET LOG NEWLOG(DB2X97.X97A.LOGCOPY1.DS08) COPY(1)
  - SET LOG NEWLOG(DB2X97.X97A.LOGCOPY1.DS07) COPY(1)
  - SET LOG NEWLOG(DB2X97.X97A.LOGCOPY2.DS08) COPY(2)
  - SET LOG NEWLOG(DB2X97.X97A.LOGCOPY2.DS07) COPY(2)
- They get used in LIFO order.

Autonomic Checkpoint Interval

- Changed

CHKFREQ=10,
CHKLOGR=NOTUSED,
CHKMINS=NOTUSED,
CHKTYPE=SINGLE

to

CHKFREQ=NOTUSED,
CHKLOGR=1000,
CHKMINS=10,
CHKTYPE=BOTH

- DSNJ371I -X97B DB2 RESTARTED 20:09:45 DEC 22, 2010

  RESTART RBA 0182B6001000

  CHECKPOINT FREQUENCY 10 MINUTES OR 1000 LOGRECORDS

- Checkpoint interval is both minutes and log records.
- With CHKLOGR, DSNR035I messages appear at irregular interval as expected and this can be sooner than our current process.

Long Running Reader Warning Messages

- LRDRTHLD=10.

- Message DSNB260I:

```
10195 0749061 CPUZ X97AMSTR DSNB260I  -X97A DSNB1PCK WARNING - A
   READER HAS BEEN
10195 0749061 CPUZ X97AMSTR RUNNING FOR 10 MINUTES
10195 0749061 CPUZ X97AMSTR CORRELATION NAME=X97BTC023
10195 0749061 CPUZ X97AMSTR CONNECTION ID=SERVER
10195 0749061 CPUZ X97AMSTR LUWID=CC35D00F.C1E2.C646887AD8D6=27
10195 0749061 CPUZ X97AMSTR PLAN NAME=DISTSERV
10195 0749061 CPUZ X97AMSTR AUTHID=SDB2X97
10195 0749061 CPUZ X97AMSTR END USER ID=DY00817
10195 0749061 CPUZ X97AMSTR TRANSACTION NAME=RFALEX00
10195 0749061 CPUZ X97AMSTR WORKSTATION
   NAME=ZF_DAILY_EXCHANGE_
```

Dataset-level Flashcopy Support

- COPY
- RECOVER
- REORG
- LOAD
- REBUILD INDEX
- REORG INDEX

FlashCopy Enhancements

- COPY and REORG utilities used FlashCopy image copy datasets.
- Choosing FlashCopy image copy dataset names a challenge
  - Name needs to allow for .D suffix since datasets are VSAM cluster
  - Want database, tablespace, date & time in dataset name but kept .exceeding 44 character limit. DB2X97.FCIC.LX60XAAA.LREPODVF.P00002.D2011006.D is 47 characters.
- How to manage FC IC datasets?
  - If use HSM and FC IC dataset migrated, RECOVER fails.
  - For RECOVER, manually find and recall FC IC dataset.

FlashCopy Enhancements

- RECOVER can not be used if there is an existing FC relationship such as an incremental FlashCopy established.

ADR918I (001)-ALLOC(04), FAST REPLICATION COULD NOT BE USED FOR DATA SET DB2X97.FCIC.SX60XAAA.REPOSRC.P00001.C2, RETURN CODE 9

VOLUME X97D02 WAS REJECTED FOR QFRVOLS VOLUME REASON

CODE C - FULL VOL FC SOURCE RELATION

FlashCopy Enhancements

- Target can not be in FC relationship when RECOVER runs.
  - We use incremental FC for BACKUP SYSTEM so we always have FC relationship.
  - Restriction now documented in DB2 10 manuals.
- FC IC recorded in SYSCOPY even if COPY fails
  - APAR PM28390.

Enhanced System Level Monitoring

- DB2 10 NFM
- SYSIBM.DSN_PROFILE_TABLE
- SYSIBM.DSN_PROFILE_ATTRIBUTES
- SYSIBM.DSN_PROFILE_HISTORY
- Filtering and threshold monitoring
  - Number of threads
  - Number of connections
  - Idle thread timeout

Enhanced System Level Monitoring

- Four filtering categories
  - IP address or DSN name (IPADDR)
  - Product Identifier (PRDID)
  - Role and/or Authorization id (ROLE, AUTHID)
  - Collection ID and/or Package Name (COLLID, PKGNAME)

Enhanced System Level Monitoring

- Tested DSN_PROFILE table with IPaddress and Authid.
-
- Design in DB2 10 assumes you know the workload causing the problems.

- Explicit limits are for well known applications.
  - There are too many requesting entities (AUTHIDs, IP addresses, etc.) for us to specify explicit limits.
  - No wild carding available.
  - No defaults available.

Enhanced System Level Monitoring - Enhancement Request

- Ability to specify defaults.
- Ability to give more specifically qualified resource connection or warning limits that are either smaller or larger than the defaults.
- Display in DLOG or IFCID's or some place that works well with automation tools and historical data gathering.
- Ability to distinguish different classes of requestors; prod, test, developer, business user

Autonomic Statistics

- Decided not to test.
- No user interface.
- Need tooling to support it.
- Auto Stats similar to a vendor product already installed.
- Administrative Task Scheduler .
- Thresholds need to be set.
- Set times to run RUNSATS.

Tablespaces

- Default table space is segmented.
  - CREATE TABLESPACE tsname

- Partitioned table space specifying NUMPARTS without specifying SEGSIZE
  - DB2 9 = classic partitioned tablespace
  - DB2 10 = UTS/PBR
    - Could impact existing DDL (CREATE INDEX)
    - DPSEGSZ – new ZPARM that allows you to specify a default for SEGSIZE so that existing DB2 9 DDL will be compatible.

LASTUSED Column

- SYSPACKAGE
- SYSPLAN

Post-GA APARS

- APREUSE, APCOMPARE - PM25679
- Inline LOBs for SPT01 - PM27811 and PM27073
- Online REORG concurrency for materializing deferred ALTERs – previously PM25648, now PM27940.
- Delete Data Sharing member – PM42528
- Additional System Profile Monitoring – PM28500
  - 3 new columns for userid, appname, and workstation
  - Wildcard support: if column is '*' then all threads pass that qualification
- Real Storage Statistics enhancements – PM24723 and PM37647.

DB2 10 for z/OS Beta Summary

- Migration
- No regression testing
- Virtual Storage Relief
- Online Dynamic Schema changes

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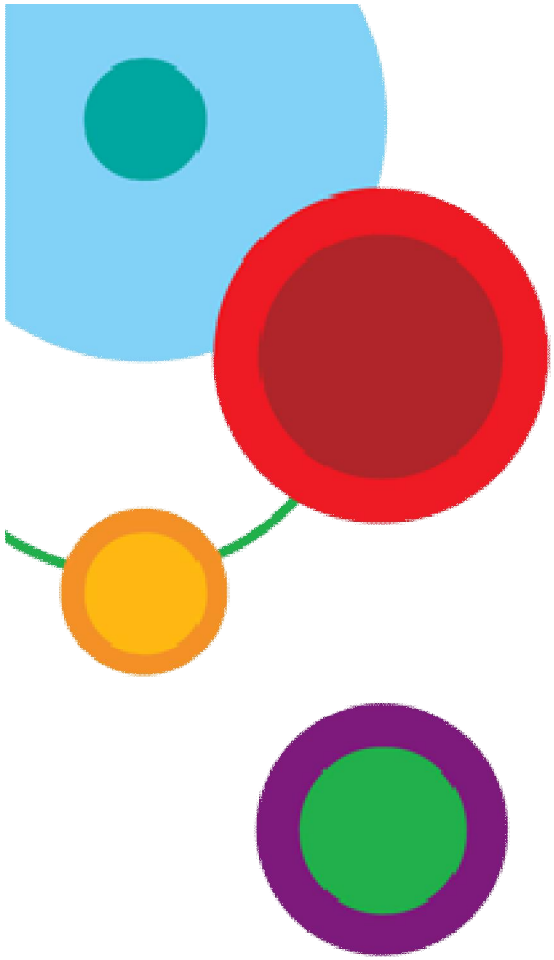

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