

# Implementing Expanded RBA/LRSN in DB2 11 for z/OS



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# David Simpson



David Simpson is currently the Vice President of Themis Inc. He teaches courses on SQL, Application Programming, Database Administration as well as optimization, performance and tuning. He also installs and maintains the database systems used for training at Themis and works with our network of instructors to deliver high quality training solutions to our customers worldwide.

Since 1993 David has worked as a developer and DBA in support of very large transactional and business intelligence systems. David is a certified DB2 DBA on both z/OS and LUW. David was voted Best User Speaker and Best Overall Speaker at IDUG North America 2006. He was also voted Best User Speaker at IDUG Europe 2006 and is a member of the IDUG Speakers Hall of Fame. David is also an IBM Champion for Information Management.

dsimpson@themisinc.com

[www.themisinc.com](http://www.themisinc.com)

@ThemisDave



# Agenda

- DB2 Logging Overview
- Basic vs Extended Format
- Working through the conversion

# RBA & LRSN

- Logging in DB2 is tracked by a Relative Byte Address (RBA) for a single DB2 subsystem and a Log Record Sequence Number (LRSN) in a Data Sharing Group.
- Each is 6 bytes long pre-DB2 11
- RBA can tolerate 256 TB of log over the life of the subsystem.
- LRSN is based on the clock and will run out in 2042 with some exceptions.

# Basic vs Extended Format

- DB2 11 allows for a 10 byte “Extended” RBA/LRSN
- Conversion requires updates to the BSDS, catalog and every application tablespace and index
- The conversion may be done at your discretion but must be complete before exhausting the 6 byte values.

# Reaching the End

- DSNJ032I issued at x'F00000000000' as a warning.
- DSNJ032I issued again at x'FFFF00000000' and DB2 shuts down.



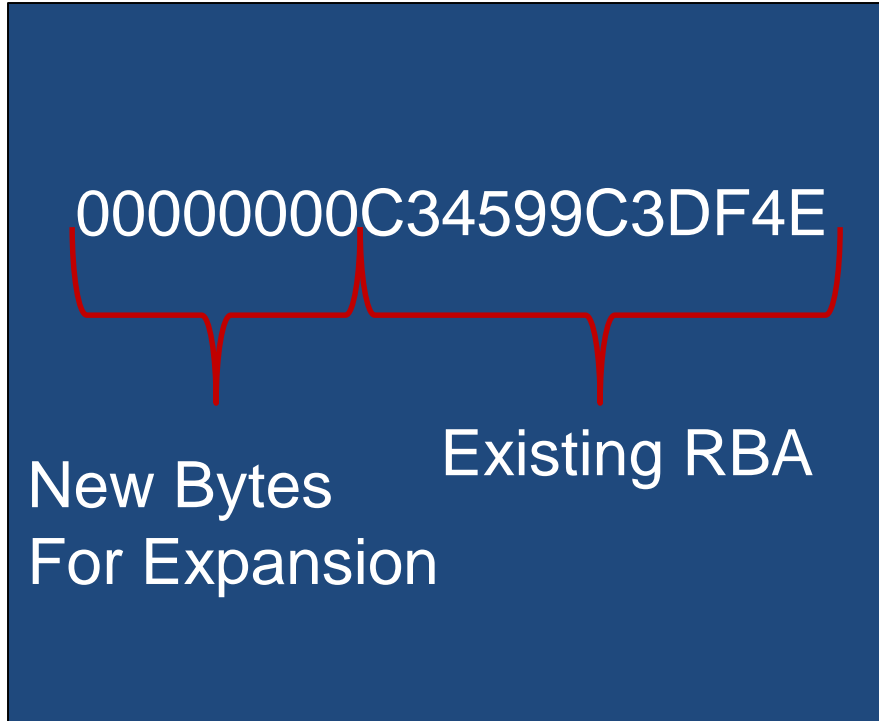
# DB2 11 Messages

Beginning in DB2 11 CM the messages will “speak” in terms of the larger RBA / LRSN regardless of whether or not the conversion is complete.

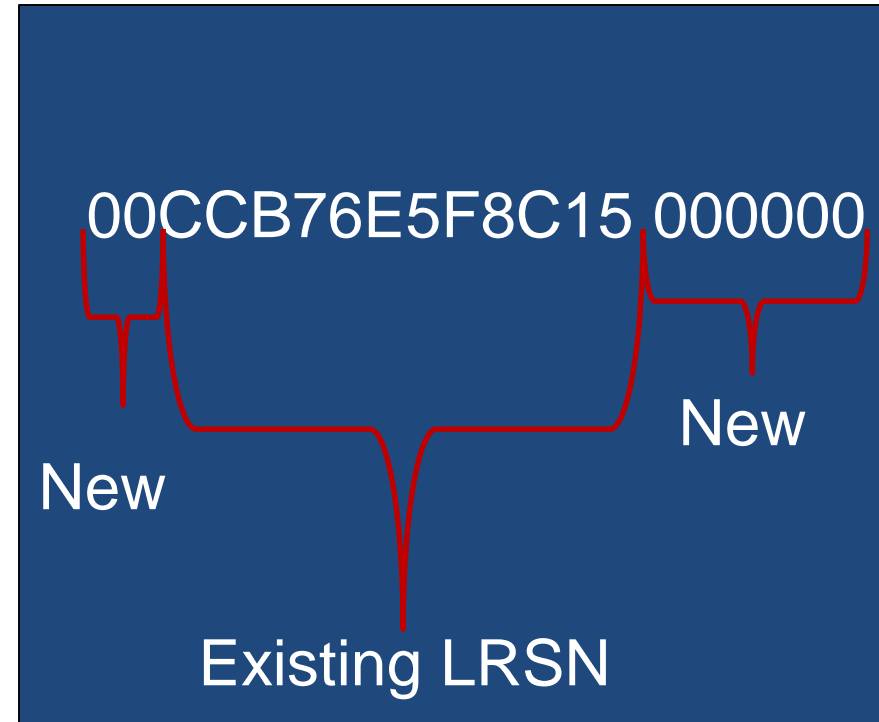
```
DSNJ001I  -BC DSNJW007 CURRENT COPY 1 ACTIVE LOG DATA 168  
SET IS DSNAME=DB1C.LOGCOPY1.DS03,  
STARTRBA=00000000000000CA80000, ENDRBA=00000000000000EC3FFFF  
DSNJ099I  -BC LOG RECORDING TO COMMENCE WITH 169  
STARTRBA=00000000000000E092000  
C DB1COPY1
```



# RBA & LRSN Format



RBA



LRSN

# DB2 11 “Limits”

- “Soft” Limit
  - RBA x'FFF800000000' or 2 months before LRSN max
  - Objects with “Basic” format are read only
  - If SYSTSCP, SYSUTILX or SYSLGRNX have not been converted then most utility processing is disallowed
- “Hard” Limit
  - RBA x'FFFFFFFFFFFFFF' or end of actual LRSN
  - Soft Limit restrictions continue
  - If BSDS has not been converted DB2 will not start

# Steps to Larger RBA/LRSN

- Convert the Bootstrap Dataset(s) – DSNTIJCB
  - DB2 must be down!
  - Very fast (a few minutes at most).
  - When this is done warning messages stop.
  - Log records begin using the longer RBA at this time(!)
- Convert the Catalog / Directory – DSNTIJCV
  - Involves online reorgs of catalog & directory
  - No application outage necessary
  - Could take a while depending on the size of your catalog
- Convert Application Tablespaces / Indexes via the REORG utility

# Printing the BSDS

```
//PLM      EXEC PGM=DSNJU004
//STEPLIB DD DSN=DSNB10.SDSNLOAD,DISP=SHR
//GROUP    DD DSN=DB1C.BSDS01,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSIN    DD *
           MEMBER *
```

```
*****
DSNJCNVB CONVERSION PROGRAM HAS RUN      DDNAME=GROUP
DSNJCNVT CONVERSION PROGRAM HAS NOT RUN  DDNAME=GROUP
LOG MAP OF BSDS DATA SET COPY 1, DSN=DB1C.BSDS01
LTIME INDICATES LOCAL TIME, ALL OTHER TIMES ARE GMT.
DATA SHARING MODE IS OFF
SYSTEM TIMESTAMP      - DATE=2014.046   LTIME= 0:57:13.10
UTILITY TIMESTAMP     - DATE=2014.028   LTIME=14:29:48.85
VSAM CATALOG NAME=DB1C
HIGHEST RBA WRITTEN   000000000000017470BD8  0000.000
HIGHEST RBA OFFLOADED 00000000000001733FFFF
RBA WHEN CONVERTED TO VA 00000000000000000000
```

# Application Objects

- REORG, LOAD or REBUILD may be used.
- Format of new objects is controlled by zParm OBJECT\_CREATE\_FORMAT
  - BASIC
  - EXTENDED
- Default for conversion of objects is controlled by zParm UTILITY\_OBJECT\_CONVERSION
  - BASIC
  - EXTENDED
  - NOBASIC
  - NONE

# Converting with REORG

```
//DSNUPROC.SYSIN DD *  
LISTDEF RERGLIST INCLUDE TABLESPACE DTHM82.TS00DEPT  
REORG TABLESPACE LIST RERGLIST  
SHRLEVEL REFERENCE COPYDDN(REGCOPY)  
RBA/RSN_CONVERSION EXTENDED
```

```
SORTBLD PHASE COMPLETE, ELAPSED TIME = 00:00:01  
- TABLESPACE DTHM82.TS00DEPT CONVERTED BY KEYWORD TO EXTENDED RBA/LRSN FORMAT  
- INDEXSPACE DTHM82.XDEPT01 CONVERTED BY KEYWORD TO EXTENDED RBA/LRSN FORMAT  
- INDEXSPACE DTHM82.XDEPT02 CONVERTED BY KEYWORD TO EXTENDED RBA/LRSN FORMAT  
- INDEXSPACE DTHM82.XDEPT03 CONVERTED BY KEYWORD TO EXTENDED RBA/LRSN FORMAT  
SWITCH PHASE COMPLETE, ELAPSED TIME = 00:00:00  
DB2 IMAGE COPY SUCCESSFUL FOR TABLESPACE DTHM82.TS00DEPT  
UTILITY EXECUTION COMPLETE, HIGHEST RETURN CODE=0
```

# Considerations

- BSDS will be BASIC upon new install or conversion until you run DSNTIJCB.
- Catalog is EXTENDED for new install
- Unless you are close to the limits you should plan a gradual conversion after NFM migration is complete.
- EXTENDED is not an option while in DB2 11 CM.
- Performance degradation may happen when the BSDS is BASIC but objects are EXTENDED.
- Plan your conversion and zParm settings accordingly.

# More Considerations

- Larger RBA means 18 fewer bytes on each data page for data.
- DSSIZE could overflow on REORG.
- Instrumentation (including IFCID 306) begins writing larger RBAs in DB2 11 CM before any actual conversion happens.
- Check your 3<sup>rd</sup> party tools!



# Catalog Support

## New Column in SYSTABLEPART & SYSINDEXPART:

Source: DB2 11 for SQL Reference Guide (SC19-4066)

RBA_FORMAT	CHAR(1) NOT NULL WITH DEFAULT	Indicates the format of the RBA/LRSN.	G
		B Basic, 6-byte RBA/LRSN format.	
		E Extended, 10-byte RBA/LRSN format.	
		U Undefined. DEFINE NO was specified when creating the table space, and the table space is not an XML table space with XML versions.	
		blank For migrated objects.	

May not be correct if any “outside-of-DB2” process has been used

Thanks for Attending!

Find me at:

[dsimpson@themisinc.com](mailto:dsimpson@themisinc.com)

Twitter: @ThemisDave

[www.themisinc.com](http://www.themisinc.com)