

**IDUG**  
2022 NA **Db2** Tech Conference



# Ready Player One! From Level V121R1M501 to V13

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Session Code: B04

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# Agenda

- Db2 13 migration in a nutshell
- Continuous Delivery in short
- Db2 12 journey from V12R1M501 to V12R1M510
- Db2 13 pre-migration considerations
- Deprecated functions, Incompatible changes, zParms
- Questions

# Db2 13 Migration in a Nutshell



# Migration to Db2 13

- Utilizes continuous delivery!
  - Pretty smooth and simple
- Skip release from Db2 11 not possible
- You need to be at
  - Function Level: **V12R1M510**
  - Catalog Level: **V12R1M509**
- You do not have to use all the V12 features
  - But there are some considerations
- For your applications consider a proper **APPLCOMPAT!**
  - Even V10R1 is still available and fully supported

# Changes in Migration to Db2 13

- Db2 12:

Function Level	Catalog level
V12R1M100	V12R1M500
V12R1M500	V12R1M500

- Db2 13

Function Level	Catalog level	Notes
V13R1M100	V13R1M100	Structurally identical to V12R1M509
V13R1M500	V13R1M100	New functions that <b>do not require</b> catalog changes
V13R1M501	V13R1M501	New functions that <b>require</b> catalog changes <b>Newly</b> installed system <b>starts here</b>

# Migrations to Db2 13

- Initial catalog level **V13R1M100** benefits:
  - Simplified Db2 12 fall back code
    - Db2 12 does not need to understand Db2 13 catalog
  - Elimination of invalidated packages that depend on the catalog
  - Simplified CATMAINT
    - Just a release marker

```
DSNU777I  DSNUECM0 - CATMAINT UPDATE STATUS - BEGINNING MIGRATION SQL PROCESSING PHASE.  
DSNU777I  DSNUECM0 - CATMAINT UPDATE STATUS - UPDATING DIRECTORY WITH NEW RELEASE MARKER.
```

- Utilizes **-DIS BLOCKERS**
  - Also available in Db2 12!
  - BLOCKING\_THREADS built-in table function

# Coexistence mode

- V13R1M100 can coexist with V12R1M510
  - V13R1M500 cannot be activated if there are still any V12 members
- The highest possible function level is displayed depending on which subsystem you run –DIS GROUP
  - On a V12 SSID displays V12R1M510
  - On a V13 SSID displays V13R1M100

```
HIGHEST ACTIVATED FUNCTION LEVEL(V13R1M100)  
HIGHEST POSSIBLE FUNCTION LEVEL(V13R1M100)  
PROTOCOL LEVEL(2)
```

```
HIGHEST ACTIVATED FUNCTION LEVEL(V13R1M100)  
HIGHEST POSSIBLE FUNCTION LEVEL(V12R1M510)  
PROTOCOL LEVEL(2)
```

**Example: Running a DISPLAY GROUP command run on a Db2 12 member during coexistence with Db2 13**

The following example output shows the result of running the following command on a Db2 12 member in the data sharing group from the previous example:

```
-DB2B DISPLAY GROUP DETAIL
```

Because the command was run on a Db2 12 member, the highest possible function level indicates V12R1M510, which is the highest level that you can activate by issuing an ACTIVATE command. However, the current function level indicates V13R1M100 because at least one member has been migrated to Db2 13.

```
-DISPLAY GROUP DETAIL  
DSN7100I -DB2C DSN7GCMDB  
*** BEGIN DISPLAY OF GROUP(DSN7CAT ) CATALOG LEVEL(V13R1M100)  
CURRENT FUNCTION LEVEL(V13R1M100)  
HIGHEST ACTIVATED FUNCTION LEVEL(V13R1M100)  
HIGHEST POSSIBLE FUNCTION LEVEL(V12R1M510)  
PROTOCOL LEVEL(2)  
GROUP ATTACH NAME(DSNG)  
-----  
DB2 MEMBER ID SYS CMDPREF STATUS DB2 LVL SYSTEM NAME IRLM SUBSYS IRLMPROC  
-----  
DB2A 1 DB2A -DB2A ACTIVE 131501 MVSA DJ2A DB2AIRLM  
DB2B 2 DB2B -DB2B ACTIVE 121510 MVSB DJ2B DB2BIRLM  
DB2C 3 DB2C -DB2C ACTIVE 131501 MVSC DJ2C DB2CIRLM  
-----  
DISPLAY SUBGROUP ATTACH INFORMATION FOR GROUP ATTACH DSNG  
-----  
SCA STRUCTURE SIZE: 12288 KB, STATUS= AC, SCA IN USE: 8 %  
LOCK1 STRUCTURE SIZE: 12288 KB  
NUMBER LOCK ENTRIES: 1048576  
NUMBER LIST ENTRIES: 23073, LIST ENTRIES IN USE: 7  
SPT01 INLINE LENGTH: 32138  
*** END DISPLAY OF GROUP(DSN7CAT )  
DSN9022I -DB2C DSN7GCMDB 'DISPLAY GROUP ' NORMAL COMPLETION
```







# Continuous Delivery

- **Code level** represents the state of the target libraries (Maintenance level)
  - Member specific
- **Catalog level** represents the state of the Db2 catalog
  - Cumulative
  - Group wide
  - **CATMAINT UPDATE LEVEL**
    - Allows specifying catalog level or target function level and Db2 will determine to appropriate catalog level (PI88058)
  - Prevents backing off any maintenance
- **Function level** specifies the level of SQL and other features available for use
  - Cumulative
  - Group wide
  - **-ACTIVATE FUNCTION LEVEL**
- Applications remain stable until rebound with a higher **APPLCOMPAT**

# Continuous Delivery

- Display format of levels is VvvRrMmmmf where
  - vv stands for the version (12)
  - r is the release number (1)
  - mmm stands for the level number (100, 500, 501, 502, 503, ..., 510)
  - f is a fallback indicator \* if applicable (applies to function level only)
- Example: **V12R1M501**
- A shortened version vvrmmm used for code level (**121501**)

# Continuous Delivery

- -DISPLAY GROUP:

```
DSN7100I  !DSN2 DSN7GCMD
```

```
*** BEGIN DISPLAY OF GROUP(DSNGRP1 ) CATALOG LEVEL(V12R1M509)  
CURRENT FUNCTION LEVEL(V12R1M510)  
HIGHEST ACTIVATED FUNCTION LEVEL(V12R1M510)  
HIGHEST POSSIBLE FUNCTION LEVEL(V12R1M510)  
PROTOCOL LEVEL(2)  
GROUP ATTACH NAME(DSNG)
```

```
-----  
DB2          SUB          DB2    SYSTEM    IRLM  
MEMBER      ID   SYS  CMDPREF  STATUS  LVL     NAME     SUBSYS  IRLMPROC  
-----  
DSN1         1  DSN1 !DSN1   ACTIVE  121510  SYS1     IRL1    DSN1IRLM  
DSN2         2  DSN2 !DSN2   ACTIVE  121510  SYS2     IRL2    DSN2IRLM  
DSN3         3  DSN3 !DSN3   ACTIVE  121510  SYS3     IRL3    DSN3IRLM  
-----
```

# Application Compatibility Considerations

- APPLCOMPAT
  - Controls DML, DDL, DCL (in Db2 11 only for DML)
    - Don't forget your admin tools
  - **Default value comes from APPLCOMPAT ZPARM**
    - Do not rely on the ZPARM, but always code APPLCOMPAT explicitly in BIND
    - Recommendation is to stabilize ZPARM at certain (conservative) level (ex. V12R1M500).
  - APPLCOMPAT syntax applies to
    - packages (BIND and REBIND), triggers (REBIND only), functions and procedures (CREATE and ALTER)
  - **May be less or equal to the currently activated function level**
    - Otherwise throws an error!
  - Allowed values:
    - V10R1, V11R1 = V12R1M100, V12R1 = V12R1M500, VvvRrrMxxx
- **Monitor application incompatibilities** using IFCID 239 and details using IFCID 376
- Keep in mind that not everything is application related (utils, zParms, ...)

# Function Level, cont.

- Fallback (lower, star) function level
  - Can be activated as a lower level than the highest activated level in case of issues
  - The packages previous bound with the higher level will continue to work
    - **APPCOMPAT on REBIND is using the existing value (is sticky)**
    - Explicit binds need to use APPLCOMPAT with the star level
  - Example: from V12R1M501 to V12R1M500 ends in V12R1M500\*
    - No new application can be bound with V12R1M501, but existing applications will continue to run with the previous level
  - **Does not change the code level nor catalog level**
    - does not enable you to remove maintenance and start Db2 at any code level lower than the catalog level!
  - **Does not enable you to remove maintenance** and start Db2 at any code level lower than the catalog level or highest ever activated function level

# SYSIBM.SYSLEVELUPDATES catalog table

FUNCTION_LVL	PREV_FUNCTION_LVL	HIGH_FUNCTION_LVL	CATALOG_LVL	OPERATION_TYPE	EFFECTIVE_TIME	OPERATION_TEXT
V12R1M100	V11R1M500	V12R1M100	V12R1M500	C	2016-07-05-15.19.43.896521949218	CATMAINT PROCESSING
V12R1M500	V12R1M100	V12R1M500	V12R1M500	F	2016-07-05-15.20.17.3207900546870	-ACTIVATE FUNCTION LEVEL(V12R1M500)
V12R1M500	V12R1M100	V12R1M500	V12R1M500	M	2018-01-05-16.25.03.897987700195	CATMAINT PROCESSING - A5 CLEARED
V12R1M500	V12R1M100	V12R1M500	V12R1M502	C	2018-03-07-15.24.54.672765723632	CATMAINT PROCESSING - V12R1M502
V12R1M502	V12R1M500	V12R1M502	V12R1M502	F	2018-03-15-15.28.50.4204731440422	-ACTIVATE FUNCTION LEVEL(V12R1M502)



# Ready Player One!

Function levels summary





# V12 Function/Catalog levels summary



Function Level	Catalog Level	Incompatible changes	Challenge
<b>V12R1M100</b>	<b>Yes</b>	<b>Yes</b>	<i>Time to move forward!</i>
<b>V12R1M500</b>	<b>No</b>	<b>Yes</b>	<i>You start at least here, right?</i>
V12R1M501	No	No	Find the Easter Egg!
<b>V12R1M502</b>	<b>Yes</b>	No	Shall we play an encryption game?
<b>V12R1M503</b>	<b>Yes</b>	<b>Yes</b>	This will be temporal!
<b>V12R1M504</b>	No	<b>Yes</b>	Speedup your UTS conversion!
<b>V12R1M505</b>	<b>Yes</b>	<b>Yes</b>	WaRRiors on the run!
<b>V12R1M506</b>	No	<b>Yes</b>	Drop the spaces!
<b>V12R1M507</b>	<b>Yes</b>	No	Control your locking limits!
V12R1M508	No	No	Move the tables!
<b>V12R1M509</b>	<b>Yes</b>	No	Choose your compression!
V12R1M510	No	No	Find the key for V13!

# V13 Function/Catalog levels summary

Function Level	Catalog Level	Incompatible changes
<b>V13R1M100</b>	<b>Yes</b> , but = V12R1M509	<b>Yes</b> (see later slides)
V13R1M500	No	No
<b>V13R1M501</b>	<b>Yes</b>	No

V12R1M501

Find the Easter Egg!



# V12R1M501

- [PI70535](#)
- new **LISTAGG** function, SQL 2016

```
SELECT workdept, LISTAGG(ALL lastname, ', ' )
      WITHIN GROUP (ORDER BY workdept, lastname)
FROM dsn81210.emp GROUP BY workdept;
```

```
| WORKDEPT |
+-----+
| A00      | HAAS, HEMMINGER, LUCCHESI, O'CONNELL, ORLANDO
| B01      | THOMPSON
...

```

# V12R1M501 considerations

SQLCODE -30025

DSNL076I !DSN1 DSNLXRSS **DDF CONNECTION REJECTED** DUE TO  
INCOMPATIBLE APPLCOMPAT VALUES.

LUWID=GA8A349C.EABE.D504FEB97D9F

CLIENTAPPLCOMPAT=\*

PACKAGEAPPLCOMPAT=V12R1M503

PACKAGE=NULLID.SYSLH200.5359534C564C3031

# IBM Data Server Driver and NULLID collections

- You need to plan if you want to BIND data server driver packages with **V12R1M501** or higher!
- **Make sure you have installed and understand APAR [PH08482](#) (April 2019)**
  - Otherwise **ClientApplCompat** value must be specified for V12R1M501 or higher!
    - enables or disables new Db2 for z/OS version 12 features
    - Controls the capability of the client
  - If ClientApplCompat is not specified and you do not have PH08482, applications will stop working!
    - SQLCODE -30025
    - Message DSNL076I:
      - DSNL076I !Q10D DSNLXRSS DDF CONNECTION REJECTED DUE TO INCOMPATIBLE APPLCOMPAT VALUES.
      - LUWID=GA8A349C.EABE.D504FEB97D9F
      - CLIENTAPPLCOMPAT=\*
      - PACKAGEAPPLCOMPAT=V12R1M503 PACKAGE=NULLID.SYSLH200.5359534C564C3031
- The needed driver version (regardless PH08482)
  - IBM Data Server Driver for JDBC and SQLJ: Versions 3.72 and 4.22, or later
  - Other IBM data server [clients and drivers](#): Db2 for Linux®, UNIX, and Windows, Version 11.1 Fix Pack 1, or later



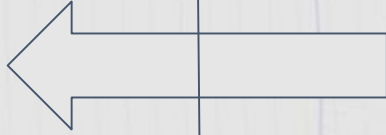
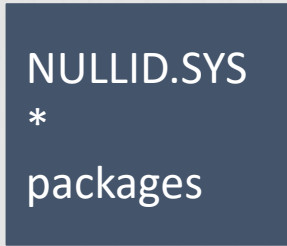
# IBM Data Server Driver and NULLID collections

- **CURRENT APPLICATION COMPATIBILITY** returns the **APPLCOMPAT** value of the **driver package**
- CURRENT APPLICATION COMPATIBILITY can be set in DSN\_PROFILE, but must be less or equal to APPLCOMPAT of the driver package
- Data server continues to **reject connections** if the client, driver, or Db2 Connect Server gateway is at a level that does not support the APPLCOMPAT bind option value of the Db2 for z/OS package
- **Recommendation** is to have multiple **NULLID** collections
  - Selected by the client currentPackageSet property
  - Or take advantage of the system monitor profiles



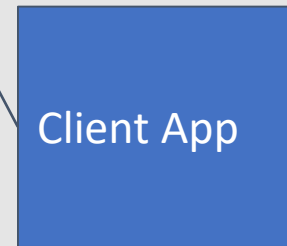
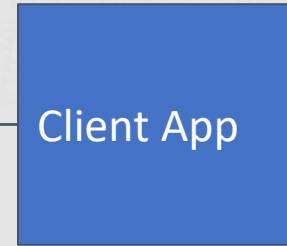
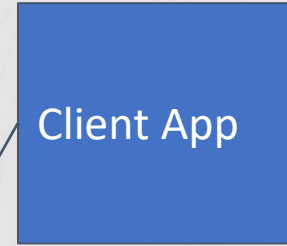


- Traditionally

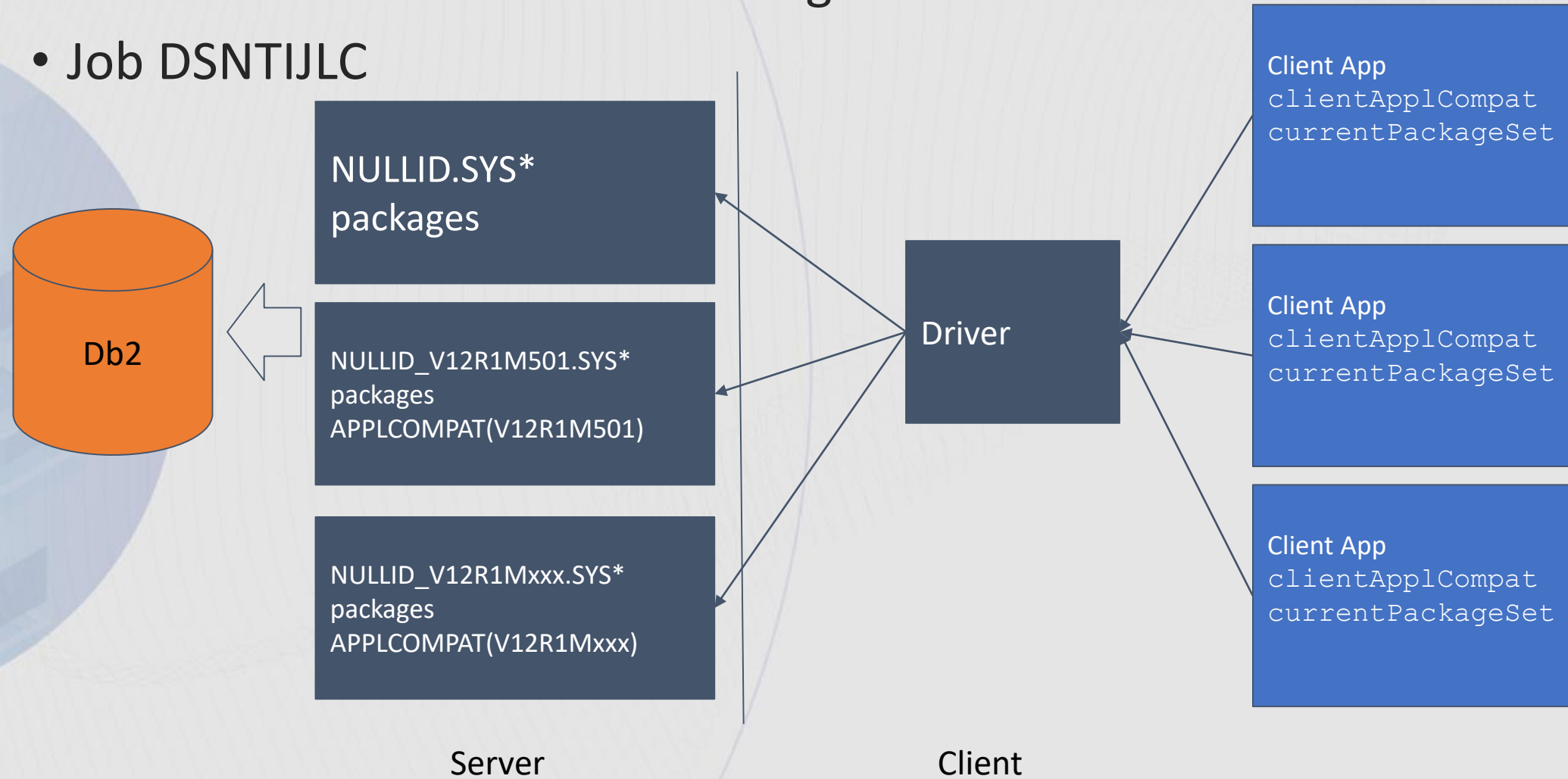


Server

Client



- Recommendation after activating V12R1M501
- Job DSNTIJLC





# V12R1M502

Shall we play an encryption game?



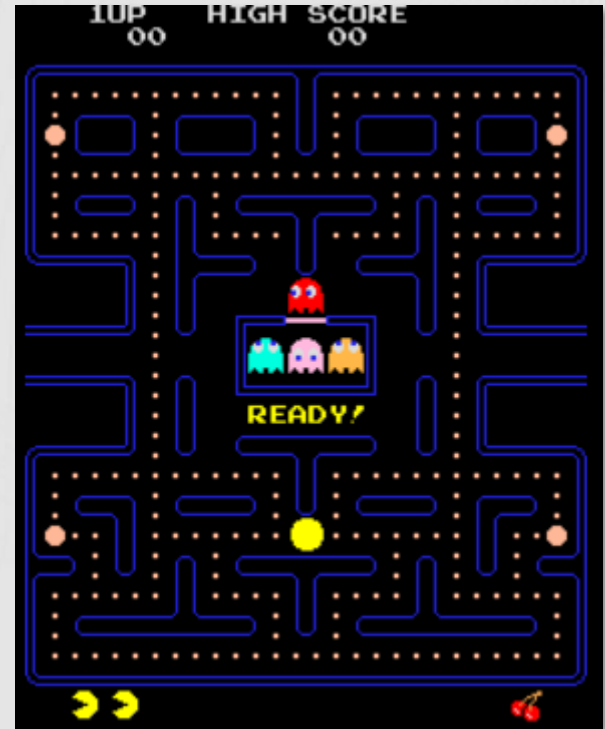
SHALL WE PLAY A GAME?

# V12R1M502

- [PI95511](#)
- **Key label management for data set encryption**
  - Support for more granular encrypted objects – particular tables
  - System and user objects (before V12R1M502)
  - Only for Db2 managed UTS and partitioned tablespaces
  - **New catalog level** and function level
    - Catalog level adds KEYLABEL column to SYSSTOGROUP, SYSINDEXES, SYSTABLES, SYSTABLESPACE
    - Function level adds new KEY LABEL option in DDL (CREATE/ALTER TABLE, STOGROUP, )
- Explicit casting of numeric data types to fixed or variable graphic strings
  - **Unqualified references** to the existing user-defined functions might invoke the built-in function instead of the user-defined function in certain situations!
- Changes in migration process (V12R1M502 from V12R1M100)
  - DSNTIJA1

# V12R1M503

This will be temporal!



# V12R1M503

- [PH00506](#)
- Db2 AI for z/OS (Db2ZAI)
  - Machine learning to empower Db2 for z/OS optimizer
  - Requires ML for z/OS (extra license)
    - Runs on Linux (z or x86)
  - APAR [PH05323](#) supports V12R1M500 and higher
- Replication of system-period temporal tables and generated expression columns
  - **New catalog level** - New SYSIBMADMIN.REPLICATION\_OVERRIDE built-in global variable
- Change to temporal audition support for temporal table
  - rows containing NULL values in the history table column that corresponds to the DATA CHANGE OPERATION column (auditing column) will now be considered part of the intermediate result set for a system-period temporal query
- Console message for catalog level or function level change
  - DSNG014I member-name DB2 NEW level-type LEVEL (new-level) DB2 CATALOG LEVEL (catalog-level) CURRENT FUNCTION LEVEL (activated-level)

# V12R1M503 considerations

- Temporal auditing - Result change for system-period temporal tables defined with ON DELETE ADD EXTRA ROW
  - Rows that were previously not returned may be returned now
  - Rows with NULL DATA CHANGE OPERATION column
  - See more [here](#)
- The SET\_MAINT\_MODE\_RECORD\_NO\_TEMPORALHISTORY stored procedure is not supported when APPLCOMPAT is V12R1M503 or higher
  - Modify applications to set SYSIBMADM.REPLICATION\_OVERRIDE = 'Y'
    - An application is allowed to specify values for row-begin, row-end, transaction-start-ID, and generated expression columns
    - The recording of temporal history for a system-period temporal table is disabled



# V12R1M504

Speedup your UTS conversion!



# V12R1M504

- [PH07672](#)
- z14 Huffman compression
  - TS\_COMPRESSION\_TYPE ZPARM level only!
  - z14
  - Only for UTS
  - Fallback code to decompress
  - Consider using V12R1M509
- **Prevent creation of new deprecated objects**
  - Segmented and partitioned non-UTS => PBGs and PBRs
  - Hash tablespaces – alternative => fast Index Traversal
  - Synonyms – alternative => Alias
  - CURRENT APPLICATION COMPATIBILITY level can be used to create these objects using an older level
- New passthrough built-in function for Analytics Accelerator
  - REGEXP
  - Unqualified references to existing user-defined functions might start invoking new built-in functions!
- New SQL syntax alternatives
  - special registers (CURRENT TIMEZONE -> CURRENT\_TIMEZONE, ...)
  - NULL predicates (IS NULL -> ISNULL, ...)
  - Careful, if you have same named columns or variables!

# V12R1M504 considerations

- Segmented multi-table
  - Multiple tables into a single PBG will fail => update your scripts!
- Alias vs Synonyms
  - An alias can be defined for an object that does not yet exist, and it persists after the object is dropped
    - Synonym is dropped implicitly when the object it references is dropped.
  - An alias is defined for all users.
  - A user needs the CREATE ALIAS authorization to create an alias.
  - Great [article](#) by Jim Dee

# V12R1M504 considerations

- CREATE TABLESPACE behavior

Type	>= V12R1M504	< V12R1M504
PBG	<ul style="list-style-type: none"><li>- MAXPARTITIONS and Numparts</li><li>- MAXPARTITIONS only</li><li>- Omit both</li></ul>	<ul style="list-style-type: none"><li>- MAXPARTITIONS and Numparts</li><li>- MAXPARTITIONS and SEGSIZE</li><li>- MAXPARTITIONS</li></ul>
PBR	<ul style="list-style-type: none"><li>- Numparts only</li></ul>	<ul style="list-style-type: none"><li>- Numparts and SEGSIZE</li></ul>
Segmented	Not supported	<ul style="list-style-type: none"><li>- SEGSIZE</li><li>- Omit MAXPARTITIONS, Numparts, SEGSIZE</li></ul>
Classical partitioned	Not supported	<ul style="list-style-type: none"><li>- Numparts and SEGSIZE 0</li></ul>

- CREATE TABLE a new table in a segmented TS will fail

# V12R1M504 considerations

- MAXPARTITIONS defaults if omitted:
  - V12R1M504: **256**
  - V13R1M500: **254**
- Why?
  - V12R1M504 sets DSSIZE to 4GB regardless of page size – inconsistency with:

Page Size	MAXPARTITIONS	DSSIZE
Any	1-254	4G
4k	255-4096	4G
8k	255-4096	8G
16k	255-4096	16G
32k	255-4096	32G

# V12R1M505

WaRRiors on the run!





# V12R1M505

- [PH09191](#)
- Improved Hybrid Transactional Analytical Processing performance
- New built-in functions for encryption and decryption with key labels
  - ENCRYPT\_DATAKEY, DECRYPT\_DATAKEY
  - Step towards the in-memory encryption
- Indexes on DECFLOAT
- **Rebind phase-in for packages that are being used for execution**
  - a rebind operation creates a new copy of the package
  - new threads can use the new package copy immediately,
  - existing threads can continue to use the copy that was in use prior to the rebind (the phased-out copy) without disruption – no outage
  - **Requires V12R1M505 catalog level** (COPYID column in SYSPACKDEP, SYSPACKSTMT)
- **Improved RUNSTATS performance** with automatic page sampling by default
  - changes the meaning of the default value of the STATPGSAMP subsystem parameter to mean the same as YES
- Temporal and archive transparency support for WHEN clause on triggers
  - allows system-period temporal tables and archive-enabled tables to be referenced in WHEN clauses of both basic and advanced triggers, regardless of the settings of the SYSTIMESENSITIVE and ARCHIVESENSITIVE bind options



# V12R1M505 considerations

- RUNSTATS does not update real-time statistics by default!
  - Page sampling cannot collect RTS (skips data)
  - Affects only UTS!
  - **STATPGSAMP** ZPARM default value SYSTEM acts as YES since V12R1M505
    - Was NO before V12R1M505
  - Can be overridden on individual RUNSTATS via TABLESAMPLE SYSTEM NONE – This will also update RTS
- Newly supported user-defined functions – same note as with prior levels apply

# V12R1M506

Drop the Spaces!



# V12R1M506

- [PH16829](#)
- Alternative function names support
  - Improves compatibility across the Db2 product family (LEFT -> STRLEFT, POWER -> POW, ...)
- Support for **implicitly dropping explicitly created table spaces**
  - Dropping a table that resides in an explicitly created universal table space no longer returns an error. Instead, the table space is implicitly dropped.
  - Dropping an auxiliary table that resides in an explicitly created LOB table space no longer leaves the LOB table space in the database. Instead, the table space is implicitly dropped.
  - Incompatible change

# V12R1M506 considerations

- Changes in **explicitly** created table space behavior:
  - Dropping a **base table** in an explicitly created tablespace **implicitly drops** the tablespace also
    - Previously returning an SQLCODE -669
    - => Replace DROP TABLESPACE by DROP TABLE
  - Dropping an **AUX table** in an explicitly created LOB tablespace **implicitly drops** the tablespace also
    - Previously, the LOB table space remained as an empty table space
    - Not possible to reuse LOB tablespace
- Other useful info: Steen's [article](#) on SET CURRENT RULES

# V12R1M507

Control your locking limits!

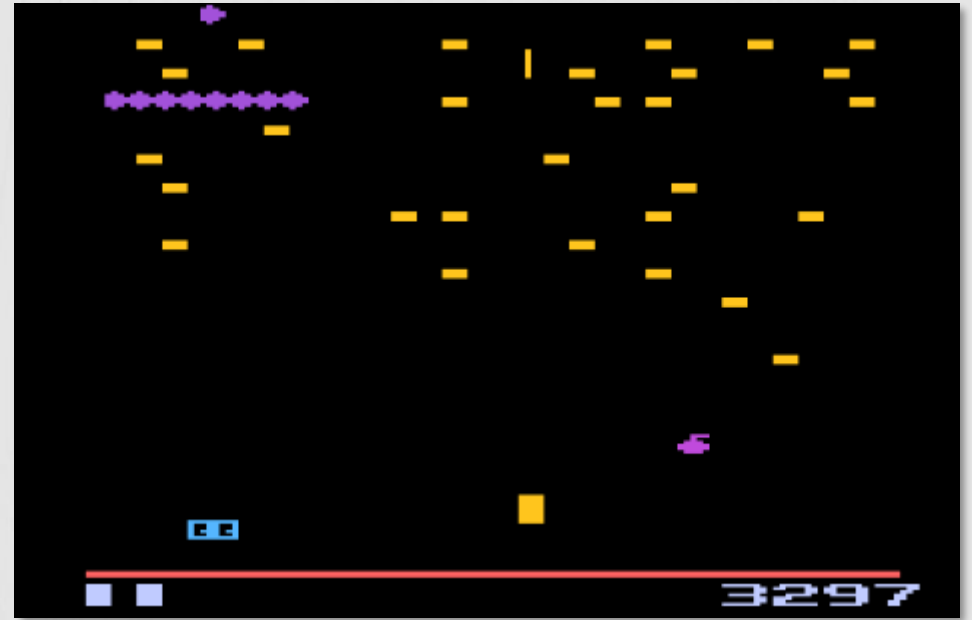


# V12R1M507

- [PH24371](#)
- **Application granularity for locking limits** (reminder: NUMLKUS and NUMLKTS ZPARMS)
  - **New catalog level** (new global variables)
  - SYSIBMADM.MAX\_LOCKS\_PER\_TABLESPACE
  - SYSIBMADM.MAX\_LOCKS\_PER\_USER
- Deletion of old statistics when using profiles
  - Db2 now also deletes existing statistics that are not part of the profile
- **CREATE OR REPLACE for procedures**
- Newly supported pass-through-only expressions with IBM Db2 Analytics Accelerator (DAYS\_BETWEEN, Regression functions, ...)

# V12R1M508

Move the tables!





# V12R1M508

- [PH29392](#)
- **Migration of multi-table table spaces to partition-by-growth universal table spaces (UTS)**
  - MOVE TABLE in ALTER TABLESPACE
  - REORG materializes the move

# V12R1M508

## not so elementary my dear Watson

- Target table space must already exist as a PBG
- Must be in **the same database** as the source multi-table table space
- Must have the following attributes:
  - DEFINE NO attribute
  - **MAXPARTITIONS value of 1**
  - LOGGED or NOT LOGGED attribute that matches the source table space
  - CCSID values that match the source table space

# V12R1M508

## not so elementary my dear Watson

- **MAXPARTITIONS 1 issues:**
  - Be careful with multi piece segmented – you need to properly size DSSIZE – might require EA!
    - DFSMS **extended addressability** function must be enabled to use a DSSIZE value greater than 4 GB
  - IBM recommends maximum size that can contain all data
    - $\text{SYSTABLES.NPAGESF} \times \text{SYSTABLESPACE.PGSIZE} = \text{table-size-in-KB}$
  - 64GB is max size of source segmented tablespace
- **DBD size**
  - Two new OBIDs per a new tablespace
  - Limit is 32767 IDs
- Max open datasets considerations (**DSMAX**)
- Materializing **REORG considerations**
  - Processing time
  - Some keywords ignored (KEEPDICTIONARY, STATISTICS), some cannot be used (AUX YES), TEMPLATE required for COPYDDN etc
  - **Invalidated packages** – plan ahead

# V12R1M509

Choose your compression!

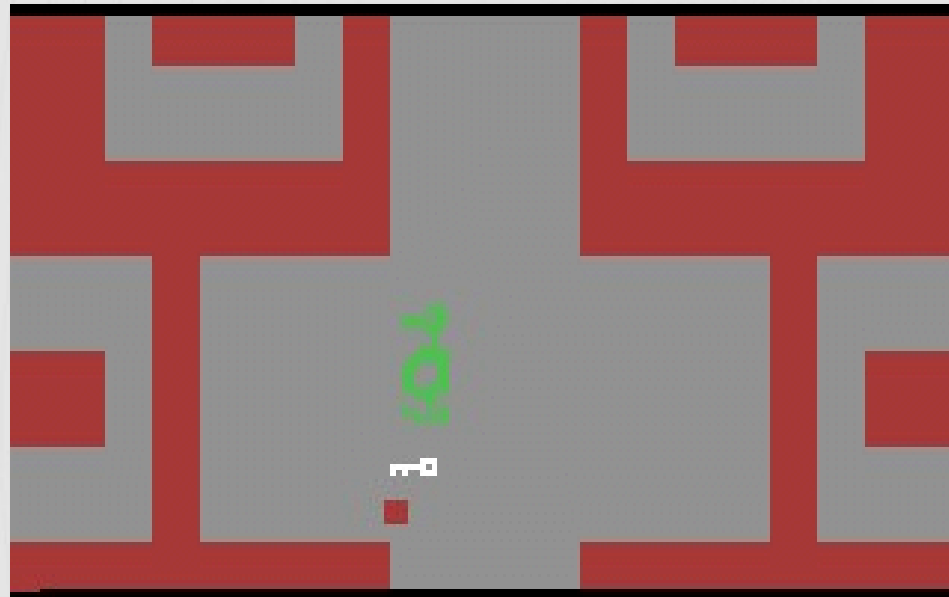


# V12R1M509

- [PH33015](#)
- Support for tamper-proof audit policies
  - Policies that cannot be stopped or modified by unauthorized users
  - External security manager is involved
- High availability for accelerator-only tables
  - Can be on more than one accelerator
- **Specify a compression algorithm at the table, table space, or partition level**
  - COMPRESS YES FIXEDLENGTH | HUFFMAN
  - **New catalog level:**
    - New COMPRESSED\_USED column in SYSTABLEPART
    - Updated COMPRESS column in SYSTABLESPACE
- Temporal RI allows UPDATE or DELETE on the parent table

# V12R1M510

Find the key for V13!



# V12R1M510

- [APAR PH33727](#)
- Does not introduce any new features or capabilities, or catalog changes
- It is not a fallback SPE for migration
  - SPE APAR is **PH37108**
- Enforces the completion of various pre-migration activities before migration to the next Db2 release
  - All Db2 12 function levels are activated. **V12R1M510**
  - All catalog updates for Db2 12 are applied, and the Db2 catalog is at the last Db2 12 catalog level. **V12R1M509**
  - **All recently used application packages are rebound recently enough to ensure that they are supported by the next Db2 release.**
    - packages that were used in the last 18 months and were last bound or rebound in a release before Db2 11
    - Should prevent AUTOBINDS
  - Activation fails if any of these conditions are not met



# V12R1M510 considerations

```
SELECT * FROM sysibm.syspackage WHERE
  lastused >= DATE(DAYS(CURRENT DATE) - 548) -- last 18 months
AND relbound NOT IN ('P','Q','R') -- not V11, V12, V13
AND valid <> 'N' AND operative <> 'N'; -- valid and operative
```

- Activation of function level 510 succeeds only if this query returns 0 rows!
  - Hint: Use ACTIVATE FUNCTION LEVEL (V12R1M510) TEST
- It is also a part of **DSNTIJPE/DSNTIPJM** pre-migration jobs (see later slides)
- Until this is resolved, Highest possible function level is V12R1M509 or lower (depending on code/catalog level)

# V12R1M510 considerations

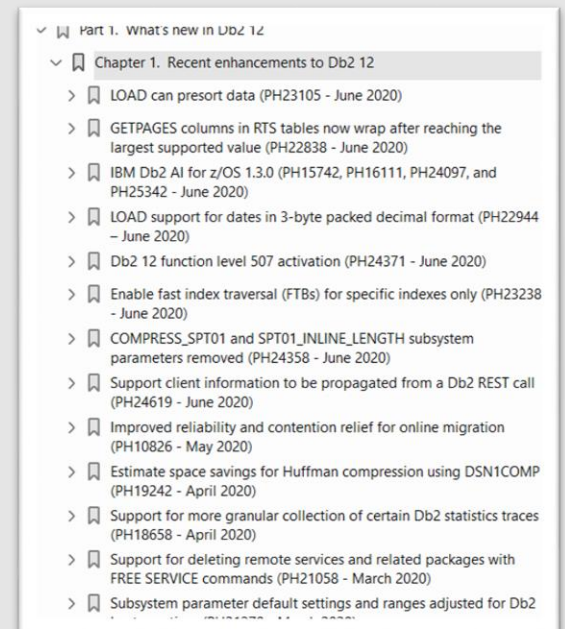
- Possible problem:
  - **SYSPACKAGE.LASTUSED** column not reliable when ZPARM **DISABLE\_EDMRTS = YES**
    - LASTUSED DATE NOT NULL WITH DEFAULT (0001-01-01)
  - NO (default) - EDM collects real-time statistics about the last use of packages.
    - The value is not updated instantly. There might be a delay of several days before the value is updated
  - YES - EDM does not collect real-time statistics about the last use of packages. Might be appropriate in the following situations:
    - You have no need to collect information about the last use of packages.
    - The SYSIBM.SYSPACKAGE table is persistently unavailable, which prevents the recording of EDM real-time statistics.
    - Deferred externalization of these statistics to the SYSIBM.SYSPACKAGE table causes excessive Db2 shutdown time.
    - Collection of these EDM statistics causes performance degradation.
  - **All members should have the same setting!**

# 510 Considerations

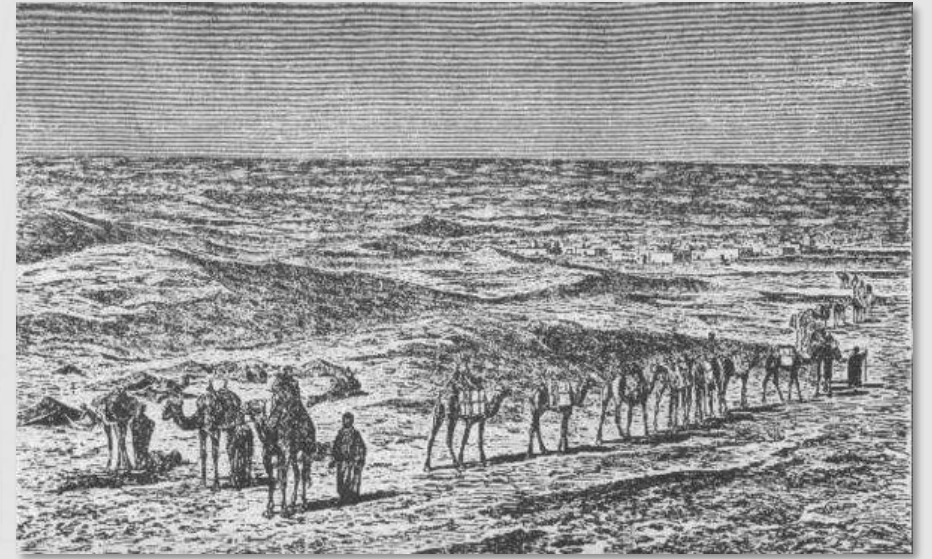
- If DISABLE\_EDMRTS = YES:
  - Function level 510 activation might succeed
  - **Automatic rebinds** remain likely to occur in the next Db2 release
- Shortcut to M510:
  - All members at code level V12R1M510
  - ACTIVATE FUNCTION LEVEL (V12R1M500) or M501
  - CATMAINT UPDATE LEVEL V12R1M509 - DSNTIJTC
  - ACTIVATE FUNCTION LEVEL (V12R1M509) – DSNTIJAF
  - Beware of possible incompatibilities!

# Reminder: Features delivered outside of function levels

- There is a [list](#) of features delivered to Db2 after the base release without requiring function levels
- Many utilities enhancements go outside function levels
- Keep in mind: Incompatible changes are tied to a function level



# Db2 13 Pre-migration jobs



# Db2 13 Pre-migration jobs

- Db2 12 prefix.SDSNSAMP(**DSNTIJPE**)
  - [PH36927](#): DSNTIJPE REPORT01 ISSUE
  - [PH37108](#): NEW FUNCTION
- Db2 13 prefix.SDSNSAMP(**DSNTIJPM**)



# DSNTIJPM

- 22 reports in total
- Compared to V12 DSNTIJPM:
  - Report 23 removed (Converting to UNLOAD privilege)
  - Report 24 removed (Report active log data sets greater than 4 GB in size)
  - Report 08 and 09 changes
  - Report 23 -> 19 – converting to UNLOAD privilege vs native SQL procedures and compiled SQL scalar functions created in V9



# DSNTIJP M reports

- 01 - Reports existence of the previous-release sample database
- 02 - Report simple table spaces
- 03 - Reports explain tables that are not in current-release fmt
- 04 - Reports user-defined indexes on the Db2 catalog that do not reside in the Db2 catalog space.
- **05 - Reports package copies that are not supported in Db2 13**
  - SELECT ... FROM SYSIBM.SYSPACKCOPY WHERE RELBOUND NOT IN ('P','Q','R')
  - not Db2 11,12,13
  - ABIND considerations, see later
- **06 - Reports packages that are autobind candidates in Db2 13**
  - SELECT ... FROM SYSIBM.SYSPACKAGE WHERE RELBOUND NOT IN ('P','Q','R')
  - not Db2 11,12,13
  - ABIND considerations, see later
- **07 - Reports plans that are autobind candidates in Db2 13**
  - SELECT ... FROM SYSIBM.SYSPLAN WHERE RELBOUND NOT IN ('P','Q','R')
  - not Db2 11,12,13
  - ABIND considerations, see later

# DSNTIJPM reports

- **08 - Reports packages to be rebound prior to migrate to release 13 or V12R1M510 activation**
  - Same as the V12R1M510 query, look at prior slides
  - **Generates REBINDs** for those packages!
- 09 - Report problem with catalog table space version numbers.
- 10 - Report inconsistent version numbers in the Db2 catalog
- 11 - Report Db2 system page discrepancies for SYSTABLES
- 12 - Report orphaned rows in SYSCOPY and SYSOBDS
- 13 - Report orphaned rows in SYSTABSTATS
- 14 - Report orphaned rows in SYSCOLAUTH

# DSNTIJPM reports

- 15 - Report extraneous text in SYSIBM.SYSTRIGGERS.TEXT
- 16 - Report Unicode columns in EBCDIC tables before V12
- 17 - Report indexes on Unicode columns in EBCDIC tables
- 18 - Report obsolete RLSTs
- 19 - Report native SQL procedures and compiled SQL scalar functions created in V9
- 20 - Report tables that have an OBID of 1
- 21 - Report foreign key constraints that have a Db2 catalog table as a parent
- 22 - Report expression-based indexes created in Db2 9

# DSNTIJPM overview – Add your action plan

Report	Description	Action
1	Previous-release sample database	Better to Fix
2	Simple table spaces	Have a Plan
3	Explain tables that are not in current-release fmt	Have a Plan
4	User-defined indexes on the Db2 catalog that do not reside in the Db2 catalog space	Better to Fix
5	Package copies that are not supported in Db2 13	Better to Fix
6	Packages that are autobind candidates in Db2 13	Better to Fix
7	Plans that are autobind candidates in Db2 13	Better to Fix
8	Packages to be rebound prior to migrate to release 13 or V12R1M510 activation	Fix
9	Problem with catalog table space version numbers	Fix
10	Inconsistent version numbers in the Db2 catalog	Fix

# DSNTIJPM overview

Report	Description	Action
11	Db2 system page discrepancies for SYSTABLES	Fix
12	Orphaned rows in SYSCOPY and SYSOBDS	Fix
13	Orphaned rows in SYSTABSTATS	Fix
14	Orphaned rows in SYSCOLAUTH	Fix
15	Extraneous text in SYSIBM.SYSTRIGGERS.TEXT	Plan
16	Unicode columns in EBCDIC tables before V12	Better to Fix
17	Indexes on Unicode columns in EBCDIC tables	Better to Fix
18	Obsolete RLSTs	Fix
19	Native SQL procedures and compiled SQL scalar functions created in V9	Better to Fix
20	Tables that have an OBID of 1	Fix

# DSNTIJPM overview

Report	Description	Action
21	Foreign key constraints that have a Db2 catalog table as a parent	Fix
22	Expression-based indexes created in Db2 9	Better to Fix

# Db2 13 zParms





# zParms – Removed (Deprecated)

- zParm changes apply to V13R1M100
- These will act as if the following value in place
- Check your current v12 setting!

zParm	Value in Db2 13	Default in Db2 12
DDF_COMPATIBILITY	NULL	NULL
HONOR_KEEPDICTIONARY	NO	NO
IX_TB_PART_CONV_EXCLUDE	YES	YES
PLANMGMTSCOPE	STATIC	STATIC
<b>REALSTORAGE_MANAGEMENT</b>	AUTO	AUTO

- REALSTORAGE\_MANAGEMENT AUTO works differently in V12 and V13!

# zParms – Removed (rarely used)

- These will act as if the following value is in place
- Check your current v12 setting!

zParm	Value in Db2 13	Default in Db2 12
DSVCI	YES	YES
EXTRAREQ	100	100
EXTRASRV	100	100
IMMEDWRI	NO	NO
MAXARCH	10000	10000
OPT1ROWBLOCKSORT	DISABLE	DISABLE
PARA_EFF	50	50
RESYNC	2	2
SUBQ_MIDX	ENABLE	ENABLE
TRACSTR	NO	NO

# zParms – New Defaults

zParm	Default in Db2 13	Default in Db2 12
DDF	AUTO	NO
EDM_SKELETON_POOL	81920	51200
EDMDBDC	40960	23400
FTB_NON_UNIQUE_INDEX	YES	NO
MAXSORT_IN_MEMORY	2000	1000
MAXCONQN	ON	OFF
MAXCONQW	ON	OFF
NUMLKTS	5000	2000
NUMLKUS	20000	10000
OUTBUFF	102400	4000
SRTPOOL	20000	10000
<b>PAGESET_PAGENUM</b>	<b>RELATIVE</b>	<b>ABSOLUTE</b>

# zParms – Increased Max values

zParm	MAX in Db2 13	Default in Db2 13	Default in Db2 12
DSMAX	400000	200000	200000

# New zParms

- V13R1M100

zParm	Value	Comment
TABLE_COL_NAME_EXPANSION	<b>OFF</b>   ON	ON Allows column names up to 128 bytes. Be very careful!
SPREG_LOCK_TIMEOUT_MAX	<b>-1</b> , 0-32767	Controls the value that can be specified in a SET CURRENT LOCK TIMEOUT

- V13R1M501

zParm	Value	Comment
UTILITY_HISTORY	<b>NONE</b>   UTILITY	specifies whether utility history information is collected

# Other zParm updates

- **AUTHEXIT\_CACHEREFRESH** - If set to ALL and the z/OS release is 2.5 or later, Db2 refreshes the entries in the plan authorization cache when a resource access on the plan object profile is changed in Resource Access Control Facility (RACF) and when the access control authorization exit (DSNX@XAC) is active
- **IRLMRWT** - online updatable
- **REORG\_INDEX\_NOSYSUT1** – in V13R1M500 and higher no longer influences whether REORG INDEX SHRLEVEL REFERENCE or CHANGE uses the NOSYSUT1 behavior, which is always enabled as the default and only option
- **STATPGSAMP** – in V13R1M500 and higher also applies to the collection of inline statistics when the LOAD or REORG TABLESPACE utilities run with the STATISTICS keyword

# Other considerations





# Incompatible changes summary

- V13R1M100
  - Automatic rebind of plans and packages created before Db2 11
    - Db2 12 vs Db2 13 incompatibility – especially in coexistence!
    - If ABIND=NO – SQLCODE -908 (package) or SQLCODE -923 (plan)
  - Removed zParms (see slides before)
- V13R1M500
  - None
- V13R1M501
  - None

# Catalog changes summary (V13R1M501)

- Updated tables:
  - SYSINDEXSPACESTATS, SYSINDEXSPACESTATS\_H
  - SYSPACKAGE
  - SYSPACKCOPY
  - SYSPACKSTMT
  - SYSTABLESPACESTATS, SYSTABLESPACESTATS\_H
  - SYSCOPY
- New tables:
  - SYSPACKSTMTCOPY
  - SYSPACKSTMTDEP
  - SYSUTILITIES

# Catalog changes summary (V13R1M501)

- New tablespaces:
  - DSNDB06.SYSTSPSC
  - DSNDB06.SYSTSPSD
  - DSNDB06.SYSTSUTL
- New indexes:
  - DSNKTX01 (SYSPACKSTMTCOPY)
  - DSNKTX02 (SYSPACKSTMTCOPY)
  - DSNKNX01 (SYSPACKSTMTEP)
  - DSNKNX02 (SYSPACKSTMTEP)
  - DSNULX01 (SYSUTILITIES)
  - DSNULX02 (SYSUTILITIES)

# Catalog changes summary (V13R1M501)

- Removed index:
  - DSNKDX02 (SYSPACKDEP)
- New RI
  - SYSPACKCOPY <- SYSPACKSTMTCOPY (LOCATION, COLLID, NAME, CONTOKEN, COPYID)
- New built-in global variables:
  - DEADLOCK\_RESOLUTION\_PRIORITY
- Sequence:
  - SYSIBM.DSNSEQ\_EVENTID

# Deprecated functions summary - Utilities

- REPAIR utility options

Value	Alternative
VERSIONS	Use REPAIR CATALOG

- LOAD utility options

Value	Alternative
IDENTITYOVERRIDE	OVERRIDE(IDENTITY)
PERIODOVERRIDE	OVERRIDE(SYSTEMPERIOD)
TRANSIDOVERRIDE	OVERRIDE(TRANSID)

- COPY utility options

Value	Alternative
CHANGELIMIT	Use DSNACCOX

- RBALRSN\_CONVERSION keyword of the LOAD, REORG, and REBUILD INDEX
  - RBALRSN\_CONVERSION(BASIC) fails
  - **Better to convert your 6 BYTE RBA objects!**

# Deprecated functions summary - Utilities

- REORG INDEX utility options

Value	Alternative
LAEFDISTLIMIT and REPORT only	Use DSNACCOX
UNLOAD ONLY	Use UNLOAD utility
UNLOAD PAUSE	Use DIAGNOSE to stop the process (?)

- REORG TABLESPACE utility options

Value	Alternative
UNLOAD EXTERNAL	Use UNLOAD utility
INDREFLIMIT and REPORTONLY	Use DSNACCOX
OFFPOSLIMIT and REPORTONLY	Use DSNACCOX
UNLOAD ONLY	Use UNLOAD utility
UNLOAD PAUSE	UNLOAD utility FORMAT INTERNAL option

# Deprecated functions summary – SP and UDF

- Stored procedures

Value	Alternative
SYSPROC.DSNUTILS	SYSPROC.DSNUTILU
SYSPROC.DSNTBIND	SYSPROC.ADMIN_COMMAND_DSN
SYSPROC.DSNWZP	SYSPROC.ADMIN_INFO_SYSPARM
External stored procedures	Native SQL procedures
DSNTPSMP	See above External stored procedures
SYSIBM.SYSROUTINES_OPTS	See above DSNTPSMP
SYSIBM.SYSROUTINES_SRC	See above DSNTPSMP

- User defined functions

Value	Alternative
DB2XML.SOAPHTTPC	DB2XML.SOAPHTTPNC
DB2XML.SOAPHTTPV	DB2XML.SOAPHTTPNV



# Deprecated functions summary – DB objects

- Database Objects

Value	Alternative
Synonyms	Aliases
Non-UTS tablespaces	UTS
Hash organized tables	Fast Index traversal
TEMP database	Workfile

# Deprecated functions summary - Other

- Basic Row Format (BRF) – **Use Reordered Row Format (RRF)**
- BIND options

Value	Alternative
PLAN MEMBER	Use BIND PACKAGE to explicitly bind into package
PACKAGE DEPLOY	CREATE or ALTER to deploy native SQL procedures and compiled SQL scalar functions

- zParms

Value	Alternative
CHECK_FASTREPLICATION	Use default value REQUIRED
DISSALLOW_SEL_INTO_UNION	Monitor IFCID 376, update your apps, set to YES
PREVENT_NEW_IXCTRL_PART	Use default value YES

# Deprecated functions summary - Other

- DSNRLMTxx before Db2 11 – use the current format
- NEWFUN – Use SQLLEVEL
- ODBC 2.0 – ODBC 3.0
- PassTickets for RACF protected userids – Use client certificate
- SNA communication methods, including the VTAM interface – Use TCP/IP

# Functions no longer supported

- None

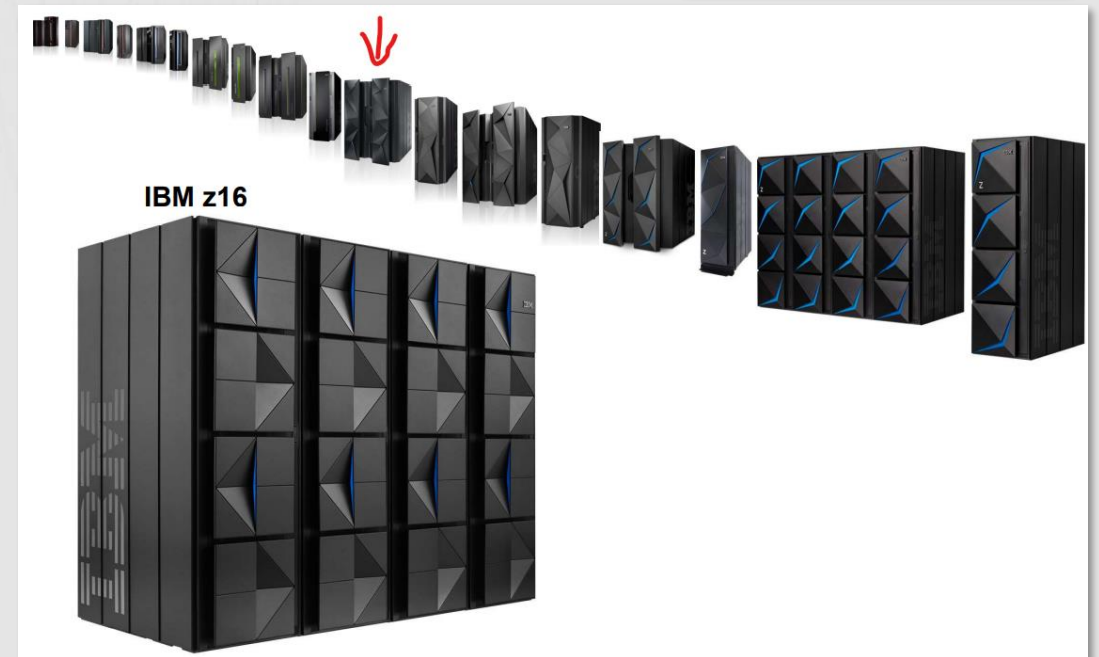




Information that did not fit  
elsewhere

# HW and SW requirements

- zEC12 or later
- z/OS 2.4 or later
- IRLM 2.3 running at function level 3.041 or later



# Fixcats

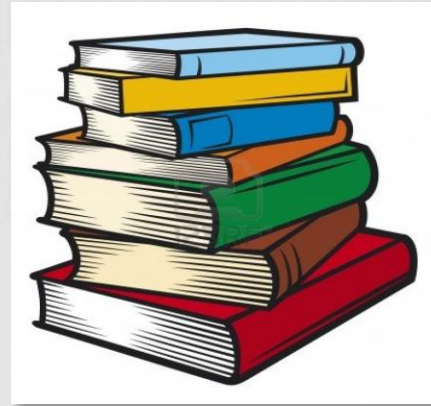
- IBM.Migrate-Fallback.DB2.V13
- IBM.Coexistence.DB2.SYSPLEXDataSharing
- SPE: SPE for migration to Db2 13 (PH37108)



# z16 and Db2 13

- SQL Data Insights – semantic queries
  - Similarity query
  - Dissimilarity query
  - Inductive reasoning semantic clustering query
  - Inductive reasoning analogy query
- New System Recovery Boost (SRB) in IBM z16 – middleware restart boost
- z16's ability to track data and directory residency statistics for Group Buffer Pools

Links



# Links

- <https://www.redbooks.ibm.com/abstracts/sg248527.html>
- <https://community.ibm.com/community/user/hybriddatamanagement/blogs/paul-mcwilliams1/2021/05/05/db2-vnext-activate-fl510>
- <https://community.ibm.com/community/user/hybriddatamanagement/blogs/paul-mcwilliams1/2022/04/19/get-ready-for-migration-to-db2-13>
- <https://www.broadcom.com/sw-tech-blogs/mainframe/are-you-ready-for-db2-13>

# Thank you!



**TOTAL SCORE RANKING**

<b>RANK</b>	<b>SCORE</b>	<b>NAME</b>	<b>CNT</b>	<b>COURSE</b>
1	156934	KEV	0	BEGINNER
2	150986	ASS	0	BEGINNER
3	129022	GBU	1	BEGINNER
4	81918	RAF	2	BEGINNER
5	80000	GUN	9	NAMCO
6	70000	BUL	9	NAMCO
7	60000	LET	9	NAMCO
8	50000	NAM	9	NAMCO

# Thank You

Speaker: Emil Kotrc

Company: Broadcom

Email Address: [Emil.Kotrc@Broadcom.com](mailto:Emil.Kotrc@Broadcom.com)

Session Code: B04

*Please fill out your session evaluation before leaving!*