

# DB2 for z/OS V11 Migration

## Kevin Harrison

Sr. Systems Engineer/Sr. IT architect  
IBM Silicon Valley Lab  
[kharrison@us.ibm.com](mailto:kharrison@us.ibm.com)



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# DB2 11 for z/OS Documentation

[Administration Guide \(SC19-4050\)](#)  
[Application Programming and SQL Guide \(SC19-4051\)](#)  
[Application Programming Guide and Reference for Java \(SC19-4052\)](#)  
[Codes \(GC19-4053\)](#)  
[Command Reference \(SC19-4054\)](#)  
[Data Sharing: Planning and Administration \(SC19-4055\)](#)  
[Installation and Migration Guide \(GC19-4056\)](#)  
[Internationalization Guide \(SC19-4057\)](#)  
[Introduction to DB2 for z/OS \(GC19-4058\)](#)  
[IRLM Messages and Codes for IMS and DB2 for z/OS \(GC19-2666\)](#)  
[Licensed Program Specifications \(GC19-4059\)](#)  
[Managing Performance \(SC19-4060\)](#)  
[Managing Security \(SC19-4061\)](#)  
[Messages \(GC19-4062\)](#)  
[ODBC Guide and Reference \(SC19-4063\)](#)  
[pureXML Guide \(SC19-4064\)](#)  
[RACF Access Control Module Guide \(SC19-4065\)](#)  
[SQL Reference \(SC19-4066\)](#)  
[Utility Guide and Reference \(SC19-4067\)](#)  
[What's New? \(GC19-2985\)](#)

**Diagnosis Guide and Reference**  
**SDSNIVPD library member DSNDR (with PM95206)**

# DB2 11 for z/OS



- **Base Pre-requisites:**
  - z10 or later
  - z/OS V1.13 or above
    - Some features require maintenance or higher levels
  - 1TB shared memory objects addressing
- **Catalog changes:**
  - Additions for new features
  - More tables changed to UTS PBG
- **DB2 Connect / Data Server Driver Levels**
  - Seamless migration with V9.7 FP6 or V10.1 FP2
  - For new features use V10.5 FP2
    - Ex. Arrays, Autocommit, Global Variables, Client Info
  - Monitor [CST RSU](#) for current recommendation
- **Migration Process:**
  - From DB2 10 for z/OS NFM
  - DB2 10 NFM & DB2 11 CM Data sharing coexistence
  - DSNTIJPB in V10
- **Application Compatibility**
- **Extended RBA / LRSN**
  - Log readers must be 10 byte RBA/LRSN ready before DB2 migration

# Prerequisite Summary & Planning ...

- **PID 5615-DB2**
  - FMIDs HDBBB10, HIYBB10, HIZBB10, HIR2230, HDREB10
- **z/Architecture (z10 and subsequent 64-bit z/Architecture Processors)**
- **z/OS 1.13 or above**
  - Data Sharing: CF Level 12, with 13 or 14 recommended
  - GBP Enhancements require CFLEVEL 17 or higher
- **DB2 LUW / Connect / Data Server Driver / JDBC / ODBC**
  - Any in-support IBM Information Managements clients / drivers
  - V10.5 FP2 advised for new features
  - See the Program Directory for more details (ex DB2 for z/OS client to DB2 LUW server)
- **Migrate from**
  - DB2 10 for z/OS NFM
  - With Fallback SPE PM31841
    - With associated coreqs & prerequisites
    - Reassemble DSNHDECP module
    - See Informational APARs II14660 (Migration), II14730 / II14732 (Client & DDF)
- **Establish performance benchmarks**

## Prerequisite Summary & Planning ...

- **Check / correct incompatibilities**
  - Run a current V10 DSNTIJPB pre-migration job (PM94057)
    - Same as V11 DSNTIJPM
    - Check maintenance for currency
  - Release Incompatibilities documented in:
    - Installation Guide
    - Application Programming and SQL Guide
- **Check programming language requirements**
  - DSNHPC7 included in the base for older COBOL and PL/I
  - See the Program Directory
- **[IBM InfoSphere Data Replication \(IIDR\) 10.2.1](#)**
- **[IBM DB2 Analytics Accelerator V4](#)**
- **[IBM DB2 Tools Compatibility](#)**

## Prerequisite Summary & Planning ...

- **Configure a minimum of (IEASYSxx):**
  - 1TB of contiguous shared private per DB2 – HVSHARE
    - Default is 510TB
  - 6GB of contiguous shared extended private per DB2 – HVCOMMON
    - Same as DB2 10
    - Default 66GB
- **No significant storage usage differences**
  - OnDemand Buffer Pool allocation from DB2 10 was removed
    - This likely does not represent a storage requirement
    - VPSIZE will be allocated when Buffer Pool is allocated
  - Early testing indicates 0 – 5% additional memory dependent on query workload
    - Consider 10% cushion for potential growth with less behaved workloads
- **SMS managed catalog and directory**
  - This was a requirement for DB2 10
    - Data Class attributes of
      - Extended Format
      - Extended Addressability
  - New areas of the Cat / Dir moved under SMS management during migration to 11
  - Additional migrated areas REORGed after V10 ENFM would also have been converted
  - [DSNTIJSS](#) provided as a sample for configuration

## Prerequisite Summary & Planning ...

- **Reestablish V10 IVP to test DB2 11 before NFM**
  - COBOL 5 will require modification program preparation PROCs generated by DSNTIJMV
    - This is not a migration specific incompatibility
    - SYSLMOD needs to be a PDSE
    - May need additional SYSUTx and SYSMDECK DDs
- **Assess ISV Requirements / Readiness**
  - Tools and applications (Check your IBM DB2 Tools)
  - Some vendors may add instructions for migration and / or require maintenance
- **Assess the training requirements for your organization**
- **PDSEs required for SDSNLOAD, SDSNLOD2, ADSNLOAD, ADSNLOD2**
  - Same as V10
- **Establish a project team and project plan**
  - Review the Installation Guide checklists and MPW Project Framework
  - Consider Single Version Charging when building your plan



# Prerequisite Summary & Planning

- **Develop conversion and coexistence goals**

- How did your V10 test plans work?
- Reuse and improve upon your experiences

	Consider REBIND APPLCOMPAT V11R1Aparm
	Update Standards
	Update DR Procedures
	Conduct Post Migration Assessment/Wrap Up ←

- **Migration occurs in three familiar phases**

- Conversion Mode (CM)
  - Data Sharing may see an X mode during coexistence
- Enable New Function Mode (ENFM)
- New Function Mode (NFM)

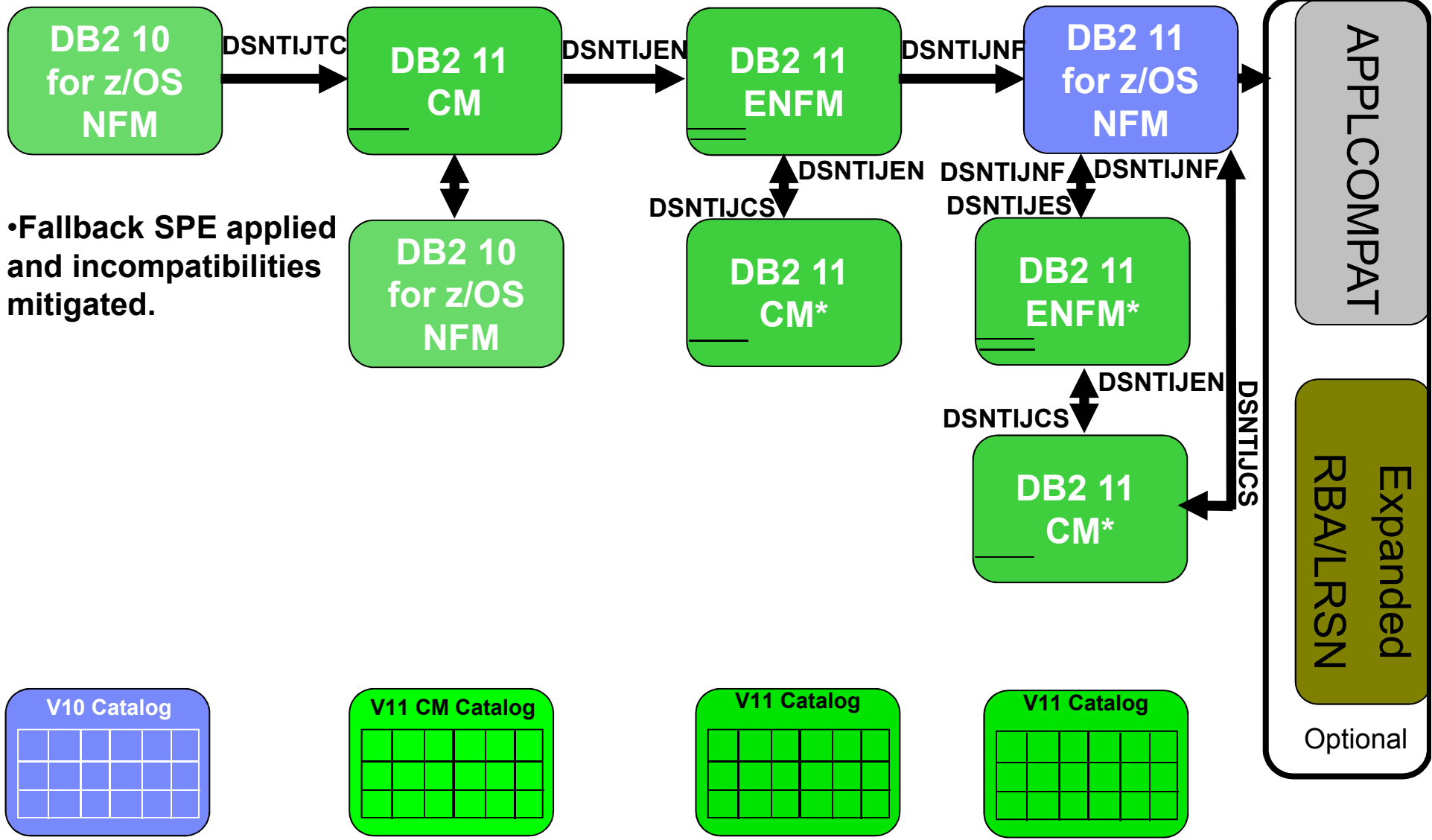
- **Use the proactive PMR process**

- This is to notify IBM DB2 Support of your up coming migration activity
  - It is typically routed to the DB2 Duty Manager on call for that time
- If problems occur during the migration, open a new Sev 1 PMR / SR

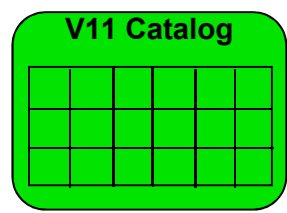
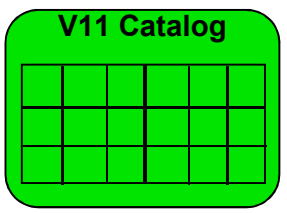
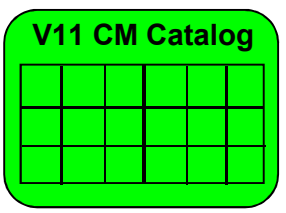
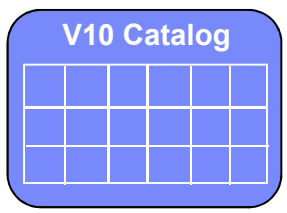
- **REBIND while in CM**

- Use Plan Management (Package / Bind Stability)
  - Consider FREEing Original Packages to establish a new DB2 10 back up
- Consider:
  - **REBIND ... EXPLAIN (YES) ... APREUSE(WARN or ERROR)**
  - **REBIND ... EXPLAIN (YES) ... APCOMPARE(WARN or ERROR)**

# DB2 11 for z/OS Migration Modes / NFM Decisions



•Fallback SPE applied and incompatibilities mitigated.



## Removed Features Summary

- **No pre-V9 bound Packages**  
Require REBIND, including PLANMGMT copies
- **Password protection of Active / Archive Logs**
- **Previous NEWFUN values**
- **DB2 Supplied Routines**  
SYSPROC.DSNAEXP  
AMI based DB2 MQ Functions  
See JPB/JPM report
- **Sysplex Query Parallelism**
- **DSN1CHKR**



## Deprecated Features Summary

- **EXPLAIN tables in a previous release format**
  - V9 & V10 format accepted
- **DSNUTILS stored procedure**
- **REORG TABLESPACE SHRLEVEL NONE on a LOB**
  - V10 returned RC=0 (without performing the REORG)
  - V11 returns RC=8
- **Synonyms**
  - Should be using Aliases
- **Simple Table Spaces remain deprecated**
  - Can not create Simple Table Spaces (since V9)
- **See Parameters for more information**



## New Parameters ...

### ▪ **APPLCOMPAT**

- Default BIND / REBIND parameter
- Determines static SQL statement behavior
- Defaults to V10R1 for migrations and V11R1 for installations
  - Migrations must be V10R1 until NFM

### ▪ **AUTEXIT\_CACHEREFRESH**

- When DSNX@XAC is active and this is set to ALL
  - DB2 listens for RACF signals for User Profile and Resource Access changes
  - Refreshed DB2 cache entries accordingly
- Not online changeable

### ▪ **AUTEXIT\_CHECK (PRIMARY)**

- Indicates if the Primary Auth ID or the Owner is used for Autobind authorization checking when DSNX@XAC is active
- “DB2” indicates that DYNAMICRULES drive the authorization ID provided
- Not online changeable

### ▪ **INDEX\_CLEANUP\_THREADS (10)**

- Specifies the maximum number of threads for Pseudo-deleted index entry clean up processes

## New Parameters ...

- **UTILITY\_OBJECT\_CONVERSION (NONE)**
  - Control of the RBALRSN\_CONVERSION keyword in utilities
  - BASIC, EXTENDED, NOBASIC (Utility keyword uses EXTENDED)
  - EXTENDED or NOBASIC before NFM, with Utility default will cause an RC=04
  - EXTENDED & NOBASIC require OBJECT\_CREATE\_FORMAT=EXTENDED
- **MAXCONQN / MAXCONQW (OFF)**
  - Monitors the Connection queue depth (N) and time (W)
  - Also added to 10
- **MAXSORT\_IN\_MEMORY (CLIST calculation or 1000)**
  - Max allocated storage (KB) for a query with an:
    - ORDER BY or
    - GROUP BY
- **OBJECT\_CREATE\_FORMAT**
  - Default BASIC for migration and EXTENDED for installation
  - Indicates if new Table Spaces and Indexes should be created with 6 byte or 10 byte RBA / LRSN support
- **PARAMDEG\_DPSI (0 or PARAMDEG)**
  - Maximum degree of parallelism for a DPSI
  - 0 – 254, DISABLE
  - 1, Child tasks are worked one at a time
  - DISABLE, DPSI will not drive parallelism

## New Parameters ...

### ▪ **PARAMDEG\_UTIL (0, or no constraint)**

- Max parallel subtasks for some utilities
  - REORG TABLESPACE
  - REBUILD INDEX
  - CHECK INDEX
  - UNLOAD
  - LOAD
- 0 - 32767

### ▪ **PCTFREE\_UPD (0)**

- Default for the PCTFREE FOR UPDATE clause of CREATE / ALTER TABLESPACE
- Reserved from INSERTs
- AUTO, 0 - 99

### ▪ **PKGREL\_COMMIT (YES)**

- Indicates default behavior for “breaking in” on persistent threads bound with RELEASE(DEALLOCATE)
- PM95929 needed with V11 Early Code
  - PM96001 toleration / PM96004 enablement

## Deprecated / Removed Parameters

### ▪ Deprecated

- PRIVATE\_PROTOCOL
- CACHE\_DEP\_TRACK\_STOR\_LIM
- DPSEGSZ

### ▪ Removed

**ASSIST**  
**COORDNTR**  
**DISABSCCL**  
**DISALLOW\_DEFAULT\_COLLID**  
**MSVGP**  
**MSVGP2**  
**OJPERFEH**  
**OPTIOPIN**  
**OPTIOWGT**  
**OPTIXIO**  
**PTCDIO**  
**RETVLCFK**  
**SEQCACH**  
**SEQPRES**  
**SMSDCFL**  
**SMSDCIX**  
**STATCLUS**  
**CHARSET**



# Parameters Default & Maximum Changes

## ▪ Default

### – DESCSTAT

- Is now the default for a new BIND/REBIND PACKAGE... DESCSTAT keyword when there is no existing value

### – REORG\_PART\_SORT\_NPSI

- Changed from NO to AUTO
- Also added to DSNTIP62

### – SUBQ\_MIDX

- Changed from DISABLE to ENABLE

## ▪ Maximum

### DSMAX

- From 100,000 to 200,000

### EDM\_SKELETON\_POOL

- From 2097152 to 4194304

### EDMDBDC

- From 2097152 to 4194304

### EDMSTMTC

- From 1048576 to 4194304

### MAXKEEPD

- From 65535 to 204800

## Migration Preparations ...

- **Review & incorporate DB2 10 migration findings**
- **Perform V10 migration consideration / incompatibilities checking**
  - DSNTIJPB in V10
  - Delivered via PM94057
  - Check for current maintenance
- **Review the documented release incompatibilities**
- **The V10 Catalog could be checked in advance**
  - REORG to clean up
  - DSN1COPY w/CHECK
  - Catalog CHECK DATA, INDEX & LOB

# Migration: Pre-Conversion Mode ...

Before Conversion Mode

- **Apply the V11 Fallback SPE on the V10 system (PM31841)**
  - Review II14660 for additional maintenance
  - See II14730 & II14732 for Client & DDF migration information
- **Validate the Catalog / Directory**
  - DSN1COPY with PARM='CHECK'
    - May produce DSN1985I, which can be ignored on
      - SYSSTR, SYSSTATS, SYSDDF, SYSUTILX, SPT01
  - CHECK DATA, INDEX, and LOB
  - DSNTESQ Queries (checks for logical correctness)
- **Activate the DB2 11 EARLY Code**
  - IPL or
  - LLA,REFRESH & REFRESH,DB2 EARLY
    - DB2 must be down, but an IPL can be avoided
- **Collect V10 Performance Baselines**
  - Save SMF Data
    - Aggregate accounting by connection type
    - Statistics COMMITs / ROLLBACKs
    - DML per COMMIT
    - LOCK / UNLOCK requests
    - Buffer Pool statistics
    - System Service, DBM1, IRLM, DDF CPU (Total and Preempt IIP SRB)
    - Storage statistics (IFCID 225)
  - Save critical access paths
  - Optim Workload Replay (OWR) could capture pre-migration baseline test scenarios

# Migration: Conversion Mode ...

Conversion Mode

## ▪ DSNTIJTC

- Tailors the DB2 Catalog in a single unit of work
- In the case of failure, changes are rolled back
- Run this with DB2 in ACCESS(MAINT)
  - Allow workload to flow to other members

**00C200EF would indicate the SMS is not set up properly for new spaces created**

**See DSNTIJSS**

**MODE(X) = Coexistence**

```

DSN7100I DB1R DSN7GCMD
*** BEGIN DISPLAY OF GROUP(.....) CATALOG LEVEL(111) MODE(CM )
      PROTOCOL LEVEL(2) GROUP ATTACH NAME(....)

DB2          DB2 SYSTEM  IRLM
MEMBER  ID  SUBSYS  CMDPREF  STATUS  LVL  NAME      SUBSYS  IRLMPROC
-----  -  -  -  -  -  -  -  -  -  -  -  -
.....  0  DB1R  DB1R    ACTIVE  111  TESTMVS  DJ1R  DB1RIRLM

SPT01  INLINE LENGTH:   32138
*** END DISPLAY OF GROUP(.....)
DSN9022I DB1R DSN7GCMD 'DISPLAY GROUP' NORMAL COMPLETION
***

Database Connection Information
Database server      = DB2 z/OS 11.1.0
SQL authorization ID = DBA015
Local database alias = T5TD0206
    
```

### Online Migrations

- Data Sharing configuration
- Run in Coexistence (V10 & V11 members in the same group)
- Use ACCESS(MAINT) while running JTC on first member to migrate
- Cycle one member at a time
- Online for application SQL access to user data
- Not meant to run other utilities, DDL, DCL, or commands

```

DSNU000I 121 10:40:31.84 DSNUGUTC - OUTPUT START FOR UTILITY, UTILID = RELODCAT
DSNU1044I 121 10:40:31.86 DSNUGTIS - PROCESSING SYSIN AS EBCDIC
DSNU050I 121 10:40:31.95 DSNUGUTC - CATMAINT UPDATE
DSNU750I 121 10:40:31.98 DSNUECM0 - CATMAINT UPDATE PHASE 1 STARTED
DSNU777I 121 10:40:31.98 DSNUECM0 - CATMAINT UPDATE STATUS - VERIFYING CATALOG IS AT CORRECT LEVEL FOR MIGRATION.
DSNU777I 121 10:40:32.02 DSNUECM0 - CATMAINT UPDATE STATUS - BEGINNING MIGRATION SQL PROCESSING PHASE.
DSNU777I 121 10:40:38.94 DSNUECM0 - CATMAINT UPDATE STATUS - UPDATING DIRECTORY WITH NEW RELEASE MARKER.
DSNU752I 121 10:40:38.94 DSNUECM0 - CATMAINT UPDATE PHASE 1 COMPLETED
DSNU010I 121 10:40:38.96 DSNUGBAC - UTILITY EXECUTION COMPLETE, HIGHEST RETURN CODE=0
    
```

## Migration: Conversion Mode ...

- **Initial checkout**
  - Start components (like DDF) reporting issue during initial V11 start
    - Or cycle DB2
  - SYSROUTINES CDC was disabled and can be re-enabled
  - Update data set Aliases, Includes, and/or direct references to libraries
  - Optional; consider Catalog verification steps
- **DSNTIJIC (V11 CM Version)**
  - Back up the Catalog / Directory
  - A back up of the Catalog / Directory is recommended before ENFM
- **Continue using V10 Dynamic programs (TEP2, TEP4, TIAUL, etc.)**

## Migration: Conversion Mode ...

- **Coexistence considerations**
  - See the referenced documentation for considerations
  - One example is for Utility execution from DB2 10 members
    - Release-dependent load module (DSNUT101) and
    - Utility-dependent load modules (DSNU10\*)
    - Need to be copied or concatenated in / with the V11 SDSNLOAD

## Migration: Conversion Mode ...

### ▪ **REBIND Packages**

- Re-enables xPROCs/zPROCs
- Enacts most performance advantages in the new release (out of the box savings)
- Consider using Plan Management (if not already)
  - Consider FREEing Original copies that may exist to establish new Package baselines
- Consider using APCOMPARE or APREUSE if concerned about access path changes
- For Data Sharing, consider your ABIND ZParm and workload coexistence plans

### ▪ **REBIND Plans**

- This does not have the same impact as rebinding the Package
- However, there are runtime structures within the Plan which should be recreated on the new code base

### ▪ **Test, test, test**

- Compare results to your Pre-CM benchmark collections
- Function behavior differences will not be part of this test phase
  - APPLCOMPAT must be V10R1 until NFM and therefore this testing must wait

### ▪ **Convert REORG Mapping Tables to new format**

# Migration: Conversion Mode

## ▪ Fallback / Remigration test

- Become familiar with these steps in a Sandbox-like environment
- DSNTIJFV / modified DSNTIJMV

## ▪ Upgrade EXPLAIN / Optimization Tables

- See DSNTESC, DSNTESH for DDL
- DSNTIJXA for table migration assistance
  - Does not create DSN\_PREDICATE\_SELECTIVITY, DSN\_STAT\_FEEDBACK, or DSN\_VIRTUAL\_KEYTARGETS

```
DSNT093I: DSNTIXTA PROCESSING COMPLETE:
- SCHEMAS EXAMINED : 1
- TABLES EXAMINED : 20
- TABLES ALTERED : 20
- INDEXES CREATED : 1
- INDEXES EXAMINED : 0
- INDEXES RECREATED: 0
- TOTAL WARNINGS : 0
- TOTAL ERRORS : 0
```

## ▪ Maintenance

- If applying maintenance, make sure to review HOLDDATA for actions
- REBINDs may be required



## Migration: Enable New Function Mode ...

### ▪ Before proceeding to ENFM ...

- Complete the Installation CLIST ENFM panels and generate jobs
  - DSNTIPT has a new field to display JDBC AND SQL DLLS
  - ENFM & NFM conversion and reversion jobs
  - DB2 11 IVP jobs
  - Catalog RBA / LRSN expansion jobs
- Checkpoint with project stakeholders
- All testing should indicate no need for Fallback to V10
  - Regression testing & CM REBINDs should be complete
- Review user defined catalog indexes
  - Create shadow data sets for user defined Indexes on user managed storage
    - Report 2 of JPM / JPB
  - Review allocations for user defined Indexes on DB2 managed storage
    - Report 3 of JPM / JPB
  - For impacted user defined Indexes with additional pieces (A002 or higher)
    - SQL in DSNTIJEN comments
- All active members of data sharing groups must be migrated to CM before proceeding

## Migration: Enable New Function Mode ...

- **Before proceeding to ENFM ...**
  - Review the UTILITY\_OBJECT\_CONVERSION setting
    - EXTENDED or NOBASIC causes JEN to convert RBA/LRSN to 10 bytes
      - Except SYSUTILX
    - This setting require OBJECT\_CREATE\_FORMAT=EXTENDED
  - Backup the Catalog and Directory (CM DSNTIJIC)
    - Optionally create a volume level backup of the subsystem / group
  - Should review DSNTIJEN impacted tables and disable Data Capture Changes
    - Do not use RESTRICT\_ALT\_COL\_FOR\_DCC=YES during migration
  - Consider MODIFY RECOVERY & RUNSTATS
  - Identify persistent threads that interrupt DSNTIJEN
    - Run CM Online REORGs of the 6 DSNTIJEN Catalog / Directory spaces
    - Gain a rough idea of the duration of the REORG for the DSNTIJEN job
  - Ensure SYSUTILX is empty
    - Utilities recorded in SYSUTILX will cause JEN to stop
    - SYSUTILX will be reset as part of the conversion

## Migration: Enable New Function Mode ...

- **Before proceeding to ENFM**

- This is a group wide event
- Table Spaces (Tables) involved:
  - SYSUTILX (SYSUTILX, SYSUTIL)
  - SYSLGRNX (SYSLGRNX)
  - SYSCOPY (SYSCOPY)
  - SYSRTSTS (SYSTABLESPACESTATS, SYSINDEXSPACESTATS)
  - SYSTSIXS (SYSINDEXES)
  - SYSTSTAB (SYSTABLES)
  - SYSSTR (SYSCHECKDEP, SYSCHECKS, SYSCHECKS2, SYSSTRINGS)

## Migration: Enable New Function Mode ...

### ▪ DSNTIJEN ...

- Converts to ENFM
- Do not attempt to modify this job
- Issues commands
  - Displays any utilities
  - Terminates previously run DSNTIJEN, if exists
    - Utility ID DSNENFM.\*
  - DISPLAY GROUP DETAIL
- Verifies that the Catalog is at the right level
- Checks for impacted objects in COPY or ICOPY status
  - Backs up any found in these statuses
- Avoid running other processes that modify the Catalog / Directory during JEN execution

### Online Migrations

- Online REORG is run against the migrated objects
- Online for application SQL access
- Not for other utilities, DDL, DCL, or commands

# Migration: Enable New Function Mode ...

## ▪ DSNTIJEN ...

- Establishes metadata about DSNDB01 tables for serviceability SQL access

- Cleans up existing

- SYSDATABASE DBID=1
- SYSTABLESPACE DBID=1

- INSERTs metadata data for Database DSNDB01

- Table Space (Table)
- SYSLGRNX (SYSLGRNX)
- SYSUTILX (SYSUTILX, SYSUTIL)
- SCT02 (SCTR)
- SPT01 (SPTR)
- SYSSPUXA (SYSSPTSEC\_DATA)\*
- SYSSPUXB (SYSSPTSEC\_EXPL)\*
- DBD01 (DBDR)
- SYSDBDXA (SYSDBD\_DATA)\*
- Except for “\*” items, Columns, Index, Keys, and Relationship metadata is also created
- Note that some meta data values for the directory may not follow documented values (PI08928 is resolving this).

```
DELETE FROM SYSTEM.SYSDATABASE WHERE DBID=1
.25 DSNUGSQL - SQLCODE = 000, SUCCESSFUL EXECUTION
.25 DSNUGSQL - SQLERRD = 0 0 1 1120734435 0
.25 DSNUGSQL - SQLERRD = X'00000000' X'00000000'

DIAGNOSTIC INFORMATION
DELETE FROM SYSTEM.SYSTABLESPACE WHERE DBID=1
.27 DSNUGSQL - SQLCODE = 000, SUCCESSFUL EXECUTION
```

```
INSERT INTO SYSTEM.SYSTABLESPACE (NAME, CREATOR, DBNAME, DBID, OBID, PSID, BPO
OL, PARTITIONS, LOCKRULE, PGSIZE, ERASERULE, STATUS, IMPLICIT, NTABLES, NACT
INSERT INTO SYSTEM.SYSTABLES (NAME, CREATOR, TYPE, DBNAME, TSNAME, DBID, OBID,
COLCOUNT, EDPROC, VALPROC, CLUSTERTYPE, CLUSTERID, CARD, NPAGES, PCTPAGES, IB
INSERT INTO SYSTEM.SYSCOLUMNS (NAME, TENAME, TS_CREATOR, COLNO, COLTYPE, LENGT
H, SCALE, NULLS, COLCARD, UPDATES, IBMREQD, REMARKS, DEFAULT, KEYSSEQ, FOREIGN
KEY, FLDPROC, LABEL, RELCREATED, HIGH2KEY, LOW2KEY) VALUES ('LGRDBID', 'SYSLG
RNX', 'SYSTEM', 1, 'CHAR', 2, 0, 'N', -1, 'N', 'X', 'N', 0, 'S', 'N
.28 DSNUGSQL - SQLCODE = 000, SUCCESSFUL EXECUTION
```

## Migration: Enable New Function Mode ...

### ▪ DSNTIJEN ...

#### – Converts (CATENFM)

- SYSUTILX
- SYSUTIL

```
2.84 DSNUECM0 - CATENFM START PHASE 1 COMPLETED
2.86 DSNUGBAC - UTILITY EXECUTION COMPLETE, HIGHEST RETURN CODE=0
2.93 DSNUGUTC - OUTPUT START FOR UTILITY, UTILID = DSNENFM.ENFM0010
2.96 DSNUGTIS - PROCESSING SYSIN AS EBCDIC
2.96 DSNUGUTC - CATENFM CONVERT INPUT SYSUTILX
2.97 DSNUECM0 - CATENFM CONVERT PHASE 1 STARTED
UPDATE SYSIBM.SYSCOLUMNS SET COLNO = 46, LENGTH = 72 WHERE TBcreator='SY
SIBM' AND TBNAME='SYSUTIL' AND NAME='USUR6'
```

#### – Converts (CATENFM) & Online REORG ... CONVERTV11

- SHRLEVEL REFERENCE when a Table Space change is made
- SHRLEVEL CHANGE when Table Space remains the same
  - SYSLGRNX            SHRLEVEL CHANGE
  - SYSCOPY            SHRLEVEL REFERENCE
  - SYSRTSTS            SHRLEVEL REFERENCE
  - SYSTSIXS            SHRLEVEL CHANGE
  - SYSTSTAB            SHRLEVEL CHANGE
  - SYSSTR              SHRLEVEL REFERENCE
  - Uses Automatic Mapping Table support
    - > See PM94690 for -551 during migration

#### – Repeats DISPLAYs and TERM

## Migration: Enable New Function Mode ...

### ▪ DSNTIJEN

- Considerations
  - SYSUTILX is reset during conversion
  - DSNTIJNH can be used to halt this job (CATENFM HALTENFM)
  - Multiple data sets for a page set may be consolidated
    - Everything converted now uses 64GB Extended Format & Addressability
  - In case of failure:
    - Isolated to the Table Space being processed at that time
    - Online REORG shadows will be thrown away
    - Resolve the problem
      - > **Do not attempt any recoveries**
    - Resubmit DSNTIJEN unaltered
  - DB2 will operate with the Catalog / Directory in a partially converted state
    - Make plans to complete the conversion as soon as practical
    - Avoid other utilities on the Catalog / Directory during this time

### ▪ DSNTIJCI

- Checks indexes of the Catalog and Directory from the ENFM conversion
  - CHECK INDEX(ALL)...on changed Catalog and Directory objects

# Migration: Enable New Function Mode

## ▪ DSNTIJCS

- Reverts to CM\*
- No Fallback available from this mode
- Return to ENFM (DSNTIJEN) before NFM

## ▪ DSNTIJIC (ENFM)

- Backup the converted Catalog / Directory

## ▪ Testing

- Application testing does not need to be repeated
- Light check out should be considered

## ▪ DB2 10 Libraries

- At this point, fallback is no longer an option
- Consider cleaning up any reference to V10 libraries to avoid future SVC issues
  - Link List
  - STEPLIBs
  - Aliases
  - Etc.

## ▪ Update shadow Catalogs if they exist

```

DSN7100I  DB1R DSN7GCMD
*** BEGIN DISPLAY OF GROUP(.....) CATALOG LEVEL(111) MODE(CM* )
                                PROTOCOL LEVEL(2)  GROUP ATTACH NAME(....)
-----
DB2
MEMBER   ID  SUBSYS  CMDPREF  STATUS  DB2 SYSTEM  IRLM
-----  -  -  -  -  -  -  -  -  -  -
.....   0  DB1R   DB1R     ACTIVE  111 TESTMVS  DJ1R  DB1RIRL
-----
SPT01  INLINE LENGTH:           32138
*** END DISPLAY OF GROUP(.....)
DSN9022I  DB1R DSN7GCMD 'DISPLAY GROUP ' NORMAL COMPLETION
***

```



## Migration: New Function Mode ...

### ▪ Planning for NFM

- Consider converting to NFM with ENFM
  - Pause for brief checkout, and proceed to NFM
- For non-Production environments
  - May want to delay NFM to avoid development using new features that cannot be promoted during this project timeframe
- Consider client behavior
  - Drivers sometimes exhibit behavior changes when “seeing” that the server is now NFM
- This is a group wide event
- Should reversion be necessary
  - DSNTIJES will return to EN\*
  - DSNTIJCS will return to CM\*

### ▪ Before converting to NFM

- Updates to the Catalog / Directory should be avoided while converting
- Disabling SCA duplexing (JNF reformats the SCA RBAs/LRSNs)

# Migration: New Function Mode ...

## ▪ DSNTIJNF

- Converts to NFM & Extends SCA LRSNs
- DB2 11 SQL capabilities are now enabled
  - New functions are not available until Packages are rebound APPLCOMPAT V11R1
    - While V10R1 (default), new SQL features return SQLCODE -4743
  - Functions will retain V10 behavior until APPLCOMPAT is addressed

## ▪ Reverting

- DSNTIJCS will return to CM\*
  - Cannot fallback from CM\*
- DSNTIJES will return to EN\*

## ▪ DSNTIJNG

- Changed DSNHDECP NEWFUN to V11

### Database Connection Information

```
Database server      = DB2 z/OS 11.1.5
SQL authorization ID = DBA015
Local database alias = TSTDB206
```

# Migration: New Function Mode

## ▪ DSNTIJNX

- REBINDs SPUFI and DSNREXX for
  - APPLCOMPAT(V11R1)
  - ARCHIVESENSITIVE(YES)
  - BUSTIMESENSITIVE(YES)
  - SYSTIMESENSITIVE(YES)
- Consider doing the same for client Packages
  - Note these keywords must be explicitly stated or the REBIND can default to the existing setting which will be V10R1
- DSNRLMTxx expanded Client Info fields
  - ALTERs provided to modifies this table if it exists, or
  - CREATE at this time to if needed

## ▪ Prepare V11 Dynamic Sample programs

- DSNTJ2A
- DSNTJ1L/P
- Make sure references to V10 programs is removed

## Migration: New Function Mode

New Function Mode

- **Consider the ZParm APPLCOMPAT setting**
  - See APPLCOMPAT section
  - Begin DB2 11 feature exploitation
  - Probably want this left at V10R1 until majority of applications complete new function testing
- **Consider RBA / LRSN expansion**
- **DB2 11 IVP testing can be performed**

# Migration Catalog / Directory Summary

Catalog / Directory Visualization

- All new non-AUX create Table Spaces are PBGs
  - MAXPARTITIONS 1
  - DSSIZE 64G
- 108 Unicode; 7 EBCDIC; 1 ASCII

- TS Page Size Counts
  - 4K = 76 -> 94
  - 8K = 10
  - 16K = 5 -> 6
  - 32K = 4 -> 6

V10 to V11 Overview

DSNDB01 / 06 Changes

Green indicates replacing an existing Tablespace

DB2_VERSION_MODE	TS Count	Table Count	Column Count	TSNAME	TSNAME	TSNAME	TSNAME	TSNAME	TSNAME
V10NFM	97	187	2522	SYSTSIXC	DBD01	SYSCOPY			
V11CM	106	196	2688	SYSTSOBX	SCT02	SYSRTSTS			
V11EN	113	199	2716	SYSTSQRE	SPT01	SYSSTR			
V11NFM	113	200	2718	SYSTSQRS	SYTSCHX				
				SYTSSFB	SYTSCKD				
				SYTSSVAD	SYTSCKS				
				SYTSSVAR	SYTSCPY				
				SYTSSVAT	SYTSSIS				
				SYTSSVAU	SYTSSRG				
					SYTSTSS				

	Table Space Count	Table Count	Column Count
V10NFM	97	187	2522
	+ 9	9	166
	- 0	0	0
V11CM	106	196	2688
	+ 10	3	28
	- 3	0	0
V11EN	113	199	2716
	+ 0	1	2
	- 0	1	0
V11NFM	113	200	2718
Overall Delta	16	13	196

## Application Compatibility ...

- **Allows applications to continue experiencing SQL DML & XML behavior from a previous release (DB2 10)**
  - APPLCOMPAT ZParm
    - Must be V10R1 until NFM
  - Migrations default to the migrate-from release (V10R1)
  - Installations default to the migrate-to release (V11R1)
- **DDL and DCL is *not* fenced by APPLCOMPAT**
- **This includes new functions, not just changes to existing behavior**
- **May not be possible when conforming to SQL standards**

## Application Compatibility ...

- **Similar limited capability in DB2 10**
  - BIF\_COMPATIBILITY
  - DDF\_COMPATIBILITY (Disabled when APPLCOMPAT set to (V11R1) via PM94719)
- **Static SQL is governed by the Package APPLCOMPAT**
  - Cannot bind with V11R1 until NFM
- **Dynamic SQL is governed by the:**
  - CURRENT APPLICATION COMPATIBILITY
  - Which defaults to the Package APPLCOMPAT if not SET
- **Once in NFM:**
  - CURRENT APPLICATION COMPATIBILITY can be set to either level
  - RE/BIND PACKAGE can choose either level

# Application Compatibility ...

## ▪ **CURRENT APPLICATION COMPATIBILITY**

- Defaults to the Package RE/BIND
- If not rebound, defaults to the ZParm
- SET this Special Register overrides all
  - Must be in NFM to SET this register

## ▪ **IFCID 239**

- Indicates Packages using a function that changes in DB2 11
- Field QPACINCOMPAT
- See SDSNMACS(DSNDQPAC) for mapping

## ▪ **IFCID 366/376**

- Records indicate SQL using the V10 code path which is different from the V11 code path
- Use these in CM to identify programs needing review
- 376 is new in V11 and is a roll up of activity reported in 366
  - Attempts once per dynamic and static statement (bound V10 or later)
  - Once per Plan, Package, Statement # bound prior to V10
- See SDSNMACS(DSNDQW05) for detailed description



# Application Compatibility ...

10 NFM

11 CM

11 ENFM

11 NFM

- **ZParm V10R1**
    - Can set to V11R1 but will not operate that way
  - **BIND/REBIND**
    - Must be V10R1
  - **CREATE/ALTER**
    - Must be V10R1
  - **SET CAC\* not available**
  - **IFCID 239/366/376**
- **Same as CM**
- **ZParm**  
V10R1 or V11R1
  - **BIND/REBIND**  
V10R1/V11R1 available
  - **BIND**  
Defaults to ZParm
  - **REBIND & Autobind**  
Defaults to previous Catalog value first  
ZParm second
  - **CREATE/ALTER**  
V10R1 or V11R1
  - **SET CAC\* available**
  - **New features**  
Require V11R1

\*CAC = CURRENT APPLICATION COMPATIBILITY

## RBA / LRSN Expansion ...

- **DB2 10 and prior used a 6 byte (Basic) RBA / LRSN**
  - Some customers have had to take RBA action to keep systems running
    - RBA reset
      - Manual recovery action to reset
    - Bring up new data sharing members
  - Represents 256 TBs of logging space
  - Messaging (DSNJ032I) and system actions
    - F000 0000 0000 warning threshold surfaces at log switch & restart
    - FFFF 0000 0000 critical threshold, DB2 will only run ACCESS(MAINT)
  - The LRSN also has a limit in Year 2042 if there's no DELTA RBA
  - STORCLK is 8 bytes, and therefore LRSN spin can occur

## RBA / LRSN Expansion ...

- **DB2 11 offers the option to convert to a 10 byte RBA / LRSN**
  - Almost 4 Billion times the logging space
  - RBA extended with high-end (left) 4 bytes
    - Extended value represents 1 YB of logging space (1 YB = 1 Trillion TBs)
  - LRSN
    - 1 byte on high-end
    - 3 bytes on the low-end
    - Adding 30,000 years of logging
  - Conversion is optional if not nearing the 6 byte limit
    - However, DB2 11 uses 10 bytes internally and converts to 6 on writes
  - Convert earlier than required to:
    - Avoid internal conversions
    - Resolve LRSN spin conditions
    - Disabling Data Sharing requires 10 byte RBA/LRSN for surviving members

## RBA / LRSN Expansion ...

- **Must restart the subsystem / member on NFM before expansion**
- **There are 3 areas for conversion which can be done in any order and schedule IF NOT NEARING 6 byte limit**
  - BSDS (DSNTIJCB)
    - DB2 is down
    - BSDSs are reformatted and will grow
    - A checkpoint will be taken at restart
  - Catalog (DSNTIJCV)
    - Some of these may have been converted during DSNTIJEN (ENFM)
  - User Data / Indexes
    - REORG, REBUILD, LOAD REPLACE with any SHRLEVEL
    - At the PART level, except for XML\* & Hashed
    - Data & Indexes can be converted independently
    - Growth is not expected, as there is enough room in the pages
- **DB2 11 internals are always using a 10 byte RBA / LRSN**
  - But can be converted to 6 byte for objects in BASIC format for writes
  - As long as DB2 is not close to the 6 byte limit, PART may be an option

# RBA / LRSN Expansion

## ▪ V11 6 byte Thresholds

### – RBA

- F000 0000 0000
  - DSNJ032I Warning with each log switch and DB2 restart
- FFF8 0000 0000
  - -904 00C2026D Soft Limit
  - No SQL Updates allowed for Basic Objects
- FFFF 0000 0000
  - DSNJ033E Critical Threshold
  - DB2 stops with 00D10251
  - DB2 only runs in ACCESS(MAINT)
- If you manage to reach all 'F's, then previous RBA reset procedure is still likely

### – LRSN

- 1 Year left
  - DSNJ034I Warning with each log switch and DB2 restart
- 2 Months left
  - 904 00C2026D Soft Limit
  - No SQL Updates allowed for Basic Objects
- 2 Weeks left
  - DSNJ033E Critical Threshold
  - DB2 stops with 00D10251
  - DB2 only runs in ACCESS(MAINT)

## Migration Summary

- **Run checks against your V10 system**
- **Review documentation**
- **Resolve / research inconsistencies and release incompatible changes**
- **Establish a Project Plan and Project Team**
- **Assess new features & training plans**
- **Complete any prerequisite projects**
- **Collect Performance Baselines**
- **Establish Test Plans**
- **Determine Conversion & Coexistence (data sharing) goals**
- **Determine your Application Compatibility and RBA Expansion plans**
- **Keep your IBM team informed**

## What did our ESP Customers say...

- Migration
  - Easy and smooth migration to NFM
  - No show stoppers compared to ESP V10
  - Code Quality Very Good and Very stable
  - Some Customers pushed very hard and created many PMRs
- ESP releases during the program
  - Most had few errors
  - Almost all announced features of the PFS made it into the product
- High Points
  - Online Migrations
  - Release Incompatibility addressed
  - DBM1 Class 2 Improvement
  - Additional zIIP utilization

## What did our ESP Customers say...

- High Points
  - Pseudo Deleted index Cleanup
  - Bufferpool enhancements ( 2GB page)
  - Bind/DDDL Breakin
  - Global Variables
- ESP Customers Plans
  - Early Uptake better than V10



THANK  
YOU

