Planning and executing a DB2 11 for z/OS Migration

Ian Cook
DB2 for z/OS Specialist, zChampion
IBM Software Group
ian_Cook@uk.ibm.com

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Platform: z/OS
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DB2 11 for z/OS Migration Agenda

- Review the DB2 11 ESP
- Project Plan / Education
- Prerequisite Summary
- Pre migration planning
- Incompatibilities, removed & deprecated items
- Test configurations
- Regression testing
- Migration Process Details
  - Migration to Conversion Mode (Running DSNTIJTC)
  - Enable New-Function-Mode (Running DSNTIJEN)
  - Catalog Evolution / Restructure

- Application Compatibility
- RBA / LRSN Expansion

- Objectives
  - Provide planning information
  - Outline the migration process
  - Share some lessons learned
  - Hints, tips, best practices
  - Help customers plan for, and execute DB2 11 for z/OS migrations as fast as possible, but safely
Review of the DB2 11 ESP

IBM announced DB2 11 Early Support Program
→ Learn more
**DB2 11 for z/OS Early Support Program (ESP)**

<table>
<thead>
<tr>
<th>ESP Start</th>
<th>February 2013</th>
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<tbody>
<tr>
<td>First Code Drop</td>
<td>March 2013</td>
</tr>
<tr>
<td>“Regular” service process</td>
<td>July 2013</td>
</tr>
<tr>
<td>GA</td>
<td>October 25, 2013</td>
</tr>
<tr>
<td>ESP Close</td>
<td>January 2014</td>
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- **Major themes**
  - Performance enhancements
  - Enhanced Resiliency and Continuous Availability
  - Enhanced business analytics
  - Simpler, faster DB2 version upgrades

- **WW Customers (21 Core & 6 Extended (2H13))**
  - Banking, Insurance, Healthcare, Financial Markets, Automotive, Computer Services, Professional Services

- **Key Customer Focus Areas**
  - Regression testing, New Function
  - Out-of-box performance, Additional performance

- **Customer views of a DB2 ESP**
  - Easy access to experts with quick feedback
  - Visibility of issues all participants encountered
  - Most meetings very informative.
  - Definitely want more ESP involvement
DB2 11 ESP Customer Feedback

- **Excellent quality and reliability at this early stage in the release cycle**
- **Good performance and CPU savings**
  - DRDA workload up to 20% CPU reduction
  - CICS workload up to 18% CPU reduction
  - Batch workload up to 20% CPU reduction
- **Greatest hits**
  - BIND, REBIND, DDL, Online REORG break in
  - Transparent archiving
  - IFI 306 filtering by object (Qreplication)
  - Online schema change
  - Utility improvements particularly Online REORG
  - Extended LRBA/LRSN
  - Optimizer and migration improvements
  - GROUP BY Grouping Sets
DB2 11 ESP Migration Status at GA

- **DB2 11 migration to CM and NFM**
  - All core participants had DB2 11 CM in sandbox or test systems
  - All participants successfully completed DB2 11 NFM migrations, some with multiple subsystems or data sharing groups

- **DB2 10 NFM, DB2 11 CM regression testing**
  - DB2 10 NFM baselines completed by most
  - Several ESP customers sent DB2 11 vs. 10 performance data to DB2 Lab for analysis
    - DB2 11 measurements looked favourable from the comparison data sent
    - Range of 5 to 20% CPU reduction in batch and OLTP workloads
    - Increased zIIP offload in both DBM1 and MSTR

- ‘Near production’ systems running DB2 11 CM
- A host of new functions tested
- DB2 11 SAP Certified at GA
- Customer rollout plans in place for 2014
  - Positive feedback continues
DB2 11 for z/OS ESP Feedback

“Higher availability, performance, lower CPU consumption amongst other new features were the benefits perceived by Banco do Brazil with DB2 11 for z/OS. During our testing with DB2 11 we noticed improved performance, along with stability.”
- Paulo Sahadi, IT Executive, Banco do Brasil

“We have seen some incredible performance results with DB2 11, a major reduction of CPU time, 3.5% before REBIND and nearly 5% after REBIND. This will significantly bring down our operating costs.”
- Conrad Wolf, Golden Living

“DB2 11 continues to raise the standard for availability, allowing object changes online and rebinding packages in use. This lets us deliver the highest availability solutions for our customers!”
- Frank Peterson, JN Data

DB2 11 SAP Certified at GA – the fastest ever certification for any DB2 for z/OS release in history

“I saw a significant performance improvement in recovery of catalog and directory. (V10 5:53 minutes, V11 2:50 minutes) That rocks! … DB2 11 is the best version I have ever seen.” - European Gov’t
DB2 11 for z/OS ESP Feedback...

“We have been involved in several DB2 for z/OS ESP’s. This one will rank as one of, if not the smoothest one yet.” – Large NA retailer

“Overall we are very satisfied and astonished about the system stability of DB2 V11. In V10 we experienced this in another way.” – European Insurance

“We have seen very few problems in [Installation, Migration, and Performance]. Overall, it has been a very pleasant experience!!…The quality of the code is clearly much higher than for the ESP for DB2 10…” - European Banking/FSS

“Good code stability, no outages, no main failures, only a few PMRs….” – European Banking

“Overall, we have been impressed with the new version of DB2.” – NA Manufacturer
Where can I find further information on DB2 11 for z/OS?
Key sources of information

- Always refer to the most current documentation when planning your migration projects
- Announcement Letter 213-376
- Program Directory - GI10-8945-00
- Installation Guide GC19-4056-02
- IBM Knowledge Center  New
- DB2 11 Technical Overview Redbook (SG24-8180)
- DB2 11 for z/OS Buffer Pool Monitoring and Tuning
- DB2 11 for z/OS Performance Topics (SG24-8222)
- Technical Conference sessions at IDUG, GSE
- World of DB2 and the series of Webcasts on offer
  - DB2 11 for z/OS Technical Overview (2 parts)
  - DB2 11 for z/OS Migration Planning and Early Customer Experiences (2 parts)
- DB2 11 for z/OS Migration Planning Workshops
- Hands on Labs workshop coming soon in Hursley
  - Experience a DB2 11 for z/OS migration for yourself
DB2 11 for z/OS Education & Conferences

Easy way to schedule the 4 GTPs

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Global Knowledge
LearnQuest
AVNET
The Fillmore Group

IBM Insight 2014
Save the date! October 26 – 30, 2014

Information On Demand is now

DB2 SYMPOSIUM
DB2 11 for z/OS Downloads & Videos

No Charge

80 WW DB2 Regional RUGS

Search for DB2 topics

New IDUG Tech Talk:
DB2 11 for z/OS IDUG User Experiences
Sheryl Larsen Advanced SQL Coding Seminar
Sheryl Larsen Tuning SQL Seminar
# DB2 11 for z/OS Book Marks

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<td>Special DB2 11 for z/OS Gaining a Competitive Edge:</td>
<td><a href="http://bit.ly/DB211webcast">http://bit.ly/DB211webcast</a></td>
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<td>DB2 11 for z/OS The Database for Big Data &amp; Analytics</td>
<td><a href="http://ibm.co/160vQgM">http://ibm.co/160vQgM</a></td>
<td>e-book</td>
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<tr>
<td>Molaro - How DB2 11 for zOS Can Help Reduce Total Cost of Ownership</td>
<td><a href="http://ibm.co/1hwmcra">http://ibm.co/1hwmcra</a></td>
<td>Whitepaper</td>
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<td>Stuhler - DB2 11 for z/OS Unmatched Efficiency for Big Data and Analytics</td>
<td><a href="http://ibm.co/16t00Nw">http://ibm.co/16t00Nw</a></td>
<td>Whitepaper</td>
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<td>Improved query performance in IBM DB2 11 for zOS</td>
<td><a href="http://ibm.co/16xwar9">http://ibm.co/16xwar9</a></td>
<td>Whitepaper</td>
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<td>DB2 11 Marketing Flash Demo</td>
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<td>DB2 11, Big Data &amp; Analytics Overview &amp; Highlights Brochure</td>
<td><a href="http://ibm.co/19SE3aL">http://ibm.co/19SE3aL</a></td>
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<td>DB2 11 and Real Time Business Critical Analytics (IBM IDAA)</td>
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<td>Whitepaper</td>
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<td>BMW Group develops eco-friendly innovation for smart drivers with IBM DB2 11</td>
<td><a href="http://ibm.co/Glt7Tu">http://ibm.co/Glt7Tu</a></td>
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<td>JN Data gets the early-adopter advantage for its growing business with DB2 11</td>
<td><a href="http://ibm.co/1b2NyE3">http://ibm.co/1b2NyE3</a></td>
<td>Case Study</td>
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DB2 11 for z/OS Packaging - PID 5615-DB2

**Base**
- DB2 Base (HDBB10)
  - REXX
  - MQListener
- IRLM V2R3 (HIR2230)
- IMS Attach (HIYBB10)
- RACF Auth Exit (HDREB10)
- Panels – English (JDBBB14)
- DB2 JDBC / SQLJ (JDBBB12)
- DB2 ODBC (JDBBB17)

**Orderable No-Charge Features**
- z/OS Appl Connectivity to DB2 for z/OS
  - (HDDA211)

**Chargeable Features**
- DB2 QMF V11
  - DB2 QMF Enterprise Edition
  - DB2 QMF Classic Edition

**Related No-Charge Product**
- DB2 Accessories Suite 5697-Q04
  - JSON (II14727) & Data Studio 4.1
  - (Announcement letter 213-395)

**When ordering DB2 11 for z/OS also order the DB2 Utilities Suite (5655-W87)
Project Planning & Detailed Test Plans
Base your DB2 11 Migration Project on a solid Plan

- Don’t short change the planning phase
- Identify your migration stakeholders
- Justification for migration:
  - Develop a plan to meet your business goals
  - Performance, New features, eventually support
    - IBM announces “End of service” for DB2 9, effective June 27, 2014.

- Establish a cross-discipline project team
  - Systems Prog, DBA and Applications to validate:
    - The overall Project Plan
    - Items listed in Test plans
    - Actual migration process
    - End results and expectations
- Assess the training requirements for the team
  - Compile the education plan
  - See earlier slides for “skills transfer” options
Project Plan – Technical considerations for the plan

• How did your V10 test plans work?
  • Review & incorporate DB2 10 migration findings
  • Reuse and improve upon your experiences

• Review the Installation Guide checklists:
  • Premigration checklist for migration to DB2 Version 11 conversion mode
  • Checklist for migration to DB2 Version 11 conversion mode

• Consider Single Version Charging when building your plan
  • Incorporate discoveries from your analysis and known company events

• Many tasks should be moveable to a degree
• Consider parallel and “add on” side projects
  • May cause pauses / expansions in the DB2 11 migration plan
• Overlay “freezes” based on your production schedules
• Review environments with multiple subsystems / members in each
• Don’t plan yourself into a corner
  • Avoid close timeframes to holidays, major company events
• Always plan for the unknown
  • PMRs
  • Testing problems
• Data sharing requires both Conversion and Coexistence goals
• Check out the MPW Functional Inventory
Project Plan – Early elimination of Risks & Issues is key

- Early discussions to identify project risks
- Systems availability during project
- Workload availability
- People associated with the project team
- Ability to measure, and capture performance information from current DB2 10 systems, for later comparison with migrated DB2 11 systems
- Plan regular status meetings
  - Update the Stakeholders
  - Keep your IBM & ISV teams informed
What’s an “MPW”?

- The DB2 11 for z/OS Migration Planning Workshop Project Plan Framework
- Incorporate tasks into your Project Plan

DB2 11 for z/OS Migration Planning Workshop

Objectives:
- To understand the breadth of features delivered in DB2 for z/OS
- To bring together a toolbox of resources for your migration planning
- To explain the current migration process
- To bring a project focus to migration
- To remain relevant throughout the GA life of the product
  - Updated with field experiences

DB2 11 for z/OS Migration Planning Workshop Agenda:
- Introductions
- DB2 11 Migration
  - Planning, Preparations, Process
  - Catalog Evolution
  - Application Compatibility Planning
  - Extended RBA / LRSN
- DB2 11 for z/OS Overview
  - Systems / Administration Topics
- Lunch
- DB2 11 for z/OS Overview (continued)
  - Application Development Topics
  - Topics for Application Development & Systems / Administration
DB2 11 Project Planning Framework Structure

- Sandbox Environment
- Development
- System Test/QA
- Production
- Installation of Code
- Break/Fix
- Enable New Function Mode
- New Function Mode
DB2 11 Project Framework...

- Project orientation
- Initial planning
  - Upgrade tools as needed
  - Log readers (Replication) should upgrade before DB2 due to 10 byte RBA/LRSN
- Acquisition
- Includes updates notes

See the Task List for task details.
DB2 11 Project Framework

- Complete all Modes in Sandbox
- Develop routines to resolve incompatible changes
- Test fallback & remigrate
- Initial tools / application testing
- New tasks for
  - Migration SQLIDs
  - APPLCOMPAT
  - Extended RBA/LRSN
  - And others ...
- Many Best Practices included
DB2 11 Project Framework

- Repeat the steps mastered in the Sandbox environment, interacted across environments
- Resolving incompatibilities
- Performance benchmark basis / measurement
- Preparatory REORGs to find potential incompatible threads in ENFM
- Time spent in CM to determine performance experience & complete REBINDs
- RBA/LRSN considerations for each landscape

Several Notes added / updated
# Sample ESP Customer Migration Test Plan - Early draft

<table>
<thead>
<tr>
<th>Priority</th>
<th>Testing planned</th>
<th>Technical Description</th>
<th>Timeframe</th>
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</table>
| 1        | Check migration process of DB2 11                         | • Pre-migration check by catalog cloning of prod systems  
|          |                                                            | • Regression tests - baseline                                                          | Start March 2013         |
| 1        | Migrate to DB2 11 CM                                     | • Non-production environment                                                            | Start March 2013         |
| 1        | Check basic functions of customer apps – Batch           | • Run batch suite with wide variety of SQL and utilities                              | Start April 2013         |
| 1        | Check basic functions of customer apps – Online          | • Run IMS transactions  
|          |                                                            | • Run WAS trans (type 2 / 4 connect)  
|          |                                                            | • DDF support                                                                         | Start May 2013           |
| 1        | Tools support (IBM & ISV)                                | DB2 11 CM mode                                                                       | Start March 2013         |
| 1 / 2    | Improvements for customer appl. Release changes          | • Online Schema Evolution  
|          |                                                            | • Plan stability                                                                       | Start June 2013          |
| 1        | Migrate to DB2 11 NFM                                    | • Run IVPs                                                                            | Start June 2013          |
| 2        | Test key new DB2 11 functions                            | • Extended RBA / LRSN  
|          |                                                            | • Data Warehousing  
|          |                                                            | • XML                                                                                 | Depends on success of above (Priority 1) items |
| 3        | Tools support (IBM & ISV)                                | DB2 11 NFM mode                                                                       | Start January 2014       |

**A summarized Migration Test Plan, ordered by test priority**
Contact your software vendors

• Review your DB2 related software inventory
  • Research ISV and in-house developed products

• Assess DB2 11 Requirements / Readiness of the software
  • Contact your software vendors / developers
  • Some software product vendors may add instructions for migration and / or require maintenance

• Develop your project plans for testing / deployment of these products
  • It’s likely these products / applications are managed by other members of your organisation
    • Plan for early meetings and outline “your” DB2 11 timescales
  • How did your V10 test plan / schedule work out?
  • Reuse and improve upon your experiences
Technical Planning and “Key Prerequisites”
Prerequisites – Hardware & Operating System

• Processor requirements:
  • EC12, z196, z10 processors supporting z/Architecture
  • Will probably require increased real storage for a workload compared to DB2 10 for z/OS (for project planning consider up to 15%)

• Software requirements:
  • z/OS V1.13 Base Services (5694-A01) at minimum
  • DFSMS V1 R13 – DB2 Catalog is SMS managed
  • Language Environment Base Services
  • z/OS Version 1 Release 13 Security Server (RACF)
  • IRLM Version 2 Release 3 (Shipped with DB2 11 for z/OS)
  • z/OS Unicode Services and appropriate conversion definitions are required
  • More to follow on subsequent slides
Additional planning for prerequisite products & installs

- **IBM InfoSphere Data Replication (IIDR) 10.2.1**
  - Single offering for a wide variety of data solutions:
  - Change Data Capture, Q Replication
  - SQL Replication, Data Event Publishing
  - Supports extended RBA / LRSN

- **IBM DB2 Tools Compatibility**
  - Tools may be “new” versions
  - Maintenance to others
  - Plan for the SMPE work

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**Product life cycle dates**

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<th>Announced</th>
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**DB2 Tools**

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<th>VRM</th>
<th>DB2 11 Support</th>
<th>Comments</th>
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<td>DataRefresher</td>
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<tr>
<td>DB2 Administration Solution Pack</td>
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<td>7.2.0</td>
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Prerequisites – DB2 Connect

- DB2 for z/OS V11 in all modes should operate with existing versions of DB2 Connect in place, even back to DB2 Connect V8
  - DB2 for z/OS Development will investigate any connectivity related issues with existing applications using older versions of DB2 Connect and try to provide a fix
  - If any issues cannot be resolved within the DB2 for z/OS server, DB2 Connect will have to be upgraded to an in-service level to obtain a fix
- For continuous availability during the migration process the minimum recommended level before leaving DB2 10 is V9.7 FP6 or V10.1 FP2
  - This is the level that provides continuous availability for a given application server as a customer goes from V10 NFM base -> V11 CM -> V11 NFM
- The minimum level for full DB2 11 for z/OS exploitation is currently V10.5 FP2
  - Required for specific new function: array support for stored procedures, WLB support with global variables, autocommit performance improvements, improved client info
  - This recommended level could and probably will change and go up over time as we gain more customer experiences, roll through best practices, and provide defect fixes into newer driver levels
Prerequisites – DB2 Connect …

• Most DB2 for z/OS engine features in NFM are supported with any version of DB2 Connect
• DB2 for z/OS Development are being proactive in recommending customers to move from the client or runtime client packages towards using the data server (ds) driver instead
• For "evergreen" and/or new function the general upgrade path is the following:
  1. DB2 for z/OS Server
  2. DB2 Connect Server (if present – we are encouraging direct connect)
  3. Drivers installed on application servers (push from client, runtime client -> ds driver)
  4. End user workstations (also push from client, runtime client -> ds driver)
• We do have customers that will push out the drivers first - those are generally driven by the need for specific application enhancements e.g.,
  • The most common example is in the .NET arena - wanting the latest tooling and driver support in the MS arena
Preparing your DB2 10 NFM for Migration to DB2 11 CM

- Apply the Fallback SPE APAR, PM31841 (UK96357) and any prerequisite fixes
  - Your DB2 10 system MUST be at the proper service level
  - See Info APAR ➔ II14660
  - See II14730 & II14732 for Client & DDF migration informat

- Non-Data Sharing
  - Current DB2 10 must be started with the SPE applied, or migration to DB2 11 will terminate

- Data Sharing
  - Before migrating a member to DB2 11, all other started DB2 10 members must have the fallback SPE applied
  - The fallback SPE must be on all active DB2 10 group members for DB2 11 to start

Important – Apply SPE to ALL Data Sharing Members Before Starting Migration!
Info APAR II14660: DB2 10 ➔ 11 MIGRATION/FALLBACK

• Check out FIX CATEGORIES:
  • IBM.Migrate-Fallback.DB2.V11
  • IBM.Coexistence.DB2.SYSPLEXDataSharing

```
SET BDY(GLOBAL).
REPORT MISSINGFIX ZONES(DSNA10T)
    FIXCAT(IBM.Migrate-Fallback.DB2.V11)
```

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</table>

• See more information on FIXCAT at External Site:
  http://www-03.ibm.com/systems/z/os/zos/smpe/fixcategory.html
DSNTIJPM (DSNTIJPB shipped with V10)

- **Check / correct incompatibilities**
  - Very early running via the V10 DSNTIJPB pre-migration job (PM94057 / UK98219)
    - Same as V11 DSNTIJPM
  - N.B. Check maintenance for currency
  - Identify pre-migration catalog cleanup requirements
  - Maximise your prepare time by running it early and often
  - See Info APAR II14660

- **Check for issues before migration**
  - Take the cleanup actions recommended by the report headers
  - Output could be DDL, Utility statements or verbage

- **Some examples:**
  - DB2 10 SAMPLE DB must exist – for DB2 11 CM verification
  - DB2 10 user-defined catalog indexes on DB2-managed storage
  - DB2 10 plans/packages suitable for automatic BIND in DB2 11
  - DB2 9 format EXPLAIN tables - deprecated

- **Release Incompatibilities documented in:**
  - Installation Guide
  - Application Programming and SQL Guide
DSNTIJPM / DSNTIJPB – Detailed breakdown...

1. Check for previous-release sample database
2. Catalog user defined indexes (user-managed storage)
   – Will need shadow data sets created before DSNTIJEN
3. Catalog user defined indexes (DB2-managed storage)
   – Will be converted during DSNTIJEN. Review space allocations
4. Plans last bound prior to V9
5. Packages last bound prior to V9
6. EXPLAIN tables prior to V10
7. **Report eliminated**
8. MQTs on the Catalog, drop before ENFM
9. AMI based DB2 MQSeries functions (dropped by JRT)
10. AMI based DB2 XML MQSeries functions (dropped by JRT)
11. Simple table spaces
12. Triggers with invalid SECTNOI. Recreate...
13. Views with a period specification must be dropped
14. MQTs with a period specification must be dropped
15. SQL Functions with a period specification must be dropped
16. Catalog Table Spaces with a versioning problem, requires MODIFY RECOVERY & REORG before CM
17. Packages which will be invalidated by TIJEN (ENFM) due to catalog changes
18. Orphaned SYSCOPY or SYSOBDS rows created during V10 ENFM w/o PM41956. No operational impact, but may impact migrations.
19. Orphaned rows in SYSTABSTATS that could impact migration
20. Orphaned rows in SYSCOLAUTH
22. Plans invalidated in ENFM
23. Packages invalidated in CM (JTC)
24. Plans invalidated in CM

Check ALL output
Prerequisite Summary & Planning ...

**Data Sharing: CF Level 12, with 13 or 14 recommended**
- GBP Enhancements require CFLEVEL 17 or higher
  - z/OS 1.13 requires APARs OA40966 and OA37550
- More information about Coupling Facility (CF) levels

**Old plans and packages V9 or before -> REBIND**
- Important to bind all Plans/Packages listed in output of pre-migration job DSNTIJPB
  - Otherwise they will go through Autobind when first allocated in V11
  - Identify early and rebind while on V10

**DROP Views, MQTs, and Table functions with Period Specification**
- Those created in V10 are not supported
- Period Specification must be on base table

**Check programming language requirements – minimum levels etc**
- Enterprise COBOL for z/OS V3.4 (5655-G53) or later
- VS Fortran 2.6 (5668-806, 5688-087, 5668-805).
  - New data type and function are not supported since DB2 9.
- Enterprise PL/I for z/OS V3.9 (5655-H31)
- DSNHPC7 included in the base for older COBOL and PL/I
  - See the Program Directory
Prerequisite Summary & Planning ...

- Configure a minimum of (IEASYSxx):
  - 1TB of contiguous shared private per DB2 – HVSHARE
    - Default is 510TB
    - Article on HVSHARE
  - 6GB of contiguous shared extended private per DB2 – HVCOMMON
    - Same as DB2 10, with a default of 66GB
    - Make sure HVCOMMON can accommodate log output buffer
  - Configure additional 1MB LFAREA (z/OS parameter in IEASYSxx) for maximum benefit.
    - Large Frame Area
  - See z/OS APAR OA34024 for LFAREA Sizing information

- SMS managed catalog and directory
  - Initially a requirement for DB2 10
    - Data Class attributes of Extended Format & Extended Addressability
  - DSNTIJSS provided as a sample for configuration

- PDSEs
  - Required for SDSNLOAD, SDSNLOD2, ADSNLOAD, ADSNLOD2 - Same as V10
Deprecation in earlier releases – **NOW Removed**

- **Password protection of Active / Archive Logs**

<table>
<thead>
<tr>
<th>DATE</th>
<th>LTIME</th>
<th>DATA SET INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010.141</td>
<td>12:50</td>
<td>DSN=DSNCCAT.LOGCOPY1.DSO2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PASSWORD=(NULL) STATUS=REUSABLE</td>
</tr>
</tbody>
</table>

- **DSNH CLIST NEWFUN values of V8 and V9 - Use V10 or V11**
- Some DB2 Supplied Routines no longer supported
  - SYSPROC.DSNAEXP → Use the EXPLAIN Privilege and issue EXPLAIN directly
  - AMI-based DB2 MQ (DB2MQ) functions – Use MQI-based functions in schema DB2MQ
    | (see APAR PK37290 for guidance and DSNTIJPB/DSNTIJPM report)
    | - DB2MQ1C.*, DB2MQ2C.*
    | - DB2MQ1N.*, DB2MQ2N.*
    | - DMQXML1C.*, DMQXML2C.*

- **Sysplex Query Parallelism - Single member parallelism still supported**

- **BIND PACKAGE options ENABLE and DISABLE (REMOTE) REMOTE (location-name,...,<luname>,...) -- specific names cannot be specified**

- **DSN1CHKR – Service aid no longer needed – No links in Catalog or Directory**
- **CHARSET application programming default value (KATAKANA) – use CCSIDs**
Depreciated Feature / Function Summary

- **EXPLAIN tables in a previous release format**
  - V9 & V10 format accepted

- **Synonyms**
  - Should be using Aliases

- **Simple Table Spaces remain deprecated**
  - Can not create Simple Table Spaces (since V9)
  - See DSNTIJPB / PM for the existence of simple table spaces
    - Should be converted to a different table space type

- **NEWFUN SQL processing options and DECP values**
  - Processing options NEWFUN(YES) and NEWFUN(NO)
    - Use NEWFUN(V11) instead of NEWFUN(YES). Use NEWFUN(V10) instead of NEWFUN(NO)

- Check the Install Guide for ALL Depreciated Features
- Plus ALL New and Removed Parameters
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 (KB)
- EDMDBDC
  - From 2097152 to 4194304 (KB)
- EDMSTMTC
  - From 1048576 to 4194304 (KB)
- MAXKEEPD
  - From 65535 to 204800
Other Performance Recommendations

- LRSN spin avoidance requires both BSDS and objects conversion in NFM
- Monitor log I/O performance due to log record size increase
  - 3% to 40% increase in log record size observed following BSDS conversion
- Essential to make sure enough zIIP capacity available before V11 CM migration
  - zIIP ‘Help Function” IIPHONORPRIORITY should be set to YES in case there is a shortage of zIIP capacity
  - Continue to monitor zIIP capacity thereafter
- Bufferpool re-classification change - prefetched pages will again be reclassified as random after random getpage
  - May need to re-evaluate VPSEQT setting for certain bufferpools
- MRU (Most Recently Used) used for pages brought in by utilities
- New FRAMESIZE parameter independent from PGFIX parameter
Early code

- If your DB2 10 system is at the prerequisite maintenance level, your Version 10 early code is upward compatible with Version 11.
- The Version 11 early code is downward compatible with Version 10.

- **Activate the DB2 11 EARLY Code**
  - IPL or
  - LLA, REFRESH & REFRESH, DB2 EARLY

- DB2 must be down, but an IPL can be avoided
Checking V10 data consistency / integrity

- DBD integrity for user data bases in Catalog & Directory
  - REPAIR DBD TEST DATABASE dbname
  - REPAIR DBD DIAGNOSE DATABASE dbname
- DB2 RI and table check constraint violations + consistency between base table and corresponding LOB/XML table spaces
  - CHECK DATA TABLESPACE dbname.tsname part SCOPE ALL
- Consistency between table spaces and indexes
  - CHECK INDEX ALL TABLESPACE or CHECK INDEX LIST (with appropriate LISTDEF)
- Invalid LOB values or structural problems with the pages in a LOB table space
  - CHECK LOB TABLESPACE dbname.tsname for each LOB table space
- Integrity of the DB2 catalog
  - IBM-provided DSNTESQ queries (should always return zero rows)
- Options to check each page of a table space for consistency
  - DSN1COPY with CHECK option
DB2 11 for z/OS Migration Modes / NFM Decisions

- **DB2 10 for z/OS NFM**
- **DB2 11 CM**
- **DB2 11 ENFM**
- **DB2 11 for z/OS NFM**

- Fallback SPE applied and incompatibilities mitigated.

- V10 Catalog
- V11 CM Catalog
- V11 Catalog
- V11 Catalog

**APPLOCOMPAT**
- Expanded RBA/LRSN
- Optional
Use the “Proactive” PMR process for Production

- Consider opening a proactive PMR when migrating in Production to inform support.
  - Use your normal support process to open a PMR
  - Use the description to briefly describe what environment is being migrated and to which mode
  - Provide good contact information
    - Several names and contact numbers
- Notifies IBM DB2 Support of your up coming migration activity
  - It is typically routed to the DB2 Duty Manager on call for that time
  - If the problem is serious, ask to be transferred to a Duty Manager
- If problems during the migration, open a new Sev 1 PMR / SR
Application Compatibility

“APPLCOMPAT”
APPLCOMPAT – Requirement & Solution

• Requirements
  • De-couple the need for application program changes to deal with incompatible SQL DML and XML changes from the actual DB2 system migration to the new DB2 release which introduced the incompatible SQL DML and XML changes
  • Provide a mechanism to identify application programs affected by incompatible SQL DML and XML changes
  • Provide a mechanism to introduce changes at an individual application program (package) level
    • Enable support so that application program changes can be phased in over much longer time
    • Enable support for mixed DB2 release co-existence in data sharing
    • Enable support for up to two back level releases of DB2 (N-2)

• Solution
  • APPLCOMPAT which separates DB2 system migration to the new DB2 release from application program migration to deal with incompatible SQL DML and XML introduced by the new release
APPLCOMPAT – Solution summary

• APPLCOMPAT zparm provides default for BIND/REBIND
  • V10R1 for DB2 10 SQL DML behaviour
  • V11R1 for DB2 11 SQL DML behaviour
  • Default is V11R1 for new installs, V10R1 for migration

• APPLCOMPAT option on BIND/REBIND to override zparm default

• CURRENT APPLICATION COMPATIBILITY special register and DSN_PROFILE_ATTRIBUTES for DDF
  • For dynamic SQL

• Does not address issues with new reserved words or other incompatibilities that could only be resolved by having multiple levels of the DB2 parser

• BIF_COMPATIBILITY=V9|V9_DECIMALVARCHAR is still honored in all modes of V11 and is independent of APPLCOMPAT

• New SQL functionality available in V11 NFM cannot be used until package is bound with APPLCOMPAT value of V11 R1
APPLCOMPAT – Solution summary...

• Migration automatically sets V10R1 prior to NFM ... otherwise
  • DSNT225I - DSN BIND ERROR FOR PACKAGE location.colid.member
  APPLCOMPAT(V11R1) OPTION IS NOT SUPPORTED

• IFCID376 – Summary of V10 function usage
• IFCID366 – Detail of V10 function usage, identifies packages
• We expect changes necessary to avoid V10R1 usage to happen after reaching NFM
• Workaround to distinguish packages which have to absolutely run as V10R1 until they are corrected
  • Annotate the package using SQL COMMENT ON PACKAGE colid.name."version" IS ‘V10R1’
    • If version is a pre-compiler timestamp then the double quotes are necessary
  • Stored in the REMARKS column in SYSIBM.SYSPACKAGE table
• Can be queried and be exploited by housekeeping
# APPLCOMPAT – What can I do at each mode?

<table>
<thead>
<tr>
<th>10 NFM</th>
<th>11 CM</th>
<th>11 ENFM</th>
<th>11 NFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ZParm V10R1</td>
<td>• Same as CM</td>
<td>• ZParm</td>
<td></td>
</tr>
<tr>
<td>• Can set to V11R1 but will not operate that way</td>
<td></td>
<td>• V10R1 or V11R1</td>
<td></td>
</tr>
<tr>
<td>• BIND/REBIND</td>
<td></td>
<td>• BIND/REBIND</td>
<td>• V10R1/V11R1 available</td>
</tr>
<tr>
<td>• Must be V10R1</td>
<td></td>
<td>• BIND</td>
<td>• Defaults to ZParm</td>
</tr>
<tr>
<td>• CREATE/ALTER</td>
<td></td>
<td>• REBIND &amp; Autobind</td>
<td>• Defaults to previous Catalog value first</td>
</tr>
<tr>
<td>• Must be V10R1</td>
<td></td>
<td>• ZParm second</td>
<td>• V10R1 or V11R1</td>
</tr>
<tr>
<td>• SET CAC* not available</td>
<td></td>
<td>• CREATE/ALTER</td>
<td>• SET CAC* available</td>
</tr>
<tr>
<td>• IFCID 239/366/376</td>
<td></td>
<td>• New features</td>
<td>• Require V11R1</td>
</tr>
</tbody>
</table>

*CAC = CURRENT APPLICATION COMPATIBILITY*
APPLCOMPAT: Migration  DB2 10 → DB2 11

DB2 10 New Function Mode
(NFM) With SPE

DB2 10 Catalog

DB2 10 Libraries

DB2 10 New Function Mode

CATMAINT UPDATE (DSNTUTC)

DB2 11 Conversion Mode

DB2 11 Catalog

DB2 11 Libraries

DB2 11 New Function Mode

CATENFM START (DSNTUEN)

DB2 11 Enabling New Function Mode

CATENFM COMPLETE (DSNTUNF)

DB2 11 New Function Mode

1 – 2 months

Data Sharing Coexistence

1 week

2 hours

1–2 months

Bind with APPLCOMPAT(V10R1) or APPLCOMPAT(V11R1)

Bind with APPLCOMPAT(V10R1) option only
Release incompatibilities
Release Incompatibilities Aren’t Just for DBAs

- **Check and correct release inconsistencies and incompatibilities:**
  - Installation Guide
  - Application Programming and SQL Guide

- **Application and SQL release incompatibilities**
  - Including these important checks:
    - New Reserved Words
    - Changed Messages
    - Changed SQLCODEs

- Utility release incompatibilities
- Command release incompatibilities
- Storage release incompatibilities
- Other release incompatibilities

- **Reserved Words**
- **Changes in Functions**
- **Bind changes & minimum package levels**
- **Database metadata stored procedures**
- **Compiler levels and options**
- **Explain tables**
- **SQLSTATE changes**

*Release incompatibilities can change over time. Ensure that current documentation is reviewed when constructing your plan.*
Suggestions for a “parallel” testing strategy
A “suggested” Parallel Test Strategy – Part 1

**Systems Programmer Environment (Sandbox)**

- Migration and fallback testing is first priority
- Then clone / copy DB2 11 CM to a second DB2 11 CM that gets migrated to NFM
  - Use of a cloning Tool may be useful
- This provides two targets (*) for problem re-creation and PTF testing during project
  - One in DB2 11 CM, one in DB2 11 NFM
    - Parallel testing environments in case of blockers
A “suggested” Parallel Test Strategy – Part 2

- DB2 10 NFM: Baseline for regression testing
- Migration testing: DB2 11 CM
- Regression testing in DB2 11 CM clone
  - Before rebinds
  - After rebinds
    - Possible use of a workload generation tool
- Regression testing in DB2 11 NFM
- New feature / function testing in DB2 11 NFM

**DB2 11 Testing Environment**

- Migration
- Clone
- Migration Testing (IVPs)

**Switch**

- Regression Testing and New Function Testing

**ESP Customer sample**

- Create a CLONE of production
- Repeatable tests to guarantee base functionalities covering:
  - Business needs and jobs,
  - Catalog health-checks
  - Housekeeping like Utilities, DR- and Recovery scenarios
- In each of the different phases:
  - DB2 V10 NFM
  - DB2 V11 CM
  - DB2 V11 NFM with and without objects in mixed mode (split of 6- and 10-byte pagesets)
A “suggested” Parallel Test Strategy – Part 3

Pre-migration Catalog Migration Testing

- Verify CATMAINT (DSNTIJTC) and ENFM (DSNTIJEN) will work
- Flush out errors
- Learn how long each process takes
Regression Test Planning
Regression Test Planning

- Establish key performance benchmarks
- Identify test suites - DB2 applications to focus on:
  - Critical on-line, batch, query, utility workloads
  - Processing peaks: month-end, quarter end, etc.
- Compare without using DB2 11 function explicitly
- What to compare?
  - “Apples to apples” comparison of same workload
  - Ideally a “Repeatable” workload
- If workload not repeatable, compare similar periods over several days
  - Normalize CPU numbers across measured intervals, i.e. CPU milliseconds per commit
- Multiple test runs recommended to ensure realistic results

- No changes in application and schema
  - V10 NFM as base line
  - DB2 11 CM without REBIND
  - DB2 11 CM after REBIND
  - DB2 11 NFM

- What to measure?
  - CPU usage in DB2 application and DB2 address spaces
  - Elapsed time
  - Transaction rate
  - DB2 virtual and real storage usage
  - zIIP usage

Statistics class (1,3,4,5,6)

RMF reports
Workload Activity

Accounting class (1,2,3,7,8)

Statistics trace
- MSTR - TCB & SRB
- DBM1 - TCB, SRB & IIP SRB
- IRLM - TCB & SRB
- DIST - TCB & SRB & IIP SRB

Accounting
For each CONNTYPE:
- Class 2 CPU on CP and zIIP
- Number of occurrences:
  - Getpages,
  - Commits
  - Rollbacks
Performance Profile (Workload indicators)

- **Performance profile comparison**
  - DML by type: SELECT, INSERT, UPDATE, FETCH, etc.
  - Commits, Rollbacks, Getpages, Buffer updates
  - Read and write activity (number of I/Os, number of pages)

- **Watch for any changes in hardware, LPAR configurations, additional workload, or buffer pool changes**

- **Save performance and access path information**
  - EXPLAIN output from DB2 10 NFM to compare with EXPLAIN in DB2 11

- **Tooling**
  - Capture pre-migration baseline test scenarios
  - Spread sheet input data generator for Statistics and Accounting

- **Functional Regression**
  - Verify applications input and output between DB2 10 NFM and DB2 11 CM

- **For performance critical business functions:**
  - Validate response times, elapsed times, throughput
  - Investigate CPU performance regression
    - Check for same pattern across releases based on combination of DB2 Statistics and Accounting traces
  - Validate no access path regression after migration, or due to application changes concurrent with migration
Information capture – RMF, Accounting, Statistics, etc

<table>
<thead>
<tr>
<th>General Information</th>
<th>(DB2 10 NFM sample)</th>
<th>(DB2 11 CM sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2 Group name</td>
<td>0901</td>
<td>0901</td>
</tr>
<tr>
<td>DB2 Subsystem name</td>
<td>062A</td>
<td>062A</td>
</tr>
<tr>
<td>Workload description</td>
<td>[Value]</td>
<td>[Value]</td>
</tr>
<tr>
<td>DB2 Version Mode</td>
<td>VI01, VM7</td>
<td>0862.11.29</td>
</tr>
<tr>
<td>DB2 code level</td>
<td>1002122</td>
<td>Bank 02</td>
</tr>
<tr>
<td>Processor Model</td>
<td>31 FP 1.32</td>
<td>3602.1.13</td>
</tr>
<tr>
<td>RMF data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of General Purpose Processors</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Number of BIP Processor</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>CPU utilization - General CPU</td>
<td>63%</td>
<td>63%</td>
</tr>
<tr>
<td>Transaction per second (application point of view)</td>
<td>32.79</td>
<td>33.85</td>
</tr>
<tr>
<td>Central Storage - Total Frames</td>
<td>150,677,500</td>
<td>150,677,500</td>
</tr>
<tr>
<td>Central Storage - Available Frames</td>
<td>40,956,780</td>
<td>40,956,780</td>
</tr>
<tr>
<td>Memory Objects and Frames - Shared</td>
<td>32,123</td>
<td>33,123</td>
</tr>
<tr>
<td>Memory Objects and Frames - 1MB</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistics - Reporting</th>
<th>(DB2 10 NFM sample)</th>
<th>(DB2 11 CM sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics report interval (sec)</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>MSTR CPU per commit</td>
<td>0.0000012</td>
<td>0.0000011</td>
</tr>
<tr>
<td>DBM1 CPU per commit</td>
<td>0.0000076</td>
<td>0.0000044</td>
</tr>
<tr>
<td>IRLM CPU per commit</td>
<td>0.0000001</td>
<td>0.0000001</td>
</tr>
<tr>
<td>DDF CPU per commit</td>
<td>0.0003763</td>
<td>0.0002072</td>
</tr>
<tr>
<td>PREEMPT HFP SRB (Interval)</td>
<td>0</td>
<td>2.9442255</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistics - Storage</th>
<th>(DB2 10 NFM sample)</th>
<th>(DB2 11 CM sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total commit (per interval)</td>
<td>233,800</td>
<td>238,500</td>
</tr>
<tr>
<td>Total DML per commit</td>
<td>42.6</td>
<td>42.3</td>
</tr>
<tr>
<td>Total Lock / Unlock request per commit</td>
<td>32.7/5</td>
<td>17.9/4</td>
</tr>
<tr>
<td>Total getpage requests per commit</td>
<td>283.47</td>
<td>180</td>
</tr>
<tr>
<td>Total Sync read request per commit</td>
<td>11.7</td>
<td>10.2</td>
</tr>
<tr>
<td>Total Buffer update per commit</td>
<td>5.3</td>
<td>5.1</td>
</tr>
<tr>
<td>Total DBM1 storage below 2GB (MB)</td>
<td>221</td>
<td>38</td>
</tr>
<tr>
<td>Total Getmained storage</td>
<td>137</td>
<td>1.6</td>
</tr>
<tr>
<td>Total Variable Storage (MB)</td>
<td>56</td>
<td>11</td>
</tr>
<tr>
<td>Total Agent Non-System Storage (MB)</td>
<td>28</td>
<td>6.5</td>
</tr>
<tr>
<td>Total Number of Active User Threads</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td>Total Stack Storage in Use</td>
<td>27</td>
<td>18.7</td>
</tr>
<tr>
<td>Buffer Pools</td>
<td>14591.4</td>
<td>14583.8</td>
</tr>
<tr>
<td>Above 2GB Shared Memory Storage (MB)</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>Real Storage Usage (MB)</td>
<td>15483</td>
<td></td>
</tr>
<tr>
<td>Statistics - Latch contention Counter (Optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCoX</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example of Customer Performance Testing Plan

- DB2 10 NFM baseline
- DB2 11 CM before REBIND
  - Before REBIND in DB2 11
    - Complete performance workload under DB2 10 NFM; document performance profile
    - Complete performance workload under DB2 11; document performance profile
    - Compare DB2 10 profile (#SQL, #GETPAGES, etc.) with DB2 11 profile
- DB2 11 CM after REBIND
- DB2 11 NFM (no need for further REBIND)
- DB2 11 NFM after REORG (to migrate object to extended LRSN)
- DB2 11 NFM Extended LRSN

**REMEMBER** - Performance expectations vary depending on many factors, including:
- Access path selections, Read/Write rate, number of rows returned
- Number and type of columns returned, number of partitions touched
- Schema - Number of partitions defined, DPSI, etc.
- RELEASE option on BIND, Table Compression
Performance Summary

- Make sure that the CPU numbers are normalized across those intervals i.e., use CPU milliseconds per commit.
- Easy to combine statistics and accounting by stacking the various components of CPU resource consumption:
  - **DB2 11:**
    - Opportunity for improved performance for legacy application programs.
    - Your mileage will vary based on your SQL application workload as certain features only apply to certain workloads.
    - Immense CPU savings observed for some workloads.
    - Highly optimized static SQL and/or simple SQL may not see much benefit.
    - More benefit for more complex SQL i.e., not read a single row by primary key.
    - Do not sell (or buy) the savings before you have seen them for your workload.

```
DB2 11 % CPU Improvement From DB2 10
```

```
MSTR TCB / (commits + rollbacks)
MSTR SRB / (commits + rollbacks)
DBM1 TCB / (commits + rollbacks)
DBM1 SRB / (commits + rollbacks)
DBM1 IIP SRB / (commits + rollbacks)
IRLM TCB / (commits + rollbacks)
IRLM SRB / (commits + rollbacks)
Average Class 2 CP CPU * occurrences / (commits + rollbacks)
Average Class 2 SE CPU * occurrences / (commits + rollbacks)
```
The Migration Process
DB2 11 migration process at a glance
Migration Process

- Final Preparations
- Customization / Tailoring
- Migration
  - Before CM
  - Migration to CM
  - Fallback to V10
  - Remigration to CM
  - Conversion to ENFM
  - Conversion to NFM
  - Application Compatibility
  - Extended RBA / LRSN
- Testing
Migration Preparations DSNTIJXZ ...

- Job to update the installation CLIST input (DSNTIDxx) to reflect current:
  - System parameters
  - Buffer pool settings

---

**CLIST INPUT MEMBER GENERATION REPORT**

**CLIST PARAMETER REPORT:**

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Value</th>
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<tr>
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**CHANGE SUMMARY REPORT:**

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<th>ZPARM/BUFFERPOOL NAME</th>
<th>VALUE</th>
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<td>* AUDIT</td>
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</table>

---

**Updated DSNTIDxx**
Migration: Pre-Conversion Mode ...

- Iterate Pre-CM / CM steps across landscapes before proceeding to ENFM
  - There are exceptions, like Sandbox environments and purchased applications
    - Check with your vendors

- Conduct the “final” review and preparation of your system for migration
  - Project planning
  - Prerequisites – System, Middleware, Tooling
  - Making adjustments for release compatibilities
  - Run the premigration queries
  - Completed other premigration tasks
  - Collected and saved (SMF) your V10 Performance Baselines?
  - Saved critical access paths

- Review all migration steps ahead
  - Meet with others that are needed to complete the tasks
  - Understand requirements / concerns of others involved
Migration: Pre-Conversion Mode

- **DSNTIJIN**
  - Defines application libraries – DB2 will define its own clusters for Catalog / Directory
- **DSNTIJMV**
  - Updates PARMLIB & PROCLIB (5xDB2 subsys, 12xWLM, 10xlanguage support)
    - In-house procedure management task
  - Sets up USS files / paths
- **DSNTIJUZ**
  - System Parameters
- **DSNTIJEX**
  - Sample or user exit routines for Signon, Authorization, and Access
    - If in use for V10
- **V10 DSNTIJIC**
  - Backup the Catalog / Directory
- **Restart DB2 (V10) in ACCESS(MAINT)**
  - While DB2 is down, optional full volume dumps for added backup
- **Ensure that V10 is stopping clean**
  - DISPLAY Utilities, Threads, and Database / Spaces
  - Clean up any potential problem conditions
  - Optional ARCHIVE LOG before stopping V10
Migration: Conversion Mode ...

- Cycle DB2, restarting with V11 Procedures & Libraries
  - Catalog level was reported as 111, but is now fixed at 101
  - Expect several messages related to needing to run JTC
    - DSNT501I & DSNL700I messages with 00C900A6
    - Resource unavailable messages

```
DSN7100I -DSNW DSN7GCMO
*** BEGIN DISPLAY OF GROUP(........) CATALOG LEVEL(101) MODE(CM )
    PROTOCOL LEVEL(2) GROUP ATTACH NAME(....)

-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
DB2         DB2 SYSTEM     IRLM
MEMBER ID   SUBSYS CMDPREF STATUS LVL NAME     SUBSYS IRLMPROC
........ 0 DSNW   -DSNW  ACTIVE 111 ADCD113  DJSW  DSNWIRLM

SPT01 INLINE LENGTH: 32138
*** END DISPLAY OF GROUP(........)
DSN9022I -DSNW DSN7GCMO 'DISPLAY GROUP ' NORMAL COMPLETION
***
```

```
DSN703I -DSNW DSNGEMLC RESOURCE UNAVAILABLE 350
    REASON 00C900A6
    TYPE 00000100
    NAME DSND806

DSNG007I -DSNW DB2 CATALOG LEVEL (1010) CODE LEVEL (1110) MODE (CM)

DSN501I -DSNW DSNICBC RESOURCE UNAVAILABLE 352
    CORRELATION-ID=DSNW
    CONNECTION-ID=DSNW
    LUW-ID=DSNW.DSNWLU1.CCEA01FG011C=0
    REASON 00C900A6
    TYPE 00000100
    NAME DSND806

DSNX230I -DSNW A RESOURCE IS UNAVAILABLE WHEN TRYING 353
    TO BUILD THE TRUSTED CONTEXT CACHE REASON = 00C900A6 TYPE OF RESOURCE
    = 00000100 RESOURCE NAME = DSND806
DSNX002I -DSNW RESTART COMPLETED
```

```
DSNY001I -DSNW SUBSYSTEM STARTING
DSNJ127I -DSNW SYSTEM TIMESTAMP FOR BSDS= 14.086 15:18:15.44
DSNJ001I -DSNW DSNJW007 CURRENT COPY 1 ACTIVE LOG 475
    DATA SET IS DSNNAME=DSNWCAT.LOGCOPY1.DS02,
    STARTRBA=000000000000000000DA9B0000, ENDRBA=0000000000000000FC5AFFF
DSNJ001I -DSNW DSNJW007 CURRENT COPY 2 ACTIVE LOG 476
    DATA SET IS DSNNAME=DSNWCAT.LOGCOPY2.DS02,
    STARTRBA=000000000000000000DA9B0000, ENDRBA=0000000000000000FC5AFFF
DSNJ099I -DSNW LOG RECORDING TO COMMENCE WITH 477
    STARTRBA=000000000000000000E3C6000
```
Migration: 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

### 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
Migration: Conversion Mode ...

- **Initial checkout**
  - Update data set Aliases, Includes, and/or direct references to libraries
  - Optional; consider Catalog verification steps
    - DSNTIJCX – runs CHECK DATA and CHECK INDEX on all indexes in Catalog / Directory
    - Run DSNTESQ – with no SPUFI as yet, use V10 DSNTEP2 to run queries
    - DSN1COPY utility with the CHECK option on the catalog table spaces
  
- **DSNTIJTM**
  - Prepares DSNTIAD, binding DSNTIA11 package / plan
  - Binds REXX Language support
  - Creates additional Work Files (if requested via DSNTIP9) via DSNTWFG

- **DSNTIJSG**
  - Prepares SPUFI, DCLGEN, SQL Utility, EXPLAIN tables
    - If re-running uncomment the CLEANUP line
  - Creates the Program Authorization Database & Extended Optimization Tables
  - Existing DSNRLMTxx tables are used until NFM (expanded Client Info fields).
Migration: Conversion Mode ...

- **DSNTIJRW**
  - Sets up the WLM environments for DB2 Supplied Routines
  - May not be needed for migration
  - Check for recommended WLM changes
    - Table of NUMTCB, authorization requirements

- **DSNTIJRT**
  - Maintains the DB2 Supplied Routines and dependent objects
  - Review the comments in this job
  - If running the Administrative Schedule (ADMT), it will not run until JRT is completed in CM
  - Job runs in INSTALL mode
    - 3 modes available: INSTALL, REINSTALL, and REINITIALIZE
    - Each of these also has a PREVIEW mode
    - RC=0 does not mean that all routines are usable
    - For JDBC / ODBC, see comments about possible need for remote bind
    - XML Schema Repository (DSNXSR) is set to DROP RESTRICT
      - Must be reversed if running in REINITIALIZE mode
Migration: Conversion Mode ...

- **DSNTIJRV**
  - Often ends with an RC=08
  - Example: If the Administrative Scheduler is not set up, those stored procedures fail verification

```
DSNT027I DSNTFVFPY VALIDATION FOR SYSPROC.ADMIN_COMMAND_DB2 SUCCESSFUL
DSNT028I DSNTFVFPY - WLM ENVIRONMENT DETAILS
   NAME  DSNWLM_GENERAL
   PROC  DB1RWLMG
   STATE  AVAILABLE
   NUMTCB  40
DSNT032I DSNTFVFPY - THE CALL TO ROUTINE WAS SUCCESSFUL
```

- **Verify Views**
  - SQL documented in Migration Step 26

- **DSNTIJIC (V11 CM Version)**
  - Recommended before ENFM
  - 7 additional table spaces included in job
    - **SYSTSCPY** replaces **SYSCOPY**
    - **SYSTSCKS, SYSTSCHX, SYSTSCKD, SYSTSSRG** replace **DSNDB06.SYSSTR**
Migration: Conversion Mode ...

- Continue using V10 Dynamic programs (TEP2, TEP4, TIAUL, etc)
- Set up attachments
  - See Migration Steps 6, 7, and 8 for TSO, IMS, CICS, etc.
  - Establish the Logon CLIST provided to others
  - Checking on LE, WLM set up, etc.
- 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 a number of 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

- **Activate your Regression Test plans and test, test, test**
  - Compare results to your Pre-CM benchmark collections

- **Run Online REORGs against Catalog and Directory objects prior to the ENFM/NFM migration**
  - Check data consistency of Catalog and Directory
  - Improve the performance of the ENFM process
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

- **Administrative Scheduler**
  - If not established, this task and supporting Database could be configured at this time

- **Maintenance**
  - If applying maintenance, make sure to review HOLDDATA for actions. E.g. REBINDs may be required.

- **CM ends the MLC SVC timing for this subsystem / member**
  - As long as a Fallback to V10 is not performed
  - Structure your project plan to reach CM within 12 months to avoid dual version charging
    - Specific customer terms and country consideration must be assessed
## Migration: CM Catalog Visualization ...

<table>
<thead>
<tr>
<th>Category</th>
<th>Table</th>
<th>Added Column</th>
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<tr>
<td>Real Time Stats</td>
<td>SYSTABLESPACESTATS</td>
<td>UPDATESIZE</td>
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<tr>
<td>Indexes</td>
<td>SYSINDEXPART</td>
<td>LASTDATACHANGE</td>
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<tr>
<td></td>
<td>SYINDEXCLEANUP*</td>
<td>RBA_FORMAT</td>
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## Migration: CM Catalog Visualization ...

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### Migration: CM Catalog Visualization ...

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## Migration: CM Catalog Visualization ...

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DB2 11 CM Performance Enhancements

**No REBIND needed**
- DDF performance improvements
- xProcs above the bar
- zIIP enablement for all SRB-mode DB2 system agents that are not response time critical
- Avoid cross-memory overhead for writing log records
- Data decompression performance improvement
- INSERT performance
- Sort performance improvements
- DPSI performance improvements for merge
- Performance improvements with large number of partitions
- XML performance improvements
- Optimize RELEASE(DEALLOCATE) execution so that it is consistently better performing than RELEASE(COMMIT)
- IFI 306 filtering capabilities to improve Replication capture performance
- Utilities performance improvements
- Automatic index pseudo delete clean-up
- ODBC/JDBC Type 2 performance improvements
- Java stored procedures - Multi threaded JVMs
- ACCESS DATABASE command performance
- DGTT performance improvement
- P-procs for LIKE predicates against Unicode tables
- Improved performance for ROLLBACK TO SAVEPOINT
- zEC12 exploitation
- Latch contention reduction and other high n-way scalability improvements
- Data sharing performance improvements

**REBIND needed (with or without APREUSE)**
- Query transformation improvements – less expertise required to write efficient SQL
  - Enhanced query rewrite to improve predicate indexability
  - Enhanced pruning of "always true" and "always false" predicates
- Enhanced duplicate removal
  - Lots of queries require duplicate removal: e.g. DISTINCT, GROUP BY, etc.
- DPSI and page range performance improvements
- Optimizer CPU and I/O cost balancing improvements
- Most In-memory techniques
- Non correlated subquery with mismatched length
- Select list do-once
- Column processing improvements
- RID overflow to workfile handled for Data Manager set functions
- Performance improvements for common operators
- DECFLOAT data type performance improvements
Migration: Before proceeding to ENFM ...

- Complete the Installation CLIST ENFM panels and generate jobs
  - DSNTIPT has a new field to display JDBC AND SQLJ 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: 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
- Consider MODIFY RECOVERY & RUNSTATS
  - Run Online REORGs against Catalog and Directory objects prior to the ENFM/NFM migration
    - Check that REORG can break in
    - Check data consistency of Catalog and Directory
    - Improve the performance of the ENFM process
    - Gain a rough idea of the duration of the REORG for the DSNTIJEN job
- Ensure SYSUTILX is empty
  - Utilities recorded in SYSUTILX will cause DSNTIJEN to stop
    - DB2 will no longer blindly re-initialize it
    - Resets and reinitializes the SYSUTILX table space
Migration: 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)
  - SYSSTTR (SYSCHECKDEP, SYSCHECKS, SYSCHECKS2, SYSSTRINGS)
Migration: Enable New Function Mode ...

- **DSNTIJEN** ...
  - Converts to ENFM
  - Do not attempt to modify this job
  - Issues commands:
    
    ```
    DSN SYSTEM(DSNW)
    -DIS UTILITY(*)
    -TERM UTILITY(DSNENFM.*)
    -DISPLAY GROUP DETAIL
    END
    ```
  - Verifies that the Catalog is at the right level
  - Checks for impacted objects in COPY or ICOPY status - DSNTIGCL
    - 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
Migration: Enable New Function Mode ...

- **DSNTIJEN ...**
  - Converts (CATENFM)
    - SYSUTILX
    - SYSUTIL
  - 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
      - SYSTISIXS SHRLEVEL CHANGE
      - SYSTSTAB SHRLEVEL CHANGE
      - SYSSTR SHRLEVEL REFERENCE
      - Uses Automatic Mapping Table support
  - Repeats DISPLAYs and TERM
DSNTIJEN – Output from final DISPLAY

```
*** BEGIN DISPLAY OF GROUP(........) CATALOG LEVEL(111) MODE(EN )
    PROTOCOL LEVEL(2) GROUP ATTACH NAME(....)

+-----------------+-------------------+-----------------+-----------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+
| DB2 MEMBER ID SUBSYS CMDPREF STATUS LVL NAME IRLM         | DB2 SYSTEM IRLM   |
+-----------------+-------------------+-----------------+-----------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+
| ............ O DSNW -DSNW ACTIVE 111 ADCD113 DJSW DSNWIRLM      |                   |
+-----------------+-------------------+-----------------+-----------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+
| TABLE SPACE     ENABLED NEW FUNCTION                           |
+-----------------+-------------------+-----------------+-----------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+
| SYSUTILX       YES               |                  |
| SYSLGRNX        YES             |                  |
| SYSCOPY         YES             |                  |
| SYSRTSTS        YES             |                  |
| SYSTIXS         YES             |                  |
| SYSTSTAB        YES             |                  |
| SYSSTR          YES             |                  |
+-----------------+-------------------+-----------------+-----------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+-------------------+
| SPT01 INLINE LENGTH: 32138                                      |
*** END DISPLAY OF GROUP(........)
DSN9022I -DSNW DSN7GCMD 'DISPLAY GROUP ' NORMAL COMPLETION
```
Migration: Enable New Function Mode ...

- **DSNTIJEN - Considerations**
  - 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.
- **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
### Migration: ENFM Catalog / Dir Visualization

<table>
<thead>
<tr>
<th>Category (Orig Table Space)</th>
<th>Table</th>
<th>*New</th>
<th>Table Space</th>
<th>Added Column</th>
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<tbody>
<tr>
<td>Directory</td>
<td>DBDR*</td>
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<td>DBD01*</td>
<td>5 Columns</td>
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<tr>
<td>Directory</td>
<td>SCTR*</td>
<td></td>
<td>SCT02*</td>
<td>3 Columns</td>
</tr>
<tr>
<td>Directory</td>
<td>SPTR*</td>
<td></td>
<td>SPT01*</td>
<td>13 Columns</td>
</tr>
<tr>
<td>Directory (SYSUTILX)</td>
<td>SYSUTIL</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directory</td>
<td>SYSDBD_DATA</td>
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<td>SYSDBDXA</td>
<td></td>
</tr>
<tr>
<td>Directory</td>
<td>SYSSPTSEC_DATA</td>
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<td>SYSSPUXA</td>
<td></td>
</tr>
<tr>
<td>Directory</td>
<td>SYSSPTSEC_EXPL</td>
<td></td>
<td>SYSSPUXB</td>
<td></td>
</tr>
<tr>
<td>Real Time Statistics (STSRTSTS)</td>
<td>SYSINDEXSPACESTATS</td>
<td></td>
<td>SYSTSISS*</td>
<td></td>
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<tr>
<td></td>
<td>SYSTABLESPACESTATS</td>
<td></td>
<td>SYSTSTSS*</td>
<td></td>
</tr>
</tbody>
</table>
## Migration: ENFM Catalog / Dir Visualization

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<th>Category (Orig Table Space)</th>
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<th>*New</th>
<th>Table Space</th>
<th>Added Column</th>
</tr>
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<td>Entities (SYSSTR)</td>
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<td>SYSTSCKD*</td>
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<tr>
<td></td>
<td>SYSCHECKS</td>
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<td>SYSTSCKS*</td>
<td></td>
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<td>SYSCHECKS2</td>
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<td>SYSTSCHX*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSSTRINGS</td>
<td></td>
<td>SYSTSSRG*</td>
<td></td>
</tr>
<tr>
<td>Copy (SYSCOPY)</td>
<td>SYSCOPY</td>
<td></td>
<td>SYSTSCPY*</td>
<td></td>
</tr>
</tbody>
</table>
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*
  - Disabling SCA duplexing (DSNTIJNF 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

- **DSNTIJRT / JRV**
  - This job was generated during the MIGRATE execution of the panels
    - Find it in the SDSNSAMP library from this generation
  - For DB2 Supplied Routines / Objects that require NFM
    - Ex. The MVS_CMD_OUTPUT CGTT
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**
  - DSNTEJ2A
  - DSNTEJ1L/P
  - Make sure references to V10 programs is removed
Migration: New Function Mode

- **Consider the ZParm APPLCOMPAT setting**
  - 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**
  - Consider the previous reviewed COBOL 5 change if appropriate

- **Conduct a DB2 11 project review**
  - What worked well?
  - What didn’t work well?
  - Where there any surprises?
  - Any new tests included for this migration?
  - Document all items that can assist your next migration project
Migration Catalog / Directory Summary

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

<table>
<thead>
<tr>
<th>DB2_VERSION_MODE</th>
<th>V10NFM to V11CM</th>
<th>V10NFM to V11EN</th>
<th>V11CM to V11EN</th>
<th>V11CM to V11NFM</th>
<th>V11EN to V11NFM</th>
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<td>Column Count</td>
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<td>V10NFM</td>
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<td>200</td>
<td>2718</td>
<td>SYSTSQRS</td>
<td>SYSTSTSS</td>
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</tbody>
</table>

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

V10 to V11 Overview

Table Space Count | V10NFM | V11CM | V11EN | V11NFM | Overall Delta |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
New Function Mode – Test Planning Actions

- **Build detailed plan of new functions to test**
  - Rank the new features of DB2 11 (perhaps 1 – 5)
  - Participation of systems, DBA and application teams to validate the plans, actual new function testing and end results

- **Contact vendors**
  - For product updates. E.g. tools support of new features
    - Assess any risk

- **Check information APAR in detail & Apply any required service**

- **Evaluate new parameters (ZPARM) etc**
  - System, database administration and application based
  - Review Info APAR recommendations for new parameters

- **Check inconsistencies and incompatibilities**

- **Run the DB2 11 IVP when in NFM**

- **Parallel testing environments in case of blockers**

- **Data consistency checking**
  - As executed in V10 before migration to V11 CM
A brief glimpse at the 10 byte Extended RBA / LRSN
Optional Enhancements need NFM + DBA effort

- **DSNTIJCB** – Optional – Convert BSDS for extended 10-byte RBAs
  - STOP DB2 MODE(QUIESCE)
- **DSNTIJCV** – Optional – Convert Catalog and Directory table and index spaces to extended 10-byte RBA format
  - REORGs all Catalog and Directory table spaces SHRLEVEL CHANGE
  - Can be split up to run REORGs in parallel

<table>
<thead>
<tr>
<th>PARTITION</th>
<th>DBNAME</th>
<th>TSNAME</th>
<th>RBA_FORMAT</th>
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<td>DSNDB01</td>
<td>DBD01</td>
<td>E</td>
</tr>
<tr>
<td>0</td>
<td>DSNDB01</td>
<td>SCT02</td>
<td>E</td>
</tr>
<tr>
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<td>DSNDB01</td>
<td>SPT01</td>
<td>E</td>
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<td>SYSSPUXB</td>
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</tr>
<tr>
<td>0</td>
<td>DSNDB01</td>
<td>SYSUTILX</td>
<td>E</td>
</tr>
</tbody>
</table>

New
Extended LRBA/LRSN

**What you need to know for DB2 11 CM and DB2 10 NFM?**

- **6 byte format** - LRBA/LRSN before DB2 11 ➔ x‘LLLLLLLLLLL’
- **10 byte extended format** - LRBA/LRSN has addressing capacity of 1 yottabyte (2**80)
  - 10 byte extended format - LRSN with DB2 11 ➔ x‘00LLLLLLLLL000000’
  - 10 byte extended format - LRBA with DB2 11 ➔ x‘00000000RRRRRRRRRRRRR’

- **Where do we find LRBA/LRSN?**
  - DB2 Catalog ➔ SYSCOPY, SYSxxxxPART, .....  
  - DB2 Directory ➔ SYSUTILX, SYSLGRNX, ..... 
  - BSDS ➔ pointer, Active & Archive Log values.. 
  - DB2 Logs ➔ Active & Archive logs 
  - DB2 Pagesets ➔ Catalog & Directory and all user-pagesets
Extended LRBA/LRSN ...

What you need to know for DB2 11 CM and DB2 10 NFM?

- **DB2 11 CM**
  - DB2 internal coding deals with 10 byte extended format LRBA/LRSN values only
  - LRSN in Utility output is shown in 10 byte extended format with precision ‘000000’ except
    - QUIESCE utility, which externalizes LRSN in 10 byte extended format with precision ‘nnnnnn’
  - RECOVER utility handles 10 byte extended format LRBA/LRSN input
  - Column ‘RBA_FORMAT’ in SYSIBM.SYSxxxPART is set to ‘B’ for newly defined objects, which are reorged or loaded with replace-option (possible values ,B, blank, U, E)

- **DB2 11 CM / DB2 10 NFM coexistence in data sharing**
  - Full toleration of 10 byte extended format LRBA/LRSN value as input to the RECOVER Utility
  - Sanity checks included for ‘wrongly used 6 byte format LRBA/LRSN’
Extended LRBA/LRSN ...

What you need to know for DB2 11 NFM?

- **Migration to DB2 11 NFM (via DSNTIJEN)**
  - Catalog & Directory Table ‘LRBA/LRSN Columns’ are altered to 10 byte extended format
  - SYSIBM.SYSLGRNX entries are now stored as 10 byte extended format LRBA/LRSN values
  - SYSIBM.SYSCOPY
    - Conversion of all LRBA/LRSN values is done for existing data to 10 byte extended format with leading byte ‘00’ and precision, ‘000000’ for LRSN and right justified right with leading ‘00000000’ for LRBA values
    - New data is stored in 10 byte extended format with precision ‘nnnnnnnn’
  - LRBA/LRSN for all Utilities use now 10 byte extended format
  - LRBA/LRSN values are still written to DB2 logs in 6 byte format
  - LRBA/LRSN values are still written to DB2 pagesets in 6 byte format
Extended LRBA/LRSN ...

**What you need to know for DB2 11 NFM?**

- **BSDS converted to 10 byte extended format LRBA/LRSN in NFM only (PGM=DSNJCNVT)**
  - There is no way back for BSDS!
  - Now LRBA/LRSN values are written to DB2 logs of the subject DB2 member now in 10 byte extended format with precision ‘nnnnnn’
  - LRBA/LRSN values are still written to DB2 pagesets in 6 byte format
    - Conversion (10 to 6 or 6 to 10 byte) has to be done
    - LRSN Spin can still happen
    - DSN1LOGP and REPORT RECOVER output will show 10 byte extended format LRBA/LRSN although never externalized to pagesets (different output, for DSN1PRNT of pagesets)
  - Can be done, whenever you want to do it after entry to V11 NFM, regardless of pageset formats
Extended LRBA/LRSN ...

What you need to know for DB2 11 NFM?

- Reorg Catalog and Directory pagesets to ‘extended format’ (in NFM only!)
  - Can be done whenever you want to, regardless of BSDS and user pageset formats
  - Now LRBA/LRSN values are written to converted pagesets in 10 byte extended format
    - LRSN with precision ‘nnnnnn’, if update is done on a DB2 member with 10 byte extended format BSDS
    - LRSN with precision ‘000000’, if update in done in a member with 6 byte format BSDS
  - Column ‘RBA_FORMAT’ in SYSIBM.SYSxxxPART is updated to ‘E’
  - LRSN Spin could still happen for DB2 member with 6 byte format BSDS
  - Can be converted back to 6 byte format (all or at part level)
Extended LRBA/LRSN ...

What you need to know for DB2 11 NFM?

- Reorg User pagesets to ‘extended format’ (in NFM only!)
  - Can be done whenever you want to, regardless of BSDS, Catalog & Directory pageset formats
  - Now LRBA/LRSN values are written to converted pagesets in 10 byte extended format
    - LRSN with precision ‘nnnnnn’, if update is done in a member with 10 byte extended format BSDS
    - LRSN with precision ‘000000’, if update in done in a member with 6 byte format BSDS
  - Column ‘RBA_FORMAT’ in SYSIBM.SYSxxxPART is set to ‘E’
  - LRSN Spin could still happen for a DB2 member with 6 byte format BSDS
  - Can be converted back to 6 byte (all or at part level)
  - Is done by REORG, LOAD .. REPLACE or REBUILD with ‘RBALRSN_CONVERSION EXTENDED’ or if zparm OBJECT_CONVERTED=EXTENDED
  - ‘RECOVER ... TOCOPY ...’ using a 6 byte Copy can reset format back to ‘basic’
Extended LRBA/LRSN ...

- Enhancements to improve usability characteristics based on 6 byte/10 byte format LRBA/LRSN handling
  - Prevent DSNJCNVT from converting DB2 10 NFM BDS to extended format
  - Support 10 byte extended format input to RECOVER in DB2 10
  - Perform sanity checks to guard against invalid LRSN values i.e., 6 byte LRSN values with leading byte of zeros, to prevent PIT recoveries using bad RBA/LRSN from failing (RC=8 in UTILINIT phase instead)
  - Sanity check also performed in DB2 10 (coexistence)
  - Support for ‘NOBASIC’ value for OBJECT_CONVERSION zparm to prevent converting back pagesets in extended format, and to ‘EXTENDED’ as default if ‘NOBASIC’ is set and catalog column is <> ‘E’
  - Add LRSN values to archive log information in REPORT RECOVERY utility output
  - Technical white paper being produced explains about ‘6/10 byte LRBA/LRSN handling’
  - Several enhancements to DB2 11 books
Extended LRBA/LRSN ...

- **Recommended best practice migration strategy**
  1. Run pre-migration jobs and steps to clean-up
  2. Migration to DB2 11 CM
  3. Migration to DB2 11 NFM
  4. Convert **ALL** BSDS of data sharing group within ‘n’ weekends
  5. Reorg **ALL** Directory & Catalog Pagesets to ‘extended LRBA/LRSN format’
  6. Set OBJECT_CREATE and UTILITY_CONVERSION zparms to EXTENDED
     - New objects will be created in 10 byte extended format
     - REORG, LOAD REPLACE and REBUILD will convert user objects to extended format without need to change utility control statements
  7. Reorg all objects to extended LRBA/LRSN format by executing normal reorg jobs or some additional jobs
     - Perform regular check for ongoing progress by selecting rows where RBA_FORMAT = ‘E’ in SYSIBM.SYSxxxxPART
  8. If all done, set OBJECT _CONVERSION zparm to NOBASIC
Migration Summary

- Establish a Project / Test Plan
- Review new features / literature and build training plans
- Run checks against V10 system
- Resolve / research inconsistencies and release incompatible changes
- Complete any prerequisite projects
- Collect Performance Baselines
- Set Conversion & Coexistence goals
- Determine your Application Compatibility / RBA Expansion plans
- Plan and run regression tests
- Execute your migration plans
- Keep your IBM team informed
Questions?
Ian Cook
DB2 for z/OS Specialist, zChampion
IBM Software Group
ian_Cook@uk.ibm.com

Session 5
Planning and executing a DB2 11 for z/OS Migration

Please fill out your session evaluation before leaving!