

IBM System z Technology Summit



Migration Best Practices and Customer Experiences with DB2 10

Presenter Name

Title



Agenda: DB2 10 for z/OS migration

- **Why DB2 10 for z/OS (How to Justify the Migration)**
- **Prerequisites and Planning the Upgrade**
 - Removed Features
 - Deprecated Features
- **Documentation**
- **The Migration Process**
 - Preparation Jobs
 - Migration Summary
 - Review of Modes
- **What to expect (day 1 and later)**

DB2 for z/OS

Lowering TCO

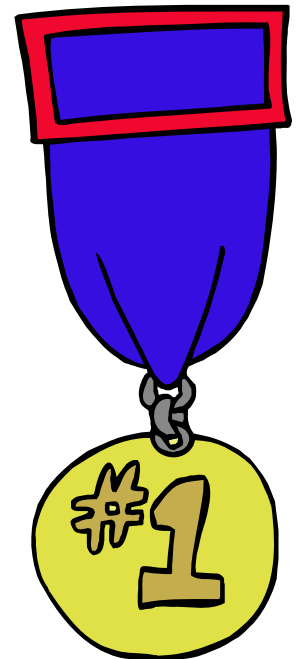
- **Maximum value for dollar investment**
 - Hardware pricing
 - CPU saving specialty engines (zIIP, zAAP..)
 - Compression of disk space (data, index)
 - Software pricing
 - Reduction for tiers
 - Parallel Sysplex aggregation
 - z990, z9, z10 technology dividend
 - 10% reduction in charge units for each
 - zEnterprise pricing, AWLC
 - zNALC, Value Unit Edition, Subcapacity pricing, Solution Editions
- **CPU + Memory + I/O and disk + Software + Energy and floor space + People = Improved Total Cost of Ownership (TCO)**



Top Items Driving DB2 10 Decisions

- **CPU / Performance improvements**
- **Virtual storage enhancements**
 - Reduce number of members, save money
- **Stability & regression**
- **Security enhancements**
 - Built-in security, trace & audit features, new roles, end-to-end auditing
 - Cleaner/safer environment; Better audit/compliance
- **Temporal**
- **Skip-level migration DB2 V8 → DB2 10**

Vast majority of beta customers plan production in 2011



Are you ready for DB2 10?

- Check prerequisites
- Migration planning workshop
- Plan gains, testing, memory, and performance
- Build detailed migration plan
- Contact vendors
- Get all the parts out of the box
- Check information APAR
- Apply required service
- Run premigration checks DSNTIJPA (or M) early and often
- Resolve incompatible changes
- Get rid of private protocol
- Convert to packages from DBRMs in plans
- Upgrade plan table formats to Unicode V8 or DB2 9 level
- Get ready for SMS
- Save performance and access path information

DB2 10 for z/OS



- **Base Pre-requisites:**
 - zSeries z890, z990, z9, z10, z196 or later
 - z/OS V1.11 or above
 - Defined shared memory objects (V9)
- **Catalog changes:**
 - Additions for new features
 - Hashes and links removed
 - Many tables changed to:
 - Single table, table spaces (UTS, PBG)
 - Row level locking
 - Using Inline LOBs
- **DB2 Connect**
 - V9 FP1
 - V9.7 FP3a for new features
 - PM24292 for Sysplex Workload Balancing
- **Migration Process:**
 - From Version 8 or 9 NFM
 - Data sharing coexistence in CM8 or CM9
 - DSNTIJPA in V8 or V9 with PM04968

DB2 Migration Planning Workshops

- Understand breadth of features in DB2 for z/OS
- Bring together a toolbox of resources for your migration planning
- Explain the current migration process
- Bring a project focus to migration
- Remain relevant through GA life of the product
 - Updated with field experiences
- Check with IBM sales team for workshop availability



Prerequisite Summary

- **z/Architecture (z890, z990, z9, z10, z196)**
- **Configure a minimum of 128GB of shared private**
- **z/OS 1.11 or above**
- **Migrate from**
 - DB2 for z/OS V8 NFM
 - DB2 9 for z/OS NFM
 - With Fallback SPE (PK56922)
- **Coming from V8**
 - BSDS reformatted for larger active / archive tracking
 - Check use of Java drivers



Prerequisite Summary

- Run DSNTIJPA pre-migration job
- Eliminate use of Private Protocol & DBRMs bound into Plans
- Check programming language requirements
 - DSNHPC7 included in the base for older COBOL and PL/I
- **SMS managed catalog and directory**
 - DSNTIJSS provided as a sample for configuration
 - A copy of [DSNTIJSS](#) can be obtained from developerWorks
 - Use hyperlink or search for file dsntijss.copy
- **PDSEs required for SDSNLOAD, SDSNLOD2, ADSNLOAD**
 - See Consolidated Checklist



Removed Features

DB2 9 to DB2 10

- Optimization Service Center
- Private Protocol
- DBRMs bound into Plans
- Explain tables before V8
- DB2 Management Clients Package
- Book Manager
- XML Extender
- REORG TABLESPACE
SHRLEVEL NONE on LOB
- Several parameters

DB2 8 to DB2 10

- DB2 Managed Stored Procedures
- Legacy Java Drivers
 - Include WLM SPAS JCL
- Creation of Simple Table Space
- AIV & Text Extenders
- Visual Explain



Deprecated Features

- **V8 / V9 Explain Table formats**
 - EBCDIC encoded PLAN_TABLEs
- **Simple Table Spaces**
- **Mapping DSNHDECP**
- **Classic partitioning**
- **DSNHPC7**
- **Several DB2 provided stored procedures**
- **Several parameters**



DB2 10 for z/OS Documentation

<http://www-01.ibm.com/support/docview.wss?uid=swg27019288>

Administration Guide

Application Programming Guide and Reference for
Java

Application Programming and SQL Guide
Codes

Command Reference

Data Sharing: Planning and Administration

Installation and Migration Guide

Internationalization Guide

Introduction to DB2 for z/OS

Managing Performance

Messages

ODBC Guide and Reference

RACF Access Control Module Guide

SQL Reference

Utility Guide and Reference

What's New?

pureXML Guide

Diagnosis Guide and Reference

SDSNIVPD library member DSNDR

DSNTIJPM(A)...

- JPA shipped for V8 & V9 with APAR PM04968
- Uses REXX Language Support
 - DSNTIJRX will bind needed packages if not done already
 - Requires use of a special package in collection DSNREXX_500 (see JPA job)
- PM15965
 - Adds 3 reports
 - Several corrections

```
READY
DSNTPMQ DB1S DBA015
DSNTPMQ entry:
  Subsystem ID ..... DB1S
  Authorization ID ..... DBA015

Report 1 completed
Report 2 completed
Report 3 completed
Report 4 completed
Report 4 completed
Report 6 completed
Report 7 completed
Report 8 completed
Report 9 completed
Report 10 completed
Report 11 completed
Report 12 completed
Report 13 completed
Report 14 completed
Report 15 completed
Report 16 completed
Report 17 completed
Report 18 completed
Report 19 completed
Report 20 completed
Report 21 completed
Report 22 completed
Report 23 completed
Report 24 completed
Report 25 completed
```

DSNTIJPM(A)...

- Checks for:

1. Check for previous-release sample database
2. User-defined indexes that reside on user-managed storage and are defined on DB2 catalog tables that are processed during enabling-new-function mode
3. User-defined indexes that reside on DB2-managed storage and are defined on DB2 catalog tables that are processed during enabling-new-function mode
4. Stored procedures that use the DB2 SPAS (from V8)
5. Plans that are autobind candidates in V10
6. Packages that are autobind candidates in V10
7. Use of external module DSNWZPR (from V8)
8. Incomplete table definitions
9. Incomplete column definitions
10. Occurrences of the DSN_PTASK_TABLE explain table with one or more column names that contain a hash mark character
11. Plans that contain DBRMs
12. Plans bound with ACQUIRE(ALLOCATE)
13. Static queries bound with query parallelism
14. EBCDIC explain tables
15. Explain tables that are not in current-release format
16. MQTs on the DB2 catalog that are affected by CATMAINT
17. MQTs on the DB2 catalog that are affected by CATENFM
18. Plans bound with DBPROTOCOL(PRIVATE) that can be converted to DRDA via REBIND
19. Plans bound with DBPROTOCOL(PRIVATE) that can be converted to DRDA via DSNTIJPD
20. Packages bound with DBPROTOCOL(PRIVATE) that can be converted to DRDA via REBIND
21. Packages bound with DBPROTOCOL(PRIVATE) that can be converted to DRDA via DSNTIJPD
22. Authorization IDs and roles that use EBCDIC-encoded routines for DB2 Metadata

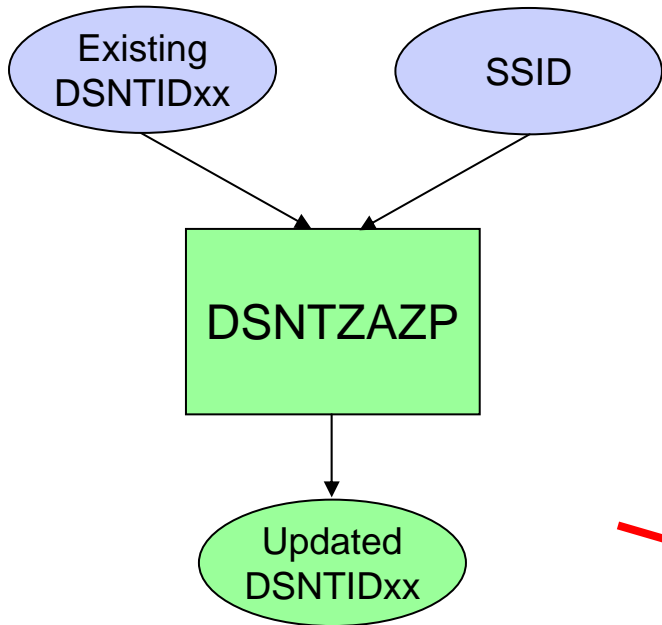
DSNTIJPM(A)...

- Checks for:
 23. Obsolete DB2-supplied objects
 24. Packages that use UDF
SYSFUN.DSN_XMLVALIDATE
 25. Existence of inconsistent UTF-8 encoding of the collection IDs and the package names that were bound by a remote client system.
 26. Reports those with EXECUTE authority on SYSPROC.DSNLEUSR. This is dropped / recreated during NFM migration.
 26. Reports on DATACAPTURE that will be disabled during migration to CM8.
 27. Reports on DATACAPTURE that will be disabled during migration to NFM.

DSNTXAZP (Job DSNTIJXZ)

- Job to update the installation CLIST input (DSNTIDxx) to reflect current:

- System parameters
- Bufferpool settings



CLIST INPUT MEMBER GENERATION REPORT ** 2010-05-21 06:28:18

CLIST PARAMETER REPORT:

```

0001 PARAMETER NAME           = ABEXP
    ZPARAM/BUFFERPOOL PARAMETER = ABEXP
    PARAMETER TYPE              = CHAR
    DATA SHARING SCOPE         = M
    MINIMUM VALUE                = NO
    MAXIMUM VALUE                = YES
    CURRENT CLIST VALUE          = YES
    CURRENT INSTALLED VALUE      = YES
    STATUS                        = RETAINED
  
```

```

0030 PARAMETER NAME           = AUDIT
    ZPARAM/BUFFERPOOL PARAMETER = AUDITST
    PARAMETER TYPE              = CHAR
    DATA SHARING SCOPE         = M
    MINIMUM VALUE                = NONE
    MAXIMUM VALUE                = NONE
    CURRENT CLIST VALUE          = YES
    CURRENT INSTALLED VALUE      = 1
    STATUS                        = UPDATED
  
```

CHANGE SUMMARY REPORT:

CLIST PARAMETER NAME	ZPARAM/BUFFERPOOL NAME	VALUE
ABEXP	-SAME-	YES
ASSIST	-SAME-	NO
* AUDIT	AUDITST	1 (YES)

DSNTXAZP Continued

- **“*”** in summary report indicates a change
- **The new value is indicated along with the old value in “()”**
- **Maps CLIST field names to ZParm names**
- **DSNTIDxx will include opaque parameters**

Migrating to DB2 10

- **FMIDs HDBAA10, HIYAA10, HIZAA10, HIR2230**
- **Complete pre-migration checks (DSNTIJPA)**
 - This will be the same as DSNTIJPM delivered with DB2 10
 - 25 reports
- **Plans and Packages prior to V6 will require REBIND**
- **Check / correct incompatibilities**
 - The BSDS needs to be expanded to V8 format (DSNJCNVB)
 - If not done before migrating to V10, DSNTIJUZ will convert the BSDS(s)
 - Release Incompatibilities documented in:
 - Installation Guide
 - Application Programming and SQL Guide
 - For example:
 - Eliminate Private Protocol / DBRMs bound into Plans
 - Review the Release Incompatibilities in the MPW Checklist
- **Must be on DB2 for z/OS V8 or DB2 9 New Function Mode**
 - With the Fallback SPE

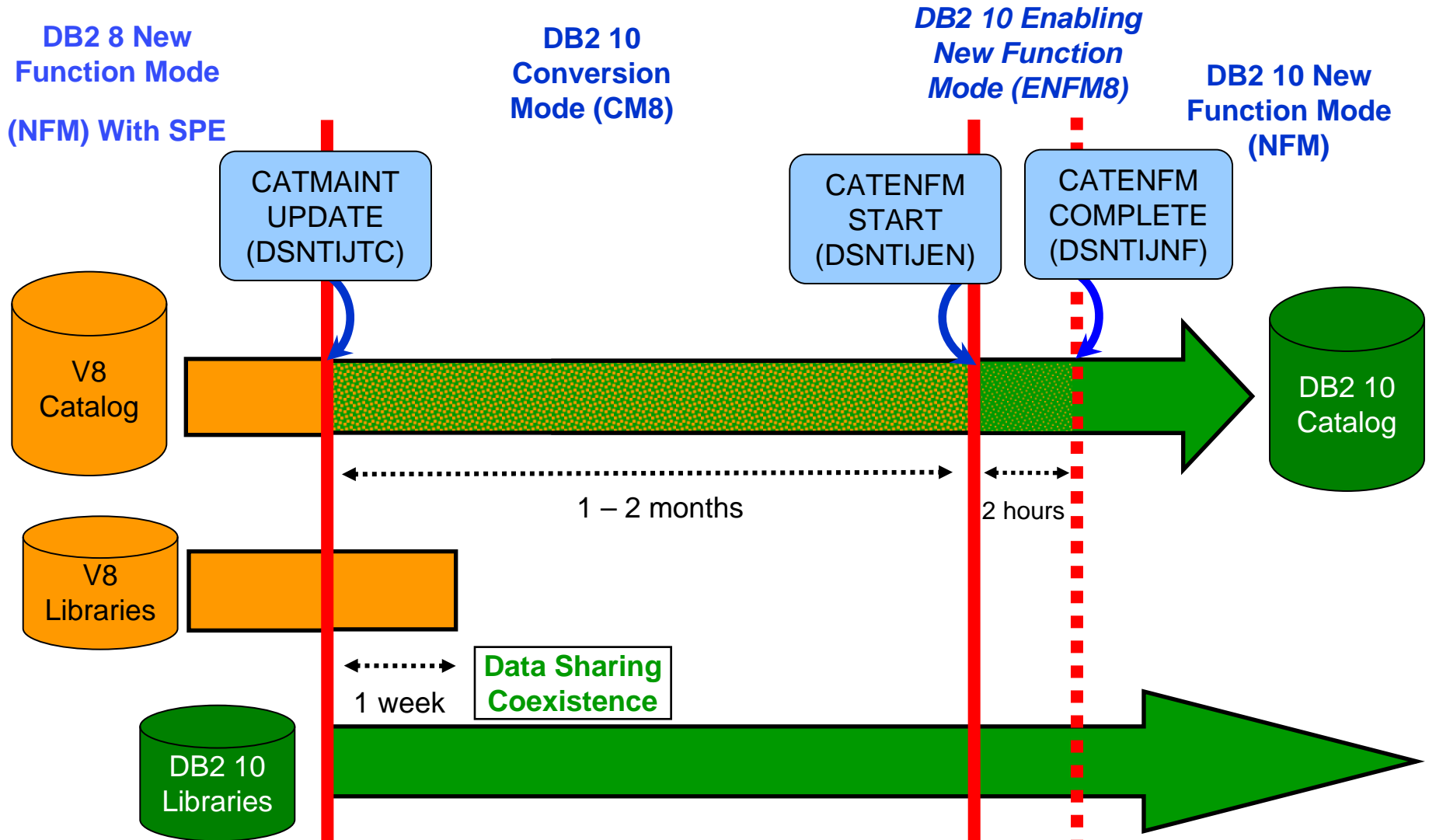
Migrating to DB2 10

- **Establish a project team and project plan**
 - Review the Installation Guide checklists
- **Develop conversion and coexistence goals**
 - How did your V9 test plans work?
 - Reuse and improve upon your experiences
- **Establish performance baselines**
- **Migration occurs in three familiar phases**
 - Conversion Mode (CM)
 - Enable New Function Mode (ENFM)
 - New Function Mode (NFM)
- **Numerical suffix mode names indicate the “migrate from” version**
 - CM9 & ENFM9

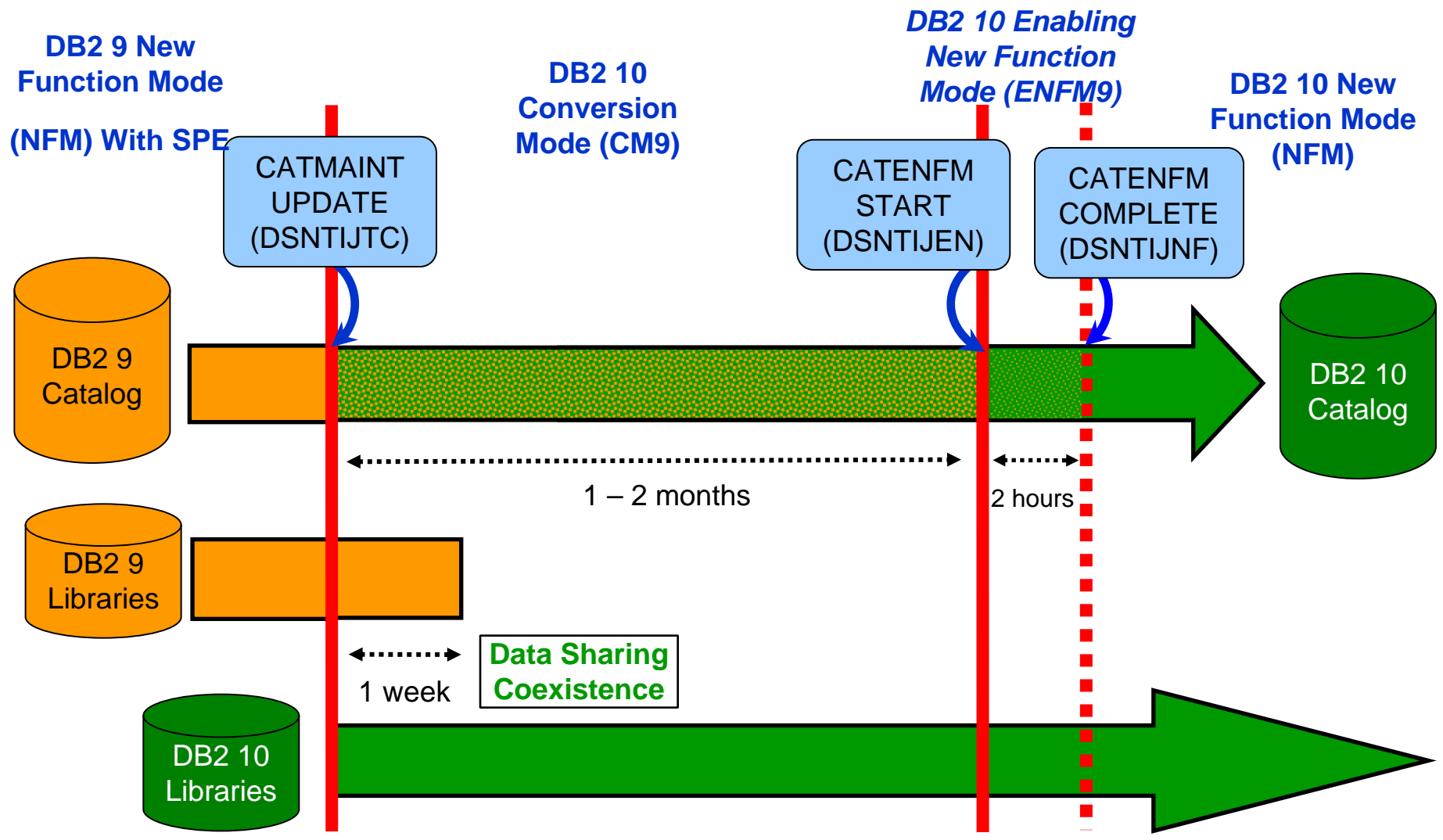
Migrating to DB2 10

- **The DB2 10 Catalog & Directory must be managed by DB2 & SMS**
 - Job DSNTIJSS provided to set up the SMS environment
 - SMS environment must be set up before migration
 - Not required to convert catalog / directory before migrating
 - Will be converted during the next REORG
 - Data Class attributes of
 - Extended Format
 - Extended Addressability
- **Reestablish V9 IVP to test DB2 10 before NFM**
- **Assess ISV Requirements / Readiness**
 - Tools and applications
 - Some vendors may add instructions for migration and / or require maintenance

Skip Migration Overview V8 → 10



Normal Migration DB2 9 → DB2 10



DB2 10 Modes

▪ CMx Considerations (1)

- Address Incompatibilities before migration
- Fall back SPE must be on all members (and restarted)
- Catalog is tailored
- Data Sharing group
 - V8 & CM8
 - V9 & CM9
- Test, test, test
- Fallback possible (CM9 to V9)
 - CM8 fall back to V8 CANNOT subsequently migrate to CM9
 - Fallback from CMx* not allowed
- Backup and Recover catalog objects in the specified order of the “migrate from” version.
 - Add new objects per:
http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/topic/com.ibm.db2z10.doc.inst/db2z_modifydsntijic.htm

V9 to V10CM8 New Table Spaces	2
TSNAME	
SYSTSASC	
SYSTSUNI	

DB2 10 Modes

▪ CMx Considerations (2)

– REBIND

- Re-enable xPROCs
- Find additional incompatibilities
- Potential virtual storage and performance improvements

DB2 10 Modes

▪ ENFMx Considerations

- This is running the same code as CMx
- Catalog conversion takes place
- All members of a data sharing group must be at the CMx level before converting to ENFMx
- Can revert to CMx from ENFMx
- Beyond CMx, Backup and Recover objects V10 specified order

▪ NFM Considerations

- Can revert to ENFMx* or CMx*
 - Must be the same ENFM or CM mode as previous executed
 - CM8 / CM9
 - ENFM8 / ENFM9
- REORG TABLESPACE for LOBs SHRLEVEL NONE no longer supported.
 - As of NFM, these jobs will complete with an RC=0, but will not do anything

SMS now a prerequisite for DB2 catalog & directory



Important – All new catalog indexes and new table spaces WILL be SMS controlled.

“SMS now a prerequisite of DB2 10”. So be prepared!

- **All new indexes & new table spaces in the catalog and directory created SMS-controlled with extended addressability (EA & EF)**
- **DSNTIJSS provides SMS classes for customers without SMS in use**
 - Environment ONLY for DB2 Catalog & Directory data sets
 - Other DB2 data sets such as logs and BSDS not covered.
- **Useful SMS reference material includes:**
 - z/OS DFSMS Introduction.
 - z/OS DFSMS Implementing System Managed Storage.
 - z/OS DFSMS Storage Administration Reference.
 - IBM Redbooks publication: Maintaining your SMS environment
 - DB2 9 for z/OS and Storage Management, SG24-7823

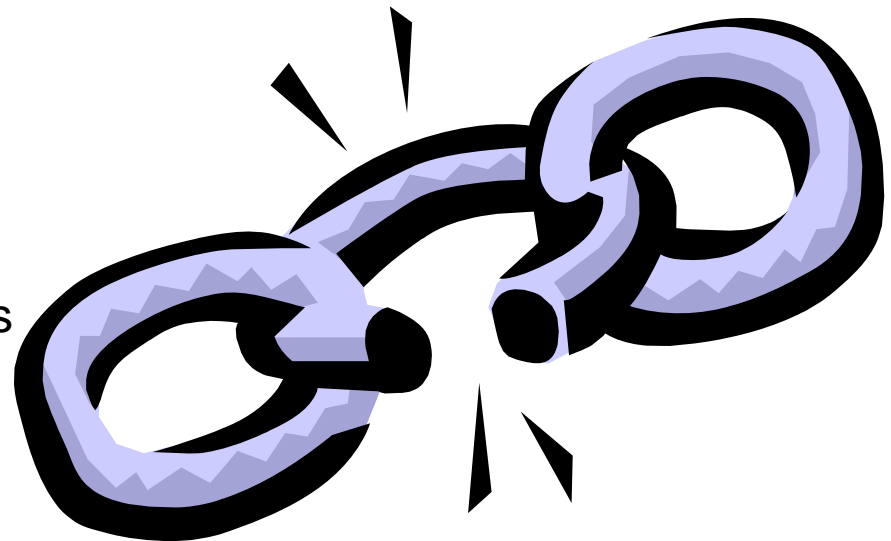


DB2 10 Catalog...

- **V10 catalog restructure provides greater concurrency for catalog operations**
 - Concurrent binds
- **V8 migrations will include new Catalog table spaces for**
 - Real-Time Statistics
 - New page size for SYSOBJ
 - XML
 - Trusted Context
 - Extended Index definitions
- **V8 and V9 migrations see many table space changes for the catalog restructure**
- **Several LOB columns**
 - Using Inline LOBs

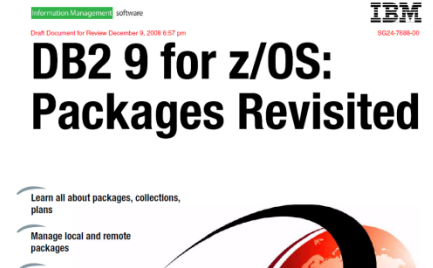
DB2 10 Catalog...

- **SYSDBASE, SYSPLAN, SYSDBAUT, SYSVIEW, SYSGROUP and DBD01 had links**
- **These table spaces used page level locking because of the links.**
- **SPT01, SYSOBJ, and SYSPKAGE are also processed in ENFM.**
- **All of these table spaces will be removed and the tables within each will be moved to new PBG table spaces**
 - Row level locking
 - New row format
 - Partition-by-growth
 - One table per table space
 - Referential Integrity in place of links
 - DSSIZE 64 G
 - MAXPARTS 1



Convert plans with DBRMs to packages

- Convert from DBRMs in PLAN to packages
- Specify the collection id for the packages
- REBIND plan option: COLLID
- Default collection id DSN_DEFAULT_COLLID_planname
- Able to specify plan name, list of plans, *
- DB2 9 APARs [PK62876](#), [PK85833](#), [PM01821](#)
- V8 APARs [PK79925](#), [PM01821](#)
- See Packages Revisited book



SG24-7688 chapter 4

Convert private protocol to DRDA

- Trace to find use of private protocol
- Private protocol trace analysis program DSN1PPTP
- Use DRDA protocol REXX tool DSNTTP2DP
- Private protocol statement checker DSNTPPCK
- Set PRIVATE_PROTOCOL parameter to NO
- Changes provided in base, PK92339, PK64045

Information Management

IBM

DB2 9 for z/OS: Distributed Functions

See Distributed book [SG24-6952-01](#) chapter 5.2

Establish connectivity to and from DB2 systems

Balance transaction workload across data sharing members



Customer experiences

Package or Access Path Stability

- **PLANMGMT default changed to EXTENDED**
 - Retains 3 versions: Current, Previous, Original
 - Ability to SWITCH to another version or fallback
 - Catalog information provided, new structures
 - BIND costs in CPU, disk space, and memory
 - If cost is too high, change default, use selective
- **ENFM can be very long**
 - Increase catalog buffer pools during this process

Performance enhancements with few changes (CM)

- SQL runtime improved efficiency
- Address space, memory changes to 64 bit, some REBINDs
- Faster single row retrievals via open / fetch / close chaining
- Distributed thread reuse High Performance DBATs
- DB2 9 utility enhancements in CM8
- Parallel index update at insert
- Workfile in-memory enhancements
- Index list prefetch
- Solid State Disk use
- Buffer pool enhancements
 - Utilize 1MB page size on z10
 - “Fully in memory” option (ALTER BUFFERPOOL)

Performance enhancements requiring REBIND (CM)

- **Most access path enhancements**
- **Further SQL runtime improvements**
- **Use of RELEASE(DEALLOCATE)**
- **SQL paging performance enhancements**
 - Single index access for complex OR predicates:
- **IN list performance**
 - Optimized Stage1 processing (single or multiple IN lists)
 - Matching index scan on multiple IN lists
- **Safe query optimization**
- **Query parallelism improvements**
- **More stage 2 predicates can be pushed down to stage 1**
- **More aggressive merge of views and table expressions**
 - Avoid materialization of views
- **If migrating from V8, get new RUNSTATS before mass rebind**

Performance enhancements requiring NFM

- **DB2 catalog concurrency and productivity**
- **Compress on insert**
- **Most utility enhancements**
- **LOB streaming between DDF and rest of DB2**
- **Faster fetch and insert, lower virtual storage consumption**
- **SQL Procedure Language performance improvements**
- **Workfile spanned records, partition by growth**
- **Access to currently committed data**
- **Insert improvement for universal table spaces**
- **Locking improvement for multirow insert**
- **Efficient caching of dynamic SQL statements with literals**

Performance enhancements which need NFM + DBA work

- Hash access path **Create + Reorg + rebind to activate**
- Index include columns **Alter + Rebuild + rebind to activate**
- Inline LOBs **Alter (need universal table space and reordered row format)**
- DEFINE NO for LOB and XML columns
- MEMBER CLUSTER for universal table space **Alter + Reorg**
- Alter to universal table space, page size, data set size, segment size **Alter + Reorg**
- Online reorg for all catalog and directory table spaces

Best Practices/Recommendations

- **Start with latest RSU + Identified Hipers**
- **Leverage CST/RSU process: DB2 9 & 10**
 - Apply 2 to 3 preventative service drops annually
 - Exploit Enhanced HOLDDATA to be vigilant on HIPERs and PEs
- **Use the DB2 9 'Package Stability' function for static SQL**
 - Offers access path preserving option. Recovers to prior access path if regression is encountered
 - PK52523 - DB2 Access Path Stability
- **Minimize potential query performance issues**
 - Use Data Studio or Optimization Service Center 9 only) to capture SQL statements
 - Run Stats Advisor to generate the recommendation for stats collection
 - Run RUNSTATS to ensure critical stats are collected as recommended by the advisor
- **Ensure a PMR is opened prior to migration start**

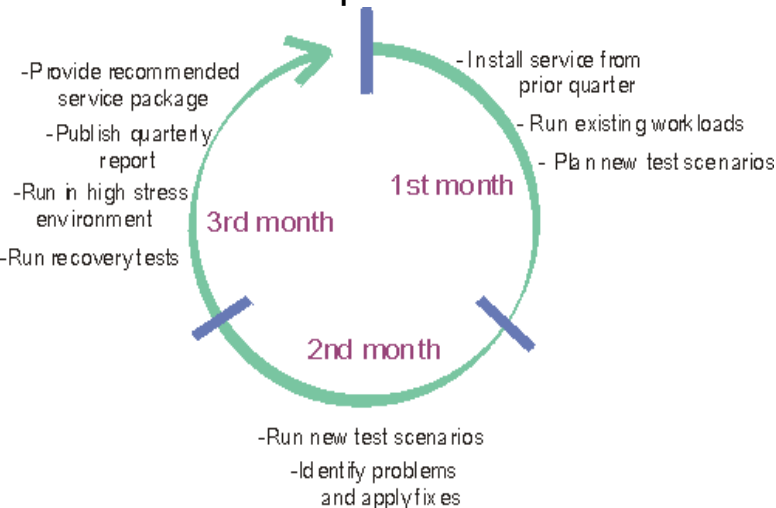
Products supported in CST and RSU

CST is provided: "AS IS"

CST does not remove the need to do your own testing

- Free offering to customers
- CST testing is done at an IBM test lab simulating a customer-like production sysplex environment in an IBM test lab with batch and data-sharing applications that exploit and stress the latest functions with up to two levels of subsystems on

The key products specifically tested in CST include:



- CICS Transaction Gateway for z/OS
- CICS Transaction Server for z/OS
- DB2 for z/OS
- DB2 Connect
- Geographically Dispersed Parallel Sysplex (GDPS/PPRC)
- IMS
- IRLM
- JAVA
- WebSphere Application Server for z/OS
- WebSphere MQ for z/OS
- z/OS
- eServer zSeries AD Tools
- IBM DB2 and IMS Tools
- IBM Tivoli

Benefits of CST for RSU

- **Better testing of maintenance by each of the products in customer-like parallel sysplex environment**
- **Recommendation for RSU identified by product experts**
- **Maintenance recommended after successful testing for a least one month**
- **Allows for consistent maintenance recommendations across the z/OS and OS/390 platform products**
- **Testing is performed in addition to existing testing programs and does not replace any current testing performed by the products.**
- **E-mail sent to you when we've completed testing of a new RSU service package.**

How to subscribe

- Order a current preventative service deliverable such as CBPDO or ESO for the products you need. You can order products and maintenance for the z/OS and OS/390 platforms using ShopzSeries on the Web. –
<https://www14.software.ibm.com/webapp/ShopzSeries/ShopzSeries.jsp>
- Register here if you'd like us to notify you by e-mail when we've completed testing of a new RSU service package.
<http://www.ibm.com/servers/eserver/zseries/zos/servicetst/>
- Questions and comments for the Consolidated Service Test team
<http://www.ibm.com/servers/eserver/zseries/zos/servicetst/contact.html>

Open Proactive PMRs during migrations

- 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
- Should a problem arise during the migration, call Support and escalate the PMR
- If the problem is serious, ask to be transferred to a Duty Manager

So where do I go from here?

- **No need to fear DB2 migration; but be cautious & thoughtful**
 - Ensure good planning, staying reasonably current on preventative service and application regression testing
 - Follow best practices/recommendations
 - PMR opened
 - Trends are improving!
- **Procedural upgrade easier**
- **Every customer experience is different**
- **Compared to DB2 V8 /DB2 9?**
 - Lower overall PMR volume
 - Less Severity 1 APARs
 - Lower PE rate
 - Lower HIPER rate



Questions?

Thank
You