

# Top 10 Dos and Don'ts for DB2 UDB for z/OS Version 8

## Considerations for DB2 V8 Transition

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# The Top Ten Dos and Don'ts

1. Do Your Homework
2. Do Know the Modes
3. Don't Forget to Bone up on CCSID and Unicode Issues
4. Don't Proceed Without Reviewing Good, Old COBOL
5. Don't Expect Performance to Stay Exactly the Same
6. Do Prepare for Storage Changes
7. Do Review Your DSNZPARMs
8. Do Prepare for DFSORT
9. Do Study Up on New Features
10. Don't Expect all 3<sup>rd</sup> Party Tools to Immediately Exploit V8



# 1. Do Your Homework

**Know the pre-requisites**

**Know the history**

**Understand the “big”-ness of DB2 V8**

**Prepare adequate time to learn before migrating**

**DB2 UDB for z/OS Version 8**

- ◆ **Became GA on March 26, 2004**
- ◆ **Large and complex release**
- ◆ **Lots of new functions and features**
- ◆ **New migration process**

# A History Lesson

## ◆ Ten years of DB2 Release history

- ◆ DB2 V4 – GA in '95 – End of Service Dec '01
- ◆ DB2 V5 – GA June '97 – EOS Dec '02
- ◆ DB2 V6 – GA June '99 – EOS June '05
- ◆ DB2 V7 – GA March '01 – EOS TBD
- ◆ DB2 V8 – GA March '04 – EOS TBD

## ◆ Why the sudden jump to a 3 year release cycle?

### ● Y2K created unique situation

- ◆ Many customers in a long-term 'freeze' for system changes
- ◆ Required IBM to support migration to V7 from V6 OR V5
- ◆ IBM recognized that many customers would take several years to migrate from V5 to V6 and/or to V7
- ◆ It took a longer time than for past releases for customers to migrate to V7
  - (Estimate that only by YE 2003 were more than ½ of DB2 customers on V7)

# DB2 Version Support Details

The screenshot shows the IBM website's product lifecycle page for DB2 for z/OS and OS/390. The browser window title is "DB2 for z/OS and OS/390 - Product Lifecycle - Microsoft Internet Explorer". The address bar shows the URL: <http://www-306.ibm.com/software/data/db2/zos/support/plc/index.html>. The page features the IBM logo, a search bar, and navigation links for Home, Products & services, Support & downloads, and My account. A sidebar on the left contains a "Select a country" dropdown and a list of product categories including "All software products", "DB2 for z/OS and OS/390", "Features and benefits", "System requirements", "Library", "Success stories", "News", "How to buy", "Events", "Education", "Services", and "Support". The main content area is titled "DB2 for z/OS and OS/390" and includes a "Product Lifecycle" section with the text: "Last Updated 02/23/2004. The DB2 OS/390 Product Lifecycle matrix displays the marketing and support services available to you over the life of your product. Hyperlinks are enabled to take you directly to the product announcement letter by simply selecting any of the dates listed. If your product or version is not listed on the Product Lifecycle chart below, it has probably reached End of Service. While every effort has been made to provide accurate information, the authoritative source for product information is the IBM announcement letters." Below this text is a "Sort Product Lifecycle Data by:" dropdown menu set to "Product". A table titled "DB2" displays the following data:

Ver/Rel	OS/Platform	PID	EOM	EOS
8	z/OS	5625-DB2	TBD	TBD
7	OS/390, z/OS	5675-DB2	TBD	TBD
6	OS/390	5645-DB2	<a href="#">30-Jun-02</a>	<a href="#">30-Jun-05</a>
5	OS/390	5655-DB2	<a href="#">31-Dec-01</a>	<a href="#">31-Dec-02</a>
4	MVS/ESA	5695-DB2	<a href="#">01-Dec-00</a>	<a href="#">31-Dec-01</a>
3	MVS	5685-DB2	<a href="#">29-Feb-00</a>	<a href="#">31-Jan-01</a>

<http://www.ibm.com/software/data/db2/zos/support/plc/index.html>

# Installation and Migration

## Environment requirements

- ◆ **DB2 V7**
- ◆ **V8 must run on zSeries in 64-bit mode**
  - Z800, z900 (or bigger) box
- ◆ **z/OS R3 or higher (see next slide)**

## Installation and Migration paths

- ◆ **Install brand new V8 Subsystem**
- ◆ **Migrate V7 to V8**
  - COMPAT, ENFM, then NFM
  - V5-V6-V7-V8
  - V5-V7-V8

# z/OS Requirements

## z/OS level required

- ◆ R3 is minimum
  - WLM Goal Mode is enforced with z/OS R3 or later
  - z/OS R3 is out of service as of March 2005
    - ◆ [http://www.ibm.com/servers/eserver/zseries/zos/support/zos\\_eos\\_dates.html](http://www.ibm.com/servers/eserver/zseries/zos/support/zos_eos_dates.html)
- ◆ With R4
  - Improved data sharing performance
  - Improved Unicode conversion performance
- ◆ With R5
  - Multilevel Security including row level security
  - System Level PIT Recovery utilities
    - ◆ **BACKUP SYSTEM**
    - ◆ **RESTORE SYSTEM** without **LOGONLY** option
  - 31-bit DSAB support
- ◆ With R6
  - zSeries Application Assist Processor (Java offload)
  - WLM enhancement for stored procedures

# Ensure Proper Mtce to V7

## Fallback SPE

- ◆ UQ81009 must be applied first
- ◆ Information is stored in BSDS /SCA
  - Checked at start-up time by DB2

***MUST START DB2 V7 AT LEAST ONCE AFTER  
THE SPE HAS BEEN APPLIED***



# Health Check

## DSNTIJPM

- ◆ Checks code page configuration
  - Evidence of multiple CCSIDs in the same encoding scheme
- ◆ Type 1 Indexes
- ◆ Data Capture on Catalog tables
- ◆ Partitioned tables that use selective partition locking
- ◆ Partitioned tables that have truncated limit key (PQ48024 in V6/V7)
- ◆ Stored procedures that use LANGUAGE COMPJAVA
- ◆ Stored procedures that use DB2 SPAS
- ◆ Use of DSNWZPR module by DSNWZP

Also shipped with DB2 V7 as DSNTIPJ8 via PQ84421

# Before Migrating...

## Ensure a stable and useful V7 environment:

- ◆ Reasonably up-to-date on maintenance
- ◆ Save accounting reports
- ◆ Save critical access paths for important applications
  - Be sure you have PLAN\_TABLE access paths
  - Also DSN\_STATEMENT\_TABLE and DSN\_FUNCTION\_TABLE
  - *Alternately, Visual Explain reports...*
    - ◆ *Visual Explain V8 XML files for the V7 access.*

## 2. Do – Understand the Modes



- ◆ **3 modes of DB2 execution in V8**
  - 1. Compatibility Mode (CM)**
  - 2. Enabling New Function Mode (ENFM)**
  - 3. New Function Mode (NM)**

# Compatibility Mode (CM)

- ◆ **Compatibility Mode (CM)**
  - Can migrate from V7, not earlier releases
  - Catalog is EBCDIC, no long names
  - Fallback to V7 is possible
  - **No new function is available**
    - Although there will be VSCR and some optimizer enhancements

# Compatibility Mode (CM) Features

**Compatibility Mode is transitional phase**

**64-bit architecture storage above the bar is available**

- Buffer pools which can be page fixed for performance
- RID pool and SORT pool
- compression dictionaries
- EDM pool for DBD cache and dynamic statement cache

**Page fixing for performance**

- PGFIX(YES) by bufferpool
- Frequent page read or writes when there is adequate real storage
- Avoids processing time for fixing and freeing pages every time there is an I/O

# CM Migration Issues

**Consider migrating all subsystems to V8 CM before moving forward to ENFM phase**

**Validate existing applications against V8 base code in CM**

- ◆ **Go through all major business cycles before moving on to ENFM**
  - **monthly, quarterly, bi-annual processing**

**Ensure you have good backup and restore procedures in place before beginning the ENFM process**

# Fallback & Coexistence

## Fallback

- ◆ Fallback to V7 only permitted from V8 CM
- ◆ The fallback SPE must be on.
- ◆ The V8 catalog structure will remain in V7 after fallback
- ◆ Returning from ENFM or NFM to CM mode is ONLY possible using restore processing

## Release coexistence

- ◆ All data sharing members must be in CM before moving to ENFM
- ◆ All data sharing members must be at least V7

# Enabling New Function Mode (ENFM)

- **Enabling New Function Mode (ENFM)**

- Converts catalog to Unicode and long names, one tablespace at a time, via ALTER and online reorg
- 18 catalog table spaces converted, with indexes – in the order shown below:

1.	SYSVIEWS	10.	SYSOBJ
2.	SYSDBASE	11.	SYSPKAGE
3.	SYSDBAUT	12.	SYSPLAN
4.	SYSDDF	13.	SYSSEQ
5.	SYSGPAUT	14.	SYSSEQ2
6.	SYSGROUP	15.	SYSSTATS
7.	SYSGRTNS	16.	SYSSTR
8.	SYSHIST	17.	SYSUSER
9.	SYSJAVA	18.	SPT01

- The process (one job) is interruptible and restartable
- ◆ **No fallback to CM or V7**
- ◆ **Still no new function available**



# ENFM Issues and Concerns

- ◆ **Do not move on to ENFM until you are absolutely certain that you will not need to return to Version 7**
- ◆ **Cannot begin ENFM processing if any active DB2 V7 subsystems still exist in data sharing group**
  - You will not be able to start a DB2 V7 member in the group once ENFM process begins
- ◆ **Restoring entire system from backup copy is ONLY option**
- ◆ **Clean up catalog prior to ENFM, removing unwanted objects**
- ◆ **Take image copy of DB2 catalog and directory after job DSNTIJNE has completed processing or DSNTIJNE paused**

# ENFM Recommendations

**Do NOT stay in ENFM phase any longer than necessary**

- ◆ Duration of ENFM will depend on the size of the catalog:
  - The larger the catalog the longer ENFM takes *Most catalogs under one hour*

**Verify that BP8K0, BP16K0 and BP32K are created**

- ◆ BP8K0 , BP16K0 must be created prior to ENFM. Will fail with resource unavailable if they do not exist
  - For data sharing must also define GBP8K0, GBP16K0 and GBP32K buffer pools

**Increase size of the catalog table space and index space VSAM data sets prior to ENFM**

- ◆ 2 byte length to existing CHAR columns

# ENFM Recommendations (2)

## Consider backing up the entire subsystem prior to ENFM

- ◆ Quiesce V8 CM system before running DFSMS to create copy of entire V8 CM subsystem
  - including DB2 catalog and directory, logs, BSDS and application data

## Keep an eye on SYSVIEWS size

- ◆ Parse trees stored in SYSVIEWS will take up more space than in previous releases, so it is recommended that you increase the allocation size.

## Change Data Capture:

- ◆ During ENFM, Change Data Capture (CDC) is turned off automatically for any catalog table that has it enabled . Once in NFM, CDC can be turned back on, but it is manual

# ENFM Recommendations (3)

## User indexes on the catalog:

- ◆ Will be automatically rebuilt as a result of REORG of table space. But that can result in a much larger index if columns were increased in size and marked as VARCHAR.
- ◆ Therefore, consider dropping user-created catalog indexes on VARCHAR columns that expand in V8. These indexes will need more space and it is best to drop them before running DSNTIJNE, and then to recreate them as NOT PADDED indexes in NFM.
  - If you don't drop them, when you get to NFM you can ALTER the index to NOT PADDED (if key column is VARCHAR) and rebuild the index(es).

# ENFM Steps

## Run DSNTINST (install CLIST)

- ◆ Enter ENFM in DSNTIPA1 panel

**Calculates preliminary space allocations for shadow data sets**

**Lists image copy dataset allocation information**

**Generates installation jobs**

- ◆ DSNTIJNE – ENFM processing
- ◆ DSNTIJNH – halt DSNTIJNE
  - Halts the table space conversion process after last successful table space
- ◆ DSNTIJNF – turn NFM on
- ◆ DSNTIJNG – update DECP for NFM
- ◆ DSNTIJEN – return to ENFM status
- ◆ DSNTIJNR – convert RLST for long name support

# DSNTIJNE Processing \*\*\*

## DSNTIJNE is the key job in the ENFM processing

- ◆ DSNTIJNE can be stopped after the REORG of any table space (with DSNTIJNH)
- ◆ Changes types and lengths of existing catalog columns
- ◆ Converts catalog data to Unicode
- ◆ Changes buffer pools for several catalog table spaces
- ◆ Changes catalog index with varying length columns to NOT PADDED
- ◆ Changes page size of several catalog table spaces
- ◆ Catalog changes
  - SYSDUMMY1 is moved to SYSEBCDC
  - No columns added to existing catalog tables
  - Most catalog tables and directory have columns that change type
  - CHAR => VARCHAR(128 or greater)
  - VARCHAR => VARCHAR(128 or greater)
  - Index padding
    - ◆ Many catalog indexes are changed to NOT PADDED
    - ◆ User indexes on the catalog will NOT be changed to NOT PADDED

# DSNTIJNE Processing Steps \*\*\*

## Unicode conversion step

- ◆ Table spaces converted to Unicode using online REORG with SHRLEVEL REFERENCE
- ◆ FOR BIT DATA columns will not be converted to Unicode
- ◆ Table spaces are marked 'UNICODE' during online REORG
- ◆ If process fails, the old catalog data is maintained
- ◆ Once table space is Unicode there is no going back
  - other than via restoring entire DB2 subsystem

# DSNTIJNE / DSNTIJNH \*\*\*

If space problems in DSNTIJNE the succeeding steps will be skipped

- ◆ Last step performs –TERM UTIL
- ◆ The old catalog data is still maintained
- ◆ The tablespace switch does not take place

Use only DSNTIJNH to halt DSNTIJNE processing

- ◆ No other means of halting conversion processing should be used.
- ◆ Restarting DSNTIJNE will skip those table spaces that have already been converted and continue for those table spaces that have failed (or that remain to be processed).



# Fallback & Coexistence

## Fallback

- ◆ No supported return to V8 CM and no fallback to V7
- ◆ Recover by doing a PIT recovery of entire DB2 subsystem or group logs, BSDS, catalog, directory and data and indexes
  - All CF structures must be purged

## Coexistence

- ◆ ENFM & NFM are group scope
  - Once in ENFM all members are considered to be in a status of ENFM.
  - A V7 subsystem cannot be started if group is in ENFM
  - A new V8 member could be started, it joins the group in ENFM status

# New Function Mode (NFM)

## ◆ New Function Mode (NFM)

- Catalog is Unicode, with long names, new page sizes
- DBRMs are Unicode (by default)
  - ◆ All new function is enabled
  - ◆ NEWFUN(YES/NO) is precompiler parameter
  - ◆ NEWFUN(NO) creates V7 compatible DBRM

## ● Other Notes

- -DIS GROUP command shows mode information
- Newly installed V8 subsystems are NFM
- Plans and/or packages that access the catalog may be invalid
- Queries accessing catalog may need to be rewritten

# NFM Catalog Considerations

## ◆ Storage Requirements?

- Possible **increase** in space required for system catalog due to CHAR -> VARCHAR conversion issues
  - Length bytes are required for the new VARCHAR columns
- Possible **decrease** in space required for system catalog due to index padding
  - DB2 defined indexes on the system catalog are converted to not padded (for indexes with variable keys)
- **Estimate? Some are seeing about a 10% increase in disk storage required for the catalog and directory**
  - But if you've never REORGed an older catalog you could see a decrease

# Fallback & Coexistence

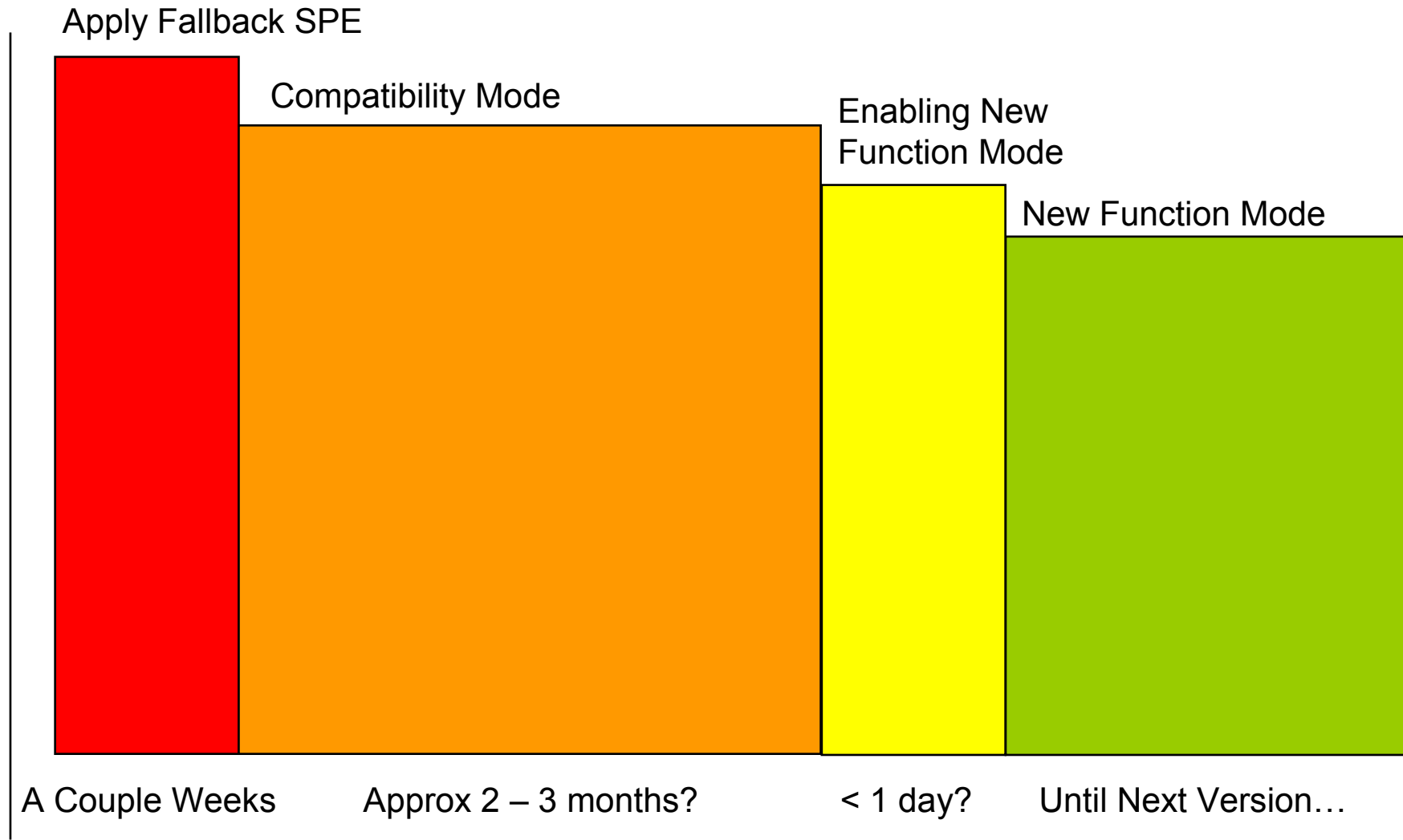
## Fallback

- ◆ DSNTIJEN – allows the system to return to ENFM
  - Fallback to V8 CM or V7 is not supported
- ◆ PIT recovery using system restore to V7

## Coexistence

- ◆ V8 NFM is group-wide

# Timeframe Estimation



# 3. Don't Forget to Bone up on CCSID and Unicode Issues

## 1. Review your CCSID settings and prepare

- ◆ DB2 Version 8 requires you to provide a DSNHDECP module that specifies valid, non-zero CCSIDs for single-byte character sets (SBCS) for both EBCDIC and ASCII.
  - For Far East languages like Chinese, and Korean, you must also specify valid, non-zero CCSIDs for mixed-byte (MBCS) and double-byte (DBCS) character sets for both EBCDIC and ASCII.
- ◆ See Appendix A of the *DB2 Installation Guide*, GC18-7418 for information on choosing valid CCSIDs for ASCII and EBCDIC.

## 2. Understand the impact of Unicode on V8

# What is a CCSID?

**CCSID** stands for Coded Character Set Identifier, a unique value that identifies a code page.

For example:

- ◆ CCSID 37 equates to U.S. EBCDIC
- ◆ CCSID 437 equates to U.S. ASCII PC
- ◆ CCSID 819 equates to U.S. AIX ASCII
- ◆ CCSID 1208 equates to Unicode.

DB2 also uses a System CCSID (SCCSID), specified on the DSNTIPF Installation Panel, and stored in DSNHDECP. This is the default CCSID for the DB2 system.

# CCSID Issues

There is the potential for incorrect character interpretation (*data corruption*) if multiple CCSIDs within one encoding scheme

- Terminal emulator using incompatible code page
- Incorrect CCSID specification
- Change of CCSID specification

Must be fixed prior to moving to V8

- ◆ V7 APAR PQ56697 introduces checks for non-zero valid CCSIDs and issues warning when trouble found
- ◆ V7 APAR PQ89018 will provide CCSID detection if DECP value does not match the emulator value
- ◆ APAR PQ97373 allows the user to specify the names of the SPUFI plans on the defaults panel. DB2 system programmers can then bind multiple SPUFI plan pairs for various EBCDIC CCSIDs, according to the CCSIDs of end-user TSO terminal sessions.



# Example \*\*\*

This problem document shows the impact of an incompatible CCSID

## Problem

In Version 8, I am receiving a syntax error on the following lines of C code in SYSIN:

```
#include <stdio.h>
EXEC SQL INCLUDE SQLCA;
struct dsnMsg {short len; char txt[7][132];} dsnMsg = {7 * 132};
extern short dsntiar(struct sqlca *,struct dsnMsg *,int *);
```

Error:

```
DSNH007I E DSNHTOKR LINE 5 COL 35 ILLEGAL CHARACTER IGNORED:
"I" ('AD'X)
```

The same program compiles in V7.1 without error.

## Cause

The precompile step is being run with a DECP with CCSID(500), but the C program contains square brackets in CCSID 1047 codepoints ('AD'x, 'BD'x):

```
OPTIONS SPECIFIED: HOST(CPP),SOURCE,XREF,MARGINS(1,80),STDSQL(NO)
```

```
OPTIONS USED - SPECIFIED OR DEFAULTED
```

```
APOST
APOSTSQL
ATTACH(TSO)
CCSID(500) <---- defaulted from DECP
NOPADNTSTR
CONNECT(2)
FLAG(I)
HOST(CPP)
FLOAT(S390)
LINECOUNT(60)
MARGINS(1,80)
NEWFUN(YES)
ONEPASS
OPTIONS
PERIOD
SOURCE
STDSQL(NO)
SQL(DB2)
XREF
```

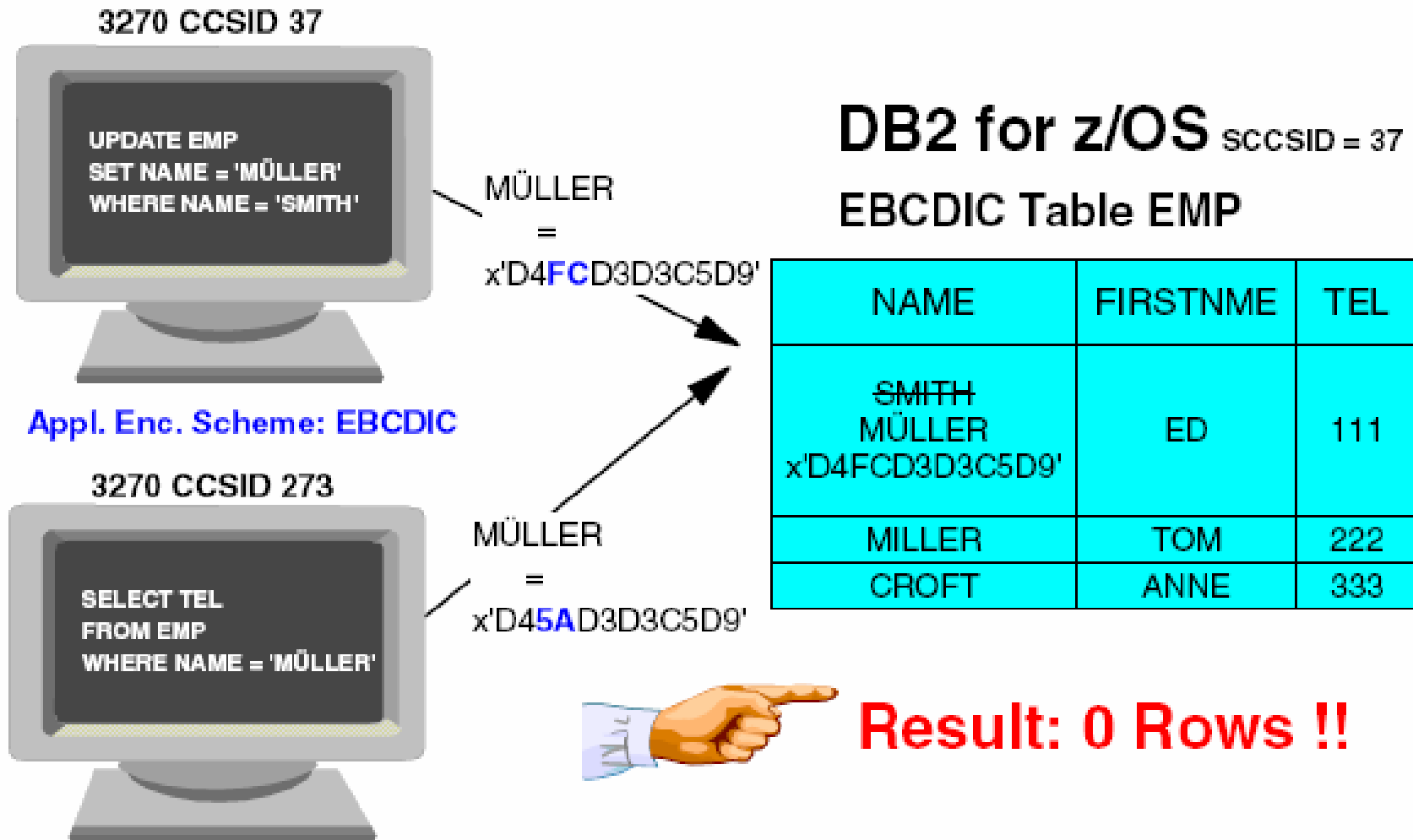
```
struct dsnMsg {short len; char txt.7..132.;}
AA9A8A48A9DA84CA899A49895488894AAAAFBAFFFB5D <--- square
brackets are 'AD'x, 'BD'x (1047 codepoints)
239433042542700286930355E038190373D7DD132DE0
```

The message DSNH007I E DSNHTOKR LINE 5 COL 35 ILLEGAL CHARACTER IGNORED: "I" ('AD'X) explains that the character that can't be recognized in CCSID 500 is the left square bracket in CCSID1047.

## Solution

Use the CCSID(1047) precompile option to precompile this program.

# CCSID Issues



# SQL with Multiple CCSID Sets \*\*\*

## When an SQL statement references table objects with multiple CCSID sets...

- ◆ If an expression or comparison involves two strings which contain columns with different CCSID sets, drive to Unicode if necessary
- ◆ If an expression or comparison involves two strings with different CCSID sets where only one of them contains a column, drive to the column's CCSID set
- ◆ If an expression or comparison involves two strings with different CCSID sets and neither contains a column, drive to Unicode
- ◆ String constants and special registers in a context by themselves use the application encoding scheme

# Encoding Schemes

Starting with V7, DB2 supports 3 encoding schemes

- ◆ ASCII
- ◆ EBCDIC
- ◆ **UNICODE**

DB2 uses the same CCSIDs for Unicode regardless of language. DB2's Unicode CCSID are:

- ◆ 367 for SBCS data
- ◆ 1208 for MBCS data
- ◆ 1200 for DBCS data.

# What is Unicode?

**Unicode is a single character set that encodes all of the world's scripts (sort of)**



**The Unicode standard provides a cross platform, cross vendor method of encoding data that enables loss-less representation and manipulation**

## **Before Unicode**

- ◆ Many Standards (ANSI, JIS, TISI)
- ◆ Provided by various vendors [IBM (ASCII and EBCDIC), HP, Microsoft...]

## **Foundation for globalization of data**

- ◆ Customers want to use DB2 to manage data from around the world
- ◆ No pre-Unicode code page handles all characters
- ◆ Handles most current and historical languages
- ◆ Handles scientific and mathematical symbols
- ◆ Handles other symbols: wingdings, dingbats, . . .
- ◆ Required by many modern standards: XML, Java, LDAP, CORBA

# Unicode Conversion Services

Most of DB2 V8 operates in Unicode (*see next slide*)

- ◆ Make sure you have all necessary conversions defined before you attempt to bring up a V8 subsystem.
- ◆ Details are provided in:
  - **DB2 Installation Guide (GC18-7418) -- Appendix A**
  - **DB2 V8 Technical Preview Redbook (SG24-6871) -- Appendix A.**

Conversion definitions need to be set up for your environment

- Must configure Unicode Conversion Services for z/OS
- Mappings must be included for every possible combination of code page translation

# Unicode Processing

## Most internal DB2 processing is done in Unicode

- ◆ Parsing – Literals in parse tree are in Unicode
- ◆ Utility parsing – Option to parse in Unicode
- ◆ Precompiler – Source converted to Unicode, parsed in Unicode
- ◆ DBRM – Unicode in NFM
- ◆ Bind – Statement text converted to Unicode if necessary
- ◆ Optimization – Catalog look up in Unicode (even in COMPAT Mode)
- ◆ Authorization – Unicode internal, EBCDIC external (e.g. RACF)
- ◆ Internal names – PLAN Name, Package Name
- ◆ Special Registers – Stored in Unicode
- ◆ Tracing – Option to output trace data in Unicode (certain fields)

# Unicode and the Catalog

## **DB2 V7 Catalog is encoded in the SYSTEM EBCDIC CCSID**

- ◆ Static statements are stored in the catalog in EBCDIC
- ◆ View definitions are stored in the catalog in EBCDIC

## **DB2 V8 Catalog is encoded in Unicode UTF-8**

- ◆ Static statements are stored in the catalog in Unicode (*by default*)
- ◆ View definitions are stored in the catalog in Unicode

**Any name which must be passed to z/OS must be convertible to EBCDIC.**

**For example:**

- ◆ Database Name(dataset qualifier)
- ◆ Table space/Index space Name(dataset qualifier)
- ◆ DBRM Name(PDS member name)
- ◆ (UDF, SP, Exits, Fieldproc...) (PDS member name)

**Identifiers may not be able to be generated from all clients so they should really be limited to common subset that can be represented on all clients.**

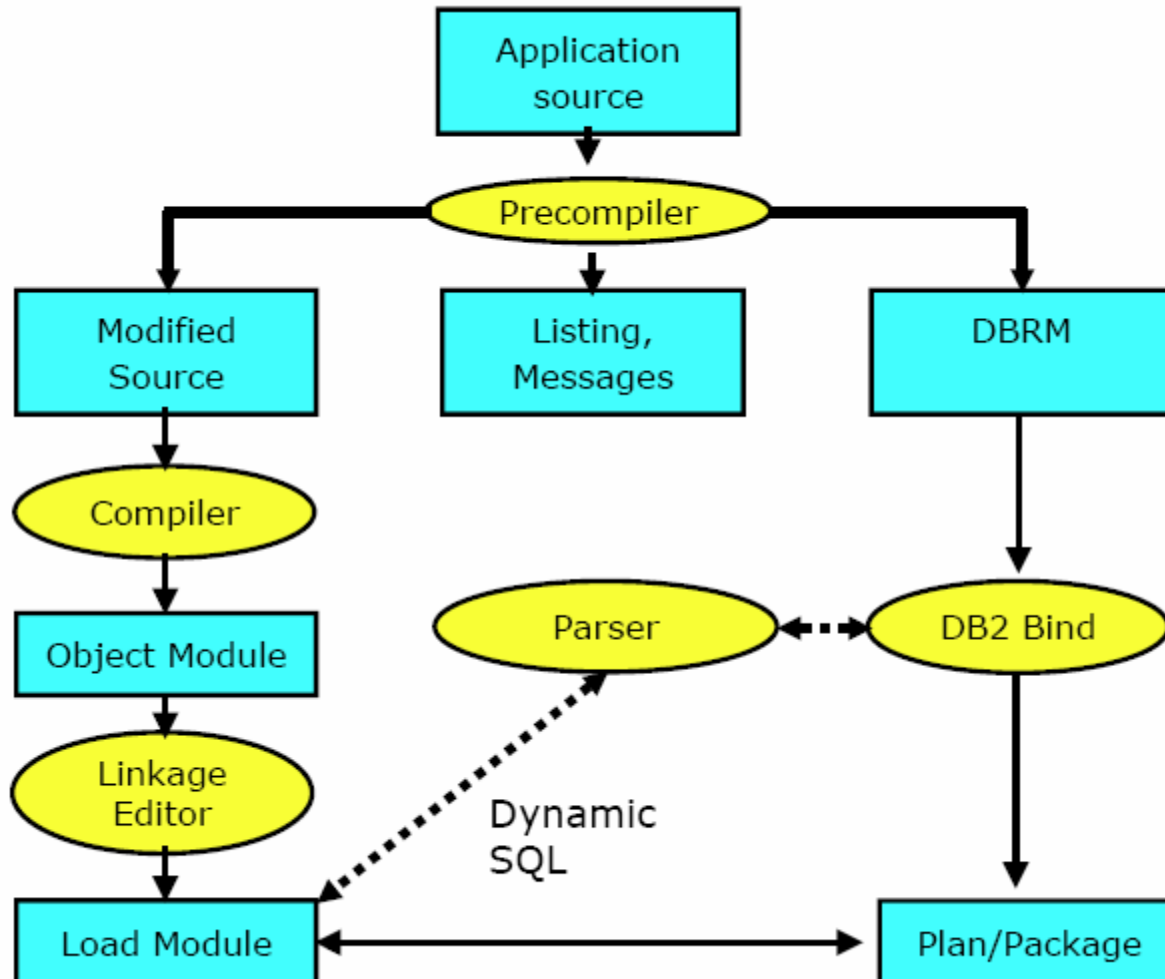


# SQL in the Catalog

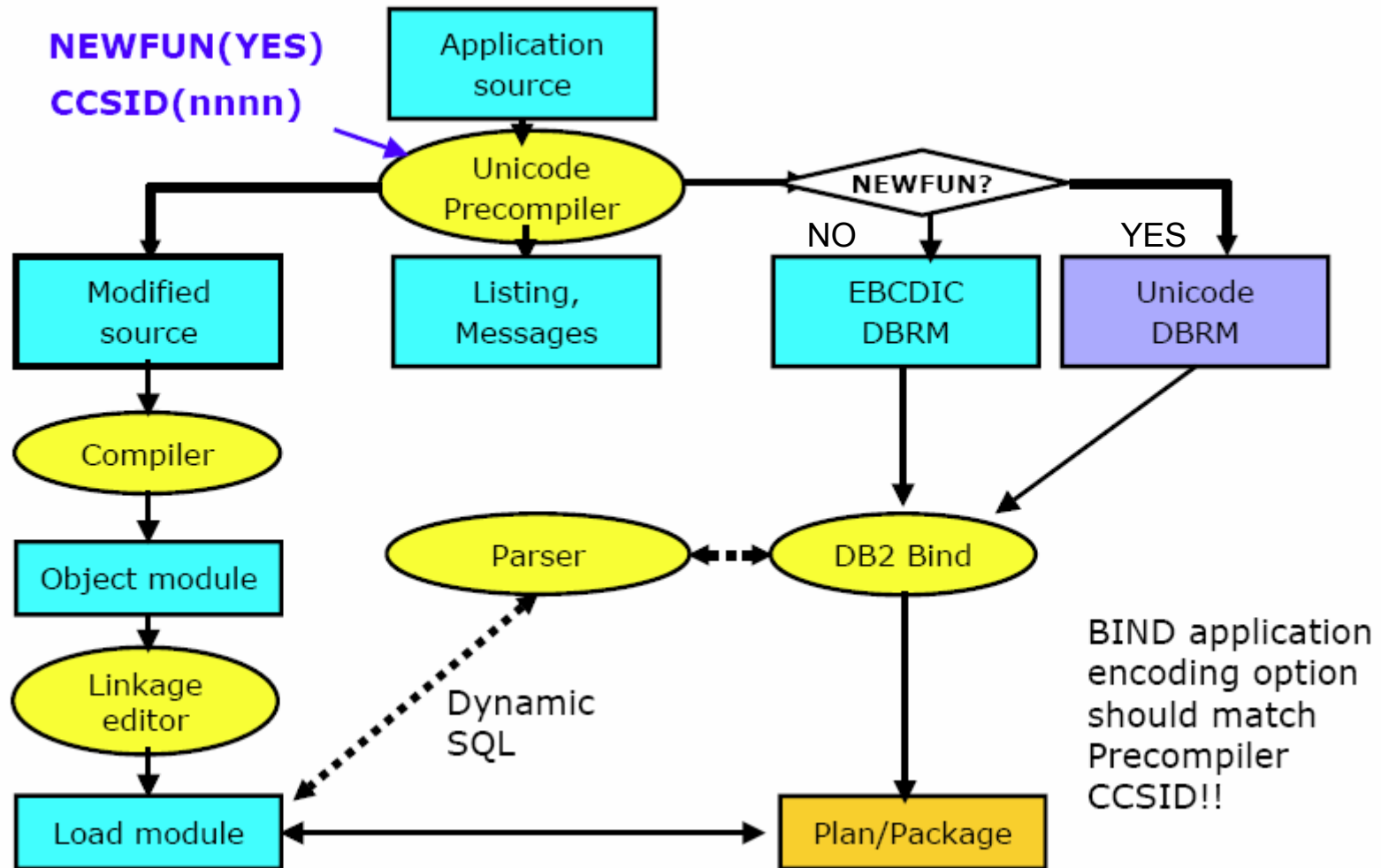
SQL statement text stored in SYSSTMT and SYSPACKSTMT:

- ◆ EBCDIC for
  - Applications Precompiled Prior To DB2 V8
  - Applications Precompiled in NEWFUN(NO) mode
- ◆ Unicode for
  - Applications Precompiled in NEWFUN(YES) mode

# Program Preparation – pre-V8 \*\*\*



# Program Preparation – V8 \*\*\*



# Accessing the Unicode Catalog

**SQL which returns, compares or orders by a DB2 catalog column**

- ◆ Evaluated now in Unicode instead of EBCDIC
- ◆ Column data will be returned in Unicode
- ◆ Comparison of column data will be evaluated in Unicode
- ◆ Ordering will cause output to be sorted in Unicode
- ◆ Result set and result set sequence may differ from Compatibility Mode (EBCDIC)

<b>EBCDIC</b>	<b>hex value</b>		<b>Unicode (ASCII)</b>	<b>hex value</b>
space	'40'x		space	'20'x
lower case	'81-89'x '91-99'x 'A1-A9'x		numerals	'30-39'x
upper case	'C1-C9'x 'D1-D9'x 'E1-E9'x		upper case	'40-4F'x '50-5A'x
numerals	'F0-F9'x		lower case	'61-6F'x '70-7A'x

# Unicode and You

**You do NOT have to convert your application data to Unicode**

**Unicode may increase your storage, but it won't double it:**

- ◆ In UTF-8, the first 127 code points are the same as that of 7-bit ASCII, with one byte being used for characters such as A-Z, a-z, and 0-9.
- ◆ Other characters are stored as one to four bytes, with accented characters often taking two bytes, and Far Eastern characters taking three to four bytes.

# Some Unicode References

Unicode Web Site

<http://www.unicode.org>

Unicode Book (download)

<http://www.unicode.org/unibook>

Redbook: SG24-6079

DB2 V8: Everything You Ever Wanted to Know... and More

- ◆ Chapter 6 – Unicode in DB2 for z/OS
- ◆ Appendix B – Unicode Setup

Redbook: SG24-6871

DB2 V8 Technical Preview

- ◆ Appendix A – Unicode Definitions

Manual: GC18-7418

DB2 Version 8 Installation Guide

- ◆ Appendix A – Character Conversion

DB2 V7/V8 Unicode Support

<ftp://ftp.software.ibm.com/software/db2storedprocedure/db2zos390/techdocs/F10.pdf>



# 4. Don't Expect to Proceed Without Re-evaluating Good Old COBOL

**Older COBOL compilers are no longer supported:**

- ◆ **OS/VS COBOL (out of support since 1994)**
- ◆ **VS COBOL II (out of support since 2001)**
  - **An existing COBOL II load module running in LE will still work though**
  - **But no more compiles for OS/VS COBOL or VS COBOL II**
- ◆ **DB2 V8 supports:**
  - **IBM COBOL V2.2 (*already end of service though!*)**
  - **Enterprise COBOL V3.2 or later**
    - ◆ **End of service coming up soon – October 2005**

## More on COBOL

See also the following Techdocs, available at:

- ◆ [http://www.ibm.com/support/docview.wss?rs=64&context=SSEP EK&q1=v8&uid=swg21164264&loc=en\\_US&cs=utf-8&lang=en](http://www.ibm.com/support/docview.wss?rs=64&context=SSEP EK&q1=v8&uid=swg21164264&loc=en_US&cs=utf-8&lang=en)
- ◆ [http://www.ibm.com/support/docview.wss?rs=64&context=SSEP EK&q1=v8&uid=swg21166881&loc=en\\_US&cs=utf-8&lang=en](http://www.ibm.com/support/docview.wss?rs=64&context=SSEP EK&q1=v8&uid=swg21166881&loc=en_US&cs=utf-8&lang=en)

In case you are not on any of the supported releases, you will need to migrate. In that case, be sure to review the following:

- ◆ *Enterprise COBOL for z/OS Compiler and Runtime Migration Guide (GC27-1409).*
- ◆ <http://www.ibm.com/software/awdtools/cobol/zos/library/>



## **5. Don't Expect Performance to Remain the Same!**

**DB2 is having to perform additional work, due to factors such as:**

- ◆ **increased code size**
- ◆ **64-bit address translation, and**
- ◆ **increased module linkage costs.**

**Performance objective is less than 10% average CPU regression — when comparing V7 and V8 subsystem with the same size buffer pools, hardware, workload, and so on.**

**Real storage requirements can also increase by at least ten percent as compared to V7... more on storage coming up in #6.**

# CPU Performance Regression?

## According to Akira Shibamiya (IBM):

Typical customer workload regression is expected to be 5 to 10% higher on average, assuming no application rewrite and no aggressive configuration change to take advantage of V8 significant performance features

- 0 to +15% Online Transaction
- -5 to +10% Online Transaction in Data Sharing
- 0 to +20% Batch
- -5 to 5% INSERT
- +5 to +20% SELECT, FETCH, UPDATE
- -10 to +15% in Batch Data Sharing
- -20 to +15% Batch DRDA
- -5 to +10% Utility
- -20 to +15% Query

## **Additional Performance Details**

**Feedback from some V8 sites indicate increased CPU for the subsystem, but that can be offset by performance gains in applications.**

**Actual CPU increase? I've heard figures that range from the expected 5%-10% range... all the way up to 40%... but everyone will be different**

**If you are running around 90% CPU under V7 then you should think VERY carefully before moving to V8...**

# Improved Performance By...

- ◆ **More Stage 1 predicates (compare unlike types)**
- ◆ **Materialized Query Tables**
  - Data warehousing, aggregates
  - Automatic Query Rewrite
- ◆ **Multi-row INSERT and FETCH**
- ◆ **CI Size = Page Size (*Page Size* > 4K)**
- ◆ **Volatile Tables**

# Trigger/UDF Performance

- ◆ **Table UDF cardinality and materialized FETCH**
  - Estimate the expected number of rows returned by table UDFs
  - All rows are returned during the first invocation of the UDF
    - ◆ Can save  $(\#rows\_in\_table\_UDF\_result - 1)$  context switches, at the cost of a one-time workfile creation, the cost to insert the rows into the workfile and the cost of deallocating the workfile.
- ◆ **TRIGGER work file creation avoided**
  - When the WHEN clause (conditional trigger) evaluates false (and the trigger is not invoked)
  - When old/new transition variables/tables can fit in a memory buffer

# Index Enhancements

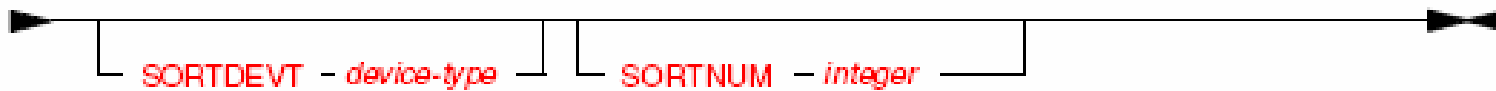
- ◆ **Indexing Enhancements**
  - **Varying-length index keys (NOT PADDED)**
    - ◆ NOT PADDED indexes can provide a true index-only access path
  - **Backward index scan**
  - **Sparse Index for Star Join**
- ◆ **Long index keys**

# Distribution Stats

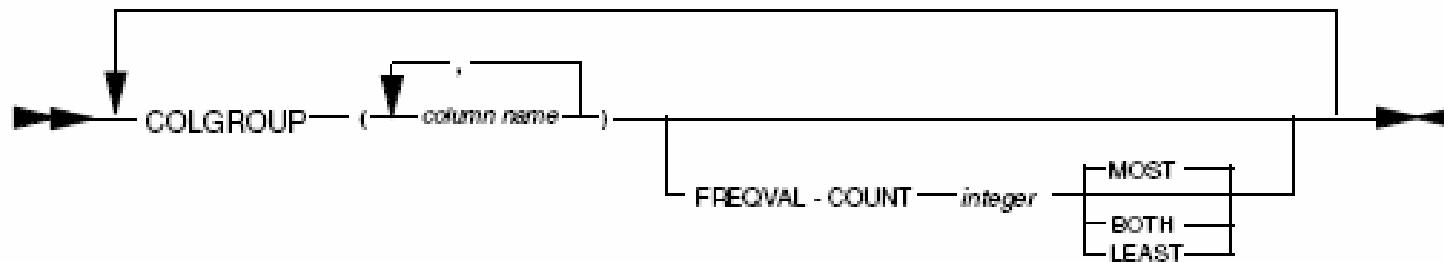
- ◆ **RUNSTATS updated to collect additional stats**
  - frequency value distributions for non-indexed columns or groups of columns
  - Cardinality values for groups of non-indexed columns
  - LEAST frequently occurring values (indexed and non-indexed)
  - MOST frequently occurring values (indexed and non-indexed)
  - Sort subtasks required (defined in utility syntax)

**No need for DSTATS (downloadable tool for V7)**

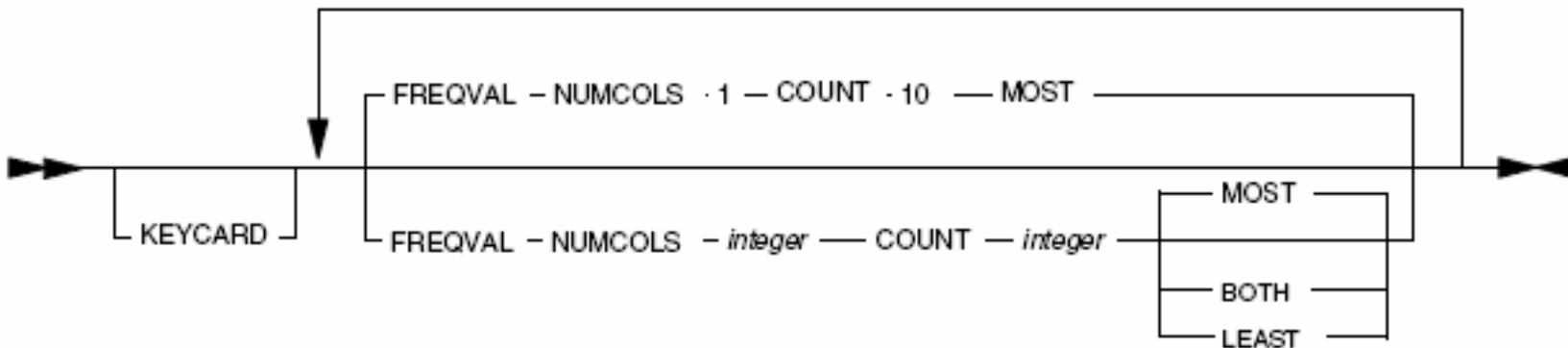
# New RUNSTATS Keywords \*\*\*



colgroup-spec:



correlation-stats-spec:



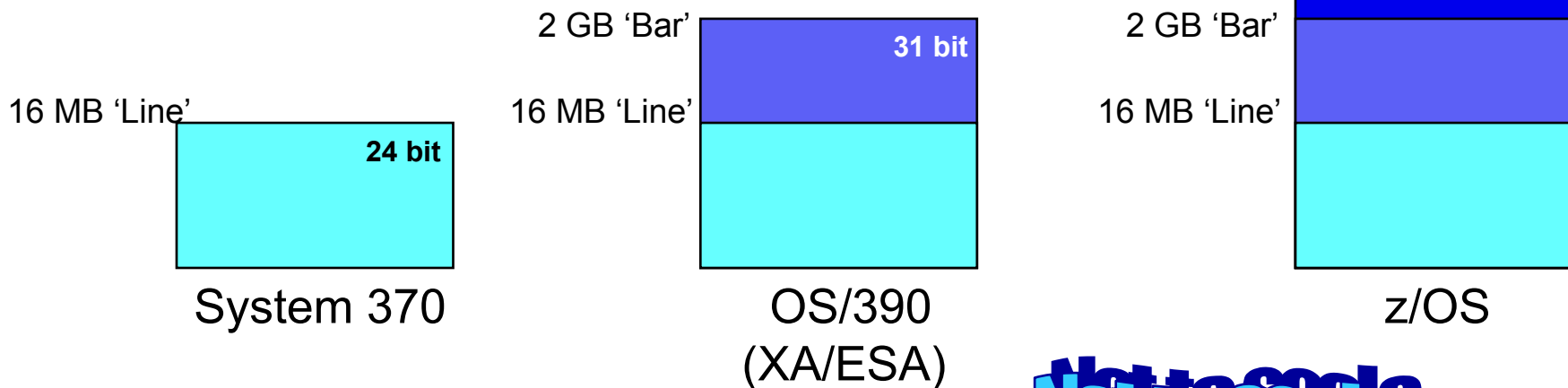


# 6. Do Prepare for Storage Changes

## 64-bit Architecture and VSCR

An exabyte (EB) is a large unit of computer data storage, two to the sixtieth power bytes. The prefix *exa* means one billion billion, or one quintillion, which is a decimal term. Two to the sixtieth power is actually 1,152,921,504,606,846,976 bytes in decimal, or somewhat over a quintillion (or ten to the eighteenth power) bytes. It is common to say that an exabyte is approximately one quintillion bytes. In decimal terms, an exabyte is a billion gigabytes.

16 EB 'Beam'



Not to scale

# Exploiting 64 bit architecture

## On migration to V8 in 64-bit real and virtual

- ◆ Buffer pools above the 2GB bar (*more on next slide*)
- ◆ EDM pool / RID pool / SORT pool / compression stored above the 2Gb bar
- ◆ EDM POOL DATASPACE SIZE becomes EDMPOOL DBD CACHE SIZE
- ◆ EDM POOL DATASPACE MAX to EDMPOOL STATEMENT CACHE SIZE
- ◆ IRLM above 2GB bar and PC=YES
  - PC=NO is no longer supported.
  - All locks are now in IRLM private storage above the bar.

# Buffer Pool Issues

## Create New Buffer Pools & Change Defaults

- ◆ ADD BP8K0 default 1000
- ◆ ADD BP16K0 default 500
- ◆ BP0 min size 2000 default 20000
- ◆ BP32K default 250

## Buffer Pool sizing

- ◆ **New limit for virtual buffer pools is 1 TB (was 1.6 GB)**
- ◆ For Virtual Pools & data spaces
  - V8 BP size is VPSIZE & data space size
- ◆ For Virtual Pools & hiperpool
  - V8 BP size is (VPSIZE + HPSIZE)
- ◆ Maintains original virtual pool and hiperpool sizes for fallback

No more buffer pools in data spaces

No more hiperpools

## CM for VSCR

**Some customers are planning to migrate to CM relatively quickly for the VSCR and optimization enhancements**

- ◆ **With no immediate plans to then migrate to ENFM and NFM**
- ◆ **Allows immediate storage and (some) optimizer benefits**
  - **And gives time to digest all of the new features and functionality to best determine how and when to use them**



## Real Storage Impact

**Important subsystems such as DB2 should not be paging to auxiliary storage**

**According to John Campbell (IBM) at IDUG 2005:**

- ◆ DB2 V8 will increase real storage usage
- ◆ Estimated typical range of 1% to 10% more

## 7. Do Review DSNZPARMS

Defaults change for many, such as:

ZPARM	Old Default	New Default
CTHREAD	70	200
MAXDBAT	64	200
CONDBAT	64	10,000
LOGAPSTG	0	100
DSMAX	3,000	10,000
CHKFREQ	50,000	500,000
IDFORE	40	50
IDBACK	20	50

## More on ZPARMs

Check out Willie Favero's blog for more on V8 system parameter changes

- ◆ You can find it here:
  - <http://blogs.ittoolbox.com/database/db2zos/archives/005423.asp>

## 8. Do Prepare for DFSORT

The IBM utilities for DB2 V8 require DFSORT

- ◆ No additional license (or cost) is required for the DB2 utilities to use DFSORT.
- ◆ You already have DFSORT installed.
  - You may not be using it, but it is there.
  - DFSORT is always shipped and installed with z/OS.
- ◆ The only action needed is:
  - Add the DFSORT load libraries to the link list after the OEM sort libraries, or;
  - Add a steplib/joblib to the DB2 utilities batch JCL.

<http://www.ibm.com/support/docview.wss?rs=0&uid=isg1114047>



# More on DFSORT

## What if You Don't Prepare for or Have DFSORT?

- ◆ DB2 will issue message DSNU1640I if the utility is unable to locate DFSORT

## Limited Functionality

- ◆ DB2 Utilities use only the SORT and MERGE functions of DFSORT. If you want to use DFSORT for any other uses outside of DB2, you will need to separately order and license DFSORT from IBM.

## Support and Maintenance for DFSORT

- ◆ Support is shipped with z/OS. If a customer has problems with DB2's use of DFSORT, they would open an ETR with DB2 Level 2 Support no different that they would do today for any other DB2 related issue.


## 9. Do Study Up on New Features

**There are a LOT of new features and functionality in DB2 V8**

**Take the time to review and understand the new features and:**

- ◆ **Determine which features your shop will most likely implement first.**
- ◆ **Determine which features are not on your short-term “needs” list**
- ◆ **Factor this into your migration planning**
  - **For evaluation of third party vendors and tools**
  - **For staff education requirements**

# My Top Ten New DB2 V8 Features

1. **2M SQL Limit**
2. **Partitioning changes**  
up to 4096 Partitions, table-based partitioning, clustering separation
3. **Stage 1 for Unlike Data Types**
4. **Data Partitioned Secondary Indexes** 
5. **Sequences**
6. **Materialized Query Tables**
7. **Multi-Row FETCH and INSERT**
8. **Distribution Statistics**
9. **Recursive SQL**
10. **Online Schema Change**



# NPSI versus DPSI

**EXP\_DATE      CUSTNO      CUSTNAME ...**

07-11-2004	500	ACME RENTAL
07-19-2004	100	MULLINS AND ASSOC.
07-25-2004	600	BMC SOFTWARE
07-31-2004	175	SUPER BANK
08-01-2004	400	SPUMCO
08-16-2004	333	SIGH BASE CORP.
08-27-2004	200	BETH-ANN INC.
08-28-2004	900	DIAL-A-DBA
09-01-2004	800	VAN THE MAN
09-02-2004	715	DBAZINE.com
09-04-2004	300	RENT-IT, INC.
09-10-2004	950	VANDALAY INDUST.

100
175
200
300
333
400
500
600
715
800
900
950

**NPSI on  
CUSTNO**

**DPSI on  
CUSTNO**

Cannot be unique



# 10. Don't Expect All Third Party Tools to Immediately *Exploit* V8

## Toleration versus Exploitation

- **Tolerate** – will run without abending
- **Exploit** – will allow you to use the new features
  - ◆ Most vendors are implementing “phased” exploitation
  - ◆ Make sure the vendors are *very clear* to you here
- **Use your list of important features to rate your tools vendor(s)**
- **Other questions to ask**
  - ◆ Explain what exploitation means?
    - If phased, explain the phases – what is supported when
    - It may be different product by product, so watch out!
  - ◆ What about the modes?

# Areas to Watch Out for!

## Unicode

- This should be in phase 1 for EVERY vendor, if not you should worry – the catalog is Unicode, after all!

## Features that may be low on the exploit list:

- **4,096 partitions**
  - ◆ Some vendors will phase in support for up to 1000 and support more later
- **Multi-level security**
- **Sequence Objects**
- **MQTs**

**When do you need them?**

# References

- ◆ **DB2 UDB for z/OS Version 8: Everything You Ever Wanted to Know, ... and More (SG24-6079)**
- ◆ DB2 UDB for z/OS Version 8 Technical Preview (SG24-6871)
- ◆ DB2 UDB for z/OS V8: Through the Looking Glass & What SAP Found There (SG24-7088)
- ◆ DB2 UDB for z/OS V8 Installation Guide (GC18-7418)
- ◆ DB2 UDB for z/OS V8 Administration Guide (SC18-7413)
- ◆ DB2 UDB for z/OS Version 8 Release Planning Guide (SC18-7425)
- ◆ DB2 Developer's Guide, 5th edition (SAMS, ISBN: 0672326132 )
- ◆ DB2 for z/OS V8 Information Roadmap  
<http://www.ibm.com/software/data/db2/zos/roadmap.html>
- ◆ Links to articles, etc. about DB2 versions and migration issues  
<http://www.db2portal.com/version.shtml>



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<http://www.craigsmullins.com>

<http://www.DB2portal.com>

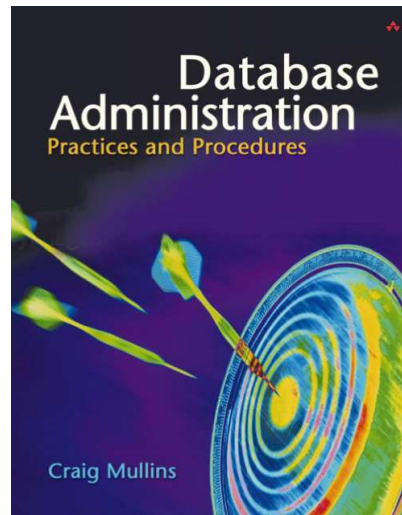
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**DB2 Developer's Guide, 5ed**

[www.craigsmullins.com/cm-book.htm](http://www.craigsmullins.com/cm-book.htm)



**DBA: Practices & Procedures**

[www.craigsmullins.com/dba\\_book.htm](http://www.craigsmullins.com/dba_book.htm)