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SAP on IBM DB2 UDB for OS/390 and z/OS

Best Practice for Installing or Migrating to DB2 V8

Version December 2005.

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Applicability, Goals, and Requirements

To ensure that this Best Practice is the one you need, consider the following goals and requirements.

Goal of Using this Service

This document should help you to get an overview of the correct procedure when installing or migrating to DB2 V8. For detailed procedure you will have to use IBM documentation like "DB2 V8 Release Planning Guide" (SES1-2305-00) and "DB2 Universal Database for z/OS: Installation Guide, Version 8" (SES1-2300-02).

Staff and Skills Requirements

Migrating DB2 on z/OS in SAP environments will require common known administrator skills on the zSeries (z/OS) platform and in SAP technology. This document was written as a guideline for:

- DB2 Database Administrator
- SAP System Administrator

System Requirements

The DB2 V8 database is available only for the z/OS platform, and it needs to run on an IBM zSeries eServer with z/OS V1R3 operating system or later.

- zSeries hardware (z800, z890, z900, z990)
- operating system z/OS V1R3 or later *

* Note: z/OS V1R4 is required for SAP on DB2 V8 (<i>SAP Note 728743</i>)

In the future, the SAP NetWeaver technology and SAP solutions based on this technology are planned to be fully supported on zSeries, built around DB2 for z/OS to meet the highest availability and scalability requirements. For a seamless integration of SAP NetWeaver technology and IBM zSeries the platform components database and the operating system need functional updates and require minimum versions of these components.

The new SAP technology makes simultaneously use of Java and ABAP runtime environments, Unicode and non-Unicode implementations using large buffers in memory. As a consequence the underlying platforms are required to provide according capabilities and sufficient functionality.

For the zSeries platform future SAP solutions require IBM DB2 UDB for z/OS Version 8 (DB2 V8), and the attached application servers accelerate the shift towards 64-bit platforms.

DB2 V8 has been re-engineered with the requirements of upcoming high-end business environments in mind, leading to many fundamental changes in architecture and structure. The new DB2 version runs in 64-bit mode utilizing the power of 64-bit zSeries hardware. Many limits of the past due to 31-bit addressability have been lifted. With Version 8, DB2 has implemented more than 50 feature requests specifically to optimize for SAP solutions on zSeries.

With kernel 6.40, DB2 Connect using DRDA substitutes the ICLI Connect. The following matrix is a summary of connectivity type depending on kernel release and DB2 version.

Kernel:	4.6D	6.20	6.40 (DCK ¹)
DB2 V7	ICLI	ICLI	ICLI ²
DB2 V8	ICLI	-- ³	DRDA

¹DCK: Downward compatible kernel

² Only as DCK for WEB AS 6.20

³ 6.40 ICLI can run with DB2 V8 while in Compatibility mode

Web Application Servers releases <= 6.30 will be supported by a 6.40 kernel which is bimodal: for DB2 V7 it is ICLI-based and for DB2 V8 it uses DB2 Connect V8.1 to access the DB2 database.

There will be a switch via SAP profile parameter (dbs/db2/use_drda), which allows to switch between the two modes.

- 6.40 using ICLI on DB2 V7 (or DB2 V8 in Compatibility mode only)
- 6.40 using DB2 Connect on DB2 V8

For more information about 6.40 DCK, DDF and DRDA, please refer to the SAP Note 731937 and "SAP on IBM DB2 UDB for OS/390 and z/OS: Database Administration Guide, Release 6.40".

WLM transition from DB2 V7 to DB2 V8

Currently, WLM (workload manager) exploitation is done on the z/OS application server side and by ICLI.

With DB2 Connect, DBSL uses the sqleseti() call to supply new WLM qualifiers to DDF. Even with the newly available qualifiers and the new mechanism for specifying them, velocity goals are still recommended

For non-z/OS application servers, there is no smooth transition. The old WLM definitions for the SAP subsystem in WLM apply only to ICLI. You need to establish new classification rules for the DDF subsystem using the new qualifiers.

Caution is needed for the classification rules: you need to specify rules with an asterisk, especially for the CI qualifier, to avoid having (for example) the E1E001 instance classified incorrectly because 'E1E' was specified in the rule and not 'E1E*'.

For more information about WLM, refer to the documentation "Planning Guide: z/OS Configuration for SAP on IBM DB2 Universal Database, Release 6.40"

Estimate Virtual Storage Consumption in the DBM1 Address Space below the 2 GB Bar with DB2 V8

DB2 V8 exploits 64-bit virtual storage for many storage structures that reside in the DBM1 address space. It moves these structures, which used to be restricted to 2 GB of virtual storage in DBM1 in previous releases of DB2, to the storage area above the 2 GB bar of DBM1. There are a few structures left that jointly use the virtual storage below this bar in DB2 V8. While the virtual storage below the 2 GB bar is used by fewer storage structures in V8, it is still necessary to plan for virtual storage needs of SAP systems in this area to prevent virtual storage shortages.

If you are planning to install a new SAP system with DB2 V8, it is highly recommended to estimate the virtual storage consumption in DBM1 to prevent running in virtual storage shortages. For the SAP releases 6.10 to 6.40, the rules of thumb to estimate the virtual storage consumption are described in chapter 'Virtual Storage Considerations' of the SAP DBA Guide for SAP NetWeaver on DB2 for z/OS 6.40. For older releases, refer to SAP note 717215.

If you are planning to migrate an existing DB2 subsystem from V7 to V8, you should use DBM1 virtual storage statistics of peak periods of your DB2 V7 system to project the virtual storage needs of your system with V8. The following storage structures no longer reside in the 2 GB area of DBM1:

- Buffer pools
- Buffer pool control blocks
- Dataspace lookaside buffers
- Compression dictionaries
- Castout buffers
- RDS OP pool
- Local DSC control blocks

The following storage structures remain below the 2 GB bar of DBM1. Their sizes evolve as follows:

- DB2 user threads: + 50 to 100%
- System threads: + 50%
- RID pool: - 75 to 90%
- SQL statements in local DSC: + 100%
- EDM pool: +/- 0%
- Pipe manager subpool: +/- 0%
- BM/DM trace table: - 50%
- Fixed storage: +/- 0%
- Stack storage: + 100%

If you find out that the projected virtual storage needs with DB2 V8 exceed the virtual storage that is available to DB2 in DBM1 below the 2 GB bar (don't forget to leave 200 MB free as a safety net), then consider the following actions:

- Try to reduce the number of SAP work processes. In SAP transaction SM50 you can display the CPU time that each SAP work process processed work since their inception. If there are work processes with permanently low CPU time, they are excellent candidates to be removed. Moreover, you should check the SAP statistics in transaction ST03N. The dialog step wait times indicate how long work units needed to wait until they were dispatched to an available work process. Use the wait time to check the effect of removing work processes on SAP performance.
- Reduce the DB2 ZPARM MAXKEEPD to a lower value (keep in mind that the general recommendation for MAXKEEPD has been lowered to 8000 with DB2 V8; consider reducing this value even further in decrements of 2000)
- Recycle DB2 workprocess more often. You may reduce rdisp/wp_auto_restart down to 14400 (i.e., four hours)
- Consider adding additional DB2 members
- If you are not using data sharing, consider planning for a data sharing implementation
- For guidance, open a PMR at IBM or open an OSS ticket

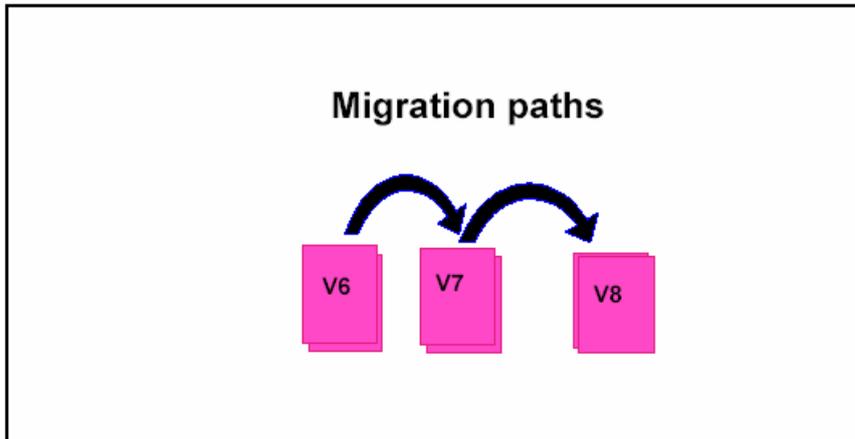
Migration Considerations

Before migrating to version 8, you should read as well the DB2 Release Planning Guide Chapter 3 “Planning for migration, conversion, and fallback” This chapter contains considerations for migration, conversion to new-function mode, and fallback from compatibility mode to Version 7, and a directory of new and revised installation panels, to learn more about the most important changes like:

- Global temporary tables need a 16-KB buffer pool
- Declared temporary tables need an 8-KB table space in the temporary database
- DB2-established data space for cached dynamic statements
- WLM Stored Procedures
- EDM pool size
- ... and other topics ...

Possible Migration Paths

DB2 V7 is the only release from which you can migrate to DB2 V8. If your DB2 level is still at V6 you need to migrate to DB2 V7 first. Note that V6 has been withdrawn from marketing by IBM and is going out of service on June 30, 2005.



Updated information is available: <http://www.ibm.com/software/data/db2/zos/support/plc/>

The DB2 V8 migration process is performed in stages.

There are 3 stages:

- DB2 V8 Compatibility mode
- DB2 V8 Enabling-New-Function mode
- DB2 V8 New-Function mode

SAP NetWeaver components require New-Function mode and are only supported in this mode.

1. Currently running SAP solutions on DB2 V7 migrate to DB2 V8 Compatibility mode. This mode is temporary and only supported as a runtime environment, i.e. SAP system installation, component add-on, system upgrades or importing transports are not supported in this mode. SAP verified its applications in New-Function mode, therefore it is recommended to stay only for a very short period of time in Compatibility mode. Customer-written reports should be verified in New-Function mode.
2. The DB2 migration process now passes through an intermediate step to move from Compatibility mode to New-Function mode, which is called Enabling-New-Function mode. Most objects of the DB2 catalog and directory are converted to Unicode format using online REORG, no fallback is possible. This stage is very short and not enabled for SAP systems to be online. It is not allowed to run SAP systems when passing through this intermediate stage.

Note: The table spaces DBD01 and SYSCOPY are not converted to Unicode
Changes of Catalog tables are described in DB2 V8 Release Planning Guide, Appendix D.

3. DB2 V8 New-Function mode is the final stage of the DB2 migration process from version 7 to version 8. There are no restrictions for SAP solutions when running on DB2 V8 in New-Function mode.
New installations start using DB2 V8 in New-Function mode.

Duration and Timing

The duration of the migration procedure depends on complexity and size of your system landscape.

For the migration time to Compatibility mode you should estimate:

1. The time needed for backup (is depended on system size)
2. The time needed for optional steps (depending on the number of necessary corrections)
3. The time for the migration into Compatibility mode (within one hour)
4. The needed time to enable the final New-Function mode (within one hour)

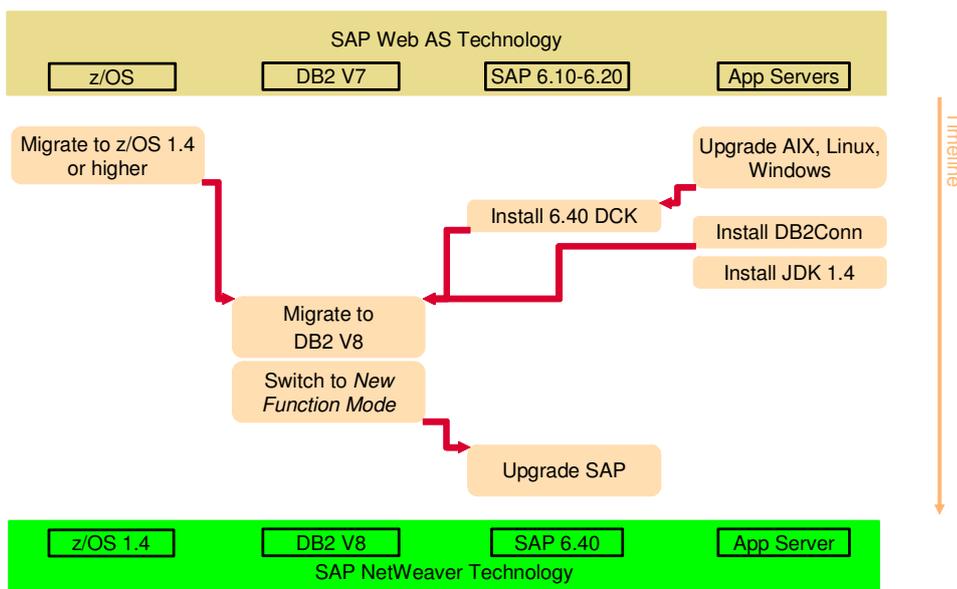
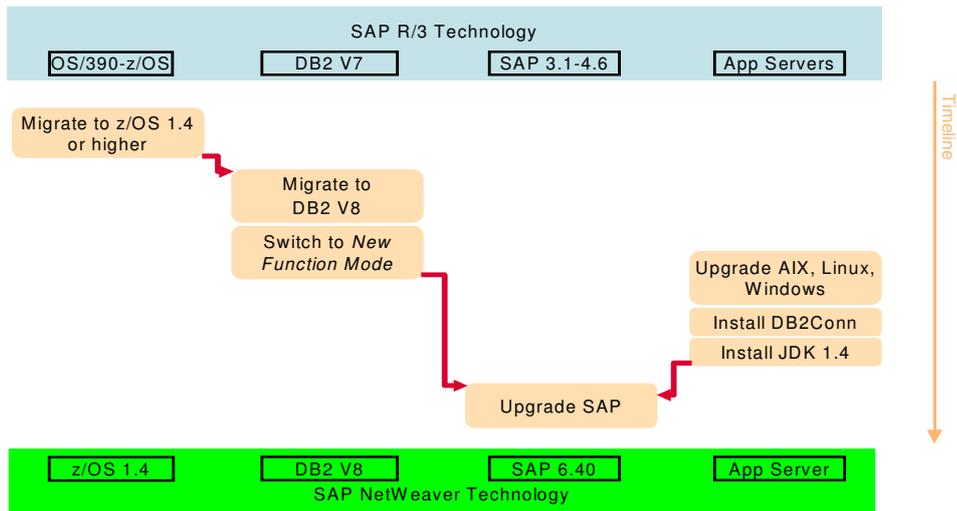
We recommend a schedule with sufficient time for:

- Careful planning and preparation of the installation or migration
- Careful planning and preparation of the fallback procedure even before starting migration
- Verification: Once your DB2 subsystem is in V8 Compatibility mode, please verify SAP system operation before continuing with Enable-New-Function mode
- Migration of DB2 in production environment should only be done after successful tests on appropriate sandbox or development systems

Note: There is a fallback option for stage 1 (Compatibility mode). Once you start stage 2 (Enabling-New-Function mode) DB2 V8 does not offer a fallback scenario. In this case, a full restore of the DB2 V7 system will be necessary.

Migration Flow Chart for SAP Environment

The flow charts explain the necessary activities to move a system to SAP NetWeaver technology.



DCK: Downward compatible kernel

Best Practice Procedure and Verification

Preliminary Tasks

Before performing this Best Practice, ensure that you perform the following preliminary tasks or checks in the system:

- In case of migration: Migration to DB2 V8 is possible only from DB2 V7 subsystem with fallback toleration APAR PQ48486 applied. To ensure a smooth migration from DB2 V7 to DB2 V8, it is recommended to run some premigration checks that DB2 provides in the job DSNTIJPM. This job is found in prefix. SDSNSAMP. It prepares customer systems for the migration process and reduces situations that would lead to fallback. For details on these checks and further premigration activities, see SAP Note 682077 and chapter 'Migrating the DB2 subsystem to Compatibility mode' in the IBM documentation 'DB2 UDB for z/OS - Installation Guide Version 8' (SES1-2300-02).
- When migrating within a data sharing group: You should make sure that all members of the data sharing group have applied fallback toleration APAR PQ48486. It is required for DB2 V7 and DB2 V8 co-existence.
- Before installation or migration to DB2 V8, you must unload the DB2 tapes or cartridges. Please refer to the Chapter 3 "Loading DB2 Libraries" of IBM documentation "DB2 Universal Database for z/OS: Installation Guide, Version 8".
- In case your DB2 system runs with EBCDIC single-byte coded character set identifier (SCCSID) of 500, follow the procedure that is described in SAP Note 660501.
- Special note for SAP systems with Basis Release 6.10/6.20:
Before migration to DB2 V8, install the 6.40 downward compatible kernel (DCK) and set up DB2 Connect on the application server. For details, refer to SAP Note 731937.
- For SAP systems with Basis Release < 6.10:
Install current ICLI PTF (refer to SAP Note 81737). Note that the ICLI PTFs support the basic operation of SAP systems with DB2 V8. This allows you to upgrade to a new SAP release. If you upgrade from a fairly old release to a current release, it is especially important to ensure that the resource requirements of the new SAP release are met. However, the ICLI PTFs do not support DB2 performance monitoring functionality (transaction ST04) as of today.
- Before migration to DB2 V8, you should import the latest DDIC and CCMS corrections and Basis Support Packages. The DDIC corrections are listed in SAP Notes 184399 (4.6x), 162818 (4.5B), 162250 (3.1I, 4.0B) and 407663 (6.10/6.20). The CCMS corrections are listed in SAP Notes 427748 (6.10/6.20/6.40), 324739 (4.6D), 217093 (4.6C).
- Before migration to DB2 V8, you should check that table fields with DDIC data type RAW, LRAW or VARC are correctly defined in the database with DB2 data type BITVARCHAR (VARCHAR FOR BIT DATA). Please refer to SAP Note 848384.
- The required Support Package level for Basis Release 6.10 is: SAPKB61041;
for Basis Release 6.20 you need: SAPKB62044. In order to support accounting and workload management at the granularity of transactions for batch jobs, you would need to apply support package SAPKB62048.
- The recommended Support Package level for BW is: 3.0B SAPKW30B27, 3.10 SAPKW31021, 3.50 SAPKW35013 (please refer to BW SAP Notes in chapter 'useful SAP Notes')
For BW based SAP Systems like SEM or APO, please consider the prerequisites and recommendations given in SAP Note 390016.
- Before migration to DB2 V8, you should check SAP Note 81737 for missing PTFs. You can do this with help of PTF check report RSDB2FIX as described in SAP Note 183311.

- Run Job DSNTIJP8 in DB2 V7 to perform pre-migration checks. This job is doing the same tasks than DSNTIJPM. Please refer to SAP Note 682077
- DB2 for z/OS Version 8 requires the z/OS Unicode Conversion Services (UCS) and appropriate conversion definitions to be set up for your environment. (Please review Info APAR's: II13048, II13049, II13277, II13695)

Procedure

1) Installation

Do a new installation of DB2 V8 according to IBM documentation "DB2 Universal Database for z/OS: Installation Guide, Version 8".

Here is the summary of installation steps:

Step	Description	Job
1	Define DB2 Version 8 to z/OS, and build cataloged procedures.	DSNTIJMV
2	Optionally, define a new integrated catalog facility (ICF) catalog and alias.	DSNTIJCA
3	Define DB2 data sets.	DSNTIJIN
4	Define DB2 initialization parameters. Please see the list of parameters required or recommended by SAP in subheading "5) Parameters" of the Chapter "Procedure".	DSNTIJUZ
5	Initialize DB2 data sets.	DSNTIJID
6	Optionally, prepare authorization exit routines.	DSNTIJEX
7	Optionally, prepare for SMF recording.	(none)
8	Optionally, establish subsystem security.	(none)
9	Establish the TSO environment for DB2.	DSNTIJVC
10	Optionally, connect IMS to DB2.	(none)
11	IPL z/OS (Early Code).	(none)
12	Start DB2 Version 8.	(none)
13	Define temporary work file table spaces and initial buffer pool sizes.	DSNTIJTM
14	Define and bind DB2 objects and user-maintained databases.	DSNTIJSG
15	Optionally, populate the user-maintained databases, and, if you are using DDF, populate the communications database (within the DB2 catalog).	(none)
16	Bind the packages for DB2 REXX Language Support, if you installed DB2 REXX Language Support.	DSNTIJRX
17	Take an image copy of the DB2 catalog and directory.	DSNTIJIC
18	Run the installation verification procedure.	DSNTEJxx

2) Migration

If you already run an SAP solution with DB2 V7 you have to migrate to V8 Compatibility mode and continue with conversion to New-Function mode.

Compatibility mode does not allow the use of any new release functions. Migration to DB2 V8 Compatibility mode is in fact migration as usual and should be done according to "DB2 Universal Database for z/OS: Installation Guide, Version 8".

Summary of migration steps to V8 Compatibility mode:

Step	Description	Job
1	Perform pre-migration activities to determine unsupported objects. Please see SAP Note 682077.	DSNTIJPM
2	Optionally, run DSN1COPY with the CHECK option on the catalog table spaces, and invoke DSN1CHKR to check for broken links on your Version 7 subsystem.	(none)
3	Optionally, determine which plans and packages will be invalid after migration.	(none)
4	Optionally, check for consistency between catalog tables.	(none)
5	Take an image copy of your Version 7 catalog.	DSNTIJIC
6	Establish the TSO environment for DB2.	DSNTIJVC
7	Optionally, connect IMS to DB2.	(none)
8	Optionally, connect CICS to DB2.	(none)
9	Stop DB2 Version 7.	(none)
10	Back up Version 7 volumes.	(none)
11	Define DB2 initialization parameters. Please see the list of parameters required or recommended by SAP in subheading "5) Parameters" of the Chapter "Procedure".	DSNTIJUZ
12	Optionally, establish subsystem security.	(none)
13	Define DB2 Version 8 to z/OS, and build cataloged procedures.	DSNTIJMV

14	Define system data sets.	DSNTIJIN
15	Define authorization exit routines.	DSNTIJEX
16	IPL z/OS. (Optional if no PARMLIB updates exist and if early code is at the correct level.)	(none)
17	Start DB2 Version 8.	(none)
18	Tailor the DB2 Version 8 catalog.	DSNTIJTC
19	Optionally, invoke DSN1CHKR to check for broken links on Version 8. Optionally, run job DSNTIJCX to check indexes in the catalog and directory.	(none)
20	Prepare the dynamic SQL program, and define initial buffer pool sizes.	DSNTIJTM
21	Bind SPUFI and DCLGEN.	DSNTIJSG
22	Bind the packages for DB2 REXX Language Support, if you installed DB2 REXX Language Support.	DSNTIJRX
23	Take an image copy of the Version 8 catalog.	DSNTIJIC
24	Run Version 7 verification jobs (optional). Note: V8 verification jobs can only be run after migrating to V8 New-Function mode	DSNTEJxx
25	Make adjustments for release incompatibilities.	(none)
26	DB2 V8 exclusively uses DFSORT to perform sorts. There is no additional license necessary for this. If DFSORT is not installed as your primary z/OS sort product, enable DB2 to use DFSORT by following one of the methods that are described in chapter 2.5.7 of the 'DB2 UDB for z/OS V8 Installation Guide'.	(none)
27	Issue the DB2 command -DIS DB(*) SP(*) to update the status of the DBDs	(none)

The next phase is a unique step within the migration process to DB2 V8 called Enable-New-Function mode. It is a process step by which the DB2 catalog is converted to V8 Unicode catalog. Your system should be verified for proper operation in DB2 V8 Compatibility mode before continuing with the next step. This process step should be performed according to IBM documentation "DB2 Universal Database for z/OS: Installation Guide, Version 8".

Summary of conversion steps to New-Function mode:

Step	Description	Job
1	Run installation CLIST using ENFM option.	(none)
2	Take an image copy of your Version 8 catalog.	DSNTIJIC
3	Convert the DB2 Version 8 catalog.	DSNTIJNE
4	Put the DB2 subsystem in new-function mode.	DSNTIJNF
5	Optionally, check for consistency between catalog tables.	(none)
6	Stop DB2 Version 8.	(none)
7	Create DSNHDECP module for new-function mode.	DSNTIJNG
8	Start DB2 Version 8	(none)
9	Optionally, invoke DSN1CHKR to check for broken links on Version 8. Optionally, run job DSNTIJCX to check indexes in the catalog and directory.	(none)
10	Optionally, check indexes in the catalog and directory	DSNTIJCX
11	Optionally, run Version 8 verification jobs.	DSNTEJxx
12	Make adjustments for release incompatibilities.	(none)

After the conversion is successfully completed, the DB2 database runs in V8 New-Function mode and is able to use all new release functions.

3) Fallback

A fallback to DB2 V7 is fully supported during and at the end of stage 1 (DB2 V8 Compatibility mode) of the database migration process.

Once you start the conversion of the database catalog, i.e. Enable-New-Function mode, you will no longer be able to fallback to DB2 V7 or DB2 V8 Compatibility mode. Therefore you should take your time to make sure that your DB2 subsystems (all members in case of data sharing) are stable and operate satisfactorily in DB2 V8 Compatibility mode. A full backup is recommended.

Operating in New-Function mode, your system will also not be able to fallback to DB2 V7 or DB2 V8 "Compatibility" mode. However, it is possible to retry or repeat stage 2, Enabling-New-Function mode. In stage 2, the SAP system is down.

For fallback procedures from DB2 V8 Compatibility mode to DB2 V7 or from DB2 V8 New-Function mode to DB2 V8 Enable-New-Function mode please refer to "DB2 Universal Database for z/OS: Installation Guide, Version 8".

4) Migrating Data Sharing Group

For the migration of a data sharing environment, please refer as well to the "Data Sharing: Planning and Administration" Guide,

- Chapter 3. Installing and enabling DB2 data sharing
 - Migrating an existing data sharing group to a new release
 - Procedure to migrate the data sharing group

a.	Connect DB2 to TSO, You do not have to run job DSNTIJVC for the second and subsequent members
b.	Connect IMS to DB2 (optional)
c.	Connect CICS to DB2 (optional)
d.	Stop Version 7 activity
e.	Define DB2 initialization parameters. Job DSNTIJUZ only contains a subset of the steps contained in the first migrating member's DSNTIJUZ job. DSNHDECP is not reassembled for each subsequent migrating member.
f.	Establish subsystem security (optional)
g.	Define DB2 Version 8 to z/OS. Job DSNTIJMV contains a subset of the steps contained in the first migrating member's DSNTIJMV job. The steps to update the IEAAPFxx and LNKLSTxx members and the steps to update the language procedures are not included when subsequent members migrate.
h.	IPL z/OS This step can be performed before migrating DB2 if you have made the appropriate updates to the z/OS libraries.
i.	Start Version 8
j.	Verify Version 8

5) Co-existence and maximum availability in a data sharing environment

Co-existence is only possible between DB2 V7 and DB2 V8 in Compatibility mode.

In a DB2 data sharing system DB2 V7 data sharing members cannot co-exist with DB2 V8 data sharing members in Enable-New-Function mode or in New-Function mode.

The following description outlines a migration procedure, which ensures maximum availability of the SAP system during the migration to DB2 V8. The assumption is that you have two data sharing members **DS1** and **DS2** in your DB2 data sharing group.

Performing a rolling upgrade of the DB2 data sharing members allows the database to stay online and the data being accessible all the time. The SAP system can be online for most of the time. However, the SAP system has to be stopped for the critical phase of catalog conversion (state 5 in the table below).

<u>State</u>	<u>DS1</u>	<u>DS2</u>
0	DB2 V7	DB2 V7
1	<i>Upgrade data sharing member to V8</i>	
2	DB2 V8 Compatibility mode	DB2 V7
3	<i>Upgrade data sharing member to V8</i>	
4	DB2 V8 Compatibility mode	DB2 V8 Compatibility mode

<u>State</u>	<u>DS1</u>	<u>DS2</u>
5	<i>Enable New-Function mode</i>	
6	DB2 V8 New-Function mode	DB2 V8 New-Function mode

- State 0. You begin with DB2 V7. Check that the PTF level is current, in particular the fallback toleration APAR PQ48486 needs to be installed. If you are using SAP 6.10 or 6.20 kernel install the 6.40 DCK kernel before you continue.
- State 1. Stop application servers connected to DS1. Next upgrade DB2 to V8 Compatibility mode as described before in detail in chapter 2 "Migration". The SAP system remains online and accesses the database via the data sharing member DS2. In case of 6.40 DCK prepare the application servers to use DB2 Connect V8.1. Be aware, that with 6.40 DCK kernel, you cannot use DB2 Connect with DB2 V7. So Sysplex failover will not be possible from an application server running with DB2 Connect against DB2 V8 to a DB2 member running DB2 V7. Sysplex failover is still possible if connected via ICL1 because the 6.40 ICL1 is able to connect to DB2 V7 and to DB2 V8 while in Compatibility mode. So for highest availability you might want to defer the switch from ICL1 to DB2 connect on the application servers to the point where all DB2 members have been migrated to DB2 V8.
- State 2. DB2 member DS1 now runs in V8 Compatibility mode, its application servers are connected to it either via DB2 Connect V8.1 or via ICL1, while DS2 is still on V7. You are now able to verify the DB2 V8 installation and perform tests. After successful completion of these tests, you can switch back the SAP workload to DB2 member DS1. In case of problems you can switch back to V7 by restarting DS1 with the old load libraries. If you are running with ICL1 you have full failover capabilities.
- State 3. Stop application servers connected to DS2. Now migrate the second data sharing member to V8 Compatibility mode. The SAP system remains online and accesses its data via DS1.
- State 4. All DB2 members now in V8 Compatibility mode. In this state you benefit from the 64-bit addressing mode of DB2 V8. However, the system is not yet enabled for the new functions like Unicode support. A switch back to V7 is still possible. If you did not already do so then this is the point where you need to switch from ICL1 to DB2 Connect on all of your application servers.
- State 5. Before you continue take a full backup of your database. In this phase the catalog is converted to Unicode. Because the catalog is shared among the subsystems this step affects all subsystems at the same time. During this critical phase the SAP system must not be active. For details on this step see chapter 2 "Migration".
- State 6. You have reached the target mode. We recommend to pass through the states 1 to 5 quickly. Especially the V7/V8 coexistence states are not meant that you run your SAP system in them for a longer period of time.

6) Parameters

For releases **older than WebAS 6.10**:

As DB2 V8 introduces many enhancements that benefit SAP systems, some of the recommendations for DB2 system parameters that were given in the documentation "SAP R/3 on DB2 for OS/390 and z/OS: Planning Guide" of the respective SAP release need to be adapted and complemented by additional recommendations. Additional recommendations are documented in SAP Note 717215.

As of SAP WebAS 6.10:

Please refer to documentation "SAP on IBM DB2 UDB for OS/390 and z/OS: Database Administration Guide, Release 6.40".

Parameters are not explicitly mentioned if their default values are fine for SAP.

For BW specific parameters please also take a look at SAP Note 390016.

7) Verification

After you have migrated to DB2 V8 Compatibility mode, you may want to run V7 verification jobs.

Note: DB2 V8 verification jobs can only be run after migrating to V8 New-Function mode.
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Post Migration Steps - Exploitation of new features in DB2 V8

Many of the new features of DB2 V8 are implicitly exploited by SAP or are explicitly exploited by the WebAS 6.40 downward compatible kernel. The features that are implicitly exploited are summarized in chapter 1.3.7 of the IBM redbook 'DB2 UDB for z/OS V8: Through the Looking Glass and What SAP Found There'. However, in order to take advantage of other new features, some activities are necessary. Post migration steps are described in the following section.

DB2 V8 new table attribute 'VOLATILE' for special tables

There are certain SAP tables that need to be accessed in a special way by DB2. These tables are the asynchronous update protocol tables, TRFC and QRFC tables, SAP cluster tables and ABAP export/import tables. Before DB2 V8 manual catalog updates were necessary to ensure adequate access paths for these tables. DB2 V8 introduces the table attribute VOLATILE. The DB2 optimizer selects index access for statements that access VOLATILE tables using the index with the largest number of matching columns. List prefetch and sequential prefetch are avoided. Therefore, the VOLATILE attribute is perfectly suited for the SAP special tables. To convert the special tables of existing SAP systems, the report **RSDB2VOLATILE** is provided. Transport M7EK000181, which is located in directory general/R3server/abap/note.0417920/relindep on SAPSERVx, makes this report available. This transport can be imported in any SAP release. After the import of the transport, call report RSDB2VOLATILE in transaction SE38 and submit it. It can be run repeatedly.

DB2 V8 varying-length indexes that are not padded

DB2 V8 supports true varying-length key columns in an index. Varying-length columns no longer need to be padded to their maximum lengths. This usually reduces the storage requirements for this type of index, because only actual data is stored. Moreover, it enables the DB2 optimizer to choose index-only access paths whenever possible. The new keyword NOT PADDED specifies that varying-length columns are not padded. Indexes that are created or altered by the 6.40 kernel are equipped with the attribute NOT PADDED. To explicitly convert existing indexes to not padded, see SAP Note 793204: "DB2-z/OS: NOT PADDED check & adjustment of indexes".

DB2 V8 table spaces with page size > 4 KB and matching control interval size

DB2 table spaces and index spaces are defined as VSAM linear data sets. DB2 V8 introduces support for VSAM control interval (CI) sizes of 8, 16, and 32 KB, activated by the default of the new DSVCI ZPARAM in panel DSNTIP7. Up to DB2 V7, every page set has been allocated in control intervals of 4 KB, even though VSAM allows CI sizes multiple of 4 up to 32 KB for linear data sets, and DB2 has chained the CI's up to the required page size.

The SAP recommendation is to rely on the default setting of DSVCI. The new CI sizes reduce integrity exposures, relieve some restrictions on concurrent copy and the use of striping, and provide the potential for reducing elapsed time for table space scans. This is particularly important when taking volume-based copies. To convert existing tablespaces with a page size that is larger than 4 KB, it is necessary to reorganize them once.

DB2 V8 Backward Index Scan

DB2 V8 provides the capability for backward index scans. This allows DB2 to avoid a sort in certain cases and allows you to define fewer indexes. With this enhancement it is no longer necessary to create an ascending and descending index on the same table columns. To be able to use the backward index scan, you have to create the index on the same columns as the ORDER BY and the ordering must be exactly opposite of what is requested in the ORDER BY. Therefore, indexes that were defined prior to DB2 V8 can be deleted if their only purpose is to avoid sorts that do not occur if other indexes are scanned in the backward direction.

DB2 V8 utilities BACKUP SYSTEM and RESTORE SYSTEM

DB2 V8 introduces the new utilities BACKUP SYSTEM and RESTORE SYSTEM that largely facilitate backing up DB2 subsystems and data sharing groups that serve SAP systems and that automate prior point in time recovery. Chapter 43 ('Backup and Recovery Options') of the "SAP on IBM DB2 UDB for z/OS: Database Administration Guide, Release 6.40" describes how to take advantage of the new capabilities.

DB2 V8 features that enhance high-availability

DB2 V8 provides new capabilities that substantially improve database availability. Many table attributes can be changed in online operations, for example the clustering index of tables. Therefore, it is fairly easy to change the clustering index of a table. Chapter 30 ('Clustering Index') of the "SAP on IBM DB2 UDB for z/OS: Database Administration Guide, Release 6.40" describes this in more detail.

Moreover, DB2 V8 accomplishes the most relevant column type changes with respect to SAP upgrade processing online. These online schema changes are also referred to as online schema evolution. In the area of table partitioning, new partitions can be added and existing partitions can be rotated without any downtime. When reorganizing partitioned table spaces, DB2 V8 avoids the BUILD2 phase during which individual partitions are not available if secondary indexes are defined as data partitioned secondary indexes.

DB2 V8 Access Control, Based on IP Address of Client

DB2 V8 exploits a new RACF feature that is introduced in z/OS 1.5. Using the RACF APPCPORT class, it controls access to DB2 for z/OS, based on the port of entry of the client application. This allows you to restrict the IP addresses of the clients that are allowed to access DB2.

For more details about new features and enhancements in DB2 V8 and their impacts on SAP please refer to IBM Redbook "DB2 UDB for z/OS V8: Through the looking glass and what SAP found there" (SG24-7088-00).

Useful SAP Notes

81737 - DB2/390: APAR List
 660528 - Requirements to run SAP NetWeaver on zSeries
 728743 - zSeries: Release of DB2 V8 for SAP Components
 682077 - DB2-z/OS: Premigration checks for DB2 V8
 848384 - DB2-z/OS: Inconsistent fields with DDIC type RAW/LRAW/VARC
 660501 - DB2/390: System CCSID 500
 710408 - DB2-z/OS: Prerequisites Kernel 6.40 with WAS 6.10, 620
 717215 - DB2-z/OS: DB2 V8 configuration for SAP Rel. <= 4.6D
 731937 - DB2-z/OS: Customizing DB2 Connect for WebAS 6.20
 836882 - DB2-z/OS: Manually Customizing DB2 Connect
 750096 - DB2-z/OS: 6.40 downward compatible kernel
 793204 - DB2-z/OS: NOT PADDED check & adjustment of indexes
 390016 - DB2/390: BW: DB settings and performance
 842792 - DB2-z/OS: BW: DD card RNPRIN01 or RNPRINT is missing
 844980 - DB2-z/OS: BW: SQL error -636
 840895 - DB2-z/OS: BW: SQL error -151
 833735 - DB2-z/OS: BW: Error 5 when adding to PSA
 821040 - DB2-z/OS: BW: SQL error -874 in the Unicode system
 815237 - DB2-z/OS: BW: SQL error -653 with DB2 Version 8
 803078 - DB2-z/OS: BW: SQL error -104 when you activate InfoSource

Troubleshooting

When executing SAP Best Practice for Installing or Migrating to DB2 V8 the process description is not satisfactory or leads into unclear situations, please open an SAP customer message and send it to component BC-DB-DB2 at <http://service.sap.com/message>.

Background Information and References

- DB2 UDB for z/OS V8: Through the looking glass and what SAP found there (SG24-7088-00)
- DB2 UDB for z/OS V8: Installation Guide (GC18-7418-00)
- DB2 Universal Database for z/OS
Data Sharing: Planning and Administration Guide (SC18-7417-01)
- DB2 UDB for z/OS Version 8 Technical Preview (SG24-6871-00)
- DB2 Universal Database for z/OS
Release Planning Guide (SES1-2305-00)
- SAP on IBM DB2 UDB for z/OS: Database Administration Guide, Release 6.40
- White Paper "Tips for Installing DB2 Connect V8 on SAP with DB2 UDB for z/OS V8".
<http://www-1.ibm.com/support/docview.wss?rs=64&uid=swg27005934>
- Contact IBM worldwide: <http://www.ibm.com/planetwide/>
- z/OS internet library: <http://www.ibm.com/servers/eserver/zseries/zos/bkserv/>
- DB2 for z/OS: <http://www.ibm.com/software/data/db2/os390/library.html>
- DB2 V8: <http://www-4.ibm.com/software/data/db2/os390/v8books.html>
- IBM Redbooks <http://www.redbooks.ibm.com/>
- DB2 UDB for z/OS Version 8 - Planning for Migration:
<http://www.ibm.com/support/docview.wss?rs=64&uid=swg27004997>
- DB2 UDB for z/OS Version 8 - The Migration Process Including Hints & Tips along the way:
<http://www.ibm.com/support/docview.wss?rs=64&uid=swg27004997>

- DB2 UDB for z/OS Version 8 – Online Schema Evolution, Some Questions and Answers:
<http://www.ibm.com/support/docview.wss?rs=64&uid=swg27004999>
- DB2 UDB for z/OS Version 8 – All for One and One for All - Introducing UNICODE:
<http://www.ibm.com/support/docview.wss?rs=64&uid=swg27004971>
- SAP Planning Guide, Release 6.40
<http://service.sap.com/InstGuidesNW04> > SAP NetWeaver > Rel.04 > installation > SAP Web AS 6.40 SR1 > IBM DB2 Universal Database for z/OS
Part I Planning and Preparation
Planning Guide: z/OS Configuration for SAP on DB2 for z/OS,
- SAP Database Administration Guide, Release 6.40
<http://service.sap.com/InstGuidesNW04> > SAP NetWeaver > Rel.04 > installation > SAP Web AS 6.40 SR1 > IBM DB2 Universal Database for z/OS
Part II Installation and Post-Installation
SAP on IBM DB2 UDB for z/OS: Database Administration Guide: SAP Web Application Server
- Unicode Conversion Guide – mySAP WebAS 6.40
<http://service.sap.com/unicode>

Feedback and Questions

Send any feedback by formulating an SAP customer message to component BC-DB-DB2 at <http://service.sap.com/message>.

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