# SAP® MaxDB™ Expert Session

SAP® MaxDB™ & SAP® Content Server - Housekeeping
March 11, 2013

Public

# SAP® MaxDB™ Expert Session

## SAP® MaxDB™ Content Server – Housekeeping

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# Agenda

Database Administration Tools
- Database Studio
- DBMCLI
- Transaction DBACockpit

Parameter Check

Database Software Update and Check

Backup / Recovery
- Backup Concept
- Backup Types
- Recovery

Consistency Checks
- Check Backup
- Check Data

# Agenda

1. Database Administration Tools
2. Parameter Check
3. Database Software Update and Check
4. Backup / Recovery
5. Consistency Checks
6. Additional Useful Information

## Database Administration Tools: Database Studio

Summary of most important tasks which can be performed with Database Studio:

- **create, configure, monitor databases**
- **define, change, delete, select database objects**
- **backup and restore databases**
- **access to log files**
- creating users
- performance analysis
- :



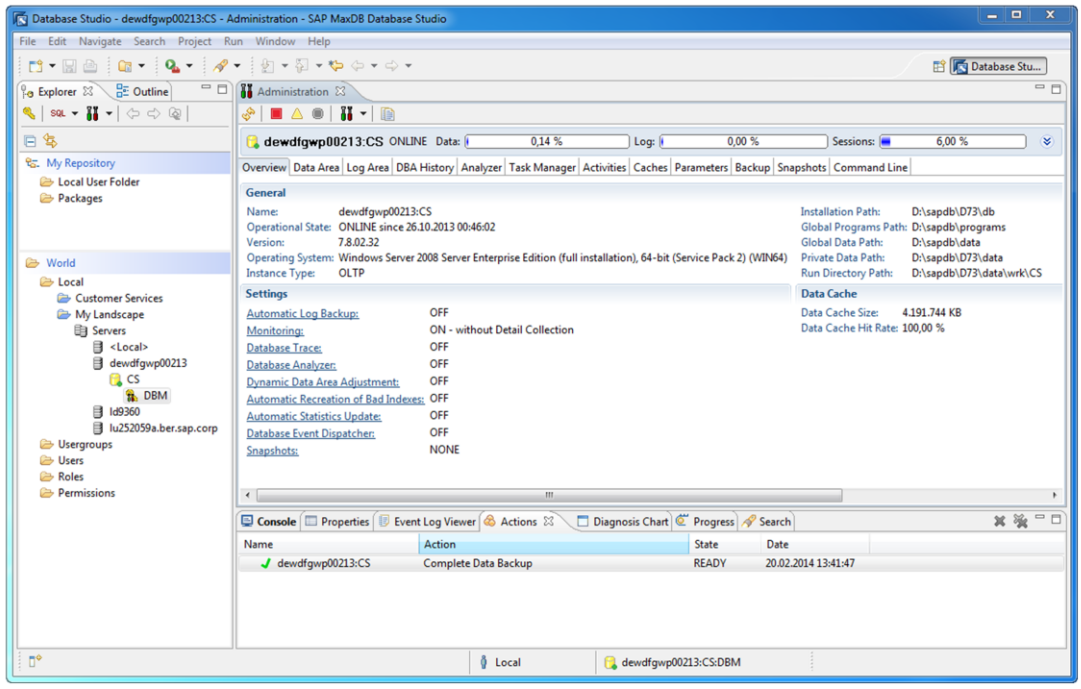

Database Studio is the graphical tool to administrate SAP MaxDB database instances (Content Server) as of version 7.5.

It replaces the previous tools Database Manager GUI and SQL Studio from SAP MaxDB version 7.7 onwards.

Database Studio is not bound to the Windows platform as the previous tools.

At present it is available for Linux and for Windows.

# Database Administration Tools: Database Studio

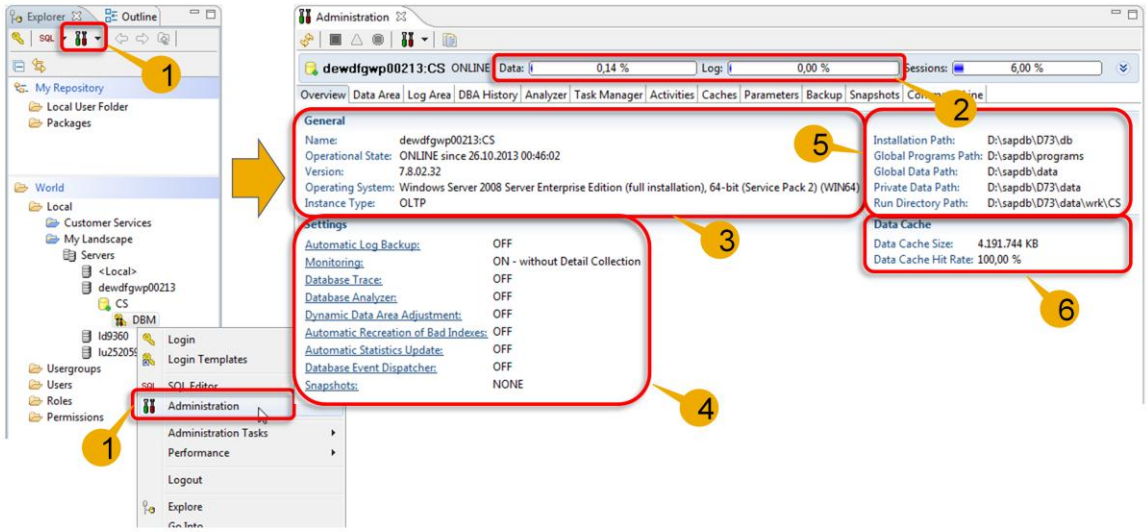






Here you can see the SAP MaxDB Database Studio with an open administration editor for database with name *CS* – our SAP MaxDB Content Server.

## Database Administration Tools: Database Studio




**SAP note 212394: DBM, DBA and Domain User initial password**

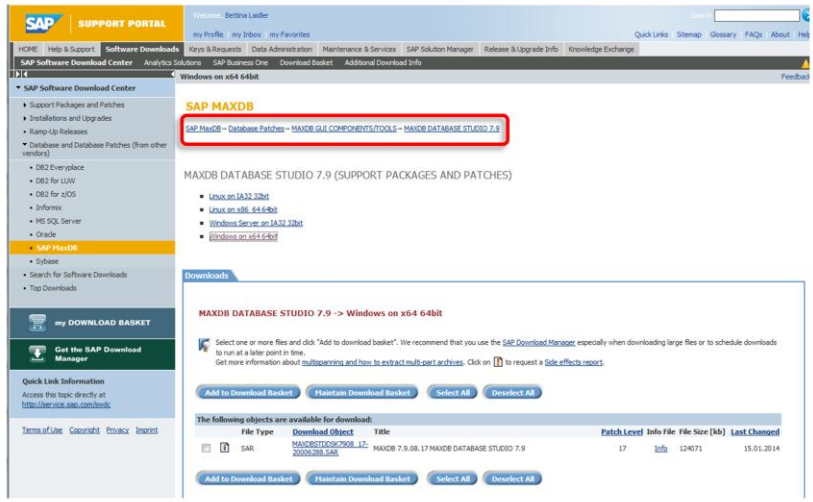



The administration editor can be opened via context menu of a corresponding user or by selecting the user and choosing the administration icon within the toolbar of the explorer view (1).

Only database manager operator user and the database system administrator user are allowed to open the administration editor (for other users the login input mask is shown). The default name and password of the database manager operator user and the database system administrator user which was created during the installation of the SAP Content Server database can be found in **SAP note 212394**.

Per default tab “Overview” is active which shows general information about the database at a glance, e.g. filling level (2), name, status, database version, operating system of database server (3), if monitoring, tracing, Database Analyzer etc. is switched on or off (4), software installation path, (5), Data Cache size and hit rate (6).

# Database Administration Tools: Database Studio




- **SAP note 1672252: SAP MaxDB Software Download (SWDC)**
- **SAP note 1097311: SAP MaxDB Database Studio installation**
- **Expert Session 2: Basic Administration with Database Studio**




SAP MaxDB Database Studio is available via SAP Support Portal in SAP Software Distribution Center. Go to:

http://service.sap.com/swdc

-> Database and Database Patches (from other vendors)

-> SAP MaxDB

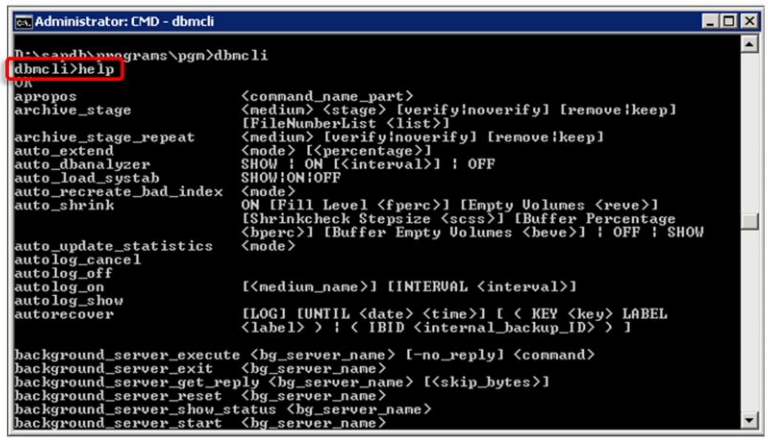
-> Database Patches

-> MAXDB GUI COMPONENTS/TOOLS

And use **SAP note 1097311** for Database Studio installation.

## Database Administration Tools: DBMCLI

**dbmcli [<options>] [[-c] <DBMServer-command>]**




DBMCLI Manual:

http://help.sap.com/saphelp_nw73/helpdata/en/18/1dedd0833b4957b68d34360814514e/frameset.htm

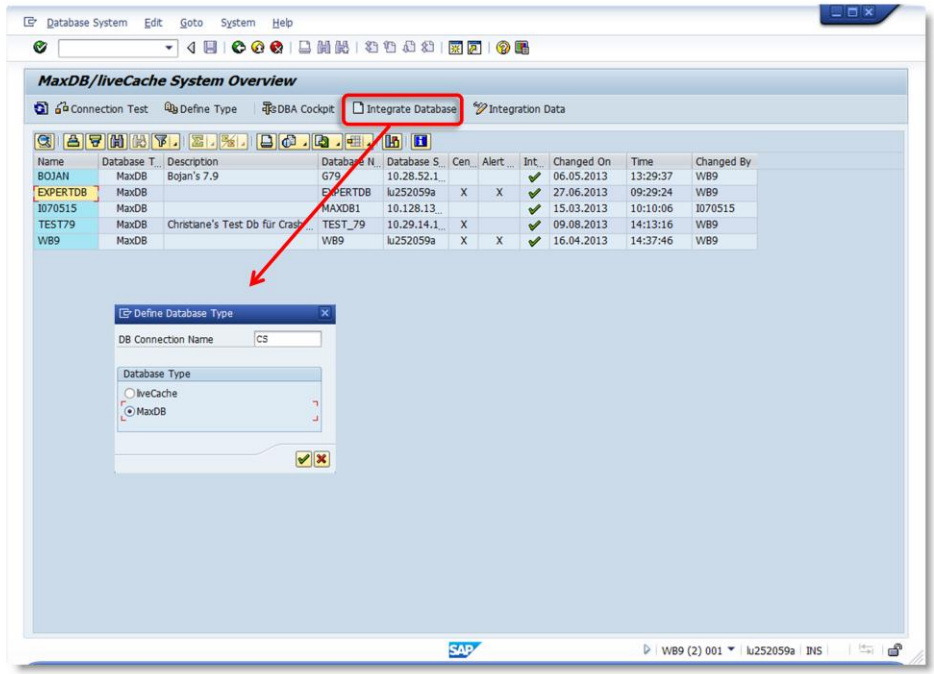



Additionally to the Database Studio you have on the command line the **D**atabase **M**anager **C**ommand **L**ine **I**nterface (DBMCLI) to administrate your SAP MaxDB Content Server. This tool is a component of the SAP MaxDB software.

Command ‚dbmcli –help' gives an overview which options are possible.

With command ‚help' in a dbmcli session an overview of all DBMServer commands is displayed or use the DBMCLI manual in the SAP MaxDB documentation.

# Database Administration Tools: DBACockpit – DB59



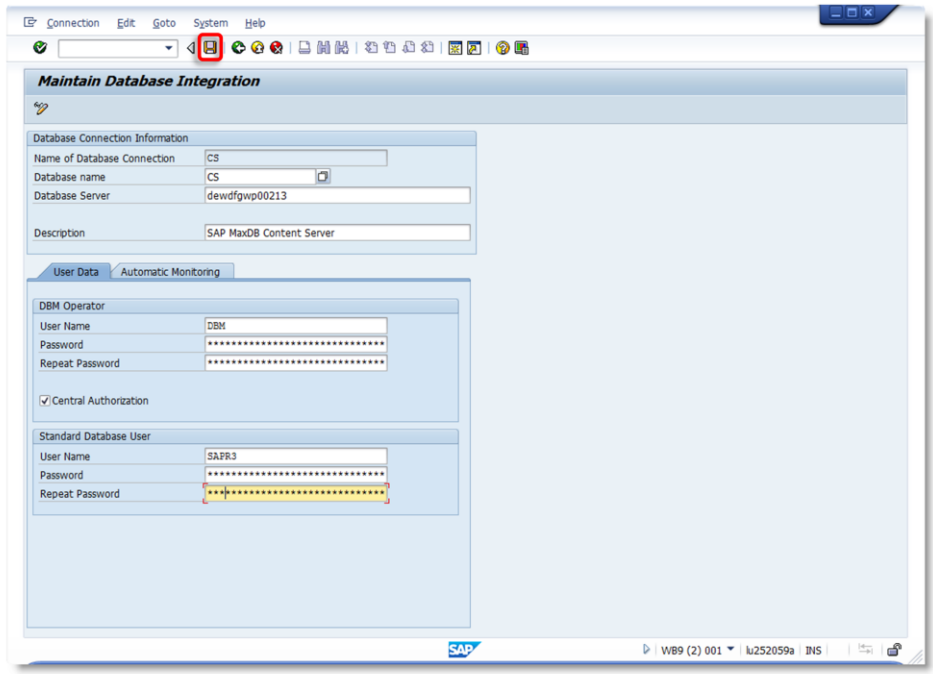




To administrate your SAP MaxDB Content Server via transaction DBACockpit in your SAP Solution Manager you have to integrate your Content Server via transaction DB59 first.

In transaction DB59 choose *Integrate Database* and specify a connection name and choose database type ‘MaxDB’.

# Database Administration Tools: DBACockpit – DB59





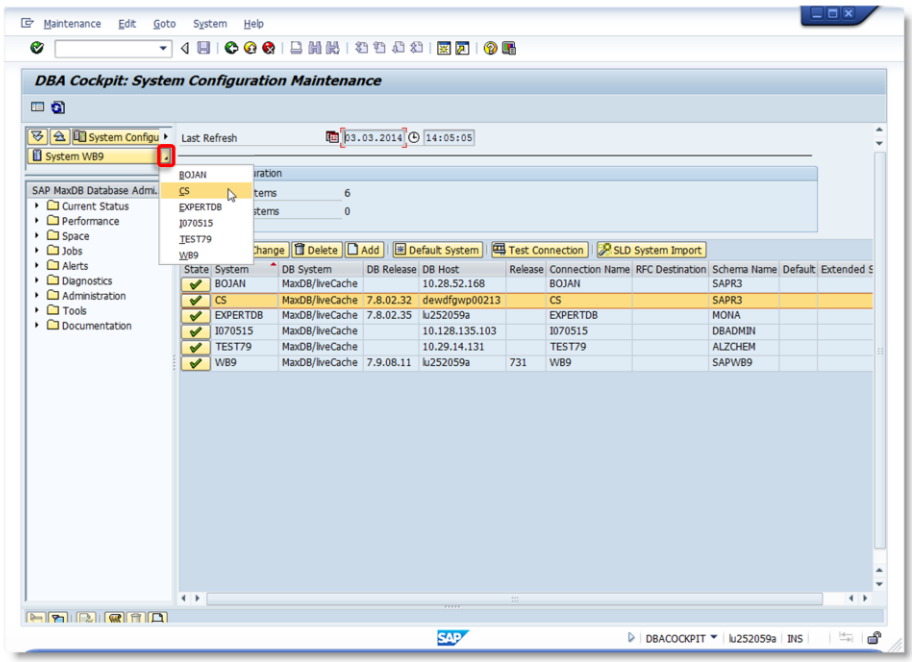


On screen *Maintain Database Integration* enter the requested information:

- *Database name* and *Database Server*,
- an optional *Description*
- *DBM Operator User Name* and his *Password*
- *Standard Database User Name* and his *Password*

and save your changes.

# Database Administration Tools: DBACockpit

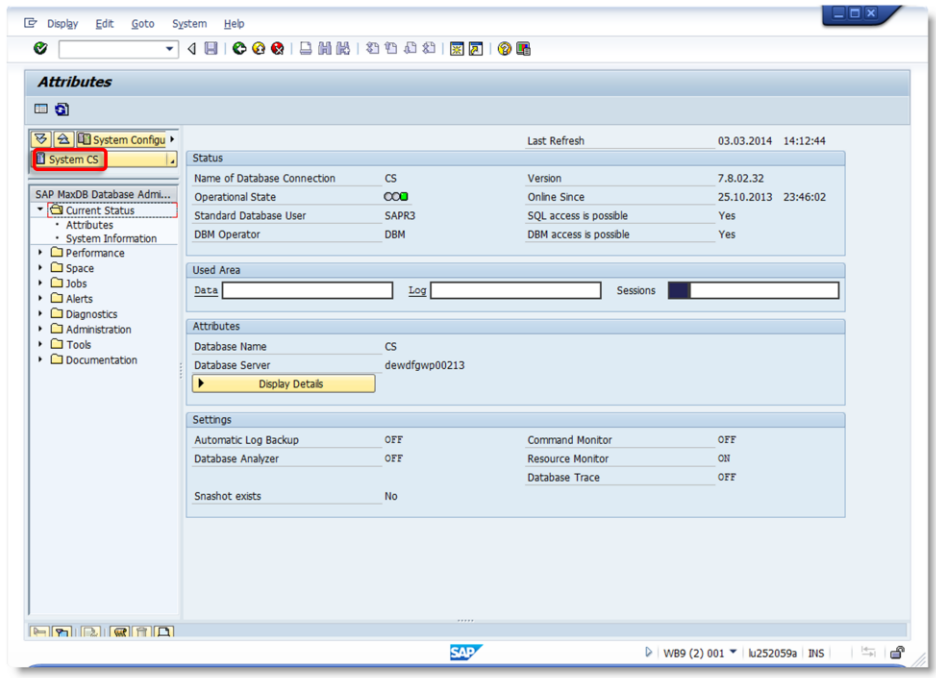






After integration via transaction DB59 you can choose your SAP MaxDB Content Server in transaction DBACockpit …

# Database Administration Tools: DBACockpit







… and have now the possibility to monitor and administrate your Content Server via this transaction.

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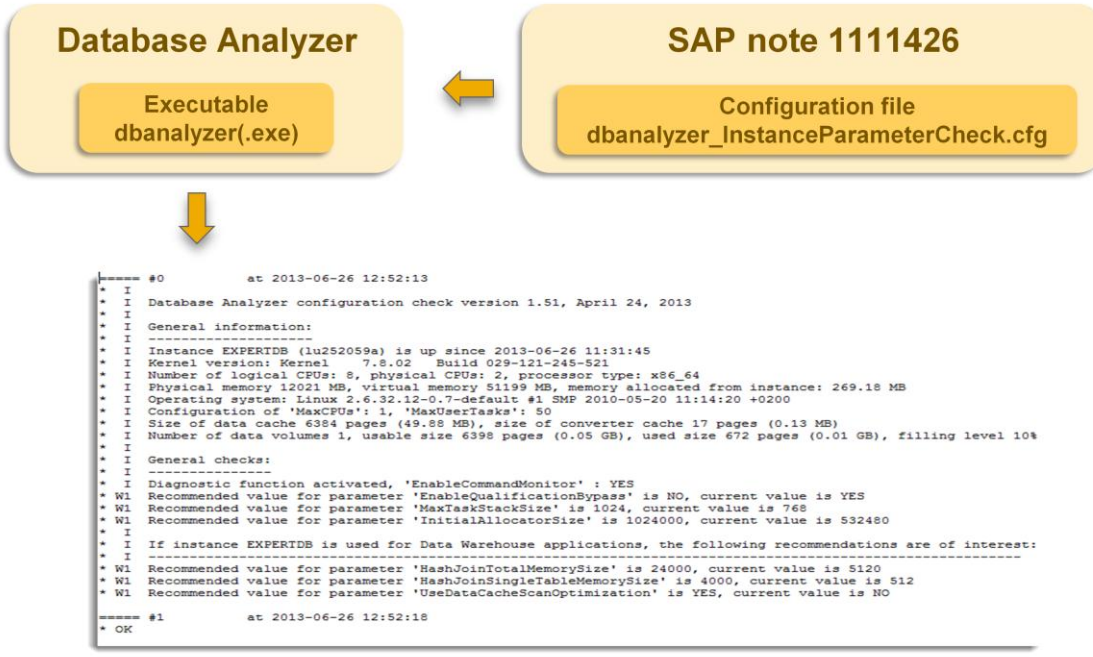
## Parameter Check with Database Analyzer







SAP MaxDB (Content Server) database parameter check is embedded into the Database Analyzer. Use this Database Analyzer feature to check if the configuration of your SAP MaxDB database corresponds to the current SAP recommendations.

The parameter check should be executed after each SAP MaxDB software upgrade. Different recommendations may be relevant for different database versions.

The parameter check uses a **special Database Analyzer configuration file** (only one file for all SAP MaxDB versions). This special configuration file is attached to **SAP note 1111426**. As this file is regulary updated, you must download it always before a new check.

## Parameter Check with Database Analyzer

SAP note 1111426:

➡ configuration file *dbanalyzer_instanceParametercheck.cfg*

***dbanalyzer –d EXPERTDB –n <server> –u superdba,<password>***
***–f dbanalyzer_instanceParametercheck.cfg -o <temp_directory> -i –c 1 –t 1,1***

➡ *<temp_directory>/<YYYYMMDD>/DBAN.prt*

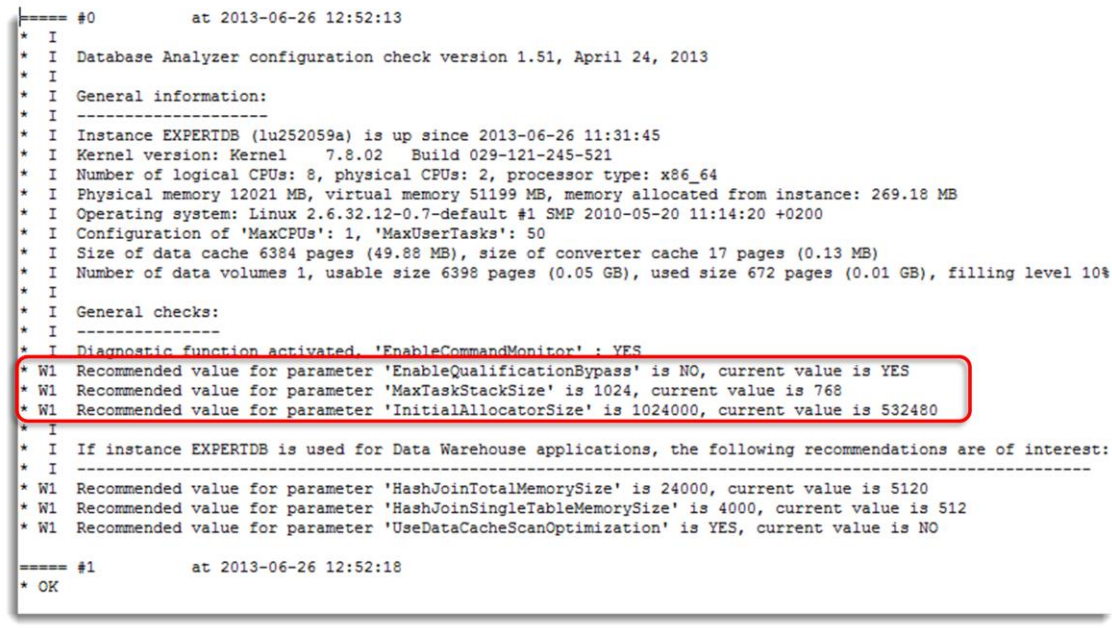



The database instance must be in operational state ONLINE when you start the parameter check tool. Perform the automatic check as SYSDBA user (e.g. superdba)

*dbanalyzer –d EXPERTDB –n <server> –u superdba,<password>*
*–f dbanalyzer_instanceParametercheck.cfg -o <temp_directory> -i –c 1 –t 1,1*

With parameter
*-i* the output directory will be cleaned up
*-c* output will be send to screen as well
*-t 1,1* only 1 snapshot in an interval of one second

## Parameter Check with Database Analyzer



```
===== #0          at 2013-06-26 12:52:13
*  I
*  I  Database Analyzer configuration check version 1.51, April 24, 2013
*  I
*  I  General information:
*  I  --------------------
*  I  Instance EXPERTDB (1u252059a) is up since 2013-06-26 11:31:45
*  I  Kernel version: Kernel    7.8.02   Build 029-121-245-521
*  I  Number of logical CPUs: 8, physical CPUs: 2, processor type: x86_64
*  I  Physical memory 12021 MB, virtual memory 51199 MB, memory allocated from instance: 269.18 MB
*  I  Operating system: Linux 2.6.32.12-0.7-default #1 SMP 2010-05-20 11:14:20 +0200
*  I  Configuration of 'MaxCPUs': 1, 'MaxUserTasks': 50
*  I  Size of data cache 6384 pages (49.88 MB), size of converter cache 17 pages (0.13 MB)
*  I  Number of data volumes 1, usable size 6398 pages (0.05 GB), used size 672 pages (0.01 GB), filling level 10%
*  I
*  I  General checks:
*  I  ---------------
*  I  Diagnostic function activated, 'EnableCommandMonitor' : YES
* W1  Recommended value for parameter 'EnableQualificationBypass' is NO, current value is YES
* W1  Recommended value for parameter 'MaxTaskStackSize' is 1024, current value is 768
* W1  Recommended value for parameter 'InitialAllocatorSize' is 1024000, current value is 532480
*  I
*  I  If instance EXPERTDB is used for Data Warehouse applications, the following recommendations are of interest:
*  I  ------------------------------------------------------------------------------------------------------------
* W1  Recommended value for parameter 'HashJoinTotalMemorySize' is 24000, current value is 5120
* W1  Recommended value for parameter 'HashJoinSingleTableMemorySize' is 4000, current value is 512
* W1  Recommended value for parameter 'UseDataCacheScanOptimization' is YES, current value is NO

===== #1          at 2013-06-26 12:52:18
* OK
```




Analyze the screen output or the generated file *<temp_directory>/<YYYYMMDD>/DBAN.prt*. Important are all messages that are marked with “* W1” to “* W3”

The following checks are executed:
- general parameters
- parameters which influence the I/O performance
- optimizer parameters
- additional checks
  - do corrupt indexes exist?
  - is the database kernel trace activated?
  - do tables exist which do not have any file directory counters?
  - is logging activated and autooverwrite deactivated?
  - does the size of the IO Buffer Cache correspond to the SAP recommendation, which is
    2% of the used data volume size for UNICODE systems and
    1% for NON-UNICODE systems which is the default of the Content Server

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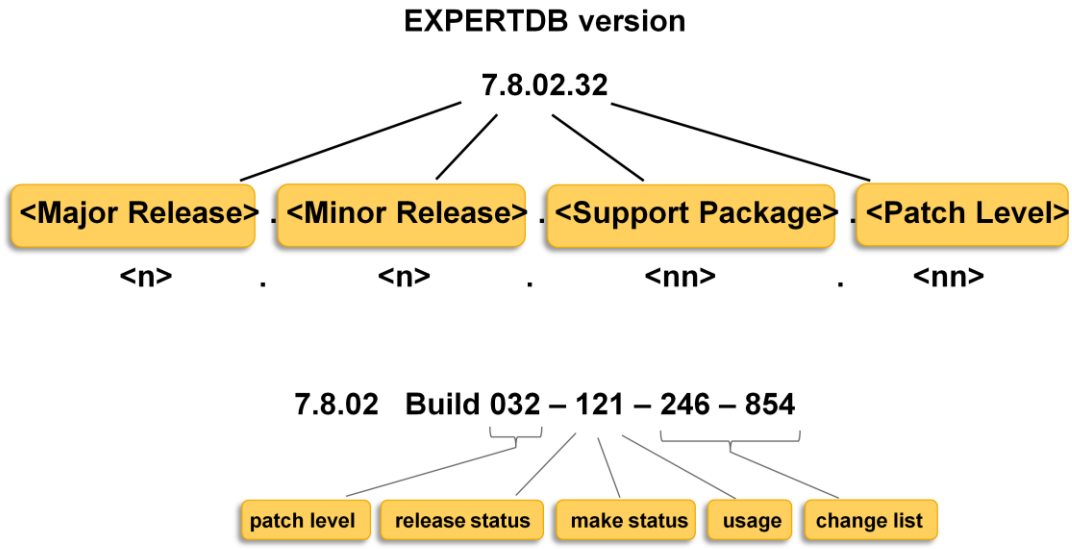
## Interpreting SAP MaxDB Version String







SAP MaxDB version string contains:

- Major release (single-digit)
- Minor release (single-digit)
- Support package (two-digit)
- Patch level (two-digit)

Support Packages contain both corrections for errors and functional enhancements.

Patch levels will be created more frequently than Support Packages in accordance with customer requirements and, in particular, in response to known errors. Only high-priority errors will be corrected. Corrections for delivered versions always result in a new Patch level number.

In database log files, for instance KnlMsg, you will find the database kernel version with build number of 12 digits. The first 3 digits represent the Patch level followed by 3 digits indicating the release status, the make status and the usage. The last 6 digits specify the change list number which uniquely identifies the underlying module amount and module instance of the MaxDB version.

More information about the SAP MaxDB version string can be found in **SAP note 820824 - FAQ: SAP MaxDB/liveCache-Technology.**

# SAP MaxDB Upgrade and Patch

## Database **upgrade**

- change of database version to a newer major or minor release (for example 7.7 to 7.8)
- often in connection with upgrade of the SAP application software
- relevant software CDs or DVDs are provided and have to be used
- upgrade guides for the relevant target releases and operating systems are available in SAP Support Portal

## Database **patch**

- change of database version to a newer Support Package or Patch Level (for example 7.7.05 to 7.7.07 or 7.8.02.16 to 7.8.02.32)
- independent from a change to a newer release of the relevant SAP application software
- software packages are available on SAP Support Portal (Software Distribution Center)
- SAP note **498036**: Overview note for importing MaxDB/liveCache versions

## Database Patch Tools

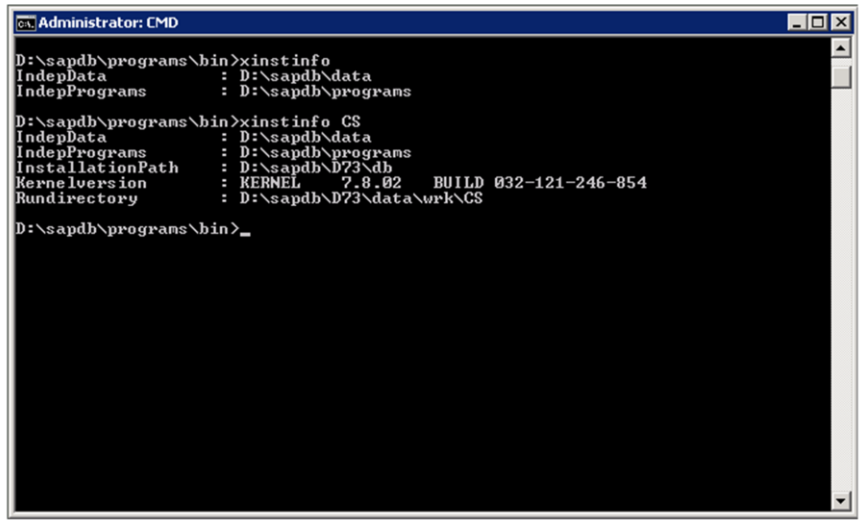
- **SDBSETUP (Installation Manager GUI)**
- **SDBUPD**
- **SDBINST**

- **Expert Session 7: SAP MaxDB Software Update Basics**
- **SAP note 1020175: FAQ: SAP MaxDB installation, upgrade or applying a patch**
- **SAP note 498036: Overview note: Installing SAP MaxDB/liveCache versions**




Applying SAP MaxDB patches (change of database version to a newer MaxDB support package or patch level) can be done with the SAP MaxDB installation and upgrade tools (SDBSETUP, SDBUPD, SDBINST) provided with the SAP MaxDB installation software packages.

## Check SAP MaxDB Installation: XINSTINFO







A helpful tool to get relevant locations of a specific database instance is XINSTINFO. Executed without any option it shows the location of <independent data path> as well as <independent program path>. If this tool is executed the following way: ‘xinstinfo <database name (SID)>’ it shows in addition to the independent locations:

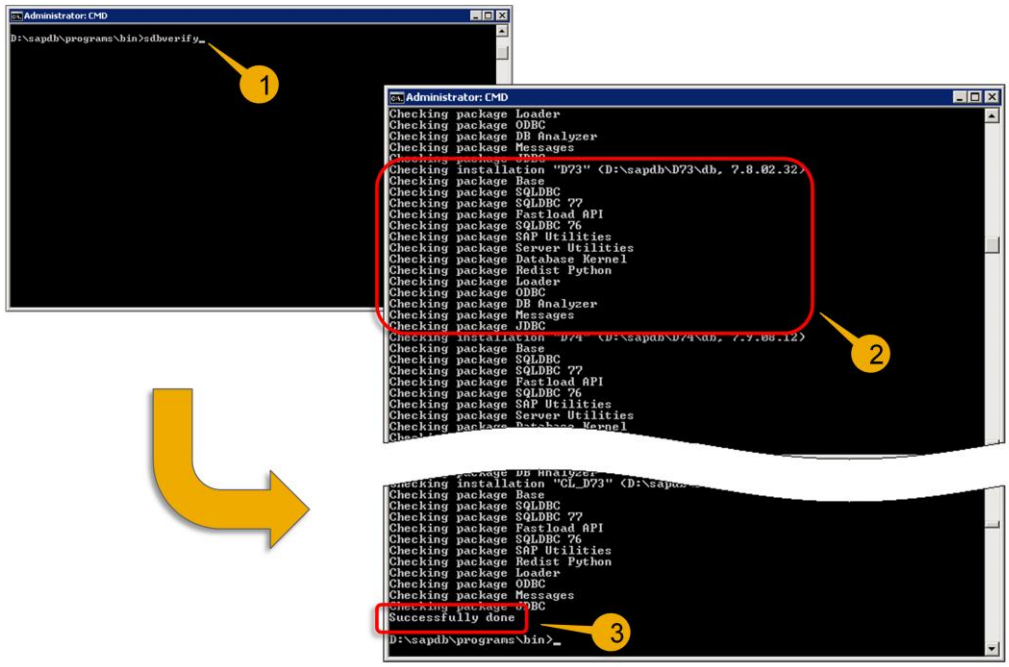
~ directory of the dependent software part of this database instance

~ the software version this database instance is based on

~ work directory (so called ‘rundirectory’) of this database instance

So a brief overview about relevant locations is on hand.

## Check SAP MaxDB Installation: SDBVERIFY



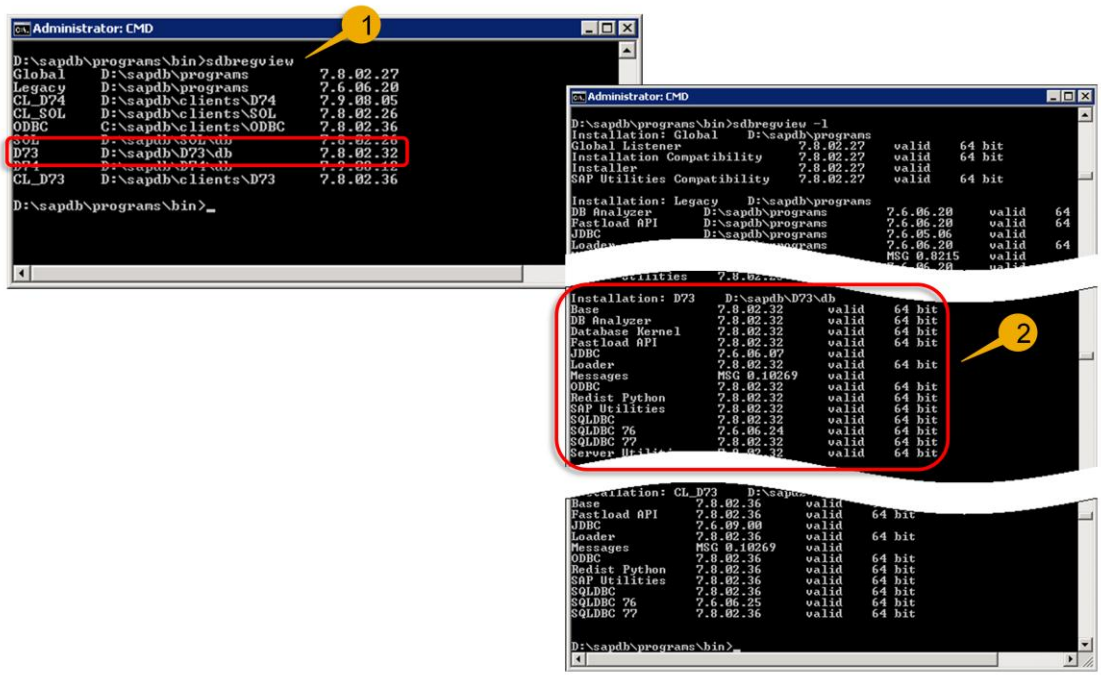




SDBVERIFY is the command line tool to check installed MaxDB software for correct installation. To check the entire installation SDBVERIFY has to be executed from command line by an OS user with administrator permissions (1).

Every installation with all installed packages will be checked (2). A concluding message indicates if all installations are consistent or not (3).

# Check SAP MaxDB Installation: SDBREGVIEW







SDBREGVIEW is the command line tool that once started checks the registration of all installed SAP MaxDB software packages. Executed by an OS user with administrator permissions it lists all registration data for each installation (1).

Command ‘sdbregview -l’ shows the version of each package of each installation (2).

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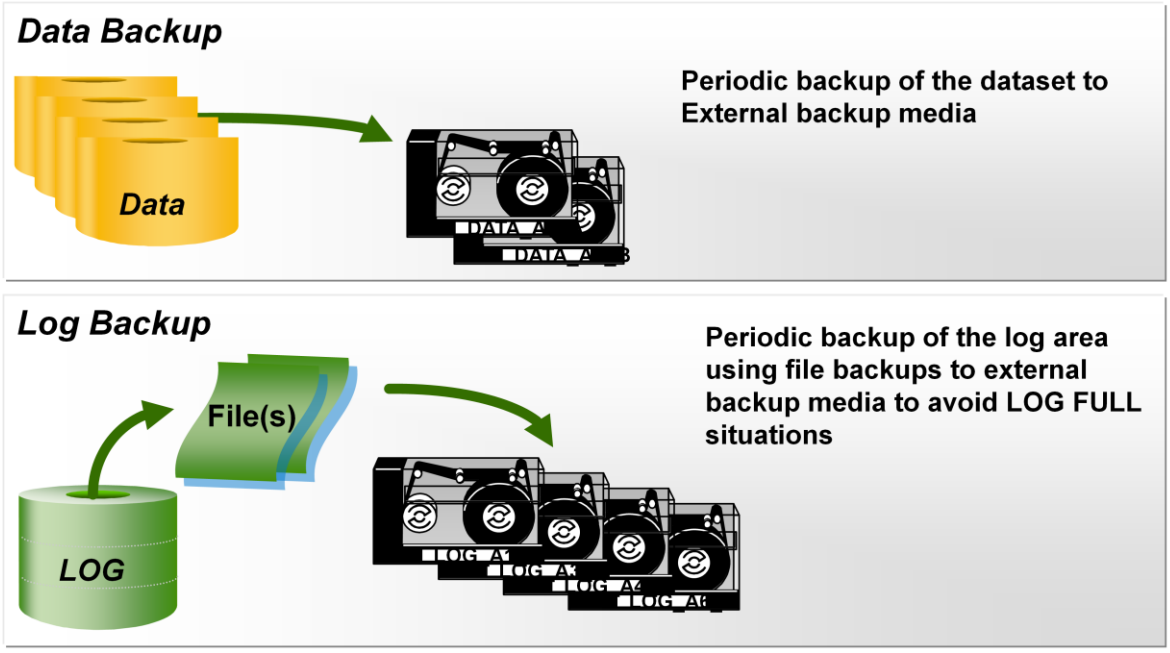
## Backup Concept – Backup Types




**Important:** **All backups are performed by the database kernel.**



To prevent data loss in a database used for production operation, it is essential that the data and log areas are backed up regularly.

With Database Studio, SAP MaxDB provides a user-friendly tool for performing these backups. This tool allows you to display the backup history and use external backup tools such as Legato NetWorker, NetVault, and TSM. The widely-used *BACKINT* for Oracle interface has also been offered since early database versions of SAP MaxDB (SAP DB). MaxDB features an enhanced version of the standard *BACKINT* interface, namely *BACKINT for SAP MaxDB*. This enhancement also allows you to use pipes for backing up databases using this interface.

A backup of the database instance consists of two elements:

- Periodic backup of the data area
- Backup of the log entries ( no Log backup possible for Cache Server)

While backups are being performed, the database remains available without restrictions.

## Backup Concept - Overview

| Type | Description | Checks |
|---|---|---|
| SAP MaxDB Backup<br><br>DATA Area | • Only database pages marked for backup are backed up | • Various page checks are performed during backup<br>• check of data backups |
| Log Area | • Log area can only be overwritten after successful log backup | • Check of Log backups |
| SAP MaxDB + External Backup Tools | • backup via SAP MaxDB Tools to pipe(s)<br>• integration via Backup Templates | • Various page checks are performed during backup<br>• check of data and log backup |
| OS / 3rd party Filer Snapshot<br>+<br>SAP MaxDB Snapshot | • (example) using NetApp Filer Snapshot tech<br><br>• Restartpage + Converter are stored<br>• Log area is not part of filer snapshot | • no MaxDB specific checking of backup content / completeness<br>• no page checks |



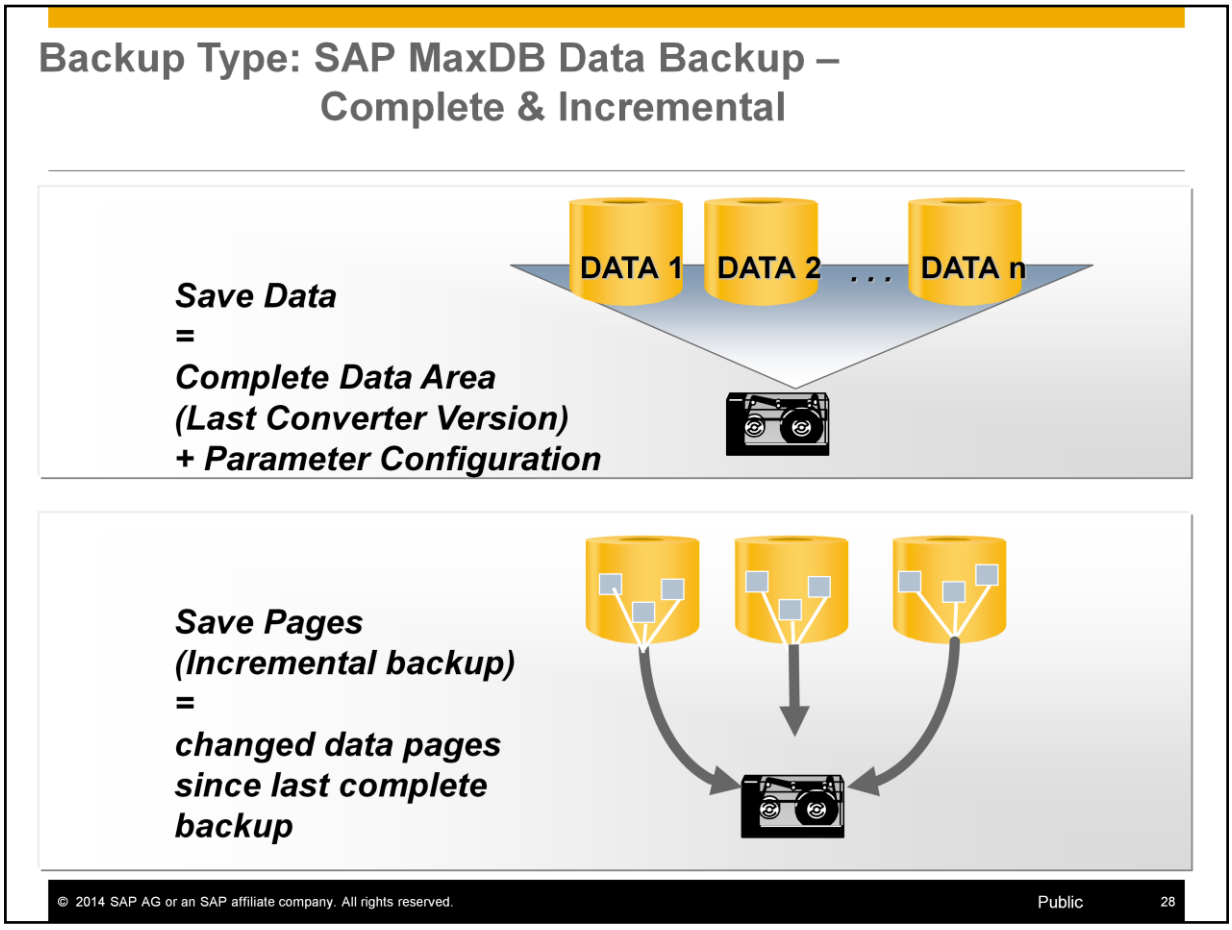

Regularly back up your data and redo log entries from the data and log areas of your database to data carriers. No downtime is required for backups: you can execute backups in the ONLINE operational state, meaning that the database is available to users during backups.

If there is a database failure due to a hardware defect or a logical error, you can restore the database to a consistent state by importing the data and log entries from the backups.

For backing up, use SAP MaxDB tools Database Studio, Database Manager CLI or SAP CCMS (in SAP systems only).

You can also create a backup concept by using external backup tools.

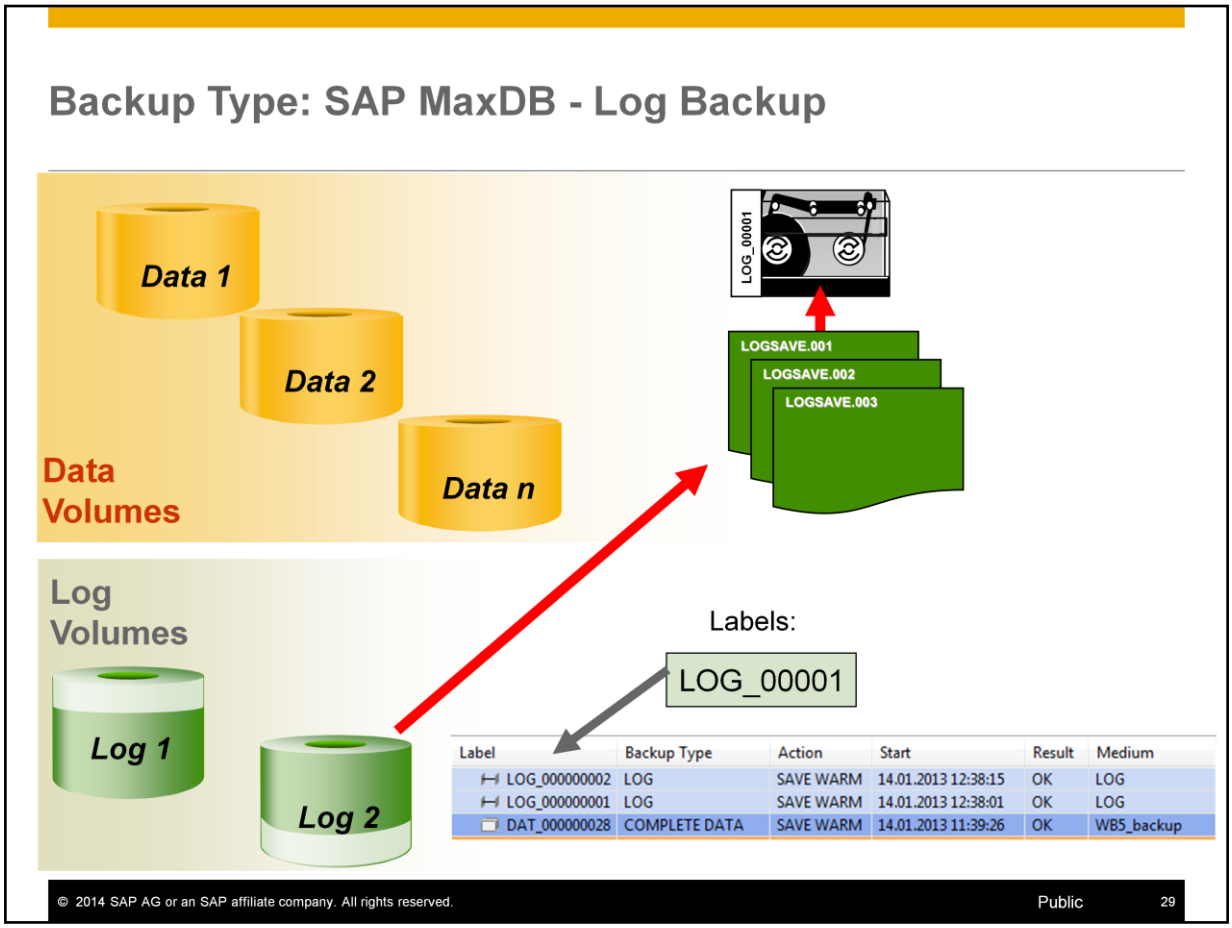
As of SAP MaxDB Version 7.8 you can use external filer snapshot in combination with SAP MaxDB snapshot to create a consistent backup in online database mode.




To create a complete backup of all valid pages used in the data area, choose as DBM-User e.g. Control *Administration Task -> Backup -> Complete Data Backup.* The configuration of the database instance is also backed up. This means that if you perform a recovery, it is also possible to restore the original configuration. Converter pages are not backed up.

To create an incremental backup of the data area, choose *Incremental Data Backup.* This backup contains all pages that have been changed since the last complete backup. Every following incremental data backup still backup only those pages changed since the last full data backup, so the size of the incremental backups will increase over time, depending on how much data was changed.

You access the backup functions in Database Studio by choosing *Backup...* from the context menu of the instance.



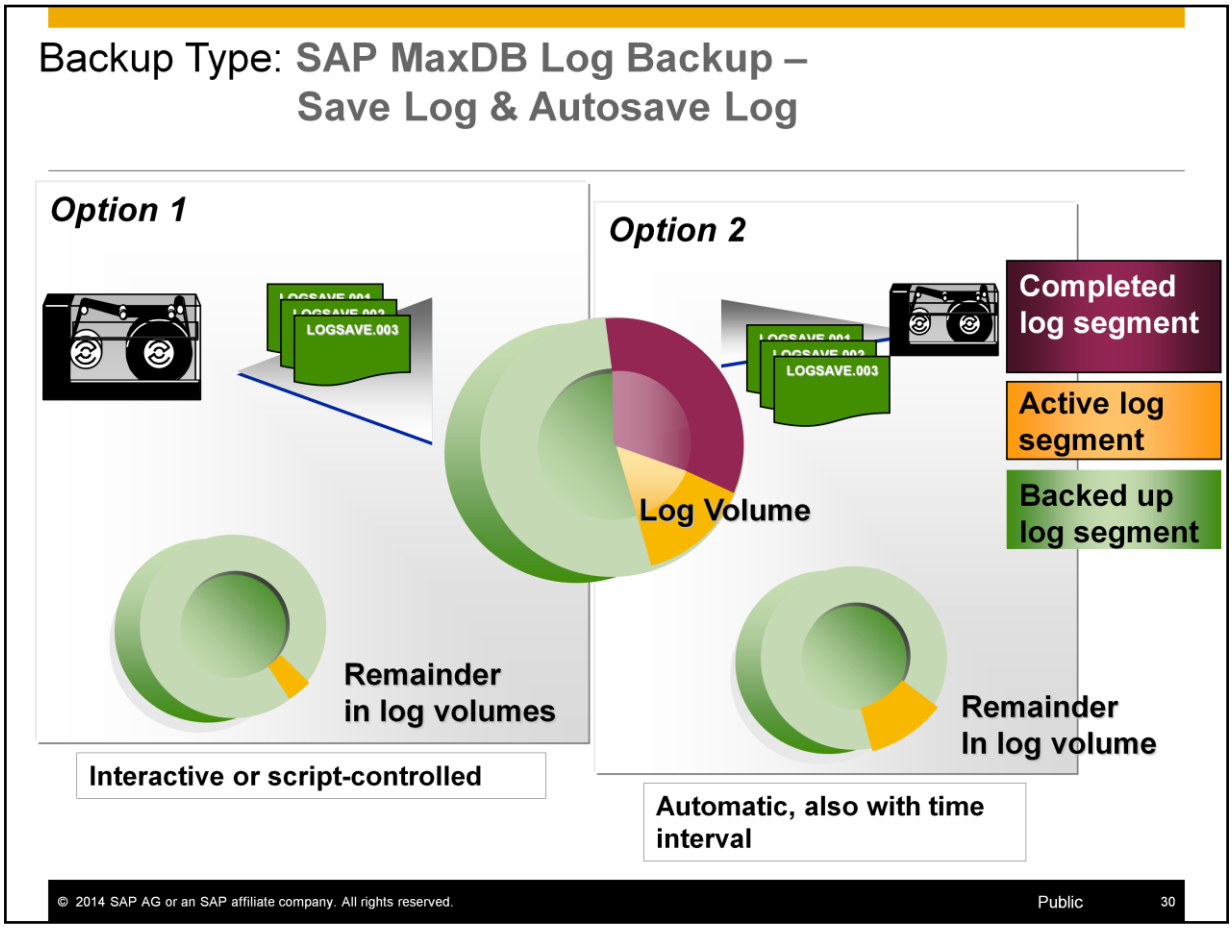

Interactive log backups back up all occupied log pages from the log volume that have not yet been backed up.

Only *version files* and external backup tools with a confirmation function are accepted as backup media for interactive log backups. For this reason, the log backups should then be stored finally on other backup media.

The system automatically adds a version number (three characters with leading zeros) to the file name defined in the backup medium. Once the number set is exhausted, additional digits are added.

The labels of the log backups are assigned independently of the numbering of the complete and incremental data backups.

All log backups are listed in the backup history in reverse chronological and logical order together with the data backups.

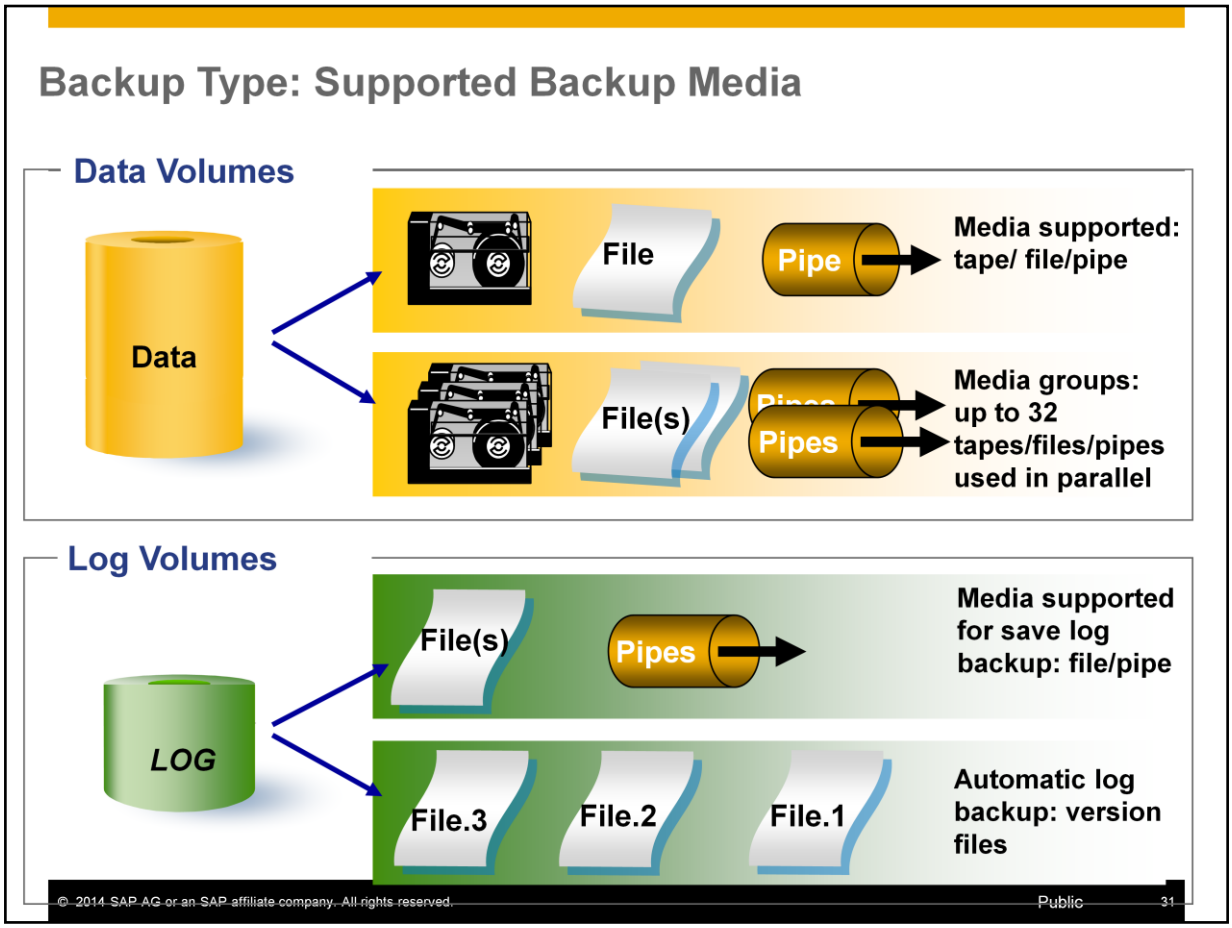



A log backup saves all content of the log area that has not yet been saved to a backup medium of your choice. The content of the log area is then released for **overwriting.** Note that the log entries are only released for overwriting and not actively deleted.

- The log backup is performed in sections, the size of which is defined (in pages) by the "AutoLogBackupSize" parameter. By default, the value of the "AutoLogBackupSize" parameter is calculated at the time of installation based on the existing log volumes and set to one third of the total log area.

When you activate automatic log backup, completed log areas are automatically backed up to backup media selected for this purpose.

- We recommend that you use a separate hard disk area for automatic log backups. Only files *(Device Type: File)* can be used as a backup medium. To learn how data can be supplied to these files automatically, see the DBMCLI command description for *archive_stage*.
- You do not need to deactivate automatic log backup during a data backup or *Check data.* The database kernel monitors the completed log segments.
- If you want to perform an interactive log backup even though the automatic log backup function is activated, you first have to deactivate automatic log backup and then reactivate it after you have performed the interactive log backup.
- You can also specify a specific time interval in which the log is saved automatically




One or more media can be used for data backups.

- If multiple media are to be used, these must be organized as a group of parallel backup media (‘template group’).
- Tapes, files, and pipes can be used as backup media. Pipes are used as an interface to external backup tools, for example.

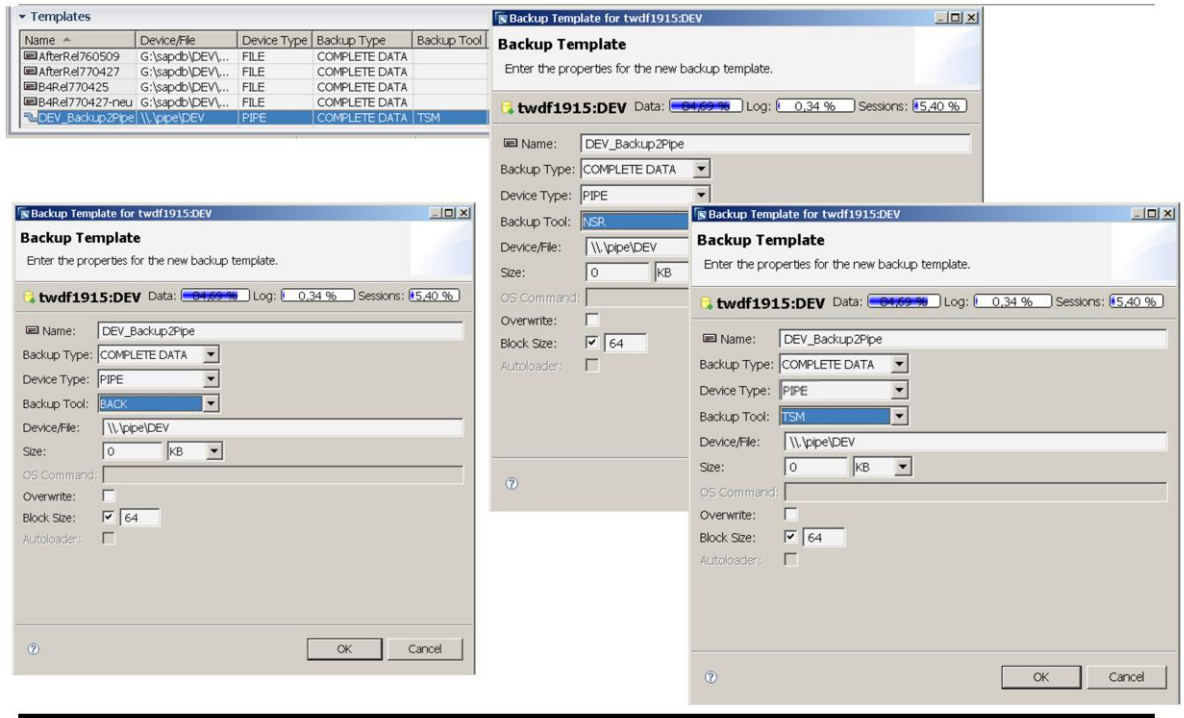
Regular files or pipes can be used for interactive log backups (save log).

- Parallel log backups are not supported.
- Pipes are only supported if backup tools receive the data from the pipe and send a confirmation after the backup is completed.

The *automatic log backup* function can be used only when logs are backed up to files.

- Pipes cannot be used.
- The automatic log backup writes *version files.*
- You can use the "archive_stage" dbmcli command to forward these version files stored in the file system to a backup tool automatically.

## Backup: External Backup Tools – Backup Templates







SAP MaxDB supports multiple external backup tools and technologies:

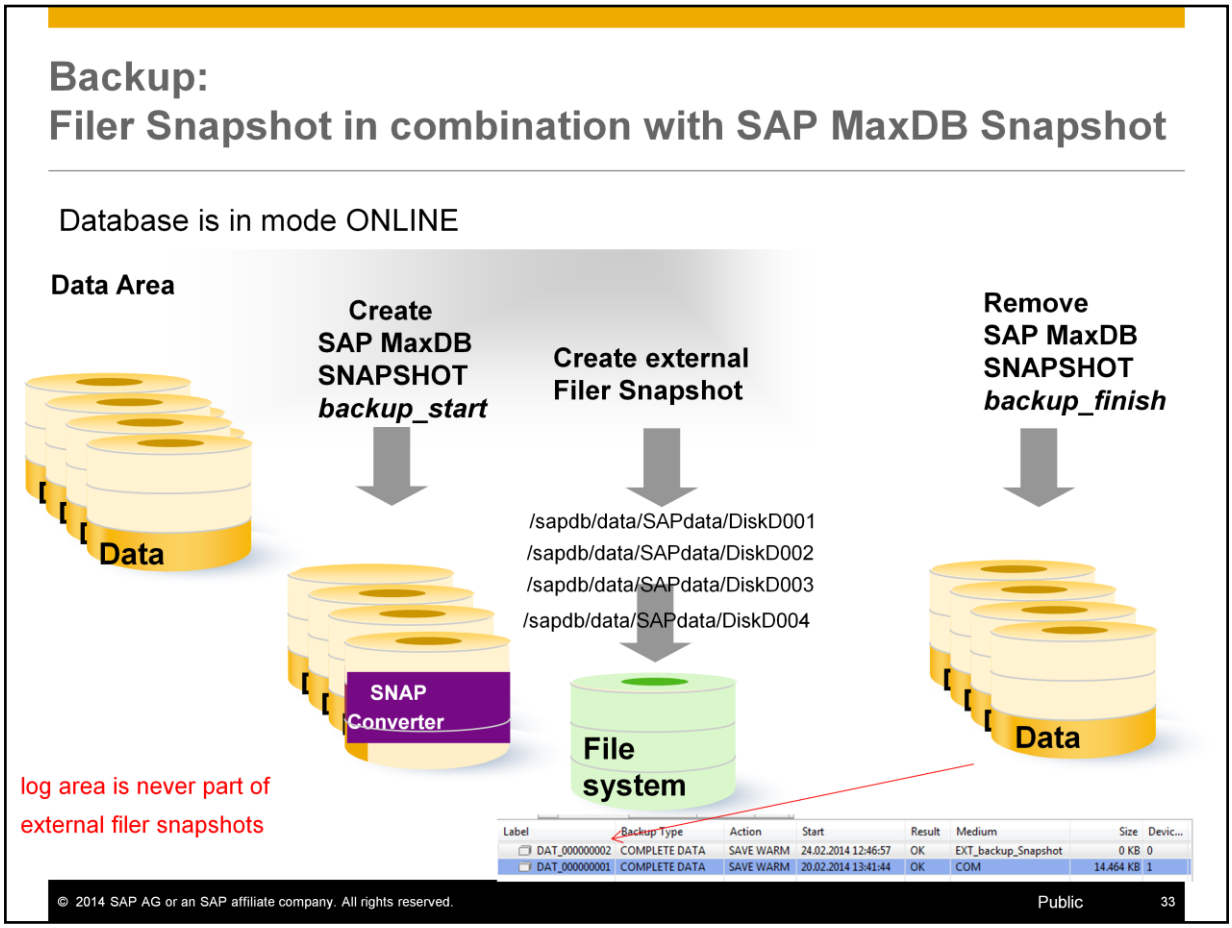
- NetWorker (NSR)
- Tivoli Storage Manager (TSM)
- Tools that support the *BACKINT for SAP MaxDB* or *BACKINT for Oracle* interface (BACK), such as:
  - HP Data Protector >6.0 supports *BACKINT for SAP MaxDB.*
  - Comvault QiNetix > 6.1 supports *BACKINT for SAP MaxDB*
  - All other external backup tools on the market must be connected using the *BACKINT for Oracle* interface, and based on our experience, these require additional adapters from their providers.

To support one of these tools, the *Device Type* of the backup template must be set to "Pipe".

Additional examples of definitions for templates in Unix and Windows:

- Windows: First tape drive: \\.\tape0
  Pipe: \\.\pipe\PipeName
- UNIX: Tape drives, for example: /dev/tape0
  Pipes: /tmp/pipe0

Template definitions are stored in the dbm.mmm file in the run directory of the database instance.

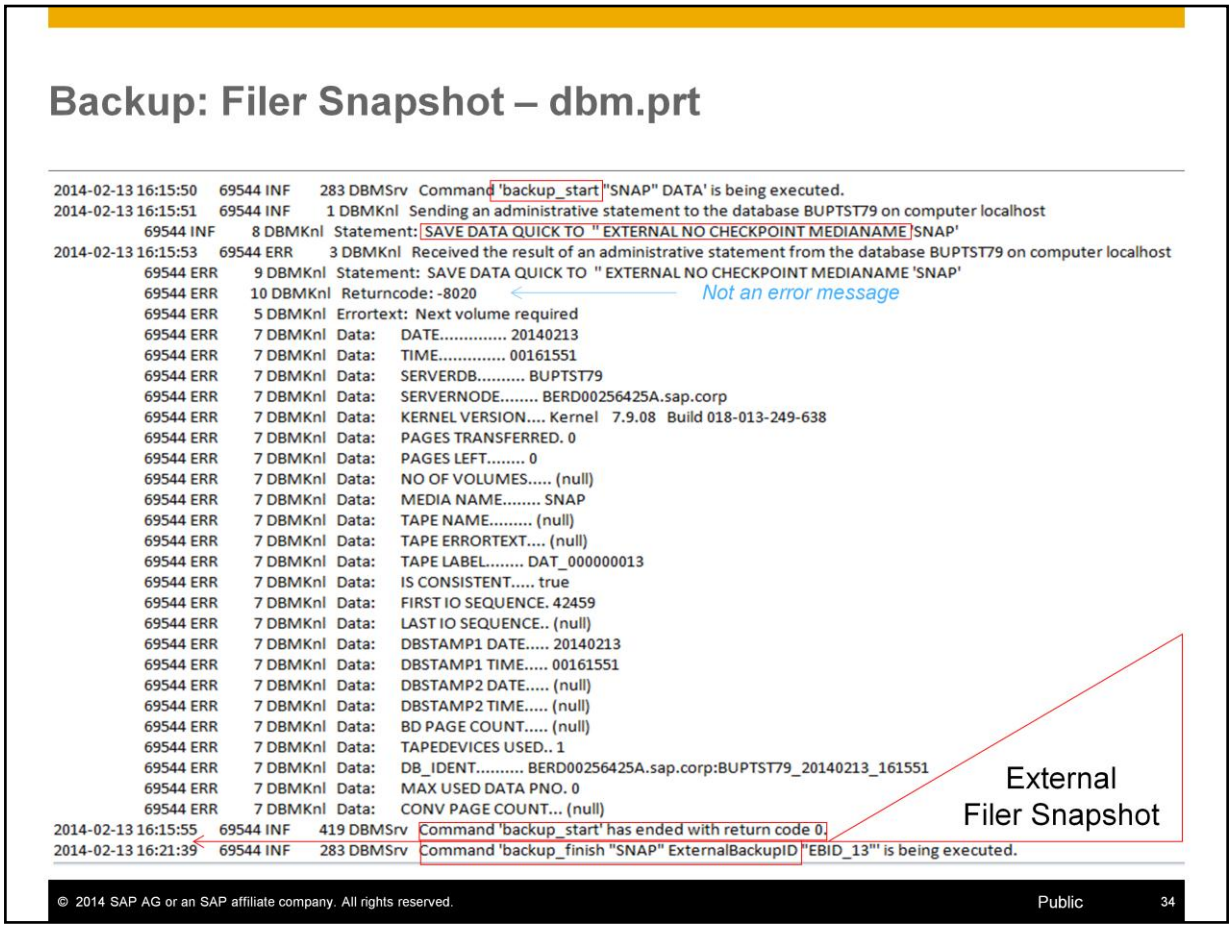



As of version 7.7 you can freeze the data area of a SAP MaxDB using internal database snapshots.

A snapshot can be created in the *ONLINE* operational state.

As of SAP MaxDB version 7.8 you can perform a complete data backup with an external file system snapshot in the operational state ONLINE in combination with a SAP MaxDB Database Snapshot.
First a SAP MaxDB (internal) Snapshot is created followed by the external file snapshot.
While this backup procedure the database is in online mode and the users can work with the application. Moreover, this procedure guarantees that this external file system backup is included in the backup history.
The Log area is never part of this backup procedure.

## Backup: Filer Snapshot – dbm.prt



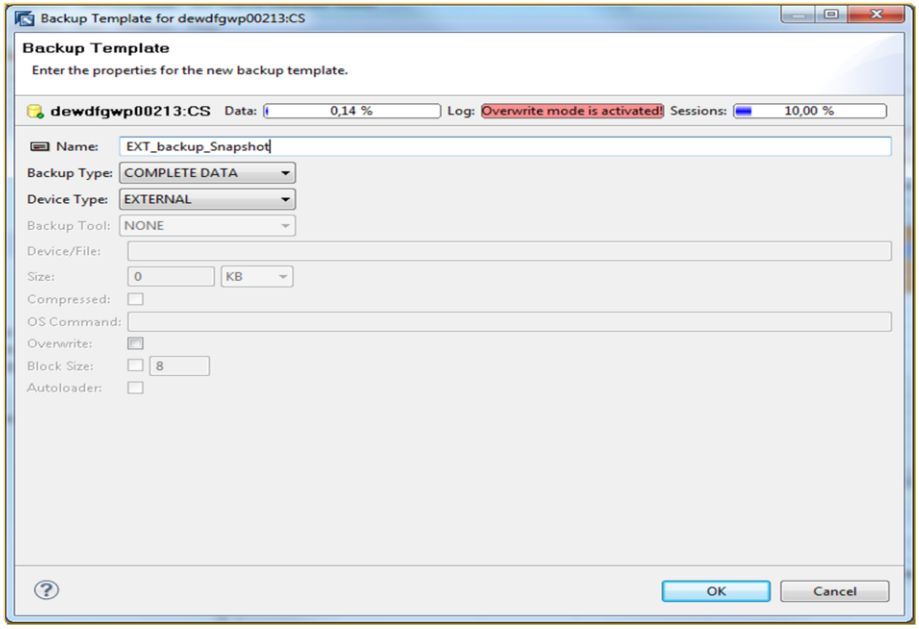

The backup procedure always starts with backup_start – on database level the converter Snapshot is created.

In response to this command, the system displays the following output:
OK
Returncode -8020
...
Max Used Data Page 0
...
The return code -8020 together with the number of maximum used data pages (Max Used Data Page), in this case 0, displays in this case that the complete data backup was successfully started.

As soon as you'll get the information backup_start has ended with return code 0 the external filer snapshot can be executed.

Note: This is not done via SAP MaxDB database Tools.
When the external filer snapshot has been created the backup_finish command sent via database tools Database Studio or DBMCLUI finished the backup process. If the backup_finish command is missing no new SAP MaxDB snapshot with ID EXTERNAL can be created.
The backup_finish command drops implicitely the internal SAP MaxDB Snapshot.

## Backup: Filer Snapshot – Create Template





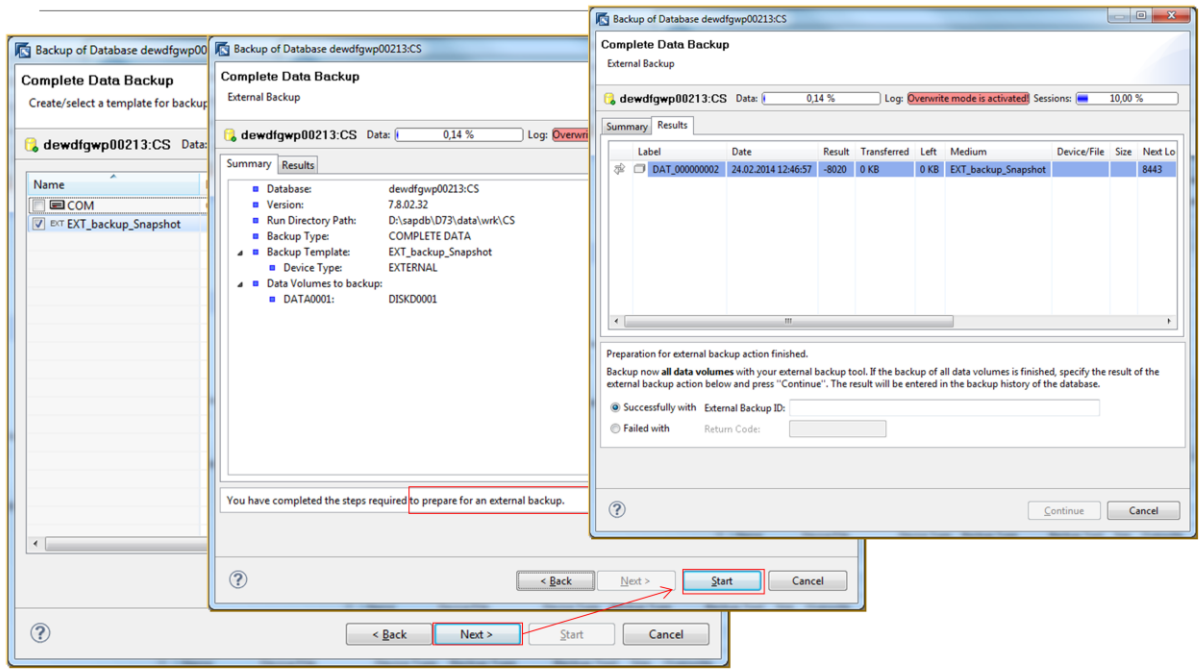


You have to create a special Backup template (<backup_template>) for this procedure:

- Backup Template:
  Database Studio: You have defined a backup template with the backup type COMPLETE DATA and the device type EXTERNAL in the Database Studio.

  DBMCLI: You have defined a backup template with the type EXTERNAL_SNAPSHOT using the following DBM command:
  backup_template_create <backup_template_name> TO EXTERNAL SNAPSHOT
  e.g. backup_template_create EXT_backup_Snapshot TO EXTERNAL SNAPSHOT

# Backup: Filer Snapshot – Database Studio







Trigger a save data with Database Studio or Dbmcli to the backup template of type EXTERNAL as first part of the backup.

- *backup_start <backup_template_name> data*

After backup_start ended with return code 0 an external file system backup (snapshot) can be executed.
Leave the DBMCLI session open. Perform your external file system backup.

When the external file system backup is complete, enter the DBM command backup_finish and specify an external backup ID (EXTERNAL BACKUP ID) chosen by yourself, as follows: *backup_finish <backup_template_name> ExternalBackupID <external_backup_ID> e.g. 11032014*

This command is the signal for the database that the complete data backup can be concluded.
A successfully concluded complete data backup is entered in the backup history. This entry contains the external backup ID that you assigned. The internal database snapshot is deleted.

# Backup Concept – Pros and Contra

| Type | Description | Pros | Cons |
|---|---|---|---|
| SAP MaxDB Backup | • Only database pages marked for backup are backed up<br>• Various page checks are performed during backup | • can be processed in parallel (scalability, speed)<br>• result can be checked, verified<br>• can be combined with incremental/log backups for recovery<br>• compression (7.8+) | • no compression in versions < 7.8 |
| SAP MaxDB + External Backup Tools | • backup via SAP MaxDB Tools to pipe(s)<br>• integration via Backup Templates | • can be processed in parallel (scalability, speed)<br>•can be combined with incremental/log backups for recovery<br>• compression (7.8+) | • no compression in versions < 7.8 |
| OS / 3rd party Filer Snapshot + SAP MaxDB Snapshot | • (example) using NetApp Filer Snapshot tech<br><br>• Restartpage + Converter are copied | • very fast<br>• integration into BackHist (7.8+) | • no MaxDB specific checking of backup<br>• no page checks |

# Backup Concept – Keep Your Backup Safe

**Do‘s and Dont‘s:**

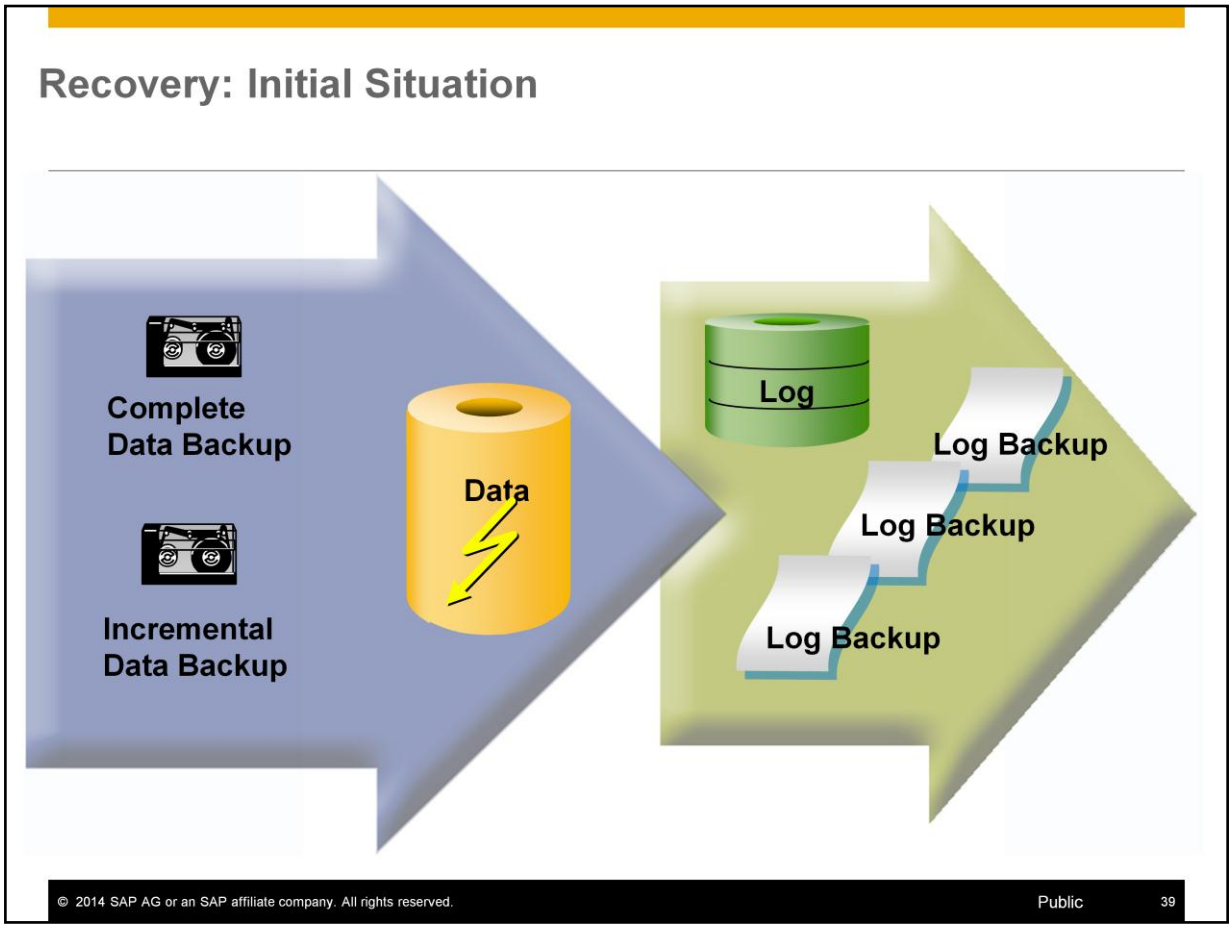
✓ Do keep your backups in a different location than the source system, at least do not store it on the same server.

✓ Do (at least occasionally) check if you can rebuild a valid system with your backups.

✓ Do mistrust your backup medium, even if it was proven to be ok - it may still have become corrupt later due to external factors.

✓ Do not rely on one single backup set - always have more than one backup generation of data backups, so that you can chose the next good backup, if your latest is faulty.

✓ Do pay attention to keep your log backups going back in time as far as the data backup you want to be able to revert back to in case of disaster. You may need it.



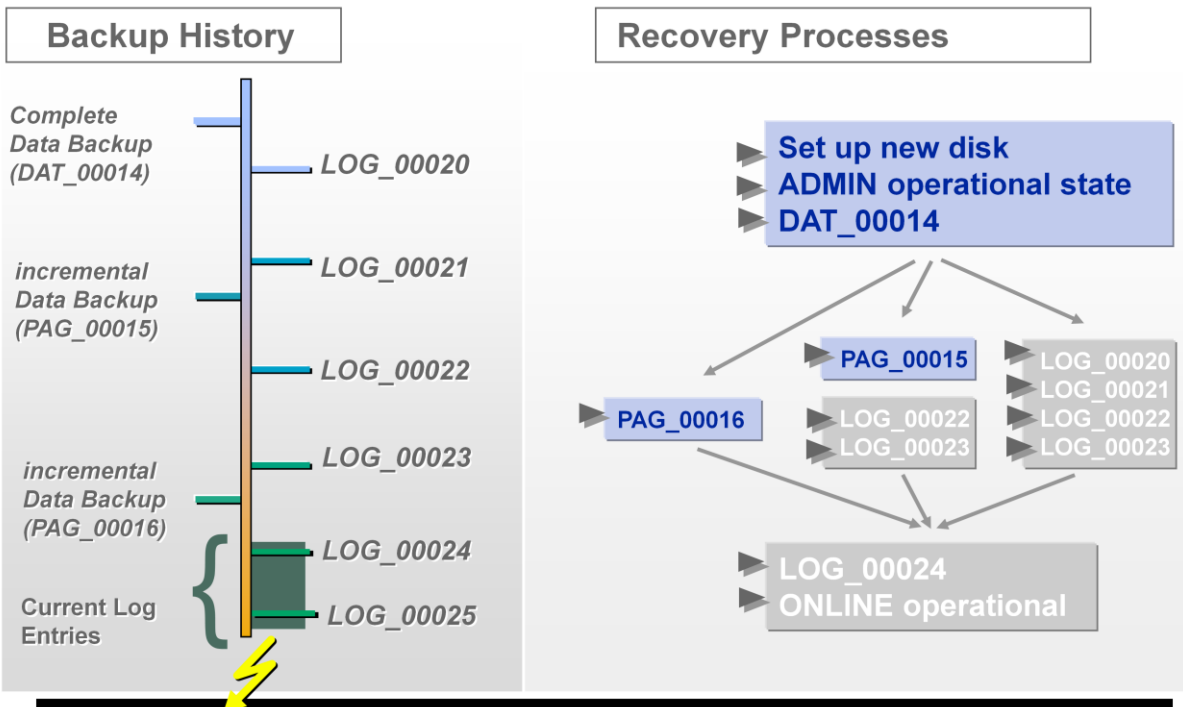

If you follow our recommendations for the disk configuration of your database instances and the backup strategy, the current log entries and at least four backup generations are always available for you to restore the content of the database instance if problems occur. It is then very unlikely that you will lose any data.

If a data volume sustains physical damage, a complete database recovery needs to be performed. This basis for this type of recovery is normally the complete and incremental data backups (not supported if you use filer snapshots) as well as log backups of the latest backup generation.

If a logical error occurs in the SAP system, making it necessary to reset the system to a previous state, you also do this by performing a database recovery using a complete data backup and then importing incremental data and log backups. The administrator can specify whether all available log information is to be recovered up to the most recent point in time possible, or only up to a specific time in the past without the most recent transactions.

To ensure you are well prepared for a recovery, we recommend that the DBAs regularly test a complete database recovery using the backups from the production system. For these tests, you require a test server comparable to the database server. This could, for example, be your quality assurance system.

## Recovery Strategy – Data Area Damaged







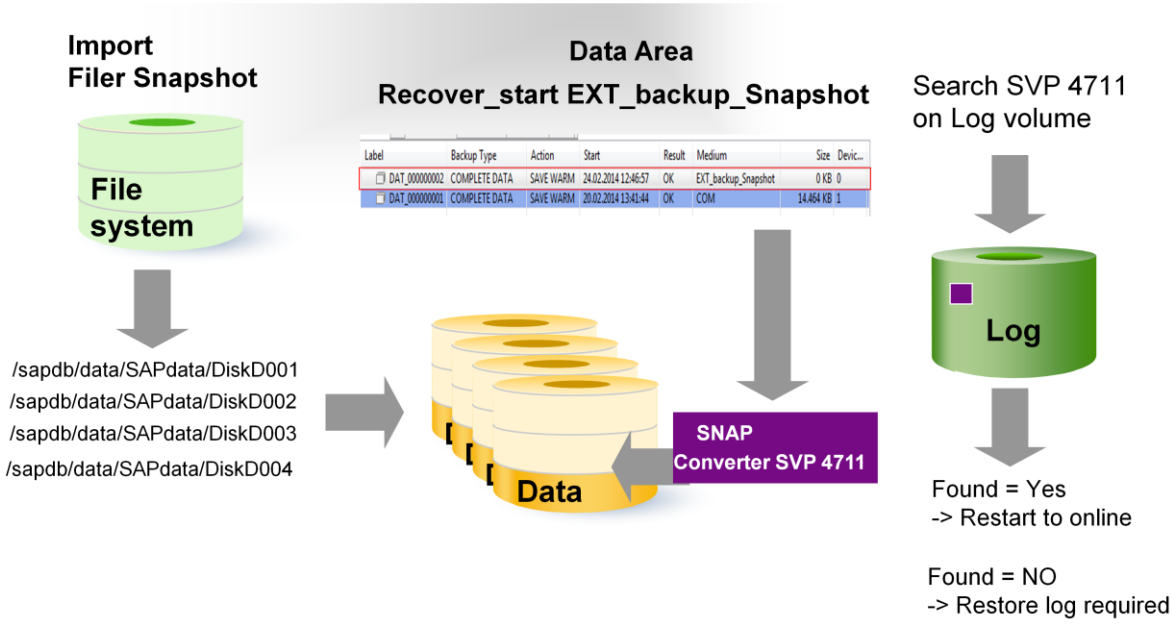
To restore the database instance after a structure or disk error, you first have to make new hard disk space available.

You can use the backup history to obtain an overview of which actions are required. Perform the recovery in the ADMIN operational state.

The first step of the recovery process is to import the most recent complete data backup.

If the information in the log area was created before the start of this data backup, the database instance can restore the most recent database state using the information from the log area immediately after the data has been imported successfully.

## Restore:
## Filer Snapshot in combination with SAP MaxDB Snapshot







Prerequisites: You have a complete data backup of the type EXTERNAL with the external backup ID you have assigned.
Start the Database Studio and log on to the database.
Check the availability of the complete data backup required for the recovery in backup history.
Import the external file system backup with operating system tools.
Set the database to the operational state ADMIN, if that has not already happened (*Administration Tasks -> Set Operational State -> Admin*).

After this has been done choose in Database Studio *Administration Tasks -> Recovery*.
The database system checks the SAP MaxDB internal snapshot which includes the savepoint number. All log information after this savepoint has to be rolled forward or rolled back. If the savepoint can be found on the log area the database system is implictely restarted into online mode. If the savepoint cannot be found on the log area you are ordered to restore a log backup.

# Restore: Filer Snapshot – dbm.prt log file

```
2013-12-13 10:50:54   34380 INF    283 DBMSrv  Command 'recover_start SNAP data ExternalBackupID EBID_10' is being executed.
2013-12-13 10:50:56   34380 INF      1 DBMKnl  Sending an administrative statement to the database BUPTST79 on computer localhost
                34380 INF      8 DBMKnl  Statement:  RESTORE data FROM '' EXTERNAL MEDIANAME 'SNAP'
2013-12-13 10:50:58   34380 INF      3 DBMKnl  Received the result of an administrative statement from the database BUPTST79 on computer localhost
                34380 INF      9 DBMKnl  Statement:  RESTORE data FROM '' EXTERNAL MEDIANAME 'SNAP'
                34380 INF     10 DBMKnl  Returncode: 0
                34380 INF      7 DBMKnl  Data:     DATE..... 20131213
                34380 INF      7 DBMKnl  Data:     TIME..... 00105057
                34380 INF      7 DBMKnl  Data:     SERVERDB..... BUPTST79
                34380 INF      7 DBMKnl  Data:     SERVERNODE..... BERD00256425A.sap.corp
                34380 INF      7 DBMKnl  Data:     KERNEL VERSION.... Kernel   7.9.08   Build 017-013-249-142
                34380 INF      7 DBMKnl  Data:     PAGES TRANSFERRED. 0
                34380 INF      7 DBMKnl  Data:     PAGES LEFT..... (null)
                34380 INF      7 DBMKnl  Data:     NO OF VOLUMES..... (null)
                34380 INF      7 DBMKnl  Data:     MEDIA NAME..... SNAP
                34380 INF      7 DBMKnl  Data:     TAPE NAME..... (null)
                34380 INF      7 DBMKnl  Data:     TAPE ERRORTEXT.... (null)
                34380 INF      7 DBMKnl  Data:     TAPE LABEL..... DAT_000000011
                34380 INF      7 DBMKnl  Data:     IS CONSISTENT..... true
                34380 INF      7 DBMKnl  Data:     FIRST IO SEQUENCE. 84661
                34380 INF      7 DBMKnl  Data:     LAST IO SEQUENCE.. (null)
                34380 INF      7 DBMKnl  Data:     DBSTAMP1 DATE..... 20131213
                34380 INF      7 DBMKnl  Data:     DBSTAMP1 TIME..... 00101624
                34380 INF      7 DBMKnl  Data:     DBSTAMP2 DATE..... (null)
                34380 INF      7 DBMKnl  Data:     DBSTAMP2 TIME..... (null)
                34380 INF      7 DBMKnl  Data:     BD PAGE COUNT..... (null)
                34380 INF      7 DBMKnl  Data:     TAPEDEVICES USED.. 0
                34380 INF      7 DBMKnl  Data:     DB_IDENT..... BERD00256425A.sap.corp:BUPTST79_20131212_165645
                34380 INF      7 DBMKnl  Data:     MAX USED DATA PNO. 107937
                34380 INF      7 DBMKnl  Data:     CONV PAGE COUNT... (null)
2013-12-13 10:51:02   34380 INF    419 DBMSrv  Command 'recover_start' has ended with return code 0.
```

# Additional Information about Backup and Recovery

**SAP Notes:**

**212394 – DBM, DBA and Domain User initial password**

**1377148 - FAQ: SAP MaxDB Backup / Recovery**

**319332 - SAP Content Server backup strategies**

**1928060 - Data backup and recovery with file system backup**

**1423732 - FAQ: SAP MaxDB Snapshots**

**869267 - FAQ: SAP MaxDB Log area**

**Online Training:**
**Session 2: Basic Administration with Database Studio**
**Session 11: SAP MaxDB Backup and Recovery**
**Session 13: Third-Party Backup Tools**

# Agenda

1. Database Administration Tools
2. Parameter Check
3. Database Software Update and Check
4. Backup / Recovery
5. Consistency Checks
6. Additional Useful Information

## Consistency Checks

- **Check Backup**

  Backups which are created with SAP MaxDB Tools can be checked.
  External filer snapshot backups cannot be checked with SAP MaxDB Software

  Log files: dbm.prt and KnlMsg* files of Service Database

- **Check Data Area**

  Checks structural consistency of the whole database. If no errors are found, „bad flags“ in the so-called filedirectory and the root page are reset.

  Log files: KnlMsg and KnlMsgArchive




SAP MaxDB supports a consistency check of backups which have been created with SAP  MaxDB Tools. SAP MaxDB does not support backup checks of external filer snapshots.

Additionally  SAP MaxDB supports a structure check of the data area. This check is called CHECK DATA (previously Verify).

## Consistency Checks: Check Backup (1)

- **Check the backup to determine whether:**

  Backup is complete
  Backup content *(Page Header)* was read correctly
  No data structure check

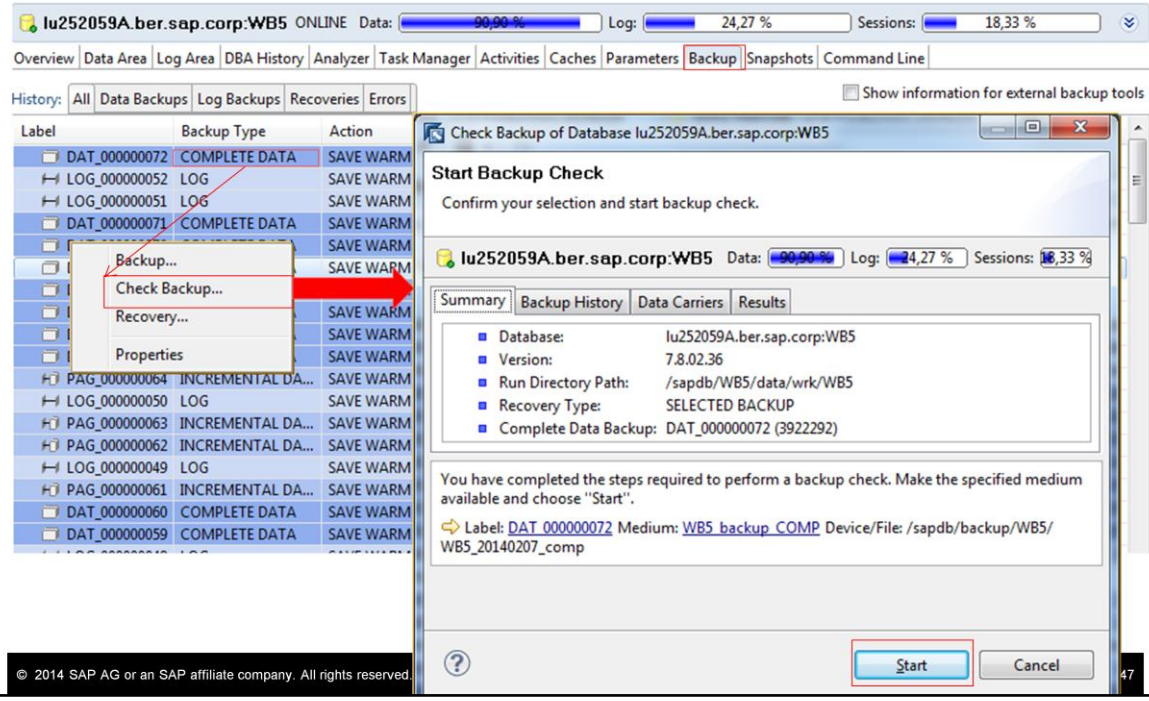
- **Using a service database:**

  Data not written to the hard disks
  Service database  does not occupy any disk space
  Possible to check parallel backups




Before you overwrite the backups of a backup generation, check whether an intact backup exists.
You can use the SAP MaxDB backup tools Database Studio, or Database Manager CLI to check whether a data or log backup can be imported and therefore, whether it can be used for a recovery. In this case, the service database (Name convention: .M<KernelVersion> ) is used to import the entire backup. The operation of the database must not be interrupted during this process.

# Consistency Checks: Check Backup (2)

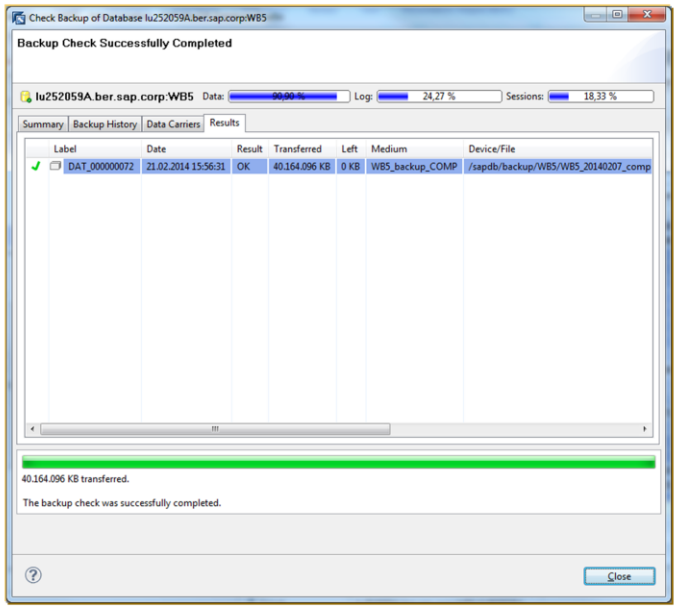



In Database Studio, you can check backups via the Backup History. Use *Administration -> Backup* mark that backup you want to check and choose *Check Backup...* from the context menu of the instance and using the *backup check Wizard* that then appears.

You can check both log and data backups.

After the backup has been checked, the results are displayed.

# Consistency Checks: Check Backup (3)







You can check in Database manager log file (dbm.prt) the return code of the backup check.

You will find more information about this in the glossary of the SAP MaxDB documentation (SAP Note 767598) in the Database Studio manual under the title "Checking Backups", as well as in the Database Manager CLI documentation under the DBM command recover_check.

## Consistency Check: Check Backup - Diagnosis Files (1)

**Database Manager** | dbm.prt | */sapdb/<SID>/data/wrk/<SID>*

```
DBMSrv   Command 'recover_check "WB5_backup_COMP" DATA' is being executed.
DBMKnl   Sending an administrative statement to the database
DBMKnl   Statement:  RESTORE DATA FROM '/sapdb/backup/WB5/WB5_20140207_comp' FILE  BLOCKSIZE 8 MEDIANAME 'WB5_backup_COMP'
DBMKnl   Received the result of an administrative statement from the database
DBMKnl   Statement:  RESTORE DATA FROM '/sapdb/backup/WB5/WB5_20140207_comp' FILE  BLOCKSIZE 8 MEDIANAME 'WB5_backup_COMP'
DBMKnl   Returncode: 0
DBMKnl   Data:       DATE.............. 20140221
DBMKnl   Data:       TIME.............. 00155631
DBMKnl   Data:       SERVERDB.......... WB5
DBMKnl   Data:       SERVERNODE........ lu252059a
DBMKnl   Data:       KERNEL VERSION.... Kernel    7.8.02   Build 036-111-248-229
DBMKnl   Data:       PAGES TRANSFERRED. 5020512
DBMKnl   Data:       PAGES LEFT........ 0
DBMKnl   Data:       NO OF VOLUMES..... 1
DBMKnl   Data:       MEDIA NAME........ WB5_backup_COMP
DBMKnl   Data:       TAPE NAME......... /sapdb/backup/WB5/WB5_20140207_comp
DBMKnl   Data:       TAPE ERRORTEXT.... (null)
DBMKnl   Data:       TAPE LABEL........ DAT_000000072
DBMKnl   Data:       IS CONSISTENT..... true
DBMKnl   Data:       FIRST IO SEQUENCE. 3922292
DBMKnl   Data:       LAST IO SEQUENCE.. (null)
DBMKnl   Data:       DBSTAMP1 DATE..... 20140207
DBMKnl   Data:       DBSTAMP1 TIME..... 00094151
DBMKnl   Data:       DBSTAMP2 DATE..... (null)
DBMKnl   Data:       DBSTAMP2 TIME..... (null)
DBMKnl   Data:       BD PAGE COUNT..... 5020388
DBMKnl   Data:       TAPEDEVICES USED.. 1
DBMKnl   Data:       DB_IDENT.......... lu252059a:WB5_20130114_113918
DBMKnl   Data:       MAX USED DATA PNO. 0
DBMKnl   Data:       CONV PAGE COUNT... 2707
DBMSrv   Command 'recover_check' has ended with return code 0.
```




In dbm.prt of the Content Server database you'll find the log information and result of your check backup.
If recover_check ends with return code 0 no errors were detected during check backup.

**If return code is not equal 0 errors were detected during check backup which are logged in the KnlMsg* files of the service database .M<version>!**

## Consistency Check: Check Backup - Diagnosis Files (2)

| Backup History | dbm.knl<br>*/sapdb/<SID>/data/wrk/.M<version>* |
|---|---|

Note: check backup is not logged in the backup history of your content server database, but in the backup history of the service database *.M<version>*

```
lu252059a:wb5adm 61> pwd
/sapdb/WB5/data/wrk/.M780236
lu252059a:wb5adm 62> ls -ltr dbm*
-rw-rw---- 1 sdb sdba 1164 21. Feb 15:56 dbm.mdf
-rw-rw---- 1 sdb sdba  849 21. Feb 15:59 dbm.knl
lu252059a:wb5adm 63>
```

```
lu252059a:wb5adm 70> vi dbm.knl
53071B500007|DAT_000000072|RESTORE  |2014-02-07 09:41:51|2014-02-07 09:41:51|2014-02-21 10:24:32|2014-02-21 10:27:34|   3922292|          |NO |W
B5_backup_COMP                                          |   5020512|         1|         0|                                          |
53075FFE0007|DAT_000000072|RESTORE  |2014-02-07 09:41:51|2014-02-07 09:41:51|2014-02-21 15:17:34|2014-02-21 15:20:39|   3922292|          |NO |W
B5_backup_COMP                                          |   5020512|         1|         0|                                          |
5307691F0007|DAT_000000072|RESTORE  |2014-02-07 09:41:51|2014-02-07 09:41:51|2014-02-21 15:56:31|2014-02-21 15:59:36|   3922292|          |NO |W
B5_backup_COMP                                          |   5020512|         1|         0|                                          |
~
~
```




You won‘t find any entries about Check Backup in Backup history file of the content server database, but in the backup history of the service database called *.M<Version>* e.g .M780236

These service database cannot be integrated into the Database Studio.

You can check the backup history on file system level in the work directory of the service database.
E.g. */sapdb/SDB/data/wrk/.M780236*

## Consistency Check: Check Backup - Diagnosis Files (3)

**SAP MaxDB Kernel**

knlMsg */sapdb/<SID>/data/wrk/.M<version>*
knlMsg.old
knlMsgArchive

```
lu252059a:wb5adm 56> pwd
/sapdb/WB5/data/wrk/.M780236
lu252059a:wb5adm 57> ls -ltr Knl*
-rw-rw-rw- 1 sdb sdba 10909639 21. Feb 15:20 KnlMsg.old
-rw-rw-rw- 1 sdb sdba    12917 21. Feb 15:59 KnlMsgArchive
-rw-rw-rw- 1 sdb sdba 10909639 21. Feb 15:59 KnlMsg
lu252059a:wb5adm 58>
```

```
Thread     0x6C71 Task     28  2014-02-21 15:58:51     RESTORE    52024:  3694800 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C71 Task     28  2014-02-21 15:58:56     RESTORE    52024:  3828600 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C71 Task     28  2014-02-21 15:59:01     RESTORE    52024:  3970600 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C75 Task     14  2014-02-21 15:59:02     CONNECT    12633:  Connect req. (.M780236, T14, connection obj.
 0x80078f9d8, Node:'lu252059a', PID: 27768)
Thread     0x6C75 Task     14  2014-02-21 15:59:02     CONNECT    12677:  Client has released connection, T14
Thread     0x6C75 Task     14  2014-02-21 15:59:02     CONNECT    12651:  Connection released (.M780236, T14, connecti
on obj. 80078f9d8)
Thread     0x6C71 Task     28  2014-02-21 15:59:06     RESTORE    52024:  4118000 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C71 Task     28  2014-02-21 15:59:11     RESTORE    52024:  4244000 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C75 Task     14  2014-02-21 15:59:15     CONNECT    12633:  Connect req. (.M780236, T14, connection obj.
 0x80078f9d8, Node:'lu252059a', PID: 27768)
Thread     0x6C75 Task     14  2014-02-21 15:59:15     CONNECT    12677:  Client has released connection, T14
Thread     0x6C75 Task     14  2014-02-21 15:59:15     CONNECT    12651:  Connection released (.M780236, T14, connecti
on obj. 80078f9d8)
Thread     0x6C71 Task     28  2014-02-21 15:59:16     RESTORE    52024:  4387800 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C71 Task     28  2014-02-21 15:59:21     RESTORE    52024:  4537000 pages <- "WB5/WB5_20140207_comp"
Thread     0x6C71 Task     28  2014-02-21 15:59:26     RESTORE    52024:  4661200 pages <- "WB5/WB5_20140207_comp"
```




You won‘t find any kernel messages (warnings, errors, info) about check backup in Knlmsg.* files of the local database , but in the log files of the service database .M<Version>

This service database cannot be integrated into the Database Studio.

If check backup ends with an return code not equal 0 (see dbm.prt of your local database), you have to convert the knlmsg* files of the service database as follows:
cd /sapdb/<SID>/data/wrk/.M<version>
protconv –o <output file name> KnlMsg

## Consistency Check: Check Data – Precondition

**Your Content Server must have one of the following SAP MaxDB Software version as minimum – then you can execute check data**

**7.3: 7.3.00 >= 61**

**7.5: 7.5.00 >= 45**

**7.6: 7.6. >= 04.02**

**7.7: 7.7. >= 03.15**

**7.8: 7.8. >= 02.00**

**Check Data** checks the structural consistency of the entire database.

**Check Data** does not repair any inconsistencies !




If your Content Server is running with a lower SAP MaxDB version than listed in this slide, upgrade the database to a version in which a "Check Data" can be executed.

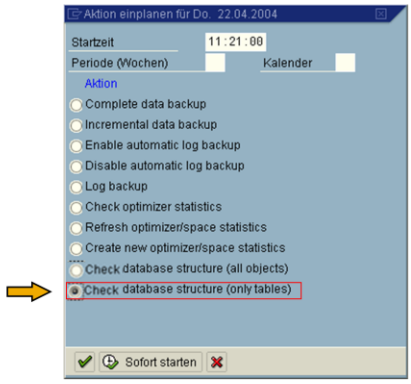
**Check Data** checks the structural consistency of the entire database. It considers tables as well as indexes and LOB columns.
The semantics of the data model is not taken into account. Logical errors are not found, but only errors caused by hardware defects.

Every page contains a header and trailer number at the beginning and end. With each read-I/O the values stored on the page are checked. If the header value at the beginning and trailer info at the end are different, there is an error.

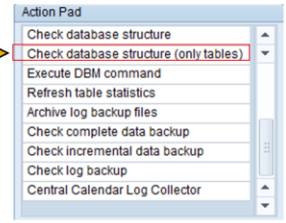
One typical error that may be detected is BAD DATA PAGE.
If errors are detected during Check data in most cases a hardware problem had caused the inconsistency.
If errors are detected and the corrupted object is a table then a recovery of the complete database is necessary to remove the inconsistency.

## Consistency Check: Check Data – DBACOCKPIT/dbmcli

Transaction DBACockpit
Planning Calendar




DBMCLI db_execute CHECK DATA







The structural consistency of the database can be checked in different ways.

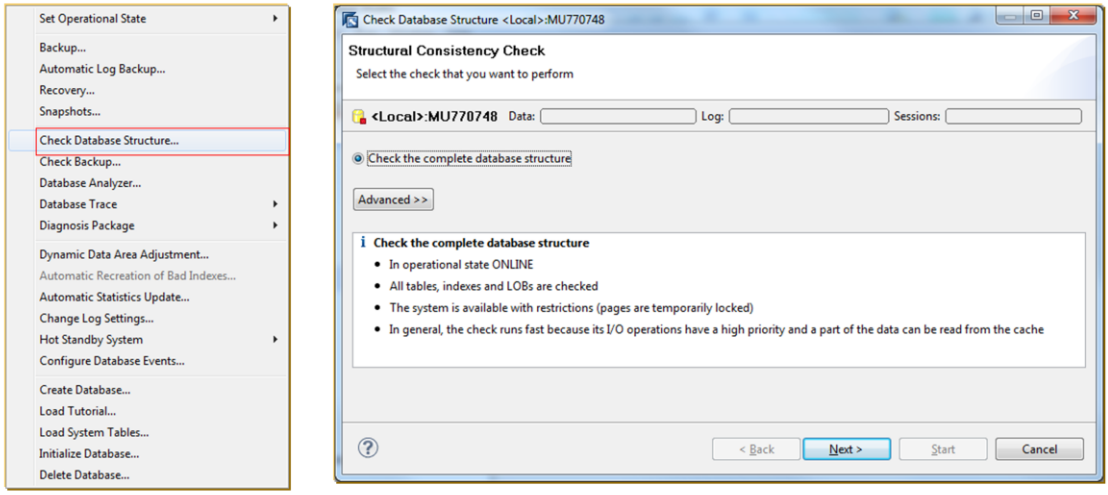
If you choose **'*Check database structure (all objects)*'** transaction DBAcockpit , all B* trees, including indexes, are checked. ***‚Check database structure (only tables)'*** checks only the tables (which is recommended for Content Server)

You can also start consistency checks with the dbmcli:
- dbmcli > db_execute check data (checks all tables and indexes)

- dbmcli > db_execute check table <owner>.<tablename> (selection of a table)

## Consistency Check: Check Data – Database Studio

Database Studio







In Database Studio choose ***‚Check Database Structure‘*** in the context menu of the database. There are different choices.

A consistency check can be executed in different operational states of the database. In ONLINE state the structural consistency of all tables, indexes and LOB columns is checked. In ADMIN mode additionally the converter is updated; pages with no more references are deleted.

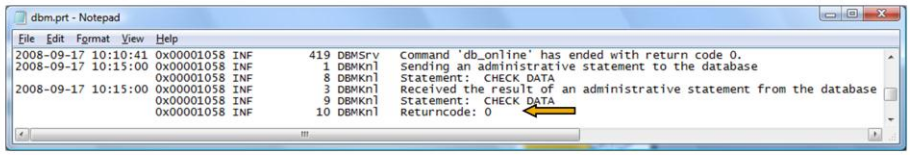
The check can be restricted to one table.

A check of the database structure is time-consuming and CPU-intensive. For a productive system the check should be planned for times of low workload (f.e. on weekends) or if possible, the check should be done on a separate system copy.

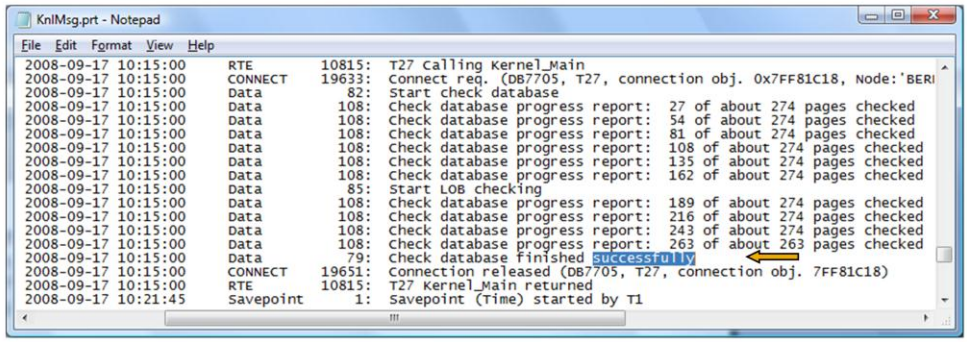
# Consistency Check: Check Data – Check Results (1)

dbm.prt

2008-09-17 10:15:00 0x000009c0 0 DBM command db_execute CHECK DATA




KnlMsg



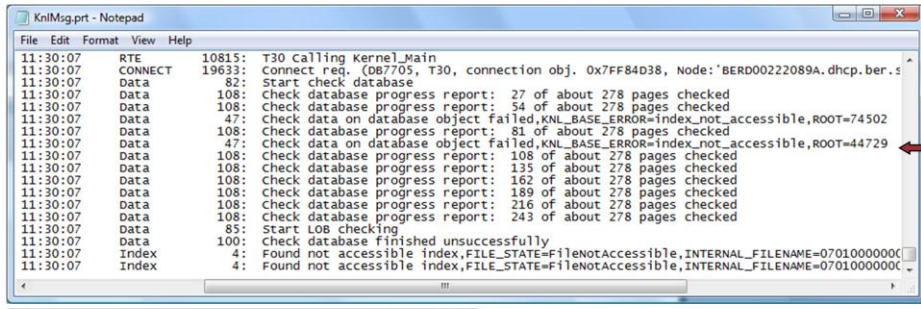

 Public 55

The successful end of CHECK DATA can be checked in ***dbm.prt*** or in file ***KnlMsg (knldiag).***

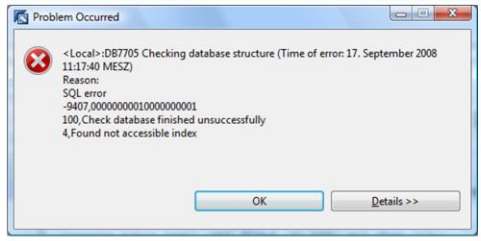
If in ***dbm.prt*** a returncode 0 is delivered the CHECK DATA was successful. In the ***KnlMsg*** at the end of the progress report a success message is written.

## Consistency Check: Check Data – Check Results (2)

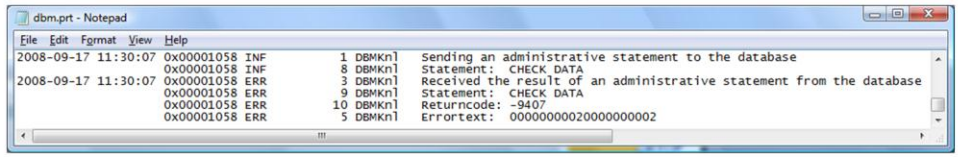
KnlMsg




Popup




dbm.prt







If in ***dbm.prt*** a returncode unequal to 0 is logged (in this case: -9407), there is an error situation and the defective data object has to be found out. The roots of the defective B* trees are listed in ***KnlMsg***.

At the end of CHECK DATA Database Studio opens a popup showing the first errror that occurred. Information about further errors has to be gathered from the diagnosis files ( KnlMsg / KnlmsgArchive).

If you have executed the Check Data via transaction DBACockpit the action is marked in red in the DBA Planning calendar.

# Consistency Check: Summary

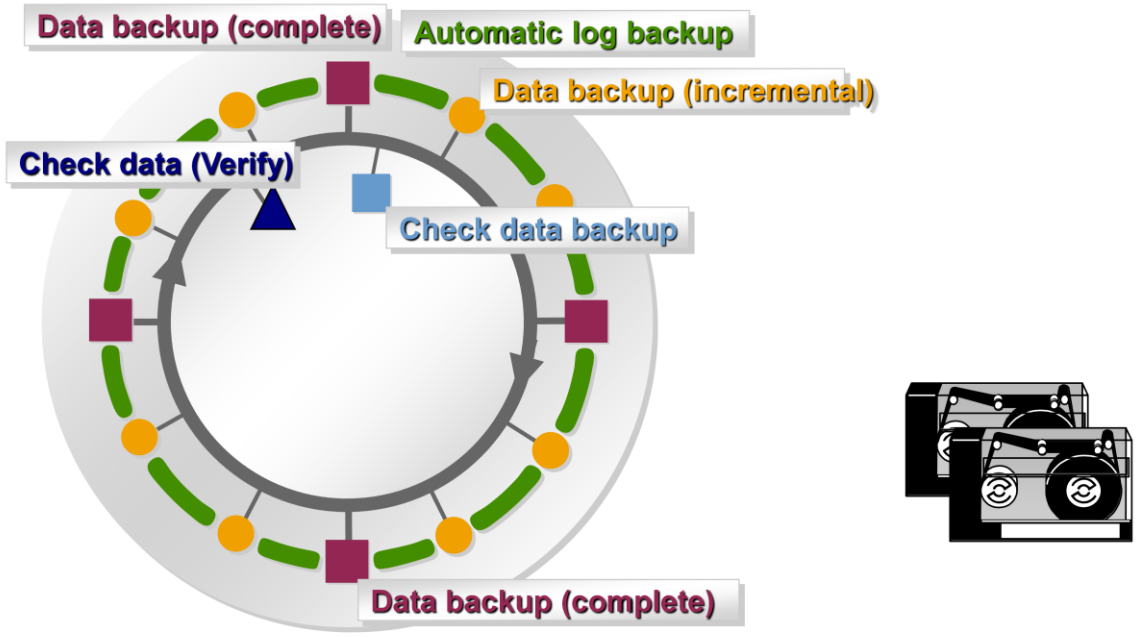
| Operation | Performed Integrity Checks | Pros | Cons |
|---|---|---|---|
| **Backup** | • Accesses all pages that are 'marked for backup' and writes them to backup medium.<br>• Performs the following checks on page access: Page-Number, Header-Trailer, Page-Type, Checksum | • ‚free' check on top of usual backup cycle.<br>• no additional performance impact | • We have to rely on the I/O system to judge if the write call was ok.<br>• Only page level checks, but no B*Tree analysis like following pointers to neighbour pages. |
| **Check Backup** | • Uses own service database reading each page to /dev/null<br>• Performs the following checks on page access: same as above plus 'total page count'. | • Verifies backups without needing a full DB instance.<br>• no data cache used | • Only page level checks, but no B*Tree analysis like following pointers to neighbour pages. |
| **Check Data Variants** | • Offers various checks ranging from complete database structure to single tables/indexes.<br>• Thorough B*Tree checks | • Complete B*Tree consistency check (neighbours, root page)<br>• Extended page level check also verifies ‚key-order' on page. | • possible performance impact (depending on check variant: I/O and/or partial table locks). |

# Consistency Check: What Makes Check Data so Important

| Operation | Do not rely on only Backups and/or , Check Backup'! | |
|---|---|---|
| **Backup** | • A successful backup cannot substitute a complete data check! | • regular check data operations are a requirement to ensure data integrity. |
| **Check Backup** | • A successful 'recover check' cannot substitute a complete data check! | • regular check data operations are a requirement to ensure data integrity. |

| What you need Check Data for: |
|---|
| • **Not all page corruptions can be detected by backup or recoveries.** |
| • **Imagine your database is corrupt and you have never performed a check data – which backup could you trust for recovery? In a worst case scenario, all of your available backups would include the page defect!** |
| • **If all available backups include the page defect, you will likely have lost some of your data.** |

## Exemplary Backup & Check Strategy







To ensure data security, it is necessary to perform data and log backups at appropriate intervals. We recommend that you perform:

- A complete data backup (of all data) at least once a week or, if possible, daily
- An incremental data backup (of individual pages) after more extensive system activities during the week
- Log backups at least daily, ideally using the automatic log backup function

This creates four backup generations in a 28-day cycle. The backup media can then be reused.

- Before reusing backup media, you must perform a consistency check (using *Check Data (VERIFY)*) of the database at least once within the backup cycle. This ensures that the database is physically consistent and it is safe to overwrite these tapes.
- At the beginning of each backup cycle, you must also check whether the complete data backups can be read (see "Checking Backups") to ensure that the backup concept is working as expected.
- If you want to use snapshots of the file system as a substitute for a backup of the database, you must check more often whether the system is consistent using the *Check Data* function. Do this at least once a week (based on the complete backup in the example above, once a week).

# Agenda

1. Database Administration Tools
2. Parameter Check
3. Database Software Update and Check
4. Backup / Recovery
5. Consistency Checks
6. Additional Useful Information

# 6. Additional Useful Information – SAP Notes

- 1464618 FAQ: SAP MaxDB Database Studio
- 1020175 FAQ: SAP MaxDB installation, upgrade or applying a patch
- 1377148 FAQ: SAP MaxDB Backup / Recovery
- 940420 FAQ: Database structure check (CHECK DATA/VERIFY)

- 1097311 SAP MaxDB Database Studio installation
- 1111426 Parameter check for liveCache/MaxDB instances
- 1672252 SAP MaxDB Software Download (SWDC)
- 498036 Overview note: Installing SAP MaxDB/liveCache versions
- 1928060 Data backup and recovery with file systen backup
- 852168 Content Server: Caution with VERIFY/CHECK DATA

# 6. Additional Useful Information – Expert Sessions

- Session 2: Basic Administration with Database Studio
- Session 5: SAP MaxDB Data Integrity I
- Session 7: SAP MaxDB Software Update Basics
- Session 11: SAP MaxDB Backup and Recovery
- Session 13: Third-Party Backup Tools
- Session 23: SAP MaxDB & SAP Content Server Architecture

http://maxdb.sap.com/training/

# Questions

SAP® MaxDB™ Content Server – Housekeeping Activities

# SAP® MaxDB™ – Expert Sessions Learning Map (1)

| SAP® MaxDB ™ Features | SAP® MaxDB ™ Administration | SAP® MaxDB ™ Problem Analysis |
|---|---|---|
| Session 1: Low TCO with the SAP MaxDB Database | Session 2: Basic Administration with Database Studio | Session 5: SAP MaxDB Data Integrity |
| Session 6: New Features in SAP MaxDB Version 7.7 | Session 3: CCMS Integration into the SAP System | Session 14: SAP MaxDB Tracing |
| Session 8: New Features in SAP MaxDB Version 7.8 | Session 11: SAP MaxDB Backup and Recovery | Session 12: Analysis of SQL Locking Situations |
| | Session 13: Third-Party Backup Tools | |
| | Session 19: SAP MaxDB Kernel Parameter Handling | |

| SAP® MaxDB ™ Installation/Upgrade |
|---|
| Session 7: SAP MaxDB Software Update Basics |

All Expert Sessions (recording and slides) are available for download
http://maxdb.sap.com/training/

# SAP® MaxDB™ – Expert Sessions Learning Map (2)

| SAP® MaxDB™ Architecture | SAP® MaxDB ™ Performance | SAP® MaxDB ™ & Content Server |
|---|---|---|
| Session 18: Introduction MaxDB Database Architecture | Session 4: Performance Optimization with SAP MaxDB | Session 23: SAP MaxDB & Content Server Architecture |
| Session 15: SAP MaxDB No-Reorganization Principle | Session 9: SAP MaxDB Optimized for SAP BW | Session 24: SAP MaxDB & Content Server Housekeeping |
| Session 17: SAP MaxDB Shadow Page Algorithm | Session 16: SAP MaxDB SQL Query Optimization (Part 1) | |
| Session 12: Analysis of SQL Locking Situations | Session 16: SAP MaxDB SQL Query Optimization (Part 2) | |
| Session 10: SAP MaxDB Logging | Session 22: SAP MaxDB Database Analyzer | |
| Session 20: SAP MaxDB Remote SQL Server | | |
| Session 21: SAP MaxDB DBM Server | | |

All Expert Sessions (recording and slides) are available for download
http://maxdb.sap.com/training/

# Thank You!
# Bye, Bye – And Remember Next Session

| | |
|---|---|
| | |
| | **Feedback and further information:**<br>http://www.scn.sap.com/irj/sdn/maxdb |
| | |
| | **Next Session: March 18, 2014**<br>**SAP MaxDB & Content Server - ODBC Driver** |
| | **Registration:**<br><br>**S-User:** https://websmp204.sap-ag.de/~sapidb/011000358700001169732013E<br><br>**Non-S-User:** 2014_03_18_SAP_MaxDB_ODBC_Driver_09CET_EN - Adobe Connect |

# Thank you

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