

2375865 - SAP HANA Dynamic Tiering 2.0: Backup and Recovery Functional Restrictions

Component: HAN-DYT (SAP HANA Dynamic Tiering), Version: 28, Released On: 24.05.2019

Symptom

You want to learn about functional restrictions and differences with SAP HANA backup and recovery functionality when SAP HANA dynamic tiering is in your landscape.

Other Terms

dynamic tiering

extended storage

Solution

Be aware of the following backup/recovery functional restrictions:

Recovery Functional Restrictions:

1. Recovery: Dynamic Tiering can Only Change Encryption State Using Recovery from a Full Backup, not from a Point-in-Time Recovery

You cannot change the encryption state when recovering using a point-in-time (PIT) recovery. In addition, an encryption state change on a full backup can only be performed on backups taken on dynamic tiering version 2.0 SP 00 or later.

Applies to:

- SAP HANA dynamic tiering 2.0 (all SPs and revisions).

2. Recovery: Point-in-Time Recovery to a system with data volume encryption enabled after Recovery from a Full Backup

If recovery from a Full Backup is performed on a system with data volume encryption enabled, recovery to a point in time cannot be performed using the same backup. Attempting to do so will break business continuity.

Solution:

You must take a new full data backup and use this new backup for all future point-in-time recoveries.

Applies to:

- SAP HANA dynamic tiering 2.0 (all SPs and revisions).

3. Recovery: CREATE/DROP EXTENDED STORAGE Breaks Business Continuity

Creating or dropping extended storage between a full data backup and recovery breaks business continuity. You must take a new full data backup.

Symptom:

You create or drop extended storage between a full data backup and recovery. The recovery attempt fails. For example:

1. You take a full data backup.
2. You take any number of log backups, or delta backups.
3. You drop extended storage.
4. You take any number of log backups, or delta backups.
5. You attempt to recover the database. The recovery fails.

Solution:

Perform a full data backup **after** you create or drop extended storage. Use this backup for all future point-in-time recoveries.

If you attempt recovery from a backup taken before you issued the CREATE EXTENDED STORAGE statement, then you must clean up ES persistency manually after recovery, or else future CREATE EXTENDED STORAGE statements will fail.

Applies to:

- SAP HANA dynamic tiering 2.0 (all SPs and revisions).

4. RECOVERY: Recovery failure when using BACKUP prefix in certain revisions of HANA 2.0 SPS 02

DATA recovery on a system with dynamic tiering when the **USING BACKUP_ID** clause is used fails with the following error:

```
2017-10-26T01:53:56-04:00 P069733 15f573e1e97 ERROR RECOVERY RECOVER DATA finished with error: [449]
recovery strategy could not be determined, [111014] The backup with backup id '1024' cannot be used for recovery
```

Solution:

Use the backup prefix used when creating the backup to recover with a SQL such as: **recover data for <SID> using file(' <backup file prefix')**

Applies to:

- SAP HANA dynamic tiering 2.0 SP 02 (Revisions 020 - 022). (Fixed in revision 023.)
- (Does not apply to SAP HANA dynamic tiering 2.0 SP 03 or later.)

5. RECOVERY: Point-in-Time Recovery after Upgrading the Database

To recover to a point in time after upgrading the database, recover using a backup taken after upgrade.

For example, use the full backup that you took immediately after upgrade, as recommended in [Post Update Tasks](#) in the *SAP HANA Dynamic Tiering: Installation and Update Guide*.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00 (all revisions).
- (Fixed in SP 01. Does not apply to SAP HANA dynamic tiering 2.0 SP 01 revisions 010 and later.)

6. RECOVERY: ES Data and Log Directory are not Cleaned-up and may Contain Pre-Existing dbfiles from Extended Storage

Symptom:

When a recovery is performed, the ES data and log directory may already contain pre-existing database files (dbfiles) from extended storage, and these files may already have been configured on the instance before the recovery. In scenarios where backups from one system are recovered on a different system, the restored files will retain their old names from the source system. This results in both the new and the old ES data files coexisting in the same ES data directory – and this can lead to out-of-space scenarios if the file system does not have enough space to accommodate all files. For large systems, this can cause unnecessary usage of disk space, and may lead to recovery failures if there is not enough space to hold both old and new database files.

Solution:

Manually delete all files from ES data and log directories before performing a recovery. This will prevent old and new ES data files from coexisting in the same ES data directory.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00, SP 01 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 02 (Fixed in Revision 24.06 onwards).
- SAP HANA dynamic tiering 2.0 SP 03 (Fixed in Revision 33 onwards).

7. RECOVERY: Security Issue – Restoring with Change in Encryption Status

Symptom:

When a complete data backup is used to recover into a system where the encryption key is changed – either while recovering into a system where the volume encryption setting is turned **ON**, or while moving from an encryption-enabled system to a system where volume encryption is turned **OFF** – using the same data backup for a future point-in-time-recovery (PITR) does not work. The issue is caused due to incorrect encryption keys being in use for decrypting log backups – and since the keys used for decrypting these log backups are different from the keys used for the data backup, errors are encountered that render the log backup files invalid.

Example: The following error is reported when a PITR is attempted in such cases:

```
“Can't use log file "/usr/sap/H11/HDB11/ld2799/trace/DB_H11/tmp_000004/tmp_000005" since it is shorter than expected.”
```

Solution:

Take a full data backup each time you execute a RECOVER DATA operation, since it changes the volume encryption state.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00, SP 01 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 02 (Fixed in Revision 24.06 onwards).
- SAP HANA dynamic tiering 2.0 SP 03 (Fixed in Revision 33 onwards).

BACKINT Functional Restrictions:**1. BACKINT: Grouping of Backint-Based Backups not Supported**

In SAP HANA 2.0, Backint-based backups can be grouped. Grouping is not supported in dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 (all SPs and revisions).

2. BACKINT: Backup to Multiple Pipes not Supported

SAP HANA supports Backint-based backup to multiple pipes. This is not supported by dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00 (all revisions)
- SAP HANA dynamic tiering 2.0 SP 01 (all revisions)
- SAP HANA dynamic tiering 2.0 SP 02 (all revisions)
- (Fixed in SP 03. Does not apply to SAP HANA dynamic tiering 2.0 SP 03 and later.)

3. BACKINT: Timeout Differences In Dynamic Tiering compared to other SAP HANA Services

In certain revisions, dynamic tiering handles third party backup tool ('hdbbackint') calls differently compared to other HANA services:

- Dynamic tiering waits for 1 minute for the BACKINT provider to open the read-end of the pipe. Other HANA services wait for the **backup/backint_response_timeout_parameter** in **global.ini**, which defaults to 10 minutes. This means dynamic tiering waits for a shorter amount of time before calling a connection error.
- If the third party does not open the pipe within this 1 minute window, but connects shortly afterward, there's a possibility the BACKINT process will continue listening after dynamic tiering has timed out. In such a situation, the BACKINT process appears to hang. Other HANA services terminate the hdbbackint process, avoiding such a hang.

Example esserver.out file output showing dynamic tiering calling a connection error:

```
Jan 12 18:05:50 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:05:50.253737 i esserver
UNKNOWN(o) : Pipe /usr/sap/Q3H/SYS/global/hdb/backint/DB_Q3H/log_backup_1024_20180111_232300094
OpenDevice mode 1
```

```
Jan 12 18:05:50 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:05:50.255401 i esserver
UNKNOWN(o) : Opening of Pipe
/usr/sap/Q3H/SYS/global/hdb/backint/DB_Q3H/log_backup_1024_20180111_232300094, failed with errno 6, retrying
```

```
Jan 12 18:06:49 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:06:49.289375 i esserver
UNKNOWN(o) : Previous message repeated 59 times
```

```
Jan 12 18:06:49 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:06:49.289490 i esserver
UNKNOWN(o) : Failed to open pipe
/usr/sap/Q3H/SYS/global/hdb/backint/DB_Q3H/log_backup_1024_20180111_232300094 during BACKUP using
BACKINT No such device or address
```

```
Jan 12 18:06:49 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:06:49.296472 i esserver
UNKNOWN(o) : Starting checkpoint of "Q3H" (Q3H.db) at Fri Jan 12 2018 18:06
```

```
Jan 12 18:06:49 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:06:49.489627 i esserver
UNKNOWN(o) : Finished checkpoint of "Q3H" (Q3H.db) at Fri Jan 12 2018 18:06
```

```
Jan 12 18:06:49 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:06:49.508502 i esserver
UNKNOWN(o) : Handler for event 'EV_PointInTimeRecoveryBackup' caused SQLSTATE '08W46'
```

```
Jan 12 18:06:49 snelnxz77 SQLAnywhere(esq3h00): [00000]{0000000000}[-1/-1] 2018-01-12 18:06:49.508605 i esserver
UNKNOWN(o) : Error during backup/restore: Failed to open pipe
/usr/sap/Q3H/SYS/global/hdb/backint/DB_Q3H/log_backup_1024_20180111_232300094 during BACKUP using
BACKINT No such device or address
```

Workaround:

- In the case of a suspected hang, terminate the hdbbackint process.

Applies to:

- SAP HANA, dynamic tiering 2.0 SP 00 (all revisions)
- SAP HANA, dynamic tiering 2.0 SP 01 (all revisions)
- SAP HANA, dynamic tiering 2.0 SP 02 revisions 020-022.(Fixed in revision 023)
- (Does not apply to SAP HANA dynamic tiering 2.0 SP 03 and later.)

4. BACKINT: A Second Backint-Based Recovery Does not Work

Symptom:

A second Backint-based recovery after the first recovery (which was done using Backint-based backups generated on a *different* source system) -- where the starting data backup for both the recoveries originated from the *other* source system -- does not work.

Solution:

Perform a complete data backup immediately after migration from one system to another using Backint-based backups. You should use this new data backup for all future point-in-time (PIT) recoveries.

Applies to:

- SAP HANA dynamic tiering 1.0 SP 12 revisions 122.02-122.12. (Fixed in revision 122.13)
- SAP HANA dynamic tiering 2.0 SP 01 revision 012. (Fixed in revision 012.01)
- SAP HANA dynamic tiering 2.0 SP 02 revisions 020-021. (Fixed in revision 022)

(In earlier releases, Backint-based system copy is not possible.)

5. BACKINT: Attempting to use BACKINT-based backups originating from a different source system to recover on a target system does not work with SAP HANA dynamic tiering in the topology.

See [SAP Note 2445787](#).

Applies to:

- SAP HANA, dynamic tiering 2.0 SP 00 (all revisions)
- SAP HANA, dynamic tiering 2.0 SP 01 revisions 012 - 012.03. (Fixed in revision 012.04)
- SAP HANA, dynamic tiering 2.0 SP 02 revisions 020 - 022. (Fixed in revision 023)
- (Does not apply to SAP HANA, dynamic tiering 2.0 SP 03 or later.)

6. BACKINT: Dynamic Tiering: Migrating from Single Container System to a Multi-Tenant System with a BACKINT-Based Backup Strategy Breaks Backup Continuity.

See [SAP Note 2573757](#).

Applies to:

- SAP HANA, dynamic tiering 2.0 SP 00 (all revisions)
- SAP HANA, dynamic tiering 2.0 SP 01 revisions 010-012 (Fixed in revision 012.01.)
- (Does not apply to SAP HANA, dynamic tiering 2.0 SP 02 or later.)

7. BACKINT: TOOLOPTION must be Provided to the backint tool (as an Optional Parameter) when it is Invoked for Backup

A valid TOOLOPTION must be provided to the backint tool (as an optional parameter) when it is invoked for backup. This is currently missing for backups on a SAP HANA system with dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00 and SP 01 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 02 (Fixed in Revision 24.04 onwards).
- SAP HANA dynamic tiering 2.0 SP 03 (Fixed in Revision 32 onwards).

8. BACKINT: Data Backup ID Mismatch when hdbbackint is Invoked

The **hdbbackint** command invoked for a data backup contains a **-s** parameter (which indicates the *Data Backup ID* of the backup being performed). For backups on a SAP HANA system with dynamic tiering, this value is not consistent, and does not match with the *Data Backup ID* provided for invocations of **hdbbackint** for other services that apply to the same data backup. This can cause errors related to the availability of files for a particular backup in context of third-party vendor tooling.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00 and SP01 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 02 (Fixed in Revision 24.03 onwards).
- SAP HANA dynamic tiering 2.0 SP 03 (Fixed in Revision 31 onwards).

9. BACKINT: Issues with Special Characters in the External Backup ID

An SAP HANA system with dynamic tiering is unable to perform backup and recovery operations if the **External Backup ID** contains special characters, such as:

- ' ' (spaces)
- ' | ' (pipes)
- ' , ' (commas)
- ' " ' (quotes)

This restriction applies only to those third-party tools which may generate external backup IDs with special characters, and not otherwise.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00, SP 01, SP 02, and SP 03 (all revisions).

BACKUP Functional Restrictions:**1. Backup: Backup Directory for Backup SQL is not Created when Extended Storage is Configured****Symptom:**

The backup directory specified in the backup SQL is not created when Extended Storage is configured on a SAP HANA system with dynamic tiering. This occurs due to errors in the following SQL statement:

```
backup data for td1 using file ('backup2', 'prefix2')
```

Here, 'backup2' is the directory that is not created.

Solution:

Use an alternate SQL statement as under for taking the backup (after creating the directory). This puts the backup in the default directory:

```
backup data for td1 using file ('backup2/prefix2')
```

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00 and SP 01 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 02 (Fixed in Revision 24.03 onwards).
- SAP HANA dynamic tiering 2.0 SP 03 (Fixed in Revision 31 onwards).

2. Backup: Error Returned When Running hdbbackupcheck Utility on Dynamic Tiering Data Backup Files**Symptom:**

The hdbbackupcheck utility fails when run against dynamic tiering data backup files, with a message similar to the following:

```
ERROR: Backup '<path>/<SID>/HDB<instance>/backup/data/<backup_directory>' check failed.
```

Applies to:

- SAP HANA dynamic tiering 2.0 (All SPs. All revisions.)

Solution:

The hdbbackupcheck utility does not support SAP HANA dynamic tiering data backup files.

The hdbbackupcheck utility performs two functions: it checks the integrity of the entire backup archive, and it returns header information. If you are only interested in the header information, and you do not need to check the integrity of the backup, use the hdbbackupdiag utility instead.

```
hdbbackupdiag -b <backup name> -d /<path>/<SID>/HDB<instance>/backup/data/<backup_directory> -v
```

For example:

General Functional Restrictions:

1. Log Backup Encryption with a Backup Encryption Root Key is not Supported

SAP HANA 2.0 SPS 01 introduced data and log backup encryption using a backup encryption root key. Log backup encryption is supported in dynamic tiering, but **not** with a backup encryption root key.

- If the dynamic tiering volume is encrypted with a persistence encryption key (PEK), then the log backups are also encrypted with the same PEK.
- If the dynamic tiering volume is not encrypted with a PEK, then the log backups are saved in cleartext and are not encrypted.

SAP HANA's backup encryption root key is not supported in dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 01 and later.

2. Redo Log Encryption with a Redo Log Encryption Root Key is not Supported

SAP HANA 2.0 SPS 01 introduced redo log encryption. Redo log encryption is supported in dynamic tiering, but **not** with a redo log encryption root key.

- If the dynamic tiering volume is encrypted with a persistence encryption key (PEK), then the redo logs are also encrypted with the same PEK.
- If the dynamic tiering volume is not encrypted with a PEK, then the redo logs are saved in cleartext and are not encrypted.

SAP HANA's redo log encryption root key is not supported in dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 01 and later.

3. Storage Snapshots

Storage snapshots are not supported in dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 (all SPs and revisions).

4. log_mode Overwrite not Supported

Dynamic tiering does not support the SAP HANA log_mode setting "overwrite". If log_mode is set to "overwrite" with dynamic tiering in your topology, SAP HANA continues to take log backups with the default (or previously set) backup interval. Do not set the log_backup_interval to 0 (disabling automatic log backups) in normal operational mode for long durations. Eventually this setting may use up space in the ES log directories and lead to errors in transactions involving dynamic tiering.

Applies to:

- SAP HANA dynamic tiering 2.0 SP 00 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 01 (all revisions).
- SAP HANA dynamic tiering 2.0 SP 02 (Revisions 020 - 021. Fixed in revision 022.)
- (Fixed in SP 03. Does not apply to SAP HANA dynamic tiering 2.0 SP 03 or later.)

Manual Activities

This document is referenced by

SAP Note/KBA Title

2594622

[SAP HANA 1 SPS12 Revision 122.16](#)

2544464	<u>SAP HANA 2 SPS01 Revision 012.04.</u>
2445787	<u>BACKINT-Based backups Originating from Different Source System will Fail when Dynamic Tiering is in Topology.</u>
2445158	<u>Point-in-time Recovery in Dynamic Tiering when Using Certain Third Party Backup Tools (BACKINT) Can Fail</u>
