

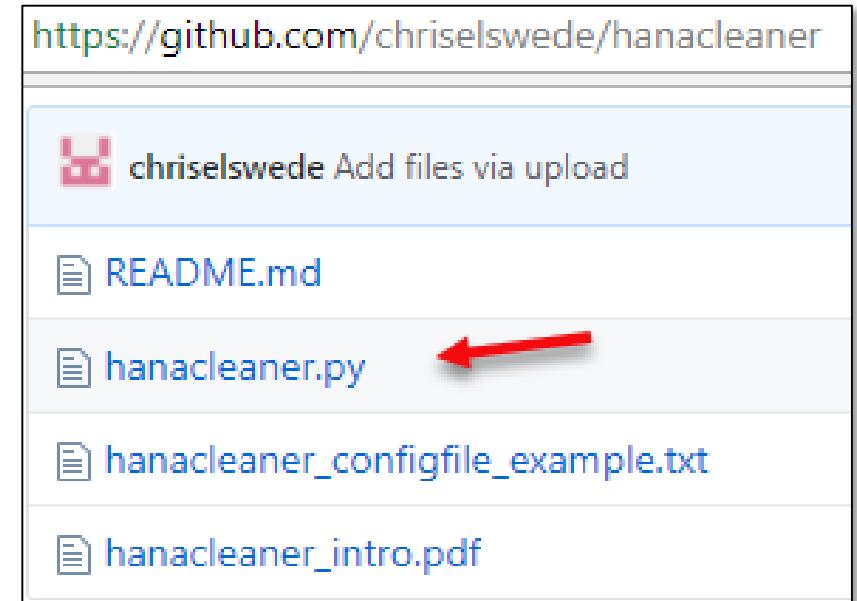
HANACleaner – SAP Note 2399996



SAP Note 2399996 presents a tool that can help with housekeeping tasks

2399996 - How-To: Configuring automatic SAP HANA Cleanup with SAP HANACleaner

- It is a python script to be downloaded from
<https://github.com/chriselswede/hanacleaner>
- It is intended to be executed as <sid>adm on your SAP HANA Server
(since then the proper python version is already in your path,
installed together with hana)
- It connects via host, port and DB user, provided in hdbuserstore
- That DB user needs proper privileges



For more about the SAP HANACleaner see SAP Note 2399996

SAP Note 2400024 provides administration suggestions, e.g. recommendations about the hanacleaner

HANACleaner – using hdbuserstore



Host, port and DB user needs to be provided in the hdbuserstore:

```
mo-fc8d991e0:~> hdbuserstore SET HANACLEANER1KEY mo-fc8d991e0:30015 HANACLEANER1 PassWord1
mo-fc8d991e0:~> hdbuserstore LIST
DATA FILE      : /usr/sap/CH0/home/.hdb/mo-fc8d991e0/SSFS_HDB.DAT
KEY FILE       : /usr/sap/CH0/home/.hdb/mo-fc8d991e0/SSFS_HDB.KEY

KEY HANACLEANER1KEY
ENV : mo-fc8d991e0:30015
USER: HANACLEANER1
```

Then the hanacleaner can connect using the info stored in hdbuserstore:

```
mo-fc8d991e0:/tmp/HANACleaner> whoami
ch0adm
mo-fc8d991e0:/tmp/HANACleaner> python hanacleaner.py -k HANACLEANER1KEY -be 20
The most used filesystem is using
21 %
In total 0 data backup entries were removed from the backup catalog
```

HANACleaner – needs privileges



The DB user that hanacleaner uses to connect needs proper privileges

Depending on what housekeeping tasks the specific hanacleaner user will do he needs specific sets of privileges:

New User

User Name*: **HANACLEANER1**

Authentication
 Password
 Password*: *********

Granted Roles | System Privileges | Object Privileges | Analytic Privileges | Package Privileges

Object Privileges

Catalog Object

	Privileges for 'HOST'
HANACLEANER1	<input checked="" type="checkbox"/> SELECT <input type="checkbox"/> UPDATE <input checked="" type="checkbox"/> DELETE
HOST_OBJECT_LOCK_STATISTICS_BASE (_SYS_STATISTICS)	
STATISTICS_ALERTS_BASE (_SYS_STATISTICS)	

Granted Roles | System Privileges

System Privilege

- AUDIT ADMIN
- AUDIT OPERATOR
- BACKUP ADMIN
- CATALOG READ
- LOG ADMIN
- MONITOR ADMIN
- RESOURCE ADMIN
- TRACE ADMIN

As an example it could be created like this:

```

CREATE USER HANACLEANER PASSWORD Md1sap00 NO FORCE_FIRST_PASSWORD_CHANGE;
ALTER USER HANACLEANER DISABLE PASSWORD LIFETIME;
GRANT SELECT, DELETE ON _SYS_STATISTICS.HOST_OBJECT_LOCK_STATISTICS_BASE TO HANACLEANER;
GRANT SELECT, DELETE ON _SYS_STATISTICS.STATISTICS_ALERTS_BASE TO HANACLEANER;
GRANT audit admin , audit operator, backup admin, catalog read, log admin, monitor admin, resource
admin, trace admin to hanacleaner;

```

HANACleaner – tells missing privileges

If the DB user is missing privileges, hanacleaner will indicate that

E.g. here the user A2 is missing the system privilege CATALOG READ:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -ct 300 -dt 300 -or true -k A2KEY
The most used filesystem is using
96 %
Cleaning of the backup catalog was not done since -rb and -rd were both negative (or not specified)

INSUFFICIENT PRIVILEGE WARNING: It appears that there are no traces.
One possible reason for this is that the user represented by the key A2KEY has unsufficient privilege,
e.g. lacking the system privilege CATALOG READ.

0 trace files were removed
```

E.g. here the user A2 is missing the system privilege TRACE ADMIN:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -ct 225 -or true -k A2KEY
The most used filesystem is using
96 %
Cleaning of the backup catalog was not done since -rb and -rd were both negative (or not
hdbsql -U A2KEY "ALTER SYSTEM CLEAR TRACES ('ALERT', 'CLIENT', 'CRASHDUMP', 'EMERGENCYDUMP',
 UNTIL '2016-07-15 00:00:00'"
* 258: insufficient privilege: Not authorized SQLSTATE: HY000

ERROR: The user represented by the key A2KEY could not clear traces.
One possible reason for this is unsufficient privilege,
e.g. lack of the system privilege TRACE ADMIN.
```

HANACleaner – backupcatalog cleanup (1/2)



For cleaning up the backup catalog (and possibly also backups) hanacleaner has the following input flags

Flag	Unit	Details	Explanation	Default
-be		minimum number of retained backup entries in the catalog	this number of entries of successful data backups will remain in the backup catalog	-1 (not used)
-bd	days	minimum retained days of backup entries in the catalog	the youngest successful data backup entry in the backup catalog that is older than this number of days is the oldest successful data backup entry not removed from the backup catalog	-1 (not used)
-bb	true/false	switch to delete backups also	if set to true the backup files corresponding to the backup entries are also deleted	false
-bo	true/false	output the backup catalog	if set to true the backup catalog is printed before and after cleanup	false
-br	true/false	output the deleted entries	if set to true the deleted backup entries are printed after the cleanup	false

Example:

Here backup catalog entries (i.e. not the backups themselves) older than 42 days are deleted, but at least 5 backup entries are kept, and the deleted backup entries are printed out

```
python hanacleaner.py -bd 42 -be 5 -br true
```

HANACleaner – backupcatalog cleanup (2/2)



Cleaning up the backup catalog can be done with the hanacleaner

Example:

Here backup catalog entries (i.e. not the backups themselves) older than 30 days are deleted, but at least 5 backup entries are kept, and the deleted backup entries are printed out:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -bd 30 -be 5 -br true
The most used filesystem is using
96 %
*****
2017-02-28 19:38:13
*****
hdbsql -U SYSTEMKEY "BACKUP CATALOG DELETE ALL BEFORE BACKUP_ID 1485547216621"

REMOVED:
| ENTRY_ID          | ENTRY_TYPE_NAME      | BACKUP_ID        | SYS_START_TIME   | STATE_NAME |
| 1484942410880    | complete data backup | 1484942410880  | 2017-01-20 21:00:10.880000000 | successful |
```

In total 1 data backup entries were removed from the backup catalog

HANACleaner – trace cleanup (1/2)

For cleaning up the traces hanacleaner has the following input flags

Flag	Unit	Details	Explanation	Default
-tc	days	minimum retained days for trace files	trace files that are older than this number of days are removed ALTER SYSTEM CLEAR TRACES... is used (see SQL. Ref.)	-1 (not used)
-tf	days	minimum retained days for trace files	trace files that are older than this number of days are removed ALTER SYSTEM REMOVE TRACES... is used (see SQL. Ref.)	-1 (not used)
-to	true/ false	output trace files	displays trace files before and after the cleanup	false
-td	true/ false	output the deleted trace files	displays the trace files that were deleted	false

Example:

Here trace file contents older than 42 days is removed and trace files older than 42 days are deleted

```
python hanacleaner.py -tc 42 -tf 42
```

HANACleaner – trace cleanup (2/2)

Cleaning of traces can be done with hanacleaner as in this example

Example:

Here trace files older than 200 days are deleted and the removed trace files are displayed:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -tc 200 -tf 200 -td true
The most used filesystem is using
96 %
*****
2017-02-28 19:52:42
*****
(Cleaning of the backup catalog was not done since -be and -bd were both negative
hdbsql -U SYSTEMKEY "ALTER SYSTEM CLEAR TRACES ('ALERT','CLIENT','CRASHDUMP','EMERGENC
REMOVED (1):
ls80010 | indexserver_ls80010.30003.executed_statements.000.trc

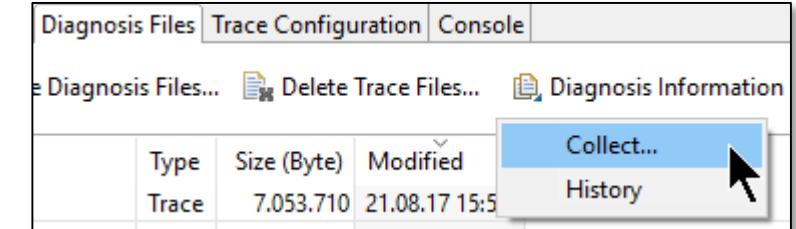
1 trace files were removed
```

HANACleaner – dump cleanup



Manually created dump files (a.k.a. rte or fullsystem dumps) can be deleted with the following flag

Flag	Unit	Details	Explanation	Default
-dr	days	retention days for dump files	manually created dump files (a.k.a. fullsystem dumps and runtime dumps) that are older than this number of days are removed	-1 (not used)



Example:

Here dump files older than 1 day are deleted

```
ch0adm@mo-fc8d991e0:/tmp/HANACleaner> cdglo
ch0adm@mo-fc8d991e0:/usr/sap/CH0/SYS/global> ll sapcontrol/snapshots/
total 28824
-rw-r--r-- 1 ch0adm sapsys 3173927 Aug 21 15:50 fullsysteminfodump_mo-fc8d991e0_CH0_2017_08_21_15_50_33.zip
-rw-r--r-- 1 ch0adm sapsys 26300975 Aug 23 17:32 fullsysteminfodump_mo-fc8d991e0_CH0_2017_08_23_17_32_02.zip
ch0adm@mo-fc8d991e0:/usr/sap/CH0/SYS/global> cd /tmp/HANACleaner/
ch0adm@mo-fc8d991e0:/tmp/HANACleaner> python hanacleaner.py -dr 1
1 fullsysteminfodump zip files (that can contain both fullsystem dumps and runtime dumps) were removed
ch0adm@mo-fc8d991e0:/tmp/HANACleaner> cdglo
ch0adm@mo-fc8d991e0:/usr/sap/CH0/SYS/global> ll sapcontrol/snapshots/
total 25720
-rw-r--r-- 1 ch0adm sapsys 26300975 Aug 23 17:32 fullsysteminfodump_mo-fc8d991e0_CH0_2017_08_23_17_32_02.zip
ch0adm@mo-fc8d991e0:/usr/sap/CH0/SYS/global>
```

HANACleaner – General File Clean Up



Any folder with files including any word in their file names can be cleaned:

Flag	Unit	Details	Explanation	Default
-gr	days	retention days for any general file	files in the directory specified with -gd and with the file names including the word specified with -gw are only saved for this number of days <u>Note:</u> -gd and -gw can also be same length lists with a commas as delimiter	-1 (not used)
-gd		directories	a comma separated list with full paths of directories with files to be deleted according to -gr (entries pairs with entries in -gw)	default "" (not used)
-gw		filename parts	a comma separated list with words that files should have in their names to be deleted according to -gr (entries pairs with entries in -gd)	default "" (not used)

Example:

Here files with CDPOS1 & hansitter_output in their file names, in the folders /tmp/tmp_analysis/ & /tmp/hansitter_output older than one day are deleted

```

oqladm@ls80010:/tmp> ls tmp_analysis/
backint_end10000.log  backup_10000.log  CDPOS1.py          CDPOS1.py.statements  CDPOS1.py.tables
backint.log            backup.log        CDPOS1.py.sorted   CDPOS1.py.statistics  CDPOS1.py.transactions
oqladm@ls80010:/tmp> ls hanasitter_output/
hanasitterlog_2018-01-05.txt                      kernel_profiler_wait_ls80010_OQL_2017-12-06_11-28-36.dot
kernel_profiler_cpu_ls80010_OQL_2017-12-06_11-28-36.dot

oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -gr 1 -gd /tmp/hanasitter_output,/tmp/tmp_analysis -gw hanasitterlog,CDPOS1
(Cleaning dumps was not done since -dr was -1 (or not specified))
7 general files were removed ←
(Compression of the backup logs was not done since -zb was negative (or not specified))

oqladm@ls80010:/tmp> ls tmp_analysis/
backint_end10000.log  backint.log  backup_10000.log  backup.log
oqladm@ls80010:/tmp> ls hanasitter_output/
kernel_profiler_cpu_ls80010_OQL_2017-12-06_11-28-36.dot  kernel_profiler_wait_ls80010_OQL_2017-12-06_11-28-36.dot

```

HANACleaner – backuplogs (1/2)



For compressing and renaming backup logs and backint logs hanacleaner has the following input flags

Flag	Unit	Details	Explanation	Default
-zb	mb	backup logs compression size limit	if there are any backup.log or backint.log file that is bigger than this size limit, then it is compressed and renamed	-1 (not used)
-zp		zip path	specifies the path of the folder (and all subfolders) where to look for the backup.log and backint.log files	the directory specified by the alias cdtrace
-zl	true/ false	zip links	specifies if symbolic links should be followed searching for backup logs	false
-zk	true/ false	keep zip file	if this is set to false the zipped file will be deleted (use with care!)	true

Example:

Here any backup.log or backint.log found in the trace folder and is larger than 50 MB will be compressed and renamed:

```
python hanacleaner.py -zb 50
```

HANACleaner – backuplogs (2/2)



Compressing backup and backint logs can be done with hanacleaner

Example:

Here any backup.log or backint.log found in the trace folder and that is larger than 20 MB will be compressed and renamed:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -zb 20
```

And it worked:

```
//usr/sap/OQL/HDB00//ls80010//trace/backup.log was compressed to //usr/sap/OQL/HDB00//ls80010//trace/backup_compressed_2017-02-28_20-50-41.tar.gz  
and then removed  
1 backup logs were compressed
```

```
oqladm@ls80010:/tmp/HANACleaner> cdtrace  
oqladm@ls80010:/usr/sap/OQL/HDB00/ls80010/trace> ll backup_compressed_2017-02-28_20-50-41.tar.gz  
-rw-r----- 1 oqladm sapsys 1135135 Feb 28 20:50 backup_compressed_2017-02-28_20-50-41.tar.gz
```

For deleting old alerts from the alert table (filled by the statistics service) hanacleaner has the following input flags

Flag	Unit	Details	Explanation	Default
-ar	days	minimum number retained days of the alerts	minimum retained age of statistics server alerts	-1 (not used)
-ao	true/ false	output alerts	if true, then all alerts will be displayed before and after the cleanup (if number of alerts are more than 10 thousand, hanacleaner will not do this output)	false
-ad	true/ false	output deleted alerts	if true, then deleted alerts will be displaye after the cleanup (if number of alerts are more than 10 thousand, hanacleaner will not do this output)	false

Example:

Here alerts older than 5 days are removed from the statistics server alert table:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -ar 5
The most used filesystem is using
96 %
*****
2017-02-28 21:24:18
*****
1701680 alerts were removed
```

HANACleaner – log segments



For reclaiming free log segments hanacleaner has the following input flag

Flag	Unit	Details	Explanation	Default
-lr		maximum number of free log segments per service	if there are more free log segments for a service than this number then ALTER SYSTEM RECLAIM LOG will be executed	-1 (not used)

Example:

Here the ALTER SYSTEM RECLAIM LOG command is executed since there was a hana process that had more than one free log segment:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -lr 1
The most used filesystem is using
96 %
*****
2017-02-28 21:32:13
*****
hdbsql -j -A -U SYSTEMKEY "ALTER SYSTEM RECLAIM LOG"
In total 1 log segments were reclaimed
```

HANACleaner – Audit Log Table



To clear the audit log database table hanacleaner has the following input flag

Flag	Unit	Details	Explanation	Default
-ur		retention time [days] of the audit log table	if the audit log database table has audit log older than these number days ALTER SYSTEM CLEAR AUDIT LOG UNTIL will be executed	-1 (not used)

Example:

Here the ALTER SYSTEM CLEAR AUDIT LOG UNTIL is executed and 29 entries in the audit log table were removed:

```
mo-fc8d991e0:/tmp/HANACleaner> python hanacleaner.py -ur 100
Will now check most used memory in the file systems.
The most used filesystem is using
36 %
*****
2017-07-31 14:22:48
hanacleaner by SYSTEMKEY
*****
29 entries in the audit log table were removed
```

HANACleaner – Pending Emails



To clear pending emails hanacleaner has the following input flag

Flag	Unit	Details	Explanation	Default
-pe		retention days for pending e-mails [days]	pending statistics server e-mail notifications older than these number of days are removed (requires SELECT and DELETE on the _SYS_STATISTICS schema)	-1 (not used)

Example:

Here the DELETE FROM _SYS_STATISTICS.STATISTICS_EMAIL_PROCESSING WHERE SECONDS_BETWEEN(SNAPSHOT_ID, CURRENT_TIMESTAMP) > 0 * 86400 is executed and 58 emails were removed:

```
pqladm@atgls90010:/tmp/HANACleaner> python hanacleaner.py -k HANACLEANERUSERKEY -pe 0
58 pending statistics server email notifications were removed
```

HANACleaner – Unknown Object Lock Entries

The transactional lock history in HOST_OBJECT_LOCK_STATISTICS may have unknown object entries that refer to dropped temporary tables (as per SAP Note 2147247)

These entries can be removed by the hanacleaner with following input flag

Flag	Unit	Details	Explanation	Default
-kr	days	min retained unknown object lock days	min age (today not included) of retained object lock entries with OBJECT_NAME = '(unknown)', see SAP Note 2147247	-1 (not used)

Example:

Here all transactional lock history entries with OBJECT_NAME = '(unknown)' are removed:

```
mo-fc8d991e0:/tmp/HANACleaner> python hanacleaner.py -kr 0
Will now check most used memory in the file systems.
The most used filesystem is using
35 %
*****
2017-08-15 18:47:58
hanacleaner by SYSTEMKEY
*****
(Cleaning of the backup catalog was not done since -be and -bd
(Cleaning traces was not done since -tc and -tf were both -1 (
(Compression of the backup logs was not done since -zb was neg
(Cleaning of the alerts was not done since -ar was negative (
13345 object locks entries with unknown object names were removed
```

HANACleaner – Object History



Object history can be cleaned (as per SAP Note 2479702) using these flags:

Flag	Unit	Details	Explanation	Default
-om	mb	object history table max size	if the table _SYS_REPO.OBJECT_HISTORY is bigger than this threshold this table will be cleaned up according to SAP Note 2479702	-1 (not used)
-oo	true/false	output cleaned memory from object table	displays how much memory was cleaned up from object history table	-1 (not used)

Example:

In this example there was nothing to clean up from the object history:

```
hsiadm@dewdfglp00836:/tmp/HANACleaner> python hanacleaner.py -om 1 -oo true
Will now check most used memory in the file systems. If it hangs there is an
(Cleaning of unknown object locks entries was not done since -kr was nega
Object History was:0 mb and is now 0 mb.
0 mb were cleaned from object history
```



HANACleaner – Disk Fragmentation (1/2)

Unused space in the disk volumes can be fixed with the flag –fl

Flag	Unit	Details	Explanation	Default
-fl	%	fragmentation limit	maximum fragmentation of data volume files, of any service, before defragmentation of that service is started: ALTER SYSTEM RECLAIM DATAVOLUME '<host>:<port>' 120 DEFragments Note: If you use HSR see next slide	-1 (not used)
-fo	true/false	output fragmentation	displays data volume statistics before and after defragmentation	false

Example:

Here defragmentation will be done of all ports if fragmentation is more than 20% for any port:

```
haladm@dewdfglp00765:/tmp/HANACleaner> python hanacleaner.py -fl 20 -fo true

BEFORE FRAGMENTATION:
Host           Port      Used Space [B]      Total Space [B]      Fragmentation [%]
dewdfglp00765 30003    4337033216        4747952128        9.0
dewdfglp00765 30007    70078464          268566528         74.0

AFTER FRAGMENTATION:
Host           Port      Used Space [B]      Total Space [B]      Fragmentation [%]
dewdfglp00765 30003    4337033216        4747952128        9.0
dewdfglp00765 30007    93069312          268435456         65.0

For Host dewdfglp00765 and Port 30007 defragmentation changed by 9.0 %
```

HANACleaner – Disk Fragmentation (2/2)



If SAP HANA has snapshots preserved RECLAIM DATAVOLUME fails with

```
general error: Shrink canceled, probably because of snapshot pages
```

This situation is normal if you use SAP HANA System Replication (HSR) (see SAP Note 1999880 Q19)

SAP Note 2332284 explains that to make RECLAIM DATAVOLUME work if you have HSR you have to temporarily change some parameters

This is not, and will not be, implemented in SAP HANACleaner!

Why?

- HANACleaner is an automatic house-keeper → dangerous if it starts to automatically change SAP HANA parameters
- Additionally, from security point of view, the technical user used to execute SAP HANACleaner should not have INIFILE ADMIN

HANACleaner – Table Compression (1/2)



Compression re-optimization of column store tables can be automated

Flag	Unit	Details	Explanation	Default
1. Both following two flags, -cc, and -ce, must be > 0 to control the force compression optimization on tables that never was compression re-optimized (i.e. last_compressed_record_count = 0):				
-cc		Max allowed raw main records	If number raw main rows are larger this could be compression optimized if compressed rows = 0 and -ce indicates it also	-1 (not used) e.g. 10000000
-ce	[GB]	Max allowed estimated size	If estimated size is larger this could be compression optimized if compressed rows = 0 and -cc indicates it also	-1 (not used) e.g. 1
2. All following three flags, -cr, -cs, and -cd, must be > 0 to control the force compression optimization on tables with columns with compression type 'DEFAULT' (i.e. no additional compression algorithm in main)				
-cr		Max allowed rows	If a column has more rows and compression = 'DEFAULT' this table could be re-compressed if -cs and -cd indicate it also	-1 (not used) e.g. 10000000
-cs	[MB]	Max allowed size	If a column is larger and compression = 'DEFAULT' this table could be re-compressed if -cr and -cd indicate it also	-1 (not used) e.g. 500
-cd	[%]	Min allowed distinct count	If a column has smaller distinct row quota this table could be re-compressed if -cr and -cs indicate it also	-1 (not used) e.g. 5
3. Both following two flags, -cq and -cu, must be > 0 to control the force compression optimization on tables whose UDIV quota is too large, i.e. #UDIVs/(#raw main + #raw delta)				
-cq	[%]	Max allowed UDIV quota	If a column's UDIV quota is larger this table could be re-compressed if -cu indicates it also	-1 (not used) e.g. 150
-cu		Max allowed UDIVs	If a column has more UDIVs → compress if -cq indicates it also	-1 (not used) e.g. 10000000

HANACleaner – Table Compression (2/2)

Some column store tables might have to have its compression re-optimized

This can be atomized with the following flags:

Flag	Unit	Details	Explanation	Default
4.	Flag -cb must be > 0 to control the force compression optimization on tables with SPARSE (<122.02) or		PREFIXED and a BLOCK index	
-cb	Max allowed rows	If more rows → compress if BLOCK and PREFIXED		-1 (not used) e.g. 100000
Following three flags are general; they control all three, 1., 2., 3., and 4. compression optimization possibilities above				
-cp	[true/false]	Per partition	Switch to consider above flags per partition	false
-cm	[true/false]	Merge before	Switch to perform a delta merge before compression	false
-co	[true/false]	Output	Switch to print out tables selected for compression optimization	false

Example: Here (1.) tables that were never compressed with more than 10 million raw records and more than 1 GB of estimated size or (2.) tables with columns only default compressed with more than 10 million rows and size more than 500 MB or (3.) tables with UDIV quota larger than 150% and more than 10 million UDIVs, will be compression re-optimized:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -cc 10000000 -ce 1
-cr 10000000 -cs 500 -cd 5 -cq 150 -cu 10000000 -cp true -cm true
(Reclaim of row store containers was not done since -rc was negative
2 column store tables were compression re-optimized ←
```

HANACleaner – events (handled/unhandled)



Events can be acknowledged and handled (in case of unhandled events) with the following input flags

Flag	Unit	Details	Explanation	Default
-eh	day	minimum retained days for handled events	handled events that are older than this number of days will be acknowledged and then deleted	-1 (not used)
-eu	day	minimum retained days for unhandled events	unhandled events that are older than this number of days will be handled, acknowledged and then deleted	-1 (not used)

Example:

Here handled events older than 5 days and unhandled events older than 34 days were deleted.

It turned out the 113 unhandled events were deleted:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -eh 5 -eu 34
In total 113 events were cleaned, 0 of those were handled. There are 61 events left, 0 of those are handled.
```

HANACleaner – Virtual Tables' Statistics



Smart Data Access Virtual Tables can get their statistics created, according to SAP Note 1872652, with the -vs flag

Flag	Unit	Details	Explanation	Default
-vs	true / false	create statistics for virtual tables	Switch to create optimization statistics for those virtual tables that are missing statistics (Note: could cause expensive operations!)	false

Example:

Here statistics optimization was created for 3 out of 4 virtual tables (the 4th already had statistics):

```
haladm@dewdfglp00766:/tmp/HANACleaner> python hanacleaner.py -vs true
Will now check most used memory in the file systems. If it hangs there is an issue with df -h,
Optimization statistics was created for 3 virtual tables (in total there are 4 virtual tables)
(Cleaning of the hanacleaner logs was not done since -or was negative (or not specified))
```

HANACleaner – INI File History (\geq H2SPS03) (1/2)



To remove old ini file content history hanacleaner has the following input flag

Flag	Unit	Details	Explanation	Default
-ir	days	ini file content history retention	deletes older ini file content history (should be more than 1 year)	-1 (not used)

Example:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -ir 300
INPUT ERROR: -ir must be larger than 365. Please see --help for more information. (If you disagree please remove this check on your own risk.)
```

Example:

```
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -ir 400
ERROR: the -ir flag is only supported starting with SAP HANA 2.0 SPS03.
You run on SAP HANA 1 revision 122 maintenance revision 15
```

HANACleaner – INI File History (\geq H2SPS03) (2/2)



To remove old ini file content history hanacleaner has the following input flag

Flag	Unit	Details	Explanation	Default
-ir	days	ini file content history retention	deletes older ini file content history (should be more than 1 year)	-1 (not used)

Example:

```
pqladm@atgls90012:/tmp/HANACleaner> python hanacleaner.py -ir 400 -k HANACLEANERUSERKEY_PQL90012
Will now check most used memory in the file systems. If it hangs there is an issue with df -h, t
      (Creation of optimization statistics for virtual tables was not done since -vs was false (or
5 ini file history contents were removed ←
      (Cleaning of the hanacleaner logs was not done since -or was negative (or not specified))
pqladm@atgls90012:/tmp/HANACleaner>
```

HANACleaner – No Execute



HANACleaner questions are normally HANA questions! With these flags it is possible to let HANACleaner print out the crucial SQLs without actually executing them → useful for debugging

Flag	Unit	Details	Explanation	Default
-es	true/false	execute sql	Execute all crucial housekeeping tasks (useful to turn off for investigations with -os=true)	True
-os	true/false	output sql	Prints all crucial housekeeping tasks (useful for debugging with -es=false)	False

```

oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -es false -os true -be 12 -bd 12 -tc 42 -ar 12 -lr 0
Will now check most used memory in the file systems. (If it takes too long, investigate why df -h hangs.)
The most used filesystem is using
94%
*****
2017-09-24 11:38:47
hanacleaner by SYSTEMKEY
Cleanup Statements will NOT be executed
*****
SELECT * from DUMMY
BACKUP CATALOG DELETE ALL BEFORE BACKUP_ID 1501268432361
0 data backup entries and 0 log backup entries were removed from the backup catalog
ALTER SYSTEM CLEAR TRACES ('ALERT', 'CLIENT', 'CRASHDUMP', 'EMERGENCYDUMP', 'EXPENSIVESTATEMENT', 'RTEDUMP', 'UNLOAD'
0 trace files were removed
    (Cleaning dumps was not done since -dr was -1 (or not specified))
    (Compression of the backup logs was not done since -zb was negative (or not specified))
DELETE FROM _SYS_STATISTICS.STATISTICS_ALERTS_BASE WHERE ALERT_TIMESTAMP < ADD_DAYS(CURRENT_TIMESTAMP, -12)
0 alerts were removed
    (Cleaning of unknown object locks entries was not done since -kr was negative (or not specified))
    (Cleaning of the object history was not done since -om was negative (or not specified))
ALTER SYSTEM RECLAIM LOG
0 log segments were reclaimed

```

HANACleaner – Configuration File



HANACleaner can be controlled with a configuration file (additional flags will overwrite the config file)

Flag	Unit	Details	Explanation	Default
-ff		flag file	full path to the configuration file	

Example:

```
xshadm@atgvm1s666:/tmp/HANACleaner> more hanacleaner_configfile.txt
My HANACleaner Configuration:
-zb 50
-tf 42
-td true
-ar 42
-eh 7
-eu 42
-fs /dev/sdb1
-op /tmp/hanacleaneroutput/
-or 42
-fs "|grep sdc3"

xshadm@atgvm1s666:/tmp/HANACleaner> python hanacleaner.py -ff hanacleaner_configfile.txt
Will now check most used memory in the file systems. (If it takes too long, investigate why df -h hangs.)
The most used filesystem is using
18%
*****
2017-09-05 09:42:57
hanacleaner by SYSTEMKEY
*****
(cleaning of the backup catalog was not done since -be and -bd were both negative (or not specified))
0 trace files were removed
(cleaning dumps was not done since -dr was -1 (or not specified))
0 backup logs were compressed
1 alerts were removed
```

HANACleaner – Configuration File Example



Note: HANACleaner will never give any recommendations! Here is an EXAMPLE of a config file:

```
start in "chicken mode" (comment out if we want to execute)
-es false
-os true
backup catalog retention days
-bd 42
backup.log backint.log size limit, use -zk to remove zip file (to be added later maybe)
-zb 50
trace files retention days see sql ref for details
-tf 42
-tc 42
alert retention days
-ar 42
event log cleanup
-eh 42
-eu 42
retention day for dump files
-dr 42
redo log reclaim
-lr 10
disk fragmentation reorg
-fl 40
ini file history cleanup older than 1 year
-i 365
hanacleaner log destination and cleanup
-op <full path>/xsc_output
-or 42
key and database
-k HANACLEANERKEY
-dbs SYSTEMDB,XSC,XS1
-df false
```



To control the output of the hanacleaner there are these flags

Flag	Unit	Details	Explanation	Default
-op		output path	full path of the folder where the hanacleaner logs are written	(not used)
-so		standard out switch	1: write to std out, 0: do not write to std out	1

Example:

Here a output folder is deleted and then automatically created again by hanacleaner and the daily log file written into it:

```

oqladm@ls80010:/tmp/HANACleaner> rm -r /tmp/hanacleaneroutput/
oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -be 100 -op /tmp/hanacleaneroutput
The most used filesystem is using
96 %
*****
2017-02-28 23:06:33
*****
In total 0 data backup entries were removed from the backup catalog
oqladm@ls80010:/tmp/HANACleaner> more /tmp/hanacleaneroutput/hanacleanerlog_2017-02-28.txt
*****
2017-02-28 23:06:33
*****
In total 0 data backup entries were removed from the backup catalog

```

HANACleaner – MDC (1/4)



In a MDC system the hanacleaner can clean the SystemDB and multiple Tenants in one execution

List the DB users for the system and the tenants in hdbuserstore and list them with the –k flag

Flag	Unit	Details	Explanation	Default
-k		DB user key(s)	This is the DB user key saved in the hdbuserstore, it could also be a list of comma separated userkeys (useful in MDC environments)	SYSTEMKEY

Example:

Here two keys are stored; one for SystemDB and one for a Tenant:

```
xshadm@atgvm1s666:/tmp/HANACleaner> hdbuserstore LIST
KEY AKEYSYSDB
  ENV : atgvm1s666.wdf.sap.corp:30013
  USER: AUSER
  DATABASE: SYSTEMDB
KEY AKEYTEN1
  ENV : atgvm1s666.wdf.sap.corp:30047
  USER: AUSER
  DATABASE: XS1
```

SQL Port for nameserver at SystemDB

SQL Port for indexserver at Tenant

HANACleaner – MDC (2/4)



Example:

Here trace files older than 42 days are deleted from the SystemDB and from a Tenant:

```
xshadm@atgvm1s666:/tmp/HANACleaner> python hanacleaner.py -tf 42 -k AKEYSYSDB,AKEYTEN1
Will now check most used memory in the file systems. If it hangs there is an issue with
The most used filesystem is using
85%
*****
2017-09-27 15:14:35
hanacleaner by AKEYSYSDB
Cleanup Statements will be executed
*****
49 trace files were removed
*****
2017-09-27 15:14:38
hanacleaner by AKEYTEN1
Cleanup Statements will be executed
*****
21 trace files were removed
```

HANACleaner – MDC (3/4)



In a MDC system the hanacleaner can clean the SystemDB and multiple Tenants with one key

Maintain a user with same user name and same password in multiple DBs in one HANA System

Example:

Here the user HANACLEANER1 with same password was created in both SystemDB and in a Tenant

SYSTEMDB@PQL (SYSTEM) SiteA-SystemDB	
User	User Parameters
HANACLEANER1	

PQL@PQL (SYSTEM) SiteA-T1	
User	User Parameters
HANACLEANER1	

(for privileges,
see earlier slides)

SYSTEMDB@PQL (SYSTEM) SiteA-SystemDB					
Overview		Landscape	Alerts	Performance	Volumes
Configuration					
Services		Hosts	Redistribution	System Replication	Host: <All>
Active	Host	Port	Service	SQL Port	
atgls90010	30001	nameserver		30013	
atgls90010	30010	compileserver			

Then only one key, for the SystemDB, was provided in hdbuserstore

```
pqladm@atgls90010:/tmp> hdbuserstore set SDBKEY atgls90010:30013 HANACLEANER1 PassWd1234
```

Test that this single key can be used to access both databases:

```
pqladm@atgls90010:/tmp> hdbsql -j -A -x -U SDBKEY -d SYSTEMDB "select * from m_database"
| SYS | DATABASE | HOST          | START_TIME           | VERSION          | USAG   |
| --- | ----- | ----- | ----- | ----- | ----- |
| PQL | SYSTEMDB | atgls90010 | 2018-09-27 15:27:00.060000000 | 2.00.032.00.1533114046 | TEST   |
pqladm@atgls90010:/tmp>
pqladm@atgls90010:/tmp> hdbsql -j -A -x -U SDBKEY -d PQL "select * from m_database"
| SYS | DAT | HOST          | START_TIME           | VERSION          | USAG   |
| --- | --- | ----- | ----- | ----- | ----- |
| PQL | PQL | atgls90010 | 2018-09-27 15:27:10.593000000 | 2.00.032.00.1533114046 | TEST   |
```

HANACleaner – MDC (4/4)



In a MDC system the hanacleaner can clean the SystemDB and multiple Tenants with one key

Flag	Unit	Details	Explanation	Default
-dbs		DB key(s)	this can be a list of databases accessed from the system defined by -k (-k can only be one key if -dbs is used)	"

Example:

Here the key SDBKEY is used to access the system, then it is specified with -dbs that two databases, SYSTEMDB and PQL, will be cleaned up on their old trace files

```
pqladm@atgls90010:/tmp/HANACleaner> python hanacleaner.py -k SDBKEY -dbs SYSTEMDB,PQL -tc 20
Will now check most used memory in the file systems. If it hangs there is an issue with df -h
The most used filesystem is using
78%
*****
2018-10-08 20:10:50
hanacleaner by SDBKEY on PQL(00) on DB SYSTEMDB with
hanacleaner.py -k SDBKEY -dbs SYSTEMDB,PQL -tc 20
Cleanup Statements will be executed (-es is default true)
Before using HANACleaner read the disclaimer!
python hanacleaner.py --disclaimer
*****
(Cleaning of the backup catalog was not done since -be and -bd were both negative (or not
0 trace files were removed ←
(Cleaning dumps was not done since -dr was -1 (or not specified))
*****
2018-10-08 20:10:51
hanacleaner by SDBKEY on PQL(00) on DB PQL with
hanacleaner.py -k SDBKEY -dbs SYSTEMDB,PQL -tc 20
Cleanup Statements will be executed (-es is default true)
Before using HANACleaner read the disclaimer!
python hanacleaner.py --disclaimer
*****
(Cleaning of the backup catalog was not done since -be and -bd were both negative (or not
6 trace files were removed ←
(Cleaning dumps was not done since -dr was -1 (or not specified))
```

HANACleaner – HANA System Replication, HSR (1/2)



On a Secondary in a HSR setup one can use -oi to let HANACleaner wait for a takeover

Flag	Unit	Details	Explanation	Default
-oi	seconds	Online Check Interval (s)	< 0: HANACleaner does not check if online or secondary = 0: if not online or not primary HANACleaner will abort > 0: time it waits before it checks if DB is online and primary again Note: For > 0, you might have to use cron with a lock (see the HANASitter pdf, "HANASitter & CRON" slide)	-1 (not used)

Example:

Here the HANACleaner is started on a system that is a Secondary in a HSR setup, with online check interval 10 seconds:

```
ha2adm@atgvmls7060:/tmp/HANACleaner> python hanacleaner.py -be 400 -bd 400 -oi 10 -k HANACLEANERUSERKEY
Will now check most used memory in the file systems. If it hangs there is an issue with df -h, then see if the -fs flag helps.
The most used filesystem is using
77%
*****
2019-11-26 23:48:57
hanacleaner by HANACLEANERUSERKEY on HA2(00) with
hanacleaner.py -be 400 -bd 400 -oi 10 -k HANACLEANERUSERKEY
Cleanup Statements will be executed (-es is default true)
Before using HANACleaner read the disclaimer!
python hanacleaner.py --disclaimer
*****
Online Check      , 2019-11-26 23:48:57      ,      -      , True      , True      , Number running services: 10 out of 10
Primary Check     , 2019-11-26 23:49:00      ,      -      , True      , False     ,
One of the online checks found out that this HANA instance, 00, is not online.
HANACleaner will now have a 10 seconds break and check again if this Instance is online after the break. ←
```

(example continues on next slide)

HANACleaner – HANA System Replication, HSR (2/2)



Example (continued from previous slide):

A take over is performed:

The screenshot shows two windows side-by-side. On the left is the 'System Replication Overview' window for a 2-Tier Configuration. It displays two nodes: SITEFER1 (atgVMLS7050) and SITEFER2 (atgVMLS7060). A red arrow points to the 'Take Over' button at the top right of this window. On the right is a 'Takeover' dialog box with the title 'Takeover' and the message 'System takeover is running.' Below it is a progress bar with three dots, and at the bottom is a 'Run in Background' button.

Then the HANACleaner that runs on the previous Secondary can now start with the cleanup tasks:

```
HANACleaner will now have a 10 seconds break and check again if this Instance is online after the break.

Online Check      , 2019-11-26 23:50:15      ,      -      , True      , True      , Number running services: 10 out of 10
Primary Check    , 2019-11-26 23:50:18      ,      -      , True      , True      ,
0 data backup entries and 0 log backup entries were removed from the backup catalog
(Cleaning traces was not done since -tc and -tf were both -1 (or not specified))
```

HANACleaner – Run as ROOT



To restrict the access to the HANACLEANER user it is possible to run HANACleaner as root, i.e. using the hdbuserstore of root, for that one must set the key also in root's hdbuserstore

```
atgvm1s866:~ # source /usr/sap/XSC/home/.sapenv.sh
root@atgvm1s866:/usr/sap/XSC/HDB00> hdbuserstore set T1CLEANKEY atgvm1s866:30015@XSC HANACLEANERUSER
root@atgvm1s866:/usr/sap/XSC/HDB00> hdbuserstore LIST
DATA FILE      : /root/.hdb/atgvm1s866/ssfs_HDB.DAT
KEY FILE       : /root/.hdb/atgvm1s866/ssfs_HDB.KEY

KEY T1CLEANKEY
ENV : atgvm1s866:30015
USER: HANACLEANERUSER
DATABASE: XSC
```

Example: Here root's hdbuserstore is filled with the key T1CLEANKEY, only root can access it, so only root can run HANACleaner using this key, preventing <sid>adm users that don't have root access to get access to all privileges of the HANACLEANERUSER

```
atgvm1s866:~ # source /usr/sap/XSC/home/.sapenv.sh
root@atgvm1s866:/usr/sap/XSC/HDB00> cd /tmp/HANACleaner/
root@atgvm1s866:/tmp/HANACleaner>
root@atgvm1s866:/tmp/HANACleaner> python hanacleaner.py -k T1CLEANKEY -be 400 -os true
Will now check most used memory in the file systems. If it hangs there is an issue with
s flag helps.
The most used filesystem is using
48%
*****
2019-11-29 14:13:52
hanacleaner as root by T1CLEANKEY on XSC(00) with
hanacleaner.py -k T1CLEANKEY -be 400 -os true
Cleanup Statements will be executed (-es is default true)
Before using HANACleaner read the disclaimer!
python hanacleaner.py --disclaimer
*****
SELECT * from DUMMY
0 data backup entries and 0 log backup entries were removed from the backup catalog
```

Run hanacleaner “forever” with the –hci flag

Flag	Unit	Details	Explanation	Default
-hci	Days	hanacleaner interval	After these number days hanacleaner will restart	-1 (exits)

Example:
(tries to clean trace files older than 400 days again after 1 day):

```

oqladm@ls80010:/tmp/HANACleaner> python hanacleaner.py -tc 400 -hci 1
The most used filesystem is using
80 %
*****
2017-07-02 20:18:09
hanacleaner by SYSTEMKEY
*****
(Cleaning of the backup catalog was not done since -be and -bd were both negative (or not specified))
23 trace files were removed
(Compression of the backup logs was not done since -zb was negative (or not specified))
(Cleaning of the alerts was not done since -ar was negative (or not specified))
(Cleaning of the object history was not done since -om was negative (or not specified))
(Reclaim of free logsements was not done since -lr was negative (or not specified))
(Cleaning of events was not done since -eh and -eu were negative (or not specified))
(Defragmentation was not done since -fl was negative (or not specified))
(Reclaim of row store containers were not done since -rc was negative (or not specified))
(Cleaning of the hanacleaner logs was not done since -or was negative (or not specified))
*****
2017-07-03 20:19:49
hanacleaner by SYSTEMKEY
*****
(Cleaning of the backup catalog was not done since -be and -bd were both negative (or not specified))
0 trace files were removed
(Compression of the backup logs was not done since -zb was negative (or not specified))

```

Do not use
together with
-hci flag!



HANACleaner can be scheduled with CRON to do cleanup e.g once per day

Note: hanacleaner expects the environment of <sid>adm → same environment as <sid>adm has to be provided to use CRON

Example: In /etc/passwd it is specified what environment <sid>adm is using, here bash:

```
oqladm@ls80010:/tmp/HANACleaner> grep oqladm /etc/passwd
oqladm:x:1001:1002:SAP HANA Database System Administrator:/home/oqladm:/bin/bash
```

This shell script, hanacleaner.sh, provides the <sid>adm environment, with `source $HOME/.bashrc` and then executes the hanacleaner command:

```
oqladm@ls80010:/tmp/HANACleaner> vi hanacleaner.sh
#!/bin/bash
source $HOME/.bashrc
python /tmp/HANACleaner/hanacleaner.py -be 100 -bo true -op /tmp/hanacleaneroutput
```

Then a new crontab can be created, calling this shell script, e.g. once every night at 1 o'clock:

```
oqladm@ls80010:/tmp/HANACleaner> crontab -e
0 1 * * * /tmp/HANACleaner/hanacleaner.sh
```

Note: if you want to log the output to std_out set up the crontab like this:

```
oqladm@ls80010:/tmp/HANACleaner> crontab -e
0 1 * * * /tmp/HANACleaner/hanacleaner.sh >> /tmp/HANACleaner/hanacleaner.log 2>&1
```

Hint 1: **00 18 * * 0** → execute 18:00 Sundays Hint 2: **00 18 * * * 0 su - <sid>adm -c "python ..hanacleaner.py ..."** as root → no need to source

HANACleaner – list all flags (1/8)



The --help flag lists all possible input flags:

```
xscadm@atgvm1s866:/tmp/HANACleaner> python hanacleaner.py --help
```

DESCRIPTION:

The HANA cleaner is a house keeping service for SAP HANA. It can be used to clean the backup catalog, diagnostic files, and alerts and to compress the backup logs. It should be executed by <sid>adm or, in case you use a CRON job, with the same environment as the <sid>adm. See SAP Note 2399996 and SAP Note 2400024.

INPUT ARGUMENTS:

```
---- BACKUP ENTRIES in BACKUP CATALOG (and possibly BACKUPS) ----
-be    minimum retained number of data backup (i.e. complete data backups and data snapshots) entries in the catalog, this
      number of entries of data backups will remain in the backup catalog, all older log backup entries will also be removed
      with BACKUP CATALOG DELETE BACKUP_ID <id> (see SQL reference for more info) default: -1 (not used)
-bd    min retained days of data backup (i.e. complete data backups and data snapshots) entries in the catalog [days], the
      youngest successful data backup entry in the backup catalog that is older than this number of days is the oldest
      successful data backup entry not removed from the backup catalog, default -1 (not used)
      Note: if both -be and -bd is used, the most conservative, i.e. the flag that removes the least number entries, decides
      Note: As mentioned in SAP Note 1812057 backup entries made via backint cannot be recovered, i.e. use -be and -bd with care
      if you want to be able to recover from older data backups (it is possible to recover from a specific data backup without
      the backup catalog)
-bb    delete backups also [true/false], backups are deleted when the related backup catalog entries are deleted with
      BACKUP CATALOG DELETE BACKUP_ID <id> COMPLETE (see SQL reference for more info), default: false
-bo    output catalog [true/false], displays backup catalog before and after the cleanup, default: false
-br    output removed catalog entries [true/false], displays backup catalog entries that were removed, default: false
      Note: Please do not use -bo and -br if your catalog is huge (>10000) entries.
```

(continued on next slide)

HANACleaner – list all flags (2/8)



The --help flag lists all possible input flags:

```
---- TRACE FILES ----
-tc retention days for trace files [days], trace files with their latest modification time older than these number of days are removed from all hosts, default: -1 (not used)
Note: Conceptual -tc is the same as -tf, but -tc is using ALTER SYSTEM CLEAR TRACES ... See SQL Ref. for more info.
Note: there is a bug (fixed with rev.122.11) that could cause younger trace files to be removed.
Note: if [expensive_statement] --> use_in_memory_tracking = true HANA will automatically flush expensive statements into memory before deleting the *.expensive_statements.*.trc files, i.e. to keep consistency some clean-up might not work
-tf retention days for trace files [days], trace files, in all hosts, that are older than this number of days are removed (except for the currently opened trace files), only files with certain extensions like .trc, .log etc are taken into account, backup.log and backint.log, are excepted, please see -zb and -zp instead, default: -1 (not used)
Note: Conceptual -tf is the same as -tc, but -tf is using ALTER SYSTEM REMOVE TRACES ... See SQL Ref. for more info.
-to output traces [true/false], displays trace files before and after the cleanup, default: false
-td output deleted traces [true/false], displays trace files that were deleted, default: false
---- DUMP FILES ----
-dr retention days for dump files [days], manually created dump files (a.k.a. fullsystem dumps and runtime dumps) that are older than this number of days are removed, default: -1 (not used)
---- ANY FILES ----
-gr retention days for any general file [days], files in the directory specified with -gd and with the file names including the word specified with -gw are only saved for this number of days, default: -1 (not used)
Note: -gd and -gw can also be same length lists with a commas as delimiter
-gd directories for general files to be deleted, a comma separated list with full paths of directories with files to be deleted according to -gr (entries pairs with entries in -gw), default "" (not used)
Note: if you include %SID, it will automatically be replaced with the actually SID of your system
-gw filename parts for general files to be deleted, a comma separated list with words that files should have in their names to be deleted according to -gr (entries pairs with entries in -gd), default "" (not used)
-gm max depth, maximum recursive folders from folder specified by -gd it will delete files from, default: 1
```

(continued on next slide)

HANACleaner – list all flags (3/8)



The --help flag lists all possible input flags:

```
---- BACKUP LOGS <H2SPS04 ----
-zb    backup logs compression size limit [mb], if there are any backup.log or backint.log file (see -zp below) that is bigger
      than this size limit, then it is compressed and renamed, default: -1 (not used)
      Note: if -tf flag is used the resulting zip file could be removed by it.
      Note: Don't use this with version HANA 2 SPS04 or later, instead configure size with parameters, see SAP Note 2797078
-zp    zip path, specifies the path (and all subdirectories) where to look for the backup.log and backint.log files,
      default is the directory specified by the alias cdtrace
-zl    zip links [true/false], specifies if symbolic links should be followed searching for backup logs in subdirectories
      of the directory defined by zp (or by alias cdtrace), default: false
-zo    print zipped backup logs, display the backup.log and backint.log that were zipped, default: false
-zk    keep zip, if this is set to false the zip file is deleted (use with care!), default: true
---- ALERTS ----
-ar    min retained alerts days [days], min age (today not included) of retained statistics server alerts, default: -1 (not used)
-ao    output alerts [true/false], displays statistics server alerts before and after the cleanup, default: false
-ad    output deleted alerts [true/false], displays statistics server alerts that were deleted, default: false
---- OBJECT LOCKS ENTRIES with UNKNOWN OBJECT NAME ----
-kr    min retained unknown object lock days [days], min age (today not included) of retained object lock entries with unknown
      object name, in accordance with SAP Note 2147247, default: -1 (not used)
---- OBJECT HISTORY ----
-om    object history table max size [mb], if the table _SYS_REPO.OBJECT_HISTORY is bigger than this threshold this table
      will be cleaned up according to SAP Note 2479702, default: -1 (not used)
-oo    output cleaned memory from object table [true/false], displays how much memory was cleaned up from object history
      table, default: false
---- LOG SEGMENTS ----
-lr    max free logsegments per service [number logsegments], if more free logsegments exist for a service the statement
      ALTER SYSTEM RECLAIM LOG is executed, default: -1 (not used)
```

(continued on next slide)

HANACleaner – list all flags (4/8)



The --help flag lists all possible input flags:

```
---- EVENTS ----
-eh min retained days for handled events [day], minimum retained days for the handled events, handled events that are older
are removed by first being acknowledged and then deleted, this is done for all hosts, default: -1 (not used)
Note: Due to a current issue in HANA all events of type INFO are ignored. If automatic cleaning of INFO events are
needed, please open an incident on component HAN-DB about the SQL statement ALTER SYSTEM SET EVENT HANDLED.

-eu min retained days for unhandled events [day], minimum retained days for events, events that are older are removed by
first being handled and acknowledged and then deleted, this is done for all hosts, default: -1 (not used)

---- AUDIT LOG ----
-ur retention days for audit log table [days], audit log content older than these number of days is removed,
default: -1 (not used)

---- DATA VOLUMES FRAGMENTATION ----
-fl fragmentation limit [%], maximum fragmentation of data volume files, of any service, before defragmentation of that
service is started: ALTER SYSTEM RECLAIM DATAVOLUME '<host>:<port>' 120 DEFragments, default: -1 (not used)
Note: If you use System Replication see Q19 in SAP Note 1999880.

-fo output fragmentation [true/false], displays data volume statistics before and after defragmentation, default: false

---- MULTIPLE ROW STORE TABLE CONTAINERS ----
-rc row store containers cleanup [true/false], switch to clean up multiple row store table containers, default: false
Note: Unfortunately there is NO nice way to give privileges to the DB User to be allowed to do this. Either you can
run hanacleaner as SYSTEM user (NOT recommended) or grant DATA ADMIN to the user (NOT recommended)

-ro output row containers [true/false], displays row store tables with more than one container before cleanup, default: false
```

(continued on next slide)

HANACleaner – list all flags (5/8)



The --help flag lists all possible input flags:

```
---- COMPRESSION OPTIMIZATION ----
1. Both following two flags, -cc, and -ce, must be > 0 to control the force compression optimization on tables that never
was compression re-optimized (i.e. last_compressed_record_count = 0):
-ac max allowed raw main records, if table has more raw main rows --> compress if -ce, default: -1 (not used) e.g. 10000000
-ce max allowed estimated size [GB], if estimated size is larger --> compress if -cc, default: -1 (not used) e.g. 1
2. All following three flags, -cr, -cs, and -cd, must be > 0 to control the force compression optimization on tables with
columns with compression type 'DEFAULT' (i.e. no additional compression algorithm in main)
-cr max allowed rows, if a column has more rows --> compress if -cs&-cd, default: -1 (not used) e.g. 10000000
-cs max allowed size [MB], if a column is larger --> compress if -cr&-cd, default: -1 (not used) e.g. 500
-cd min allowed distinct count [%], if a column has less distinct quota --> compress if -cr&-cs, default -1 (not used) e.g. 5
3. Both following two flags, -cu and -cq, must be > 0 to control the force compression optimization on tables whose UDIV
quota is too large, i.e. #UDIVs/(#raw main + #raw delta)
-cq max allowed UDIV quota [%], if the table has larger UDIV quota --> compress if -cu, default: -1 (not used) e.g. 150
-cu max allowed UDIVs, if a column has more then this number UDIVs --> compress if -cq, default: -1 (not used) e.g. 10000000
4. Flag -cb must be > 0 to control the force compression optimization on tables with columns with SPARSE (<122.02) or
PREFIXED and a BLOCK index
-cb max allowed rows, if a column has more rows and a BLOCK index and SPARSE (<122.02) or PREFIXED then this table should
be compression re-optimized, default -1 (not used) e.g. 100000
Following three flags are general; they control all three, 1., 2., 3., 4., compression optimization possibilities above
per partition [true/false], switch to consider flags above per partition instead of per column, default: false
-cp
-cm
-co output compressed tables [true/false], switch to print all tables that were compression re-optimized, default: false
---- VIRTUAL TABLE STATISTICS ----
-vs create statistics for virtual tables [true/false], switch to create optimization statistics for those virtual tables
that are missing statistics according to SAP Note 1872652 (Note: could cause expensive operations), default: false
-vl schema list of virtual tables, if you only want tables in some schemas to be considered for the creation of statistics
provide here a comma separated list of those schemas, default '' (all schemas will be considered)
---- INIFILE CONTENT HISTORY ----
-ir infile content history retention [days], deletes older inifile content history, default: -1 (not used) (should > 1 year)
```

(continued on next slide)

HANACleaner – list all flags (6/8)



The --help flag lists all possible input flags:

```
---- COMPRESSION OPTIMIZATION ----
1. Both following two flags, -cc, and -ce, must be > 0 to control the force compression optimization on tables that never
was compression re-optimized (i.e. last_compressed_record_count = 0):
-cs max allowed raw main records, if table has more raw main rows --> compress if -ce, default: -1 (not used) e.g. 10000000
-ce max allowed estimated size [GB], if estimated size is larger --> compress if -cc, default: -1 (not used) e.g. 1
2. All following three flags, -cr, -cs, and -cd, must be > 0 to control the force compression optimization on tables with
columns with compression type 'DEFAULT' (i.e. no additional compression algorithm in main)
-cr max allowed rows, if a column has more rows --> compress if -cs&-cd, default: -1 (not used) e.g. 10000000
-cs max allowed size [MB], if a column is larger --> compress if -cr&-cd, default: -1 (not used) e.g. 500
-cd min allowed distinct count [%], if a column has less distinct quota --> compress if -cr&-cs, default -1 (not used) e.g. 5
3. Both following two flags, -cu and -cq, must be > 0 to control the force compression optimization on tables whose UDIV
quota is too large, i.e. #UDIVs/(#raw main + #raw delta)
-cq max allowed UDIV quota [%], if the table has larger UDIV quota --> compress if -cu, default: -1 (not used) e.g. 150
-cu max allowed UDIVs, if a column has more then this number UDIVs --> compress if -cq, default: -1 (not used) e.g. 10000000
4. Flag -cb must be > 0 to control the force compression optimization on tables with columns with SPARSE (<122.02) or
PREFIXED and a BLOCK index
-cb max allowed rows, if a column has more rows and a BLOCK index and SPARSE (<122.02) or PREFIXED then this table should
be compression re-optimized, default -1 (not used) e.g. 100000
Following three flags are general; they control all three, 1., 2., 3., 4., compression optimization possibilities above
per partition [true/false], switch to consider flags above per partition instead of per column, default: false
-cp
-cm
-co output compressed tables [true/false], switch to print all tables that were compression re-optimized, default: false
---- VIRTUAL TABLE STATISTICS ----
-vs create statistics for virtual tables [true/false], switch to create optimization statistics for those virtual tables
that are missing statistics according to SAP Note 1872652 (Note: could cause expensive operations), default: false
-vl schema list of virtual tables, if you only want tables in some schemas to be considered for the creation of statistics
provide here a comma separated list of those schemas, default '' (all schemas will be considered)
---- INIFILE CONTENT HISTORY ----
-ir infile content history retention [days], deletes older inifile content history, default: -1 (not used) (should > 1 year)
```

(continued on next slide)

HANACleaner – list all flags (7/8)



The --help flag lists all possible input flags:

```
---- INTERVAL ----
-hci  hana cleaner interval [days], number days that hanacleaner waits before it restarts, default: -1 (exits after 1 cycle)
      NOTE: Do NOT use if you run hanacleaner in a cron job!
      ---- INPUT ----
-ff   flag file, full path to a file that contains input flags, each flag in a new line, all lines in the file that does not
      start with a flag are considered comments, if this flag is used no other flags should be given, default: '' (not used)
      Note: if you include %SID in the path, it will automatically be replaced with the actually SID of your system
      ---- EXECUTE ----
-es   execute sql [true/false], execute all crucial housekeeping tasks (useful to turn off for investigation with -os=true,
      a.k.a. chicken mode :) default: true
      ---- OUTPUT ----
-os   output sql [true/false], prints all crucial housekeeping tasks (useful for debugging with -es=false), default: false
-op   output path, full literal path of the folder for the output logs (will be created if not there), default = '' (not used)
      Note: if you include %SID in the output path, it will automatically be replaced with the actually SID of your system
-of   output prefix, adds a string to the output file, default: '' (not used)
-or   output retention days, logs in the paths specified with -op are only saved for this number of days, default: -1 (not used)
-so   standard out switch [true/false], switch to write to standard out, default: true
      ---- INSTANCE ONLINE CHECK ----
-oi   online test interval [seconds], < 0: HANACleaner does not check if online or secondary,                      default: -1 (not used)
      = 0: if not online or not primary HANACleaner will abort
      > 0: time it waits before it checks if DB is online and primary again
            Note: For the > 0 option it might be necessary to use cron with the lock option
                  See the HANASitter & CRON slide in the HANASitter pdf
```

(continued on next slide)

HANACleaner – list all flags (8/8)



The --help flag lists all possible input flags:

```
---- SERVER FULL CHECK ----
-fs    file system, path to server to check for disk full situation before hanacleaner runs, default: blank, i.e. df -h is used
      Could also be used to specify a couple of servers with e.g. -fs "|grep sapmnt"
-if    ignore filesystems and mounts, before hanacleaner starts it checks that there is no disk full situation in any of the
      filesystems and/or mounts, this flag makes it possible to ignore some filesystems, with comma separated list, from the
      df -h command (filesystems are in the first column and mounts normally in the 5th or 6th column), default: ''
-df    filesystem check switch [true/false], it is possible to completely ignore the filesystem check (necessary if non-ascii
      comes out from df -h). However, hanacleaner is NOT supported in case of full filesystem so if you turn this to false
      it is necessary that you check for disk full situation manually! default: true
---- SSL ----
-ssl   turns on ssl certificate [true/false], makes it possible to use SAP HANA Cleaner despite SSL, default: false
---- HOST ---
-vlh   virtual local host, if hanacleaner runs on a virtual host this has to be specified, default: '' (physical host is assumed)
---- USER KEY ---
-k     DB user key, this one has to be maintained in hdbuserstore, i.e. as <sid>adm do
      > hdbuserstore SET <DB USER KEY> <ENV> <USERNAME> <PASSWORD> , default: SYSTEMKEY
      It could also be a list of comma seperated userkeys (useful in MDC environments), e.g.: SYSTEMKEY,TENANT1KEY,TENANT2KEY
      Note: It is not possible to use underscore in the user key, e.g. HANA_HOUSEKEEPING is NOT possible
-dbs   DB key, this can be a list of databases accessed from the system defined by -k (-k can only be one key if -dbs is used)
      Note: Users with same name and password have to be maintained in all databases , default: '' (not used)
      Example: -k PQLSYSDB -dbs SYSTEMDB, PQL
---- EMAIL ---
-en    email notification, <recievers email>,<sender's email>,<mail server>
      example: -en you@ourcompany,me@ourcompany.com,smtp.intra.ourcompany.com
      NOTE: For this to work you have to install the linux program "sendmail" and add a line similar to
      DSsmtp.intra.ourcompany.com in the file sendmail.cf in /etc/mail/, see
      https://www.systutorials.com/5167/sending-email-using-mailx-in-linux-through-internal-smtp/
```