



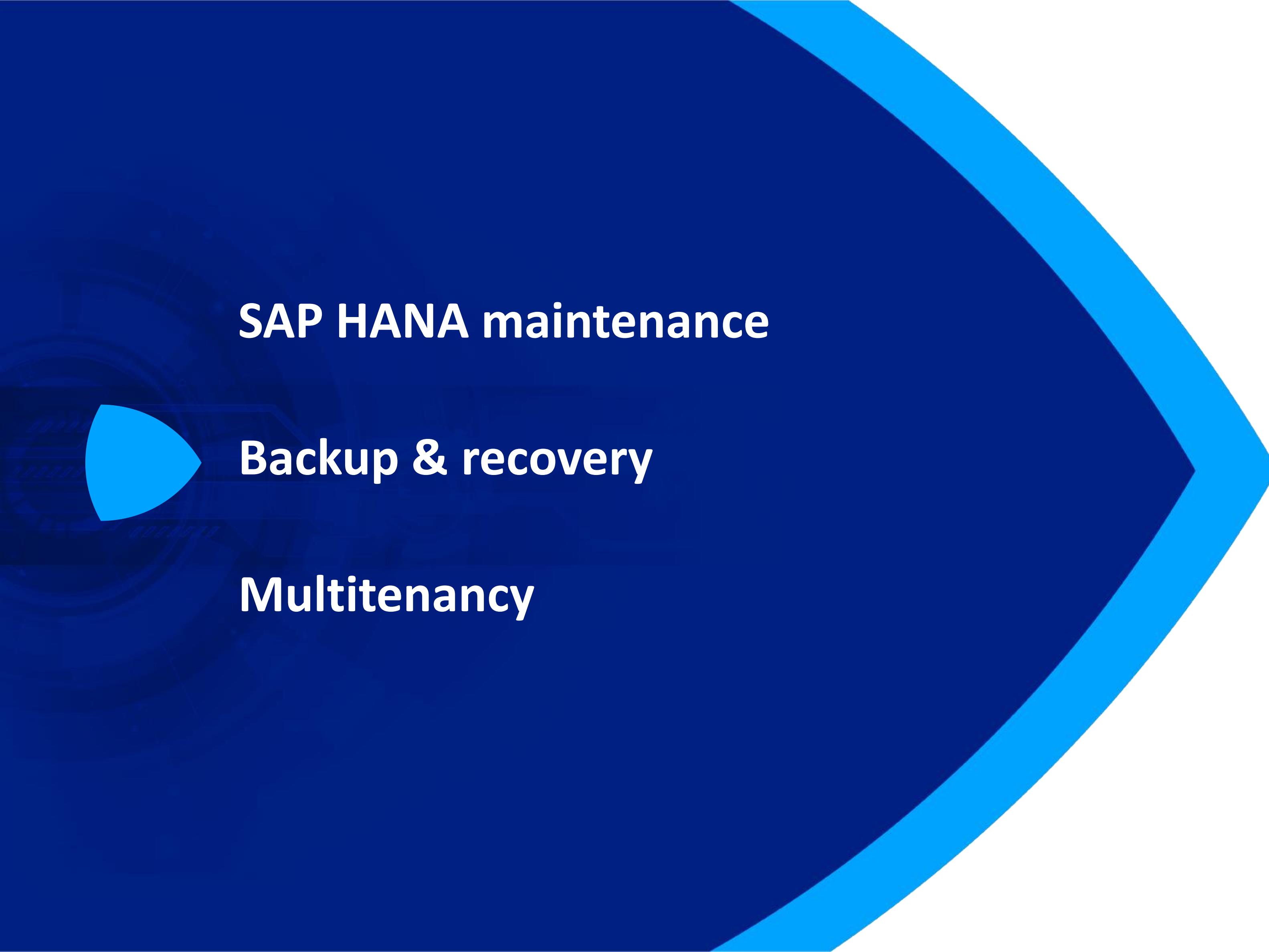
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# SAP HANA Workshop

## Kapitola 3: Administrace

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SAP HANA maintenance

Backup & recovery

Multitenancy



**SAP HANA maintenance**



**Backup & recovery**

**Multitenancy**

## SAP HANA - Administrace

### Maintenance - Start/Stop

#### Multiple ways to start and stop SAP HANA Database

Use SAP HANA cockpit in a browser

- Needs the password of <sid>adm

Use OS command within a ssh shell

- **Use HDB as <sid>adm**
  - *HDB stop / HDB start*
- **Use sapcontrol as root**
  - *sapcontrol –nr 00 –function Stop*
  - *sapcontrol –nr 00 –function Start*
  - *sapcontrol –nr 00 –function GetProcessList*

## SAP HANA - Administrace

Maintenance - Start/Stop (commandline)

### Starting SAP HANA database

#### Using sapcontrol

```
/usr/sap/hostctrl/exe/sapcontrol -nr <Instance_Number> -function Start
```

#### Using HDB as <sapsid>adm

```
/usr/sap/<SAPSID>/<Instance_Name>/HDB start
```

### Stopping SAP HANA database

#### Using sapcontrol

```
/usr/sap/hostctrl/exe/sapcontrol -nr <Instance_Number> -function Stop
```

#### Using HDB as <sapsid>adm

```
/usr/sap/<SAPSID>/<Instance_Name>/HDB stop
```

## SAP HANA - Administrace

### Maintenance - Start/Stop (commandline)

Action	Command
<b>Start the system</b>	/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function StartSystem
<b>Stop the system</b>	/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function StopSystem
<b>Query current host status</b>	/usr/sap/hostctrl/exe/sapcontrol -nr <instance_number> -function GetSystemInstanceList

# SAP HANA - Administrace

## Maintenance – process list (commandline)

### Displaying process list at command line

#### Log on to Linux command line as root

```
/usr/sap/hostctrl/exe/sapcontrol -nr <instancenr> -function  
GetProcessList
```

#### Log on to Linux command line as <sid>adm

```
HDB info
```

```
wdflbmt7194:/usr/sap/SHS/HDB20> HDB info  
USER      PID  PPID %CPU    VSZ   RSS COMMAND  
shsadm   13602 13601  0.0  22096  2940 -sh  
shsadm   17397 13602  0.0  12896  1724  \_ /bin/sh /usr/sap/SHS/HDB20/HDB info  
shsadm   17420 17397  0.0  13148  1072  \_ ps fx -U shsadm -o user,pid,ppid,  
shsadm    16446   1  0.0  22000  1552 sapstart pf=/hana/shared/SHS/profile/SHS_  
shsadm   16454 16446  0.4  463928 293356  \_ /usr/sap/SHS/HDB20/wdflbmt7194/trace  
shsadm   16468 16454  1.6  4290328 1128872  \_ hdbnameserver  
shsadm   16603 16454  1.7  2913792 342544  \_ hdbpreprocessor  
shsadm   16606 16454  0.8  2890504 348080  \_ hdbcompileserver  
shsadm   16627 16454 13.7  6693900 3470372  \_ hdbindexserver  
shsadm   16630 16454  5.6  4666476 1586556  \_ hdbstatisticsserver  
shsadm   16632 16454  4.3  4081964 1066972  \_ hdbxsengine  
shsadm   17233 16454  1.9  3205172 561856  \_ hdbwebdispatcher  
shsadm   10106   1  0.0  222496  74672 /usr/sap/SHS/HDB20/exe/sapstartsrv pf=/ha
```

### Displaying Process list in GUI

You can also use SAP Microsoft Management console (SAP MMC) from Windows PC to display SAP HANA process list

# SAP HANA - Administrace

## Maintenance - Start/Stop (cockpit)

The screenshot illustrates the SAP HANA Cockpit interface for managing services. On the left, a summary box shows 'Overall Database Status' with '7 Services' running. A red box highlights the 'Running' status icon and the number '7'. A red arrow points from this summary to the main cockpit window.

**1 - Select the running services to see the services details**

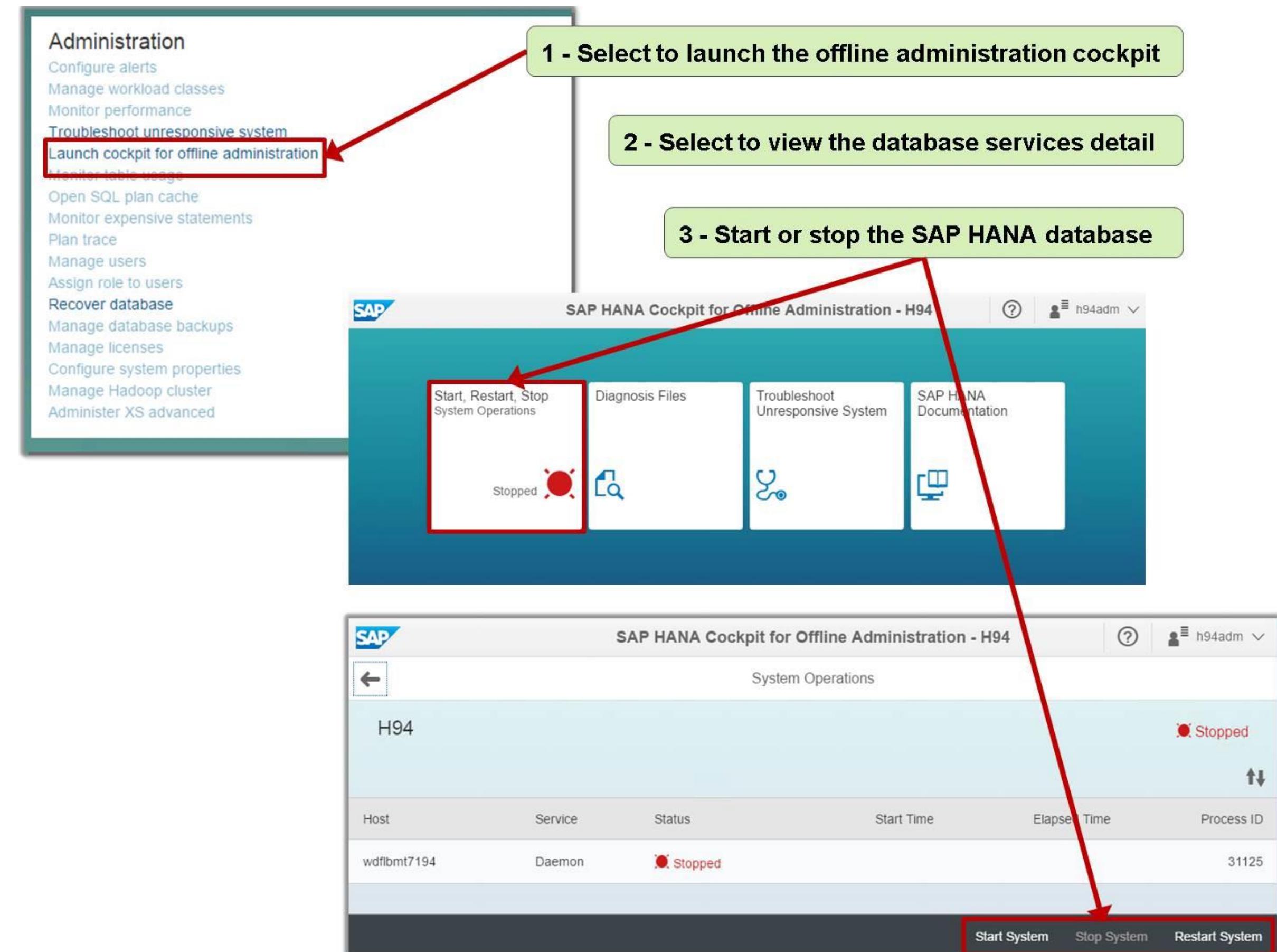
**2 - Stop or start the SAP HANA database**

The main window is titled 'SAP HANA Cockpit | H94' and shows a table of services. The table has columns: Host, Status, Service, Role, Port, Start Time, CPU, and Memory. Seven services are listed, all marked as 'Running'. A context menu is open over the first service (daemon) in the list, with options: Kill Service, Remove Service, Reset Memory Statistics, Go to Alerts, Start System, and Stop System. The 'Stop System' option is highlighted with a red box and a red arrow pointing to it from the '2 -' callout.

Host	Status	Service	Role	Port	Start Time	CPU	Memory
wdfibmt7194	<span>Running</span>	daemon		30000	Apr 25, 2017, 2:32:47 PM		
	<span>Running</span>	nameserver	master	30001	Apr 25, 2017, 2:32:49 PM		
	<span>Running</span>	preprocessor		30002	Apr 25, 2017, 2:32:53 PM		
	<span>Running</span>	indexserver	master	30003	Apr 25, 2017, 2:32:56 PM		
	<span>Running</span>	webdispatcher		30006	Apr 25, 2017, 2:33:13 PM		
	<span>Running</span>	xsengine		30007	Apr 25, 2017, 2:32:56 PM		
	<span>Running</span>	compileserver		30010	Apr 25, 2017, 2:32:52 PM		

# SAP HANA - Administrace

## Maintenance - Start/Stop (cockpit)



# SAP HANA - Administrace

## Konfigurace (cockpit)

Administration

- Configure alerts
- Manage workload classes
- Monitor performance
- Troubleshoot unresponsive system
- Launch cockpit for offline administration
- Monitor table usage
- Open SQL plan cache
- Monitor expensive statements
- Plan trace
- Manage users
- Assign role to users
- Recover database
- Manage database backups
- Manage licenses
- Configure system properties**
- Manage Hadoop cluster
- Administer XS advanced

Select Configuration File, Section, and Host

Section	Parameter	Layer	Specific Value	
global.ini	audit_statement_length	DEFAULT	-1	
	default_audit_trail_type	DEFAULT	CSTABLE	
authentication	authentication_methods	DEFAULT	password,kerberos,spnego,saml,	
	backup	backint_response_timeout	DEFAULT	600
catalog_backup_parameter_file		catalog_backup_parameter_file	DEFAULT	
		catalog_backup_using_backint	DEFAULT	false
		data_backup_buffer_size	DEFAULT	512
		data_backup_max_chunk_size	DEFAULT	0
		data_backup_parameter_file	DEFAULT	
		data_backup_savepoint_lock_ti...	DEFAULT	7200
		enable_accumulated_catalog_b...	DEFAULT	true
		log_backup_buffer_size	DEFAULT	128
		log_backup_interval_mode	DEFAULT	immediate
log_backup_parameter_file	DEFAULT			
log_backup_using_backint	DEFAULT	false		

# SAP HANA - Administrace

## Konfigurace (cockpit)

SAP HANA Cockpit | H94

Configuration of System Properties

Configuration File: All Section: All Host: All Go

Configuration File Contents

basepath

Section	Parameter	Layer	Specific Value
global.ini	basepath_catalogbackup	DEFAULT	\$(DIR_INSTANCE)/backup/log
	basepath_databackup	DEFAULT	\$(DIR_INSTANCE)/backup/data
	basepath_databackup_ets	DEFAULT	\$(DIR_INSTANCE)/backup/data_
	basepath_datavolumes	DEFAULT	\$(DIR_GLOBAL)/hdb/data
		SYSTEM	/hana/data/H94
	basepath_datavolumes_es	DEFAULT	\$(DIR_GLOBAL)/hdb/data_es
	basepath_datavolumes_ets	DEFAULT	\$(DIR_GLOBAL)/hdb/data_ets
	basepath_export	DEFAULT	\$(DIR_INSTANCE)/work
	basepath_filedownload_rdsync	DEFAULT	\$(DIR_GLOBAL)/hdb/data_rdsyn
	basepath_fileupload_rdsync	DEFAULT	\$(DIR_GLOBAL)/hdb/data_rdsyn
	basepath_logbackup	DEFAULT	\$(DIR_INSTANCE)/backup/log
	basepath_logbackup_ets	DEFAULT	\$(DIR_INSTANCE)/backup/log_e
	basepath_logmirror	DEFAULT	\$(DIR_GLOBAL)/hdb/logmirror
	basepath_logvolumes	DEFAULT	\$(DIR_GLOBAL)/hdb/log
	SYSTEM	/hana/log/H94	
basepath_logvolumes_es	DEFAULT	\$(DIR_GLOBAL)/hdb/log	

# SAP HANA - Administrace

## Konfigurace (commandline)

### Global Parameters:

```
wdflbmt7194.wdf.sap.corp - PuTTY
h94adm@wdflbmt7194:/usr/sap/H94/SYS/global/hdb/custom/config> ll
total 24
-rw-r--r-- 1 h94adm sapsys 278 Apr 26 17:40 global.ini
-rw-r--r-- 1 h94adm sapsys 43 Apr 28 15:15 indexserver.ini
drwxr-x--- 3 h94adm sapsys 4096 Apr 26 14:58 lexicon
-rw-r--r-- 1 h94adm sapsys 234 Apr 29 09:52 nameserver.ini
-rw-r--r-- 1 h94adm sapsys 42 Apr 29 09:53 statisticsserver.ini
-rw-r--r-- 1 h94adm sapsys 42 Apr 29 09:53 webdispatcher.ini
h94adm@wdflbmt7194:/usr/sap/H94/SYS/global/hdb/custom/config>
```

### Server Parameters:

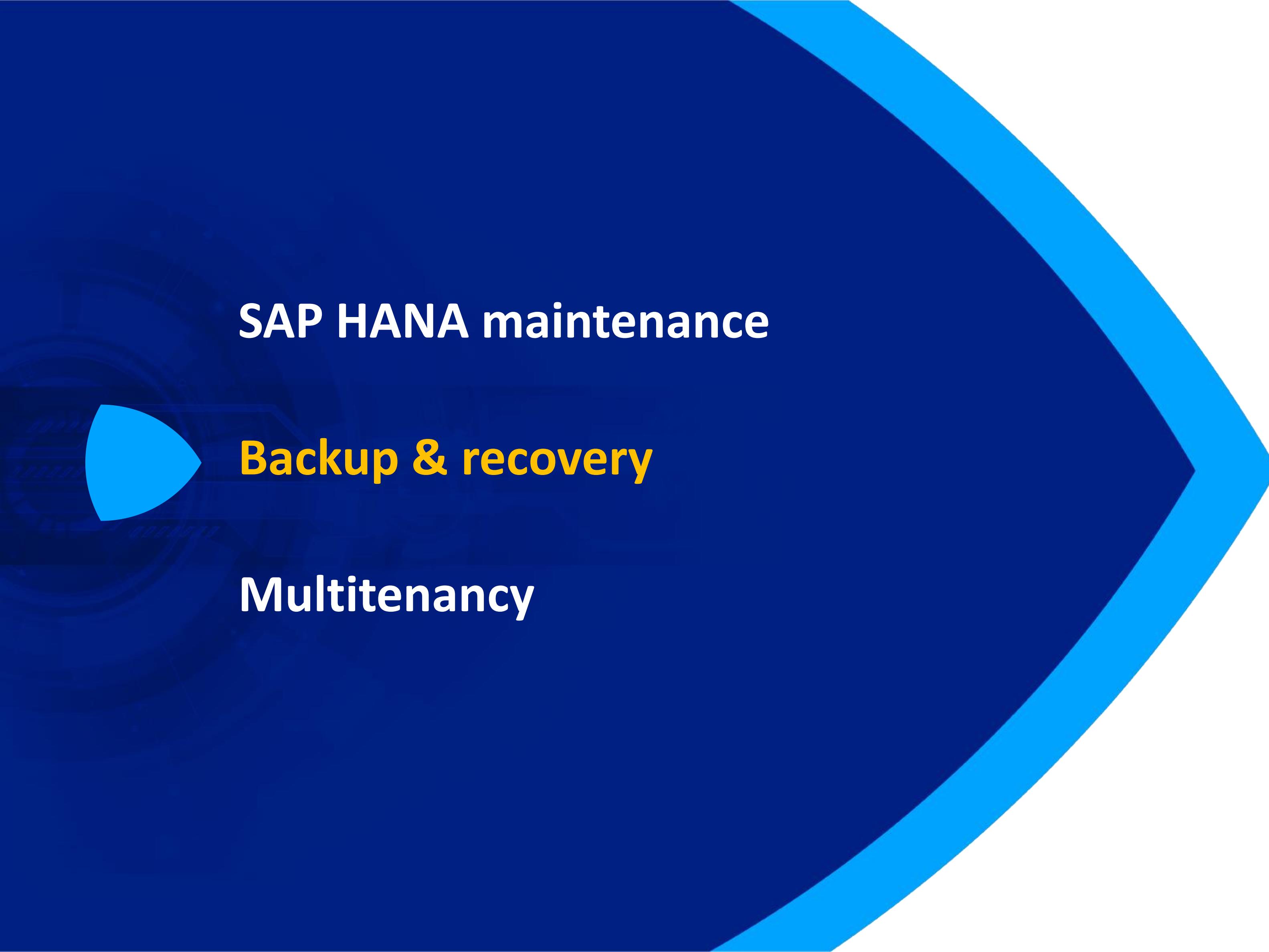
```
wdflbmt7194.wdf.sap.corp - PuTTY
h94adm@wdflbmt7194:/usr/sap/H94/HDB00/wdflbmt7194> ll
total 44
-rw-r----- 1 h94adm sapsys 53 Apr 26 14:58 daemon.ini
drwxr-x--- 2 h94adm sapsys 4096 Apr 29 09:53 lock
drwxr-x--- 5 h94adm sapsys 4096 Apr 26 14:59 log
drwxr-x--x 2 h94adm sapsys 4096 Apr 26 17:39 plan_trace
-rwxr-x--- 1 h94adm sapsys 136 Apr 26 14:58 saprofile.ini
drwxr-x--- 2 h94adm sapsys 4096 Apr 26 15:00 sec
drwxr-x--- 3 h94adm sapsys 4096 Apr 29 09:53 tmp
drwxr-x--- 2 h94adm sapsys 4096 Apr 29 09:53 trace
drwxr-x--- 4 h94adm sapsys 4096 Apr 26 15:00 wdisp
-rw-r--r-- 1 h94adm sapsys 94 Apr 29 09:53 webdispatcher.ini
drwxr-x--- 2 h94adm sapsys 4096 Apr 26 14:58 work
h94adm@wdflbmt7194:/usr/sap/H94/HDB00/wdflbmt7194>
```

# SAP HANA - Administrace

## Konfigurace (HANA studio)

The screenshot shows the SAP HANA Studio interface for managing the HOP (SYSTEM) instance. The left sidebar displays a tree view of database objects under the 'Systems' node, including 'HOP (SYSTEM)', 'Catalog' (with sub-items like 'Public Synonyms', 'HANA\_XS\_BASE', etc.), 'SYS', and 'SYSTEM'. The main workspace is titled 'HOP (SYSTEM)' and shows various tabs: Overview, Landscape, Alerts, Performance, Volumes, Configuration, System Information, Diagnosis Files, and Trace Configuration. The 'Configuration' tab is selected, displaying a table of configuration files:

Name	Default	System	Host - hana2-125
attributes.ini			
computeserver.ini			
diserver.ini		◆	
docstore.ini			
dpserver.ini			
esserver.ini			
executor.ini			
global.ini	◆		
indexserver.ini	◆		
multidb.ini			
scriptserver.ini			
statisticsserver.ini			
streamingserver.ini			
xscontroller.ini		◆	
xsengine.ini		◆	



SAP HANA maintenance

Backup & recovery

Multitenancy

# SAP HANA - Administrate

## Backup

**After the initial setup and the initial data load perform a**

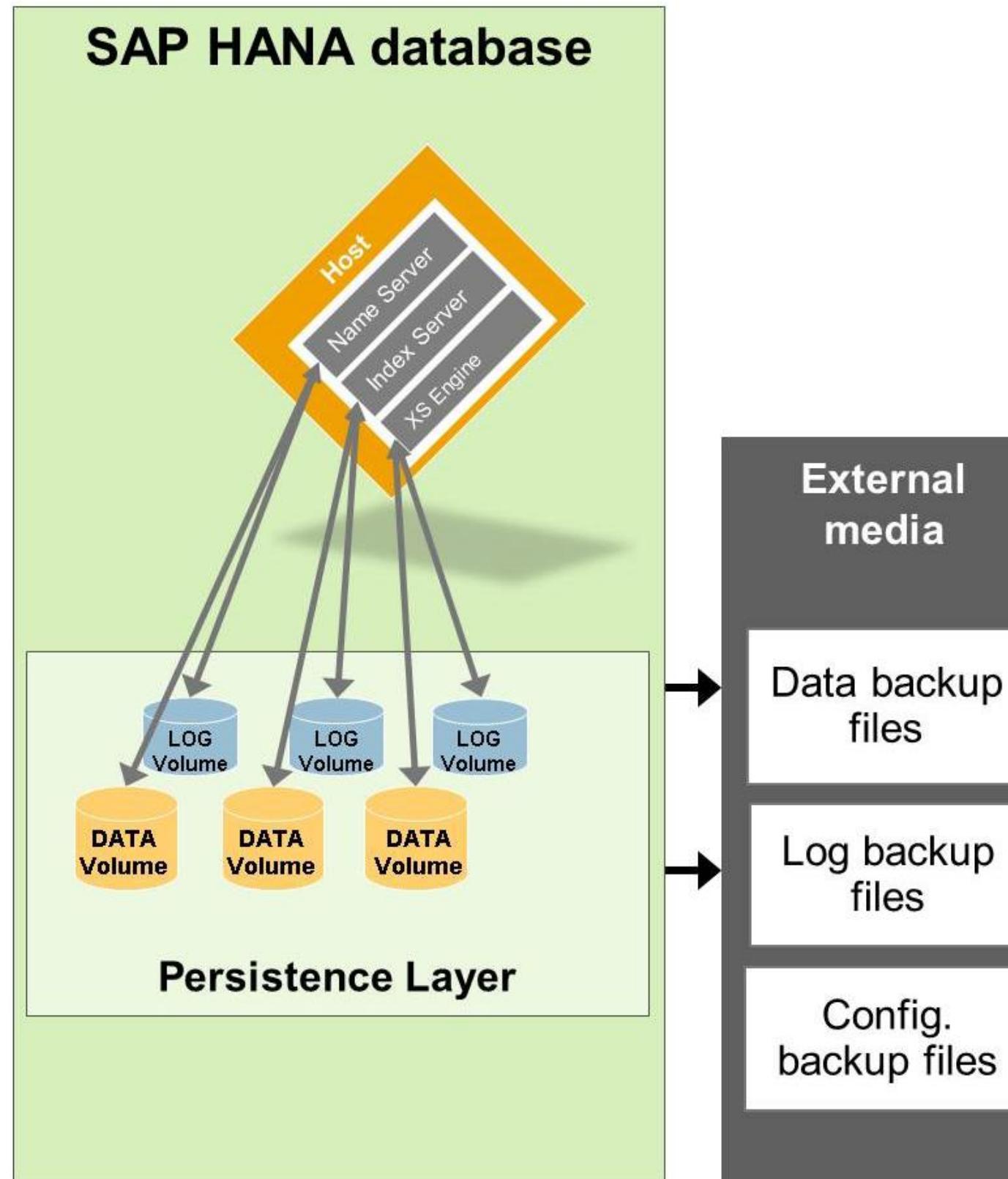
- Full data backup
- File system backup (including a configuration backup)



The screenshot shows the SAP HANA Cockpit interface with the title "SAP HANA Cockpit | H94". Below it, the page title is "Backup Catalog - H94". The main area displays a table titled "Backup Catalog" with the following columns: Status, Start Time, Backup Type, Duration, Size, Destination Type, and Comment. A message "No data" is shown below the table. At the bottom right of the table area, there are three buttons: "Create Backup" (highlighted with a red box), "Create Schedule", and "Go to Schedules". Above the table, a blue bar indicates filtering: "Filtered by: Backup Type (Complete Data Backup, Data Snapshot), Start Time (Last four weeks)". The top navigation bar includes icons for home, grid, SAP logo, help, and export.

# SAP HANA - Administrace

## Backup



### Why should database be backed up?

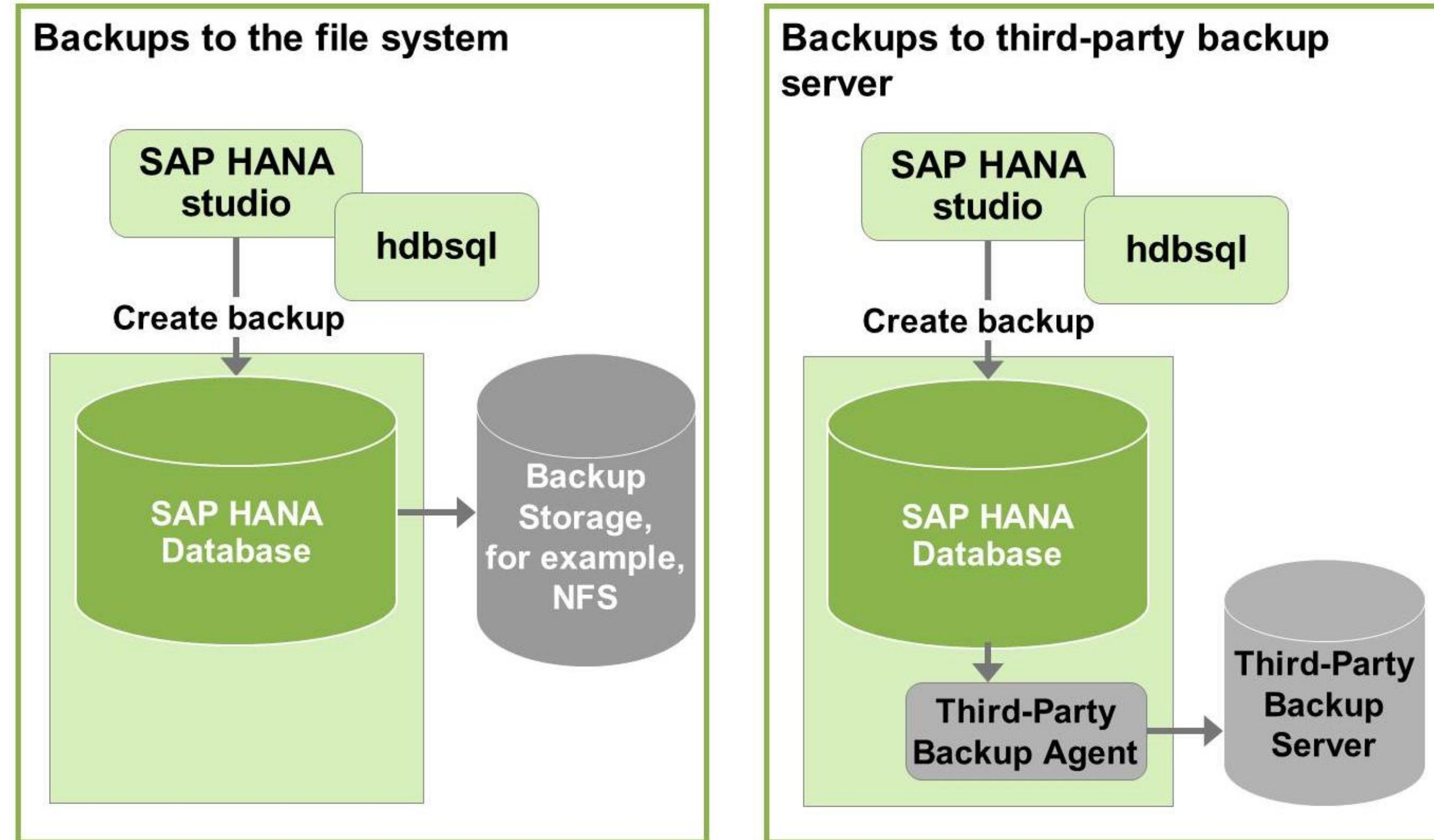
- To avoid data loss due to disk failures

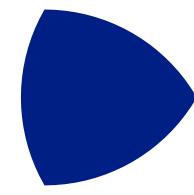
### What data could be backed up and restored?

- Database backup included back up of:
  - Data area – from persistent storage to external backup locations
  - Log area – is backed up automatically
  - Configuration files (.ini files) – can be backed up manually

# SAP HANA - Administrate

## Backup





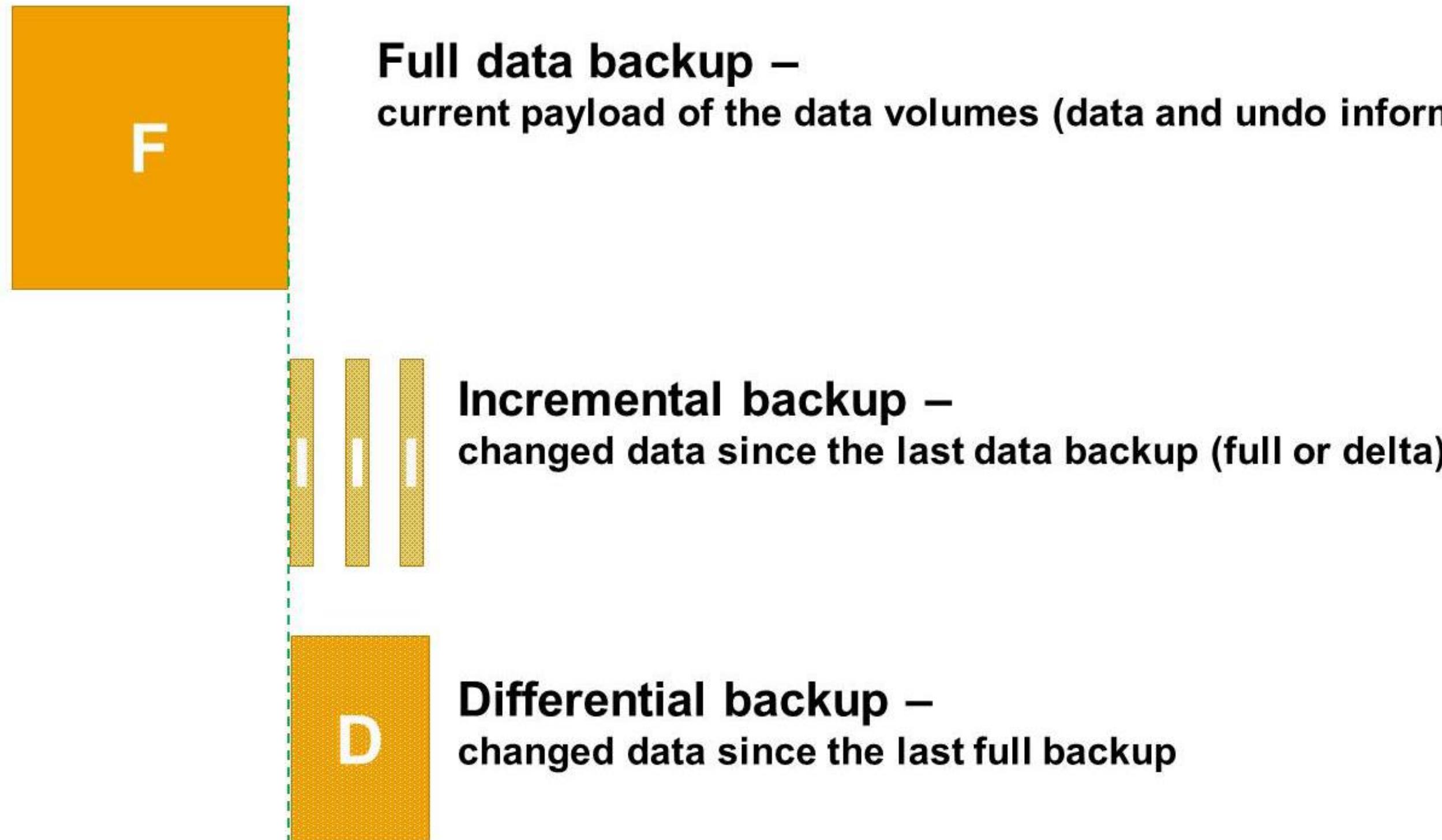
## SAP HANA - Administrace

### Backup – required authorizations

Task	Required authorizations
Back up SAP HANA using SAP HANA cockpit or SAP HANA studio	BACKUP ADMIN or BACKUP OPERATOR
	CATALOG READ This privilege is required to collect the information needed by the backup wizard
Back up the database without a user interface	BACKUP ADMIN or BACKUP OPERATOR (recommended for batch users only)
Recover the database without a user interface	This is supported for an SAP HANA single container system or the system database in an SAP HANA multitenant data-base container. The recovery is executed as the operating system user (<sid>adm). You therefore require the logon credentials of this user.
Physically delete data, and log backups and obsolete versions of the backup catalog from the backup location	BACKUP ADMIN
Administration tasks executed on a tenant database through the system database	DATABASE ADMIN

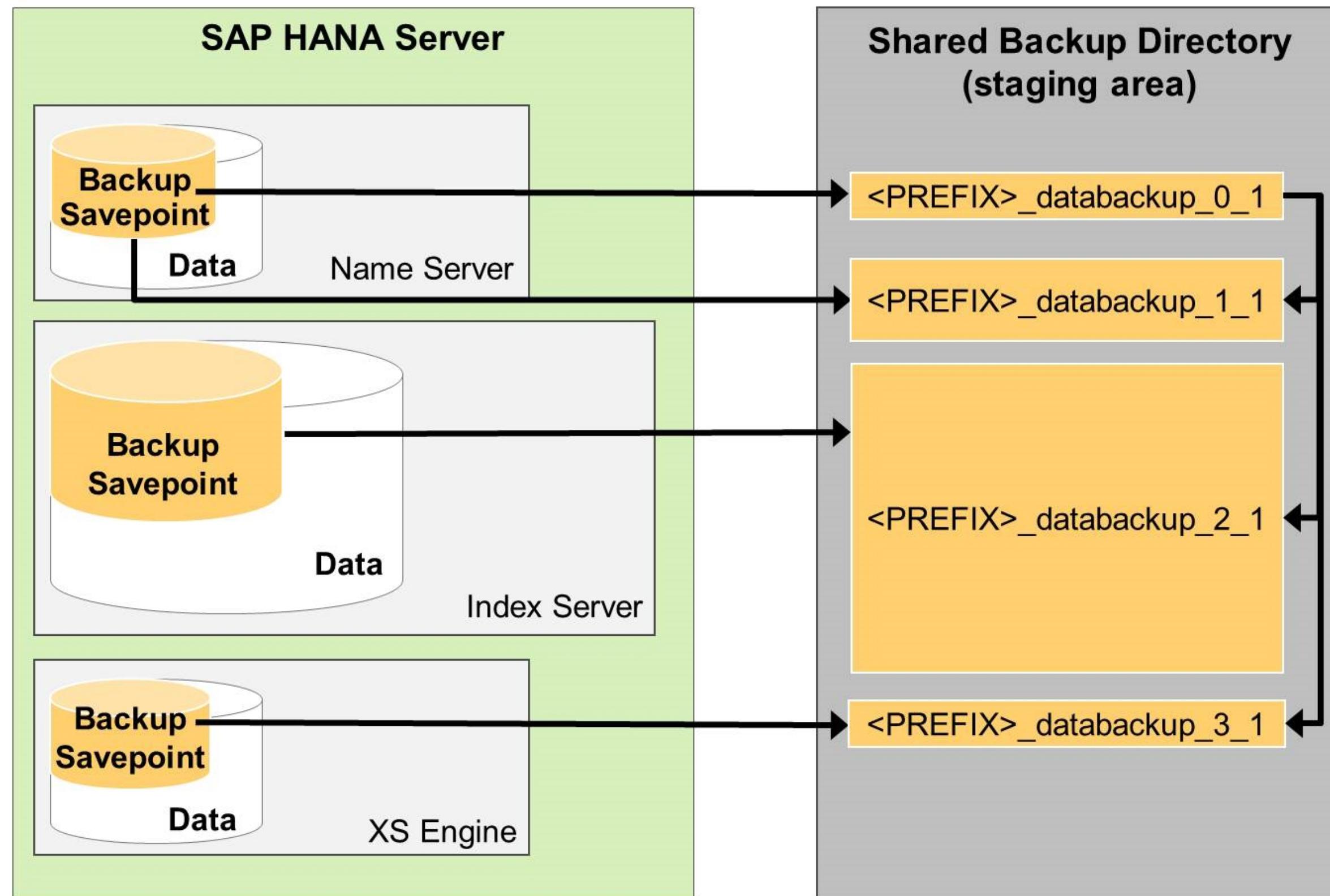
# SAP HANA - Administrace

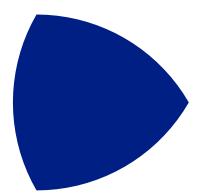
## Data Area Backup



# SAP HANA - Administrace

## Data Area Backup





## SAP HANA - Administrace

ini files backup

### The configuration files (.ini files)

- Contain details of the configuration of the database
- Customer specific modification in .ini files could be backed up manually
- Should be copied to an external backup destination
- The .ini files are located in the following directories:

For global configuration settings

**\$DIR\_INSTANCE/..SYS/global/hdb/  
custom/config**

For host-specific configuration settings:

**\$SAP\_RETRIEVAL\_PATH**



# SAP HANA - Administrace

## Perform recovery

### Prerequisites

To perform a recovery, the following requirements must be met:

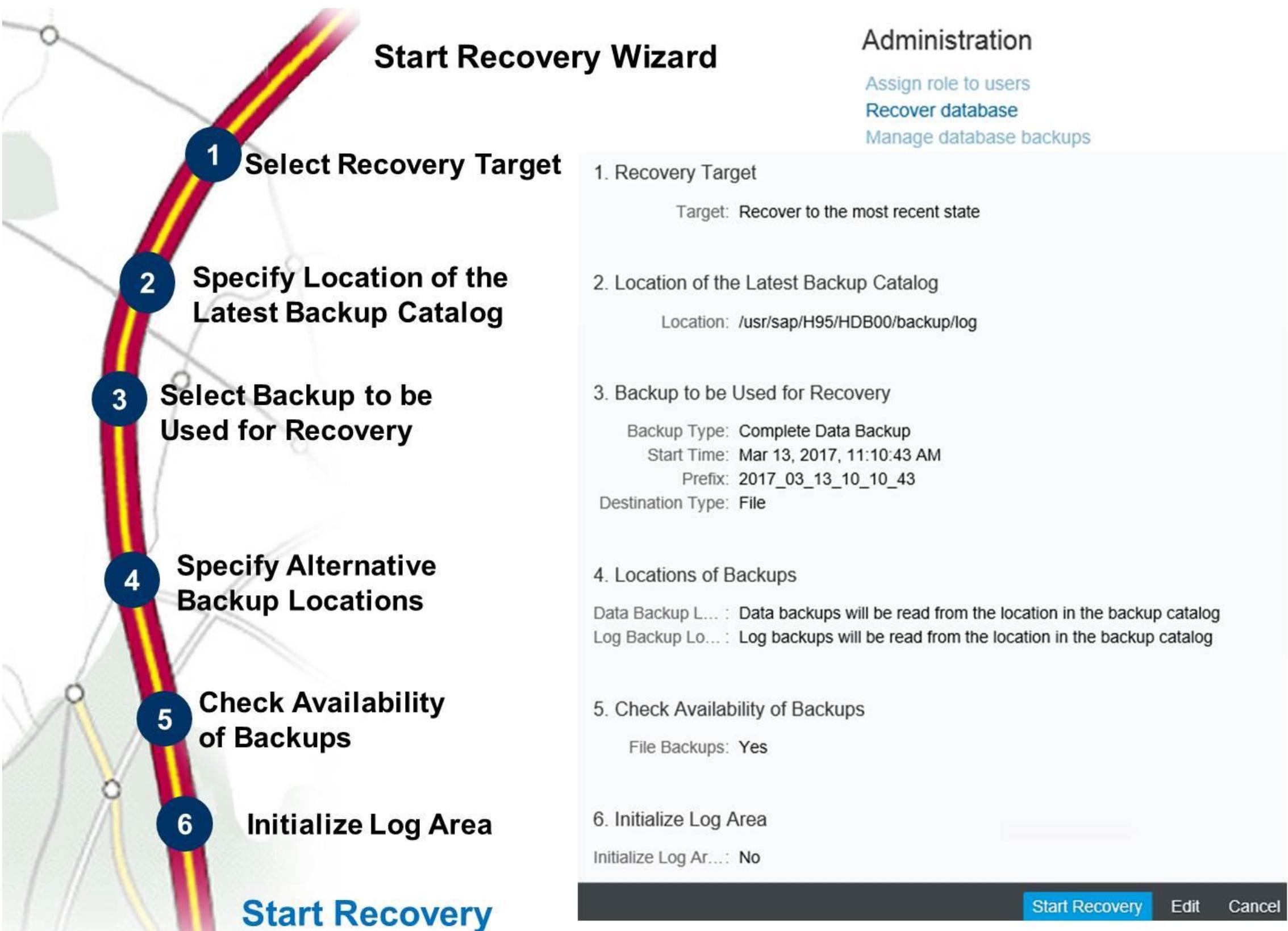
- The SAP HANA database needs to be shut down
- The user must have the system privilege BACKUP ADMIN.
- The <sid>adm operating system user are required.
- At least one data backup is needed.
- Before a recovery can start, all the data and log backups must be either accessible in the file system or available through the third-party backup tool.
- The number and type of services is identical in both the source and the target system.
- To recover customer-specific configuration settings, configure the customer-specific settings before starting the recovery.

### Constraints

- Recovery to a lower software version is not possible

# SAP HANA - Administrace

Perform recovery (wizard)





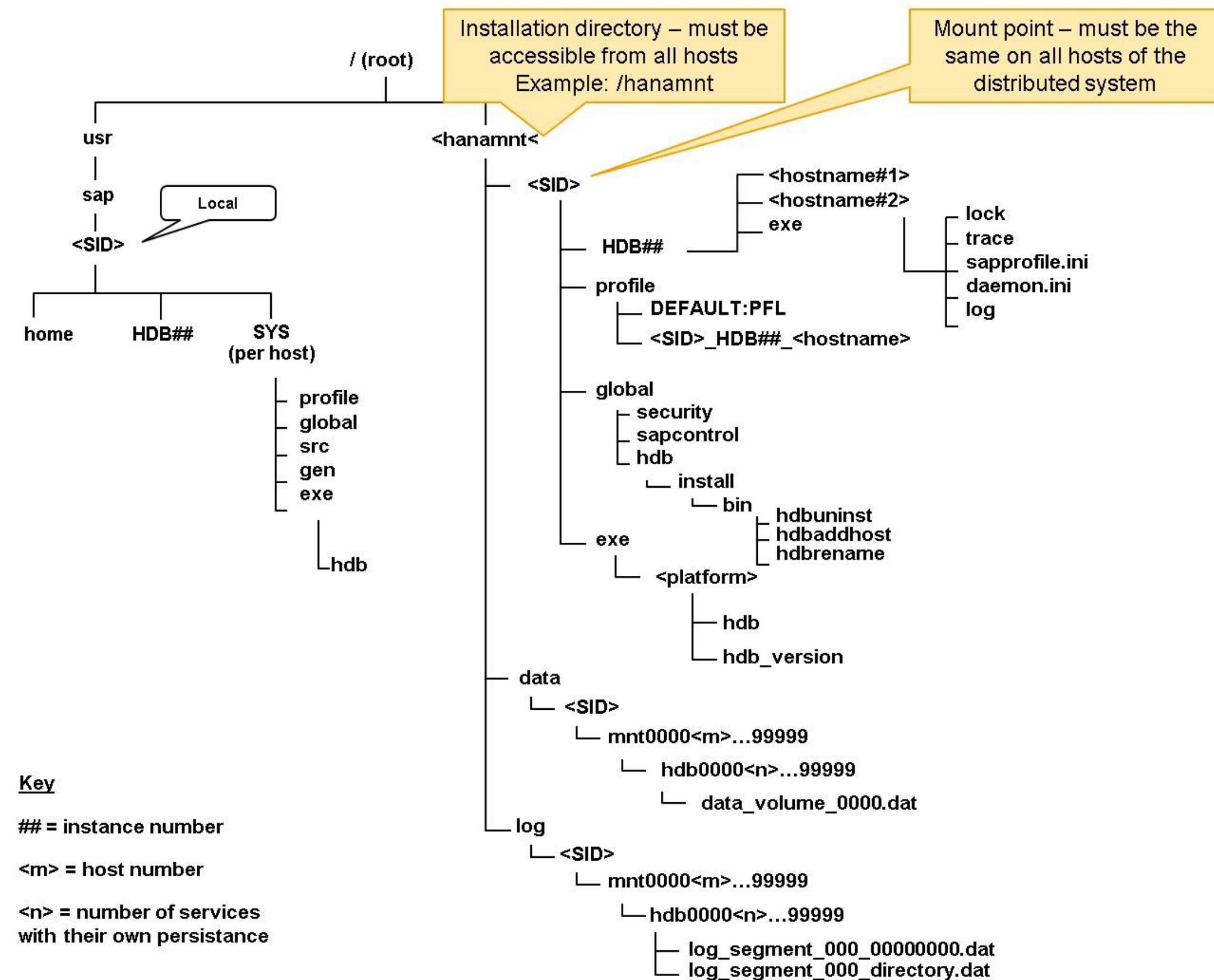
SAP HANA maintenance

Backup & recovery

Multitenancy

# SAP HANA - Administrace

## Distributed filesystem installation

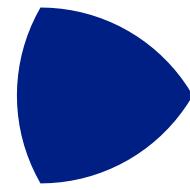


### Key

**## = instance number**

**<m> = host number**

**<n> = number of services  
with their own persistance**



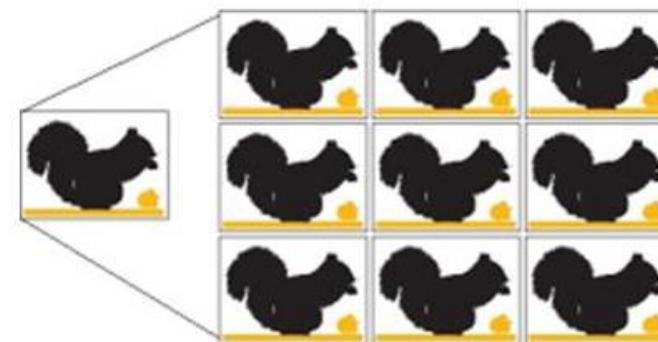
## SAP HANA - Administrace

### Scaling



#### Scale-up (scale vertically)

- Increase the size of the hardware (main memory, number of CPUs)
- Challenge:
  - Availability of suitable hardware



#### Scale-out (scale horizontally)

- Several nodes (servers) are switched together for one database
- Data is distributed over the main memories of these different nodes
- Challenge:
  - Cross-node communication is expensive:  
Avoid cross-node joins / views
  - Table distribution has to be customer / usage pattern specific
  - Dynamic redistribution must be allowed

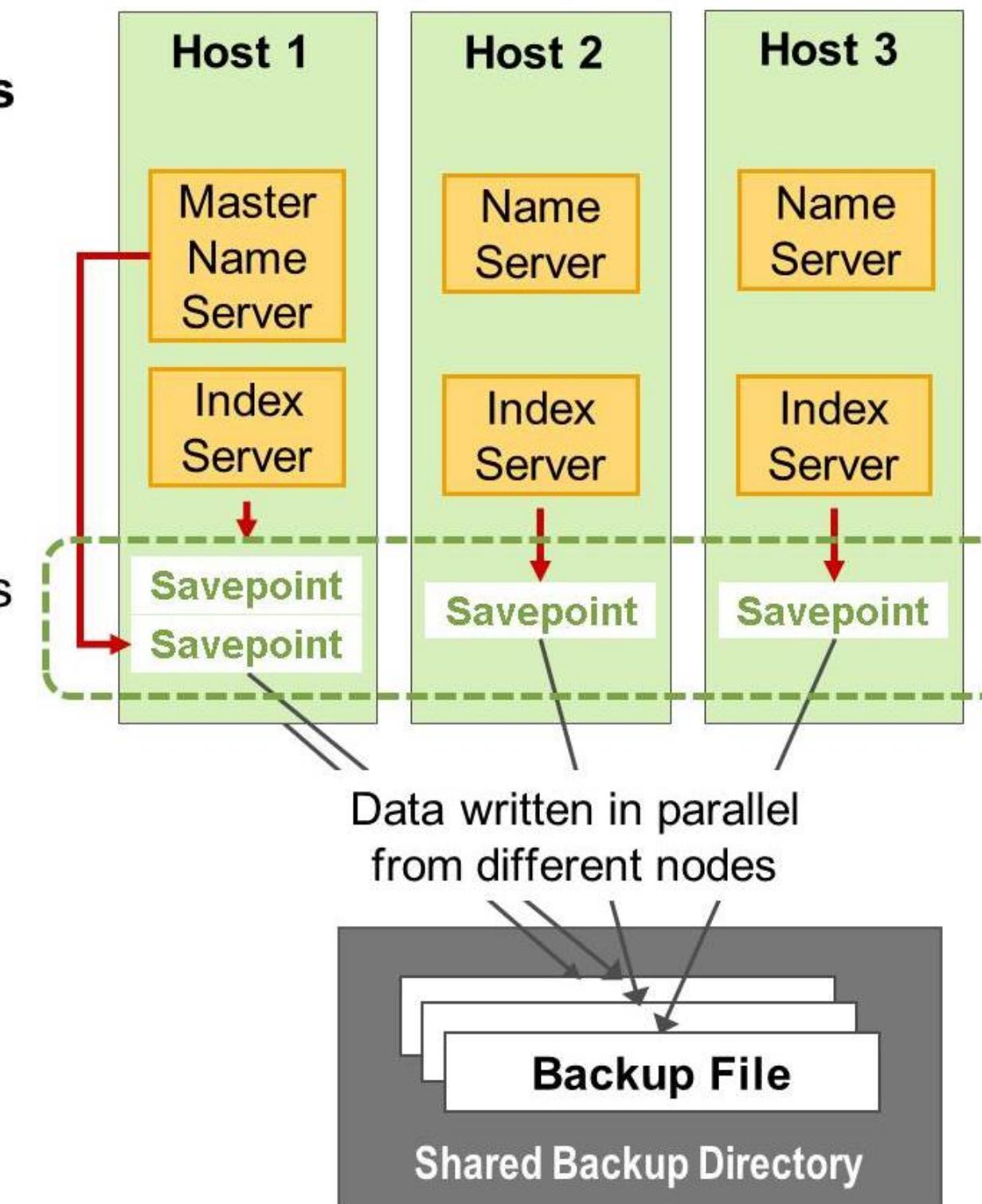
# SAP HANA - Administrate

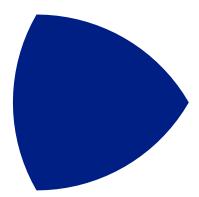
## Scale-out

**SAP HANA automatically handles the synchronization of backups for all nodes**  
→ no special user interaction required

### What happens internally:

- All services with a persistence need to be backed up (for example, index servers, master name server)
- A global, synchronized backup savepoint is written for all these services
  - All transactions are stopped for a brief moment
  - Kept until the backup is finished for all services
- Data marked in the savepoint is written from the data volume to a backup file
  - One backup file per service
  - Written in parallel → read from different disks (depends on appliance configuration)





## SAP HANA - Administrace

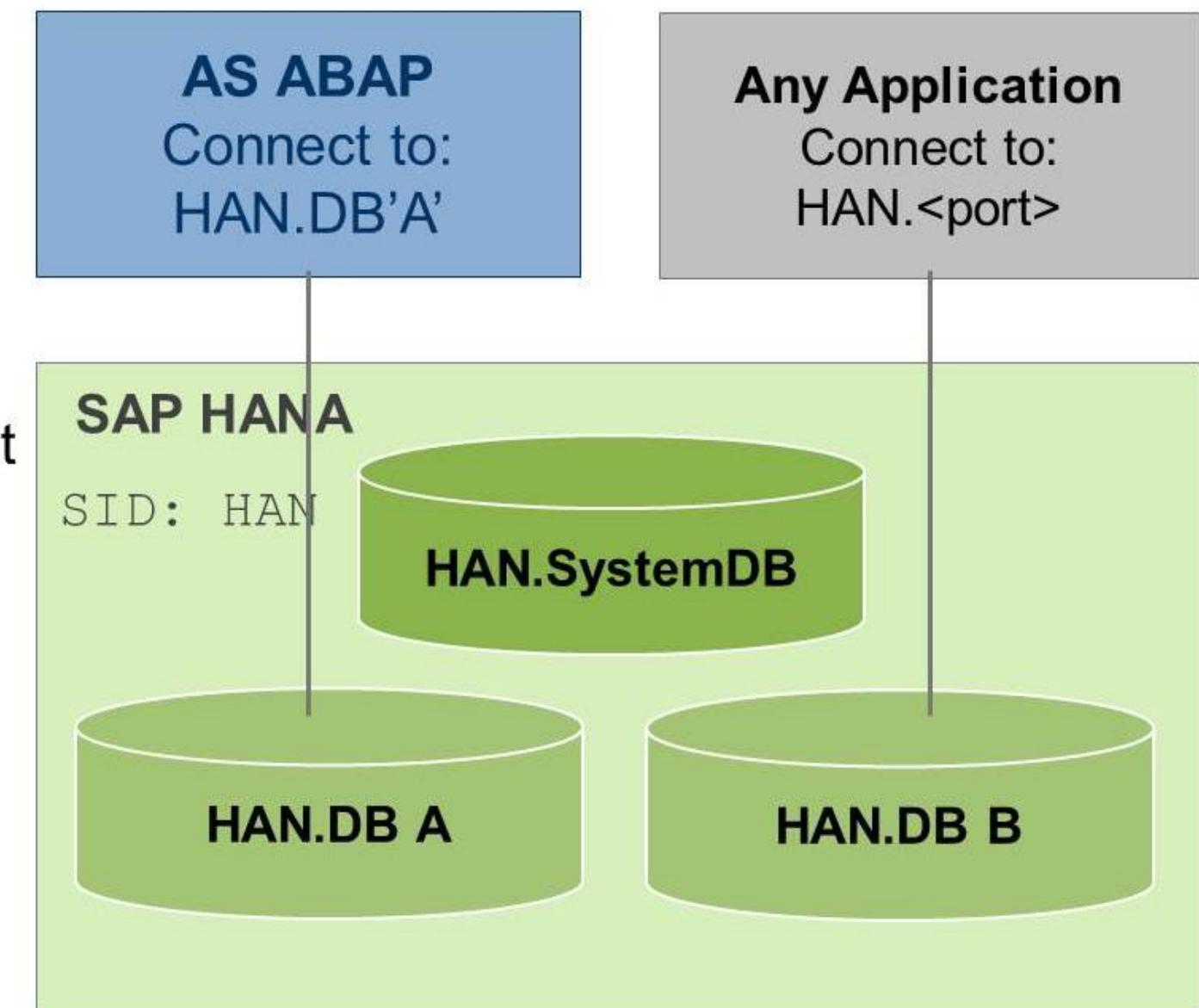
Scale-out

### Administration layer containing a System database

- Landscape topology information
- System-wide parameter settings
- Focal point for complete backup of all databases
- Resource management for all tenant DBs (CPU, memory, and so on)

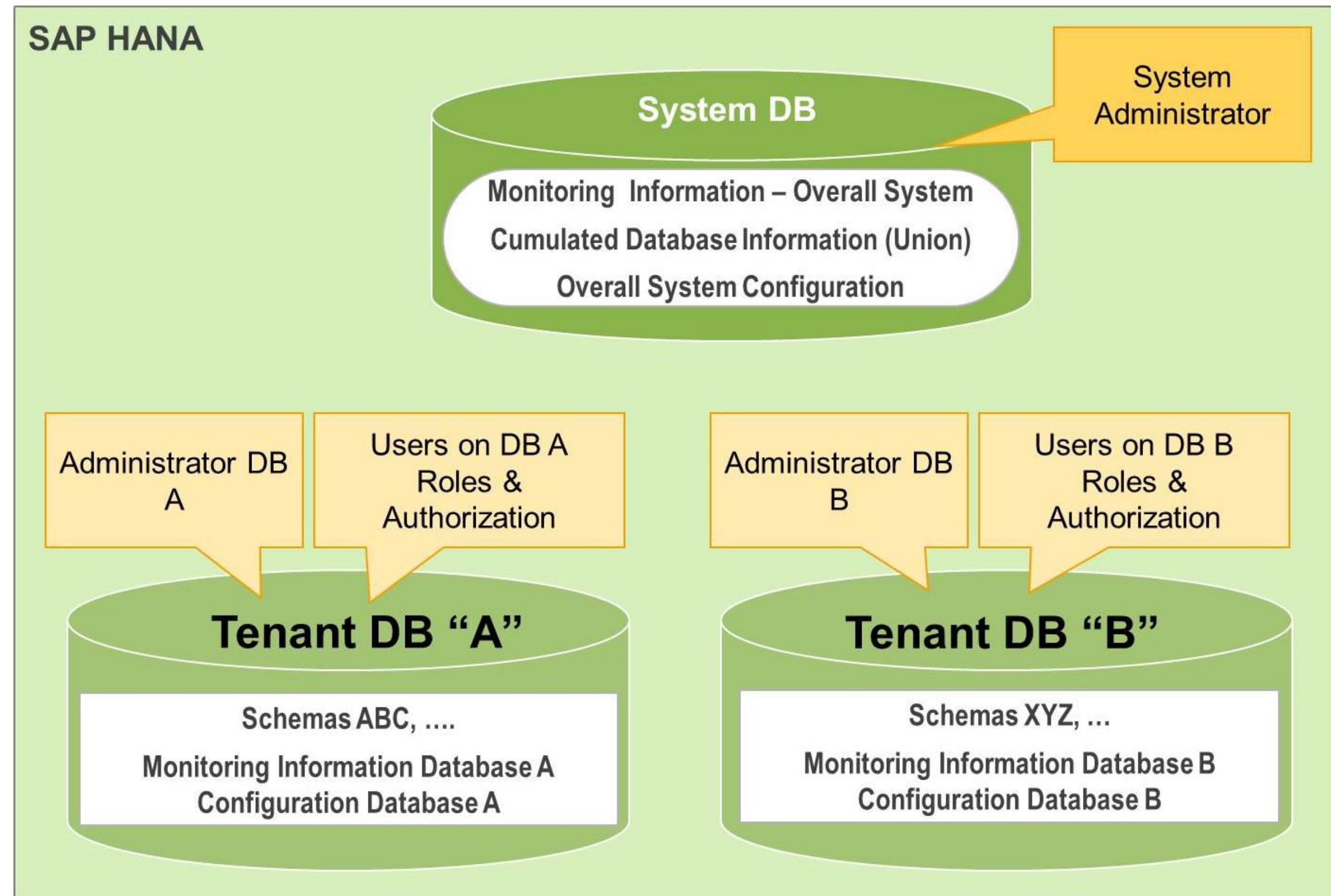
### 0 to n tenant databases identified by their names

- Tenant database related parameter settings
- Individual backup/restore of tenant database
- Clear separation of application data and user management



# SAP HANA - Administrace

Scale-out



# SAP HANA - Administrace

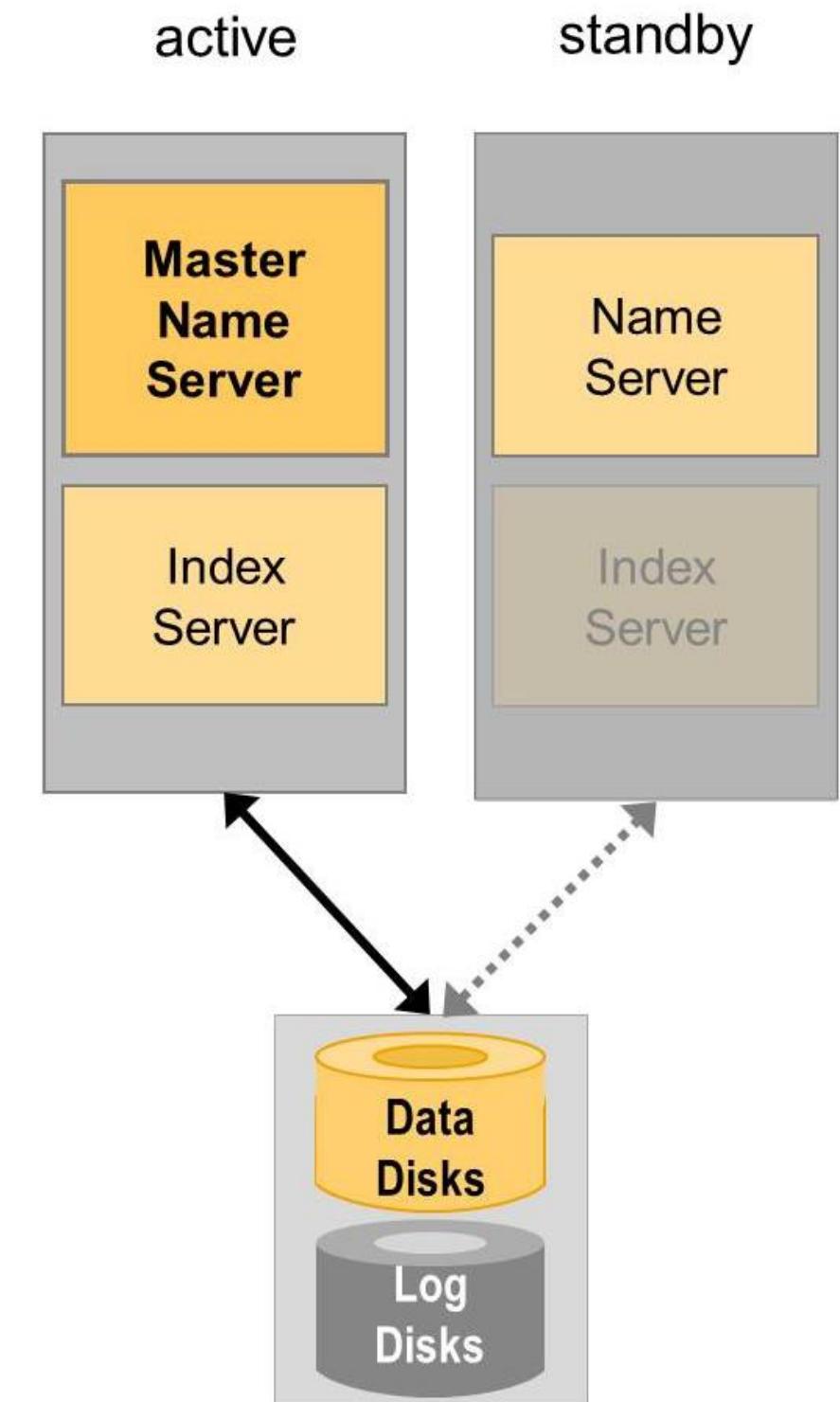
## Scale-out minimal setup

### Minimal setup for a Scale-Out:

- 2 Servers, including one Standby
- External storage or similar technology necessary, which ensures the data provisioning to second node via external data location
- This setup aims for High Availability, not performance scaling or size.

#### Note:

Some use cases might have different requirements for minimal setups.



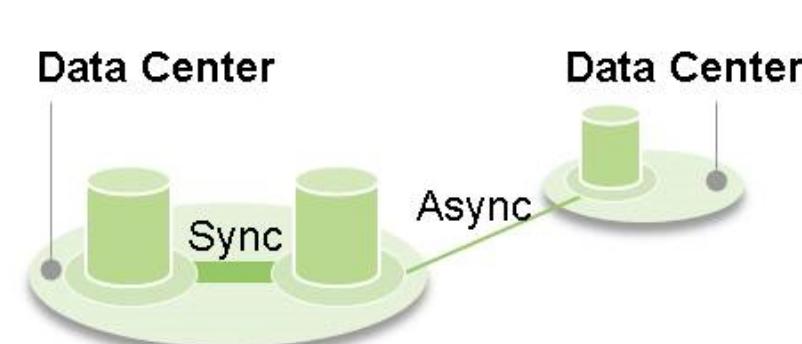
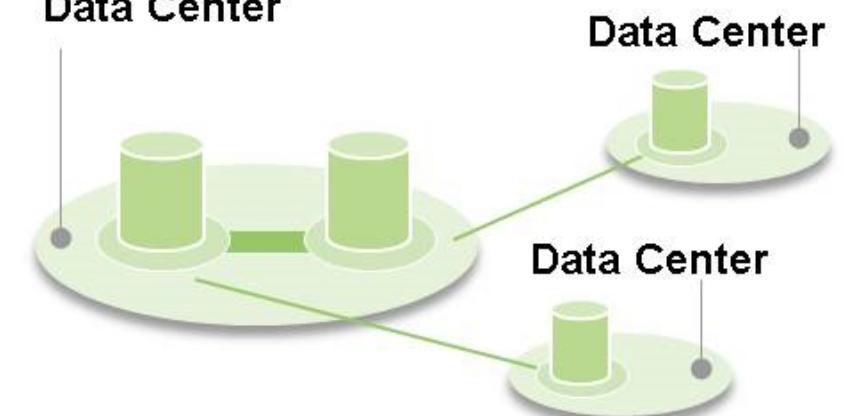
## SAP HANA - Administrace

Typical configuration for a distributed system

Host	Name Server Configured Role	Name Server Actual Role	Index Server Configured Role	Index Server Actual Role
Initial host	Master 1	Master	Worker	Master
1 <sup>st</sup> host added	Master 2	Slave	Worker	Slave
2 <sup>nd</sup> host added	Master 3	Slave	Worker	Slave
3 <sup>rd</sup> host added	Slave	Slave	Worker	Slave
4 <sup>th</sup> host added	Slave	Slave	Worker	Slave
5 <sup>th</sup> host added	Slave	Slave	Worker	Slave
6 <sup>th</sup> host added	Slave	Slave	Worker	Slave
7 <sup>th</sup> host added	Slave	Slave	Standby	Standby

# SAP HANA - Administrace

## High Availability

Host Auto-Failover	System Replication	Storage Replication
Cluster-like solution <ul style="list-style-type: none"><li>Only single data center</li></ul>	Similar to classical shadow database solutions <ul style="list-style-type: none"><li>Single or multiple data centers</li></ul>	Often already used by several customers <ul style="list-style-type: none"><li>Single or multiple data centers</li></ul>
		
Feature-set defined by SAP HANA Standby <b>not pre-loaded</b> Replacing often only parts (host or nodes) of a system	Feature-set defined by SAP HANA Shadow instances can be <b>pre-loaded</b> Fast take-overs to prepared instances - min. performance ramp	Possibilities defined by Storage partner tool features <b>No pre-load</b> Whole system replaced/started fresh on alternative HW

THANK YOU



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