SAP HANA Restore Guide (for Ivy-Bridge Model) for RHEL 6.5 / 6.6

Version 1.2

2015-07-15

NEC SAP Global Competence Center
## Version history

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<th>Date</th>
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<tr>
<td>1.0</td>
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1. Preparation

1.1. Objective of this document
This document describes a restore procedure of a HANA system from a full backup media.

1.2. Assumptions
- Backup data has been taken on Redhat Enterprise Linux 6.5 or 6.6
- Backup data should be saved on a USB memory storage.

1.3. Scope
This procedure can be applied to any single node server.

2. Planning

2.1. SAP HANA data allocation
This chapter describes the disk and filesystem layout.

2.1.1. Appliances up to 1TB
All data except those on devices "/dev/sda4" and "/dev/sda5" in the following table will be restored.

<table>
<thead>
<tr>
<th>HWRAID</th>
<th>Size</th>
<th>Device</th>
<th>Partition name</th>
<th>Software RAID</th>
<th>Filesystem</th>
<th>Size</th>
<th>Usage</th>
<th>Mount point</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID5</td>
<td>650GB</td>
<td>/dev/sda</td>
<td>/dev/sda1</td>
<td>-</td>
<td>vfat</td>
<td>1GB</td>
<td>uEFI</td>
<td>/boot/efi</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>/dev/sda2</td>
<td>-</td>
<td>ext4</td>
<td>1GB</td>
<td>Boot</td>
<td>/boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>/dev/sda3</td>
<td>-</td>
<td>ext3</td>
<td>300GB</td>
<td>OS/AP</td>
<td>/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>/dev/sda4</td>
<td>-</td>
<td>swap</td>
<td>50GB</td>
<td>SWAP</td>
<td>(swap)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>/dev/sda5</td>
<td>-</td>
<td>ext3</td>
<td>298GB</td>
<td>Backup</td>
<td>-</td>
</tr>
<tr>
<td>4TB</td>
<td></td>
<td>/dev/sdb</td>
<td>/dev/sdb1</td>
<td>-</td>
<td>xfs</td>
<td>4TB</td>
<td>Data and Shared</td>
<td>/hana/disk</td>
</tr>
<tr>
<td>1TB</td>
<td></td>
<td>/dev/sdc</td>
<td>/dev/sdc1</td>
<td>-</td>
<td>xfs</td>
<td>1TB</td>
<td>Log</td>
<td>/hana/log</td>
</tr>
</tbody>
</table>
2.1.2. 2TB appliance

All data except those on devices "/dev/sda3" and "/dev/sda4" in the following table will be restored.

<table>
<thead>
<tr>
<th>Internal disks</th>
<th>HW RAID</th>
<th>Size</th>
<th>Device</th>
<th>Partition name</th>
<th>File system</th>
<th>Size</th>
<th>Usage</th>
<th>Mount point</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>1800GB</td>
<td>/dev/sda</td>
<td>/dev/sda1</td>
<td>vfat</td>
<td>1GB</td>
<td>uEFI</td>
<td>/boot/efi</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/dev/sda2</td>
<td>ext4</td>
<td>1GB</td>
<td>Boot</td>
<td>/boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/dev/sda3</td>
<td>ext3</td>
<td>300GB</td>
<td>BACKUP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/dev/sda4</td>
<td>swap</td>
<td>50GB</td>
<td>SWAP</td>
<td>(swap)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/dev/sda5</td>
<td>ext3</td>
<td>1,4TB</td>
<td>OS/AP</td>
<td>/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,1TB</td>
<td>/dev/sdb</td>
<td>/dev/sdb1</td>
<td>xfs</td>
<td>2,1TB</td>
<td>Shared</td>
<td>/hana/shared</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,2TB</td>
<td>/dev/sdc</td>
<td>/dev/sdc1</td>
<td>xfs</td>
<td>1,2TB</td>
<td>Log</td>
<td>/hana/log</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External disks</th>
<th>HW RAID</th>
<th>Size</th>
<th>Device</th>
<th>Partition name</th>
<th>File system</th>
<th>Size</th>
<th>Usage</th>
<th>Mount point</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60</td>
<td>6,5TB</td>
<td>/dev/sdd</td>
<td>/dev/sdd1</td>
<td>xfs</td>
<td>6,5TB</td>
<td>Data</td>
<td>/hana/data</td>
</tr>
</tbody>
</table>

2.2. Overview

The restore procedure exists of the following 4 phases:

1. Boot up to the rescue mode.
2. Read-write mount each volume.
3. Restore each volume with the tar command.
4. Reboot server and start SAP HANA.

Note: it is possible to restore directly from external media, but you should copy backup data files to local disks in order to reduce restore time.
3. Restore Procedure

3.1. Before you start
Before you proceed with the restore please confirm that you have these media as below.

- Redhat Enterprise Linux Installation DVD
- The media which has backup data.
  (In this document it is assumed to be an USB memory)

3.2. Restore all volumes

3.2.1. Boot to rescue mode
Start your NEC SAP HANA appliance with the rescue mode:

① Insert the RHEL Installation Media and boot from DVD

② As soon as the system starts from the DVD the following screen is displayed:

```
Press any key to enter the menu

Booting Red Hat Enterprise Linux 6.5 in 3 seconds...
```

Please press any key to enter the boot menu.

③ Select “rescue” in the menu and then press “ENTER”:

```
GRUB version 0.97 (640K lower / 1661428K upper memory)

Red Hat Enterprise Linux 6.5
Install system with basic video driver
rescue

Use the ↑ and ↓ keys to select which entry is highlighted. Press enter to boot the selected OS. ‘e’ to edit the commands before booting, ‘a’ to modify the kernel arguments before booting, or ‘c’ for a command-line.
```
When the rescue mode loads it will ask you several questions. Please use the following settings:

- Change a Language: English
- Keyboard Type: us
- Rescue Method: Local CD/DVD
- Setup Networking: No
- Rescue: Skip (no automatic mount on /mnt/sysimage)
- Start shell: Ok

3.2.2. Copy backup data

All commands are valid for all appliance models, if not otherwise mentioned.

① As soon as the system is running in the rescue mode please connect the USB storage to your SAP HANA server.

② Open the Terminal console and confirm whether USB memory has been detected by typing “dmesg”.

```bash
sd 36:0:0:0: [sde] Attached SCSI removable disk
hash-4 1:
```

In this example the USB memory has been detected as “sde”.

③ Create a temporary mount point to attach the USB memory:

```bash
mkdir /tmp/usbdevice
```

④ Mount the USB memory to the mount point created before:

```bash
mount /dev/sde1 /tmp/usbdevice
```

⑤ Create a temporary mount point to store the backup data:

```bash
mkdir /tmp/backup
```

⑥ Mount the backup data partition to the temporary mount point created before:

For up to 1TB only:

```bash
mount -o rw /dev/sda5 /tmp/backup
```

For 2TB only:

```bash
mount -o rw /dev/sda3 /tmp/backup
```

⑦ Verify that the backup data files exist in the correct directory

```bash
ls -l /tmp/usbdevice
```

- hana-root.tar.gz
- hana-log.tar.gz
For up to 1TB there should be additionally:

- hana-disk.tar.gz

For 2TB there should be additionally:

- hana-shared.tar.gz
- hana-data.tar.gz

8. Copy all tar files to the backup data device to speed up the restore process:

```
cp /tmp/usbdevice/* /tmp/backup/
```

3.2.3. Restore

This chapter describes the restore procedure of the different partitions.

1. Create a temporary mount point for every device:

```
mkdir /tmp/osmount
mkdir /tmp/logmount
mkdir /tmp/bootmount
mkdir /tmp/bootefimount
```

For up to 1TB additionally:

```
mkdir /tmp/diskmount
```

For 2TB additionally:

```
mkdir /tmp/datamount
mkdir /tmp/sharedmount
```

2. Take a note of the UUIDs. You will need them in them in the next step. Use the command:

```
blkid
```

Example from 1TB appliance

```
bash-4.1$ blkid
/dev/sda1: UUID=“7816-66E3” TYPE=“vfat”
/dev/sdb1: UUID=“3816-66E3” TYPE=“vfat”
/dev/sdb2: UUID=“3816-66E3” TYPE=“vfat”
/dev/sdb3: LABEL=“HANA_ROOT” UUID=“6c7ba95b-659f-5125-8d80-e580676534e5” SEC_TYPE=“ext4” TYPE=“ext4”
/dev/sdb4: LABEL=“HANA_SWAP” UUID=“71616d8c-6c7b-5125-8d80-e580676534e5” TYPE=“swap”
/dev/sdb5: LABEL=“HANA_DISK” UUID=“2c68885e-3997-4a91-b804-37415f4f9f62” TYPE=“ext4”
/dev/sdb6: LABEL=“HANA_LOG” UUID=“1d8043a5-2b7d-30c5-8c0d-2b8c66639f63” TYPE=“ext4”
```

3. For up to 1TB:

Format the following partitions uEFI Boot (/dev/sda1), Boot (/dev/sda2), OS/AP (/dev/sda3), HANA data (/dev/sdb1), HANA log (/dev/sdc1) with the appropriate filesystem and use the previous UUIDs.

Attention: You must use the UUIDs you found in the previous step, otherwise your recovery will fail!

```
mkfs.vfat /dev/sda1 -i <UUID of /dev/sda1 without “-” like 701665E3>
mkfs.ext4 /dev/sda2 -U <UUID of /dev/sda2>
mkfs.ext3 /dev/sda3 -L HANA_ROOT -U <UUID of /dev/sda3>
mkserv /dev/sda4 -L HANA_SWAP -U <UUID of /dev/sda4>
```
mkfs.xfs -f /dev/sdb1 -d sunit=2048,swidth=14336,agcount=51 -L HANA_DISK
mkfs.xfs -f /dev/sdc1 -L HANA_LOG
xfs_admin -U <UUID of /dev/sdb1> /dev/sdb1
xfs_admin -U <UUID of /dev/sdc1> /dev/sdc1

For 2TB:
Format the following partitions uEFI Boot (/dev/sda1), Boot (/dev/sda2), OS/AP (/dev/sda5), HANA shared (/dev/sdb1), HANA log (/dev/sdc1) and HANA data (/dev/sdd1) with the appropriate filesystem and use the previous UUIDs.
Attention: You must use the UUIDs you found in the previous step, otherwise your recovery will fail!
mkfs.vfat /dev/sda1 -i <UUID of /dev/sda1 without "-" like 701665E3>
mkfs.ext4 /dev/sda2 -U <UUID of /dev/sda2>
mkfs.ext3 /dev/sda5 -L HANA_ROOT -U <UUID of /dev/sda3>
mkswap /dev/sda4 -L HANA_SWAP -U <UUID of /dev/sda4>
mkfs.xfs -f /dev/sdb1 -L HANA_SHARED
mkfs.xfs -f /dev/sdc1 -d sunit=64,swidth=384 -L HANA_LOG
mkfs.xfs -f /dev/sdd1 -d sunit=2048,swidth=24576,agcount=51 -L HANA_DATA
xfs_admin -U <UUID of /dev/sdb1> /dev/sdb1
xfs_admin -U <UUID of /dev/sdc1> /dev/sdc1
xfs_admin -U <UUID of /dev/sdd1> /dev/sdd1

④ Mount all devices to relevant mount points:
  mount -o rw /dev/sda1 /tmp/bootefimount
  mount -o rw /dev/sda2 /tmp/bootmount
  mount -o rw /dev/sdc1 /tmp/logmount

  For up to 1TB additionally:
  mount -o rw /dev/sdb1 /tmp/diskmount
  mount -o rw /dev/sda3 /tmp/osmount

  For 2TB additionally:
  mount -o rw /dev/sdd1 /tmp/datamount
  mount -o rw /dev/sda5 /tmp/osmount
  mount -o rw /dev/sdb1 /tmp/sharedmount

⑤ Change the current directory to “/tmp/bootefimount” and restore the uEFI boot partition:
  cd /tmp/bootefimount
  tar -zxvf /tmp/backup/hana-bootefi.tar.gz

⑥ Verify if the last operation was successful. The following command should give you a “0”.
  echo $?

⑦ Change the current directory to “/tmp/bootmount” and restore the boot partition:
  cd /tmp/bootmount
  tar -zxvf /tmp/backup/hana-boot.tar.gz

⑧ Verify if the last operation was successful. The following command should give you a “0”.
  echo $?
⑨ Change the current directory to “/tmp/osmount” and restore the OS / AP partition:
```bash
cd /tmp/osmount
tar -zxvf /tmp/backup/hana-root.tar.gz
```

⑩ Verify if the last operation was successful. The following command should give you a “0”.
```bash
echo $?
```

⑪ For up to 1TB only:
Change the current directory to “/tmp/diskmount” and restore the partition for HANA data and shared:
```bash
cd /tmp/diskmount
tar -zxvf /tmp/backup/hana-disk.tar.gz
```
For 2TB only:
Change the current directory to “/tmp/datamount” and restore the partition for HANA data:
```bash
cd /tmp/datamount
tar -zxvf /tmp/backup/hana-data.tar.gz
```

⑫ Verify if the last operation was successful. The following command should give you a “0”.
```bash
echo $?
```

⑬ For 2TB only:
Change the current directory to “/tmp/sharedmount” and restore the partition for HANA shared:
```bash
cd /tmp/sharedmount
tar -zxvf /tmp/backup/hana-shared.tar.gz
```

⑭ Verify if the last operation was successful. The following command should give you a “0”.
```bash
echo $?
```

⑮ Change the current directory to “/tmp/logmount” and restore the HANA log partition:
```bash
cd /tmp/logmount
tar -zxvf /tmp/backup/hana-log.tar.gz
```

⑯ Verify if the last operation was successful. The following command should give you a “0”.
```bash
echo $?
### 3.2.4. Reboot and HANA startup

After the recovery finished you will restart your NEC HANA appliance and start HANA in this chapter.

1. Reboot your server by typing
   `shutdown -r now`

2. Remove all DVD / USB medias used in the previous steps before the bios boots up.

3. Login to the OS, open a terminal and change to `/usr/sap/hostctrl/exe/`:
   ```bash
cd /usr/sap/hostctrl/exe
```

4. Start your HANA instance and verify the command output is “OK”:
   ```bash
./sapcontrol -nr <instance no> -function Start
```

5. Run this command and check its output says “OK” and all listed processes have the status “Green”. If some are still “Initializing”, wait a while and issue the same command again:
   ```bash
./sapcontrol -nr <instance no> -function GetProcessList
```

```
mechana01:/usr/sap/hostctrl/exe # ./sapcontrol -nr 00 -function GetProcessList
22.08.2012 10:34:08
GetProcessList
OK
name, description, diepstatus, texitstatus, starttime, elapseddime, pid
hdbdataemon, HDB Daemon, GREEN, Running, 2012 08 22 10:33:17, 0:00:51, 36349
hdbnameserver, HDB Nameserver, GREEN, Running, 2012 08 22 10:33:19, 0:00:49, 36372
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2012 08 22 10:33:29, 0:00:39, 36466
hdbindexserver, HDB Indexserver, GREEN, Running, 2012 08 22 10:33:32, 0:00:36, 36485
hdbstatisticsserver, HDB Statisticsserver, GREEN, Running, 2012 08 22 10:33:33, 0:00:35, 36493
hdbxsengine, HDB XSEngine, GREEN, Running, 2012 08 22 10:33:34, 0:00:34, 36512
sapwebdisp_hdb, SAP WebDispatcher, GREEN, Running, 2012 08 22 10:33:50, 0:00:18, 37447
```