Host setup

NetApp Solutions

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Previous: Storage controller setup.

All the host-setup steps described in this section are valid for both SAP HANA environments on physical servers and for SAP HANA running on VMware vSphere.

Configuration parameter for SUSE Linux Enterprise Server

Additional kernel and configuration parameters at each SAP HANA host must be adjusted for the workload generated by SAP HANA.

SUSE Linux Enterprise Server 12 and 15

Starting with SUSE Linux Enterprise Server 12 SP1, the kernel parameter must be set in a configuration file in the `/etc/sysctl.d` directory. For example, you must create a configuration file with the name `91-NetApp-HANA.conf`.

```
net.core.rmem_max = 16777216
net.core.wmem_max = 16777216
net.ipv4.tcp_rmem = 4096 131072 16777216
net.ipv4.tcp_wmem = 4096 16384  16777216
net.core.netdev_max_backlog = 300000
net.ipv4.tcp_slow_start_after_idle=0
net.ipv4.tcp_no_metrics_save = 1
net.ipv4.tcp_moderate_rcvbuf = 1
net.ipv4.tcp_window_scaling = 1
net.ipv4.tcp_timestamps = 1
net.ipv4.tcp_sack = 1
```

Saptune, included in SLES for SAP OS versions, can be used to set these values. For more information, see SAP Note 3024346 (requires SAP login).

If NFSv3 is used for connecting the storage, `sunrpc.tcp_max_slot_table_entries` must be set in `/etc/modprobe.d/sunrpc.conf`. If the file does not exist, you must first create it by adding the following line:

```
options sunrpc tcp_max_slot_table_entries=128
```

If the nconnect mount option is used, this value can be increased from 256 to 512.

Configuration parameters for Red Hat Enterprise Linux 7.2 or later

You must adjust additional kernel and configuration parameters at each SAP HANA host for the workload generated by SAP HANA.

If NFSv3 is used for connecting the storage, you must set the parameter `sunrpc.tcp_max_slot_table_entries parameter` in `/etc/modprobe.d/sunrpc.conf`. If the file does not exist, you must first create it by adding the following line:

```
options sunrpc tcp_max_slot_table_entries=128
```

If the nconnect mount option is used, this value can be increased from 256 to 512.

Starting with Red Hat Enterprise Linux 7.2, you must set the kernel parameters in a configuration file in the `/etc/sysctl.d` directory. For example, you must create a configuration file with the name `91-NetApp-HANA.conf`.

```
net.core.rmem_max = 16777216
net.core.wmem_max = 16777216
net.ipv4.tcp_rmem = 4096 131072 16777216
net.ipv4.tcp_wmem = 4096 16384  16777216
net.core.netdev_max_backlog = 300000
net.ipv4.tcp_slow_start_after_idle=0
net.ipv4.tcp_no_metrics_save = 1
net.ipv4.tcp_moderate_rcvbuf = 1
net.ipv4.tcp_window_scaling = 1
net.ipv4.tcp_timestamps = 1
net.ipv4.tcp_sack = 1
```

Create subdirectories in /hana/shared volume

The following examples show an SAP HANA database with SID=NF2.

To create the required subdirectories, take one of the following actions:

- For a single- host system, mount the `/hana/shared` volume and create the `shared` and `usr-sap` subdirectories.

```
sapcc-hana-tst-06:/mnt # mount <storage-hostname>:/NF2_shared /mnt/tmp
sapcc-hana-tst-06:/mnt # cd /mnt/tmp
sapcc-hana-tst-06:/mnt/tmp # mkdir shared
sapcc-hana-tst-06:/mnt/tmp # mkdir usr-sap
sapcc-hana-tst-06:/mnt/tmp # cd ..
sapcc-hana-tst-06:/mnt # umount /mnt/tmp
```

- For a multiple-host system, mount the `/hana/shared` volume and create the `shared` and the `usr-sap` subdirectories for each host.

  The example commands show a 2+1 multiple-host HANA system.

```
sapcc-hana-tst-06:/mnt # mount <storage-hostname>:/NF2_shared /mnt/tmp
sapcc-hana-tst-06:/mnt # cd /mnt/tmp
sapcc-hana-tst-06:/mnt/tmp # mkdir shared
sapcc-hana-tst-06:/mnt/tmp # mkdir usr-sap-host1
sapcc-hana-tst-06:/mnt/tmp # mkdir usr-sap-host2
sapcc-hana-tst-06:/mnt/tmp # mkdir usr-sap-host3
sapcc-hana-tst-06:/mnt/tmp # cd ..
sapcc-hana-tst-06:/mnt # umount /mnt/tmp
```

Create mount points

The following examples show an SAP HANA database with SID=NF2.

To create the required mount point directories, take one of the following actions:

- For a single-host system, create mount points and set the permissions on the database host.

```
sapcc-hana-tst-06:/ # mkdir -p /hana/data/NF2/mnt00001
sapcc-hana-tst-06:/ # mkdir -p /hana/log/NF2/mnt00001
sapcc-hana-tst-06:/ # mkdir -p /hana/shared
sapcc-hana-tst-06:/ # mkdir -p /usr/sap/NF2
sapcc-hana-tst-06:/ # chmod –R 777 /hana/log/NF2
sapcc-hana-tst-06:/ # chmod –R 777 /hana/data/NF2
sapcc-hana-tst-06:/ # chmod -R 777 /hana/shared
sapcc-hana-tst-06:/ # chmod -R 777 /usr/sap/NF2
```

- For a multiple-host system, create mount points and set the permissions on all worker and standby hosts. The following example commands are for a 2+1 multiple-host HANA system.
  - First worker host:

```
sapcc-hana-tst-06:~ # mkdir -p /hana/data/NF2/mnt00001
sapcc-hana-tst-06:~ # mkdir -p /hana/data/NF2/mnt00002
sapcc-hana-tst-06:~ # mkdir -p /hana/log/NF2/mnt00001
sapcc-hana-tst-06:~ # mkdir -p /hana/log/NF2/mnt00002
sapcc-hana-tst-06:~ # mkdir -p /hana/shared
sapcc-hana-tst-06:~ # mkdir -p /usr/sap/NF2
sapcc-hana-tst-06:~ # chmod -R 777 /hana/log/NF2
sapcc-hana-tst-06:~ # chmod -R 777 /hana/data/NF2
sapcc-hana-tst-06:~ # chmod -R 777 /hana/shared
sapcc-hana-tst-06:~ # chmod -R 777 /usr/sap/NF2
```

- Second worker host:

```
sapcc-hana-tst-07:~ # mkdir -p /hana/data/NF2/mnt00001
sapcc-hana-tst-07:~ # mkdir -p /hana/data/NF2/mnt00002
sapcc-hana-tst-07:~ # mkdir -p /hana/log/NF2/mnt00001
sapcc-hana-tst-07:~ # mkdir -p /hana/log/NF2/mnt00002
sapcc-hana-tst-07:~ # mkdir -p /hana/shared
sapcc-hana-tst-07:~ # mkdir -p /usr/sap/NF2
sapcc-hana-tst-07:~ # chmod -R 777 /hana/log/NF2
sapcc-hana-tst-07:~ # chmod -R 777 /hana/data/NF2
sapcc-hana-tst-07:~ # chmod -R 777 /hana/shared
sapcc-hana-tst-07:~ # chmod -R 777 /usr/sap/NF2
```

- Standby host:

```
sapcc-hana-tst-08:~ # mkdir -p /hana/data/NF2/mnt00001
sapcc-hana-tst-08:~ # mkdir -p /hana/data/NF2/mnt00002
sapcc-hana-tst-08:~ # mkdir -p /hana/log/NF2/mnt00001
sapcc-hana-tst-08:~ # mkdir -p /hana/log/NF2/mnt00002
sapcc-hana-tst-08:~ # mkdir -p /hana/shared
sapcc-hana-tst-08:~ # mkdir -p /usr/sap/NF2
sapcc-hana-tst-08:~ # chmod -R 777 /hana/log/NF2
sapcc-hana-tst-08:~ # chmod -R 777 /hana/data/NF2
sapcc-hana-tst-08:~ # chmod -R 777 /hana/shared
sapcc-hana-tst-08:~ # chmod -R 777 /usr/sap/NF2
```

Mount file systems

Different mount options must be used depending on the NFS version and ONTAP release. The following file systems must be mounted to the hosts:

- `/hana/data/SID/mnt0000*`
- `/hana/log/SID/mnt0000*`
- `/hana/shared`
- `/usr/sap/SID`

The following table shows the NFS versions that you must use for the different files systems for single-host and multiple-host SAP HANA databases.

File systems	SAP HANA single host	SAP HANA multiple hosts
/hana/data/SID/mnt0000*	NFSv3 or NFSv4	NFSv4
/hana/log/SID/mnt0000*	NFSv3 or NFSv4	NFSv4
/hana/shared	NFSv3 or NFSv4	NFSv3 or NFSv4
/usr/sap/SID	NFSv3 or NFSv4	NFSv3 or NFSv4

The following table shows the mount options for the various NFS versions and ONTAP releases. The common parameters are independent of the NFS and ONTAP versions.

SAP LaMa requires the /usr/sap/SID directory to be local. Therefore, don't mount an NFS volume for /usr/sap/SID if you are using SAP LaMa.

For NFSv3, you must switch off NFS locking to avoid NFS lock cleanup operations in case of a software or server failure.

With ONTAP 9, the NFS transfer size can be configured up to 1MB. Specifically, with 40GbE or faster connections to the storage system, you must set the transfer size to 1MB to achieve the expected throughput values.

Common parameter	NFSv3	NFSv4	NFSv4.1	NFS transfer size with ONTAP 9	NFS transfer size with ONTAP 8
rw, bg, hard, timeo=600, noatime	vers=3,nolock	vers=4,minorversion=0,lock	vers=4,minorversion=1,lock	rsize=1048576,wsize=1048576	rsize=65536,wsize=65536

To improve read performance with NFSv3, NetApp recommends that you use the `nconnect=n` mount option, which is available with SUSE Linux Enterprise Server 12 SP4 or later and RedHat Enterprise Linux (RHEL) 8.3 or later.

Performance tests showed that `nconnect=8` provides good read results. Log writes might benefit from a lower number of sessions, such as `nconnect=2`. Be aware that the first mount from an NFS server (IP address) defines the amount of sessions being used. Further mounts do not change this even if different values are used for nconnect.

For NFSv4, the nconnect option is supported by NetApp for NFSv4.1, starting with ONTAP 9.8. First NFS clients supporting nconnect with NFSv4.1 are available with SLES15SP2 and RHEL 8.3. For additional information check Linux vendor documentation.

The following example shows a single host SAP HANA database with SID=NF2 using NFSv3 and an NFS transfer size of 1MB. To mount the file systems during system boot with the `/etc/fstab` configuration file, complete the following steps:

1. Add the required file systems to the `/etc/fstab` configuration file.

```
sapcc-hana-tst-06:/ # cat /etc/fstab
<storage- vif-data01>:/NF2_data_mnt00001 /hana/data/NF2/mnt00001 nfs
rw,vers=3,hard,timeo=600,rsize=1048576,wsize=1048576, bg, noatime,nolock
0 0
<storage- vif-log01>:/NF2_log_mnt00001 /hana/log/NF2/mnt00001 nfs
rw,vers=3,hard,timeo=600,rsize=1048576,wsize=1048576, bg, noatime,nolock
0 0
<storage- vif-data01>:/NF2_shared/usr- sap /usr/sap/NF2 nfs
rw,vers=3,hard,timeo=600,rsize=1048576,wsize=1048576, bg, noatime,nolock
0 0
<storage- vif-data01>:/NF2_shared/shared /hana/shared nfs
rw,vers=3,hard,timeo=600,rsize=1048576,wsize=1048576, bg, noatime,nolock
0 0
```

2. Run `mount -a` to mount the file systems on all hosts.

The next example shows a multiple-host SAP HANA database with SID=NF2 using NFSv4.1 for data and log file systems and NFSv3 for the `/hana/shared` and `/usr/sap/NF2` file systems. An NFS transfer size of 1MB is used.

1. Add the required file systems to the `/etc/fstab` configuration file on all hosts.

The `/usr/sap/NF2` file system is different for each database host. The following example shows `/NF2_shared/usr- sap- host1`.

```
stlrx300s8-5:/ # cat /etc/fstab
<storage- vif-data01>:/NF2_data_mnt00001 /hana/data/NF2/mnt00001 nfs
rw, vers=4, minorversion=1,hard,timeo=600,rsize=1048576,wsize=1048576,
bg, noatime,lock 0 0
<storage- vif-data02>:/NF2_data_mnt00002 /hana/data/NF2/mnt00002 nfs rw,
vers=4, minorversion=1,hard,timeo=600,rsize=1048576,wsize=1048576, bg,
noatime,lock 0 0
<storage- vif-log01>:/NF2_log_mnt00001 /hana/log/NF2/mnt00001 nfs rw,
vers=4, minorversion=1,hard,timeo=600,rsize=1048576,wsize=1048576, bg,
noatime,lock 0 0
<storage- vif-log02>:/NF2_log_mnt00002 /hana/log/NF2/mnt00002 nfs rw,
vers=4, minorversion=1,hard,timeo=600,rsize=1048576,wsize=1048576, bg,
noatime,lock 0 0
<storage- vif-data02>:/NF2_shared/usr- sap- host1 /usr/sap/NF2 nfs
rw,vers=3,hard,timeo=600,rsize=1048576,wsize=1048576, bg, noatime,nolock
0 0
<storage- vif-data02>:/NF2_shared/shared /hana/shared nfs
rw,vers=3,hard,timeo=600,rsize=1048576,wsize=1048576, bg, noatime,nolock
0 0
```

2. Run `mount -a` to mount the file systems on all hosts.

Next: SAP HANA installation preparations for NFSv4.