# Homework M3: Distributed and Shared Storage

Main goal is to build further on what was demonstrated during the practice Prerequisites may vary between different tasks. You should adjust your infrastructure according to the task you chose to implement

## Tasks

Choose and implement one or more of the following:

* Create a Samba group share (one folder, two users, one group, accessible only by the group)
* Create an NFS share with different access (read-write and read-only) for two stations
* Create an iSCSI disk-based target
* Create a GlusterFS dispersed volume
* Please note that even if you choose to implement more than one task, they are quite independent and different, so you may need to create a separate infrastructure (environment) for each

## Proof

Prepare a document that shows what you accomplished and how you did it. It can include (not limited to):

* The commands you used to achieve the above tasks
* A few pictures showing intermediary steps or results

## Solutions

* alma/homework-alma.md
* debian/homework-debian.md
* suse/homework-suse.md

## OpenSUSE solution

### Create a Samba group share (one folder, two users, one group, accessible only by the group)

1. Install **Samba** packages

$ sudo zypper install samba samba-client

1. Enable and start the service

$ sudo systemctl enable smb nmb  
Created symlink /etc/systemd/system/multi-user.target.wants/smb.service → /usr/lib/systemd/system/smb.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/nmb.service → /usr/lib/systemd/system/nmb.service.  
  
$ sudo systemctl start smb nmb

1. Add firewall exception for **Samba** and reload it.

$ sudo firewall-cmd --add-service samba --permanent  
success  
  
$ sudo firewall-cmd --reload  
success

1. Create folder

$ sudo mkdir -p /homework/samba/department

1. Create group department

$ sudo groupadd department

1. Change the group ownership and permissions of the directory

$ sudo chgrp department /homework/samba/department/  
  
$ sudo chmod -R 770 /homework/samba/department/  
  
$ ls -al /homework/samba/  
total 0  
drwxr-xr-x 1 root root 20 Feb 1 09:18 .  
drwxr-xr-x 1 root root 10 Feb 1 09:17 ..  
drwxrwx--- 1 root department 0 Feb 1 09:18 department

1. Create two users on **Samba** server and add users in department group

$ sudo useradd user-1  
$ sudo useradd user-2  
  
$ sudo usermod -aG department user-1  
$ sudo usermod -aG department user-2

1. Add the users to **Samba** server

# add user-1  
$ sudo smbpasswd -a user-1  
New SMB password: # type password  
Retype new SMB password: # re-type password  
Added user user-1.  
  
# add user-2  
$ sudo smbpasswd -a user-2  
New SMB password: # type password  
Retype new SMB password: # re-type password  
Added user user-2.  
  
# check  
$ sudo pdbedit -Lv  
---------------  
Unix username: user-1  
NT username:  
Account Flags: [U ]  
User SID: S-1-5-21-2203497296-1643005602-2407561709-1000  
Primary Group SID: S-1-5-21-2203497296-1643005602-2407561709-513  
Full Name:  
Home Directory: \\SUSE-1\user-1\.9xprofile  
HomeDir Drive: P:  
Logon Script:  
Profile Path: \\SUSE-1\profiles\.msprofile  
Domain: SUSE-1  
Account desc:  
Workstations:  
Munged dial:  
Logon time: 0  
Logoff time: Wed, 06 Feb 2036 17:06:39 EET  
Kickoff time: Wed, 06 Feb 2036 17:06:39 EET  
Password last set: Sat, 01 Feb 2025 09:39:27 EET  
Password can change: Sat, 01 Feb 2025 09:39:27 EET  
Password must change: never  
Last bad password : 0  
Bad password count : 0  
Logon hours : FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF  
---------------  
Unix username: user-2  
NT username:  
Account Flags: [U ]  
User SID: S-1-5-21-2203497296-1643005602-2407561709-1001  
Primary Group SID: S-1-5-21-2203497296-1643005602-2407561709-513  
Full Name:  
Home Directory: \\SUSE-1\user-2\.9xprofile  
HomeDir Drive: P:  
Logon Script:  
Profile Path: \\SUSE-1\profiles\.msprofile  
Domain: SUSE-1  
Account desc:  
Workstations:  
Munged dial:  
Logon time: 0  
Logoff time: Wed, 06 Feb 2036 17:06:39 EET  
Kickoff time: Wed, 06 Feb 2036 17:06:39 EET  
Password last set: Sat, 01 Feb 2025 09:40:04 EET  
Password can change: Sat, 01 Feb 2025 09:40:04 EET  
Password must change: never  
Last bad password : 0  
Bad password count : 0  
Logon hours : FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

1. Configure **Samba** sudo nano /etc/samba/smb.conf. Add the following contents to share out our department directory to the group department.

...  
[department]  
 comment = Department work folder  
 path = /homework/samba/department  
 writable = yes  
 public = yes  
 valid users = @department  
 write list = @department  
 force group = department  
 create mask = 0770  
 directory mask = 2770  
 hosts allow = 192.168.99.102

1. Test configuration

$ sudo testparm  
Load smb config files from /etc/samba/smb.conf  
Loaded services file OK.  
Weak crypto is allowed by GnuTLS (e.g. NTLM as a compatibility fallback)  
  
Server role: ROLE\_STANDALONE  
  
Press enter to see a dump of your service definitions

1. Restart two deamons

$ sudo systemctl reload smb nmb

1. Check for available shares locally

$ sudo smbclient -NL //localhost  
  
 Sharename Type Comment  
 --------- ---- -------  
 profiles Disk Network Profiles Service  
 users Disk All users  
 groups Disk All groups  
 print$ Disk Printer Drivers  
 department Disk Department work folder  
 IPC$ IPC IPC Service (Samba 4.19.9-git.399.71536ca297e150600.3.9.6SUSE-oS15.0-x86\_64)  
 nobody Disk Home Directories  
SMB1 disabled -- no workgroup available

1. Install **Samba** client on suse-2 vm.

$ sudo zypper install samba-client

1. List shares from client

$ smbclient -L //192.168.99.101 -U user-1  
Password for [WORKGROUP\user-1]:  
  
 Sharename Type Comment  
 --------- ---- -------  
 profiles Disk Network Profiles Service  
 users Disk All users  
 groups Disk All groups  
 print$ Disk Printer Drivers  
 department Disk Department work folder  
 IPC$ IPC IPC Service (Samba 4.19.9-git.399.71536ca297e150600.3.9.6SUSE-oS15.0-x86\_64)  
 user-1 Disk Home Directories  
SMB1 disabled -- no workgroup available

1. Create mount point and mount the group share

$ sudo mkdir -p /mnt/department  
  
# using noperm option to disables local permission checks on the client side  
$ sudo mount -o username=user-1,password=New\_123123,noperm //192.168.99.101/department /mnt/department

1. Test

$ echo "test with new params" | tee /mnt/department/test-new.txt  
test with new params

1. Mount the share on boot

# unmount  
$ sudo umount /mnt/department  
  
# create credentials file to store username and password  
$ sudo touch /etc/smbcredentials  
  
$ sudo cat /etc/credentials  
username=user-1  
password=New\_123123  
  
# change permissions on file  
$ sudo chmod 600 /etc/smbcredentials

1. add new row in /etc/fstab

# Samba share  
//192.168.99.101/department /mnt/department cifs credentials=/etc/smbcredentials,noperm,\_netdev 0 0

1. Test

# umount the share  
$ sudo umount /mnt/department  
  
# load fstab with new record  
$ sudo mount -a  
  
# perform test  
$ cd /mnt/department  
$ touch test-new-file.txt  
  
$ ls -al  
total 0  
drwxr-xr-x 2 root root 0 Feb 1 12:01 .  
drwxr-xr-x 1 root root 20 Feb 1 11:00 ..  
-rwxr-xr-x 1 root root 0 Feb 1 11:58 test-new-file.txt

### Create an NFS share with different access (read-write and read-only) for two stations

1. Install **NFS** server

$ sudo zypper install nfs-kernel-server

1. Enable and start service

$ sudo systemctl enable --now nfsserver  
Created symlink /etc/systemd/system/multi-user.target.wants/nfsserver.service → /usr/lib/systemd/system/nfsserver.service.

1. Create folder and allow everyone to be able to do anything

$ sudo mkdir -p /homework/nfs/share

1. Add record in /etc/exports

# See the exports(5) manpage for a description of the syntax of this file.  
# This file contains a list of all directories that are to be exported to  
# other computers via NFS (Network File System).  
# This file used by rpc.nfsd and rpc.mountd. See their manpages for details  
# on how make changes in this file effective.  
  
/homework/nfs/share 192.168.99.102(rw) 192.168.99.103(ro)

1. Apply changes

$ sudo exportfs -rav  
exporting 192.168.99.102:/homework/nfs/share  
exporting 192.168.99.103:/homework/nfs/share

1. More information about shares

$ sudo exportfs -v  
/homework/nfs/share  
 192.168.99.102(sync,wdelay,hide,no\_subtree\_check,sec=sys,rw,secure,root\_squash,no\_all\_squash)  
/homework/nfs/share  
 192.168.99.103(sync,wdelay,hide,no\_subtree\_check,sec=sys,ro,secure,root\_squash,no\_all\_squash)

1. Check what services are allowed in firewall

$ sudo firewall-cmd --list-services  
dhcpv6-client ssh

1. Add **NFS** service to firewall allow list

$ sudo firewall-cmd --add-service nfs --permanent  
success  
  
# reload the firewall service  
$ sudo firewall-cmd --reload  
success

1. Login on suse-2 and install nfs-client if necessary.

$ sudo zypper install nfs-client

1. Create mount point

$ sudo mkdir -pv /mnt/nfs/share  
mkdir: created directory '/mnt/nfs'  
mkdir: created directory '/mnt/nfs/share'

1. Mount **NFS** share

$ sudo mount -t nfs4 suse-1:/homework/nfs/share /mnt/nfs/share  
  
$ df  
Filesystem 1K-blocks Used Available Use% Mounted on  
/dev/sda2 10476524 3421216 6140880 36% /  
devtmpfs 4096 0 4096 0% /dev  
tmpfs 1010176 0 1010176 0% /dev/shm  
tmpfs 404072 6340 397732 2% /run  
/dev/sda2 10476524 3421216 6140880 36% /boot/grub2/i386-pc  
/dev/sda2 10476524 3421216 6140880 36% /opt  
/dev/sda2 10476524 3421216 6140880 36% /boot/grub2/x86\_64-efi  
/dev/sda2 10476524 3421216 6140880 36% /home  
/dev/sda2 10476524 3421216 6140880 36% /root  
/dev/sda2 10476524 3421216 6140880 36% /srv  
/dev/sda2 10476524 3421216 6140880 36% /tmp  
/dev/sda2 10476524 3421216 6140880 36% /usr/local  
/dev/sda2 10476524 3421216 6140880 36% /var  
vagrant 999297020 184249424 815047596 19% /vagrant  
tmpfs 202032 4 202028 1% /run/user/1000  
suse-1:/homework/nfs/share 10476544 3392256 6169856 36% /mnt/nfs/share

1. Check the access

$ cd /mnt/nfs/share/  
$ echo "test from suse-2" | tee /mnt/nfs/share/new-file-suse-2.txt  
test from suse-2  
  
$ ls -al  
total 0  
drwxrwxrwx 1 root root 38 Feb 1 14:27 .  
drwxr-xr-x 1 root root 10 Feb 1 14:24 ..  
-rw-r--r-- 1 vagrant users 0 Feb 1 14:27 new-file-suse-2.txt

1. Login on suse-3 and install nfs-client if necessary.

$ sudo zypper install nfs-client

1. Create mount point on suse-3

$ sudo mkdir -pv /mnt/nfs/share  
mkdir: created directory '/mnt/nfs'  
mkdir: created directory '/mnt/nfs/share'

1. Mount **NFS** share

$ sudo mount -t nfs4 suse-1:/homework/nfs/share /mnt/nfs/share  
  
$ df  
Filesystem 1K-blocks Used Available Use% Mounted on  
/dev/sda2 10476524 3395596 6166516 36% /  
devtmpfs 4096 0 4096 0% /dev  
tmpfs 1010176 0 1010176 0% /dev/shm  
tmpfs 404072 6340 397732 2% /run  
/dev/sda2 10476524 3395596 6166516 36% /boot/grub2/i386-pc  
/dev/sda2 10476524 3395596 6166516 36% /boot/grub2/x86\_64-efi  
/dev/sda2 10476524 3395596 6166516 36% /opt  
/dev/sda2 10476524 3395596 6166516 36% /home  
/dev/sda2 10476524 3395596 6166516 36% /root  
/dev/sda2 10476524 3395596 6166516 36% /srv  
/dev/sda2 10476524 3395596 6166516 36% /tmp  
/dev/sda2 10476524 3395596 6166516 36% /usr/local  
/dev/sda2 10476524 3395596 6166516 36% /var  
vagrant 999297020 184257124 815039896 19% /vagrant  
tmpfs 202032 4 202028 1% /run/user/1000  
suse-1:/homework/nfs/share 10476544 3392256 6169856 36% /mnt/nfs/share

1. Test access form suse-3

$ cd /mnt/nfs/share/  
$ cat new-file-suse-2.txt  
test from suse-2  
  
$ echo "test from suse-3" | tee new-file-suse-3.txt  
tee: new-file-suse-3.txt: Read-only file system  
test from suse-3

### Create an iSCSI disk-based target

1. On Target (suse-1) install required package

$ sudo zypper install targetcli-fb

1. Create a folder to store the iSCSI disk files

$ sudo mkdir -pv /var/lib/iscsi\_disks/  
mkdir: created directory '/var/lib/iscsi\_disks/'

1. Start the admin tool

sudo targetcli

1. Create iSCSI disk

/> ls /  
o- / ......................................................................................................................... [...]  
 o- backstores .............................................................................................................. [...]  
 | o- block .................................................................................................. [Storage Objects: 0]  
 | o- fileio ................................................................................................. [Storage Objects: 0]  
 | o- pscsi .................................................................................................. [Storage Objects: 0]  
 | o- ramdisk ................................................................................................ [Storage Objects: 0]  
 o- iscsi ............................................................................................................ [Targets: 0]  
 o- loopback ......................................................................................................... [Targets: 0]  
 o- vhost ............................................................................................................ [Targets: 0]  
 o- xen-pvscsi ....................................................................................................... [Targets: 0]  
/> cd backstores/fileio  
/backstores/fileio> create disk1 /var/lib/iscsi\_disks/disk1.img 1G  
Created fileio disk1 with size 1073741824  
/backstores/fileio> ls  
o- fileio ..................................................................................................... [Storage Objects: 1]  
 o- disk1 ........................................................ [/var/lib/iscsi\_disks/disk1.img (1.0GiB) write-back deactivated]  
 o- alua ....................................................................................................... [ALUA Groups: 1]  
 o- default\_tg\_pt\_gp ........................................................................... [ALUA state: Active/optimized]

1. Create target IQN

/backstores/fileio> cd /iscsi  
/iscsi> create iqn.2025-02.lab.homework:suse-1.target1  
Created target iqn.2025-02.lab.homework:suse-1.target1.  
Created TPG 1.  
Global pref auto\_add\_default\_portal=true  
Created default portal listening on all IPs (0.0.0.0), port 3260.

1. Create LUN

/iscsi> cd iqn.2025-02.lab.homework:suse-1.target1/tpg1/luns  
/iscsi/iqn.20...et1/tpg1/luns> create /backstores/fileio/disk1  
Created LUN 0.

1. Register initiator

/iscsi/iqn.20...et1/tpg1/luns> cd ../acls  
/iscsi/iqn.20...et1/tpg1/acls> create iqn.2025-02.lab.homework:suse-2.init1  
Created Node ACL for iqn.2025-02.lab.homework:suse-2.init1  
Created mapped LUN 0.

1. Set username and password for initiator

/iscsi/iqn.20...et1/tpg1/acls> ls  
o- acls .................................................................................................................. [ACLs: 1]  
 o- iqn.2025-02.lab.homework:suse-2.init1 ........................................................................ [Mapped LUNs: 1]  
 o- mapped\_lun0 ........................................................................................ [lun0 fileio/disk1 (rw)]  
/iscsi/iqn.20...et1/tpg1/acls> cd iqn.2025-02.lab.homework:suse-2.init1  
/iscsi/iqn.20...:suse-2.init1> set auth userid=user-1  
Parameter userid is now 'user-1'.  
/iscsi/iqn.20...:suse-2.init1> set auth password=New\_123123  
Parameter password is now 'New\_123123'.

1. Setup authentication flag of the target portal group (tpg1)

cd /iscsi/iqn.2025-02.lab.homework:suse-1.target1/tpg1/  
/iscsi/iqn.20....target1/tpg1> set attribute authentication=1  
Parameter authentication is now '1'.  
/iscsi/iqn.20....target1/tpg1> cd /  
/> ls  
o- / ......................................................................................................................... [...]  
 o- backstores .............................................................................................................. [...]  
 | o- block .................................................................................................. [Storage Objects: 0]  
 | o- fileio ................................................................................................. [Storage Objects: 1]  
 | | o- disk1 ...................................................... [/var/lib/iscsi\_disks/disk1.img (1.0GiB) write-back activated]  
 | | o- alua ................................................................................................... [ALUA Groups: 1]  
 | | o- default\_tg\_pt\_gp ....................................................................... [ALUA state: Active/optimized]  
 | o- pscsi .................................................................................................. [Storage Objects: 0]  
 | o- ramdisk ................................................................................................ [Storage Objects: 0]  
 o- iscsi ............................................................................................................ [Targets: 1]  
 | o- iqn.2025-02.lab.homework:suse-1.target1 ........................................................................... [TPGs: 1]  
 | o- tpg1 .......................................................................................... [no-gen-acls, auth per-acl]  
 | o- acls .......................................................................................................... [ACLs: 1]  
 | | o- iqn.2025-02.lab.homework:suse-2.init1 .................................................... [1-way auth, Mapped LUNs: 1]  
 | | o- mapped\_lun0 ................................................................................ [lun0 fileio/disk1 (rw)]  
 | o- luns .......................................................................................................... [LUNs: 1]  
 | | o- lun0 ............................................... [fileio/disk1 (/var/lib/iscsi\_disks/disk1.img) (default\_tg\_pt\_gp)]  
 | o- portals .................................................................................................... [Portals: 1]  
 | o- 0.0.0.0:3260 ..................................................................................................... [OK]  
 o- loopback ......................................................................................................... [Targets: 0]  
 o- vhost ............................................................................................................ [Targets: 0]  
 o- xen-pvscsi ....................................................................................................... [Targets: 0]

1. setup firewall

$ sudo firewall-cmd --add-service iscsi-target --permanent  
success  
$ sudo firewall-cmd --reload  
success

1. Start the **iSCSI** service

$ sudo systemctl enable --now targetcli.service  
Created symlink /etc/systemd/system/remote-fs.target.wants/targetcli.service → /usr/lib/systemd/system/targetcli.service.

1. Login on suse-2 and install iscsi client

$ sudo zypper install open-iscsi

1. Set the initiator name /etc/iscsi/initiatorname.iscsi

##  
## /etc/iscsi/initiatorname.iscsi  
##  
## Default iSCSI Initiatorname.  
##  
## DO NOT EDIT OR REMOVE THIS FILE!  
## If you remove this file, the iSCSI daemon will not start.  
## If you change the InitiatorName, existing access control lists  
## may reject this initiator. The InitiatorName must be unique  
## for each iSCSI initiator. Do NOT duplicate iSCSI InitiatorNames.  
  
InitiatorName=iqn.2025-02.lab.homework:suse-2.init1

1. Set the behavior of initiator ib /etc/iscsi/iscsid.conf

# change the start mode to automatic  
node.startup = automatic  
  
# uncomment CHAP settings  
node.session.auth.authmethod = CHAP  
  
# uncoment and setup username and password  
node.session.auth.username = user-1  
node.session.auth.password = New\_123123

1. Initiate a target discovery

$ sudo iscsiadm -m discovery -t sendtargets -p suse-1  
192.168.99.101:3260,1 iqn.2025-02.lab.homework:suse-1.target1

1. Try to login on target (this also mean to attach the disk)

$ sudo iscsiadm -m node --login  
Logging in to [iface: default, target: iqn.2025-02.lab.homework:suse-1.target1, portal: 192.168.99.101,3260]  
Login to [iface: default, target: iqn.2025-02.lab.homework:suse-1.target1, portal: 192.168.99.101,3260] successful.  
  
$ lsblk  
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS  
sda 8:0 0 10G 0 disk  
├─sda1 8:1 0 8M 0 part  
└─sda2 8:2 0 10G 0 part /var  
 /usr/local  
 /tmp  
 /srv  
 /root  
 /home  
 /boot/grub2/x86\_64-efi  
 /opt  
 /boot/grub2/i386-pc  
 /  
sdb 8:16 0 1G 0 disk  
sr0 11:0 1 1024M 0 rom

1. Crearte patition, format and mount

$ sudo parted -s /dev/sdb -- mklabel msdos mkpart primary 16384s -0m  
  
$ sudo mkfs.ext4 /dev/sdb1  
mke2fs 1.47.0 (5-Feb-2023)  
Creating filesystem with 260096 4k blocks and 65024 inodes  
Filesystem UUID: 2f1dadf2-a6ac-4e65-a828-c509e3daaecb  
Superblock backups stored on blocks:  
 32768, 98304, 163840, 229376  
  
Allocating group tables: done  
Writing inode tables: done  
Creating journal (4096 blocks): done  
Writing superblocks and filesystem accounting information: done  
  
$ sudo mount /dev/sdb1 /mnt/iscsi/  
  
$ df  
Filesystem 1K-blocks Used Available Use% Mounted on  
/dev/sda2 10476524 3435436 6126660 36% /  
devtmpfs 4096 8 4088 1% /dev  
tmpfs 1010176 0 1010176 0% /dev/shm  
tmpfs 404072 6356 397716 2% /run  
/dev/sda2 10476524 3435436 6126660 36% /boot/grub2/i386-pc  
/dev/sda2 10476524 3435436 6126660 36% /opt  
/dev/sda2 10476524 3435436 6126660 36% /boot/grub2/x86\_64-efi  
/dev/sda2 10476524 3435436 6126660 36% /home  
/dev/sda2 10476524 3435436 6126660 36% /root  
/dev/sda2 10476524 3435436 6126660 36% /srv  
/dev/sda2 10476524 3435436 6126660 36% /tmp  
/dev/sda2 10476524 3435436 6126660 36% /usr/local  
/dev/sda2 10476524 3435436 6126660 36% /var  
vagrant 999297020 184760992 814536028 19% /vagrant  
tmpfs 202032 4 202028 1% /run/user/1000  
/dev/sdb1 1005120 24 936696 1% /mnt/iscsi

1. Mount on boot

# take UUID of partition  
$ sudo blkid /dev/sdb1  
/dev/sdb1: UUID="2f1dadf2-a6ac-4e65-a828-c509e3daaecb" BLOCK\_SIZE="4096" TYPE="ext4" PARTUUID="0dcb9cd6-01"  
  
# add record in /etc/fstab  
# iSCSI  
UUID="2f1dadf2-a6ac-4e65-a828-c509e3daaecb" /mnt/iscsi ext4 \_netdev 0 0

### Create a GlusterFS dispersed volume

1. Add repo for **GlusterFS** on suse-1, suse-2 and suse-3

$ sudo zypper ar https://download.opensuse.org/repositories/home:/glusterfs:/SLES15SP5-10/15.5/home:glusterfs:SLES15SP5-10.repo

1. install the package

$ sudo zypper install glusterfs

1. Enable and start the service

$ sudo systemctl enable --now glusterd  
Created symlink /etc/systemd/system/multi-user.target.wants/glusterd.service → /usr/lib/systemd/system/glusterd.service.

1. Create firewall service for GlusterFS - sudo vi /etc/firewalld/services/glusterfs.xml

<?xml version="1.0" encoding="utf-8"?>  
<service>  
<short>glusterfs-static</short>  
<description>Default ports for gluster-distributed storage</description>  
<port protocol="tcp" port="24007"/> <!--For glusterd -->  
<port protocol="tcp" port="24008"/> <!--For glusterd RDMA port management -->  
<port protocol="tcp" port="55555"/> <!--For glustereventsd -->  
<port protocol="tcp" port="38465"/> <!--Gluster NFS service -->  
<port protocol="tcp" port="38466"/> <!--Gluster NFS service -->  
<port protocol="tcp" port="38467"/> <!--Gluster NFS service -->  
<port protocol="tcp" port="38468"/> <!--Gluster NFS service -->  
<port protocol="tcp" port="38469"/> <!--Gluster NFS service -->  
<port protocol="tcp" port="49152-60999"/> <!--Ports needed for bricks -->  
</service>

1. Reload firewall service

$ sudo systemctl reload firewalld

1. Reload firewall settings

$ sudo firewall-cmd --add-service=glusterfs --permanent  
success  
$ sudo firewall-cmd --reload  
success

1. Create partition on /dev/sdb and format

$ sudo parted -s /dev/sdb -- mklabel msdos mkpart primary 16384s -0m  
  
$ sudo mkfs.ext4 /dev/sdb1

1. Mount partition

$ sudo mkdir -p /mnt/glusterfs  
  
$ sudo mount /dev/sdb1 /mnt/glusterfs  
  
$ lsblk  
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS  
sda 8:0 0 10G 0 disk  
├─sda1 8:1 0 8M 0 part  
└─sda2 8:2 0 10G 0 part /usr/local  
 /var  
 /boot/grub2/x86\_64-efi  
 /tmp  
 /srv  
 /root  
 /opt  
 /home  
 /boot/grub2/i386-pc  
 /  
sdb 8:16 0 5G 0 disk  
└─sdb1 8:17 0 5G 0 part /mnt/glusterfs  
sr0 11:0 1 1024M 0 rom

1. Test communication and add brics from suse-1.

$ sudo gluster peer probe suse-2  
peer probe: success  
  
$ sudo gluster peer probe suse-3  
peer probe: success  
  
$ sudo gluster peer status  
Number of Peers: 2  
  
Hostname: suse-2  
Uuid: cf1a18be-bc27-44b7-8eea-1f8c8e975d3e  
State: Peer in Cluster (Connected)  
  
Hostname: suse-3  
Uuid: f419e833-2449-4238-b264-f92f82c3539d  
State: Peer in Cluster (Connected)

1. Create a volume

$ sudo gluster volume create homework-vol disperse 3 redundancy 1 suse-1:/mnt/glusterfs suse-2:/mnt/glusterfs suse-3:/mnt/glusterfs force  
volume create: homework-vol: success: please start the volume to access data

1. Get information about the volume

$ sudo gluster volume info homework-vol  
  
Volume Name: homework-vol  
Type: Disperse  
Volume ID: ab22ce1e-ea44-4f25-9f88-ec2f383f344f  
Status: Created  
Snapshot Count: 0  
Number of Bricks: 1 x (2 + 1) = 3  
Transport-type: tcp  
Bricks:  
Brick1: suse-1:/mnt/glusterfs  
Brick2: suse-2:/mnt/glusterfs  
Brick3: suse-3:/mnt/glusterfs  
Options Reconfigured:  
storage.fips-mode-rchecksum: on  
transport.address-family: inet  
nfs.disable: on

1. Start the volume

$ sudo gluster volume start homework-vol  
volume start: homework-vol: success

1. Login on suse-4 and install neccessary package.

$ sudo zypper ar https://download.opensuse.org/repositories/home:/glusterfs:/SLES15SP5-10/15.5/home:glusterfs:SLES15SP5-10.repo  
  
$ sudo zypper install glusterfs

1. Create mount point

$ sudo mkdir -p /mnt/glusterfs

1. mount the volume

$ sudo mount -t glusterfs suse-1:/homework-vol /mnt/glusterfs  
  
$ df -hT  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /  
devtmpfs devtmpfs 4.0M 0 4.0M 0% /dev  
tmpfs tmpfs 987M 0 987M 0% /dev/shm  
tmpfs tmpfs 395M 6.2M 389M 2% /run  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /boot/grub2/i386-pc  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /boot/grub2/x86\_64-efi  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /opt  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /tmp  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /srv  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /root  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /usr/local  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /home  
/dev/sda2 btrfs 10G 3.3G 5.9G 36% /var  
vagrant vboxsf 954G 181G 773G 19% /vagrant  
tmpfs tmpfs 198M 4.0K 198M 1% /run/user/1000  
suse-1:/homework-vol fuse.glusterfs 9.7G 102M 9.2G 2% /mnt/glusterfs

1. Write some files on mounted volume

$ echo "test" | sudo tee /mnt/glusterfs/test-file-0{1..9}  
test  
  
$ ls -al /mnt/glusterfs/  
total 9  
drwxr-xr-x 1 root root 236 Feb 1 16:29 .  
drwxr-xr-x 1 root root 18 Feb 1 16:21 ..  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-01  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-02  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-03  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-04  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-05  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-06  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-07  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-08  
-rw-r--r-- 1 root root 5 Feb 1 16:29 test-file-09

1. Check the hashes on all bricks to ensure Dispersed mode

# suse-1  
$ md5sum /mnt/glusterfs/test-file-01  
24b1d3fc0aaf94b269dee4a6a0f1ff63 /mnt/glusterfs/test-file-01  
  
# suse-2  
$ md5sum /mnt/glusterfs/test-file-01  
f66587b187a2e86849e0c5427292aace /mnt/glusterfs/test-file-01  
  
# suse-3  
$ md5sum /mnt/glusterfs/test-file-01  
9761724f232eedffa8a7857d2eac5c75 /mnt/glusterfs/test-file-01

We had different md5sum values for the same file (test-file-01) across all bricks. This means the file is being dispersed (erasure coded).