# Homework M6: Clustering and High Availability

Main goal is to build further on what was demonstrated during the practice

## Tasks

Implement the following:

* Research and implement two node failover cluster that hosts a web site served by LVM volume group managed by the cluster. The volume group must reside on a separate iSCSI target server

## 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 (partially)

debian/homework-debian.md

suse/homework-suse.md (failed failover test)

## Debian solution

### Diagram

------------+---------------------------+---------------------------+------------  
 | | |  
 enp0s8|192.168.99.101 enp0s8|192.168.99.102 enp0s8|192.168.99.103  
+-----------+-----------+ +-----------+-----------+ +-----------+-----------+  
| [ fo-node-1 ] | | [ fo-node-2 ] | | [ iscsi-srv ] |  
| | | | | |  
| nginx | | nginx | | targetcli-fb |  
| pacemaker | | pacemaker | | |  
| pcs | | pcs | | |  
| open-iscsi | | open-iscsi | | |  
| lvm2 | | lvm2 | | |  
| | | | | |  
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### Steps

Step 1 - Setup iSCSI Target server.  
Step 2 - Discover and log in to the iSCSI target on nodes.  
Step 3 - Set up Pacemaker & Corosync for failover on nodes.  
Step 4 - Create a Cluster Resource for LVM & Filesystem management.  
Step 5 - Install Nginx and setup Cluster resource for it.  
Step 6 - Test failover.

### Step 1. Setup iSCSI Target server

lsblk  
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS  
sda 8:0 0 20G 0 disk   
├─sda1 8:1 0 19G 0 part /  
├─sda2 8:2 0 1K 0 part   
└─sda5 8:5 0 975M 0 part [SWAP]  
sdb 8:16 0 5G 0 disk   
sr0 11:0 1 1024M 0 rom

* Install iSCSI package
* sudo apt update && sudo apt install targetcli-fb -y
* Start iSCSI administrative tool
* sudo targetcli
* Create block storage device
* /backstores/block create name=iscsi\_disk dev=/dev/sdb
* Create an iSCSI target
* /iscsi create iqn.2025-02.lab.homework:iscsi-srv.target
* Attach /dev/sdb as LUN
* /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/luns create /backstores/block/iscsi\_disk
* Register initiators
* # create initiator for first node  
  /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/acls create iqn.2025-02.lab.homework.fo-node-1.init  
    
  # create initiator for second node  
  /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/acls create iqn.2025-02.lab.homework.fo-node-2.init
* Set **username** and **password** for initiator
* # set username and password for first initiator  
  /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/acls/iqn.2025-02.lab.homework.fo-node-1.init/ set auth userid=web-app  
  /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/acls/iqn.2025-02.lab.homework.fo-node-1.init/ set auth password=New\_123123  
    
  # set username and password for second initiator  
  /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/acls/iqn.2025-02.lab.homework.fo-node-2.init/ set auth userid=web-app  
  /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/acls/iqn.2025-02.lab.homework.fo-node-2.init/ set auth password=New\_123123
* Set authentication flag on for the target portal group (tpg1)
* /iscsi/iqn.2025-02.lab.homework:iscsi-srv.target/tpg1/ set attribute authentication=1
* Setup after save and exit with sudo targetcli ls

o- / ......................................................................................................................... [...]  
 o- backstores .............................................................................................................. [...]  
 | o- block .................................................................................................. [Storage Objects: 1]  
 | | o- iscsi\_disk ....................................................................... [/dev/sdb (5.0GiB) write-thru activated]  
 | | o- alua ................................................................................................... [ALUA Groups: 1]  
 | | o- default\_tg\_pt\_gp ....................................................................... [ALUA state: Active/optimized]  
 | o- fileio ................................................................................................. [Storage Objects: 0]  
 | o- pscsi .................................................................................................. [Storage Objects: 0]  
 | o- ramdisk ................................................................................................ [Storage Objects: 0]  
 o- iscsi ............................................................................................................ [Targets: 1]  
 | o- iqn.2025-02.lab.homework:iscsi-srv.target ......................................................................... [TPGs: 1]  
 | o- tpg1 .......................................................................................... [no-gen-acls, auth per-acl]  
 | o- acls .......................................................................................................... [ACLs: 2]  
 | | o- iqn.2025-02.lab.homework.fo-node-1.init .................................................. [1-way auth, Mapped LUNs: 1]  
 | | | o- mapped\_lun0 ............................................................................ [lun0 block/iscsi\_disk (rw)]  
 | | o- iqn.2025-02.lab.homework.fo-node-2.init .................................................. [1-way auth, Mapped LUNs: 1]  
 | | o- mapped\_lun0 ............................................................................ [lun0 block/iscsi\_disk (rw)]  
 | o- luns .......................................................................................................... [LUNs: 1]  
 | | o- lun0 ................................................................. [block/iscsi\_disk (/dev/sdb) (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]

* Start and enable service
* sudo systemctl start rtslib-fb-targetctl  
  sudo systemctl enable rtslib-fb-targetctl

### Step 2. Discover and log in to the iSCSI target on fo-node-1 and fo-node-2. Steps are similar for both nodes.

* Install the iSCSI initiator package
* sudo apt update && sudo apt install -y open-iscsi
* Add initiator name into /etc/iscsi/initiatorname.iscsi (replace fo-node-1 with fo-node-2 for other node)
* InitiatorName=iqn.2025-02.lab.homework.fo-node-1.init
* Adjust the authentication settings in /etc/iscsi/iscsid.conf file
* # Change the on line 54  
  node.startup = automatic  
    
  # Uncomment line 67  
  node.session.auth.authmethod = CHAP # uncomment  
    
  # Uncomment line 79 and 80 and set iscsi username and password  
  node.session.auth.username = web-app  
  node.session.auth.password = New\_123123
* Restart the service
* sudo systemctl restart iscsid.service
* Initiate a target discovery
* sudo iscsiadm -m discovery -t sendtargets -p iscsi-srv
* Login to the target
* sudo iscsiadm -m node --login
* Confirm the established session
* sudo iscsiadm -m session -o show

### Step 3. Set up Pacemaker & Corosync for failover on both fo-node-1 and fo-node-2.

* Install Hing Availability packages
* sudo apt update && sudo apt install -y pacemaker pcs
* Set password for hacluster user
* sudo passwd hacluster
* Remove corosync config file (on both nodes)
* sudo rm /etc/corosync/corosync.conf
* Start and enable Pacemaker service
* sudo systemctl start pacemaker  
  sudo systemctl enable pacemaker
* Authenticate both nodes (execute on one node)
* sudo pcs host auth fo-node-1.homework.lab fo-node-2.homework.lab
* Create and start the cluster (execute on one node)
* sudo pcs cluster setup cluster-1 fo-node-1.homework.lab fo-node-2.homework.lab --force
* Start and enable the cluster
* sudo pcs cluster start --all  
  sudo pcs cluster enable --all
* Check the cluster status
* sudo pcs cluster status
* Disable STONITH, we don’t have hardware fencing.
* sudo pcs property set stonith-enabled=false

### Step 4. Create a Cluster Resource for LVM & Filesystem management.

* Create a virtual IP address for the cluster
* sudo pcs resource create cluster-virtual-ip ocf:heartbeat:IPaddr2 \  
   ip=192.168.99.200 cidr\_netmask=24 \  
   op monitor interval=30s \  
   --group web-application
* Create iSCSI initiator resource
* sudo pcs resource create iscsi\_initiator ocf:heartbeat:iscsi \  
   portal="192.168.99.103:3260" \  
   target="iqn.2025-02.lab.homework:iscsi-srv.target" \  
   op monitor OCF\_CHECK\_LEVEL="0" timeout="30s" interval="120s" \  
   --group web-application
* Install LVM package (on both nodes)
* sudo apt update && sudo apt install -y lvm2
* Modify LVM configuration /etc/lvm/lvm.conf. Ensures LVM is correctly handled in a clustered environment and avoids conflicts when both fo-node-1 and fo-node-2 access the same LVM resources (on both nodes)
* system\_id\_source = "uname" # uncomment and set to "uname"
* Check LVM configuration
* sudo lvm lvmconfig
* Make sure commands sudo lvm systemid and uname -n had same output.
* Create partition on /dev/sdb
* sudo parted -s /dev/sdb -- mklabel msdos mkpart primary 16384s -0m set 1 lvm on
* Create a physical volume.
* sudo pvcreate /dev/sdb1
* Create the Volume group iscsi\_vg
* sudo vgcreate iscsi\_vg /dev/sdb1
* Check if the system ID is correctly applied
* sudo vgs -o+systemid
* Create logical volume web\_lv
* sudo lvcreate -l 100%FREE -n web\_lv iscsi\_vg
* Check the result with command
* sudo lvs
* Create filesystem
* sudo mkfs.ext4 /dev/iscsi\_vg/web\_lv
* Turn off automounting. Make sure Pacemaker manage volume groups instead system. Open and modify /etc/lvm/lvm.conf
* # Unmount and add only system volume groups, exclude that we should create  
  auto\_activation\_volume\_list = []
* Check the configuration
* sudo lvm lvmconfig
* Rebuild the initramfs by executing
* sudo update-initramfs -u
* Reboot both nodes
* Create mounting point on both nodes
* sudo mkdir -p /var/www/html
* Create iSCSI volume group resource
  + vgname -> Specifies the Volume Group to activate.
  + lvname -> If set, only the specified LV will be activated.
  + vg\_access\_mode -> Ensures LVM only activates on one node (as we already configured system\_id\_source in lvm.conf).
* sudo pcs resource create lvm\_ha ocf:heartbeat:LVM-activate \  
   vgname="iscsi\_vg" \  
   lvname="web\_lv" \  
   vg\_access\_mode="system\_id" \  
   op monitor timeout="90s" interval="30s" OCF\_CHECK\_LEVEL="0" \  
   --group web-application
* Add Filesystem resource
  + device -> The Logical Volume to mount.
  + directory -> The mount point for the website.
  + fstype -> The filesystem type (you formatted it as XFS).
* sudo pcs resource create lvm\_fs ocf:heartbeat:Filesystem \  
   device="/dev/iscsi\_vg/web\_lv" \  
   directory="/var/www/html" \  
   fstype="ext4" \  
   op monitor OCF\_CHECK\_LEVEL="0" timeout="40s" interval="20s" \  
   --group web-application
* Check resources status
* sudo pcs resource status

### Step 5. Install Nginx and setup Cluster resource for it

* Install Nginx on both nodes
* sudo apt update && sudo apt install nginx -y
* Set folder permissions on both nodes
* sudo chmod -R 755 /var/www/html
* Crete index.html on both nodes
* sudo echo "<h1>Hello from the Clustered Nginx</h1><p>$(date)</p>" | sudo tee /var/www/html/index.html
* Add Nginx resource
* sudo pcs resource create nginx\_service ocf:heartbeat:nginx \  
   configfile="/etc/nginx/nginx.conf" \  
   testclient="curl" \  
   status10url="http://192.168.99.200/" \  
   status10regex="200" \  
   op monitor timeout="90s" OCF\_CHECK\_LEVEL="0" interval="10s" \  
   --group web-application
* Status of cluster
* Cluster name: cluster-1  
  Status of pacemakerd: 'Pacemaker is running' (last updated 2025-02-24 10:47:30 +02:00)  
  Cluster Summary:  
   \* Stack: corosync  
   \* Current DC: fo-node-1.homework.lab (version 2.1.5-a3f44794f94) - partition with quorum  
   \* Last updated: Mon Feb 24 10:47:31 2025  
   \* Last change: Mon Feb 24 10:46:06 2025 by root via cibadmin on fo-node-1.homework.lab  
   \* 2 nodes configured  
   \* 5 resource instances configured  
    
  Node List:  
   \* Online: [ fo-node-1.homework.lab fo-node-2.homework.lab ]  
    
  Full List of Resources:  
   \* Resource Group: web-application:  
   \* cluster-virtual-ip (ocf:heartbeat:IPaddr2): Started fo-node-1.homework.lab  
   \* iscsi\_initiator (ocf:heartbeat:iscsi): Started fo-node-1.homework.lab  
   \* lvm\_ha (ocf:heartbeat:LVM-activate): Started fo-node-1.homework.lab  
   \* lvm\_fs (ocf:heartbeat:Filesystem): Started fo-node-1.homework.lab  
   \* nginx\_service (ocf:heartbeat:nginx): Started fo-node-1.homework.lab  
    
  Daemon Status:  
   corosync: active/enabled  
   pacemaker: active/enabled  
   pcsd: active/enabled
* Open webpage from outside
* A screenshot of a computer

  AI-generated content may be incorrect.

### Step 6. Test failover.

* Put fo-node-1.homework.lab in standby mode
* sudo pcs node standby fo-node-1.homework.lab
* Check cluster status form fo-node-1.homework.lab
* Cluster name: cluster-1  
  Status of pacemakerd: 'Pacemaker is running' (last updated 2025-02-24 10:48:15 +02:00)  
  Cluster Summary:  
   \* Stack: corosync  
   \* Current DC: fo-node-1.homework.lab (version 2.1.5-a3f44794f94) - partition with quorum  
   \* Last updated: Mon Feb 24 10:48:15 2025  
   \* Last change: Mon Feb 24 10:48:08 2025 by root via cibadmin on fo-node-1.homework.lab  
   \* 2 nodes configured  
   \* 5 resource instances configured  
    
  Node List:  
   \* Node fo-node-1.homework.lab: standby  
   \* Online: [ fo-node-2.homework.lab ]  
    
  Full List of Resources:  
   \* Resource Group: web-application:  
   \* cluster-virtual-ip (ocf:heartbeat:IPaddr2): Started fo-node-2.homework.lab  
   \* iscsi\_initiator (ocf:heartbeat:iscsi): Started fo-node-2.homework.lab  
   \* lvm\_ha (ocf:heartbeat:LVM-activate): Started fo-node-2.homework.lab  
   \* lvm\_fs (ocf:heartbeat:Filesystem): Started fo-node-2.homework.lab  
   \* nginx\_service (ocf:heartbeat:nginx): Started fo-node-2.homework.lab  
    
  Daemon Status:  
   corosync: active/enabled  
   pacemaker: active/enabled  
   pcsd: active/enabled
* Open webpage from outside. Our web server should be served by second node.
* A screenshot of a computer

  AI-generated content may be incorrect.