High Availability Clustering with RHEL 8 and z/VM®

Getting Started, Hints and Tips

—

Solution Assurance

Bodo Brand, Daniel Kaiser, David Stark

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IBM Z

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RHEL HA - **Agenda**

- **Introduction**
- **Prerequisites** and **End-Result**
- **Guidance Notes**

1.x - **Pacemaker Installation**

2.x - **Fencing** – z/VM admin tasks
2.x - **Fencing** – Create Resources

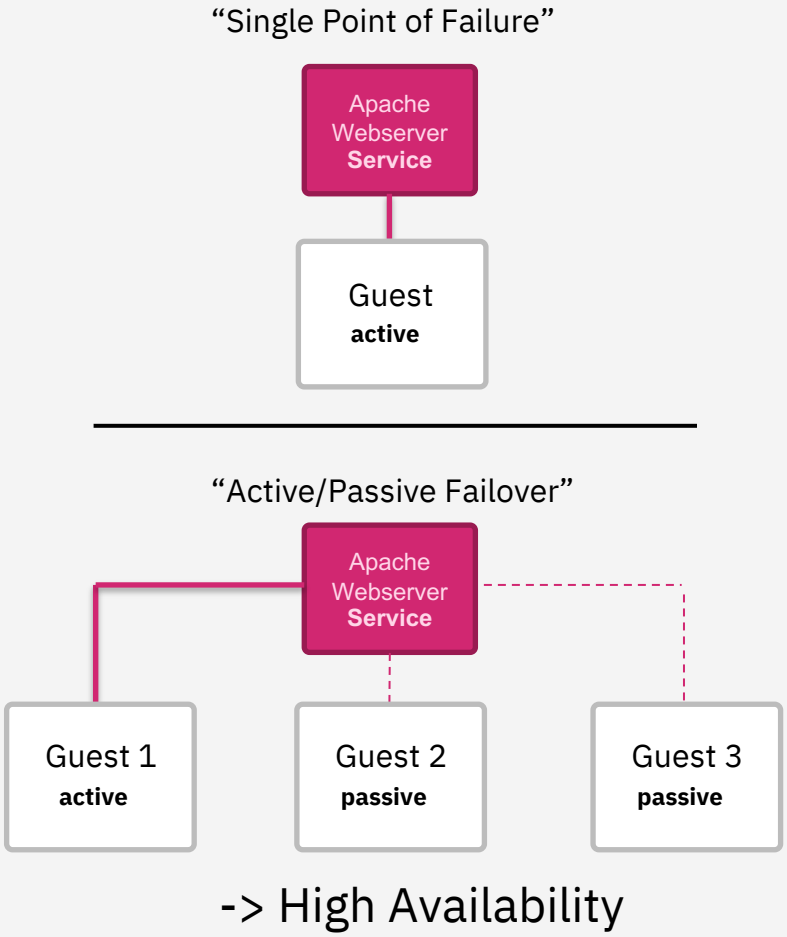
3.x - **Shared Storage** – z/VM admin tasks
3.x - **Shared Storage** – Create Resources

4.x - **Apache Installation**
4.x - **Apache** – Create Resources

Introduction

High Availability:

- For mission-critical workloads
- Official Red Hat ® documentation: LINK
- Support statement: LINK



Prerequisites and **End-Result**

Setup:

z15™ and DS8000®

3 Nodes

1 ECKD DASD Fullpack Minidisk (shared storage)

3 ECKD DASD (local storage)

Nodes (z/VM Guests):

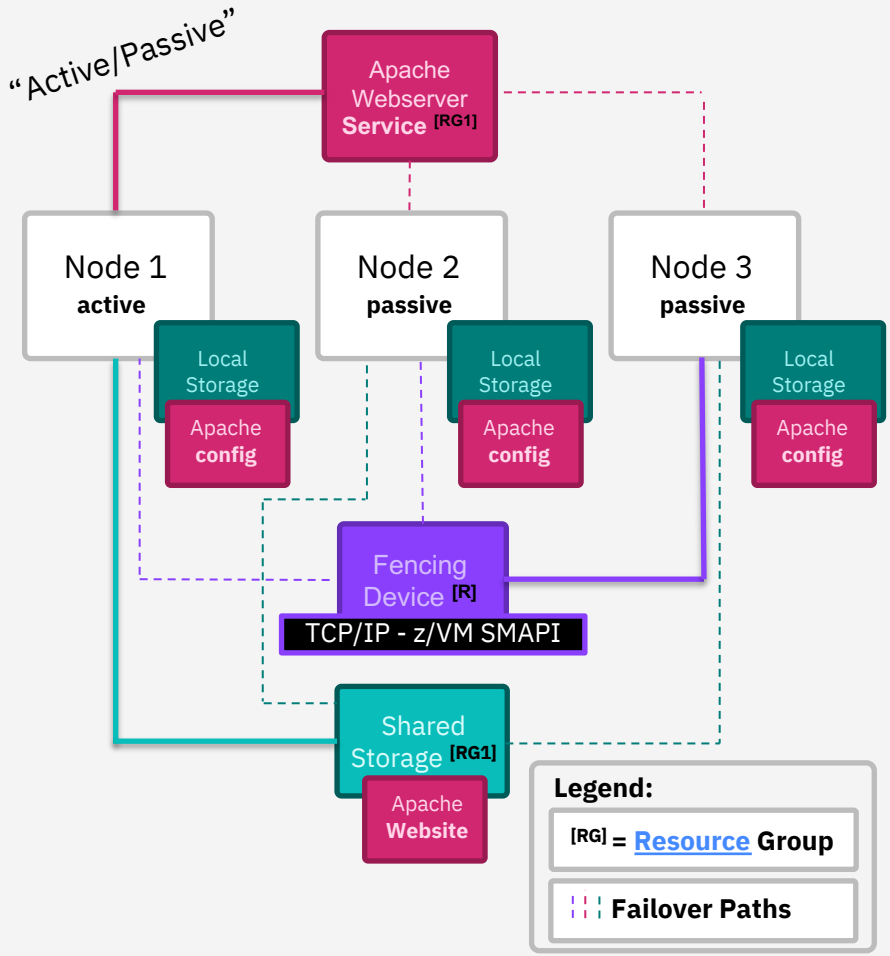
On z/VM 7.2

Distro: RHEL 8.3

Resources are marked with **[R]**

On Failover: Resources Migrate to **one** of these nodes.

Migration only happens when **Quorum** is reached.



Guidance Notes

- Some of the operations must be run on all nodes and some only one one node.
- The ”**Run on**” graphic on the right indicate on which of the nodes you have to run the command.

Run on:
- Node 1
- Node 2
- Node 3

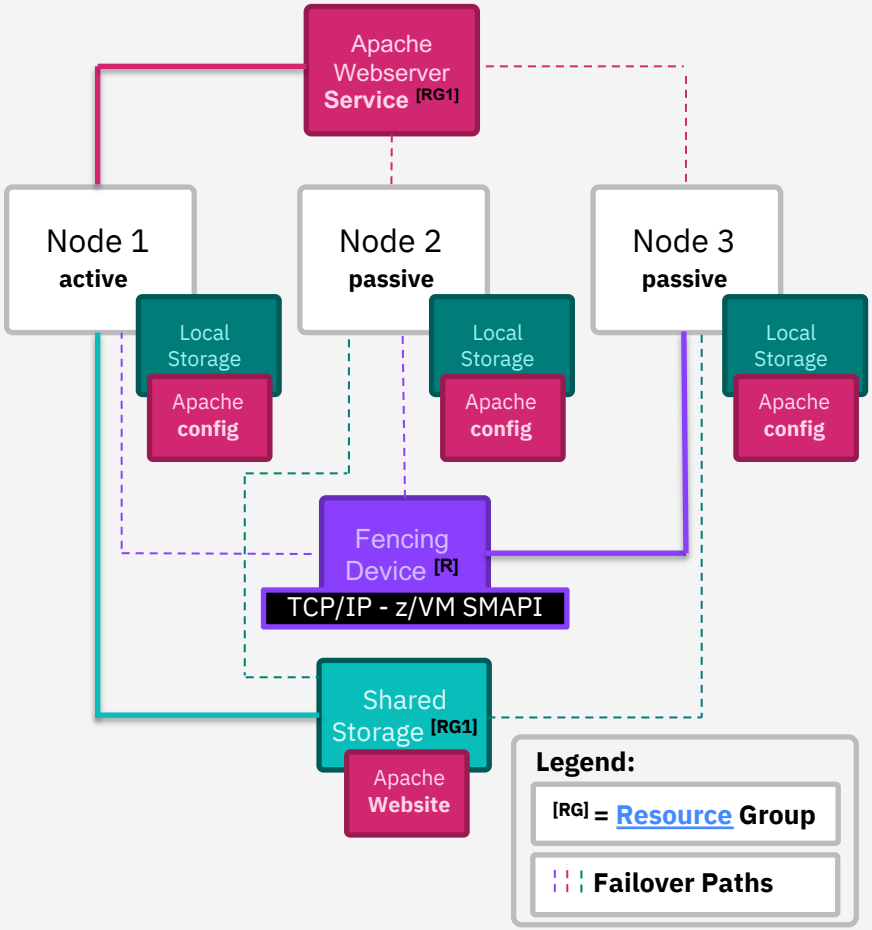
- ”#” at the beginning of the line indicate a privileged bash command.

```
# echo "Example command"
```

Run on:
- Node 1
- Node 2
- Node 3

- The graphic on the right is used for illustration purposes.

- Optional: Link terminal to run SSH commands in parallel on multiple hosts.
  For example, use Ansible®.



Pacemaker Installation

Step 1.0 – RHEL HA Installation

Run on: Node 1, Node 2, Node 3

```
# subscription-manager register --auto-attach
# dnf config-manager --set-enabled \
  rhel-8-for-s390x-highavailability-rpms
# dnf update -y
# dnf install -y pcs pacemaker fence-agents-all
```

Step 1.1 – Firewall Configuration

Run on: Node 1, Node 2, Node 3

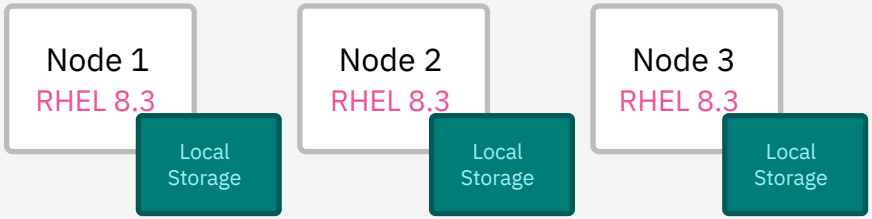
```
# firewall-cmd --permanent \
  --add-service=high-availability
# firewall-cmd --reload
```

Step 1.2 – Setup Linux® RHEL HA User

Run on: Node 1, Node 2, Node 3

```
# passwd hacluster
```

Note:
- Same password for each node recommended.
- Disable password based authentication for SSH.



Pacemaker Installation

Step 1.3 – Enable pcsd

Run on: Node 1, Node 2, Node 3

```
# systemctl enable pcsd.service --now
```

Step 1.4 – Auth Nodes

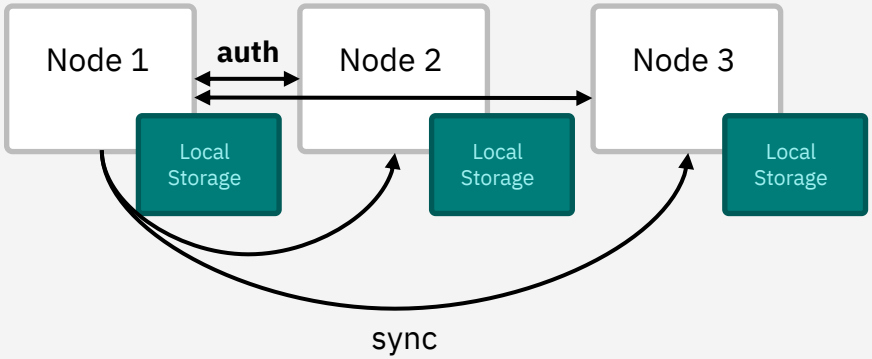
Run on: Node 1

```
# pcs host auth node1 node2 node3
Username: hacluster
Password: …
```

Step 1.5 – Setup Cluster

Run on: Node 1

```
# pcs cluster setup \
my_cluster node1 node2 node3
```



Pacemaker Installation

Step 1.6 – Start and Enable Services

Run on: Node 1

```
# pcs cluster start --all
# pcs cluster enable --all
```

Step 1.7 – Enable Monitoring (Optional)

Run on: Node 1, Node 2, Node 3

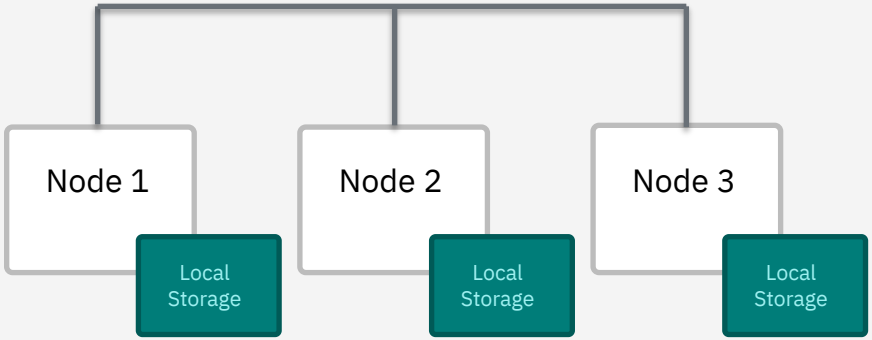
```
# dnf install pcp-zeroconf
```

Step 1.8 – Check before Continuing

Run on: Node 1

```
# pcs cluster status
```

Note:
- Make sure everything is up and running.



Fencing

Fencing - z/VM admin tasks

Step 2.0 – Set up SMAPI Authorization

Run on: z/VM

- Create ZCLUSTER User:

```
USER ZCLUSTER xxxxxxxx 32M 128M G
   INCLUDE IBMDFLT
   IPL CMS
   MDISK 0191 3390 AUTOV 10 T513T1 MR
```

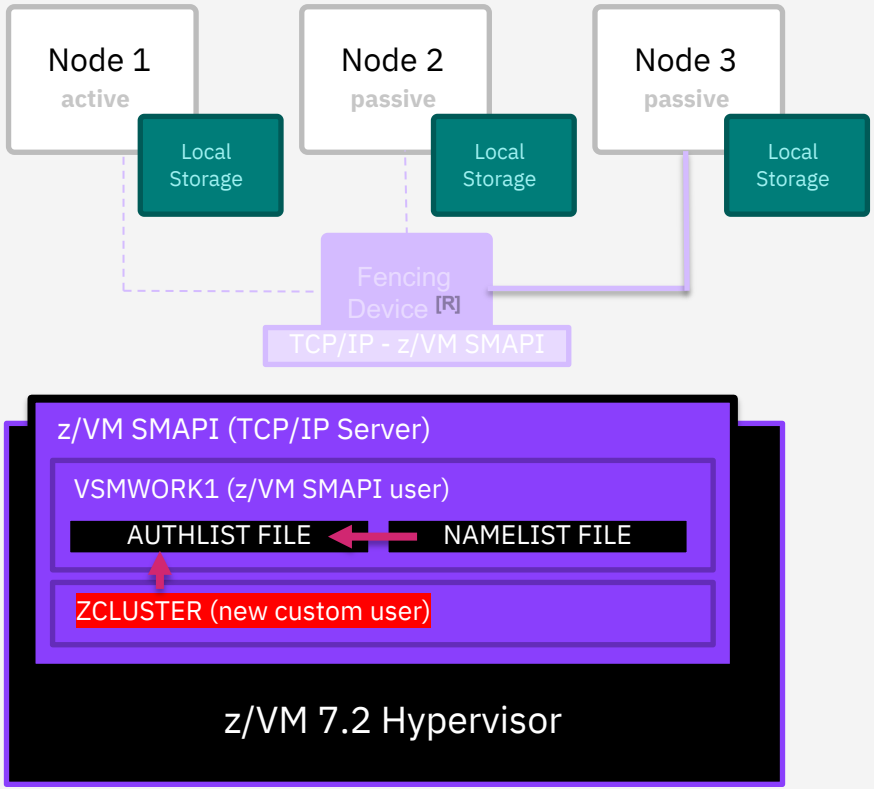
- Add ZCLUSTER to z/VM Directory:

```
DIRM ADD ZCLUSTER
```

- Set Authorization Policy:

```
Authorization_Policy =
Authorization_Policy_AuthlistOnly
```

- XEDIT documentation



Fencing - z/VM admin tasks

Step 2.1 – Set up SMAPI Authorization

Run on: z/VM

- File VSMWORK1 NAMELIST:

```
:nick.ZVM_FENCE
:list.
IMAGE_ACTIVATE
IMAGE_DEACTIVATE
IMAGE_STATUS_QUERY
CHECK_AUTHENTICATION
IMAGE_NAME_QUERY_DM
```

- File VSMWORK1 AUTHLIST:

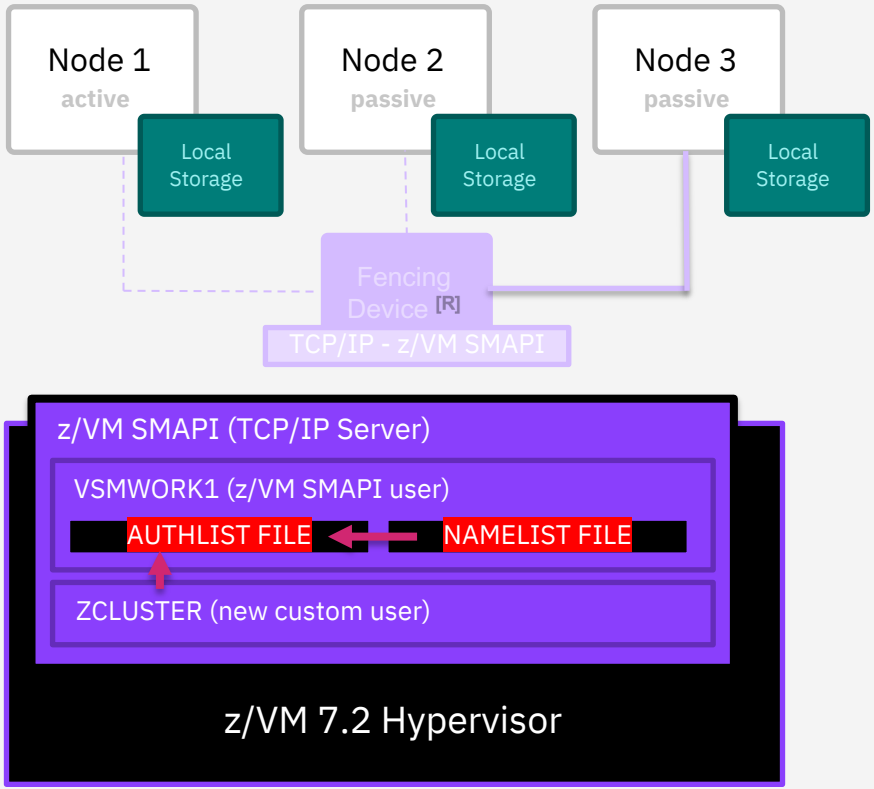
```
COLUMN 1            COLUMN 66           COLUMN 131
|                   |                   |
|                   |                   |
|                   |                   |
V                   V                   V
DO.NOT.REMOVE       DO.NOT.REMOVE       DO.NOT.REMOVE
ZCLUSTER            ALL                 ZVM_FENCE
```

Step 2.2 – Enable SMAPI

Run on: z/VM

- Follow Getting Started with SMAPI in the z/VM Doc.

Note:
- Make sure that after a restart of the z/VM hypervisor that the SMAPI is started.



Fencing - z/VM admin tasks

Step 2.3 – IPL DASD on LOGON

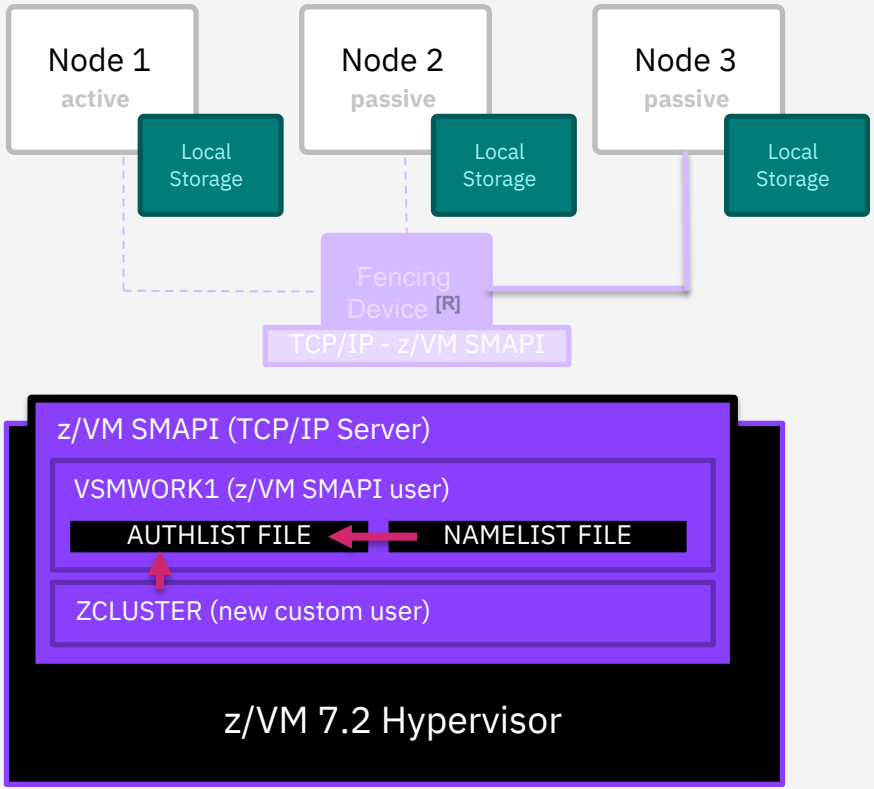
Run on: z/VM

- **Option 1:**
  - Add IPL statement to each directory entry.

```
IPL 1E00
```

- **Option 2:**
  - Add IPL statement to profile exec from CMS.

```
/* */
'IPL 1E00'
```



Fencing – Create Resources

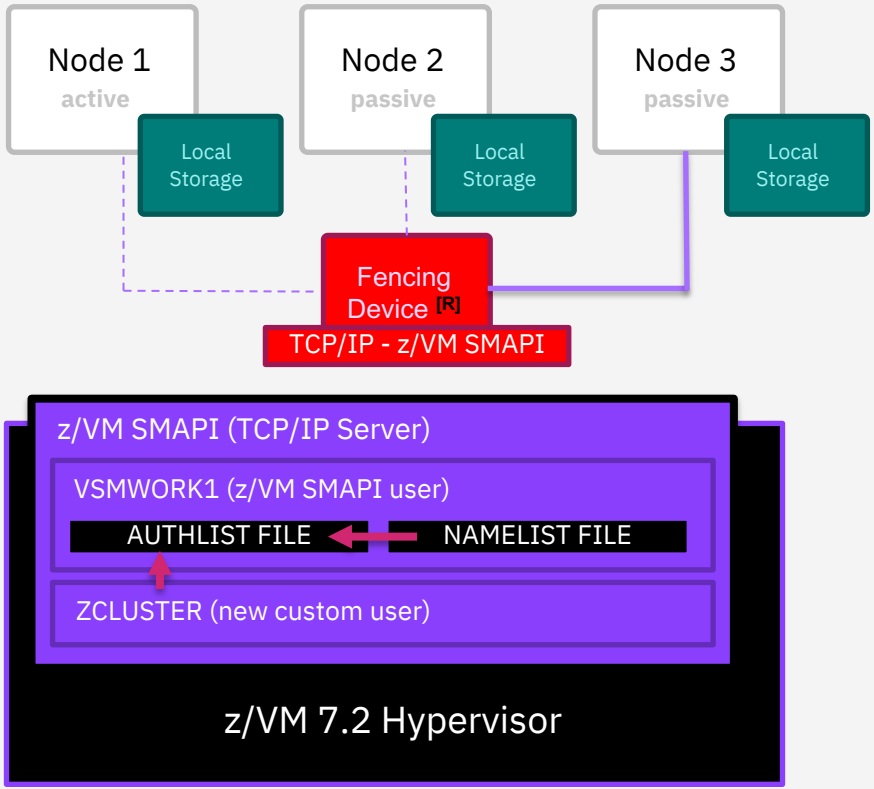
Step 2.4 – Create fence_zvmip Stonith Resource

Run on: Node 1

```
# pcs stonith create zvm-smapi1 fence_zvmip \
            ip=zvm-smapi1.example.com \
            username="ZCLUSTER" \
            password="ZPASSWD" \
            pcmk_host_map="node1:RHELHA-
1;node2:RHELHA-2;node3:RHELHA-3"
```

Note:

- `pcmk_host_map="<NODENAME>:<IMAGE>[;<NODENAME>:<IMAGE>...]"`



Fencing – Create Resources

Run on:

Node 1

Step 2.5 – Quick Test Fencing

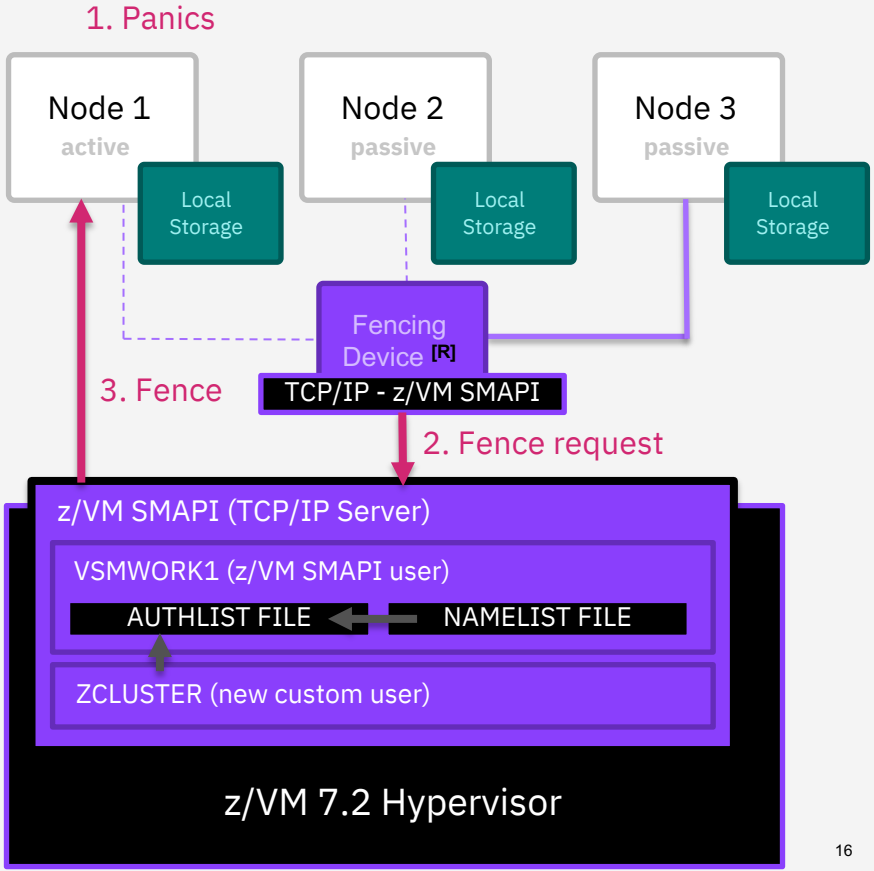
- Trigger fencing manually:

```
# pcs stonith fence node1
```

- Simulate a panic:

```
# echo c > /proc/sysrq-trigger
```

Note:
- Check the "`pcs stonith history`" to make sure fencing was successful.



Shared Storage

Shared Storage - z/VM admin tasks

Step 3.0 – Create Fullpack Minidisk

Run on: z/VM

- Create new user LINSHARE: (**See Step 2.0**)

```
USER LINSHARE NOLOG
MDISK 0200 3390 DEVNO 1111 MWV
```

Step 3.1 – Link Minidisk to Linux

Run on: z/VM

- **Option 1 (on z/VM hypervisor)**:
  - Link both Minidisks

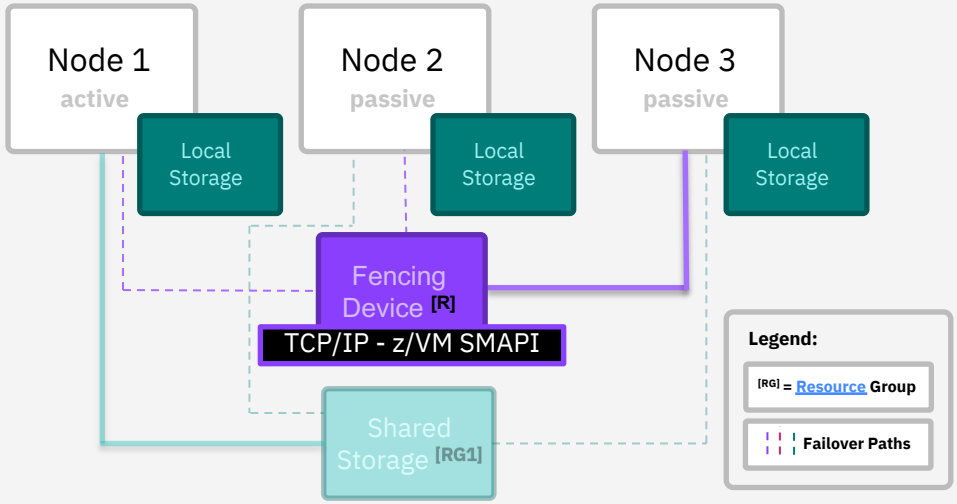
```
DIRM FOR RHELHA-1 LINK LINSHARE 200 200 MW
DIRM FOR RHELHA-2 LINK LINSHARE 200 200 MW
DIRM FOR RHELHA-3 LINK LINSHARE 200 200 MW
```

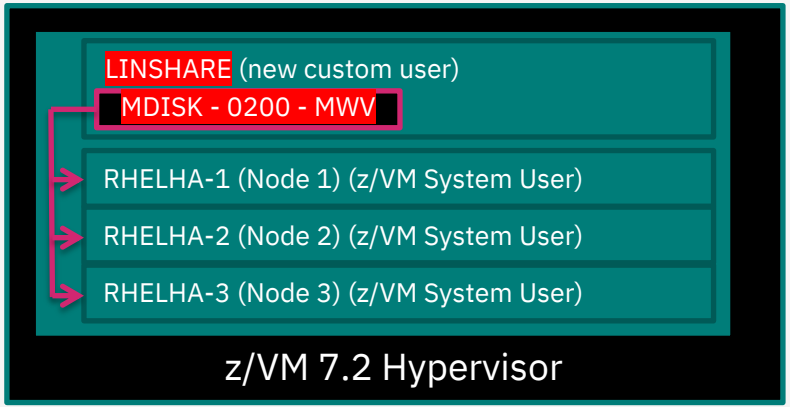
  - LOGOFF and LOGON each guest

- **Option 2 (on Linux guest)**:

```
# vmcp 'link * 0200 0200 rw'
```

Run on: Node 1, Node 2, Node 3





Shared Storage – Create Resources

Step 3.2 – Make DASD persistent

Run on:
- Node 1
- Node 2
- Node 3

De-ignore, enable and make DASD persistent:

```
# cio_ignore -r 0200
# chccwdev -e 0200
# echo 0.0.0200 >> /etc/dasd.conf
# echo add > /sys/bus/ccw/devices/0.0.0200/uevent
```

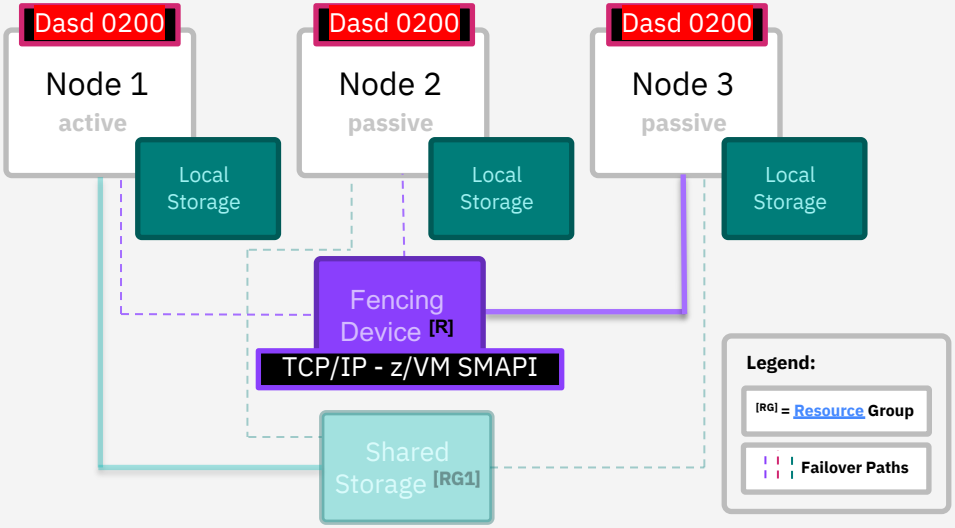
(Alternatively you can use "chzdev -e dasd 0.0.0200")

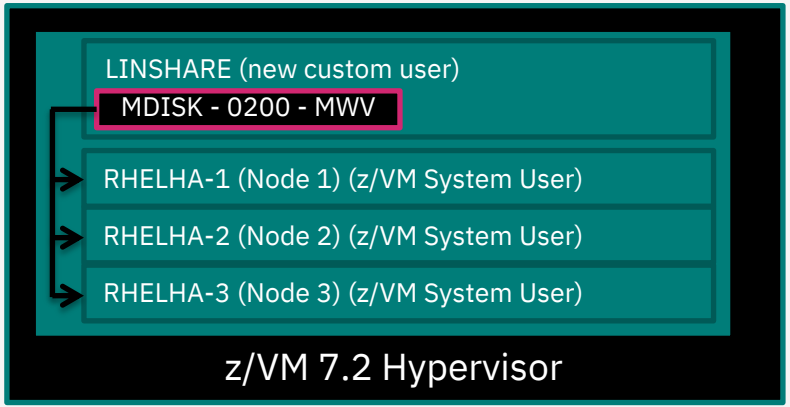
Step 3.3 – Format DASD

Run on:
- Node 1

```
# dasdfmt -b 4096 -d cdl -p /dev/dasdc
# fdasd -a /dev/dasdc
```

Note:
- /dev/dasdc might be named differently on your system – check with "lsdasd".





Shared Storage – Create Resources

Step 3.4 – Change LVM config

Run on: Node 1

- Change option in /etc/lvm/lvm.conf to:

```
system_id_source = "uname"
```

Step 3.5 – Create LVM volume

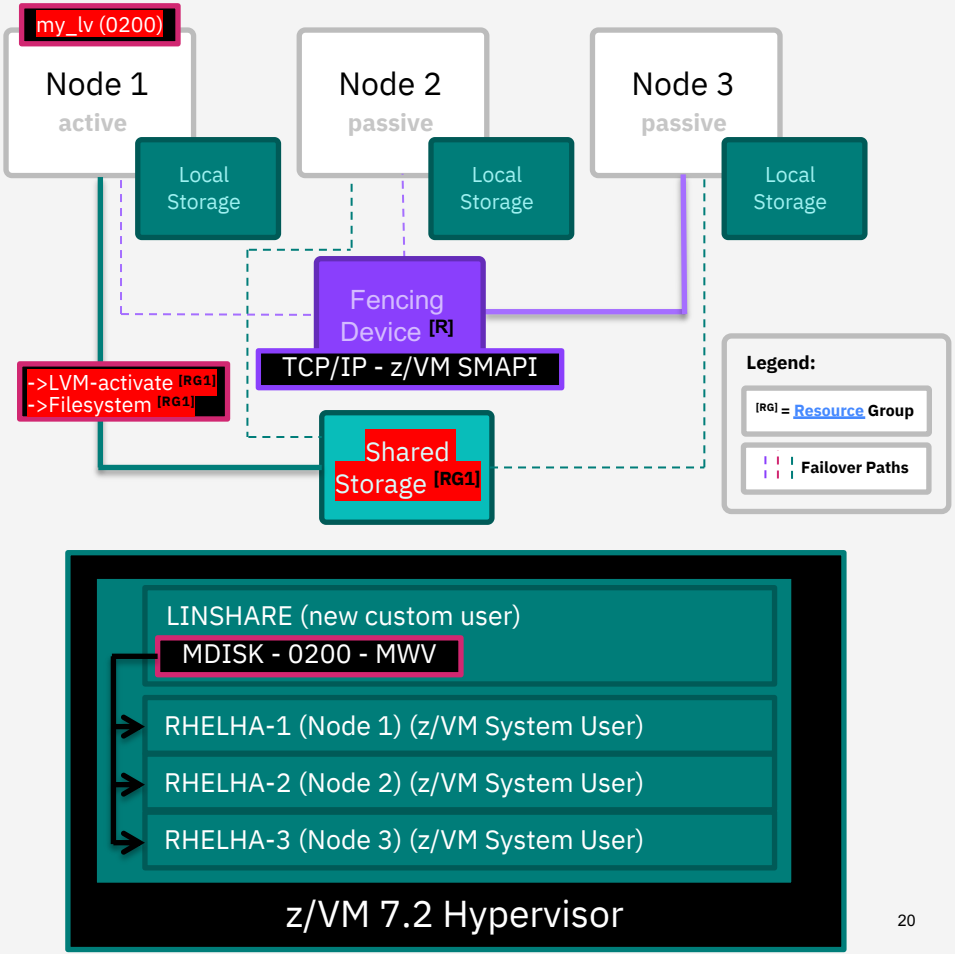
Run on: Node 1

```
# pvcreate /dev/dasdc1
# vgcreate my_vg /dev/dasdc1
# lvcreate -n my_lv -l 100%FREE my_vg
# mkfs.ext4 /dev/my_vg/my_lv
```

Step 3.6 – Create resources

Run on: Node 1

```
# pcs resource create my_lvm LVM-activate \
            vgname=my_vg \
            vg_access_mode=system_id \
            --group apachegroup
# pcs resource create my_fs Filesystem \
            device="/dev/my_vg/my_lv" \
            directory="/var/www" fstype="ext4" \
            --group apachegroup
```



Apache HA

Apache Installation

Step 4.0 – Apache Installation

Run on:

- Node 1
- Node 2
- Node 3

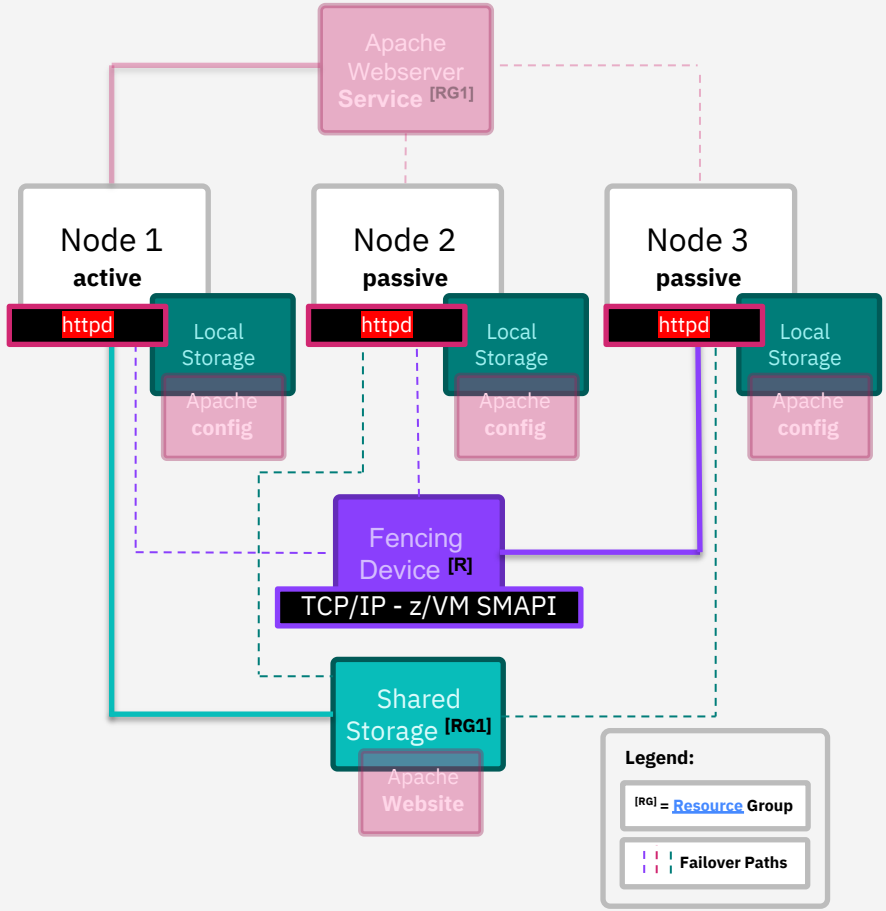
```
# dnf install -y httpd wget
```

Step 4.1 – Firewall Configuration

Run on:

- Node 1
- Node 2
- Node 3

```
# firewall-cmd --permanent \
  --add-service=http
# firewall-cmd --reload
```



Apache – Create Resources

Step 4.2 – Create web site

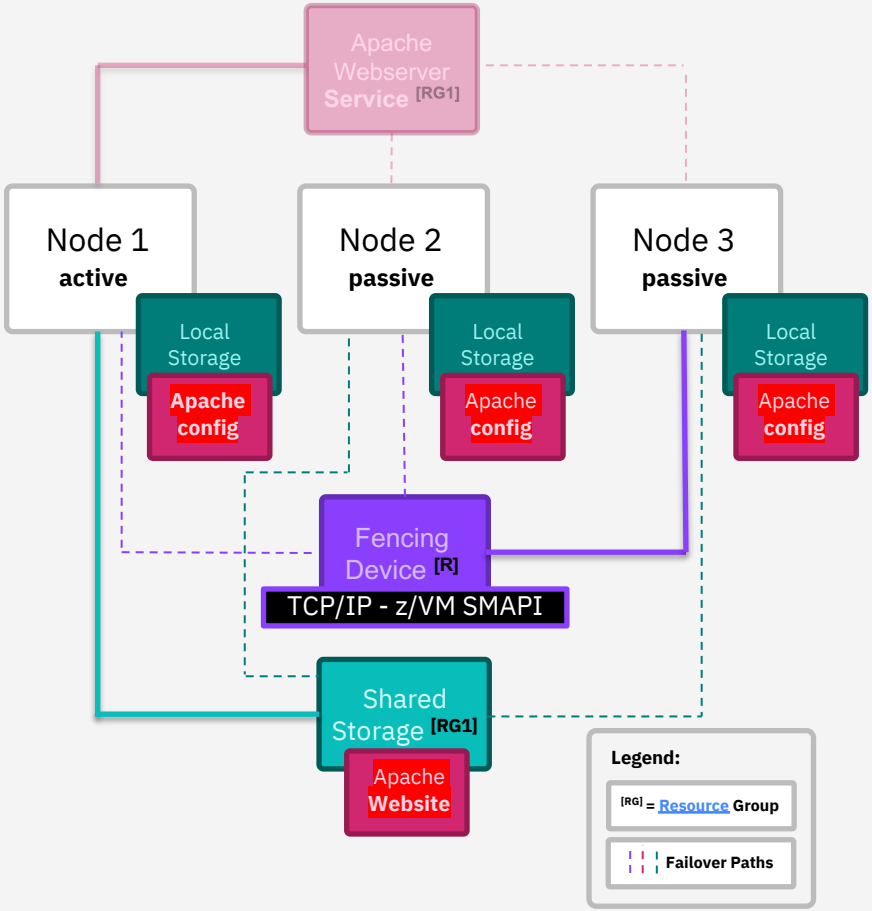
Run on: Node 1

```
# cat <<-END >/var/www/html/index.html
<html>
<body>My Test Site - $(hostname)</body>
</html>
END
# restorecon -R /var/www
```

Step 4.3 – Create configuration file

Run on: Node 1, Node 2, Node 3

```
# cat <<-END > /etc/httpd/conf.d/status.conf
<Location /server-status>
SetHandler server-status
Order deny,allow
Deny from all
Allow from 127.0.0.1
Allow from ::1
</Location>
END
```



Apache – Create Resources

Run on:

- Node 1
- Node 2
- Node 3

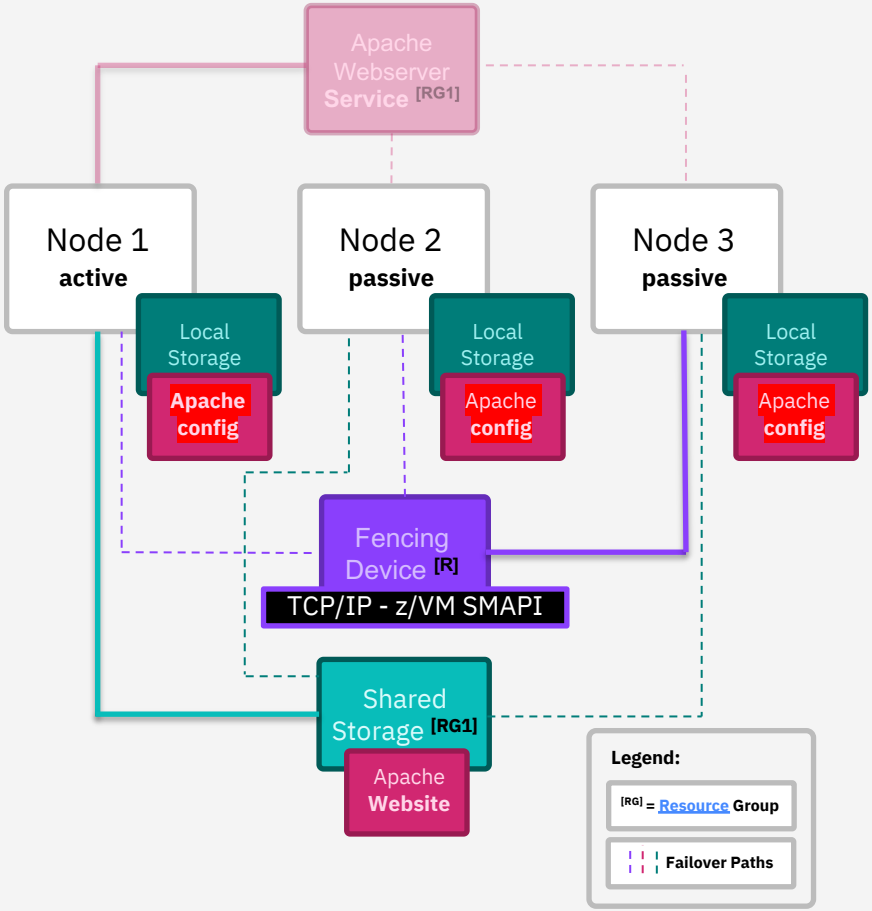
Step 4.4 – Edit logrotate

- **Replace** in the file /etc/logrotate.d/httpd:

```
/bin/systemctl reload httpd.service > /dev/null
2>/dev/null || true
```

with:

```
/usr/bin/test -f /run/httpd.pid >/dev/null
2>/dev/null && /usr/bin/ps -q $(/usr/bin/cat
/run/httpd.pid) >/dev/null 2>/dev/null &&
/usr/sbin/httpd -f /etc/httpd/conf/httpd.conf \ -c
"PidFile /run/httpd.pid" -k graceful > /dev/null
2>/dev/null || true
```



Apache – Create Resources

Step 4.5 – Create resources

Run on: Node 1

```
# pcs resource create ClusterIP
ocf:heartbeat:IPaddr2
ip="${FLOATING_IP_ADDRESS}" --group
apachegroup --before my_lvm

# pcs resource create WebSite
ocf:heartbeat:apache
configfile=/etc/httpd/conf/httpd.conf
statusurl="http://localhost/server-status" -
-group apachegroup --after my_fs
```

Note:
- Floating IP addresses is similar to a static IP address in the network.
- `${FLOATING_IP_ADDRESS}` is a placeholder.

Step 4.6 – Test with wget

Run on: Node 2

```
# wget http://${FLOATING_IP_ADDRESS}
```