Proxmox VE 5

Lecture 11
High Availability and CEPH Storage

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Why High Availability?

- Eliminate single point of failure
- Reduce downtime

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HA in Proxmox VE

- Proxmox VE make it much easier to reach high availability because they remove the “hardware” dependency.
- It also supports to setup and use redundant storage and network devices.
- So if one host fails, you can simply start services on another host within your cluster.
  - Proxmox VE provides a software stack called ha-manager, which can do that automatically for you

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Requirements

- At least three cluster nodes (to get reliable quorum)
- Shared storage for VMs and containers
- Hardware redundancy (everywhere)
- Use reliable “server” components

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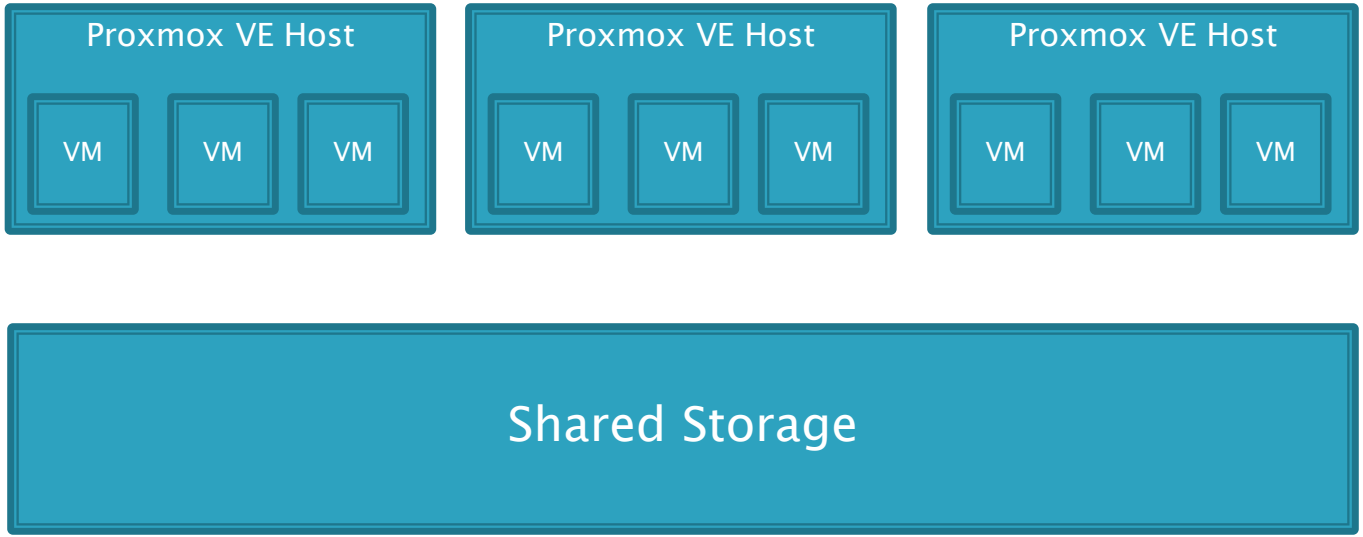
Why Shared Storage?

- All the Hosts have access to the same storage



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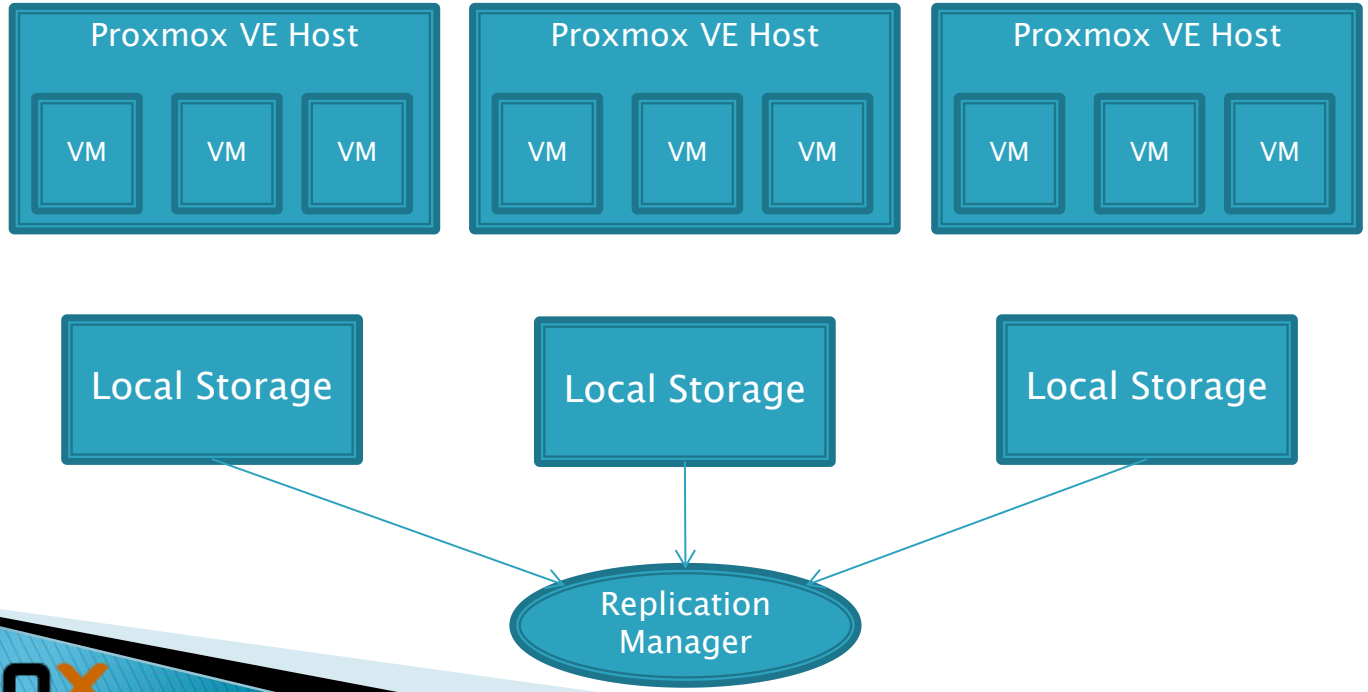
Why Shared Storage?

- CEPH Uses Local Storage as Shared Storage



What is CEPH?

- Ceph is a distributed replicated clustered filesystem
- Ceph is a distributed object store and file system designed to provide excellent performance, reliability and scalability.

Why Ceph?

- Easy setup and management with CLI and GUI support on Proxmox VE
- Thin provisioning
- Snapshots support
- Self healing
- No single point of failure
- Scalable to the exabyte level
- Runs on economical commodity hardware
- No need for hardware RAID controllers
- Easy management
- Open source

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Ceph Components

- (1) OSDs (Object Storage Device)
  - Corresponds to a physical disk. An OSD is actually a directory that Ceph uses, residing on a regular filesystem
    - (eg. /var/lib/ceph/osd-1)

Ceph Components

- (2) Placement Groups
  - Placement groups used for tracking metadata for objects
  - It represents a mostly-static mapping to one or more underlying OSDs.
  - All PGs in a pool will replicate stored objects into multiple OSDs.
  - PG calculator
    - https://ceph.com/pgcalc/

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Ceph Components

- (3) CRUSH maps
  - Ensures that replicas don’t end up on the same disk/host/rack/etc,

Ceph Components

- (4) Pools
  - A pool is the layer at which most user-interaction takes place.
  - This is the important stuff like GET, PUT, DELETE actions for objects in a pool.
  - Pools contain a number of PGs, not shared with other pools (if you have multiple pools).
  - The number of PGs in a pool is defined when the pool is first created, and can't be changed later.
  - You can think of PGs as providing a hash mapping for objects into OSDs, to ensure that the OSDs are filled evenly when adding objects to the pool.

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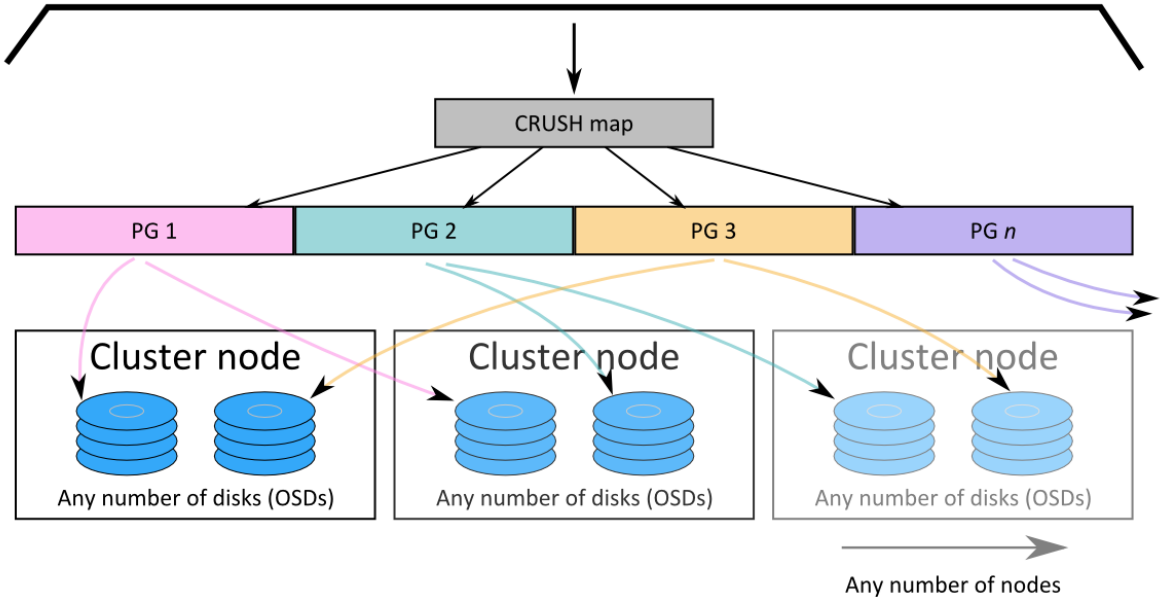
Ceph Components



Pool

Placement Groups

OSDs

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Before Installing Ceph

- We are going to use our 3-nodes cluster that we have created in our previous lecture
- On each Proxmox VE host:
  - Add additional Disks (i.e 2 x 2GB)
  - Add additional NIC
    - And make a new subnet for Ceph (i.e 10.0.0.0/24)

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Install Ceph

- Install Ceph on each node
  - *pveceph install --version luminous*
  - This will download some packages from the internet
  - You might face disk space problem if you are using 8GB disk for your host

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Configure Ceph Network

- Configure network on one node
  - *pveceph init --network 10.0.0.0/24*
  - This creates an initial config at /etc/pve/ceph.conf

Create Monitors

- The Ceph Monitor maintains a master copy of the cluster map.
- For HA you need to have at least 3 monitors.
- You can create monitor service using the command:
  - *pveceph createmon*
- Or from GUI
  - You should run 3 monitors, one on each node

Creating Monitors From GUI

PROXMOX Virtual Environment 5.1-41 | Search | You are logged in as 'root@pam' | Documentation | Create VM

Server View

- Datacenter
  - node01
    - local (node01)
    - local-lvm (node01)
  - node02
    - 100 (test01)
    - local (node02)
    - local-lvm (node02)
  - node03
    - local (node03)
    - local-lvm (node03)

Node 'node03' | Restart | Shutdown | Shell | Bu

- System
  - Network
  - DNS
  - Time
  - Syslog
- Updates
- Firewall
- Disks
- Ceph
  - Configuration
  - Monitor
  - OSD
  - Pools

Start | Stop | Create | Remove

Name	Host	Quorum	Address
mon.node01	node01	Yes	10.0.0.1:6789/0
mon.node02	node02	Yes	10.0.0.2:6789/0
mon.node03	node03	Yes	10.0.0.3:6789/0

Tasks | Cluster log

Start Time	End Time	Node	User name	Description	Status
May 22 11:18:11	May 22 11:18:36	node03	root@pam	Ceph Monitor mon.node03 - Create	OK

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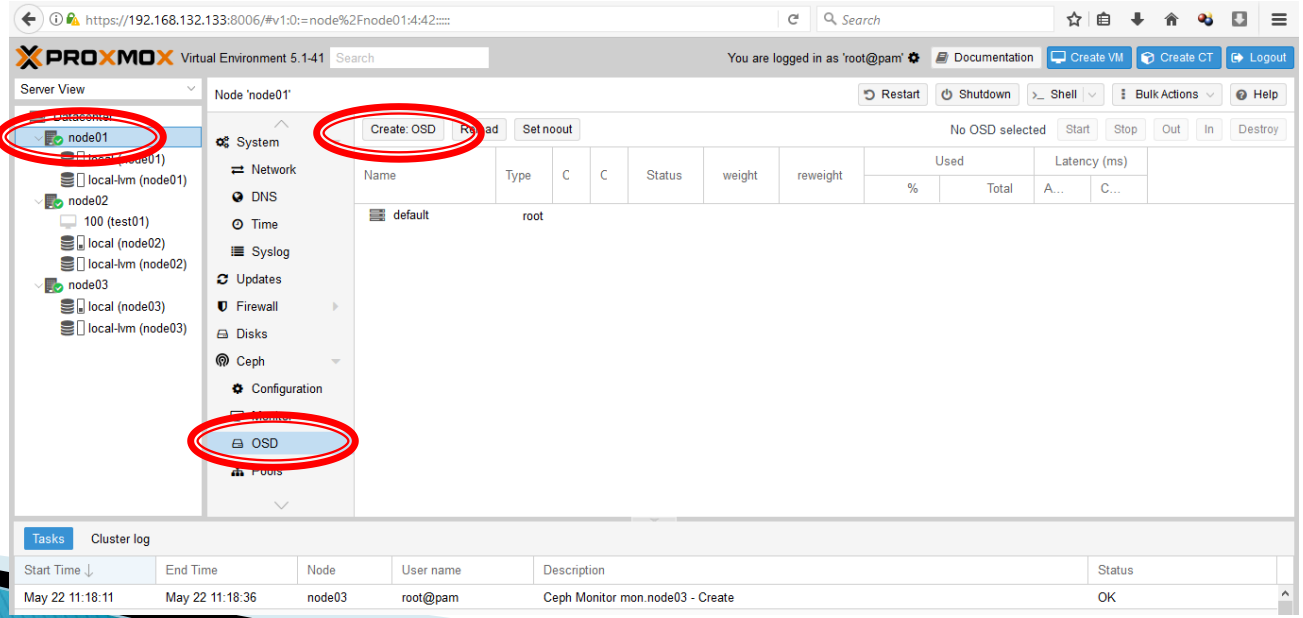
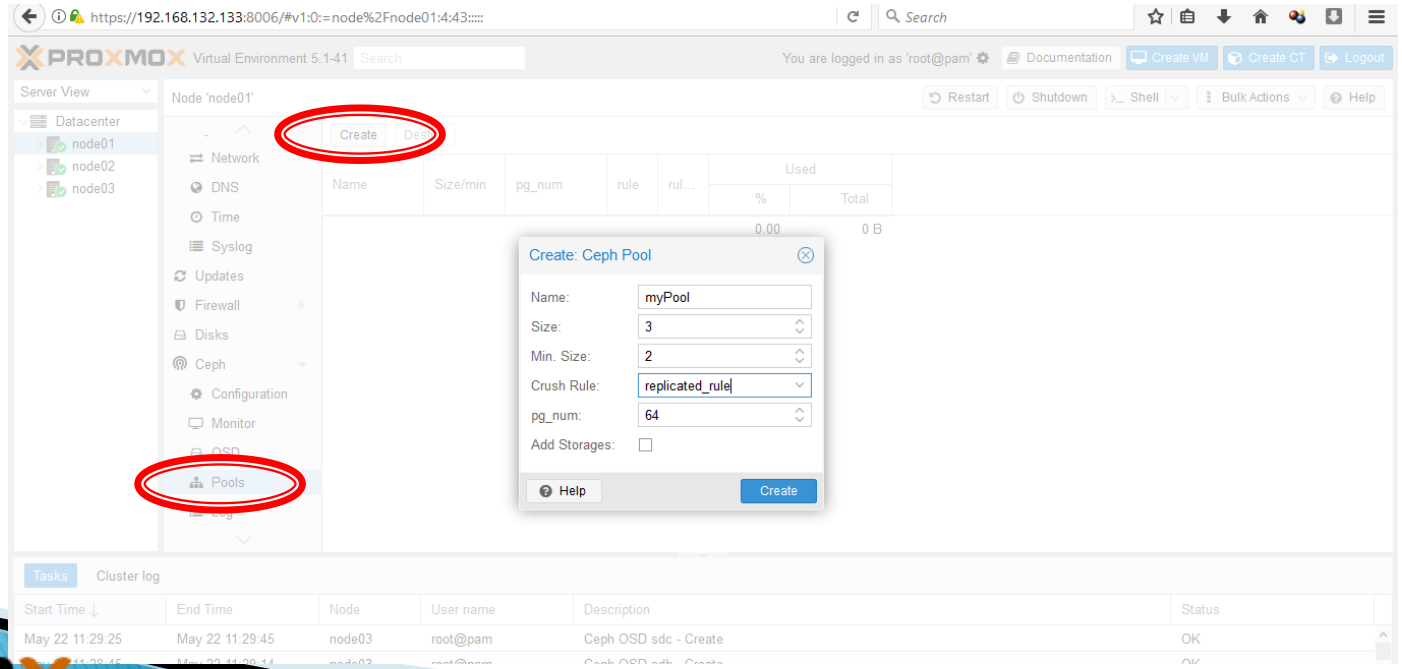
Create OSDs

- Add the required disks (6 disks)
  - Again: Don’t use RAID



Create the Pool

- The pool == our storgae



Keyring

- To build a trust relationship between ceph and Proxmox VE (Requires for external Ceph)
  - mkdir /etc/pve/priv/ceph
  - cp /etc/pve/priv/ceph.client.admin.keyring /etc/pve/priv/ceph/my-ceph-storage.keyring
- As we use local Ceph, this step is not required

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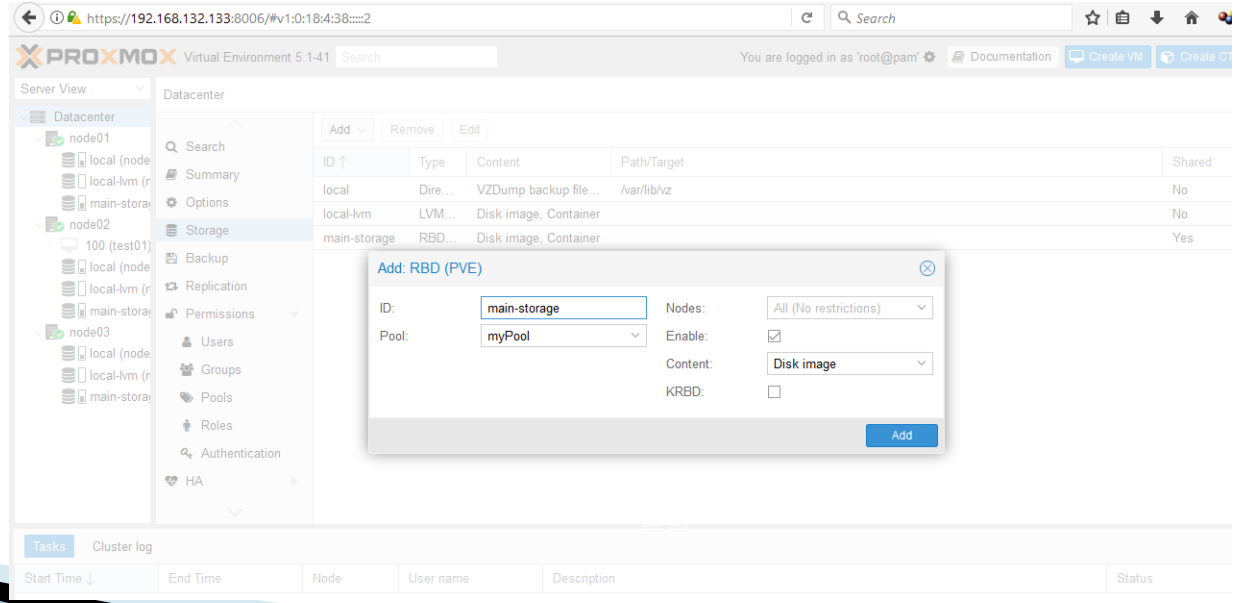
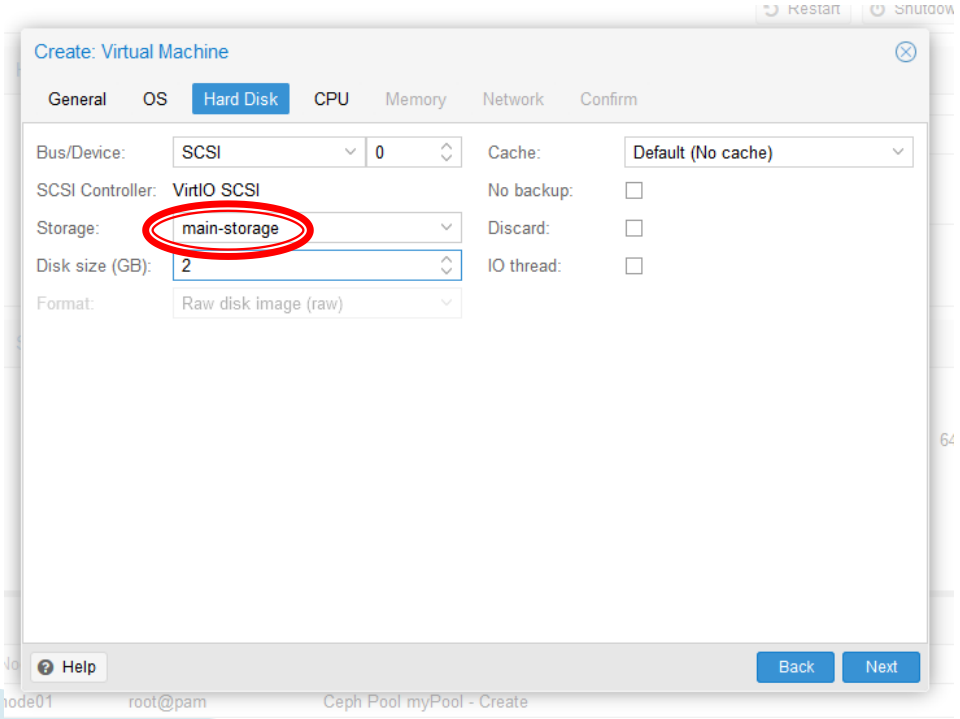
Create Storage

- Create a storage that maps to the created Pool (choos RBD PVE storage)



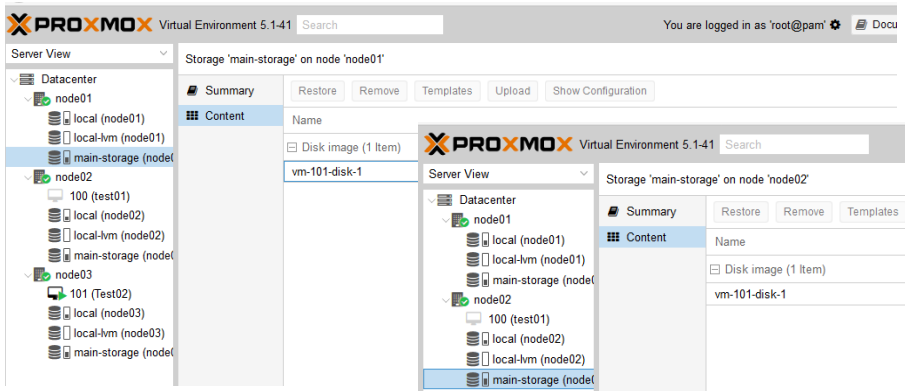
High Availability

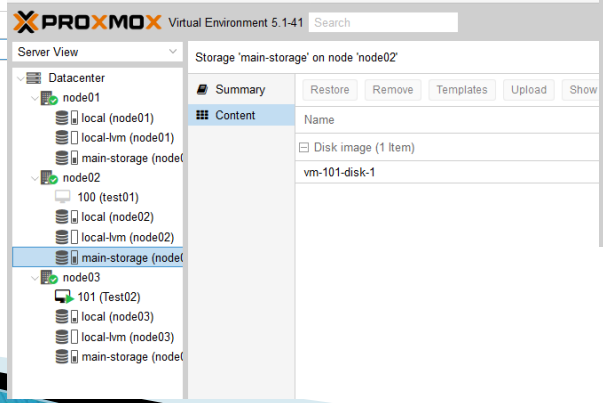
- Create a VM and choose the Ceph storage for its Hard Disk

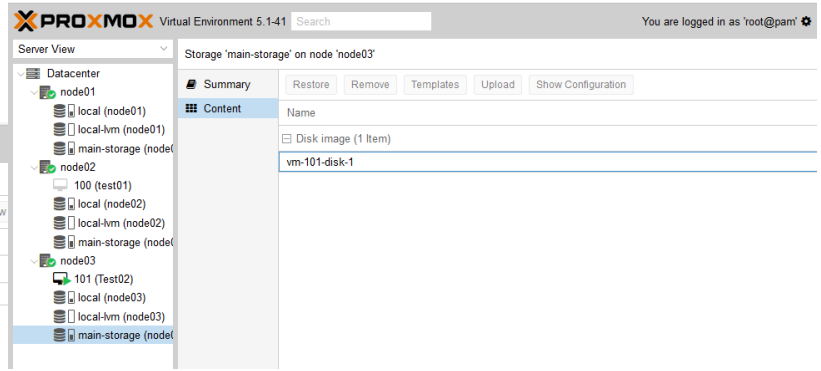


Migration

- Now you can migrate VMs and containers on the shared storage ONLINE, with no down time





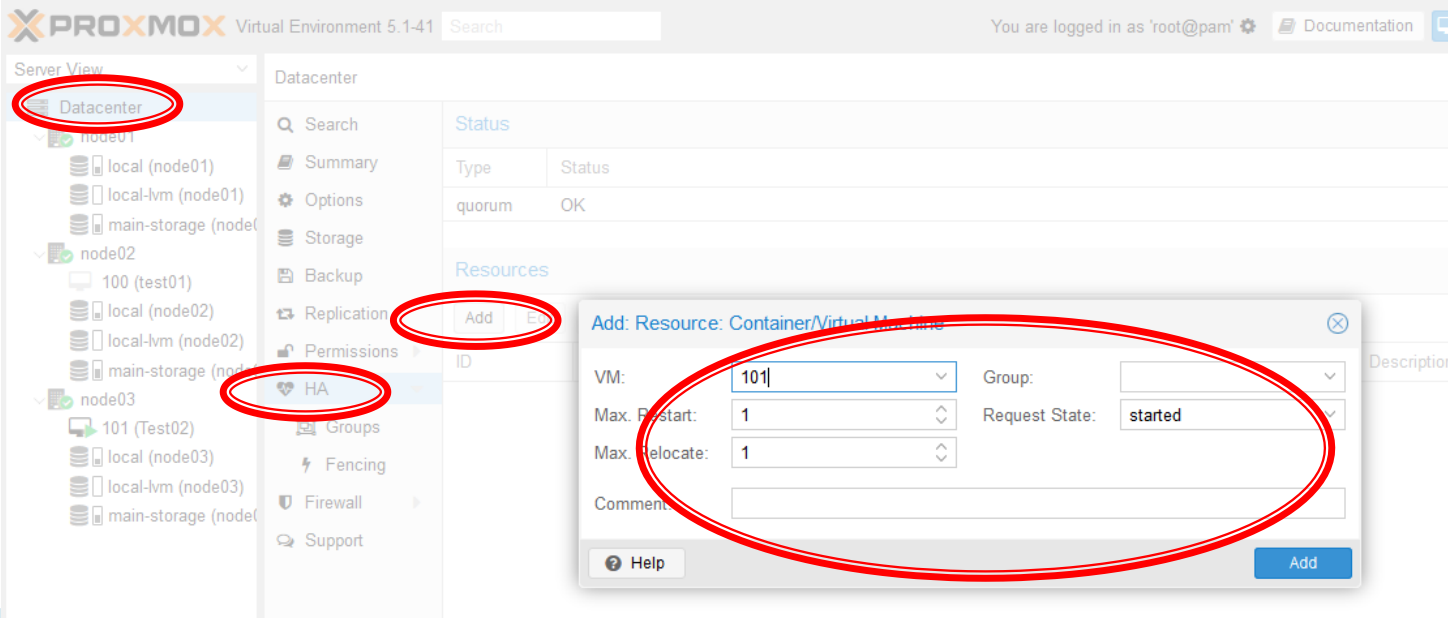


What is High Availability?

- When one of your Hosts fail, the HA manager will migrate all the HA-enabled VMs to another Host

Enable HA for VMs

- Add VM as resource to HA



Active Resources

PROXMOX Virtual Environment 5.1-41 Search You are logged in as 'root@pam'

Server View

- Datacenter
  - node01
    - local (node01)
    - local-lvm (node01)
    - main-storage (node(
  - node02
    - 100 (test01)
    - local (node02)
    - local-lvm (node02)
    - main-storage (node(
  - node03
    - 101 (Test02)
    - local (node03)
    - local-lvm (node03)
    - main-storage (node(

Datacenter

- Search
- Summary
- Options
- Storage
- Backup
- Replication
- Permissions
- HA
  - Groups
  - Fencing
- Firewall
- Support

Status

Type	Status
quorum	OK
master	node02 (active, Tue May 22 13:13:10 2018)
lrm	node01 (idle, Tue May 22 13:13:14 2018)
lrm	node02 (idle, Tue May 22 13:13:14 2018)
lrm	node03 (active, Tue May 22 13:13:14 2018)

Resources

Add Edit Remove

ID	State	Node	Max. Restart	Max. Reloc...	Group
vm:101	started	node03	1	1	

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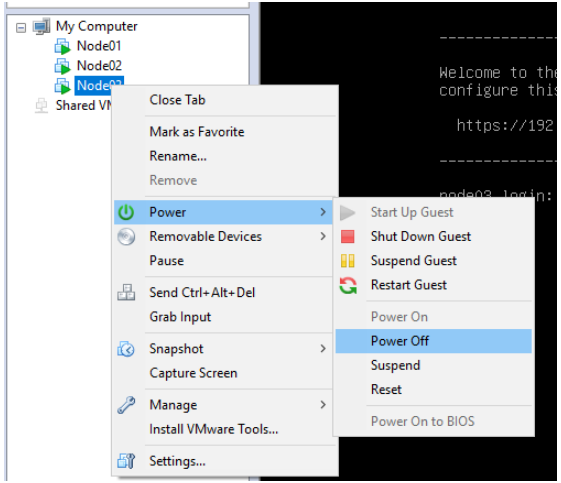
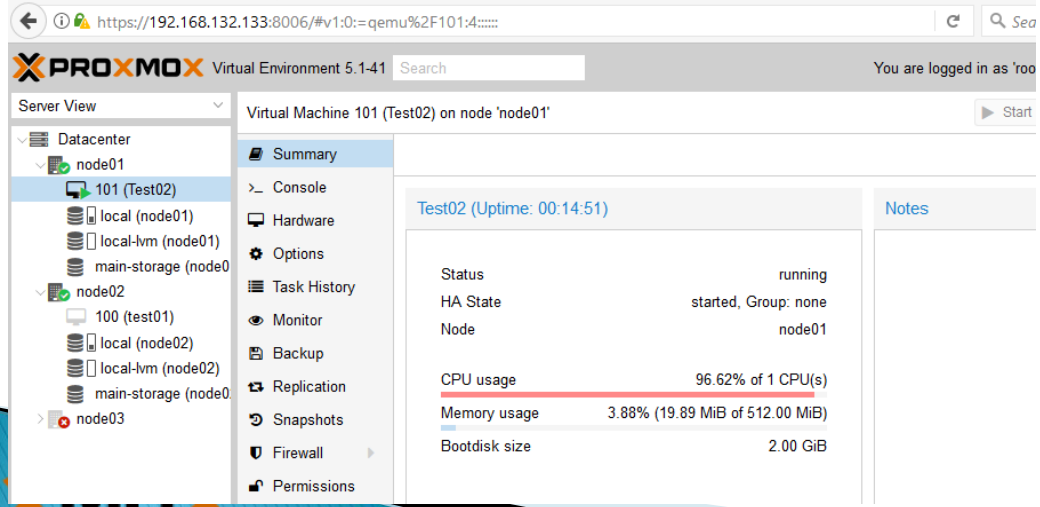
Test HA

- Power off the Host: node03
- VM 101 must transfer to Another host





Ceph Health

https://192.168.132.133:8006/#v1:0:=node%2Fnode01:4:38:::::

PROXMOX Virtual Environment 5.1-41 | Search | You are logged in as 'root@pam' | Documentation | Create VM | Create CT | Logout

Server View

- Datacenter
  - node01
  - node02
  - node03

Node 'node01' | Restart | Shutdown | Shell | Bulk Actions | Help

- Search
- Summary
- Shell
- Shell (JS)
- System
  - Network
  - DNS
  - Time
  - Syslog
- Updates
- Firewall
- Disks
- Ceph
  - Configuration
  - Monitor
  - OSD
  - Pools

Health

Status

HEALTH_WARN

Severity	Summary
!	1/3 mons down, quorum node01,node02
!	2 osds down
!	1 host (2 osds) down
!	Degraded data redundancy: 5/15 objects degraded (33.333...
!	too few PGs per OSD (21 < min 30)

Status

Monitors

node01: ✔ node02: ✔ node03: ✖

OSDs

	In	Out
Up	4	0
Down	2	0

Total: 6

PGs

active+undersized:	60
active+undersized+degraded:	4

Performance

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Increase and Decrease Storage

- To add more disks:
  - Add new Disk
  - Create OSD for the new Disk

- To remove disks:
  - Stop the OSD for the required disk
  - Make the disk out

Discussion

- The disk is shared, but what about RAM?
- What if the VM has a local ISO for CD-ROM?

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Conclusion

- Now you must be able to:
  - Create Ceph shared storage
  - Make Online migrations
  - Enable High Availability for specific VMs

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