→ Convenciones:

```
# En todos los nodos como 'sudo su'.
[root@srv1 ~]# Solo en servidor 'srv1'→ como 'sudo su'.
[root@srv2 ~]# Solo en servidor 'srv2'→ como 'sudo su'.
```

363.2 Ceph Storage Clusters (weight: 8)

Weight	8
Description	Candidates should be able to manage and maintain a Ceph Cluster. This includes the configuration of RGW, RDB devices and CephFS.

Key Knowledge Areas:

- Understand the architecture and components of Ceph
- Manage OSD, MGR, MON and MDS
- Understand and manage placement groups and pools
- Understand storage backends (FileStore and BlueStore)
- Initialize a Ceph cluster
- Create and manage Rados Block Devices
- Create and manage CephFS volumes, including snapshots
- Mount and use an existing CephFS
- Understand and adjust CRUSH maps
- Configure high availability aspects of Ceph
- Scale up a Ceph cluster
- Restore and verify the integrity of a Ceph cluster after an outage
- Understand key concepts of Ceph updates, including update order, tunables and features

Partial list of the used files, terms and utilities:

- ceph-deploy (including relevant subcommands)
- ceph.conf
- ceph (including relevant subcommands)
- rados (including relevant subcommands)
- rbd (including relevant subcommands)
- cephfs (including relevant subcommands)
- ceph-volume (including relevant subcommands)
- ceph-authtool
- ceph-bluestore-tool
- crushtool

→ Conceptos Teóricos Preliminares

Red Hat Ceph Storage (RHCS) es una plataforma de almacenamiento escalable, abierta y definida por software que combina la versión más estable del sistema de almacenamiento Ceph con una plataforma de gestión Ceph, utilidades de implantación y servicios de soporte.

Red Hat Ceph Storage está diseñado para la infraestructura de nube y el almacenamiento de objetos a escala web. Los clústeres de Red Hat Ceph Storage constan de los siguientes tipos de nodos:

Nodo de administración de Red Hat Ceph Storage Ansible

Este tipo de nodo actúa como lo hacía el nodo tradicional de administración de Ceph en las versiones anteriores de Red Hat Ceph Storage. Este tipo de nodo proporciona las siguientes funciones:

→ Gestión centralizada del clúster de almacenamiento
→ Los archivos de configuración y las claves de Ceph
→ Opcionalmente, repositorios locales para instalar Ceph en nodos que no pueden acceder a Internet por razones de seguridad

Monitorear los nodos

Cada nodo monitor ejecuta el demonio monitor (`ceph-mon`), que mantiene una copia maestra del mapa del cluster. El mapa del cluster incluye la topología del cluster. Un cliente que se conecta al clúster Ceph recupera la copia actual del mapa del clúster desde el monitor, lo que permite al cliente leer y escribir datos en el clúster.

Importante

Ceph puede funcionar con un solo monitor; sin embargo, para asegurar una alta disponibilidad en un cluster de producción, Red Hat sólo soportará implementaciones con al menos tres nodos de monitorización. Red Hat recomienda desplegar un total de 5 monitores Ceph para clusters de almacenamiento que superen los 750 OSD.

Nodos OSD

Cada nodo de Dispositivo de Almacenamiento de Objetos (OSD) ejecuta el demonio Ceph OSD (`ceph-osd`), que interactúa con los discos lógicos conectados al nodo. Ceph almacena los datos en estos nodos OSD.

Ceph puede funcionar con muy pocos nodos OSD, que por defecto son tres, pero los clusters de producción obtienen un mejor rendimiento a partir de escalas modestas, por ejemplo 50 OSD en un cluster de almacenamiento. Lo ideal es que un clúster Ceph tenga varios nodos OSD, lo que permite crear dominios de fallo aislados mediante la creación del mapa CRUSH.

Nodos MDS

Cada nodo del Servidor de Metadatos (MDS) ejecuta el demonio MDS (`ceph-mds`), que gestiona los metadatos relacionados con los archivos almacenados en el Sistema de Archivos Ceph (CephFS). El demonio MDS también coordina el acceso al clúster compartido.

Nodo de la pasarela de objetos

El nodo Ceph Object Gateway ejecuta el demonio Ceph RADOS Gateway (`ceph-radosgw`), y es una interfaz de almacenamiento de objetos construida sobre `librados` para proporcionar a las aplicaciones una puerta de enlace RESTful a los clusters de almacenamiento Ceph. El Ceph Object Gateway soporta dos interfaces:

S3

Proporciona la funcionalidad de almacenamiento de objetos con una interfaz que es compatible con un gran subconjunto de la API RESTful de Amazon S3.

Swift

Proporciona funcionalidad de almacenamiento de objetos con una interfaz que es compatible con un gran subconjunto de la API de OpenStack Swift.

→ Configuración → ceph-deploy ==> Para CentOS 7 → nautilius

ceph-nodo1 ~ # python -V
Python 3.9.2
ceph-nodo1 ~ # pip-3.9 install ceph-deploy

```
   -^-
  /   \
  |O o|  ceph-deploy v2.0.1
  ).-.(
 '/|||\`
 | '|` |
   '|`
```

→ Topología

 # vim /etc/hosts

```
# Cluster ceph.
192.168.10.160  ceph-mon.cadilinea.lan        ceph-mon

192.168.10.161  ceph-osd1.cadilinea.lan       ceph-osd1
192.168.10.162  ceph-osd2.cadilinea.lan       ceph-osd2
192.168.10.163  ceph-osd3.cadilinea.lan       ceph-osd3
```

→ Sincronización Horaria → chronyd.service

→ Permisos sudo y ssh

 # vim /etc/sudoers.d/ceph

```
ceph ALL=(root) NOPASSWD:ALL
```

```
# id ceph
uid=167(ceph) gid=167(ceph) grupos=167(ceph)

ceph-mon ~ # ssh-keygen
ceph-mon ~ # ssh-copy-id ceph-osd1
ceph-mon ~ # ssh-copy-id ceph-osd2
ceph-mon ~ # ssh-copy-id ceph-osd3
ceph-mon ~ # ssh-copy-id ceph-mon

ceph-mon ~ # vim ~/.ssh/config

Host ceph-mon
   Hostname ceph-mon.cadilinea.lan
   User root
Host ceph-osd1
   Hostname ceph-osd1.cadilinea.lan
   User root
Host ceph-osd2
   Hostname ceph-osd2.cadilinea.lan
   User root
Host ceph-osd3
   Hostname ceph-osd3.cadilinea.lan
   User root

ceph-mon ~ # chmod 0600 ~/.ssh/config
```

→ Instalación del software

```
# yum install epel-release
# rpm --import 'https://download.ceph.com/keys/release.asc'

# vim /etc/yum.repos.d/ceph.repo

[ceph]
name=Ceph packages for $basearch
baseurl=https://download.ceph.com/rpm-nautilus/el7/$basearch
enabled=1
priority=2
gpgcheck=1
gpgkey=https://download.ceph.com/keys/release.asc

[ceph-noarch]
name=Ceph noarch packages
baseurl=https://download.ceph.com/rpm-nautilus/el7//noarch
enabled=1
priority=2
gpgcheck=1
```

gpgkey=https://download.ceph.com/keys/release.asc

[ceph-source]
name=Ceph source packages
baseurl=https://download.ceph.com/rpm-nautilus/el7/SRPMS
enabled=0
priority=2
gpgcheck=1
gpgkey=https://download.ceph.com/keys/release.asc

 # yum update
 # yum install ceph ceph-deploy

→ → Despliegue ceph → nautilus

→ Construimos el cluster

ceph-mon ~ # mkdir /etc/ceph
ceph-mon ~ # cd /etc/ceph

ceph-mon ceph # ls /etc/ceph/
rbdmap

ceph-mon ceph # cat /etc/ceph/rbdmap
RbdDevice Parameters
#poolname/imagename id=client,keyring=/etc/ceph/ceph.client.keyring

**** Toda la configuración del despliegue se albergará en este directorio → /etc/ceph ****

ceph-mon ceph # ceph-deploy
usage: ceph-deploy [-h] [-v | -q] [--version] [--username USERNAME]
[--overwrite-conf] [--ceph-conf CEPH_CONF]
COMMAND ...

Easy Ceph deployment

```
  -^-
 /   \
 |O o|  ceph-deploy v2.0.1
 ).-.(
'/|||\`
| '|` |
  '|`
```

Full documentation can be found at: http://ceph.com/ceph-deploy/docs

optional arguments:

```
  -h, --help          show this help message and exit
  -v, --verbose       be more verbose
  -q, --quiet         be less verbose
  --version           the current installed version of ceph-deploy
  --username USERNAME   the username to connect to the remote host
  --overwrite-conf      overwrite an existing conf file on remote host (if
                        present)
  --ceph-conf CEPH_CONF
                        use (or reuse) a given ceph.conf file

commands:
  COMMAND             description
    new               Start deploying a new cluster, and write a
                      CLUSTER.conf and keyring for it.
    install           Install Ceph packages on remote hosts.
    rgw               Ceph RGW daemon management
    mgr               Ceph MGR daemon management
    mds               Ceph MDS daemon management
    mon               Ceph MON Daemon management
    gatherkeys        Gather authentication keys for provisioning new nodes.
    disk              Manage disks on a remote host.
    osd               Prepare a data disk on remote host.
    repo              Repo definition management
    admin             Push configuration and client.admin key to a remote
                      host.
    config            Copy ceph.conf to/from remote host(s)
    uninstall         Remove Ceph packages from remote hosts.
    purgedata         Purge (delete, destroy, discard, shred) any Ceph data
                      from /var/lib/ceph
    purge             Remove Ceph packages from remote hosts and purge all
                      data.
    forgetkeys        Remove authentication keys from the local directory.
    pkg               Manage packages on remote hosts.
    calamari          Install and configure Calamari nodes. Assumes that a
                      repository with Calamari packages is already
                      configured. Refer to the docs for examples
                      (http://ceph.com/ceph-deploy/docs/conf.html)
```

ceph-mon ceph-cluster # ceph --version
ceph version 14.2.21 (5ef401921d7a88aea18ec7558f7f9374ebd8f5a6) **nautilus (stable)**

→ Desplegamos el monitoring → ceph-mon

ceph-mon ceph # ceph-deploy new ceph-mon --public-network 192.168.10.0/24

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy new ceph-mon --public-network
```

```
192.168.10.0/24
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  func                          : <function new at 0x7fdc192aa2a8>
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  overwrite_conf                : False
[ceph_deploy.cli][INFO  ]  quiet                         : False
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at
0x7fdc18c285a8>
[ceph_deploy.cli][INFO  ]  cluster                       : ceph
[ceph_deploy.cli][INFO  ]  ssh_copykey                   : True
[ceph_deploy.cli][INFO  ]  mon                           : ['ceph-mon']
[ceph_deploy.cli][INFO  ]  public_network                : 192.168.10.0/24
[ceph_deploy.cli][INFO  ]  ceph_conf                     : None
[ceph_deploy.cli][INFO  ]  cluster_network               : None
[ceph_deploy.cli][INFO  ]  default_release               : False
[ceph_deploy.cli][INFO  ]  fsid                          : None
[ceph_deploy.new][DEBUG ] Creating new cluster named ceph
[ceph_deploy.new][INFO  ] making sure passwordless SSH succeeds
[ceph-mon][DEBUG ] connected to host: ceph-mon
[ceph-mon][DEBUG ] detect platform information from remote host
[ceph-mon][DEBUG ] detect machine type
[ceph-mon][DEBUG ] find the location of an executable
[ceph-mon][INFO  ] Running command: /usr/sbin/ip link show
[ceph-mon][INFO  ] Running command: /usr/sbin/ip addr show
[ceph-mon][DEBUG ] IP addresses found: [u'192.168.10.160']
[ceph_deploy.new][DEBUG ] Resolving host ceph-mon
[ceph_deploy.new][DEBUG ] Monitor ceph-mon at 192.168.10.160
[ceph_deploy.new][DEBUG ] Monitor initial members are ['ceph-mon']
[ceph_deploy.new][DEBUG ] Monitor addrs are [u'192.168.10.160']
[ceph_deploy.new][DEBUG ] Creating a random mon key...
[ceph_deploy.new][DEBUG ] Writing monitor keyring to ceph.mon.keyring...
[ceph_deploy.new][DEBUG ] Writing initial config to ceph.conf...
```

ceph-mon ceph # ls

```
ceph.conf  ceph-deploy-ceph.log  ceph.mon.keyring  rbdmap
```

ceph-mon ceph # cat ceph.conf

```
[global]
fsid = 2137b4f3-ea3e-4721-bf88-98bfe6419420
public_network = 192.168.10.0/24
mon_initial_members = ceph-mon
mon_host = 192.168.10.160
auth_cluster_required = cephx
auth_service_required = cephx
auth_client_required = cephx
```

ceph-mon ceph # cat ceph.mon.keyring
[mon.]
key = AQDdxahgAAAAABAAQsciS4Dh56TkwtWG5JhIfw==
caps mon = allow *

ceph-mon ceph # cat ceph-deploy-ceph.log
[2021-05-22 10:50:36,901][ceph_deploy.conf][DEBUG] found configuration file at: /root/.cephdeploy.conf
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] Invoked (2.0.1): /usr/bin/ceph-deploy new ceph-mon --public-network 192.168.10.0/24
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] ceph-deploy options:
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] username : None
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] func : <function new at 0x7fdc192aa2a8>
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] verbose : False
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] overwrite_conf : False
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] quiet : False
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] cd_conf : <ceph_deploy.conf.cephdeploy.Conf instance at 0x7fdc18c285a8>
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] cluster : ceph
[2021-05-22 10:50:36,902][ceph_deploy.cli][INFO] ssh_copykey : True
[2021-05-22 10:50:36,903][ceph_deploy.cli][INFO] mon : ['ceph-mon']
[2021-05-22 10:50:36,903][ceph_deploy.cli][INFO] public_network : 192.168.10.0/24
[2021-05-22 10:50:36,903][ceph_deploy.cli][INFO] ceph_conf : None
[2021-05-22 10:50:36,903][ceph_deploy.cli][INFO] cluster_network : None
[2021-05-22 10:50:36,903][ceph_deploy.cli][INFO] default_release : False
[2021-05-22 10:50:36,903][ceph_deploy.cli][INFO] fsid : None
[2021-05-22 10:50:36,903][ceph_deploy.new][DEBUG] Creating new cluster named ceph
[2021-05-22 10:50:36,903][ceph_deploy.new][INFO] making sure passwordless SSH succeeds
[2021-05-22 10:50:36,967][ceph-mon][DEBUG] connected to host: ceph-mon
[2021-05-22 10:50:36,978][ceph-mon][DEBUG] detect platform information from remote host
[2021-05-22 10:50:36,996][ceph-mon][DEBUG] detect machine type
[2021-05-22 10:50:37,000][ceph-mon][DEBUG] find the location of an executable
[2021-05-22 10:50:37,001][ceph-mon][INFO] Running command: /usr/sbin/ip link show
[2021-05-22 10:50:37,026][ceph-mon][INFO] Running command: /usr/sbin/ip addr show
[2021-05-22 10:50:37,031][ceph-mon][DEBUG] IP addresses found: [u'192.168.10.160']
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Resolving host ceph-mon
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Monitor ceph-mon at 192.168.10.160
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Monitor initial members are ['ceph-mon']
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Monitor addrs are [u'192.168.10.160']
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Creating a random mon key...
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Writing monitor keyring to ceph.mon.keyring...
[2021-05-22 10:50:37,031][ceph_deploy.new][DEBUG] Writing initial config to ceph.conf...

→ Instalar paquetería de despliegue en el cluster → ceph → Todos los nodos !.

```
ceph-mon ceph # ceph-deploy install ceph-mon ceph-osd1 ceph-osd2 ceph-osd3
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy install ceph-mon ceph-osd1 ceph-osd2 ceph-osd3
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  testing                       : None
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at 0x7f19c348c7e8>
[ceph_deploy.cli][INFO  ]  cluster                       : ceph
[ceph_deploy.cli][INFO  ]  dev_commit                    : None
[ceph_deploy.cli][INFO  ]  install_mds                   : False
[ceph_deploy.cli][INFO  ]  stable                        : None
[ceph_deploy.cli][INFO  ]  default_release               : False
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  adjust_repos                  : True
[ceph_deploy.cli][INFO  ]  func                          : <function install at 0x7f19c4369a28>
[ceph_deploy.cli][INFO  ]  install_mgr                   : False
[ceph_deploy.cli][INFO  ]  install_all                   : False
[ceph_deploy.cli][INFO  ]  repo                          : False
[ceph_deploy.cli][INFO  ]  host                          : ['ceph-mon', 'ceph-osd1', 'ceph-osd2', 'ceph-osd3']
…
[ceph-osd3][DEBUG ] Running transaction test
[ceph-osd3][DEBUG ] Transaction test succeeded
[ceph-osd3][DEBUG ] Running transaction
[ceph-osd3][DEBUG ]   Instalando    : mailcap-2.1.41-2.el7.noarch                1/2
[ceph-osd3][DEBUG ]   Instalando    : 2:ceph-radosgw-14.2.21-0.el7.x86_64        2/2
[ceph-osd3][DEBUG ]   Comprobando   : mailcap-2.1.41-2.el7.noarch                1/2
[ceph-osd3][DEBUG ]   Comprobando   : 2:ceph-radosgw-14.2.21-0.el7.x86_64        2/2
[ceph-osd3][DEBUG ]
[ceph-osd3][DEBUG ] Instalado:
[ceph-osd3][DEBUG ]   ceph-radosgw.x86_64 2:14.2.21-0.el7
[ceph-osd3][DEBUG ]
[ceph-osd3][DEBUG ] Dependencia(s) instalada(s):
[ceph-osd3][DEBUG ]   mailcap.noarch 0:2.1.41-2.el7
[ceph-osd3][DEBUG ]
[ceph-osd3][DEBUG ] ¡Listo!
[ceph-osd3][INFO  ] Running command: ceph --version
[ceph-osd3][DEBUG ] ceph version 14.2.21 (5ef401921d7a88aea18ec7558f7f9374ebd8f5a6) nautilus (stable)
```

→ Desplegar monitorización inicial y gatherkeys

```
ceph-mon ceph # ceph-deploy mon create-initial
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
```

```
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy mon create-initial
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  overwrite_conf                : False
[ceph_deploy.cli][INFO  ]  subcommand                    : create-initial
[ceph_deploy.cli][INFO  ]  quiet                         : False
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at
0x7fa102a6b200>
[ceph_deploy.cli][INFO  ]  cluster                       : ceph
[ceph_deploy.cli][INFO  ]  func                          : <function mon at 0x7fa102cc5848>
[ceph_deploy.cli][INFO  ]  ceph_conf                     : None
[ceph_deploy.cli][INFO  ]  default_release               : False
[ceph_deploy.cli][INFO  ]  keyrings                      : None
[ceph_deploy.mon][DEBUG ] Deploying mon, cluster ceph hosts ceph-mon
[ceph_deploy.mon][DEBUG ] detecting platform for host ceph-mon ...
…
[ceph_deploy.gatherkeys][INFO  ] Storing ceph.client.admin.keyring
[ceph_deploy.gatherkeys][INFO  ] Storing ceph.bootstrap-mds.keyring
[ceph_deploy.gatherkeys][INFO  ] Storing ceph.bootstrap-mgr.keyring
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.mon.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] Storing ceph.bootstrap-osd.keyring
[ceph_deploy.gatherkeys][INFO  ] Storing ceph.bootstrap-rgw.keyring
[ceph_deploy.gatherkeys][INFO  ] Destroy temp directory /tmp/tmp3SexnG
```

```
ceph-mon ceph # ls
ceph.bootstrap-mds.keyring  ceph.bootstrap-osd.keyring  ceph.client.admin.keyring  ceph-deploy-
ceph.log  rbdmap
ceph.bootstrap-mgr.keyring  ceph.bootstrap-rgw.keyring  ceph.conf                  ceph.mon.keyring
```

```
ceph-mon ceph # cat ceph.bootstrap-mds.keyring
[client.bootstrap-mds]
        key = AQD/z6hgINp8GRAASAqDJHAQW9qSjgxOBKo2DA==
        caps mon = "allow profile bootstrap-mds"
```

```
ceph-mon ceph # cat ceph.bootstrap-osd.keyring
[client.bootstrap-osd]
        key = AQD/z6hgGfR8GRAAlfePyYlgvK/naPYsQED+KQ==
        caps mon = "allow profile bootstrap-osd"
```

```
ceph-mon ceph # cat ceph.client.admin.keyring
[client.admin]
        key = AQD/z6hgxsd8GRAAmq/f7TS6XtFq6lC8AC6DpA==
        caps mds = "allow *"
        caps mgr = "allow *"
        caps mon = "allow *"
        caps osd = "allow *"
```

ceph-mon ceph # cat ceph.bootstrap-mgr.keyring
```
[client.bootstrap-mgr]
        key = AQD/z6hgeed8GRAAjf7Va/G8YCXe0UH01Sw4pQ==
        caps mon = "allow profile bootstrap-mgr"
```

ceph-mon ceph # cat ceph.bootstrap-rgw.keyring
```
[client.bootstrap-rgw]
        key = AQD/z6hgdhx9GRAAdQpBq+R0zWsR5Z+Oaedsrw==
        caps mon = "allow profile bootstrap-rgw"
```

→ Desplegamos la configuración para admin y para administrar todos los nodos y de forma autónoma.

ceph-mon ceph # ceph-deploy admin ceph-mon ceph-osd1 ceph-osd2 ceph-osd3
```
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy admin ceph-mon ceph-osd1 ceph-
osd2 ceph-osd3
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  overwrite_conf                : False
[ceph_deploy.cli][INFO  ]  quiet                         : False
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at
0x7f292cd5f758>
[ceph_deploy.cli][INFO  ]  cluster                       : ceph
[ceph_deploy.cli][INFO  ]  client                        : ['ceph-mon', 'ceph-osd1', 'ceph-osd2', 'ceph-osd3']
[ceph_deploy.cli][INFO  ]  func                          : <function admin at 0x7f292d5f4668>
[ceph_deploy.cli][INFO  ]  ceph_conf                     : None
[ceph_deploy.cli][INFO  ]  default_release               : False
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to ceph-mon
[ceph-mon][DEBUG ] connected to host: ceph-mon
[ceph-mon][DEBUG ] detect platform information from remote host
[ceph-mon][DEBUG ] detect machine type
[ceph-mon][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to ceph-osd1
[ceph-osd1][DEBUG ] connected to host: ceph-osd1
[ceph-osd1][DEBUG ] detect platform information from remote host
[ceph-osd1][DEBUG ] detect machine type
[ceph-osd1][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to ceph-osd2
[ceph-osd2][DEBUG ] connected to host: ceph-osd2
[ceph-osd2][DEBUG ] detect platform information from remote host
[ceph-osd2][DEBUG ] detect machine type
[ceph-osd2][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to ceph-osd3
[ceph-osd3][DEBUG ] connected to host: ceph-osd3
```

```
[ceph-osd3][DEBUG ] detect platform information from remote host
[ceph-osd3][DEBUG ] detect machine type
[ceph-osd3][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
```

ceph-mon ceph # ssh ceph-osd3

ceph-osd3 ~ # tree /etc/ceph/

```
/etc/ceph/
├── ceph.client.admin.keyring
├── ceph.conf
├── rbdmap
└── tmpMWUJcy
```

ceph-osd3 ~ # cat /etc/ceph/ceph.client.admin.keyring

```
[client.admin]
        key = AQD/z6hgxsd8GRAAmq/f7TS6XtFq6lC8AC6DpA==
        caps mds = "allow *"
        caps mgr = "allow *"
        caps mon = "allow *"
        caps osd = "allow *"
```

ceph-osd3 ~ # cat /etc/ceph/ceph.conf

```
[global]
fsid = 2137b4f3-ea3e-4721-bf88-98bfe6419420
public_network = 192.168.10.0/24
mon_initial_members = ceph-mon
mon_host = 192.168.10.160
auth_cluster_required = cephx
auth_service_required = cephx
auth_client_required = cephx
```

ceph-osd3 ~ # cat /etc/ceph/rbdmap

```
# RbdDevice             Parameters
#poolname/imagename     id=client,keyring=/etc/ceph/ceph.client.keyring
```

ceph-osd3 ~ # cat /etc/ceph/tmpMWUJcy

→ Estado actual del cluster

ceph-mon ceph # ceph -s

```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_WARN
            mon is allowing insecure global_id reclaim

  services:
    mon: 1 daemons, quorum ceph-mon (age 35m)
```

```
    mgr: no daemons active
    osd: 0 osds: 0 up, 0 in

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   0 B used, 0 B / 0 B avail
    pgs:
```

```
ceph-mon ceph # ceph config set mon auth_allow_insecure_global_id_reclaim false
ceph-mon ~ # ceph config dump
WHO   MASK LEVEL    OPTION                            VALUE RO
  mon      advanced auth_allow_insecure_global_id_reclaim false
```

```
ceph-mon ceph # ceph -w
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 1 daemons, quorum ceph-mon (age 39m)
    mgr: no daemons active
    osd: 0 osds: 0 up, 0 in

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   0 B used, 0 B / 0 B avail
    pgs:

2021-05-22 12:13:43.386908 mon.ceph-mon [INF] Health check cleared:
AUTH_INSECURE_GLOBAL_ID_RECLAIM_ALLOWED (was: mon is allowing insecure
global_id reclaim)
2021-05-22 12:13:43.386933 mon.ceph-mon [INF] Cluster is now healthy
<CTRL-C>
```

→ Desplegamos los gatherkeys para aprovisionar los nodos.

```
ceph-mon ceph # ceph-deploy gatherkeys ceph-mon
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy gatherkeys ceph-mon
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  overwrite_conf                : False
[ceph_deploy.cli][INFO  ]  quiet                         : False
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at
```

```
0x7fcf8768bf80>
[ceph_deploy.cli][INFO  ]  cluster                : ceph
[ceph_deploy.cli][INFO  ]  mon                    : ['ceph-mon']
[ceph_deploy.cli][INFO  ]  func                   : <function gatherkeys at 0x7fcf878d2de8>
[ceph_deploy.cli][INFO  ]  ceph_conf              : None
[ceph_deploy.cli][INFO  ]  default_release         : False
[ceph_deploy.gatherkeys][INFO  ] Storing keys in temp directory /tmp/tmpwID6sj
[ceph-mon][DEBUG ] connected to host: ceph-mon
[ceph-mon][DEBUG ] detect platform information from remote host
[ceph-mon][DEBUG ] detect machine type
[ceph-mon][DEBUG ] get remote short hostname
[ceph-mon][DEBUG ] fetch remote file
[ceph-mon][INFO  ] Running command: /usr/bin/ceph --connect-timeout=25 --cluster=ceph --
admin-daemon=/var/run/ceph/ceph-mon.ceph-mon.asok mon_status
[ceph-mon][INFO  ] Running command: /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name
mon. --keyring=/var/lib/ceph/mon/ceph-ceph-mon/keyring auth get client.admin
[ceph-mon][INFO  ] Running command: /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name
mon. --keyring=/var/lib/ceph/mon/ceph-ceph-mon/keyring auth get client.bootstrap-mds
[ceph-mon][INFO  ] Running command: /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name
mon. --keyring=/var/lib/ceph/mon/ceph-ceph-mon/keyring auth get client.bootstrap-mgr
[ceph-mon][INFO  ] Running command: /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name
mon. --keyring=/var/lib/ceph/mon/ceph-ceph-mon/keyring auth get client.bootstrap-osd
[ceph-mon][INFO  ] Running command: /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name
mon. --keyring=/var/lib/ceph/mon/ceph-ceph-mon/keyring auth get client.bootstrap-rgw
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.client.admin.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.bootstrap-mds.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.bootstrap-mgr.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.mon.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.bootstrap-osd.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] keyring 'ceph.bootstrap-rgw.keyring' already exists
[ceph_deploy.gatherkeys][INFO  ] Destroy temp directory /tmp/tmpwID6sj
```

→ Despliegue/Creación de ceph-mgr daemon

```
ceph-mon ceph # ceph-deploy mgr create ceph-mon
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy mgr create ceph-mon
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                : None
[ceph_deploy.cli][INFO  ]  verbose                 : False
[ceph_deploy.cli][INFO  ]  mgr                     : [('ceph-mon', 'ceph-mon')]
[ceph_deploy.cli][INFO  ]  overwrite_conf          : False
[ceph_deploy.cli][INFO  ]  subcommand              : create
[ceph_deploy.cli][INFO  ]  quiet                   : False
[ceph_deploy.cli][INFO  ]  cd_conf                 : <ceph_deploy.conf.cephdeploy.Conf instance at
0x7fb606ab3a70>
[ceph_deploy.cli][INFO  ]  cluster                 : ceph
```

```
[ceph_deploy.cli][INFO  ]  func                       : <function mgr at 0x7fb607117578>
[ceph_deploy.cli][INFO  ]  ceph_conf                  : None
[ceph_deploy.cli][INFO  ]  default_release             : False
[ceph_deploy.mgr][DEBUG ] Deploying mgr, cluster ceph hosts ceph-mon:ceph-mon
[ceph-mon][DEBUG ] connected to host: ceph-mon
[ceph-mon][DEBUG ] detect platform information from remote host
[ceph-mon][DEBUG ] detect machine type
[ceph_deploy.mgr][INFO  ] Distro info: CentOS Linux 7.9.2009 Core
[ceph_deploy.mgr][DEBUG ] remote host will use systemd
[ceph_deploy.mgr][DEBUG ] deploying mgr bootstrap to ceph-mon
[ceph-mon][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph-mon][WARNIN] mgr keyring does not exist yet, creating one
[ceph-mon][DEBUG ] create a keyring file
[ceph-mon][DEBUG ] create path recursively if it doesn't exist
[ceph-mon][INFO  ] Running command: ceph --cluster ceph --name client.bootstrap-mgr --
keyring /var/lib/ceph/bootstrap-mgr/ceph.keyring auth get-or-create mgr.ceph-mon mon allow
profile mgr osd allow * mds allow * -o /var/lib/ceph/mgr/ceph-ceph-mon/keyring
[ceph-mon][INFO  ] Running command: systemctl enable ceph-mgr@ceph-mon
[ceph-mon][WARNIN] Created symlink from /etc/systemd/system/ceph-mgr.target.wants/ceph-
mgr@ceph-mon.service to /usr/lib/systemd/system/ceph-mgr@.service.
[ceph-mon][INFO  ] Running command: systemctl start ceph-mgr@ceph-mon
[ceph-mon][INFO  ] Running command: systemctl enable ceph.target
```

ceph-mon ceph # systemctl status ceph

```
ceph-crash.service        ceph-mgr@ceph-mon.service  ceph-mon@ceph-mon.service  ceph-
osd.target           ceph.target
ceph-mds.target           ceph-mgr.target           ceph-mon.target           ceph-radosgw.target
```

ceph-mon ceph # systemctl status ceph.target

```
● ceph.target - ceph target allowing to start/stop all ceph*@.service instances at once
   Loaded: loaded (/usr/lib/systemd/system/ceph.target; enabled; vendor preset: enabled)
   Active: active since sáb 2021-05-22 08:29:58 CEST; 4h 34min ago

may 22 08:29:58 ceph-mon.cadilinea.lan systemd[1]: Reached target ceph target allowing to
start/stop all ceph*@.service instanc... once.
Hint: Some lines were ellipsized, use -l to show in full.
```

ceph-mon ceph # ceph -s

```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_WARN
            OSD count 0 < osd_pool_default_size 3

  services:
    mon: 1 daemons, quorum ceph-mon (age 95m)
    mgr: ceph-mon(active, since 8m)
    osd: 0 osds: 0 up, 0 in
```

```
  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   0 B used, 0 B / 0 B avail
    pgs:
```

→ Habilitamos Firewall → ceph

```
ceph-mon ceph # firewall-cmd --permanent --add-service={ceph,ceph-mon}
ceph-mon ceph # firewall-cmd --reload
```

→ Preparamos discos en los hosts remotos ceph-osd1 ceph-osd2 ceph-osd3

```
# lsblk /dev/vd[b-z]
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
vdb  252:16   0  20G  0 disk
vdc  252:32   0  20G  0 disk
vdd  252:48   0  20G  0 disk
```

→ Creación de servidores ceph-osd

```
ceph-mon ceph # ceph-deploy osd create ceph-osd1 --data /dev/vdb
ceph-mon ceph # ceph-deploy osd create ceph-osd2 --data /dev/vdb
ceph-mon ceph # ceph-deploy osd create ceph-osd3 --data /dev/vdb
```

→ Ejemplo:

```
ceph-mon ceph # ceph-deploy osd create ceph-osd3 --data /dev/vdb
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy osd create ceph-osd3 --data
/dev/vdb
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  verbose                    : False
[ceph_deploy.cli][INFO  ]  bluestore                  : None
[ceph_deploy.cli][INFO  ]  cd_conf                    : <ceph_deploy.conf.cephdeploy.Conf instance at
0x7f7645854758>
[ceph_deploy.cli][INFO  ]  cluster                   : ceph
[ceph_deploy.cli][INFO  ]  fs_type                    : xfs
…

[ceph-osd3][WARNIN] --> ceph-volume lvm prepare successful for: /dev/vdb
[ceph-osd3][WARNIN] Running command: /bin/chown -R ceph:ceph /var/lib/ceph/osd/ceph-2
[ceph-osd3][WARNIN] Running command: /bin/ceph-bluestore-tool --cluster=ceph prime-osd-dir
--dev /dev/ceph-4cc2b8e2-bbdf-45ec-9f84-613a9d26616b/osd-block-9d3f2eca-2f78-491f-ac3e-
640f03d264ce --path /var/lib/ceph/osd/ceph-2 --no-mon-config
[ceph-osd3][WARNIN] Running command: /bin/ln -snf /dev/ceph-4cc2b8e2-bbdf-45ec-9f84-
613a9d26616b/osd-block-9d3f2eca-2f78-491f-ac3e-640f03d264ce /var/lib/ceph/osd/ceph-2/block
[ceph-osd3][WARNIN] Running command: /bin/chown -h ceph:ceph
```

```
/var/lib/ceph/osd/ceph-2/block
[ceph-osd3][WARNIN] Running command: /bin/chown -R ceph:ceph /dev/dm-6
[ceph-osd3][WARNIN] Running command: /bin/chown -R ceph:ceph /var/lib/ceph/osd/ceph-2
[ceph-osd3][WARNIN] Running command: /bin/systemctl enable ceph-volume@lvm-2-9d3f2eca-
2f78-491f-ac3e-640f03d264ce
[ceph-osd3][WARNIN]  stderr: Created symlink from
/etc/systemd/system/multi-user.target.wants/ceph-volume@lvm-2-9d3f2eca-2f78-491f-ac3e-
640f03d264ce.service to /usr/lib/systemd/system/ceph-volume@.service.
[ceph-osd3][WARNIN] Running command: /bin/systemctl enable --runtime ceph-osd@2
[ceph-osd3][WARNIN]  stderr: Created symlink from
/run/systemd/system/ceph-osd.target.wants/ceph-osd@2.service to /usr/lib/systemd/system/ceph-
osd@.service.
[ceph-osd3][WARNIN] Running command: /bin/systemctl start ceph-osd@2
[ceph-osd3][WARNIN] --> ceph-volume lvm activate successful for osd ID: 2
[ceph-osd3][WARNIN] --> ceph-volume lvm create successful for: /dev/vdb
[ceph-osd3][INFO  ] checking OSD status...
[ceph-osd3][DEBUG ] find the location of an executable
[ceph-osd3][INFO  ] Running command: /bin/ceph --cluster=ceph osd stat --format=json
[ceph_deploy.osd][DEBUG ] Host ceph-osd3 is now ready for osd use.
```

```
ceph-mon ceph # ceph -s
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_WARN
            2 osds down
            2 hosts (2 osds) down

  services:
    mon: 1 daemons, quorum ceph-mon (age 19m)
    mgr: ceph-mon(active, since 18m)
    osd: 3 osds: 1 up (since 56s), 3 in (since 2m)

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:
```

```
ceph-mon ceph # ssh ceph-osd1 lsblk /dev/vdb
NAME                                                                    MAJ:MIN RM SIZE RO
TYPE MOUNTPOINT
vdb                                                                     252:16   0  20G  0 disk
└─ceph--4744afc0--6372--44b5--a74e--7bd0d30d5ad7-osd--block--8acc47ed--3737--4f21--8f80--
922a176b9c28 253:6    0  20G  0 lvm
```

```
ceph-mon ceph # ceph osd tree
ID CLASS WEIGHT  TYPE NAME         STATUS REWEIGHT PRI-AFF
```

```
-1       0.05846 root default
-3       0.01949     host ceph-osd1
 0   hdd 0.01949         osd.0       down  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1       down  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2         up  1.00000 1.00000
```

ceph-mon ceph # ceph-deploy disk list ceph-osd1

```
…
[ceph-osd1][INFO  ] Disk /dev/mapper/ceph--4744afc0--6372--44b5--a74e--7bd0d30d5ad7-osd--block--8acc47ed--3737--4f21--8f80--922a176b9c28: 21.5 GB, 21470642176 bytes, 41934848 sectors
```

ceph-mon ceph # ceph -s

```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 1 daemons, quorum ceph-mon (age 8m)
    mgr: ceph-mon(active, since 7m)
    osd: 3 osds: 3 up (since 17s), 3 in (since 11m)

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:
```

→ Creación de servidores de metadatos ceph-mds

ceph-mon ceph # ceph-deploy mds create ceph-osd1 ceph-osd2 ceph-osd3

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy mds create ceph-osd1 ceph-osd2 ceph-osd3
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  overwrite_conf                : False
[ceph_deploy.cli][INFO  ]  subcommand                    : create
[ceph_deploy.cli][INFO  ]  quiet                         : False
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at 0x7f963bcd8638>
[ceph_deploy.cli][INFO  ]  cluster                       : ceph
[ceph_deploy.cli][INFO  ]  func                          : <function mds at 0x7f963bf2b398>
```

```
[ceph_deploy.cli][INFO  ]  ceph_conf                  : None
[ceph_deploy.cli][INFO  ]  mds                        : [('ceph-osd1', 'ceph-osd1'), ('ceph-osd2', 'ceph-osd2'), ('ceph-osd3', 'ceph-osd3')]
…
[ceph-osd3][WARNIN] mds keyring does not exist yet, creating one
[ceph-osd3][DEBUG ] create a keyring file
[ceph-osd3][DEBUG ] create path if it doesn't exist
[ceph-osd3][INFO  ] Running command: ceph --cluster ceph --name client.bootstrap-mds --keyring /var/lib/ceph/bootstrap-mds/ceph.keyring auth get-or-create mds.ceph-osd3 osd allow rwx mds allow mon allow profile mds -o /var/lib/ceph/mds/ceph-ceph-osd3/keyring
[ceph-osd3][INFO  ] Running command: systemctl enable ceph-mds@ceph-osd3
[ceph-osd3][WARNIN] Created symlink from /etc/systemd/system/ceph-mds.target.wants/ceph-mds@ceph-osd3.service to /usr/lib/systemd/system/ceph-mds@.service.
[ceph-osd3][INFO  ] Running command: systemctl start ceph-mds@ceph-osd3
[ceph-osd3][INFO  ] Running command: systemctl enable ceph.target
```

→ Monitorización de todos los nodos → ceph-osd1 ceph-osd2 ceph-osd3

ceph-mon ceph # ceph-deploy mon create ceph-osd1 ceph-osd2 ceph-osd3

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy mon create ceph-osd1 ceph-osd2 ceph-osd3
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                    : None
[ceph_deploy.cli][INFO  ]  verbose                     : False
[ceph_deploy.cli][INFO  ]  overwrite_conf              : False
[ceph_deploy.cli][INFO  ]  subcommand                  : create
[ceph_deploy.cli][INFO  ]  quiet                       : False
[ceph_deploy.cli][INFO  ]  cd_conf                     : <ceph_deploy.conf.cephdeploy.Conf instance at 0x7fe73c6a8200>
[ceph_deploy.cli][INFO  ]  cluster                     : ceph
[ceph_deploy.cli][INFO  ]  mon                         : ['ceph-osd1', 'ceph-osd2', 'ceph-osd3']
[ceph_deploy.cli][INFO  ]  func                        : <function mon at 0x7fe73c902848>
[ceph_deploy.cli][INFO  ]  ceph_conf                   : None
[ceph_deploy.cli][INFO  ]  default_release             : False
[ceph_deploy.cli][INFO  ]  keyrings                    : None
[ceph_deploy.mon][DEBUG ] Deploying mon, cluster ceph hosts ceph-osd1 ceph-osd2 ceph-osd3
[ceph_deploy.mon][DEBUG ] detecting platform for host ceph-osd1 ...
…
[ceph-osd3][DEBUG ] }
[ceph-osd3][DEBUG ]
********************************************************************************
[ceph-osd3][INFO  ] monitor: mon.ceph-osd3 is currently at the state of synchronizing
[ceph-osd3][INFO  ] Running command: ceph --cluster=ceph --admin-daemon /var/run/ceph/ceph-mon.ceph-osd3.asok mon_status
[ceph-osd3][WARNIN] ceph-osd3 is not defined in `mon initial members`
```

[ceph-osd3][WARNIN] monitor ceph-osd3 does not exist in monmap

 # firewall-cmd --permanent --add-service={ceph,ceph-mon}
 # firewall-cmd --reload

ceph-mon ceph # ceph -s
```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 3m)
    mgr: ceph-mon(active, since 3m)
    mds:  3 up:standby
    osd: 3 osds: 3 up (since 3m), 3 in (since 57m)

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:
```

→ Desplegamos ceph-mgr para todos los nodos → ceph-osd1 ceph-osd2 ceph-osd3

ceph-mon ceph # ceph-deploy mgr create ceph-osd1 ceph-osd2 ceph-osd3

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /root/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /usr/bin/ceph-deploy mgr create ceph-osd1 ceph-osd2
ceph-osd3
[ceph_deploy.cli][INFO  ] ceph-deploy options:
[ceph_deploy.cli][INFO  ]  username                      : None
[ceph_deploy.cli][INFO  ]  verbose                       : False
[ceph_deploy.cli][INFO  ]  mgr                           : [('ceph-osd1', 'ceph-osd1'), ('ceph-osd2', 'ceph-
osd2'), ('ceph-osd3', 'ceph-osd3')]
[ceph_deploy.cli][INFO  ]  overwrite_conf                : False
[ceph_deploy.cli][INFO  ]  subcommand                    : create
[ceph_deploy.cli][INFO  ]  quiet                         : False
[ceph_deploy.cli][INFO  ]  cd_conf                       : <ceph_deploy.conf.cephdeploy.Conf instance at
0x7fa971639a70>
[ceph_deploy.cli][INFO  ]  cluster                       : ceph
…

[ceph-osd3][INFO  ] Running command: ceph --cluster ceph --name client.bootstrap-mgr --
keyring /var/lib/ceph/bootstrap-mgr/ceph.keyring auth get-or-create mgr.ceph-osd3 mon allow
profile mgr osd allow * mds allow * -o /var/lib/ceph/mgr/ceph-ceph-osd3/keyring
[ceph-osd3][INFO  ] Running command: systemctl enable ceph-mgr@ceph-osd3
[ceph-osd3][WARNIN] Created symlink from /etc/systemd/system/ceph-mgr.target.wants/ceph-
```

mgr@ceph-osd3.service to /usr/lib/systemd/system/ceph-mgr@.service.
[ceph-osd3][INFO] Running command: systemctl start ceph-mgr@ceph-osd3
[ceph-osd3][INFO] Running command: systemctl enable ceph.target

ceph-mon ceph # ceph -s
```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 18m)
    mgr: ceph-mon(active, since 17m), standbys: ceph-osd1, ceph-osd2, ceph-osd3
    mds:  3 up:standby
    osd: 3 osds: 3 up (since 17m), 3 in (since 72m)

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:
```

→ Definimos un pool de datos → pool-test

ceph-mon ceph # ceph osd pool create pool-test 10
pool 'pool-Replicated' created

→ Permitimos el borrado de pool's

ceph-mon ~ # ceph tell mon.* injectargs '--mon-allow-pool-delete=true'
injectargs:mon_allow_pool_delete = 'true'
mon.ceph-mon: injectargs:mon_allow_pool_delete = 'true'
mon.ceph-osd1: injectargs:mon_allow_pool_delete = 'true'
mon.ceph-osd2: injectargs:mon_allow_pool_delete = 'true'
mon.ceph-osd3: injectargs:mon_allow_pool_delete = 'true'

→ También
ceph-mon ceph # vim /etc/ceph/ceph.conf
…
mon_allow_pool_delete = true
ceph-mon ceph # systemctl restart ceph.target

→ Borramos como comprobación y creamos de nuevo.

ceph-mon ceph # ceph osd pool rm pool-test pool-test --yes-i-really-really-mean-it
pool 'pool-test' removed
ceph-mon ceph # ceph osd pool create pool-test 10 10
pool 'pool-test' created

```
ceph-mon ceph # ceph osd tree
ID CLASS WEIGHT  TYPE NAME          STATUS REWEIGHT PRI-AFF
-1       0.05846 root default
-3       0.01949     host ceph-osd1
 0   hdd 0.01949         osd.0          up  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1          up  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2          up  1.00000 1.00000

ceph-mon ceph # ceph osd df
ID CLASS WEIGHT  REWEIGHT SIZE   RAW USE DATA    OMAP   META     AVAIL  %USE
VAR  PGS STATUS
 0   hdd 0.01949  1.00000 20 GiB 1.0 GiB 6.5 MiB 20 KiB 1024 MiB 19 GiB 5.03 1.00   0     up
 1   hdd 0.01949  1.00000 20 GiB 1.0 GiB 6.5 MiB 20 KiB 1024 MiB 19 GiB 5.03 1.00   0     up
 2   hdd 0.01949  1.00000 20 GiB 1.0 GiB 6.5 MiB 20 KiB 1024 MiB 19 GiB 5.03 1.00   0     up
                    TOTAL 60 GiB 3.0 GiB  20 MiB 60 KiB  3.0 GiB 57 GiB 5.03
MIN/MAX VAR: 1.00/1.00  STDDEV: 0

ceph-mon ceph # ceph osd metadata
…
   {
       "id": 2,
       "arch": "x86_64",
       "back_addr": "[v2:192.168.10.163:6804/1180,v1:192.168.10.163:6805/1180]",
       "back_iface": "eth0",
       "bluefs": "1",
       "bluefs_single_shared_device": "1",
       "bluestore_bdev_access_mode": "blk",
       "bluestore_bdev_block_size": "4096",
       "bluestore_bdev_dev_node": "/dev/dm-5",
       "bluestore_bdev_driver": "KernelDevice",
       "bluestore_bdev_partition_path": "/dev/dm-5",
       "bluestore_bdev_rotational": "1",
       "bluestore_bdev_size": "21470642176",
       "bluestore_bdev_support_discard": "0",
       "bluestore_bdev_type": "hdd",
       "ceph_release": "nautilus",
       "ceph_version": "ceph version 14.2.21 (5ef401921d7a88aea18ec7558f7f9374ebd8f5a6)
nautilus (stable)",
       "ceph_version_short": "14.2.21",
       "cpu": "Intel Core Processor (Haswell, no TSX, IBRS)",
       "default_device_class": "hdd",
       "device_ids": "",
       "device_paths": "vdb=/dev/disk/by-path/pci-0000:05:00.0",
       "devices": "vdb",
```

```
        "distro": "centos",
        "distro_description": "CentOS Linux 7 (Core)",
        "distro_version": "7",
        "front_addr": "[v2:192.168.10.163:6802/1180,v1:192.168.10.163:6803/1180]",
        "front_iface": "eth0",
        "hb_back_addr": "[v2:192.168.10.163:6808/1180,v1:192.168.10.163:6809/1180]",
        "hb_front_addr": "[v2:192.168.10.163:6806/1180,v1:192.168.10.163:6807/1180]",
        "hostname": "ceph-osd3.cadilinea.lan",
        "journal_rotational": "1",
        "kernel_description": "#1 SMP Wed Apr 28 21:49:45 UTC 2021",
        "kernel_version": "3.10.0-1160.25.1.el7.x86_64",
        "mem_swap_kb": "2621436",
        "mem_total_kb": "2847936",
        "network_numa_unknown_ifaces": "eth0",
        "objectstore_numa_unknown_devices": "vdb",
        "os": "Linux",
        "osd_data": "/var/lib/ceph/osd/ceph-2",
        "osd_objectstore": "bluestore",
        "rotational": "1"
    }
]
```


→ Instalar y crear → ceph-radosgw

```
ceph-mon ceph # ceph-deploy install --rgw ceph-mon ceph-osd1 ceph-osd2 ceph-osd3
ceph-mon ceph # ceph-deploy rgw create ceph-mon ceph-osd1 ceph-osd2 ceph-osd3
…
[ceph-osd3][DEBUG ] connected to host: ceph-osd3
[ceph-osd3][DEBUG ] detect platform information from remote host
[ceph-osd3][DEBUG ] detect machine type
[ceph_deploy.rgw][INFO  ] Distro info: CentOS Linux 7.9.2009 Core
[ceph_deploy.rgw][DEBUG ] remote host will use systemd
[ceph_deploy.rgw][DEBUG ] deploying rgw bootstrap to ceph-osd3
[ceph-osd3][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph-osd3][WARNIN] rgw keyring does not exist yet, creating one
[ceph-osd3][DEBUG ] create a keyring file
[ceph-osd3][DEBUG ] create path recursively if it doesn't exist
[ceph-osd3][INFO  ] Running command: ceph --cluster ceph --name client.bootstrap-rgw --
keyring /var/lib/ceph/bootstrap-rgw/ceph.keyring auth get-or-create client.rgw.ceph-osd3 osd allow
rwx mon allow rw -o /var/lib/ceph/radosgw/ceph-rgw.ceph-osd3/keyring
[ceph-osd3][INFO  ] Running command: systemctl enable ceph-radosgw@rgw.ceph-osd3
[ceph-osd3][WARNIN] Created symlink from
/etc/systemd/system/ceph-radosgw.target.wants/ceph-radosgw@rgw.ceph-osd3.service to
/usr/lib/systemd/system/ceph-radosgw@.service.
[ceph-osd3][INFO  ] Running command: systemctl start ceph-radosgw@rgw.ceph-osd3
[ceph-osd3][INFO  ] Running command: systemctl enable ceph.target
[ceph_deploy.rgw][INFO  ] The Ceph Object Gateway (RGW) is now running on host ceph-osd3
```

and default port **7480**

```
ceph-mon ceph # ceph -s
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 39m)
    mgr: ceph-mon(active, since 39m), standbys: ceph-osd1, ceph-osd3, ceph-osd2
    mds:  3 up:standby
    osd: 3 osds: 3 up (since 39m), 3 in (since 8h)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:

  data:
    pools:   4 pools, 128 pgs
    objects: 189 objects, 2.3 KiB
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:     128 active+clean
```

```
# firewall-cmd --permanent --add-port=7480/tcp ; firewall-cmd --reload
```

→ Creamos un pool → replicated → pool-test

```
ceph-mon ceph # ceph osd pool rm pool-test pool-test --yes-i-really-really-mean-it
pool 'pool-test' removed

ceph-mon ceph # ceph osd pool create pool-test 10 10 replicated
pool 'pool-test' created

ceph-mon ceph # ceph osd pool stats pool-test
pool pool-test id 7
  nothing is going on

ceph-mon ceph # ceph -s
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_WARN
            1 pool(s) have non-power-of-two pg_num
            no active mgr

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd3 (age 0.854576s), out of quorum: ceph-
osd2
    mgr: no daemons active (since 6s)
```

```
    mds:  3 up:standby
    osd: 3 osds: 3 up (since 2h), 3 in (since 9h)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:

  data:
    pools:   5 pools, 138 pgs
    objects: 189 objects, 2.3 KiB
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:     138 active+clean
```

ceph-mon ceph # ceph config set mon.* mon_warn_on_pool_pg_num_not_power_of_two false

ceph-mon ceph # vim ceph.conf

```
…
mon_warn_on_pool_pg_num_not_power_of_two = false
osd pool default pg num = 1024
osd pool default pgp num = 1024
```

ceph-mon ceph # ceph -s

```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 4m)
    mgr: ceph-osd1(active, since 5m), standbys: ceph-mon, ceph-osd2, ceph-osd3
    mds:  3 up:standby
    osd: 3 osds: 3 up (since 4m), 3 in (since 9h)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:

  data:
    pools:   5 pools, 138 pgs
    objects: 189 objects, 2.3 KiB
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:     138 active+clean
```

→ Cargamos el módulo → rbd [todos los nodos]

 # modprobe rbd
 # lsmod | grep rbd

```
rbd                    83733  0
libceph               306750  1 rbd
```

 # touch /etc/modules-load.d/rbd

→ Habilitamos la aplicación del pool

ceph-mon ceph # ceph osd pool application enable pool-test rbd
enabled application 'rbd' on pool 'pool-test'

→ Asignación de Discos → disco-01

ceph-mon ceph # rbd create disco-01 --size 1 -p pool-test
ceph-mon ceph # rbd list -p pool-test
disco-01

ceph-mon ceph # rbd list --pool pool-test -l
NAME SIZE PARENT FMT PROT LOCK
disco-01 1 MiB 2

→ Mapeo del disco → disco-01

ceph-mon ceph # rbd map disco-01 -p pool-test
rbd: sysfs write failed
RBD image feature set mismatch. You can disable features unsupported by the kernel with "rbd feature disable pool-test/disco-01 object-map fast-diff deep-flatten".
In some cases useful info is found in syslog - try "dmesg | tail".
rbd: map failed: (6) No such device or address

ceph-mon ceph # dmesg | tail
[1740.108159] Key type dns_resolver registered
[1740.125663] Key type ceph registered
[1740.126294] libceph: loaded (mon/osd proto 15/24)
[1740.132144] rbd: loaded (major 251)
[1740.136877] libceph: mon0 192.168.10.160:6789 session established
[1740.137761] libceph: mon0 192.168.10.160:6789 socket closed (con state OPEN)
[1740.138645] libceph: mon0 192.168.10.160:6789 session lost, hunting for new mon
[1740.142242] libceph: mon1 192.168.10.161:6789 session established
[1740.143460] libceph: client234908 fsid 2137b4f3-ea3e-4721-bf88-98bfe6419420
[1740.230561] rbd: image disco-01: image uses unsupported features: 0x38

→ Deshabilitamos característica del núcleo no soportada

ceph-mon ceph # rbd feature disable pool-test/disco-01 object-map fast-diff deep-flatten

→ Mapeamos de nuevo el disco → disco-01

ceph-mon ceph # rbd map disco-01 -p pool-test
/dev/rbd0

ceph-mon ceph # ls /dev/rbd/pool-test/disco-01
/dev/rbd/pool-test/disco-01
ceph-mon ceph # ls /dev/rbd0
/dev/rbd0

→ Configuración actual → /etc/ceph/ceph.conf

ceph-mon ceph # cat /etc/ceph/ceph.conf
[global]
fsid = 2137b4f3-ea3e-4721-bf88-98bfe6419420
public_network = 192.168.10.0/24
mon_initial_members = ceph-mon
mon_host = 192.168.10.160
auth_cluster_required = cephx
auth_service_required = cephx
auth_client_required = cephx

mon_allow_pool_delete = true
mon_warn_on_pool_pg_num_not_power_of_two = false

osd pool default pg num = 1024
osd pool default pgp num = 1024

→ Creación de un Filesystem|ext4
(Elegimos un FS ext4 porque puede efectuarse una reducción posterior. No sería así si fuese un FS xfs).
ceph-mon ceph # mkfs.ext4 /dev/rbd0
mke2fs 1.42.9 (28-Dec-2013)

El sistema de ficheros es demasiado pequeño para un fichero de transacciones
Discarding device blocks: hecho
Etiqueta del sistema de ficheros=
OS type: Linux
Tamaño del bloque=1024 (bitácora=0)
Tamaño del fragmento=1024 (bitácora=0)
Stride=4096 blocks, Stripe width=4096 blocks
128 inodes, 1024 blocks
51 blocks (4.98%) reserved for the super user
Primer bloque de datos=1
Número máximo de bloques del sistema de ficheros=1048576
1 bloque de grupo
8192 bloques por grupo, 8192 fragmentos por grupo
128 nodos-i por grupo

Allocating group tables: hecho
Escribiendo las tablas de nodos-i: hecho
Escribiendo superbloques y la información contable del sistema de ficheros: hecho

```
ceph-mon ceph # mkdir /mnt/rbd-test
ceph-mon ceph # mount /dev/rbd0 /mnt/rbd-test/
ceph-mon ceph # df -hT /dev/rbd0
S.ficheros     Tipo Tamaño Usados  Disp Uso% Montado en
/dev/rbd0      ext4  1003K    21K  911K   3% /mnt/rbd-test

ceph-mon ceph # touch /mnt/rbd-test/Desde-ceph-mon.txt

ceph-mon ceph # rbd ls -l -p pool-test
NAME     SIZE  PARENT FMT PROT LOCK
disco-01 1 MiB          2      excl

→ Ampliación del FileSystem → ext4
** Debe hacerse con el Stma. Montado. **

ceph-mon ceph # rbd resize --image disco-01 --size 500M -p pool-test
Resizing image: 100% complete...done.

ceph-mon ceph # rbd ls -l -p pool-test
NAME     SIZE    PARENT FMT PROT LOCK
disco-01 500 MiB          2

ceph-mon ceph # ls /mnt/rbd-test/
Desde-ceph-mon.txt  lost+found

→ Reducción del FileSystem → ext4 (** No permitido para xfs|FileSystem **).
** Debe hacerse con el Stma. Montado **

ceph-mon ceph # rbd resize --image disco-01 --size 250M --allow-shrink -p pool-test
Resizing image: 100% complete...done.
ceph-mon ceph # rbd ls -l -p pool-test
NAME     SIZE    PARENT FMT PROT LOCK
disco-01 250 MiB          2

ceph-mon ceph #  ls /mnt/rbd-test/
Desde-ceph-mon.txt  lost+found

→ Renombrar imagen RBD → disco-01 ==> rbd_disco-01

ceph-mon ceph # rbd mv disco-01 rbd_disco-01 -p pool-test
ceph-mon ceph # rbd ls -l -p pool-test
NAME         SIZE    PARENT FMT PROT LOCK
rbd_disco-01 250 MiB          2
ceph-mon ceph # ls /mnt/rbd-test/
Desde-ceph-mon.txt  lost+found
```

→ Habilitar → dashboard → ceph-mon → 8443/tcp | grafana → 3000/tcp

```
ceph-mon ceph # firewall-cmd --permanent --add-port=8443/tcp
ceph-mon ceph # firewall-cmd --permanent --add-port=3000/tcp
ceph-mon ceph # firewall-cmd --reload

ceph-mon ceph # yum install ceph-mgr python-jwt python-routes

ceph-mon ceph # vim /etc/yum.repos.d/grafana.repo
[grafana]
name=grafana
baseurl=https://packages.grafana.com/oss/rpm
repo_gpgcheck=1
enabled=1
gpgcheck=1
gpgkey=https://packages.grafana.com/gpg.key
sslverify=1
sslcacert=/etc/pki/tls/certs/ca-bundle.crt

ceph-mon ceph # yum install grafana
ceph-mon ceph # yum install fontconfig freetype* urw-fonts

ceph-mon ceph # yum install https://download.ceph.com/rpm-nautilus/el7/noarch/ceph-grafana-dashboards-14.2.21-0.l7.noarch.rpm

ceph-mon ceph # yum install https://download.ceph.com/rpm-nautilus/el7/noarch/ceph-mgr-dashboard-14.2.21-0.el7.narch.rpm

ceph-mon ceph # systemctl enable --now grafana-server

ceph-mon ceph # ceph mgr module enable dashboard --force
ceph-mon ceph # ceph mgr module ls | less
…
    "enabled_modules": [
        "dashboard",
        "iostat",
        "restful"
    ],
…

ceph-mon ceph # ceph dashboard create-self-signed-cert
Self-signed certificate created

ceph-mon ceph # ceph mgr services
{
    "dashboard": "https://ceph-mon.cadilinea.lan:8443/"
}
```

→ Creamos usuario/password de acceso → administrator

ceph-mon ceph # vim /etc/ceph/secret.admin
123456

ceph-mon ceph # ceph dashboard ac-user-create carlos -i /etc/ceph/secret.admin administrator
{"username": "carlos", "lastUpdate": 1622491815, "name": null, "roles": ["administrator"], "password": "$2b$12$IyO7SEr8XZqHzLhJODjLf.U1WMVXhDPCL4of9UkWzHXz0PJYVCvVG", "email": null}

ceph-mon ceph # ceph dashboard ac-user-show
["carlos"]

→ Acceso Entorno Gráfico → https://ceph-mon.cadilinea.lan:8443/ → carlos:123456

Mostramos varias imágenes !.

→ Activación de Meta Datos → ceph-mds →ceph-osd1 ceph-osd2 ceph-osd3
==> Necesario para almacenar objetos → **cephfs**.

ceph-mon ~ # ceph -s
```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 28m)
    mgr: ceph-osd1(active, since 28m), standbys: ceph-mon, ceph-osd3, ceph-osd2
    mds:  3 up:standby
    osd: 3 osds: 3 up (since 27m), 3 in (since 14h)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:

  data:
    pools:   5 pools, 138 pgs
    objects: 226 objects, 1.0 MiB
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:     138 active+clean
```

ceph-mon ceph # ceph-deploy --overwrite-conf mds create ceph-osd1:ceph-mds1
```
 …
[ceph-osd1][INFO  ] Running command: systemctl enable ceph-mds@ceph-mds1
[ceph-osd1][INFO  ] Running command: systemctl start ceph-mds@ceph-mds1
```

```
[ceph-osd1][INFO  ] Running command: systemctl enable ceph.target

ceph-mon ceph # ceph-deploy --overwrite-conf mds create ceph-osd2:ceph-mds2
…
[ceph-osd2][INFO  ] Running command: systemctl enable ceph-mds@ceph-mds2
[ceph-osd2][INFO  ] Running command: systemctl start ceph-mds@ceph-mds2
[ceph-osd2][INFO  ] Running command: systemctl enable ceph.target

ceph-mon ceph # ceph-deploy --overwrite-conf mds create ceph-osd3:ceph-mds3
…
[ceph-osd3][INFO  ] Running command: systemctl enable ceph-mds@ceph-mds3
[ceph-osd3][INFO  ] Running command: systemctl start ceph-mds@ceph-mds3
[ceph-osd3][INFO  ] Running command: systemctl enable ceph.target

ceph-mon ceph # ceph -s
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 53m)
    mgr: ceph-osd1(active, since 53m), standbys: ceph-mon, ceph-osd3, ceph-osd2
    mds:  6 up:standby
    osd: 3 osds: 3 up (since 53m), 3 in (since 14h)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:

  data:
    pools:   5 pools, 138 pgs
    objects: 226 objects, 1.0 MiB
    usage:   3.0 GiB used, 57 GiB / 60 GiB avail
    pgs:     138 active+clean
```

→ **Creamos pool's de almacenamiento ==> cephfs-metadatos → cephfs-datos**

```
ceph-mon ceph # ceph osd pool create cephfs-metadatos 10 10
pool 'cephfs-metadatos' created
ceph-mon ceph # ceph osd pool create cephfs-datos 10 10
pool 'cephfs-datos' created

ceph-mon ceph # ceph osd pool stats
pool .rgw.root id 3
  nothing is going on

pool default.rgw.control id 4
  nothing is going on
```

pool default.rgw.meta id 5
  nothing is going on

pool default.rgw.log id 6
  nothing is going on

pool pool-test id 9
  nothing is going on

pool cephfs-metadatos id 12
  nothing is going on

pool cephfs-datos id 13
  nothing is going on

ceph-mon ceph # ceph osd pool ls
.rgw.root
default.rgw.control
default.rgw.meta
default.rgw.log
pool-test
cephfs-metadatos
cephfs-datos

→ Creamos → FileSystem|cephfs → cephfs-metadatos → cephfs-datos

ceph-mon ceph # ceph fs ls
No filesystems enabled

ceph-mon ceph # ceph fs new cephfs-01 cephfs-metadatos cephfs-datos
new fs with metadata pool 12 and data pool 13
ceph-mon ceph # ceph fs ls
name: cephfs-01, metadata pool: cephfs-metadatos, data pools: [cephfs-datos]

ceph-mon ceph # ceph -s
  cluster:
    id: 2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 50m)
    mgr: ceph-mon(active, since 59m), standbys: ceph-osd1, ceph-osd3, ceph-osd2
    mds: cephfs-01:1 {0=ceph-osd1=up:active} 5 up:standby
    osd: 3 osds: 3 up (since 58m), 3 in (since 24h)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

```
 task status:
   scrub status:
      mds.ceph-osd1: idle

 data:
   pools:   7 pools, 158 pgs
   objects: 248 objects, 1.0 MiB
   usage:   3.1 GiB used, 57 GiB / 60 GiB avail
   pgs:     158 active+clean
```

→ Copiamos la clave de autenticación para poder montar el FileSystem →
ceph.client.admin.keyring ==> ceph.client.key

```
ceph-mon ceph # cat ceph.client.admin.keyring
[client.admin]
        key = AQD/z6hgxsd8GRAAmq/f7TS6XtFq6lC8AC6DpA==
        caps mds = "allow *"
        caps mgr = "allow *"
        caps mon = "allow *"
        caps osd = "allow *"

ceph-mon ceph # ceph-authtool --print-key /etc/ceph/ceph.client.admin.keyring >
ceph.client.key
ceph-mon ceph # cat /etc/ceph/ceph.client.key
AQD/z6hgxsd8GRAAmq/f7TS6XtFq6lC8AC6DpA==

ceph-mon ceph # chmod 0400 /etc/ceph/ceph.client.key
ceph-mon ceph # ceph auth get client.admin
exported keyring for client.admin
[client.admin]
        key = AQD/z6hgxsd8GRAAmq/f7TS6XtFq6lC8AC6DpA==
        caps mds = "allow *"
        caps mgr = "allow *"
        caps mon = "allow *"
        caps osd = "allow *"

ceph-mon ceph # mkdir /mnt/mi_cephfs-mon
ceph-mon ceph # mkdir /mnt/mi_cephfs-osd1
ceph-mon ceph # mkdir /mnt/mi_cephfs-osd2
ceph-mon ceph # mkdir /mnt/mi_cephfs-osd3

ceph-mon ceph # ssh ceph-osd1 mkdir /mnt/mi_cephfs-osd1
ceph-mon ceph # ssh ceph-osd2 mkdir /mnt/mi_cephfs-osd2
ceph-mon ceph # ssh ceph-osd3 mkdir /mnt/mi_cephfs-osd3

ceph-mon ceph # scp /etc/ceph/ceph.client.key ceph-osd1:/etc/ceph
ceph-mon ceph # scp /etc/ceph/ceph.client.key ceph-osd2:/etc/ceph
```

```
ceph-mon ceph # scp /etc/ceph/ceph.client.key ceph-osd3:/etc/ceph

ceph-mon ceph # yum install ceph-fuse
ceph-mon ceph # ssh ceph-osd1 yum install ceph-fuse -y
ceph-mon ceph # ssh ceph-osd2 yum install ceph-fuse -y
ceph-mon ceph # ssh ceph-osd3 yum install ceph-fuse -y

ceph-mon ceph # mount -t ceph ceph-mon:6789:/  /mnt/mi_cephfs-mon/ -o
name=admin,secretfile=/etc/ceph/ceph.client.key -vvv
parsing options: rw,name=admin,secretfile=/etc/ceph/ceph.client.key

ceph-mon ceph # df -hT
S.ficheros              Tipo     Tamaño Usados  Disp Uso% Montado en
devtmpfs                devtmpfs   1,4G      0  1,4G   0% /dev
tmpfs                   tmpfs      1,4G      0  1,4G   0% /dev/shm
tmpfs                   tmpfs      1,4G   8,7M  1,4G   1% /run
tmpfs                   tmpfs      1,4G      0  1,4G   0% /sys/fs/cgroup
/dev/mapper/centos-root xfs         17G   2,3G   15G  14% /
/dev/vda1               xfs       1014M   199M  816M  20% /boot
tmpfs                   tmpfs      279M      0  279M   0% /run/user/0
192.168.10.160:6789:/   ceph        18G      0   18G   0% /mnt/mi_cephfs-mon
```

→ **Creamos un testigo en ceph-mon y Desmontamos para probar y en otro nodo.**

```
ceph-mon ceph # touch /mnt/mi_cephfs-mon/Desde-ceph-mon.txt
ceph-mon ceph # umount /mnt/mi_cephfs-mon

ceph-mon ceph # mount -t ceph ceph-osd1:6789:/  /mnt/mi_cephfs-osd1/ -o
name=admin,secretfile=/etc/ceph/ceph.client.key -vvv
parsing options: rw,name=admin,secretfile=/etc/ceph/ceph.client.key

ceph-mon ceph # df -hT
S.ficheros              Tipo     Tamaño Usados  Disp Uso% Montado en
devtmpfs                devtmpfs   1,4G      0  1,4G   0% /dev
tmpfs                   tmpfs      1,4G      0  1,4G   0% /dev/shm
tmpfs                   tmpfs      1,4G   8,7M  1,4G   1% /run
tmpfs                   tmpfs      1,4G      0  1,4G   0% /sys/fs/cgroup
/dev/mapper/centos-root xfs         17G   2,3G   15G  14% /
/dev/vda1               xfs       1014M   199M  816M  20% /boot
tmpfs                   tmpfs      279M      0  279M   0% /run/user/0
192.168.10.161:6789:/   ceph        18G      0   18G   0% /mnt/mi_cephfs-osd1

ceph-mon ceph # ls /mnt/mi_cephfs-mon/
Desde-ceph-mon.txt
```

→ **Desmontamos de nuevo**

ceph-mon ceph # umount /mnt/mi_cephfs-osd1

ceph-mon ceph # ceph fs status

```
cephfs-01 - 0 clients
=========
+------+--------+-----------+---------------+-------+-------+
| Rank | State  |    MDS    |    Activity   |  dns  |  inos |
+------+--------+-----------+---------------+-------+-------+
|  0   | active | ceph-osd1 | Reqs:    0 /s |   11  |   14  |
+------+--------+-----------+---------------+-------+-------+
+-----------------+----------+-------+-------+
|       Pool      |   type   | used  | avail |
+-----------------+----------+-------+-------+
| cephfs-metadatos | metadata | 1536k | 17.9G |
|   cephfs-datos   |   data   |    0  | 17.9G |
+-----------------+----------+-------+-------+
+-------------+
| Standby MDS |
+-------------+
|  ceph-osd2  |
|  ceph-osd3  |
|  ceph-mds1  |
|  ceph-mds2  |
|  ceph-mds3  |
+-------------+
MDS version: ceph version 14.2.21 (5ef401921d7a88aea18ec7558f7f9374ebd8f5a6) nautilus
(stable)
```

ceph-mon ceph # ceph fs get cephfs-01

```
Filesystem 'cephfs-01' (1)
fs_name         cephfs-01
epoch   36
flags   12
created2021-06-01 09:59:51.077794
modified        2021-06-01 09:59:52.677270
tableserver     0
root    0
session_timeout         60
session_autoclose       300
max_file_size 1099511627776
min_compat_client    -1 (unspecified)
last_failure    0
last_failure_osd_epoch          0
compatcompat={},rocompat={},incompat={1=base v0.20,2=client writeable ranges,3=default file
layouts on dirs,4=dir inode in separate object,5=mds uses versioned encoding,6=dirfrag is stored in
omap,8=no anchor table,9=file layout v2,10=snaprealm v2}
max_mds         1
```

```
in      0
up      {0=264172}
failed
damaged
stopped
data_pools      [13]
metadata_pool12
inline_data     disabled
balancer
standby_count_wanted        1
[mds.ceph-osd1{0:264172} state up:active seq 643 addr
[v2:192.168.10.161:6800/845818693,v1:192.168.10.161:6801/845818693]]
```

→ Volvemos a montar y de forma global → ceph-osd{1,2,3}

```
ceph-mon ceph # mount -t ceph ceph-osd1:6789:/  /mnt/mi_cephfs-osd1/ -o
name=admin,secretfile=/etc/ceph/ceph.client.key -vvv
parsing options: rw,name=admin,secretfile=/etc/ceph/ceph.client.key

ceph-mon ceph # mount -t ceph ceph-osd2:6789:/  /mnt/mi_cephfs-osd2/ -o
name=admin,secretfile=/etc/ceph/ceph.client.key -vvv
parsing options: rw,name=admin,secretfile=/etc/ceph/ceph.client.key

ceph-mon ceph # mount -t ceph ceph-osd3:6789:/  /mnt/mi_cephfs-osd3/ -o
name=admin,secretfile=/etc/ceph/ceph.client.key -vvv
parsing options: rw,name=admin,secretfile=/etc/ceph/ceph.client.key

ceph-mon ceph # df -hT
S.ficheros              Tipo     Tamaño Usados  Disp Uso% Montado en
devtmpfs                devtmpfs  1,4G      0  1,4G   0% /dev
tmpfs                   tmpfs     1,4G      0  1,4G   0% /dev/shm
tmpfs                   tmpfs     1,4G   8,7M  1,4G   1% /run
tmpfs                   tmpfs     1,4G      0  1,4G   0% /sys/fs/cgroup
/dev/mapper/centos-root xfs        17G   2,3G   15G  14% /
/dev/vda1               xfs      1014M   199M  816M  20% /boot
tmpfs                   tmpfs     279M      0  279M   0% /run/user/0
192.168.10.161:6789:/   ceph       18G      0   18G   0% /mnt/mi_cephfs-osd1
192.168.10.162:6789:/   ceph       18G      0   18G   0% /mnt/mi_cephfs-osd2
192.168.10.163:6789:/   ceph       18G      0   18G   0% /mnt/mi_cephfs-osd3

ceph-mon ceph # umount /mnt/mi_cephfs-osd*
SSS
```

→ Montaje con ceph-fuse

```
ceph-mon ceph # mkdir /mnt/fuse
```

→ Crear otra estructura LVM → ceph-osd1 → /dev/vdc

Creamos un disco de reserva → **/dev/vdc**

```
ceph-osd1 ~ # ceph-volume inventory
Device Path           Size         rotates available Model name
/dev/vdc              20.00 GB     True    True
/dev/vdd              20.00 GB     True    True
/dev/vda              25.00 GB     True    False
/dev/vdb              20.00 GB     True    False

ceph-osd1 ~ # lsblk /dev/vd[b-z]
NAME                                                                                                  MAJ:MIN RM SIZE RO
TYPE MOUNTPOINT
vdb                                                                                                   252:16   0  20G  0 disk
└─ceph--4744afc0--6372--44b5--a74e--7bd0d30d5ad7-osd--block--8acc47ed--3737--4f21--8f80--
922a176b9c28 253:6    0  20G  0 lvm
vdc                                                                                                   252:32   0  20G  0 disk
vdd                                                                                                   252:48   0  20G  0 disk

ceph-osd1 ~ # ceph-volume lvm create --data /dev/vdc
Running command: /usr/bin/ceph-authtool --gen-print-key
Running command: /usr/bin/ceph --cluster ceph --name client.bootstrap-osd --keyring
/var/lib/ceph/bootstrap-osd/ceph.keyring -i - osd new 59c9fb12-d0b9-4588-b5d7-423bdd7713a5
Running command: /usr/sbin/vgcreate --force --yes ceph-d91c5050-eb48-4d55-a103-2b6d2f5b00d3
/dev/vdc
 stdout: Physical volume "/dev/vdc" successfully created.
 stdout: Volume group "ceph-d91c5050-eb48-4d55-a103-2b6d2f5b00d3" successfully created
Running command: /usr/sbin/lvcreate --yes -l 5119 -n osd-block-59c9fb12-d0b9-4588-b5d7-
423bdd7713a5 ceph-d91c5050-eb48-4d55-a103-2b6d2f5b00d3
 stdout: Logical volume "osd-block-59c9fb12-d0b9-4588-b5d7-423bdd7713a5" created.
…

Running command: /usr/bin/systemctl enable ceph-volume@lvm-3-59c9fb12-d0b9-4588-b5d7-
423bdd7713a5
 stderr: Created symlink from /etc/systemd/system/multi-user.target.wants/ceph-volume@lvm-3-
59c9fb12-d0b9-4588-b5d7-423bdd7713a5.service to /usr/lib/systemd/system/ceph-
volume@.service.
Running command: /usr/bin/systemctl enable --runtime ceph-osd@3
 stderr: Created symlink from /run/systemd/system/ceph-osd.target.wants/ceph-osd@3.service to
/usr/lib/systemd/system/ceph-osd@.service.
Running command: /usr/bin/systemctl start ceph-osd@3
--> ceph-volume lvm activate successful for osd ID: 3
--> ceph-volume lvm create successful for: /dev/vdc

ceph-osd1 ~ # ceph-volume inventory
Device Path           Size         rotates available Model name
/dev/vdd              20.00 GB     True    True
/dev/vda              25.00 GB     True    False
/dev/vdb              20.00 GB     True    False
```

/dev/vdc 20.00 GB True False

ceph-osd1 ~ # ceph osd tree

```
ID CLASS WEIGHT  TYPE NAME          STATUS REWEIGHT PRI-AFF
-1       0.07794 root default
-3       0.03897     host ceph-osd1
 0   hdd 0.01949         osd.0          up  1.00000 1.00000
 3   hdd 0.01949         osd.3          up  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1          up  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2          up  1.00000 1.00000
```

→ Sustitución de disco averiado en ceph-osd1 → /dev/vdb ==> /dev/vdc

ceph-mon ceph # ceph -s

```
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_WARN
            1 osds down
            Degraded data redundancy: 80/744 objects degraded (10.753%), 20 pgs degraded, 70 pgs
            undersized

  services:
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 3m)
    mgr: ceph-osd3(active, since 95m), standbys: ceph-mon, ceph-osd2, ceph-osd1
    mds: cephfs-01:1 {0=ceph-mds2=up:active} 5 up:standby
    osd: 4 osds: 3 up (since 3m), 4 in (since 23m)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:
    scrub status:
        mds.ceph-mds2: idle

  data:
    pools:   7 pools, 158 pgs
    objects: 248 objects, 1.0 MiB
    usage:   4.1 GiB used, 76 GiB / 80 GiB avail
    pgs:     80/744 objects degraded (10.753%)
             88 active+clean
             50 active+undersized
             20 active+undersized+degraded
```

ceph-mon ceph # ceph osd tree

```
ID CLASS WEIGHT  TYPE NAME          STATUS REWEIGHT PRI-AFF
-1       0.07794 root default
-3       0.03897     host ceph-osd1
```

```
 0   hdd 0.01949         osd.0       down  1.00000 1.00000
 3   hdd 0.01949         osd.3         up  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1         up  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2         up  1.00000 1.00000
```

```
ceph-mon ceph # ceph osd unset noout
noout is unset
```

```
ceph-mon ceph # ceph osd crush reweight osd.0 0
reweighted item id 0 name 'osd.0' to 0 in crush map
```

```
ceph-mon ceph # ceph osd tree
ID CLASS WEIGHT  TYPE NAME          STATUS REWEIGHT PRI-AFF
-1       0.05846 root default
-3       0.01949     host ceph-osd1
 0   hdd       0         osd.0       down  1.00000 1.00000
 3   hdd 0.01949         osd.3         up  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1         up  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2         up  1.00000 1.00000
```

```
ceph-mon ceph # ceph osd out osd.0 0
osd.0 is already out. osd.0 is already out.
```

```
ceph-mon ceph # ceph osd crush remove osd.0
removed item id 0 name 'osd.0' from crush map
```

```
ceph-mon ceph # ceph osd tree
ID CLASS WEIGHT  TYPE NAME          STATUS REWEIGHT PRI-AFF
-1       0.05846 root default
-3       0.01949     host ceph-osd1
 3   hdd 0.01949         osd.3         up  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1         up  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2         up  1.00000 1.00000
 0             0 osd.0               down        0 1.00000
```

```
ceph-mon ceph # ceph -s
  cluster:
    id:     2137b4f3-ea3e-4721-bf88-98bfe6419420
    health: HEALTH_OK

  services:
```

```
    mon: 4 daemons, quorum ceph-mon,ceph-osd1,ceph-osd2,ceph-osd3 (age 14m)
    mgr: ceph-osd3(active, since 105m), standbys: ceph-mon, ceph-osd2, ceph-osd1
    mds: cephfs-01:1 {0=ceph-mds2=up:active} 5 up:standby
    osd: 4 osds: 3 up (since 14m), 3 in (since 4m)
    rgw: 4 daemons active (ceph-mon, ceph-osd1, ceph-osd2, ceph-osd3)

  task status:
    scrub status:
        mds.ceph-mds2: idle

  data:
    pools:   7 pools, 158 pgs
    objects: 248 objects, 1.0 MiB
    usage:   3.1 GiB used, 57 GiB / 60 GiB avail
    pgs:     158 active+clean
```

ceph-mon ceph # ceph auth del osd.0

```
updated
```

ceph-mon ceph # ceph osd rm osd.0

```
removed osd.0
```

ceph-mon ceph # ceph osd tree

```
ID CLASS WEIGHT  TYPE NAME         STATUS REWEIGHT PRI-AFF
-1       0.05846 root default
-3       0.01949     host ceph-osd1
 3   hdd 0.01949         osd.3         up  1.00000 1.00000
-5       0.01949     host ceph-osd2
 1   hdd 0.01949         osd.1         up  1.00000 1.00000
-7       0.01949     host ceph-osd3
 2   hdd 0.01949         osd.2         up  1.00000 1.00000
```

ceph-mon ceph # ceph osd df

```
ID CLASS WEIGHT  REWEIGHT SIZE   RAW USE DATA   OMAP   META    AVAIL  %USE
VAR  PGS STATUS
 3   hdd 0.01949  1.00000 20 GiB 1.0 GiB 33 MiB 23 KiB 1024 MiB 19 GiB 5.16 1.00 158     up
 1   hdd 0.01949  1.00000 20 GiB 1.0 GiB 33 MiB 11 KiB 1024 MiB 19 GiB 5.16 1.00 158     up
 2   hdd 0.01949  1.00000 20 GiB 1.0 GiB 33 MiB 11 KiB 1024 MiB 19 GiB 5.16 1.00 158     up
                    TOTAL 60 GiB 3.1 GiB 99 MiB 47 KiB  3.0 GiB 57 GiB 5.16
MIN/MAX VAR: 1.00/1.00  STDDEV: 0
```

→ Configuración Actual.

ceph-mon ceph # grep -v "#" /etc/ceph/ceph.conf | sed -e '/^$/d' | grep -v ';'

```
[global]
fsid = 2137b4f3-ea3e-4721-bf88-98bfe6419420
public_network = 192.168.10.0/24
```

```
mon_initial_members = ceph-mon
mon_host = 192.168.10.160
auth_cluster_required = cephx
auth_service_required = cephx
auth_client_required = cephx
mon_allow_pool_delete = true
mon_warn_on_pool_pg_num_not_power_of_two = false
osd pool default pg num = 1024
osd pool default pgp num = 1024
```

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