

Luminous Ceph Installation Configuration and Administration Reference

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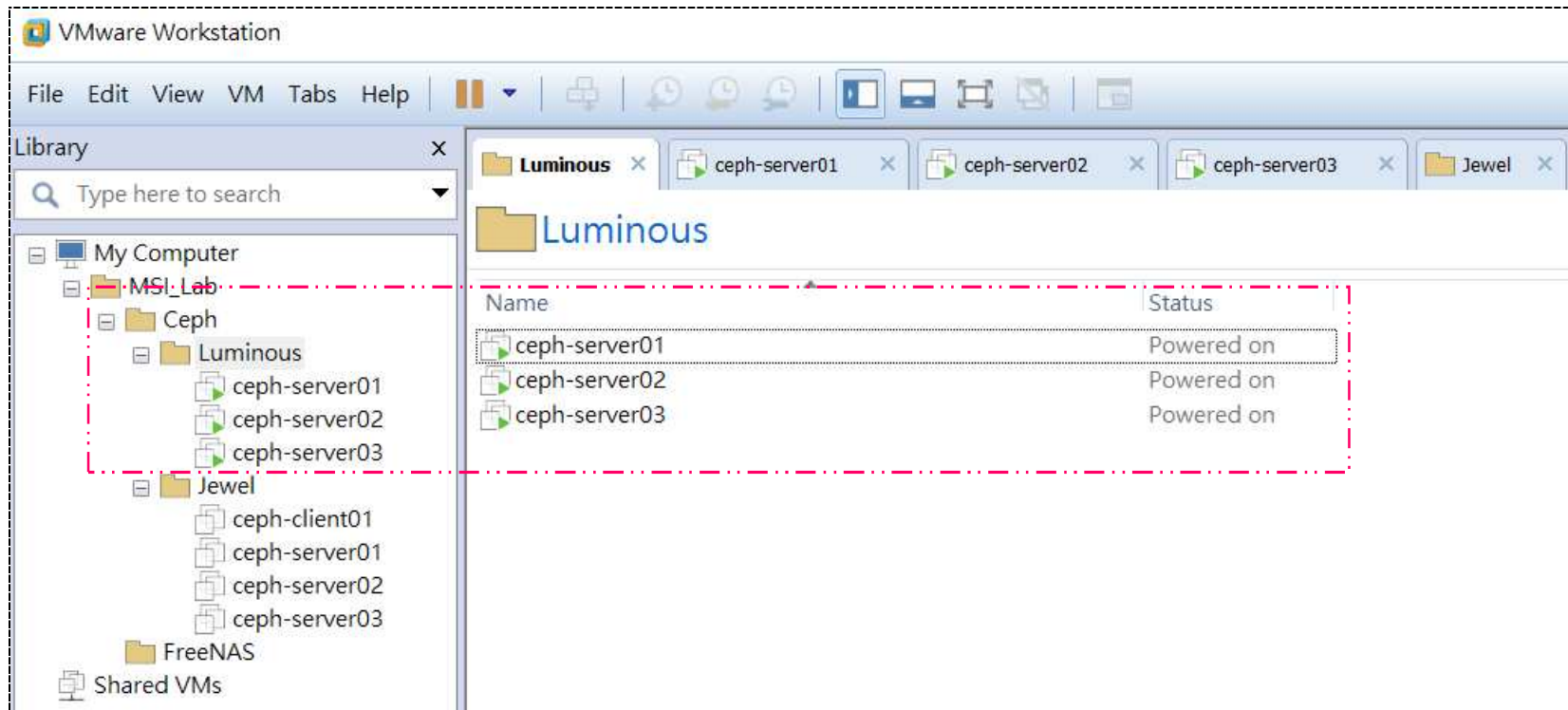
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Reference information		
Item	Description	URLs
1	<i>Welcome to Ceph</i>	http://docs.ceph.com/docs/mimic/
2	<i>Ceph Storage Cluster</i>	http://docs.ceph.com/docs/mimic/rados/
3	<i>Ceph Development</i>	http://docs.ceph.com/docs/mimic/rados/deployment/
4	<i>Product Documentation for Red Hat Ceph Storage</i>	https://access.redhat.com/documentation/en-us/red_hat_ceph_storage/
5	<i>How to build a Ceph Distributed Storage Cluster on CentOS 7</i>	https://www.howtoforge.com/tutorial/how-to-build-a-ceph-cluster-on-centos-7/
6	<i>Monitoring of a Ceph Cluster with Ceph-dash on CentOS 7</i>	https://www.howtoforge.com/tutorial/monitoring-of-a-ceph-cluster-with-ceph-dash/
7	<i>Ceph Releases</i>	http://docs.ceph.com/docs/master/releases/
8	<i>Pool, PG and CRUSH Config Reference</i>	http://docs.ceph.com/docs/master/rados/configuration/pool-pg-config-ref/
9	<i>install-ceph-Luminous-on-centos7</i>	https://liuxu.co/2017/09/19/install-ceph-Luminous-on-centos7-with-ceph-deploy/
10	<i>Ceph iSCSI Gateway</i>	http://docs.ceph.com/docs/master/rbd/iscsi-overview/

1. Please refer to my pdf file as below (page 2 ~ page 42) - *for how to use VMware Workstation Pro 14 to demo the installation of CentOS 7.5 (1804) used as the Ceph storage server nodes!*

[https://github.com/dl1963tw/MyLearning/blob/master/Ceph installation configuration admin ref doc.pdf](https://github.com/dl1963tw/MyLearning/blob/master/Ceph%20installation%20configuration%20admin%20ref%20doc.pdf)

2. Finally, we create and install three Ceph storage server nodes:



3. Before configuring the bond network interface, we stop and disable the NetworkManager service: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# systemctl status NetworkManager | grep Active
```

```
Active: active (running) since Sun 2018-07-15 10:20:25 CST; 1h 47min ago
```

```
[root@Lceph-server01 ~]# systemctl stop NetworkManager; systemctl disable NetworkManager; systemctl status NetworkManager
```

```
Removed symlink /etc/systemd/system/multi-user.target.wants/NetworkManager.service.
```

```
Removed symlink /etc/systemd/system/dbus-org.freedesktop.NetworkManager.service.
```

```
Removed symlink /etc/systemd/system/dbus-org.freedesktop.nm-dispatcher.service.
```

```
● NetworkManager.service - Network Manager
```

```
– Network Manager
```

```
Loaded: loaded (/usr/lib/systemd/system/NetworkManager.service; disabled; vendor preset: enabled)
```

```
Active: inactive (dead) since Sun 2018-07-15 12:08:53 CST; 176ms ago
```

```
Docs: man:NetworkManager(8)
```

```
Main PID: 835 (code=exited, status=0/SUCCESS)
```

```
Jul 15 10:20:50 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531650050.9916] device...)
```

```
Jul 15 10:20:51 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531650051.0572] device...)
```

```
Jul 15 10:20:51 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531650051.0861] device...)
```

```
Jul 15 10:20:51 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531650051.0865] device...d
```

```
Jul 15 10:20:51 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531650051.0865] device...0
```

```
Jul 15 12:08:53 Lceph-server01.lab.gidanet.com.tw systemd[1]: Stopping Network Manager...
```

```
Jul 15 12:08:53 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531656533.6852] caught...
```

```
Jul 15 12:08:53 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531656533.6914] devic...0
```

```
Jul 15 12:08:53 Lceph-server01.lab.gidanet.com.tw NetworkManager[835]: <info> [1531656533.7028] exiti...)
```

```
Jul 15 12:08:53 Lceph-server01.lab.gidanet.com.tw systemd[1]: Stopped Network Manager.
```

```
Hint: Some lines were ellipsized, use -l to show in full.
```

4. We check (list) and probe bonding kernel module to load it: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# lsmod | grep bonding
```

```
[root@Lceph-server01 ~]# modprobe bonding; lsmod | grep bonding
```

bonding 149864 0

5. We edit and create the bond0 (virtual) network interface configuration: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# vi /etc/sysconfig/network-scripts/ifcfg-bond0
```

```
DEVICE=bond0
```

```
NAME=bond0
```

```
TYPE=Bond
```

```
BOOTPROTO=none
```

```
ONBOOT=yes
```

```
DEFROUTE=yes
```

```
IPV4_FAILURE_FATAL=no
```

```
IPV6INIT=no
```

```
IPADDR=192.168.10.241
```

```
PREFIX=24
```

```
GATEWAY=192.168.10.2
```

```
DNS1=192.168.10.240
```

```
DNS2=168.95.1.1
```

```
DNS3=8.8.8.8
```

```
BONDING_MASTER=yes
```

```
BONDING_OPTS="mode=active-backup miimon=100"
```

6. We edit and update the physical network interface configuration to match the bonding requirement: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# vi /etc/sysconfig/network-scripts/ifcfg-ens33 /etc/sysconfig/network-scripts/ifcfg-ens34
```

```
DEVICE=ens33
```

```
TYPE=Ethernet
```

```
BOOTPROTO=none
```

ONBOOT=yes

MASTER=bond0

SLAVE=yes

DEVICE=ens34

TYPE=Ethernet

BOOTPROTO=none

ONBOOT=yes

MASTER=bond0

SLAVE=yes

7. After editing the network interface configuration, we restart and check the status of network service: (executed on all Ceph storage server/client nodes)

[root@Lceph-server01 ~]# *systemctl restart network; systemctl status network*

- network.service - LSB: Bring up/down networking
Loaded: loaded (/etc/rc.d/init.d/network; bad; vendor preset: disabled)
Active: **active (running)** since Sun 2018-07-15 12:38:47 CST; 14ms ago
Docs: man:systemd-sysv-generator(8)
Process: 4285 ExecStop=/etc/rc.d/init.d/network stop (code=exited, status=0/SUCCESS)
Process: 4508 ExecStart=/etc/rc.d/init.d/network start (code=exited, status=0/SUCCESS)
Tasks: 2
CGroup: /system.slice/network.service
├─4714 /bin/bash /etc/sysconfig/network-scripts/ifup-eth ifcfg-bond0 boot
└─4716 sleep 2

Jul 15 12:38:43 Lceph-server01.lab.gidanet.com.tw systemd[1]: Starting LSB: Bring up/down networking...

Jul 15 12:38:43 Lceph-server01.lab.gidanet.com.tw network[4508]: Bringing up loopback interface: [OK]

Jul 15 12:38:47 Lceph-server01.lab.gidanet.com.tw network[4508]: Bringing up interface bond0: [OK]

Jul 15 12:38:47 Lceph-server01.lab.gidanet.com.tw systemd[1]: Started LSB: Bring up/down networking.

Hint: Some lines were ellipsized, use -l to show in full.

8. We use command to check the NIC information - ens33, ens34 and bond0: (executed on all Ceph storage server/client nodes)

[root@Lceph-server01 ~]# ip addr list

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast master bond0 state UP group default qlen 1000
    link/ether 00:0c:29:e0:cb:a6 brd ff:ff:ff:ff:ff:ff
3: ens34: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast master bond0 state UP group default qlen 1000
    link/ether 00:0c:29:e0:cb:a6 brd ff:ff:ff:ff:ff:ff
4: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default qlen 1000
    link/ether 52:54:00:a1:0a:ca brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
        valid_lft forever preferred_lft forever
5: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc pfifo_fast master virbr0 state DOWN group default qlen 1000
    link/ether 52:54:00:a1:0a:ca brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 00:0c:29:e0:cb:a6 brd ff:ff:ff:ff:ff:ff
    inet 192.168.10.241/24 brd 192.168.10.255 scope global bond0
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fee0:cba6/64 scope link
```

```
valid_lft forever preferred_lft forever
```

```
[root@Lceph-server01 ~]# ip route list
```

```
default via 192.168.10.2 dev bond0
```

```
169.254.0.0/16 dev bond0 scope link metric 1006
```

```
192.168.10.0/24 dev bond0 proto kernel scope link src 192.168.10.241
```

```
192.168.122.0/24 dev virbr0 proto kernel scope link src 192.168.122.1
```

9. We use command to check the bond0 information to make sure the settings configured as what we want them to be: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# cat /proc/net/bonding/bond0
```

```
Ethernet Channel Bonding Driver: v3.7.1 (April 27, 2011)
```

```
Bonding Mode: fault-tolerance (active-backup)
```

```
Primary Slave: None
```

```
Currently Active Slave: ens33
```

```
MII Status: up
```

```
MII Polling Interval (ms): 100
```

```
Up Delay (ms): 0
```

```
Down Delay (ms): 0
```

```
Slave Interface: ens33
```

```
MII Status: up
```

```
Speed: 1000 Mbps
```

```
Duplex: full
```

```
Link Failure Count: 0
```

```
Permanent HW addr: 00:0c:29:e0:cb:a6
```

Slave queue ID: 0

Slave Interface: ens34

MII Status: up

Speed: 1000 Mbps

Duplex: full

Link Failure Count: 0

Permanent HW addr: 00:0c:29:e0:cb:b0

Slave queue ID: 0

10. We disable security-enhanced linux: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# sed -i 's/SELINUX=enforcing/SELINUX=disabled/g' /etc/selinux/config
```

11. After rebooting, we use command to check and make sure the security-enhanced linux is disabled: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# getenforce
```

Disabled

12. We create a Ceph user - cephuser, set password and configure sudo for “cephuser”: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# useradd -d /home/cephuser -m cephuser
```

```
[root@Lceph-server01 ~]# passwd cephuser (01Ceph!qaz)
```

```
[root@Lceph-server01 ~]# echo "cephuser ALL = (root) NOPASSWD:ALL" | tee /etc/sudoers.d/cephuser
```

cephuser ALL = (root) NOPASSWD:ALL


```
[root@Lceph-server01 ~]# chmod 0440 /etc/sudoers.d/cephuser
```

13. We install NTP for time synchronization between Ceph servers and Ceph clients: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# yum install -y ntp ntpdate ntp-doc
```

```
:::~::~:
```

Installed:

```
ntp.x86_64 0:4.2.6p5-28.el7.centos          ntp-doc.noarch 0:4.2.6p5-28.el7.centos
```

Dependency Installed:

```
autogen-libopts.x86_64 0:5.18-5.el7
```

Complete!

14. We execute ntpdate command to set a date/time via NTP protocol from local NTP server (Taiwan): (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# ntpdate 0.tw.pool.ntp.org
```

```
15 Jul 17:46:17 ntpdate[2143]: step time server 103.18.128.60 offset 0.938400 sec
```

15. We set the hardware clock (RTC) to the current system time: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# hwclock --systohc
```

16. We enable, start and check the status of ntpd service: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# systemctl enable ntpd; systemctl start ntpd; systemctl status ntpd
```

Created symlink from /etc/systemd/system/multi-user.target.wants/ntpd.service to /usr/lib/systemd/system/ntpd.service.

- ntpd.service – Network Time Service

Loaded: loaded (/usr/lib/systemd/system/ntpd.service; **enabled**; vendor preset: disabled)

Active: **active** (**running**) since Sun 2018-07-15 17:48:38 CST; 6ms ago
Process: 2197 ExecStart=/usr/sbin/ntpd -u ntp:ntp \$OPTIONS (code=exited, status=0/SUCCESS)
Main PID: 2198 (ntpd)
Tasks: 1
CGroup: /system.slice/ntpd.service
└─2198 /usr/sbin/ntpd -u ntp:ntp -g

Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: ntp_io: estimated max descriptors: 1024...16
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen and drop on 0 v4wildcard 0.0.0.0...23
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen and drop on 1 v6wildcard :: UDP 123
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen normally on 2 lo 127.0.0.1 UDP 123
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen normally on 3 bond0 192.168.10.2...23
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen normally on 4 virbr0 192.168.122...23
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen normally on 5 lo ::1 UDP 123
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listen normally on 6 bond0 fe80::20c:29...23
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw ntpd[2198]: Listening on routing socket on fd #23 f...es
Jul 15 17:48:38 Lceph-server01.lab.gidanet.com.tw systemd[1]: Started Network Time Service.
Hint: Some lines were ellipsized, use -l to show in full.

17. We install/update the open virtual machine tools for virtual machines hosted on VMware: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# yum install -y open-vm-tools
```

.....

Updated:

open-vm-tools.x86_64 0:10.1.10-3.el7_5.1

Dependency Updated:

```
open-vm-tools-desktop.x86_64 0:10.1.10-3.el7_5.1
```

Complete!

18. We configure /etc/hosts for easy access to Ceph servers and Ceph clients by means of hostname: (executed on all Ceph storage server/client nodes)

```
[root@Lceph-server01 ~]# vi /etc/hosts
```

```
127.0.0.1    localhost localhost.localdomain localhost4 localhost4.localdomain4
::1         localhost localhost.localdomain localhost6 localhost6.localdomain6
```

```
192.168.10.241 Lceph-server01.lab.gidanet.com.tw Lceph-server01
192.168.10.242 Lceph-server02.lab.gidanet.com.tw Lceph-server02
192.168.10.243 Lceph-server03.lab.gidanet.com.tw Lceph-server03
```

```
192.168.10.231 Lceph-client01.lab.gidanet.com.tw Lceph-client01
```

19. We configure ssh server so password-less ssh access for “cephuser”: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# su - cephuser
```

```
[cephuser@Lceph-server01 ~]$ ssh-keygen
```

Generating public/private rsa key pair.

Enter file in which to save the key (/home/cephuser/.ssh/id_rsa):

Created directory '/home/cephuser/.ssh'.

Enter passphrase (empty for no passphrase):

Enter same passphrase again:

Your identification has been saved in /home/cephuser/.ssh/id_rsa.

Your public key has been saved in /home/cephuser/.ssh/id_rsa.pub.

The key fingerprint is:

SHA256:V9I3nMnuUt6uxdEF5opcbxoIcAwxptePIqdGlpCVl6Q cephuser@Lceph-server01.lab.gidanet.com.tw

The key's randomart image is:

```
+---[RSA 2048]-----+
|  .oB=.      o  |
|  o.+o=.    . = + |
|  o E.. o . + 0 . |
|  . o   = * = .o |
|  = o S * o =.. |
|  o + . .   B o. |
|  o      o o + |
|  .      . o |
|      ... |
+-----[SHA256]-----+
```

[cephuser@Lceph-server01 ~]\$ vi ~/.ssh/config

Host Lceph-server01

 Hostname Lceph-server01

 User cephuser

Host Lceph-server02

 Hostname Lceph-server02

 User cephuser

Host Lceph-server03

 Hostname Lceph-server03

 User cephuser

Host Lceph-client01

Hostname Lceph-client01

User cephuser

```
[cephuser@Lceph-server01 ~]$ chmod 640 ~/.ssh/config; ls -l ~/.ssh/config
```

```
-rw-r----- 1 cephuser cephuser 299 Jul 15 18:04 /home/cephuser/.ssh/config
```

```
[cephuser@Lceph-server01 ~]$ ssh-keyscan Lceph-server02 Lceph-server03 Lceph-client01 >> ~/.ssh/known_hosts
```

```
# Lceph-server02:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-server02:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-server02:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-server03:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-server03:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-server03:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-client01:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-client01:22 SSH-2.0-OpenSSH_7.4
```

```
# Lceph-client01:22 SSH-2.0-OpenSSH_7.4
```

```
[cephuser@Lceph-server01 ~]$ ssh-copy-id Lceph-server02
```

```
/bin/ssh-copy-id: INFO: Source of key(s) to be installed: "/home/cephuser/.ssh/id_rsa.pub"
```

```
/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed
```

```
/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys
```

```
cephuser@lceph-server02's password:
```

```
Number of key(s) added: 1
```

Now try logging into the machine, with: "ssh 'Lceph-server02' "
and check to make sure that only the key(s) you wanted were added.

```
[cephuser@Lceph-server01 ~]$ ssh-copy-id Lceph-server03
```

```
:::~::~
```

```
[cephuser@Lceph-server01 ~]$ ssh-copy-id Lceph-client01
```

```
:::~::~
```

20. We test password-less ssh access for “cephuser”: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 ~]$ date; ssh Lceph-server02 date
```

```
Sun Jul 15 18:10:18 CST 2018
```

```
Sun Jul 15 18:10:18 CST 2018
```

```
[cephuser@Lceph-server01 ~]$ date; ssh Lceph-server03 date
```

```
Sun Jul 15 18:10:38 CST 2018
```

```
Sun Jul 15 18:10:38 CST 2018
```

```
[cephuser@Lceph-server01 ~]$ date; ssh Lceph-client01 date
```

```
Sun Jul 15 18:10:55 CST 2018
```

```
Sun Jul 15 18:10:55 CST 2018
```

21. We check the status of firewalld service, if it is not running, we enable and start it: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# systemctl status firewalld
```

- firewalld.service - firewalld - dynamic firewall daemon

Loaded: loaded (/usr/lib/systemd/system/firewalld.service; **enabled**; vendor preset: enabled)

Active: **active (running)** since Sun 2018-07-15 17:27:13 CST; 45min ago
Docs: man:firewalld(1)
Main PID: 820 (firewalld)
Tasks: 2
CGroup: /system.slice/firewalld.service
└─820 /usr/bin/python -Es /usr/sbin/firewalld --nofork --nopid

Jul 15 17:26:53 Lceph-server01.lab.gidanet.com.tw systemd[1]: Starting firewalld - dynamic firewall d.....

Jul 15 17:27:13 Lceph-server01.lab.gidanet.com.tw systemd[1]: Started firewalld - dynamic firewall daemon.

Hint: Some lines were ellipsized, use -l to show in full.

22. We open the following ports needed by Ceph administration, Ceph monitor and Ceph OSD: (executed on all Ceph storage server nodes)

[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=80/tcp --permanent

success

[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=2003/tcp --permanent

success

[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=4505-4506/tcp --permanent

success

[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=6789/tcp --permanent

success

[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=6800-7300/tcp --permanent

success

These ports are for Ceph administration.

This port is for Ceph monitor.

These ports are for Ceph OSD.

```
[root@Lceph-server01 ~]# firewall-cmd --reload
```

success

```
[root@Lceph-server01 ~]# iptables -L IN_public_allow
```

Chain IN_public_allow (1 references)

target	prot	opt	source	destination	
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:ssh ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:http ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:cfinger ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpts:4505:4506 ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:smc-https ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpts:6800:7300 ctstate NEW

23. We add the Ceph repository: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# yum install -y https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
```

.....

Installed:

epel-release.noarch 0:7-11

Complete!

```
[root@Lceph-server01 ~]# cat >> /etc/yum.repos.d/ceph.repo
```

[ceph-noarch]

name=Ceph noarch packages

baseurl=http://download.ceph.com/rpm-luminous/el7/noarch

enabled=1


```

gpgcheck=1
type=rpm-md
gpgkey=https://download.ceph.com/keys/release.asc
[ceph]
name=Ceph packages
baseurl=http://download.ceph.com/rpm-luminous/el7/x86_64
enabled=1
gpgcheck=1
type=rpm-md
gpgkey=https://download.ceph.com/keys/release.asc
[ceph-source]
name=Ceph source packages
baseurl=http://download.ceph.com/rpm-mimic/el7/SRPMS
enabled=1
gpgcheck=1
type=rpm-md
gpgkey=https://download.ceph.com/keys/release.asc

```

24. We update all currently installed packages then install ceph-deploy: (executed on all Ceph storage server nodes)

```
[root@lceph-server01 ~]# yum -y update && yum -y install ceph-deploy
```

```

:::
:::
selinux-policy.noarch 0:3.13.1-192.el7_5.4
selinux-policy-targeted.noarch 0:3.13.1-192.el7_5.4
sos.noarch 0:3.5-9.el7.centos
spice-glib.x86_64 0:0.34-3.el7_5.1
spice-gtk3.x86_64 0:0.34-3.el7_5.1

```

```
spice-server.x86_64 0:0.14.0-2.el7_5.4
sssd-client.x86_64 0:1.16.0-19.el7_5.5
sudo.x86_64 0:1.8.19p2-14.el7_5
systemtap.x86_64 0:3.2-8.el7_5
systemtap-client.x86_64 0:3.2-8.el7_5
systemtap-devel.x86_64 0:3.2-8.el7_5
systemtap-runtime.x86_64 0:3.2-8.el7_5
targetcli.noarch 0:2.1.fb46-6.el7_5
tzdata.noarch 0:2018e-3.el7
tzdata-java.noarch 0:2018e-3.el7
vdo.x86_64 0:6.1.0.168-18
xorg-x11-drv-wacom.x86_64 0:0.34.2-5.el7
```

Complete!

::::::::::

::::::::::

Installed:

```
ceph-deploy.noarch 0:2.0.1-0
```

Complete!

25. We change user to cephuser for creating and configuring Ceph cluster:

```
[root@Lceph-server01 ~]# su - cephuser
```

26. We create cluster directory to hold cluster related configuration files: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 ~]$ mkdir cluster
```

```
[cephuser@Lceph-server01 ~]$ cd cluster
```

27. We create a new cluster configuration with ceph-deploy command: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph-deploy new Lceph-server01 Lceph-server02 Lceph-server03
```

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
[ceph_deploy.cli][INFO ] Invoked (2.0.1): /bin/ceph-deploy new Lceph-server01 Lceph-server02 Lceph-server03
[ceph_deploy.cli][INFO ] ceph-deploy options:
[ceph_deploy.cli][INFO ] username                : None
[ceph_deploy.cli][INFO ] func                : <function new at 0x7fe9997772a8>
[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 0x7fe998eed200>
[ceph_deploy.cli][INFO ] cluster              : ceph
[ceph_deploy.cli][INFO ] ssh_copykey          : True
[ceph_deploy.cli][INFO ] mon                  : ['Lceph-server01', 'Lceph-server02', 'Lceph-server03']
[ceph_deploy.cli][INFO ] public_network       : None
[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
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
```

```
[Lceph-server01][DEBUG ] find the location of an executable
[Lceph-server01][INFO  ] Running command: sudo /usr/sbin/ip link show
[Lceph-server01][INFO  ] Running command: sudo /usr/sbin/ip addr show
[Lceph-server01][DEBUG ] IP addresses found: [u'192.168.10.241', u'192.168.122.1' ]
[ceph_deploy.new][DEBUG ] Resolving host Lceph-server01
[ceph_deploy.new][DEBUG ] Monitor Lceph-server01 at 192.168.10.241
[ceph_deploy.new][INFO  ] making sure passwordless SSH succeeds
[Lceph-server02][DEBUG ] connected to host: Lceph-server01.lab.gidanet.com.tw
[Lceph-server02][INFO  ] Running command: ssh -CT -o BatchMode=yes Lceph-server02
[Lceph-server02][DEBUG ] connection detected need for sudo
[Lceph-server02][DEBUG ] connected to host: Lceph-server02
[Lceph-server02][DEBUG ] detect platform information from remote host
[Lceph-server02][DEBUG ] detect machine type
[Lceph-server02][DEBUG ] find the location of an executable
[Lceph-server02][INFO  ] Running command: sudo /usr/sbin/ip link show
[Lceph-server02][INFO  ] Running command: sudo /usr/sbin/ip addr show
[Lceph-server02][DEBUG ] IP addresses found: [u'192.168.10.242', u'192.168.122.1' ]
[ceph_deploy.new][DEBUG ] Resolving host Lceph-server02
[ceph_deploy.new][DEBUG ] Monitor Lceph-server02 at 192.168.10.242
[ceph_deploy.new][INFO  ] making sure passwordless SSH succeeds
[Lceph-server03][DEBUG ] connected to host: Lceph-server01.lab.gidanet.com.tw
[Lceph-server03][INFO  ] Running command: ssh -CT -o BatchMode=yes Lceph-server03
[Lceph-server03][DEBUG ] connection detected need for sudo
[Lceph-server03][DEBUG ] connected to host: Lceph-server03
[Lceph-server03][DEBUG ] detect platform information from remote host
[Lceph-server03][DEBUG ] detect machine type
[Lceph-server03][DEBUG ] find the location of an executable
```

```
[Lceph-server03][INFO ] Running command: sudo /usr/sbin/ip link show
[Lceph-server03][INFO ] Running command: sudo /usr/sbin/ip addr show
[Lceph-server03][DEBUG ] IP addresses found: [u'192.168.10.243', u'192.168.122.1' ]
[ceph_deploy.new][DEBUG ] Resolving host Lceph-server03
[ceph_deploy.new][DEBUG ] Monitor Lceph-server03 at 192.168.10.243
[ceph_deploy.new][DEBUG ] Monitor initial members are ['Lceph-server01', 'Lceph-server02', 'Lceph-server03' ]
[ceph_deploy.new][DEBUG ] Monitor addrs are ['192.168.10.241', '192.168.10.242', '192.168.10.243' ]
[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...
```

28. We check the cluster configuration: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ cat ceph.conf
```

[global]

```
fsid = 1dc946aa-f0f3-48d5-a973-e9cd3e4a383b
```

```
mon_initial_members = Lceph-server01, Lceph-server02, Lceph-server03
```

```
mon_host = 192.168.10.241,192.168.10.242,192.168.10.243
```

```
auth_cluster_required = cephx
```

```
auth_service_required = cephx
```

```
auth_client_required = cephx
```

```
[cephuser@Lceph-server01 cluster]$ cp -p ceph.conf ceph.conf.Orig
```

29. We update the cluster configuration by adding network definition: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ vi ceph.conf
```

• • • • •
• • • • •

• • • • •
• • • • •

```
# By default, Ceph makes 3 replicas of objects. If you want to make four copies of
# an object, the default value -- a primary copy and three replica copies -- reset
# the default values as shown in 'osd pool default size'.
# If you want to allow Ceph to write a lesser number of copies in a degraded state,
# set 'osd pool default min size' to a number less than the 'osd pool default size'
# value.
```

```
osd pool default size = 3      # Write an object 3 times.
osd pool default min size = 2  # Allow writing two copies in a degraded state.
```

```
# Ensure you have a realistic number of placement groups. We recommend approximately
# 100 per OSD. E.g., total number of OSDs multiplied by 100 divided by the number of
# replicas (i.e., osd pool default size). So for 10 OSDs and osd pool default size =
# 4, we'd recommend approximately  $(100 * 10) / 4 = 250$ .
```

```
osd pool default pg num = 250
osd pool default pgp num = 250
```

```
# Your network address
public network = 192.168.10.0/24
```

30. We install Ceph on all Ceph storage nodes: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph-deploy install Lceph-server01 Lceph-server02 Lceph-server03
```

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
```

```
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /bin/ceph-deploy install Lceph-server01 Lceph-server02 Lceph-server03
```

```
[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 0x7fea90d74518>
[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 0x7fea91e51a28>
[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             : ['Lceph-server01', 'Lceph-server02', 'Lceph-server03']
[ceph_deploy.cli][INFO ] install_rgw      : False
[ceph_deploy.cli][INFO ] install_tests    : False
[ceph_deploy.cli][INFO ] repo_url         : None
[ceph_deploy.cli][INFO ] ceph_conf        : None
[ceph_deploy.cli][INFO ] install_osd      : False
[ceph_deploy.cli][INFO ] version_kind     : stable
[ceph_deploy.cli][INFO ] install_common   : False
[ceph_deploy.cli][INFO ] overwrite_conf   : False
[ceph_deploy.cli][INFO ] quiet            : False
[ceph_deploy.cli][INFO ] dev              : master
[ceph_deploy.cli][INFO ] nogpgcheck       : False
[ceph_deploy.cli][INFO ] local_mirror     : None

```

```

[ceph_deploy.cli][INFO ] release : None
[ceph_deploy.cli][INFO ] install_mon : False
[ceph_deploy.cli][INFO ] gpg_url : None
[ceph_deploy.install][DEBUG ] Installing stable version mimic on cluster ceph hosts Lceph-server01 Lceph-server02 Lceph-server03
[ceph_deploy.install][DEBUG ] Detecting platform for host Lceph-server01 ...
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
[ceph_deploy.install][INFO ] Distro info: CentOS Linux 7.5.1804 Core
[Lceph-server01][INFO ] installing Ceph on Lceph-server01
[Lceph-server01][INFO ] Running command: sudo yum clean all
[Lceph-server01][DEBUG ] Loaded plugins: fastestmirror, langpacks
[Lceph-server01][DEBUG ] Cleaning repos: base ceph-noarch extras updates
[Lceph-server01][DEBUG ] Cleaning up everything
[Lceph-server01][DEBUG ] Maybe you want: rm -rf /var/cache/yum, to also free up space taken by orphaned data from disabled or removed repos
[Lceph-server01][DEBUG ] Cleaning up list of fastest mirrors
[Lceph-server01][INFO ] Running command: sudo yum -y install epel-release
[Lceph-server01][DEBUG ] Loaded plugins: fastestmirror, langpacks
[Lceph-server01][DEBUG ] Determining fastest mirrors
:::
:::
[Lceph-server03][DEBUG ] Dependencies Resolved
[Lceph-server03][DEBUG ]
[Lceph-server03][DEBUG ] =====
[Lceph-server03][DEBUG ] Package Arch Version Repository Size
[Lceph-server03][DEBUG ]

```



```
[Lceph-server03][DEBUG ] =====
[Lceph-server03][DEBUG ] Installing:
[Lceph-server03][DEBUG ] ceph                x86_64  2:12.2.6-0.el7                ceph    3.0 k
[Lceph-server03][DEBUG ] ceph-radosgw        x86_64  2:12.2.6-0.el7                ceph    3.8 M
[Lceph-server03][DEBUG ] Installing for dependencies:
[Lceph-server03][DEBUG ] ceph-base           x86_64  2:12.2.6-0.el7                ceph    3.9 M
[Lceph-server03][DEBUG ] ceph-common         x86_64  2:12.2.6-0.el7                ceph    15 M
[Lceph-server03][DEBUG ] ceph-mds            x86_64  2:12.2.6-0.el7                ceph    3.6 M
[Lceph-server03][DEBUG ] ceph-mgr            x86_64  2:12.2.6-0.el7                ceph    3.6 M
[Lceph-server03][DEBUG ] ceph-mon            x86_64  2:12.2.6-0.el7                ceph    5.0 M
[Lceph-server03][DEBUG ] ceph-osd            x86_64  2:12.2.6-0.el7                ceph    13 M
[Lceph-server03][DEBUG ] ceph-selinux        x86_64  2:12.2.6-0.el7                ceph    20 k
[Lceph-server03][DEBUG ] leveldb             x86_64  1:12.0-11.el7                 epel    161 k
[Lceph-server03][DEBUG ] libbabeltrace       x86_64  1.2.4-3.el7                   epel    147 k
[Lceph-server03][DEBUG ] libcephfs2          x86_64  2:12.2.6-0.el7                ceph    433 k
[Lceph-server03][DEBUG ] libradosstriper1    x86_64  2:12.2.6-0.el7                ceph    331 k
[Lceph-server03][DEBUG ] librgw2             x86_64  2:12.2.6-0.el7                ceph    1.7 M
[Lceph-server03][DEBUG ] lttng-ust           x86_64  2.4.1-4.el7                   epel    176 k
[Lceph-server03][DEBUG ] mailcap             noarch  2.1.41-2.el7                  base     31 k
[Lceph-server03][DEBUG ] pyOpenSSL           x86_64  0.13.1-3.el7                  base    133 k
[Lceph-server03][DEBUG ] python-babel        noarch  0.9.6-8.el7                   base    1.4 M
[Lceph-server03][DEBUG ] python-beaker        noarch  1.5.4-10.el7                  base     80 k
[Lceph-server03][DEBUG ] python-cephfs       x86_64  2:12.2.6-0.el7                ceph     82 k
[Lceph-server03][DEBUG ] python-cherrypy      noarch  3.2.2-4.el7                   base    422 k
[Lceph-server03][DEBUG ] python-flask         noarch  1:0.10.1-4.el7                extras   204 k
[Lceph-server03][DEBUG ] python-itsdangerous noarch  0.23-2.el7                    extras    24 k
[Lceph-server03][DEBUG ] python-jinja2        noarch  2.7.2-2.el7                   base    515 k
```

```

[Lceph-server03][DEBUG ] python-mako          noarch 0.8.1-2.e17          base 307 k
[Lceph-server03][DEBUG ] python-markupsafe      x86_64 0.11-10.e17          base 25 k
[Lceph-server03][DEBUG ] python-paste           noarch 1.7.5.1-9.20111221hg1498.e17 base 866 k
[Lceph-server03][DEBUG ] python-pecan           noarch 0.4.5-2.e17          epel 255 k
[Lceph-server03][DEBUG ] python-prettytable     noarch 0.7.2-3.e17          base 37 k
[Lceph-server03][DEBUG ] python-rados           x86_64 2:12.2.6-0.e17        ceph 175 k
[Lceph-server03][DEBUG ] python-rbd             x86_64 2:12.2.6-0.e17        ceph 106 k
[Lceph-server03][DEBUG ] python-requests        noarch 2.6.0-1.e17_1         base 94 k
[Lceph-server03][DEBUG ] python-rgw             x86_64 2:12.2.6-0.e17        ceph 73 k
[Lceph-server03][DEBUG ] python-simplegeneric   noarch 0.8-7.e17             epel 12 k
[Lceph-server03][DEBUG ] python-singledispatch  noarch 3.4.0.2-2.e17         epel 18 k
[Lceph-server03][DEBUG ] python-tempita         noarch 0.5.1-6.e17          base 33 k
[Lceph-server03][DEBUG ] python-urllib3         noarch 1.10.2-5.e17          base 102 k
[Lceph-server03][DEBUG ] python-webob           noarch 1.2.3-7.e17          base 202 k
[Lceph-server03][DEBUG ] python-webtest         noarch 1.3.4-6.e17          base 102 k
[Lceph-server03][DEBUG ] python-werkzeug        noarch 0.9.1-2.e17          extras 562 k
[Lceph-server03][DEBUG ] userspace-rcu          x86_64 0.7.16-1.e17          epel 73 k
[Lceph-server03][DEBUG ] Updating for dependencies:
[Lceph-server03][DEBUG ] librados2             x86_64 2:12.2.6-0.e17        ceph 2.9 M
[Lceph-server03][DEBUG ] librbd1               x86_64 2:12.2.6-0.e17        ceph 1.1 M
[Lceph-server03][DEBUG ]
[Lceph-server03][DEBUG ] Transaction Summary
[Lceph-server03][DEBUG ] =====
[Lceph-server03][DEBUG ] Install 2 Packages (+39 Dependent packages)
[Lceph-server03][DEBUG ] Upgrade      ( 2 Dependent packages)
[Lceph-server03][DEBUG ]
[Lceph-server03][DEBUG ] Total download size: 60 M

```

.....

.....

[Lceph-server03][DEBUG] Installed:

[Lceph-server03][DEBUG] ceph.x86_64 2:12.2.6-0.el7 ceph-radosgw.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG]

[Lceph-server03][DEBUG] Dependency Installed:

[Lceph-server03][DEBUG] ceph-base.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] ceph-common.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] ceph-mds.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] ceph-mgr.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] ceph-mon.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] ceph-osd.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] ceph-selinux.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] leveldb.x86_64 0:1.12.0-11.el7

[Lceph-server03][DEBUG] libbabeltrace.x86_64 0:1.2.4-3.el7

[Lceph-server03][DEBUG] libcephfs2.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] libradosstriper1.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] librgw2.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] lttng-ust.x86_64 0:2.4.1-4.el7

[Lceph-server03][DEBUG] mailcap.noarch 0:2.1.41-2.el7

[Lceph-server03][DEBUG] pyOpenSSL.x86_64 0:0.13.1-3.el7

[Lceph-server03][DEBUG] python-babel.noarch 0:0.9.6-8.el7

[Lceph-server03][DEBUG] python-beaker.noarch 0:1.5.4-10.el7

[Lceph-server03][DEBUG] python-cephfs.x86_64 2:12.2.6-0.el7

[Lceph-server03][DEBUG] python-cherrypy.noarch 0:3.2.2-4.el7

[Lceph-server03][DEBUG] python-flask.noarch 1:0.10.1-4.el7

[Lceph-server03][DEBUG] python-itsdangerous.noarch 0:0.23-2.el7

```

[Lceph-server03][DEBUG ] python-jinja2.noarch 0:2.7.2-2.el7
[Lceph-server03][DEBUG ] python-mako.noarch 0:0.8.1-2.el7
[Lceph-server03][DEBUG ] python-markupsafe.x86_64 0:0.11-10.el7
[Lceph-server03][DEBUG ] python-paste.noarch 0:1.7.5.1-9.20111221hg1498.el7
[Lceph-server03][DEBUG ] python-pecan.noarch 0:0.4.5-2.el7
[Lceph-server03][DEBUG ] python-prettytable.noarch 0:0.7.2-3.el7
[Lceph-server03][DEBUG ] python-rados.x86_64 2:12.2.6-0.el7
[Lceph-server03][DEBUG ] python-rbd.x86_64 2:12.2.6-0.el7
[Lceph-server03][DEBUG ] python-requests.noarch 0:2.6.0-1.el7_1
[Lceph-server03][DEBUG ] python-rgw.x86_64 2:12.2.6-0.el7
[Lceph-server03][DEBUG ] python-simplegeneric.noarch 0:0.8-7.el7
[Lceph-server03][DEBUG ] python-singledispatch.noarch 0:3.4.0.2-2.el7
[Lceph-server03][DEBUG ] python-tempita.noarch 0:0.5.1-6.el7
[Lceph-server03][DEBUG ] python-urllib3.noarch 0:1.10.2-5.el7
[Lceph-server03][DEBUG ] python-webob.noarch 0:1.2.3-7.el7
[Lceph-server03][DEBUG ] python-webtest.noarch 0:1.3.4-6.el7
[Lceph-server03][DEBUG ] python-werkzeug.noarch 0:0.9.1-2.el7
[Lceph-server03][DEBUG ] userspace-rcu.x86_64 0:0.7.16-1.el7
[Lceph-server03][DEBUG ]
[Lceph-server03][DEBUG ] Dependency Updated:
[Lceph-server03][DEBUG ] librados2.x86_64 2:12.2.6-0.el7          librbd1.x86_64 2:12.2.6-0.el7
[Lceph-server03][DEBUG ]
[Lceph-server03][DEBUG ] Complete!
[Lceph-server03][INFO ] Running command: sudo ceph --version
[Lceph-server03][DEBUG ] ceph version 12.2.6 (488df8a1076c4f5fc5b8d18a90463262c438740f) luminous (stable)

```

```

[cephuser@Lceph-server01 cluster]# rpm -qa --last | grep -e " Sun 15 Jul 2018 08"

```

ceph-release-1-1.el7.noarch	Sun 15 Jul 2018 08:28:46 PM CST
ceph-radosgw-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:17:10 PM CST
ceph-mgr-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:17:09 PM CST
ceph-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:17:09 PM CST
python-simplegeneric-0.8-7.el7.noarch	Sun 15 Jul 2018 08:17:08 PM CST
python-pecan-0.4.5-2.el7.noarch	Sun 15 Jul 2018 08:17:08 PM CST
python2-six-1.9.0-0.el7.noarch	Sun 15 Jul 2018 08:17:08 PM CST
python2-bcrypt-3.1.4-4.el7.x86_64	Sun 15 Jul 2018 08:17:08 PM CST
mailcap-2.1.41-2.el7.noarch	Sun 15 Jul 2018 08:17:08 PM CST
ceph-osd-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:17:08 PM CST
ceph-mds-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:17:08 PM CST
ceph-mon-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:17:05 PM CST
ceph-selinux-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:52 PM CST
ceph-base-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:51 PM CST
ceph-common-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:50 PM CST
python-urllib3-1.10.2-5.el7.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-singledispatch-3.4.0.2-2.el7.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-requests-2.6.0-1.el7_1.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-pycparser-2.14-1.el7.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-ply-3.4-11.el7.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-jinja2-2.7.2-2.el7.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-cffi-1.6.0-5.el7.x86_64	Sun 15 Jul 2018 08:16:48 PM CST
python-babel-0.9.6-8.el7.noarch	Sun 15 Jul 2018 08:16:48 PM CST
python-werkzeug-0.9.1-2.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-tempita-0.5.1-6.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-routes-1.13-2.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-repoze-lru-0.4-3.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST

python-prettytable-0.7.2-3.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-paste-1.7.5.1-9.20111221hg1498.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-mako-0.8.1-2.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-cherrypy-3.2.2-4.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
python-beaker-1.5.4-10.el7.noarch	Sun 15 Jul 2018 08:16:47 PM CST
libradosstriper1-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:47 PM CST
libbbltrace-1.2.4-3.el7.x86_64	Sun 15 Jul 2018 08:16:47 PM CST
python-rgw-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
python-rbd-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
python-rados-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
python-cephfs-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
librgw2-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
librbd1-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
librados2-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
libcephfs2-13.2.0-0.el7.x86_64	Sun 15 Jul 2018 08:16:46 PM CST
userspace-rcu-0.7.16-1.el7.x86_64	Sun 15 Jul 2018 08:16:45 PM CST
python-webtest-1.3.4-6.el7.noarch	Sun 15 Jul 2018 08:16:45 PM CST
python-webob-1.2.3-7.el7.noarch	Sun 15 Jul 2018 08:16:45 PM CST
python-markupsafe-0.11-10.el7.x86_64	Sun 15 Jul 2018 08:16:45 PM CST
pyOpenSSL-0.13.1-3.el7.x86_64	Sun 15 Jul 2018 08:16:45 PM CST
ltnng-ust-2.4.1-4.el7.x86_64	Sun 15 Jul 2018 08:16:45 PM CST
liboath-2.4.1-9.el7.x86_64	Sun 15 Jul 2018 08:16:45 PM CST
leveldb-1.12.0-11.el7.x86_64	Sun 15 Jul 2018 08:16:45 PM CST
gpg-pubkey-352c64e5-52ae6884	Sun 15 Jul 2018 08:15:38 PM CST
yum-plugin-priorities-1.1.31-45.el7.noarch	Sun 15 Jul 2018 08:05:54 PM CST
epel-release-7-11.noarch	Sun 15 Jul 2018 08:04:52 PM CST

31. Based on timestamp, we check how many Ceph related rpms installed: (executed on all Ceph storage server nodes)

```
[cephuser@Lceph-server01 cluster]$ rpm -qa --last | grep -e " Sun 15 Jul 2018 08" | wc -L
```

53

```
[cephuser@Lceph-server02 ~]$ rpm -qa --last | grep -e " Sun 15 Jul 2018 08" | wc -L
```

53

```
[cephuser@Lceph-server03 ~]$ rpm -qa --last | grep -e " Sun 15 Jul 2018 08" | wc -L
```

53

```
[cephuser@Lceph-server01 cluster]$ systemctl | grep ceph
```

ceph-mds.target	loaded active active
ceph target allowing to start/stop all ceph-mds@.service instances at once	
ceph-mgr.target	loaded active active
ceph target allowing to start/stop all ceph-mgr@.service instances at once	
ceph-mon.target	loaded active active
ceph target allowing to start/stop all ceph-mon@.service instances at once	
ceph-osd.target	loaded active active
ceph target allowing to start/stop all ceph-osd@.service instances at once	
ceph-radosgw.target	loaded active active
ceph target allowing to start/stop all ceph-radosgw@.service instances at once	
ceph.target	loaded active active
ceph target allowing to start/stop all ceph*@.service instances at once	

32. We deploy ceph-mon for all Ceph storage server nodes: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph-deploy mon create-initial
```

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
```

```

[ceph_deploy.cli][INFO ] Invoked (2.0.1): /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 0x7efe514915a8>
[ceph_deploy.cli][INFO ] cluster                  : ceph
[ceph_deploy.cli][INFO ] func                     : <function mon at 0x7efe516e7848>
[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 Lceph-server01 Lceph-server02 Lceph-server03
[ceph_deploy.mon][DEBUG ] detecting platform for host Lceph-server01 ...
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
[Lceph-server01][DEBUG ] find the location of an executable
[ceph_deploy.mon][INFO ] distro info: CentOS Linux 7.5.1804 Core
[Lceph-server01][DEBUG ] determining if provided host has same hostname in remote
[Lceph-server01][DEBUG ] get remote short hostname
[Lceph-server01][DEBUG ] deploying mon to Lceph-server01
[Lceph-server01][DEBUG ] get remote short hostname
[Lceph-server01][DEBUG ] remote hostname: Lceph-server01
[Lceph-server01][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf

```



```

[Lceph-server01][DEBUG ] create the mon path if it does not exist
[Lceph-server01][DEBUG ] checking for done path: /var/lib/ceph/mon/ceph-Lceph-server01/done
[Lceph-server01][DEBUG ] create a done file to avoid re-doing the mon deployment
[Lceph-server01][DEBUG ] create the init path if it does not exist
[Lceph-server01][INFO  ] Running command: sudo systemctl enable ceph.target
[Lceph-server01][INFO  ] Running command: sudo systemctl enable ceph-mon@Lceph-server01
[Lceph-server01][INFO  ] Running command: sudo systemctl start ceph-mon@Lceph-server01
[Lceph-server01][INFO  ] Running command: sudo ceph --cluster=ceph --admin-daemon /var/run/ceph/ceph-mon.Lceph-server01.asok mon_status
[Lceph-server01][DEBUG ] *****
[Lceph-server01][DEBUG ] status for monitor: mon.Lceph-server01
[Lceph-server01][DEBUG ] {
[Lceph-server01][DEBUG ]   "election_epoch": 6,
[Lceph-server01][DEBUG ]   "extra_probe_peers": [
[Lceph-server01][DEBUG ]     "192.168.10.242:6789/0",
[Lceph-server01][DEBUG ]     "192.168.10.243:6789/0"
[Lceph-server01][DEBUG ]   ],
[Lceph-server01][DEBUG ]   "feature_map": {
[Lceph-server01][DEBUG ]     "mon": [
[Lceph-server01][DEBUG ]       {
[Lceph-server01][DEBUG ]         "features": "0x1ffddff8ffa4fffb",
[Lceph-server01][DEBUG ]         "num": 1,
[Lceph-server01][DEBUG ]         "release": "luminous"
[Lceph-server01][DEBUG ]       }
[Lceph-server01][DEBUG ]     ]
[Lceph-server01][DEBUG ]   },
[Lceph-server01][DEBUG ]   "features": {
[Lceph-server01][DEBUG ]     "quorum_con": "2305244844817448955",

```

```

[Lceph-server01][DEBUG ] "quorum_mon": [
[Lceph-server01][DEBUG ]     "kraken",
[Lceph-server01][DEBUG ]     "luminous",
[Lceph-server01][DEBUG ]     "mimic",
[Lceph-server01][DEBUG ]     "osdmap-prune"
[Lceph-server01][DEBUG ] ],
[Lceph-server01][DEBUG ] "required_con": "144115738102218752",
[Lceph-server01][DEBUG ] "required_mon": [
[Lceph-server01][DEBUG ]     "kraken",
[Lceph-server01][DEBUG ]     "luminous",
[Lceph-server01][DEBUG ]     "mimic",
[Lceph-server01][DEBUG ]     "osdmap-prune"
[Lceph-server01][DEBUG ] ]
[Lceph-server01][DEBUG ] },
[Lceph-server01][DEBUG ] "monmap": {
[Lceph-server01][DEBUG ]     "created": "2018-07-15 20:55:21.655095",
[Lceph-server01][DEBUG ]     "epoch": 1,
[Lceph-server01][DEBUG ]     "features": {
[Lceph-server01][DEBUG ]         "optional": [],
[Lceph-server01][DEBUG ]         "persistent": [
[Lceph-server01][DEBUG ]             "kraken",
[Lceph-server01][DEBUG ]             "luminous",
[Lceph-server01][DEBUG ]             "mimic",
[Lceph-server01][DEBUG ]             "osdmap-prune"
[Lceph-server01][DEBUG ]         ]
[Lceph-server01][DEBUG ]     },
[Lceph-server01][DEBUG ]     "fsid": "1dc946aa-f0f3-48d5-a973-e9cd3e4a383b",

```

```

[Lceph-server01][DEBUG ] "modified": "2018-07-15 20:55:21.655095",
[Lceph-server01][DEBUG ] "mons": [
[Lceph-server01][DEBUG ] {
[Lceph-server01][DEBUG ]   "addr": "192.168.10.241:6789/0",
[Lceph-server01][DEBUG ]   "name": "Lceph-server01",
[Lceph-server01][DEBUG ]   "public_addr": "192.168.10.241:6789/0",
[Lceph-server01][DEBUG ]   "rank": 0
[Lceph-server01][DEBUG ] },
[Lceph-server01][DEBUG ] {
[Lceph-server01][DEBUG ]   "addr": "192.168.10.242:6789/0",
[Lceph-server01][DEBUG ]   "name": "Lceph-server02",
[Lceph-server01][DEBUG ]   "public_addr": "192.168.10.242:6789/0",
[Lceph-server01][DEBUG ]   "rank": 1
[Lceph-server01][DEBUG ] },
[Lceph-server01][DEBUG ] {
[Lceph-server01][DEBUG ]   "addr": "192.168.10.243:6789/0",
[Lceph-server01][DEBUG ]   "name": "Lceph-server03",
[Lceph-server01][DEBUG ]   "public_addr": "192.168.10.243:6789/0",
[Lceph-server01][DEBUG ]   "rank": 2
[Lceph-server01][DEBUG ] }
[Lceph-server01][DEBUG ] ]
[Lceph-server01][DEBUG ] },
[Lceph-server01][DEBUG ] "name": "Lceph-server01",
[Lceph-server01][DEBUG ] "outside_quorum": [],
[Lceph-server01][DEBUG ] "quorum": [
[Lceph-server01][DEBUG ]   0,
[Lceph-server01][DEBUG ]   1

```

```

[Lceph-server01][DEBUG ] ],
[Lceph-server01][DEBUG ] "rank": 0,
[Lceph-server01][DEBUG ] "state": "leader",
[Lceph-server01][DEBUG ] "sync_provider": []
[Lceph-server01][DEBUG ] }
[Lceph-server01][DEBUG ] *****
[Lceph-server01][INFO ] monitor: mon.Lceph-server01 is running
[Lceph-server01][INFO ] Running command: sudo ceph --cluster=ceph --admin-daemon /var/run/ceph/ceph-mon.Lceph-server01.asok mon_status
:::~::~
:::~::~
[ceph_deploy.mon][INFO ] processing monitor mon.Lceph-server01
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
[Lceph-server01][DEBUG ] find the location of an executable
[Lceph-server01][INFO ] Running command: sudo ceph --cluster=ceph --admin-daemon /var/run/ceph/ceph-mon.Lceph-server01.asok mon_status
[ceph_deploy.mon][INFO ] mon.Lceph-server01 monitor has reached quorum!
[ceph_deploy.mon][INFO ] processing monitor mon.Lceph-server02
[Lceph-server02][DEBUG ] connection detected need for sudo
[Lceph-server02][DEBUG ] connected to host: Lceph-server02
[Lceph-server02][DEBUG ] detect platform information from remote host
[Lceph-server02][DEBUG ] detect machine type
[Lceph-server02][DEBUG ] find the location of an executable
[Lceph-server02][INFO ] Running command: sudo ceph --cluster=ceph --admin-daemon /var/run/ceph/ceph-mon.Lceph-server02.asok mon_status
[ceph_deploy.mon][INFO ] mon.Lceph-server02 monitor has reached quorum!
[ceph_deploy.mon][INFO ] processing monitor mon.Lceph-server03

```

```
[Lceph-server03][DEBUG ] connection detected need for sudo
[Lceph-server03][DEBUG ] connected to host: Lceph-server03
[Lceph-server03][DEBUG ] detect platform information from remote host
[Lceph-server03][DEBUG ] detect machine type
[Lceph-server03][DEBUG ] find the location of an executable
[Lceph-server03][INFO  ] Running command: sudo ceph --cluster=ceph --admin-daemon /var/run/ceph/ceph-mon.Lceph-server03.asok mon_status
[ceph_deploy.mon][INFO  ] mon.Lceph-server03 monitor has reached quorum!
[ceph_deploy.mon][INFO  ] all initial monitors are running and have formed quorum
[ceph_deploy.mon][INFO  ] Running gatherkeys...
[ceph_deploy.gatherkeys][INFO  ] Storing keys in temp directory /tmp/tmpv0Bphy
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
[Lceph-server01][DEBUG ] get remote short hostname
[Lceph-server01][DEBUG ] fetch remote file
[Lceph-server01][INFO  ] Running command: sudo /usr/bin/ceph --connect-timeout=25 --cluster=ceph --admin-daemon=/var/run/ceph/ceph-mon.Lceph-server01.asok mon_status
[Lceph-server01][INFO  ] Running command: sudo /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name mon. --keyring=/var/lib/ceph/mon/ceph-Lceph-server01/keyring auth get client.admin
[Lceph-server01][INFO  ] Running command: sudo /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name mon. --keyring=/var/lib/ceph/mon/ceph-Lceph-server01/keyring auth get client.bootstrap-mds
[Lceph-server01][INFO  ] Running command: sudo /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name mon. --keyring=/var/lib/ceph/mon/ceph-Lceph-server01/keyring auth get client.bootstrap-mgr
[Lceph-server01][INFO  ] Running command: sudo /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name mon. --keyring=/var/lib/ceph/mon/ceph-Lceph-server01/keyring auth get client.bootstrap-osd
[Lceph-server01][INFO  ] Running command: sudo /usr/bin/ceph --connect-timeout=25 --cluster=ceph --name mon. --
```

```
keyring=/var/lib/ceph/mon/ceph-Lceph-server01/keyring auth get client.bootstrap-rgw
[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/tmpv0Bphy
```

33. We use command to check the relationship of ceph-mon on all Ceph server nodes:

```
[cephuser@Lceph-server01 cluster]$ sudo netstat -antlp | grep mon
```

```
tcp        0      0 192.168.10.241:6789    0.0.0.0:*               LISTEN      72240/ceph-mon
tcp        0      0 192.168.10.241:6789    192.168.10.243:35656    ESTABLISHED 72240/ceph-mon
tcp        0      0 192.168.10.241:36370   192.168.10.242:6789     ESTABLISHED 72240/ceph-mon
```

```
[cephuser@Lceph-server02 ~]$ sudo netstat -antlp | grep mon
```

```
tcp        0      0 192.168.10.242:6789    0.0.0.0:*               LISTEN      71978/ceph-mon
tcp        0      0 192.168.10.242:6789    192.168.10.243:53624    ESTABLISHED 71978/ceph-mon
tcp        0      0 192.168.10.242:6789    192.168.10.241:36370    ESTABLISHED 71978/ceph-mon
```

```
[cephuser@Lceph-server03 ~]$ sudo netstat -antlp | grep mon
```

```
tcp        0      0 192.168.10.243:6789    0.0.0.0:*               LISTEN      72690/ceph-mon
tcp        0      0 192.168.10.243:35656   192.168.10.241:6789     ESTABLISHED 72690/ceph-mon
tcp        0      0 192.168.10.243:53624   192.168.10.242:6789     ESTABLISHED 72690/ceph-mon
```

34. We list keyring files: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ls -alt
```

```
total 340
drwxrwxr-x 2 cephuser cephuser 4096 Jul 15 21:06 .
-rw-rw-r-- 1 cephuser cephuser 301470 Jul 15 21:06 ceph-deploy-ceph.log
-rw----- 1 cephuser cephuser 113 Jul 15 21:06 ceph.bootstrap-rgw.keyring
-rw----- 1 cephuser cephuser 113 Jul 15 21:06 ceph.bootstrap-osd.keyring
-rw----- 1 cephuser cephuser 113 Jul 15 21:06 ceph.bootstrap-mgr.keyring
-rw----- 1 cephuser cephuser 113 Jul 15 21:06 ceph.bootstrap-mds.keyring
-rw----- 1 cephuser cephuser 151 Jul 15 21:06 ceph.client.admin.keyring
drwx----- 7 cephuser cephuser 4096 Jul 15 19:25 ..
-rw-rw-r-- 1 cephuser cephuser 1233 Jul 15 19:25 ceph.conf
-rw-rw-r-- 1 cephuser cephuser 268 Jul 15 19:03 ceph.conf.Orig
-rw----- 1 cephuser cephuser 73 Jul 15 19:03 ceph.mon.keyring
```

35. We deploy the management key to all Ceph storage nodes: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph-deploy admin Lceph-server01 Lceph-server02 Lceph-server03
```

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
[ceph_deploy.cli][INFO ] Invoked (2.0.1): /bin/ceph-deploy admin Lceph-server01 Lceph-server02 Lceph-server03
[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 0x7f6cedd68c68>
[ceph_deploy.cli][INFO ] cluster                 : ceph
[ceph_deploy.cli][INFO ] client                  : ['Lceph-server01', 'Lceph-server02', 'Lceph-server03']
[ceph_deploy.cli][INFO ] func                    : <function admin at 0x7f6cee5f3668>
[ceph_deploy.cli][INFO ] ceph_conf                : None
```

```

[ceph_deploy.cli][INFO ] default_release : False
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to Lceph-server01
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
[Lceph-server01][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to Lceph-server02
[Lceph-server02][DEBUG ] connection detected need for sudo
[Lceph-server02][DEBUG ] connected to host: Lceph-server02
[Lceph-server02][DEBUG ] detect platform information from remote host
[Lceph-server02][DEBUG ] detect machine type
[Lceph-server02][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[ceph_deploy.admin][DEBUG ] Pushing admin keys and conf to Lceph-server03
[Lceph-server03][DEBUG ] connection detected need for sudo
[Lceph-server03][DEBUG ] connected to host: Lceph-server03
[Lceph-server03][DEBUG ] detect platform information from remote host
[Lceph-server03][DEBUG ] detect machine type
[Lceph-server03][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf

```

36. We change permission so the management key can be read by non-root user: (executed on all Ceph storage server nodes)

```
[cephuser@Lceph-server01 cluster]$ sudo chmod +r /etc/ceph/ceph.client.admin.keyring
```

37. We install jq package for JSON output processing: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# yum -y install jq
```

```
.....
```

```
Installed:
```


jq.x86_64 0:1.5-1.el7

Dependency Installed:

oniguruma.x86_64 0:5.9.5-3.el7

Complete!

38. We check Ceph cluster status: (executed on any Ceph storage server node)

[root@Lceph-server01 ~]# ceph --cluster ceph quorum_status | jq

```
{
  "election_epoch": 10,
  "quorum": [
    0,
    1,
    2
  ],
  "quorum_names": [
    "Lceph-server01",
    "Lceph-server02",
    "Lceph-server03"
  ],
  "quorum_leader_name": "Lceph-server01",
  "monmap": {
    "epoch": 1,
    "fsid": "1dc946aa-f0f3-48d5-a973-e9cd3e4a383b",
    "modified": "2018-07-15 20:55:21.655095",
    "created": "2018-07-15 20:55:21.655095",
```

```
"features": {
  "persistent": [
    "kraken",
    "luminous",
    "mimic",
    "osdmap-prune"
  ],
  "optional": []
},
"mons": [
  {
    "rank": 0,
    "name": "Lceph-server01",
    "addr": "192.168.10.241:6789/0",
    "public_addr": "192.168.10.241:6789/0"
  },
  {
    "rank": 1,
    "name": "Lceph-server02",
    "addr": "192.168.10.242:6789/0",
    "public_addr": "192.168.10.242:6789/0"
  },
  {
    "rank": 2,
    "name": "Lceph-server03",
    "addr": "192.168.10.243:6789/0",
    "public_addr": "192.168.10.243:6789/0"
  }
]
```

```
}  
]  
}  
}
```

```
[root@Lceph-server01 ~]# ceph quorum_status --format json-pretty
```

```
{  
  "election_epoch": 10,  
  "quorum": [  
    0,  
    1,  
    2  
  ],  
  "quorum_names": [  
    "Lceph-server01",  
    "Lceph-server02",  
    "Lceph-server03"  
  ],  
  "quorum_leader_name": "Lceph-server01",  
  "monmap": {  
    "epoch": 1,  
    "fsid": "1dc946aa-f0f3-48d5-a973-e9cd3e4a383b",  
    "modified": "2018-07-15 20:55:21.655095",  
    "created": "2018-07-15 20:55:21.655095",  
    "features": {  
      "persistent": [  

```

```

        "kraken",
        "luminous",
        "mimic",
        "osdmap-prune"
    ],
    "optional": []
},
"mons": [
    {
        "rank": 0,
        "name": "Lceph-server01",
        "addr": "192.168.10.241:6789/0",
        "public_addr": "192.168.10.241:6789/0"
    },
    {
        "rank": 1,
        "name": "Lceph-server02",
        "addr": "192.168.10.242:6789/0",
        "public_addr": "192.168.10.242:6789/0"
    },
    {
        "rank": 2,
        "name": "Lceph-server03",
        "addr": "192.168.10.243:6789/0",
        "public_addr": "192.168.10.243:6789/0"
    }
]

```

```
}  
}
```

39. We use command to scan newly added SCSI disks without rebooting server: (executed on all Ceph storage server nodes)

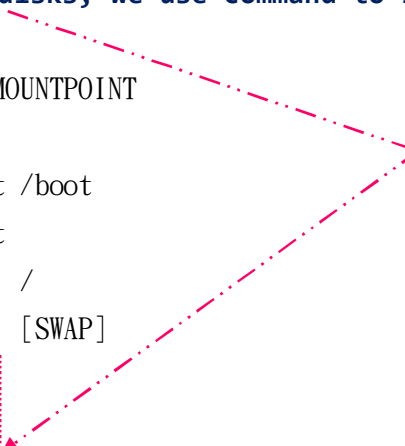
```
[root@Lceph-server01 ~]# grep mpt /sys/class/scsi_host/host?/proc_name  
/sys/class/scsi_host/host2/proc_name:mptspi
```

```
[root@Lceph-server01 ~]# echo "- - -" > /sys/class/scsi_host/host2/scan
```

40. After scanning newly added SCSI disks, we use command to list them: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# lsblk
```

NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINT
sda	8:0	0	32G	0	disk	
└─sda1	8:1	0	400M	0	part	/boot
└─sda2	8:2	0	31.6G	0	part	
└─vg00-root	253:0	0	27.6G	0	lvm	/
└─vg00-swap	253:1	0	4G	0	lvm	[SWAP]
sdb	8:16	0	180G	0	disk	
sdc	8:32	0	180G	0	disk	
sdd	8:48	0	180G	0	disk	
sde	8:64	0	180G	0	disk	
sr0	11:0	1	4.2G	0	rom	



41. We change user to cephuser again to check and add OSDs to cluster: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# su - cephuser
```

```
[cephuser@Lceph-server01 ~]$ cd cluster
```

```
[cephuser@Lceph-server01 cluster]$ ceph-deploy disk list Lceph-server01 Lceph-server02 Lceph-server03 2>&1 | grep 193.3
```

```
[Lceph-server01][INFO ] Disk /dev/sdb: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server01][INFO ] Disk /dev/sdc: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server01][INFO ] Disk /dev/sdd: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server01][INFO ] Disk /dev/sde: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server02][INFO ] Disk /dev/sdb: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server02][INFO ] Disk /dev/sdc: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server02][INFO ] Disk /dev/sdd: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server02][INFO ] Disk /dev/sde: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server03][INFO ] Disk /dev/sdb: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server03][INFO ] Disk /dev/sdc: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server03][INFO ] Disk /dev/sdd: 193.3 GB, 193273528320 bytes, 377487360 sectors
[Lceph-server03][INFO ] Disk /dev/sde: 193.3 GB, 193273528320 bytes, 377487360 sectors
```

42. We use a simple command pipeline to compose command line option used by ceph-deploy command to create OSDs: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ for SERVER_DISKS in `ceph-deploy disk list Lceph-server01 Lceph-server02 Lceph-server03 2>&1 | grep -e 193.3 | awk -F: '{ print $1 }' | cut -c 2- | sed -e 's/\][INFO \] Disk /\:/'`; do echo ${SERVER_DISKS}; done
```

```
Lceph-server01:/dev/sdb
Lceph-server01:/dev/sdc
Lceph-server01:/dev/sdd
Lceph-server01:/dev/sde
Lceph-server02:/dev/sdb
Lceph-server02:/dev/sdc
Lceph-server02:/dev/sdd
Lceph-server02:/dev/sde
```

```
Lceph-server03:/dev/sdb
Lceph-server03:/dev/sdc
Lceph-server03:/dev/sdd
Lceph-server03:/dev/sde
```

43. We use “ceph-deploy disk zap” command to erase a device's partition table and contents: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ for SERVER_DISKS in `ceph-deploy disk list Lceph-server01 Lceph-server02 Lceph-server03 2>&1 | grep
-e 193.3 | awk -F: '{ print $1 }' | cut -c 2- | sed -e 's/\)\[INFO \] Disk /\:/'`; do echo "ceph-deploy disk zap `echo
${SERVER_DISKS} | sed -e 's:/: /'`; done
ceph-deploy disk zap Lceph-server01 /dev/sdb
ceph-deploy disk zap Lceph-server01 /dev/sdc
ceph-deploy disk zap Lceph-server01 /dev/sdd
ceph-deploy disk zap Lceph-server01 /dev/sde
ceph-deploy disk zap Lceph-server02 /dev/sdb
ceph-deploy disk zap Lceph-server02 /dev/sdc
ceph-deploy disk zap Lceph-server02 /dev/sdd
ceph-deploy disk zap Lceph-server02 /dev/sde
ceph-deploy disk zap Lceph-server03 /dev/sdb
ceph-deploy disk zap Lceph-server03 /dev/sdc
ceph-deploy disk zap Lceph-server03 /dev/sdd
ceph-deploy disk zap Lceph-server03 /dev/sde
```

```
[cephuser@Lceph-server01 cluster]$ for SERVER_DISKS in `ceph-deploy disk list Lceph-server01 Lceph-server02 Lceph-server03 2>&1 | grep
-e 193.3 | awk -F: '{ print $1 }' | cut -c 2- | sed -e 's/\)\[INFO \] Disk /\:/'`
> do
>     ceph-deploy disk zap `echo ${SERVER_DISKS} | sed -e 's:/: /'`
```

```

> done
:::
:::
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
[ceph_deploy.cli][INFO ] Invoked (2.0.1): /bin/ceph-deploy disk zap Lceph-server03 /dev/sde
[ceph_deploy.cli][INFO ] ceph-deploy options:
[ceph_deploy.cli][INFO ] username                : None
[ceph_deploy.cli][INFO ] verbose                : False
[ceph_deploy.cli][INFO ] debug                  : False
[ceph_deploy.cli][INFO ] overwrite_conf         : False
[ceph_deploy.cli][INFO ] subcommand              : zap
[ceph_deploy.cli][INFO ] quiet                  : False
[ceph_deploy.cli][INFO ] cd_conf                 : <ceph_deploy.conf.cephdeploy.Conf instance at 0x7fa124bf8560>
[ceph_deploy.cli][INFO ] cluster                 : ceph
[ceph_deploy.cli][INFO ] host                    : Lceph-server03
[ceph_deploy.cli][INFO ] func                    : <function disk at 0x7fa124e33d70>
[ceph_deploy.cli][INFO ] ceph_conf                : None
[ceph_deploy.cli][INFO ] default_release         : False
[ceph_deploy.cli][INFO ] disk                    : ['/dev/sde']
[ceph_deploy.osd][DEBUG ] zapping /dev/sde on Lceph-server03
[Lceph-server03][DEBUG ] connection detected need for sudo
[Lceph-server03][DEBUG ] connected to host: Lceph-server03
[Lceph-server03][DEBUG ] detect platform information from remote host
[Lceph-server03][DEBUG ] detect machine type
[Lceph-server03][DEBUG ] find the location of an executable
[ceph_deploy.osd][INFO ] Distro info: CentOS Linux 7.5.1804 Core
[Lceph-server03][DEBUG ] zeroing last few blocks of device

```



```
[Lceph-server03][DEBUG ] find the location of an executable
[Lceph-server03][INFO  ] Running command: sudo /usr/sbin/ceph-volume lvm zap /dev/sde
[Lceph-server03][DEBUG ] --> Zapping: /dev/sde
[Lceph-server03][DEBUG ] Running command: /usr/sbin/cryptsetup status /dev/mapper/
[Lceph-server03][DEBUG ] stdout: /dev/mapper/ is inactive.
[Lceph-server03][DEBUG ] Running command: /usr/sbin/wipefs --all /dev/sde
[Lceph-server03][DEBUG ] Running command: /bin/dd if=/dev/zero of=/dev/sde bs=1M count=10
[Lceph-server03][DEBUG ] stderr: 10+0 records in
[Lceph-server03][DEBUG ] 10+0 records out
[Lceph-server03][DEBUG ] 10485760 bytes (10 MB) copied
[Lceph-server03][DEBUG ] stderr: , 0.016499 s, 636 MB/s
[Lceph-server03][DEBUG ] --> Zapping successful for: /dev/sde
```

44. We use “ceph-deploy osd create” command to create disks for Ceph OSDs: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ for SERVER_DISKS in `ceph-deploy disk list Lceph-server01 Lceph-server02 Lceph-server03 2>&1 | grep
-e 193.3 | awk -F: '{ print $1 }' | cut -c 2- | sed -e 's/\][INFO \] Disk /\:/' | grep -v mapper`
> do
>     ceph-deploy osd create `echo ${SERVER_DISKS} | sed -e 's/\: / /' | awk '{ printf( "%s --data %s --journal %s\n", $1, $2, $2 ) }`
> done
:::
:::
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
[ceph_deploy.cli][INFO  ] Invoked (2.0.1): /bin/ceph-deploy osd create Lceph-server03 --data /dev/sde --journal /dev/sde
[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 0x7faa706e96c8>
```

```

[ceph_deploy.cli][INFO ] cluster           : ceph
[ceph_deploy.cli][INFO ] fs_type       : xfs
[ceph_deploy.cli][INFO ] block_wal     : None
[ceph_deploy.cli][INFO ] default_release : False
[ceph_deploy.cli][INFO ] username      : None
[ceph_deploy.cli][INFO ] journal       : /dev/sde
[ceph_deploy.cli][INFO ] subcommand    : create
[ceph_deploy.cli][INFO ] host          : Lceph-server03
[ceph_deploy.cli][INFO ] filestore     : None
[ceph_deploy.cli][INFO ] func          : <function osd at 0x7faa7091ecf8>
[ceph_deploy.cli][INFO ] ceph_conf     : None
[ceph_deploy.cli][INFO ] zap_disk      : False
[ceph_deploy.cli][INFO ] data          : /dev/sde
[ceph_deploy.cli][INFO ] block_db      : None
[ceph_deploy.cli][INFO ] dmccrypt      : False
[ceph_deploy.cli][INFO ] overwrite_conf : False
[ceph_deploy.cli][INFO ] dmccrypt_key_dir : /etc/ceph/dmccrypt-keys
[ceph_deploy.cli][INFO ] quiet         : False
[ceph_deploy.cli][INFO ] debug         : False
[ceph_deploy.osd][DEBUG ] Creating OSD on cluster ceph with data device /dev/sde
[Lceph-server03][DEBUG ] connection detected need for sudo
[Lceph-server03][DEBUG ] connected to host: Lceph-server03
[Lceph-server03][DEBUG ] detect platform information from remote host
[Lceph-server03][DEBUG ] detect machine type
[Lceph-server03][DEBUG ] find the location of an executable
[ceph_deploy.osd][INFO ] Distro info: CentOS Linux 7.5.1804 Core
[ceph_deploy.osd][DEBUG ] Deploying osd to Lceph-server03

```

```

[Lceph-server03][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[Lceph-server03][DEBUG ] find the location of an executable
[Lceph-server03][INFO  ] Running command: sudo /usr/sbin/ceph-volume --cluster ceph lvm create --bluestore --data /dev/sde
[Lceph-server03][DEBUG ] Running command: /bin/ceph-authtool --gen-print-key
[Lceph-server03][DEBUG ] Running command: /bin/ceph --cluster ceph --name client.bootstrap-osd --keyring /var/lib/ceph/bootstrap-
osd/ceph.keyring -i - osd new c616655f-73f2-4581-9f3c-ba2865b9e5fb
[Lceph-server03][DEBUG ] Running command: /usr/sbin/vgcreate --force --yes ceph-2f291091-9a3c-4bb4-ace2-77e0b7e60c8d /dev/sde
[Lceph-server03][DEBUG ] stdout: Physical volume "/dev/sde" successfully created.
[Lceph-server03][DEBUG ] stdout: Volume group "ceph-2f291091-9a3c-4bb4-ace2-77e0b7e60c8d" successfully created
[Lceph-server03][DEBUG ] Running command: /usr/sbin/lvcreate --yes -l 100%FREE -n osd-block-c616655f-73f2-4581-9f3c-ba2865b9e5fb ceph-
2f291091-9a3c-4bb4-ace2-77e0b7e60c8d
[Lceph-server03][DEBUG ] stdout: Logical volume "osd-block-c616655f-73f2-4581-9f3c-ba2865b9e5fb" created.
[Lceph-server03][DEBUG ] Running command: /bin/ceph-authtool --gen-print-key
[Lceph-server03][DEBUG ] Running command: /bin/mount -t tmpfs tmpfs /var/lib/ceph/osd/ceph-11
[Lceph-server03][DEBUG ] Running command: /bin/chown -R ceph:ceph /dev/dm-5
[Lceph-server03][DEBUG ] Running command: /bin/ln -s /dev/ceph-2f291091-9a3c-4bb4-ace2-77e0b7e60c8d/osd-block-c616655f-73f2-4581-9f3c-
ba2865b9e5fb /var/lib/ceph/osd/ceph-11/block
[Lceph-server03][DEBUG ] Running command: /bin/ceph --cluster ceph --name client.bootstrap-osd --keyring /var/lib/ceph/bootstrap-
osd/ceph.keyring mon getmap -o /var/lib/ceph/osd/ceph-11/activate.monmap
[Lceph-server03][DEBUG ] stderr: got monmap epoch 1
[Lceph-server03][DEBUG ] Running command: /bin/ceph-authtool /var/lib/ceph/osd/ceph-11/keyring --create-keyring --name osd.11 --add-key
AQDgXlFbe+IXIxAAU1oMHKbNCWzm4vYAlsltcQ==
[Lceph-server03][DEBUG ] stdout: creating /var/lib/ceph/osd/ceph-11/keyring
[Lceph-server03][DEBUG ] added entity osd.11 auth auth(auid = 18446744073709551615 key=AQDgXlFbe+IXIxAAU1oMHKbNCWzm4vYAlsltcQ== with 0 caps)
[Lceph-server03][DEBUG ] Running command: /bin/chown -R ceph:ceph /var/lib/ceph/osd/ceph-11/keyring
[Lceph-server03][DEBUG ] Running command: /bin/chown -R ceph:ceph /var/lib/ceph/osd/ceph-11/
[Lceph-server03][DEBUG ] Running command: /bin/ceph-osd --cluster ceph --osd-objectstore bluestore --mkfs -i 11 --monmap

```

```

/var/lib/ceph/osd/ceph-11/activate.monmap --keyfile - --osd-data /var/lib/ceph/osd/ceph-11/ --osd-uuid c616655f-73f2-4581-9f3c-ba2865b9e5fb
--setuser ceph --setgroup ceph
[Lceph-server03][DEBUG ] --> ceph-volume lvm prepare successful for: /dev/sde
[Lceph-server03][DEBUG ] Running command: /bin/ceph-bluestore-tool --cluster=ceph prime-osd-dir --dev /dev/ceph-2f291091-9a3c-4bb4-ace2-77e0b7e60c8d/osd-block-c616655f-73f2-4581-9f3c-ba2865b9e5fb --path /var/lib/ceph/osd/ceph-11
[Lceph-server03][DEBUG ] Running command: /bin/ln -snf /dev/ceph-2f291091-9a3c-4bb4-ace2-77e0b7e60c8d/osd-block-c616655f-73f2-4581-9f3c-ba2865b9e5fb /var/lib/ceph/osd/ceph-11/block
[Lceph-server03][DEBUG ] Running command: /bin/chown -R ceph:ceph /dev/dm-5
[Lceph-server03][DEBUG ] Running command: /bin/chown -R ceph:ceph /var/lib/ceph/osd/ceph-11
[Lceph-server03][DEBUG ] Running command: /bin/systemctl enable ceph-volume@lvm-11-c616655f-73f2-4581-9f3c-ba2865b9e5fb
[Lceph-server03][DEBUG ] stderr: Created symlink from /etc/systemd/system/multi-user.target.wants/ceph-volume@lvm-11-c616655f-73f2-4581-9f3c-ba2865b9e5fb.service to /usr/lib/systemd/system/ceph-volume@.service.
[Lceph-server03][DEBUG ] Running command: /bin/systemctl start ceph-osd@11
[Lceph-server03][DEBUG ] --> ceph-volume lvm activate successful for osd ID: 11
[Lceph-server03][DEBUG ] --> ceph-volume lvm create successful for: /dev/sde
[Lceph-server03][INFO ] checking OSD status...
[Lceph-server03][DEBUG ] find the location of an executable
[Lceph-server03][INFO ] Running command: sudo /bin/ceph --cluster=ceph osd stat --format=json
[ceph_deploy.osd][DEBUG ] Host Lceph-server03 is now ready for osd use.

```

45. We show Ceph cluster status: (executed on any Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph status
```

```
cluster:
```

```
id: 1dc946aa-f0f3-48d5-a973-e9cd3e4a383b
```

```
health: HEALTH_WARN
```

```
no active mgr
```

```
services:
  mon: 3 daemons, quorum Lceph-server01,Lceph-server02,Lceph-server03
  mgr: no daemons active
  osd: 12 osds: 12 up, 12 in
```

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

46. We create ceph-mgr for all Ceph storage server nodes: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph-deploy mgr create Lceph-server01 Lceph-server02 Lceph-server03
```

```
[ceph_deploy.conf][DEBUG ] found configuration file at: /home/cephuser/.cephdeploy.conf
[ceph_deploy.cli][INFO ] Invoked (2.0.1): /bin/ceph-deploy mgr create Lceph-server01 Lceph-server02 Lceph-server03
[ceph_deploy.cli][INFO ] ceph-deploy options:
[ceph_deploy.cli][INFO ] username                : None
[ceph_deploy.cli][INFO ] verbose                : False
[ceph_deploy.cli][INFO ] mgr                    : [('Lceph-server01', 'Lceph-server01'), ('Lceph-server02', 'Lceph-server02'),
('Lceph-server03', 'Lceph-server03')]
[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 0x7fad19efd638>
[ceph_deploy.cli][INFO ] cluster                : ceph
[ceph_deploy.cli][INFO ] func                   : <function mgr at 0x7fad1a7d9578>
[ceph_deploy.cli][INFO ] ceph_conf              : None
```

```
[ceph_deploy.cli][INFO ] default_release : False
[ceph_deploy.mgr][DEBUG ] Deploying mgr, cluster ceph hosts Lceph-server01:Lceph-server01 Lceph-server02:Lceph-server02 Lceph-
server03:Lceph-server03
[Lceph-server01][DEBUG ] connection detected need for sudo
[Lceph-server01][DEBUG ] connected to host: Lceph-server01
[Lceph-server01][DEBUG ] detect platform information from remote host
[Lceph-server01][DEBUG ] detect machine type
[ceph_deploy.mgr][INFO ] Distro info: CentOS Linux 7.5.1804 Core
[ceph_deploy.mgr][DEBUG ] remote host will use systemd
[ceph_deploy.mgr][DEBUG ] deploying mgr bootstrap to Lceph-server01
[Lceph-server01][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[Lceph-server01][WARNIN] mgr keyring does not exist yet, creating one
[Lceph-server01][DEBUG ] create a keyring file
[Lceph-server01][DEBUG ] create path recursively if it doesn't exist
[Lceph-server01][INFO ] Running command: sudo ceph --cluster ceph --name client.bootstrap-mgr --keyring /var/lib/ceph/bootstrap-
mgr/ceph.keyring auth get-or-create mgr.Lceph-server01 mon allow profile mgr osd allow * mds allow * -o /var/lib/ceph/mgr/ceph-Lceph-
server01/keyring
[Lceph-server01][INFO ] Running command: sudo systemctl enable ceph-mgr@Lceph-server01
[Lceph-server01][WARNIN] Created symlink from /etc/systemd/system/ceph-mgr.target.wants/ceph-mgr@Lceph-server01.service to
/usr/lib/systemd/system/ceph-mgr@.service.
[Lceph-server01][INFO ] Running command: sudo systemctl start ceph-mgr@Lceph-server01
[Lceph-server01][INFO ] Running command: sudo systemctl enable ceph.target
[Lceph-server02][DEBUG ] connection detected need for sudo
[Lceph-server02][DEBUG ] connected to host: Lceph-server02
[Lceph-server02][DEBUG ] detect platform information from remote host
[Lceph-server02][DEBUG ] detect machine type
[ceph_deploy.mgr][INFO ] Distro info: CentOS Linux 7.5.1804 Core
```

```
[ceph_deploy.mgr][DEBUG ] remote host will use systemd
[ceph_deploy.mgr][DEBUG ] deploying mgr bootstrap to Lceph-server02
[Lceph-server02][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[Lceph-server02][WARNIN] mgr keyring does not exist yet, creating one
[Lceph-server02][DEBUG ] create a keyring file
[Lceph-server02][DEBUG ] create path recursively if it doesn't exist
[Lceph-server02][INFO ] Running command: sudo ceph --cluster ceph --name client.bootstrap-mgr --keyring /var/lib/ceph/bootstrap-
mgr/ceph.keyring auth get-or-create mgr.Lceph-server02 mon allow profile mgr osd allow * mds allow * -o /var/lib/ceph/mgr/ceph-Lceph-
server02/keyring
[Lceph-server02][INFO ] Running command: sudo systemctl enable ceph-mgr@Lceph-server02
[Lceph-server02][WARNIN] Created symlink from /etc/systemd/system/ceph-mgr.target.wants/ceph-mgr@Lceph-server02.service to
/usr/lib/systemd/system/ceph-mgr@.service.
[Lceph-server02][INFO ] Running command: sudo systemctl start ceph-mgr@Lceph-server02
[Lceph-server02][INFO ] Running command: sudo systemctl enable ceph.target
[Lceph-server03][DEBUG ] connection detected need for sudo
[Lceph-server03][DEBUG ] connected to host: Lceph-server03
[Lceph-server03][DEBUG ] detect platform information from remote host
[Lceph-server03][DEBUG ] detect machine type
[ceph_deploy.mgr][INFO ] Distro info: CentOS Linux 7.5.1804 Core
[ceph_deploy.mgr][DEBUG ] remote host will use systemd
[ceph_deploy.mgr][DEBUG ] deploying mgr bootstrap to Lceph-server03
[Lceph-server03][DEBUG ] write cluster configuration to /etc/ceph/{cluster}.conf
[Lceph-server03][WARNIN] mgr keyring does not exist yet, creating one
[Lceph-server03][DEBUG ] create a keyring file
[Lceph-server03][DEBUG ] create path recursively if it doesn't exist
[Lceph-server03][INFO ] Running command: sudo ceph --cluster ceph --name client.bootstrap-mgr --keyring /var/lib/ceph/bootstrap-
mgr/ceph.keyring auth get-or-create mgr.Lceph-server03 mon allow profile mgr osd allow * mds allow * -o /var/lib/ceph/mgr/ceph-Lceph-
```

server03/keyring

[Lceph-server03][INFO] Running command: sudo systemctl enable ceph-mgr@Lceph-server03

[Lceph-server03][WARNIN] Created symlink from /etc/systemd/system/ceph-mgr.target.wants/ceph-mgr@Lceph-server03.service to /usr/lib/systemd/system/ceph-mgr@.service.

[Lceph-server03][INFO] Running command: sudo systemctl start ceph-mgr@Lceph-server03

[Lceph-server03][INFO] Running command: sudo systemctl enable ceph.target

47. We show Ceph cluster status again: (executed on any Ceph storage server node)

[cephuser@Lceph-server01 cluster]\$ *ceph status*

cluster:

id: 1dc946aa-f0f3-48d5-a973-e9cd3e4a383b

health: HEALTH_OK

services:

mon: 3 daemons, quorum Lceph-server01,Lceph-server02,Lceph-server03

mgr: Lceph-server01(active), standbys: Lceph-server03, Lceph-server02

osd: 12 osds: 12 up, 12 in

data:

pools: 0 pools, 0 pgs

objects: 0 objects, 0 B

usage: 12 GiB used, 2.1 TiB / 2.1 TiB avail

pgs:

48. We show utilization statistics, including disk usage (bytes) and object counts, over the entire system and broken down by

pool: (executed on any Ceph storage server node)

[cephuser@Lceph-server01 cluster]\$ *rados df*

POOL_NAME USED OBJECTS CLONES COPIES MISSING_ON_PRIMARY UNFOUND DEGRADED RD_OPS RD WR_OPS WR

```
total_objects    0
total_used       12 GiB
total_avail      2.1 TiB
total_space      2.1 TiB
```

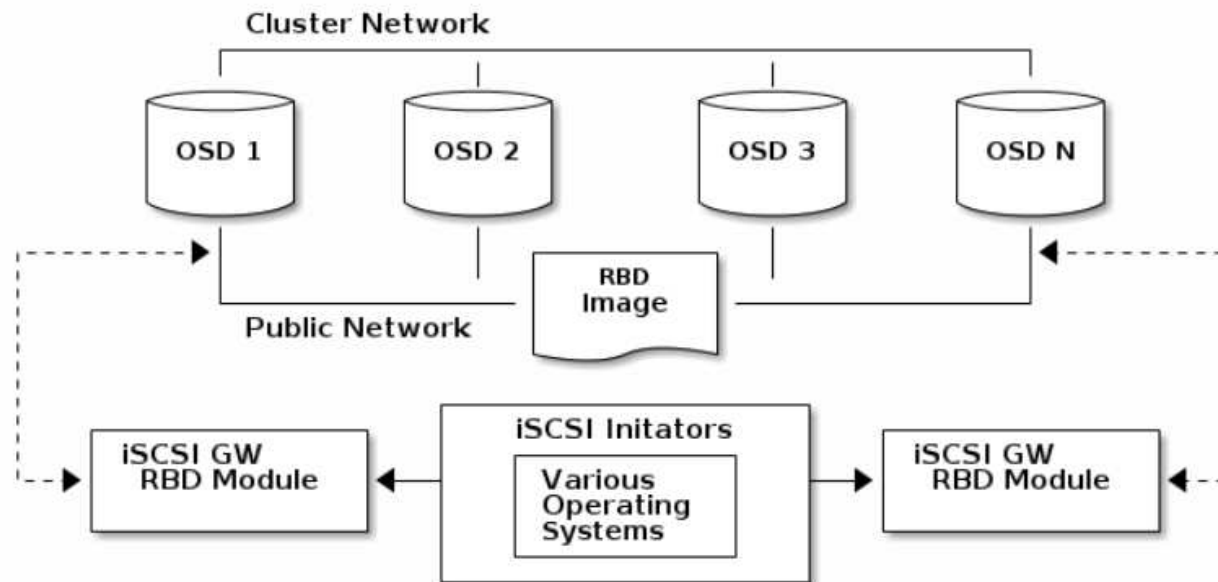
[cephuser@Lceph-server01 cluster]\$ **lsblk** (executed on any Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda                                8:0    0   32G  0 disk
├─sda1                            8:1    0   400M  0 part /boot
├─sda2                            8:2    0   31.6G  0 part
│   └─vg00-root                  253:0    0   27.6G  0 lvm /
│   └─vg00-swap                  253:1    0    4G  0 lvm [SWAP]
sdb                                8:16    0   180G  0 disk
├─ceph--c730cf6e--95eb--4696--a7aa--88c8a9dd110b-osd--block--6bf8cd1e--b015--463e--8fce--07c66a708374
│   └─                           253:2    0   180G  0 lvm
sdc                                8:32    0   180G  0 disk
├─ceph--c1b1f581--223f--488c--a239--7d03ecb46fbd-osd--block--0727cf19--4bf1--4eab--ac2d--7d5acaa8225f
│   └─                           253:3    0   180G  0 lvm
sdd                                8:48    0   180G  0 disk
├─ceph--9d2c0edb--380b--460f--8356--098b03abcd0d-osd--block--70f44617--a4df--4cba--bfc0--cac2d34d0eff
│   └─                           253:4    0   180G  0 lvm
sde                                8:64    0   180G  0 disk
├─ceph--45533260--1c45--4886--a052--fed61819639a-osd--block--56006825--c161--41de--8128--9981903c7089
│   └─                           253:5    0   180G  0 lvm
sr0                               11:0    1    4.2G  0 rom
```

CEPH ISCSI GATEWAY

The iSCSI gateway is integrating Ceph Storage with the iSCSI standard to provide a Highly Available (HA) iSCSI target that exports RADOS Block Device (RBD) images as SCSI disks. The iSCSI protocol allows clients (initiators) to send SCSI commands to SCSI storage devices (targets) over a TCP/IP network. This allows for heterogeneous clients, such as Microsoft Windows, to access the Ceph Storage cluster.

Each iSCSI gateway runs the Linux IO target kernel subsystem (LIO) to provide the iSCSI protocol support. LIO utilizes a userspace passthrough (TCMU) to interact with Ceph's librbd library and expose RBD images to iSCSI clients. With Ceph's iSCSI gateway you can effectively run a fully integrated block-storage infrastructure with all the features and benefits of a conventional Storage Area Network (SAN).



reference:

[osd]

osd heartbeat grace = 20

osd heartbeat interval = 5

49. We show OSD information – we need **osd.xx** data: (executed on any Ceph storage server node)

[cephuser@Lceph-server02 ~]\$ ceph osd tree

ID	CLASS	WEIGHT	TYPE	NAME	STATUS	REWEIGHT	PRI-AFF
-1		2.10956	root	default			
-3		0.70319	host	Lceph-server01			
0	hdd	0.17580		osd.0	up	1.00000	1.00000
1	hdd	0.17580		osd.1	up	1.00000	1.00000
2	hdd	0.17580		osd.2	up	1.00000	1.00000
3	hdd	0.17580		osd.3	up	1.00000	1.00000
-5		0.70319	host	Lceph-server02			
4	hdd	0.17580		osd.4	up	1.00000	1.00000
5	hdd	0.17580		osd.5	up	1.00000	1.00000
6	hdd	0.17580		osd.6	up	1.00000	1.00000
7	hdd	0.17580		osd.7	up	1.00000	1.00000
-7		0.70319	host	Lceph-server03			
8	hdd	0.17580		osd.8	up	1.00000	1.00000
9	hdd	0.17580		osd.9	up	1.00000	1.00000
10	hdd	0.17580		osd.10	up	1.00000	1.00000
11	hdd	0.17580		osd.11	up	1.00000	1.00000

50. We use one command loop for online updating OSD configuration by means of Ceph Monitor: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ for OSD_LIST in `ceph osd tree | grep osd | awk '{ print $4 }'`  
> do  
>     ceph tell ${OSD_LIST} config set osd_heartbeat_grace 20  
>     ceph tell ${OSD_LIST} config set osd_heartbeat_interval 5
```

> *done*

.....

.....

Set osd_heartbeat_grace to 20

Set osd_heartbeat_interval to 5

example:

wget -O /etc/yum.repos.d/ceph-iscsi.repo <http://download.ceph.com/ceph-iscsi/latest/rpm/el7/ceph-iscsi.repo>

51. We download some source rpms to build binary rpms for installation - refer to the following: (executed on the first Ceph storage server node)

CONFIGURING THE ISCSI TARGET USING THE COMMAND LINE INTERFACE

The Ceph iSCSI gateway is the iSCSI target node and also a Ceph client node. The Ceph iSCSI gateway can be a standalone node or be colocated on a Ceph Object Store Disk (OSD) node. Completing the following steps will install, and configure the Ceph iSCSI gateway for basic operation.

Requirements:

- A running Ceph Luminous or later storage cluster
- RHEL/CentOS 7.5; Linux kernel v4.16 or newer; or the Ceph iSCSI client test kernel
- The following packages must be installed from your Linux distribution's software repository:

- targetcli-2.1.fb47 or newer package
- python-rtplib-2.1.fb64 or newer package
- tcmu-runner-1.3.0 or newer package
- ceph-iscsi-config-2.4 or newer package
- ceph-iscsi-cli-2.5 or newer package

Important: If previous versions of these packages exist, then they must be removed first before installing the newer versions.

```
[root@Lceph-server01 ~]# wget -c http://ftp.redhat.com/pub/redhat/linux/enterprise/7Server/en/RHCEPH/SRPMS/targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7cp.src.rpm
```

```
[root@Lceph-server01 ~]# wget -c http://ftp.redhat.com/pub/redhat/linux/enterprise/7Server/en/RHCEPH/SRPMS/python-rtslib-2.1.fb64-3.el7cp.src.rpm
```

```
[root@Lceph-server01 ~]# wget -c http://ftp.redhat.com/pub/redhat/linux/enterprise/7Server/en/RHCEPH/SRPMS/tcmu-runner-1.3.0-0.4.2.el7cp.src.rpm
```

```
[root@Lceph-server01 ~]# wget -c https://3.chacra.ceph.com/r/ceph-iscsi-config/master/6531beb0cc41c6e8b864a91c9ef27d3d566a8a51/centos/7/flavors/default/noarch/ceph-iscsi-config-2.5-8.g6531beb.el7.noarch.rpm
```

```
[root@Lceph-server01 ~]# wget -c http://ftp.redhat.com/pub/redhat/linux/enterprise/7Server/en/RHCEPH/SRPMS/ceph-iscsi-cli-2.5-10.el7cp.src.rpm
```

52. We install the source rpms: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# rpm -ivh targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7cp.src.rpm python-rtslib-2.1.fb64-3.el7cp.src.rpm tcmu-runner-1.3.0-0.4.2.el7cp.src.rpm ceph-iscsi-cli-2.5-10.el7cp.src.rpm
```

warning: targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7cp.src.rpm: Header V3 RSA/SHA256 Signature, key ID fd431d51: NOKEY

Updating / installing...

```
1:targetcli-2.1.fb47-0.1.20170815.g##### [100%]
2:python-rtslib-2.1.fb64-3.el7cp ##### [100%]
3:tcmu-runner-1.3.0-0.4.2.el7cp ##### [100%]
4:ceph-iscsi-cli-2.5-10.el7cp ##### [100%]
```

```
[root@Lceph-server01 ~]# ls rpmbuild/SPECS
```

ceph-iscsi-cli.spec python-rtslib.spec targetcli.spec tcmu-runner.spec

[root@Lceph-server01 ~]# cd rpmbuild/SPECS

53. We install the prerequisite rpms: (executed on the first Ceph storage server node)

[root@Lceph-server01 SPECS]# yum -y install python-devel epypdoc

.....

.....

Installed:

epypdoc.noarch 0:3.0.1-14.el7 python-devel.x86_64 0:2.7.5-69.el7_5

Dependency Installed:

libXaw.x86_64 0:1.0.13-4.el7

tcl.x86_64 1:8.5.13-8.el7

texlive-ae.noarch 2:svn15878.1.4-38.el7

texlive-algorithms.noarch 2:svn15878.0.1-38.el7

.....

.....

texlive-xkeyval.noarch 2:svn27995.2.6a-38.el7

texlive-xunicode.noarch 2:svn23897.0.981-38.el7

texlive-zapfchan.noarch 2:svn28614.0-38.el7

texlive-zapfding.noarch 2:svn28614.0-38.el7

tix.x86_64 1:8.4.3-12.el7

tk.x86_64 1:8.5.13-6.el7

tkinter.x86_64 0:2.7.5-69.el7_5

zziplib.x86_64 0:0.13.62-5.el7

Complete!

```
[root@Lceph-server01 SPECS]# yum -y install cmake glib2-devel kmod-devel libnl3-devel librbd-devel
```

.....

.....

Installed:

```
cmake.x86_64 0:2.8.12.2-2.el7      glib2-devel.x86_64 0:2.54.2-2.el7      kmod-devel.x86_64 0:20-21.el7
libnl3-devel.x86_64 0:3.2.28-4.el7  librbd-devel.x86_64 2:12.2.7-0.el7
```

Dependency Installed:

```
librados-devel.x86_64 2:12.2.7-0.el7      pcre-devel.x86_64 0:8.32-17.el7
```

Complete!

54. We use “rpmbuild -bb” to build the binary rpms: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 SPECS]# rpmbuild -bb targetcli.spec
```

.....

.....

Wrote: /root/rpmbuild/RPMS/noarch/targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7.noarch.rpm

Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.uf0gMt

+ umask 022

+ cd /root/rpmbuild/BUILD

+ cd targetcli-fb-2.1.fb46

+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7.x86_64

+ exit 0

```
[root@Lceph-server01 SPECS]# rpmbuild -bb python-rtslib.spec
```

```
.....  
.....  
Wrote: /root/rpmbuild/RPMS/noarch/python-rtslib-2.1.fb64-3.el7.noarch.rpm  
Wrote: /root/rpmbuild/RPMS/noarch/python-rtslib-doc-2.1.fb64-3.el7.noarch.rpm  
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.hc6FEu  
+ umask 022  
+ cd /root/rpmbuild/BUILD  
+ cd rtslib-fb-2.1.fb64  
+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/python-rtslib-2.1.fb64-3.el7.x86_64  
+ exit 0
```

```
[root@Lceph-server01 SPECS]# rpmbuild -bb tcmu-runner.spec
```

```
.....  
.....  
Wrote: /root/rpmbuild/RPMS/x86_64/tcmu-runner-1.3.0-0.4.2.el7.x86_64.rpm  
Wrote: /root/rpmbuild/RPMS/x86_64/libtcmu-1.3.0-0.4.2.el7.x86_64.rpm  
Wrote: /root/rpmbuild/RPMS/x86_64/libtcmu-devel-1.3.0-0.4.2.el7.x86_64.rpm  
Wrote: /root/rpmbuild/RPMS/x86_64/tcmu-runner-debuginfo-1.3.0-0.4.2.el7.x86_64.rpm  
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.EABmBk  
+ umask 022  
+ cd /root/rpmbuild/BUILD  
+ cd tcmu-runner-1.3.0-rc4  
+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/tcmu-runner-1.3.0-0.4.2.el7.x86_64  
+ exit 0
```

```
[root@Lceph-server01 SPECS]# rpmbuild -bb ceph-iscsi-cli.spec
```

```
.....
```



```
Wrote: /root/rpmbuild/RPMS/noarch/ceph-iscsi-cli-2.5-10.el7.noarch.rpm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.srtbNy
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd ceph-iscsi-cli-2.5
+ /usr/bin/rm -rf /root/rpmbuild/BUILDROOT/ceph-iscsi-cli-2.5-10.el7.x86_64
+ exit 0
```

55. We install the binary rpms that are required for Ceph storage server node as iSCSI provider (target): (executed on the first Ceph storage server node)

Installed:

Dependency Installed:

libtomcrypt.x86_64 0:1.17-26.e17	libtommath.x86_64 0:0.42.0-6.e17
python-netaddr.noarch 0:0.7.5-9.e17	python-netifaces.x86_64 0:0.10.4-3.e17
python2-crypto.x86_64 0:2.6.1-15.e17	

Updated:

python-rtplib.noarch 0:2.1.fb64-3.el7 targetcli.noarch 0:2.1.fb47-0.1.20170815.git5bf3517.el7

Complete!

56. We copy the binary rpms to the other two Ceph storage server nodes for installation: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# scp -p rpmbuild/RPMS/noarch/targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7.noarch.rpm  
rpmbuild/RPMS/noarch/python-rtplib-2.1.fb64-3.el7.noarch.rpm rpmbuild/RPMS/x86_64/tcmu-runner-1.3.0-0.4.2.el7.x86_64.rpm ceph-iscsi-  
config-2.5-8.g6531beb.el7.noarch.rpm rpmbuild/RPMS/noarch/ceph-iscsi-cli-2.5-10.el7.noarch.rpm rpmbuild/RPMS/x86_64/libtcmu-1.3.0-  
0.4.2.el7.x86_64.rpm Lceph-server02:~/
```

```
[root@Lceph-server01 ~]# scp -p rpmbuild/RPMS/noarch/targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7.noarch.rpm  
rpmbuild/RPMS/noarch/python-rtplib-2.1.fb64-3.el7.noarch.rpm rpmbuild/RPMS/x86_64/tcmu-runner-1.3.0-0.4.2.el7.x86_64.rpm ceph-iscsi-  
config-2.5-8.g6531beb.el7.noarch.rpm rpmbuild/RPMS/noarch/ceph-iscsi-cli-2.5-10.el7.noarch.rpm rpmbuild/RPMS/x86_64/libtcmu-1.3.0-  
0.4.2.el7.x86_64.rpm Lceph-server03:~/
```

57. We install the prerequisite rpms then the binary rpms copied from the first node: (executed on the second and third Ceph storage server nodes)

```
[root@Lceph-server02 ~]# yum -y install python-devel epypdoc
```

```
[root@Lceph-server02 ~]# yum -y install cmake glib2-devel kmod-devel libnl3-devel librbd1-devel
```

```
[root@Lceph-server02 ~]# yum -y install yum -y install targetcli-2.1.fb47-0.1.20170815.git5bf3517.el7.noarch.rpm python-rtplib-  
2.1.fb64-3.el7.noarch.rpm tcmu-runner-1.3.0-0.4.2.el7.x86_64.rpm ceph-iscsi-config-2.5-8.g6531beb.el7.noarch.rpm ceph-iscsi-cli-2.5-  
10.el7.noarch.rpm libtcmu-1.3.0-0.4.2.el7.x86_64.rpm
```

58. We create one pool for iSCSI using and list it in detail: (executed on the first Ceph storage server node)

```
[cephuser@Lceph-server01 cluster]$ ceph osd pool create iscsi_pool 128 128
```

```
pool 'iscsi_pool' created
```

```
[cephuser@Lceph-server01 cluster]$ ceph osd lspools
```

```
1 iscsi_pool
```

```
[cephuser@Lceph-server01 cluster]$ ceph osd pool ls detail
```

```
pool 1 'iscsi_pool' replicated size 3 min_size 2 crush_rule 0 object_hash rjenkins pg_num 128 pgp_num 128 last_change 62 flags hashpspool stripe_width 0
```

59. We use Ceph storage server (OSD) nodes as iSCSI gateway nodes, too – creating iSCSI gateway configuration: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# vi /etc/ceph/iscsi-gateway.cfg
```

```
[config]
```

```
# Name of the Ceph storage cluster. A suitable Ceph configuration file allowing  
# access to the Ceph storage cluster from the gateway node is required, if not  
# colocated on an OSD node.
```

```
cluster_name = ceph
```

```
# Place a copy of the ceph cluster's admin keyring in the gateway's /etc/ceph  
# directory and reference the filename here
```

```
gateway_keyring = ceph.client.admin.keyring
```

```
# API settings.
```

```
# The API supports a number of options that allow you to tailor it to your
```

```
# local environment. If you want to run the API under https, you will need to
# create cert/key files that are compatible for each iSCSI gateway node, that is
# not locked to a specific node. SSL cert and key files *must* be called
# 'iscsi-gateway.crt' and 'iscsi-gateway.key' and placed in the '/etc/ceph/' directory
# on *each* gateway node. With the SSL files in place, you can use 'api_secure = true'
# to switch to https mode.
```

```
# To support the API, the bear minimum settings are:
```

```
api_secure = false
```

```
# Additional API configuration options are as follows, defaults shown.
```

```
# api_user = admin
```

```
# api_password = admin
```

```
# api_port = 5001
```

```
trusted_ip_list = 192.168.10.241,192.168.10.242,192.168.10.243
```

60. We copy the iSCSI gateway configuration to the other two Ceph storage server nodes: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# scp -p /etc/ceph/iscsi-gateway.cfg Lceph-server02:/etc/ceph/iscsi-gateway.cfg
```

```
[root@Lceph-server01 ~]# scp -p /etc/ceph/iscsi-gateway.cfg Lceph-server03:/etc/ceph/iscsi-gateway.cfg
```

61. For Ceph iSCSI CLI, a pool with the name **rbd is required, so we rename the pool from iscsi_pool to rbd: (executed on the first Ceph storage server node)**

```
[root@Lceph-server01 ~]# ceph osd pool rename iscsi_pool rbd
```

```
pool 'iscsi_pool' renamed to 'rbd'
```

```
[root@Lceph-server01 ~]# ceph osd pool application enable rbd rbd
```

enabled application 'rbd' on pool 'rbd'

62. We reload systemd manager configuration, then enable, start and check the status of rbd-target-api service: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# systemctl daemon-reload
```

```
[root@Lceph-server01 ~]# systemctl enable rbd-target-api; systemctl start rbd-target-api; systemctl status rbd-target-api
```

- rbd-target-api.service – Ceph iscsi target configuration API
Loaded: loaded (/usr/lib/systemd/system/rbd-target-api.service; enabled; vendor preset: disabled)
Active: active (running) since Fri 2018-07-20 23:42:30 CST; 34ms ago
Main PID: 10224 (rbd-target-api)
Tasks: 1
CGroup: /system.slice/rbd-target-api.service
└─10224 /usr/bin/python /usr/bin/rbd-target-api

```
Jul 20 23:42:30 Lceph-server01.lab.gidanet.com.tw systemd[1]: Started Ceph iscsi target configuration API.
Jul 20 23:42:30 Lceph-server01.lab.gidanet.com.tw systemd[1]: Starting Ceph iscsi target configuration....
Jul 20 23:42:31 Lceph-server01.lab.gidanet.com.tw rbd-target-api[1512]: Started the configuration objec...r
Jul 20 23:42:31 Lceph-server01.lab.gidanet.com.tw rbd-target-api[1512]: Checking for config object chan...s
Jul 20 23:42:31 Lceph-server01.lab.gidanet.com.tw rbd-target-api[1512]: * Running on http://0.0.0.0:5000/
Hint: Some lines were ellipsized, use -l to show in full.
```

```
[root@Lceph-server01 ~]# pstree | grep -e ceph -e rbd
```

```
|-ceph-mgr---23*[{ceph-mgr}]
|-ceph-mon---23*[{ceph-mon}]
|-4*[ceph-osd---55*[{ceph-osd}]]
```

```
| -rbd-target-api---27*[{rbd-target-api}]
| -rbd-target-gw---13*[{rbd-target-gw}]
```

63. We open the following ports needed by Ceph iSCSI target: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=3260/tcp --permanent
```

success

```
[root@Lceph-server01 ~]# firewall-cmd --zone=public --add-port=5000/tcp --permanent
```

success

```
[root@Lceph-server01 ~]# firewall-cmd --reload
```

success

```
[root@Lceph-server01~]# iptables -L IN_public_allow
```

Chain IN_public_allow (1 references)

target	prot	opt	source	destination	
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:ssh ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:http ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:cfinger ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpts:4505:4506 ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:smc-https ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpts:6800:7300 ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:iscsi-target ctstate NEW
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:complex-main ctstate NEW

64. We use gwcli to configure iSCSI target and RBD images: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# gwcli
```

```

/> cd /iscsi-target
/iscsi-target> create iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw
Ok
/iscsi-target> cd iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw/gateways
/iscsi-target...-igw/gateways> create Lceph-server01 192.168.10.241 skipchecks=true
OS version/package checks have been bypassed
Adding gateway, sync'ing 0 disk(s) and 0 client(s)
ok
/iscsi-target...-igw/gateways> create Lceph-server02 192.168.10.242 skipchecks=true
OS version/package checks have been bypassed
Adding gateway, sync'ing 0 disk(s) and 0 client(s)
ok
/iscsi-target...-igw/gateways> create Lceph-server03 192.168.10.243 skipchecks=true
OS version/package checks have been bypassed
Adding gateway, sync'ing 0 disk(s) and 0 client(s)
ok
/iscsi-target...-igw/gateways> ls
o- gateways ..... [Up: 3/3, Portals: 3]
  o- Lceph-server01 ..... [192.168.10.241 (UP)]
  o- Lceph-server02 ..... [192.168.10.242 (UP)]
  o- Lceph-server03 ..... [192.168.10.243 (UP)]
/iscsi-target...-igw/gateways> cd /disks
/disks> create pool=rbd image=iSCSI_disk_1 size=90G
ok
/disks> ls
o- disks ..... [90G, Disks: 1]
  o- rbd.iSCSI_disk_1 ..... [iSCSI_disk_1 (90G)]

```

```
/disks> exit
```

```
[root@Lceph-server01~]# rados df
```

POOL_NAME	USED	OBJECTS	CLONES	COPIES	MISSING_ON_PRIMARY	UNFOUND	DEGRADED	RD_OPS	RD	WR_OPS	WR
rbid	8284	6	0	18	0	0	0	2424	2389k	42	25600

```
total_objects    6
total_used       12389M
total_avail      2147G
total_space      2159G
```

65. We get iSCSI initiator name from client:

```
[root@Lceph-client01 ~]# cat /etc/iscsi/initiatorname.iscsi
```

```
InitiatorName=iqn.1994-05.com.redhat:9e503b585391
```

66. We create/configure a client, set client's CHAP (authentication) and add the disk to the client: (executed on the first Ceph storage server node)

```
[root@Lceph-server01 ~]# gwcli
```

```
/disks> ls
```

```
o- disks ..... [90G, Disks: 1]
  o- rbd.iSCSI_disk_1 ..... [iSCSI_disk_1 (90G)]
```

```
/disks> cd /iscsi-target/iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw/hosts
```

```
/iscsi-target...csi-igw/hosts> create iqn.1994-05.com.redhat:9e503b585391
```

```
ok
```

```
/iscsi-target...:9e503b585391> auth chap=myiSCSIUser01/myiSCSIcLient01
```

```
ok
```

```
/iscsi-target...:9e503b585391> disk add rbd.iSCSI_disk_1
```


ok

```
/iscsi-target...:9e503b585391> exit
```

67. Now, we configure the iSCSI client - first of all, we install rpms required for iSCSI client:

```
[root@Lceph-client01 ~]# yum -y install iscsi-initiator-utils device-mapper-multipath
```

```
.....
```

```
Package iscsi-initiator-utils-6.2.0.874-7.el7.x86_64 already installed and latest version
```

```
Package device-mapper-multipath-0.4.9-119.el7.x86_64 already installed and latest version
```

```
Nothing to do
```

68. We create the default /etc/multipath.conf and enable multipathd service:

```
[root@Lceph-client01 ~]# mpathconf --enable --with_multipathd y
```

```
[root@Lceph-client01 ~]# pstree | grep multi
```

```
|-multipathd---5*[{multipathd}]
```

```
[root@Lceph-client01 ~]# systemctl status multipathd
```

- multipathd.service - Device-Mapper Multipath Device Controller
Loaded: loaded (/usr/lib/systemd/system/multipathd.service; enabled; vendor preset: enabled)
Active: active (running) since Thu 2018-07-26 11:22:59 CST; 29s ago
Process: 2649 ExecStart=/sbin/multipathd (code=exited, status=0/SUCCESS)
Process: 2646 ExecStartPre=/sbin/multipath -A (code=exited, status=0/SUCCESS)
Process: 2645 ExecStartPre=/sbin/modprobe dm-multipath (code=exited, status=0/SUCCESS)
Main PID: 2653 (multipathd)
Tasks: 6
CGroup: /system.slice/multipathd.service
└─2653 /sbin/multipathd

69. We check the default settings for `/etc/multipath.conf` and add devices information as below:

```
[root@Lceph-client01 ~]# grep -v ^# /etc/multipath.conf | awk 'NF'
```

```
defaults {
    user_friendly_names yes
    find_multipaths yes
}
blacklist {
}
```

```
[root@Lceph-client01 ~]# cat >> /etc/multipath.conf
```

```
devices {
    device {
        vendor                "LIO-ORG"
        hardware_handler      "1 alua"
        path_grouping_policy   "failover"
        path_selector          "queue-length 0"
        failback               60
        path_checker           tur
        prio                   alua
        prio_args               exclusive_pref_bit
        fast_io_fail_tmo       25
        no_path_retry           queue
    }
}
```

70. After updating `/etc/multipath.conf`, we reload the multipath configuration and check the log:

```
[root@Lceph-client01 ~]# systemctl reload multipathd
```

```
[root@Lceph-client01 ~]# grep multipathd /var/log/messages | grep -e reconfig -e ok
```

```
Jul 26 11:40:41 Lceph-client01 multipathd: reconfigure (operator)
```

```
Jul 26 11:40:41 Lceph-client01 multipathd: ok
```

71. We edit iscsid.conf to add authentication information to connect iSCSI target (Ceph storage server providing iSCSI):

```
[root@Lceph-client01 ~]# vi /etc/iscsi/iscsid.conf
```

```
[root@Lceph-client01 ~]# grep ^node /etc/iscsi/iscsid.conf | grep auth
```

```
node.session.auth.authmethod = CHAP
```

```
node.session.auth.username = myiSCSIuser01
```

```
node.session.auth.password = myiSCSIclient01
```

72. We use iscsiadm command to discover and login Ceph storage server providing iSCSI:

```
[root@Lceph-client01 ~]# iscsiadm -m discovery -t st -p Lceph-server01
```

```
192.168.10.241:3260,1 iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw
```

```
192.168.10.242:3260,2 iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw
```

```
192.168.10.243:3260,3 iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw
```

```
[root@Lceph-client01 ~]# iscsiadm -m node -T iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw -l
```

```
Logging in to [iface: default, target: iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw, portal: 192.168.10.241,3260] (multiple)
```

```
Logging in to [iface: default, target: iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw, portal: 192.168.10.242,3260] (multiple)
```

```
Logging in to [iface: default, target: iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw, portal: 192.168.10.243,3260] (multiple)
```

```
Login to [iface: default, target: iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw, portal: 192.168.10.241,3260] successful.
```

```
Login to [iface: default, target: iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw, portal: 192.168.10.242,3260] successful.
```

```
Login to [iface: default, target: iqn.2018-07.tw.com.gidanet.iscsi-gw:iscsi-igw, portal: 192.168.10.243,3260] successful.
```

73. We can find the iSCSI LUN as below - /dev/mapper/mpatha:

```
[root@Lceph-client01 ~]# multipath -ll
```

```
mpatha (36001405051fe8alde884e6b98e6fd0ac) dm-2 LIO-ORG ,TCMU device
size=90G features='1 queue_if_no_path' hwhandler='1 alua' wp=rw
|-+- policy='queue-length 0' prio=50 status=active
| '- 5:0:0:0 sdc 8:32 active ready running
|-+- policy='queue-length 0' prio=10 status=enabled
| '- 3:0:0:0 sdb 8:16 active ready running
'-+- policy='queue-length 0' prio=10 status=enabled
    '- 4:0:0:0 sdd 8:48 active ready running
```

74. We list device information - /dev/mapper/mpatha, use it as a logical volume, format it as ext4 file system and mount it:

```
[root@Lceph-client01 ~]# fdisk -l /dev/mapper/mpatha
```

```
Disk /dev/mapper/mpatha: 96.6 GB, 96636764160 bytes, 188743680 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 4194304 bytes
```

```
[root@Lceph-client01 ~]# pvcreate /dev/mapper/mpatha
```

```
Physical volume "/dev/mapper/mpatha" successfully created.
```

```
[root@Lceph-client01 ~]# vgcreate vg01 /dev/mapper/mpatha
```

```
Volume group "vg01" successfully created
```

```
[root@Lceph-client01 ~]# lvcreate -L 30G -n lvol0 vg01
```

Logical volume "lvol0" created.

```
[root@Lceph-client01 ~]# mke2fs -j -t ext4 /dev/vg01/lvol0
```

```
[root@Lceph-client01 ~]# mkdir /rbd.iSCSI_disk_1
```

```
[root@Lceph-client01 ~]# mount -t ext4 /dev/vg01/lvol0 /rbd.iSCSI_disk_1
```

```
[root@Lceph-client01 ~]# df -kP /rbd.iSCSI_disk_1
```

Filesystem	1024-blocks	Used	Available	Capacity	Mounted on
/dev/mapper/vg01-lvol0	30832548	45080	29198220	1%	/rbd.iSCSI_disk_1

75. We install some rpms for building up Ceph Dashboard - Web admin: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# yum -y install httpd mod_wsgi mod_ssl git
```

.....

Installed:

httpd.x86_64	0:2.4.6-80.el7.centos.1	mod_ssl.x86_64	1:2.4.6-80.el7.centos.1	mod_wsgi.x86_64	0:3.4-12.el7_0
--------------	-------------------------	----------------	-------------------------	-----------------	----------------

Dependency Installed:

httpd-tools.x86_64	0:2.4.6-80.el7.centos.1
--------------------	-------------------------

Complete!

76. We enable, start and check the status of httpd service: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# systemctl enable httpd; systemctl start httpd; systemctl status httpd
```

Created symlink from /etc/systemd/system/multi-user.target.wants/httpd.service to /usr/lib/systemd/system/httpd.service.

- httpd.service - The Apache HTTP Server

```
Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
Active: active (running) since Thu 2018-07-12 22:03:21 CST; 4ms ago
    Docs: man:httpd(8)
          man:apachectl(8)
Main PID: 3945 (httpd)
Status: "Processing requests..."
Tasks: 3
CGroup: /system.slice/httpd.service
        └─3945 /usr/sbin/httpd -DFOREGROUND
           └─3948 /usr/sbin/httpd -DFOREGROUND
              └─3949 /usr/sbin/httpd -DFOREGROUND
                 └─3951 /usr/sbin/httpd -DFOREGROUND
```

Jul 12 22:03:21 ceph-server01.lab.gidanet.com.tw systemd[1]: Starting The Apache HTTP Server...

Jul 12 22:03:21 ceph-server01.lab.gidanet.com.tw systemd[1]: Started The Apache HTTP Server.

77. We use git command to clone (download) Ceph Dashboard: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# cd /var/www/html
```

```
[root@Lceph-server01 html]# git clone https://github.com/Crapworks/ceph-dash.git
```

Cloning into 'ceph-dash'...

remote: Counting objects: 1004, done.

remote: Total 1004 (delta 0), reused 0 (delta 0), pack-reused 1004

Receiving objects: 100% (1004/1004), 4.66 MiB | 991.00 KiB/s, done.

Resolving deltas: 100% (482/482), done.

```
[root@Lceph-server01 html]# chown -R apache:apache ceph-dash
```

78. We copy template and edit configuration file for Ceph Dashboard: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 html]# cd ceph-dash
```

```
[root@Lceph-server01 ceph-dash]# cp -p contrib/apache/cephdash /etc/httpd/conf.d/cephdash.conf
```

```
[root@Lceph-server01 ceph-dash]# vi /etc/httpd/conf.d/cephdash.conf
```

```
<VirtualHost *:80>
```

```
    ServerName ceph-server01.lab.gidanet.com.tw
```

```
    RewriteEngine On
```

```
    RewriteCond %{REQUEST_URI} !^/server-status
```

```
    RewriteRule ^/?(.*) https://%{HTTP_HOST}/$1 [R,L]
```

```
</VirtualHost>
```

```
<VirtualHost *:443>
```

```
    ServerName ceph-server01.lab.gidanet.com.tw
```

```
    WSGIDaemonProcess cephdash user=apache group=apache processes=1 threads=5
```

```
    WSGIScriptAlias / /var/www/html/ceph-dash/contrib/wsgi/cephdash.wsgi
```

```
    WSGIPassAuthorization On
```

```
    SSLEngine on
```

```
    SSLCertificateFile /etc/httpd/ssl/ssl.crt
```

```
    SSLCertificateKeyFile /etc/httpd/ssl/ssl.key
```

```
    <Directory /var/www/html/ceph-dash>
```

```

WSGIProcessGroup cephdash
WSGIApplicationGroup %{GLOBAL}
Order deny,allow
Allow from all

AuthType Basic
AuthName "Restricted Content"
AuthUserFile /etc/httpd/.htpasswd
Require valid-user
</Directory>
</VirtualHost>

```

79. We edit the default httpd configuration file: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ceph-dash]# vi /etc/httpd/conf/httpd.conf
```

```
[root@Lceph-server01 ceph-dash]# grep -e ceph -e 192.168 /etc/httpd/conf/httpd.conf
```

```

Listen 192.168.10.241:80
ServerAdmin root@Lceph-server01.lab.gidanet.com.tw
ServerName ceph-server01.lab.gidanet.com.tw:80

```

80. Based on configuration, we generate two SSL files - ssl.key and ssl.crt: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ceph-dash]# mkdir -p /etc/httpd/ssl/
```

```

[root@Lceph-server01 ceph-dash]# openssl req -x509 -nodes -days 365 -newkey rsa:2048 \
> -keyout /etc/httpd/ssl/ssl.key -out /etc/httpd/ssl/ssl.crt

```

```

Generating a 2048 bit RSA private key
.....+++

```


.....+++
writing new private key to '/etc/httpd/ssl/ssl.key'

You are about to be asked to enter information that will be incorporated
into your certificate request.

What you are about to enter is what is called a Distinguished Name or a DN.

There are quite a few fields but you can leave some blank

For some fields there will be a default value,

If you enter '.', the field will be left blank.

Country Name (2 letter code) [XX]:TW

State or Province Name (full name) []:Taiwan

Locality Name (eg, city) [Default City]:Taipei

Organization Name (eg, company) [Default Company Ltd]:Gidanet

Organizational Unit Name (eg, section) []:Lab

Common Name (eg, your name or your server's hostname) []:ceph-server01.lab.gidanet.com.tw

Email Address []:dl1963inet@outlook.com

81. We change permission for the SSL files, read/write by root only: (executed on all Ceph storage server nodes)

[root@Lceph-server01 ceph-dash]# *chmod 600 /etc/httpd/ssl/**

82. We create .htpasswd for basic authentication to access Ceph Dashboard: (executed on all Ceph storage server nodes)

[root@Lceph-server01 ceph-dash]# *htpasswd -c /etc/httpd/.htpasswd cephdashbd*

New password: (01Ceph!qaz)

Re-type new password:

Adding password for user **cephdashbd**

83. We test configuration, restart and check the status of httpd service: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ceph-dash]# apachectl configtest
```

Syntax OK

```
[root@Lceph-server01 ceph-dash]# systemctl restart httpd; systemctl status httpd
```

- httpd.service - The Apache HTTP Server

Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)

Active: active (running) since Thu 2018-07-12 22:39:02 CST; 11ms ago

Docs: man:httpd(8)

man:apachectl(8)

Process: 4354 ExecStop=/bin/kill -WINCH \${MAINPID} (code=exited, status=0/SUCCESS)

Main PID: 4361 (httpd)

Status: "Processing requests..."

Tasks: 14

CGroup: /system.slice/httpd.service

├─4361 /usr/sbin/httpd -DFOREGROUND

├─4362 /usr/sbin/httpd -DFOREGROUND

├─4363 /usr/sbin/httpd -DFOREGROUND

├─4364 /usr/sbin/httpd -DFOREGROUND

├─4365 /usr/sbin/httpd -DFOREGROUND

├─4367 /usr/sbin/httpd -DFOREGROUND

└─4368 /usr/sbin/httpd -DFOREGROUND

Jul 12 22:39:02 ceph-server01.lab.gidanet.com.tw systemd[1]: Starting The Apache HTTP Server...

Jul 12 22:39:02 ceph-server01.lab.gidanet.com.tw systemd[1]: Started The Apache HTTP Server.

84. We open the https port for Ceph Dashboard access: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ceph-dash]# firewall-cmd --zone=public --add-port=443/tcp --permanent
```

SUCCESS

```
[root@Lceph-server01 ceph-dash]# firewall-cmd --reload
```

SUCCESS

85. We add two lines as below so more logging generated for trouble-shooting: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# vi /var/www/html/ceph-dash/contrib/wsgi/cephdash.wsgi
```

```
::::::::::
```

```
import logging
```

```
logging.basicConfig(stream=sys.stderr)
```

```
::::::::::
```

86. We change permission so WSGI script can be executed: (executed on all Ceph storage server nodes)

```
[root@Lceph-server01 ~]# chmod +x /var/www/html/ceph-dash/contrib/wsgi/cephdash.wsgi
```

87. We try to access Ceph Dashboard by means of CLI (curl):

```
[root@Lceph-server01 ~]# curl -u cephdashbd:01Ceph\!qaz -k --basic https://Lceph-server01.lab.gidanet.com.tw/
```

```
::::::::::
```

```
<script type="text/javascript" src="/static/js/jquery-2.1.4.min.js"></script>
```

```
<script type="text/javascript" src="/static/js/bootstrap.min.js"></script>
```

```
<script type="text/javascript" src="/static/js/globalize.min.js"></script>
```

```
<script type="text/javascript" src="/static/js/dx.chartjs.js"></script>
```

```
<script type="text/javascript" src="/static/js/jquery.flot.js"></script>
```

```
<script type="text/javascript" src="/static/js/jquery.flot.time.js"></script>
```

```
<script type="text/javascript" src="/static/js/jquery.flot.byte.js"></script>
```



```
<script type="text/javascript" src="/static/js/jquery.flot.tooltip.js"></script>
```

```
<script type="text/javascript" src="/static/js/ceph.dash.js"></script>
```

```
</body>
```



88. We try to access Ceph Dashboard from any browser to make sure everything is workable:






https://ceph-server01.lab.gidanet.com.tw

...





Ceph Dashboard

4d00630f-ff91-4bf0-b7e1-fe9f616753ea

Ceph Cluster Overall Status

⚡ Cluster Status:HEALTH_WARN

⚡ too few PGs per OSD (10 < min 30)

Ceph Cluster Monitor Status

✓ Monitor CEPH-SERVER01: HEALTH_OK

✓ Monitor CEPH-SERVER02: HEALTH_OK

✓ Monitor CEPH-SERVER03: HEALTH_OK

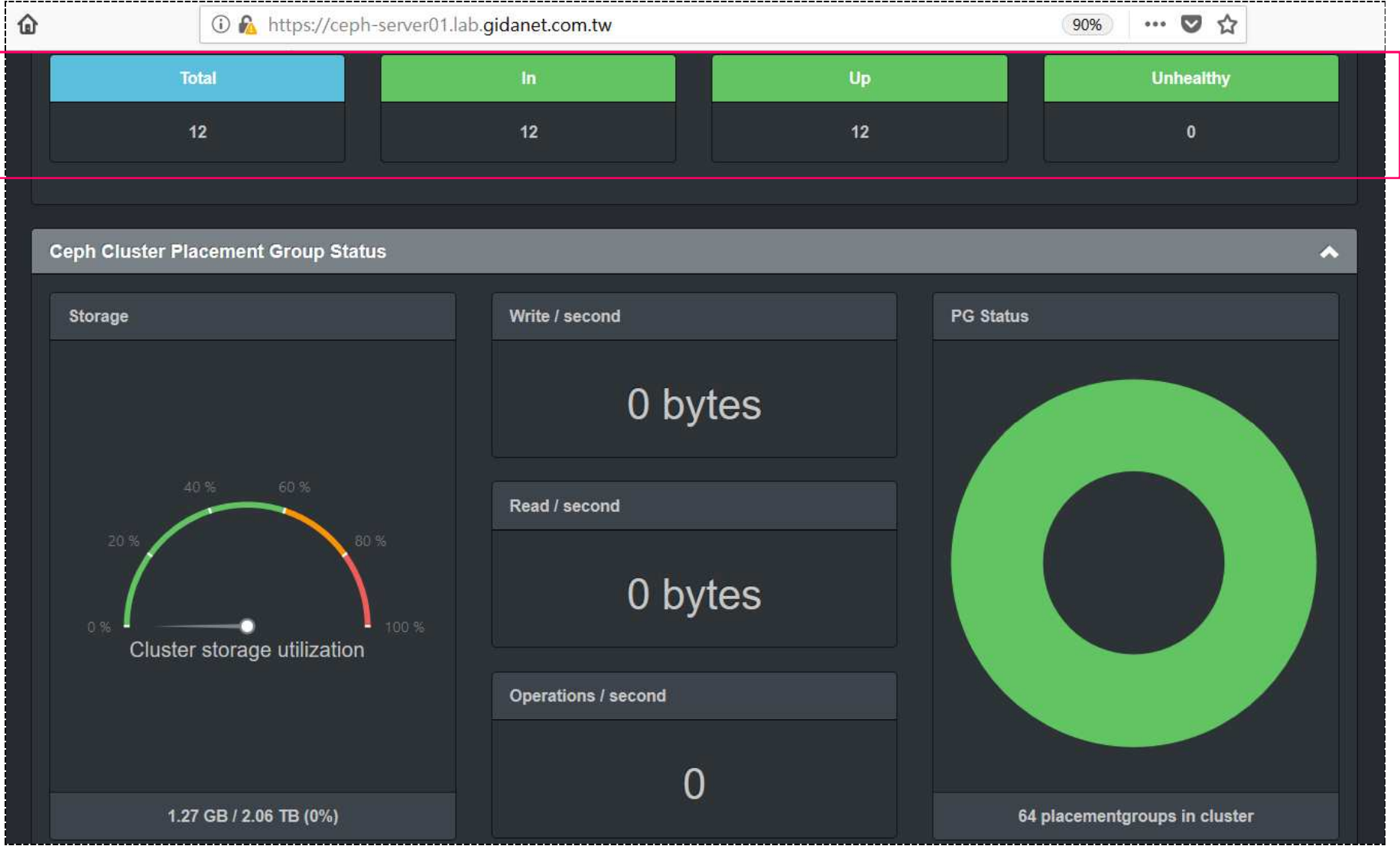
Ceph Cluster OSD Status

Total

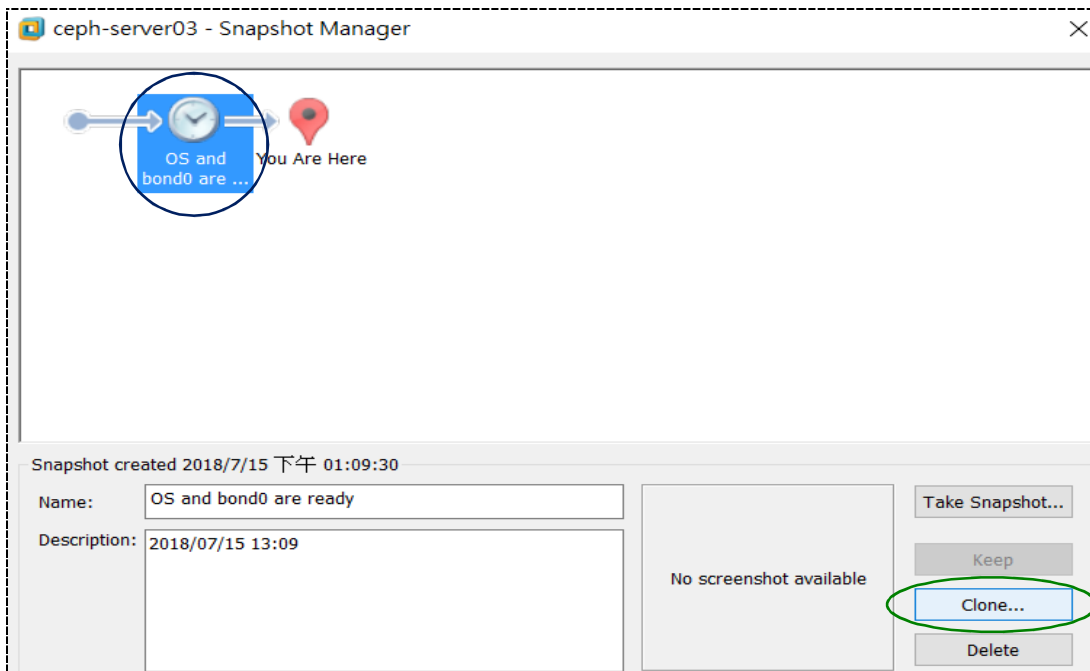
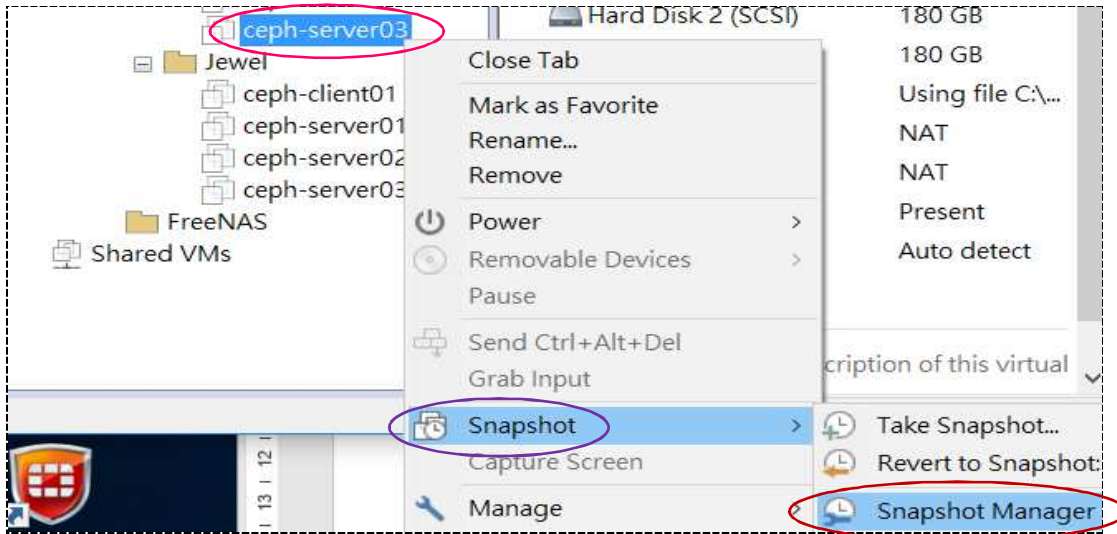
In

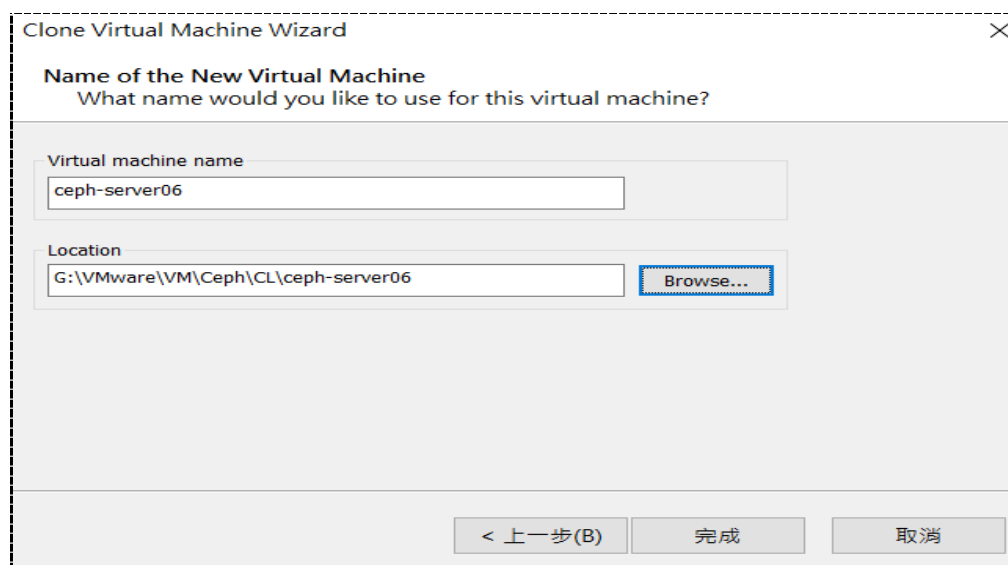
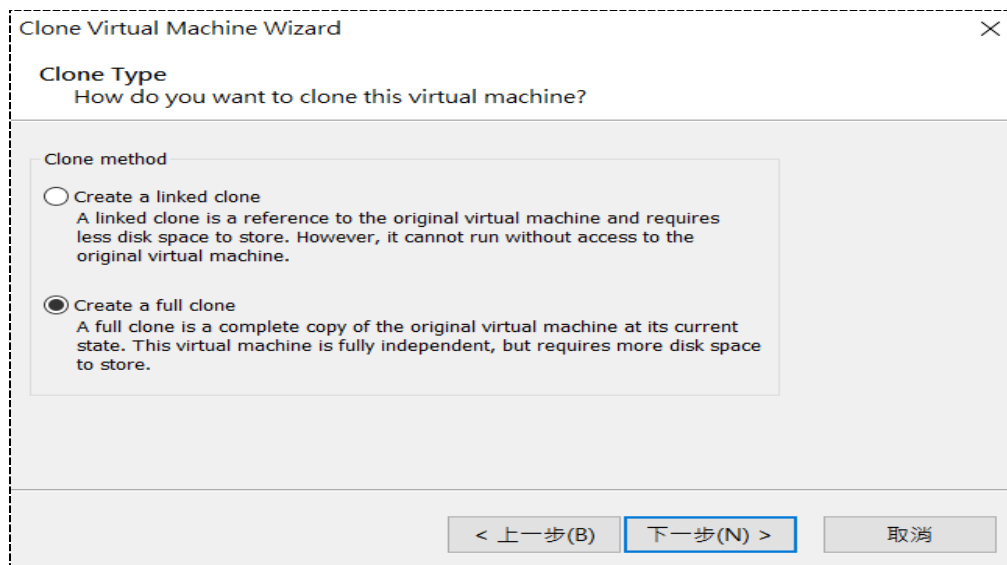
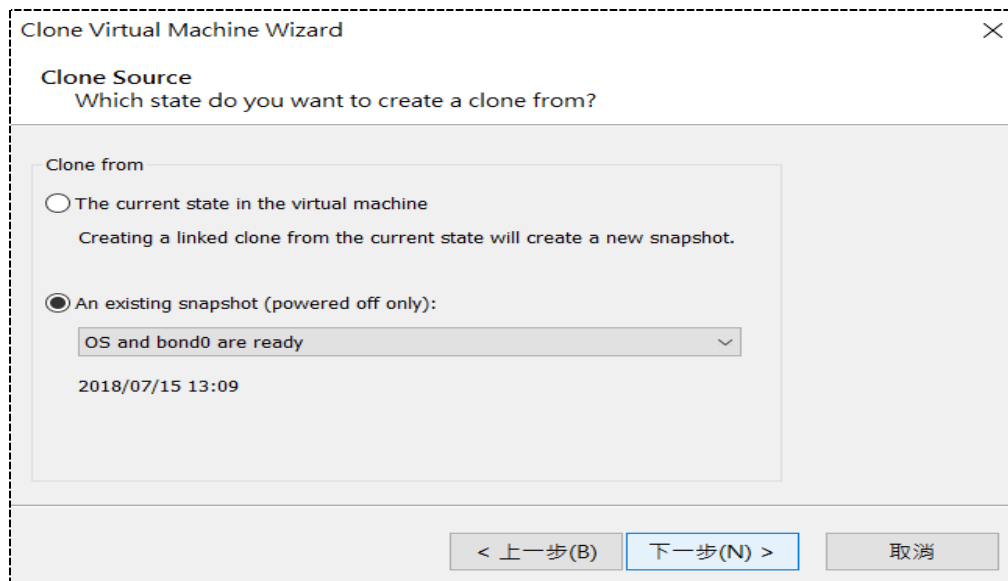
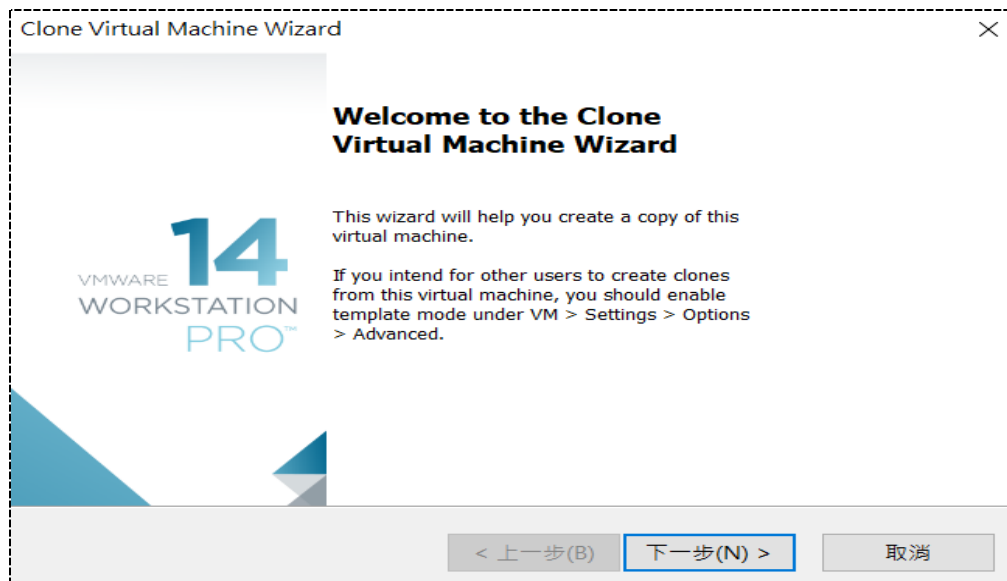
Up

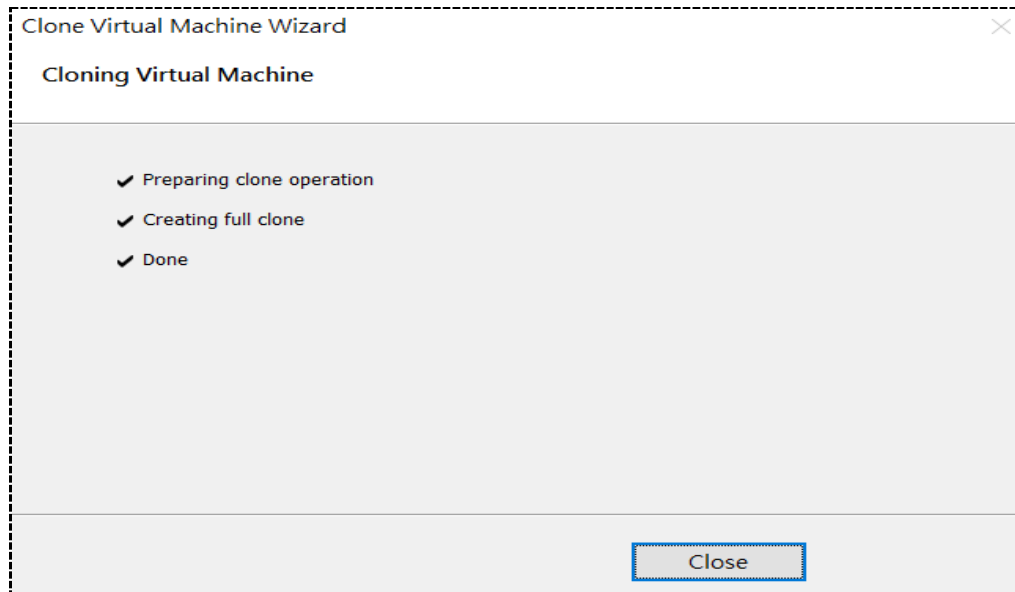
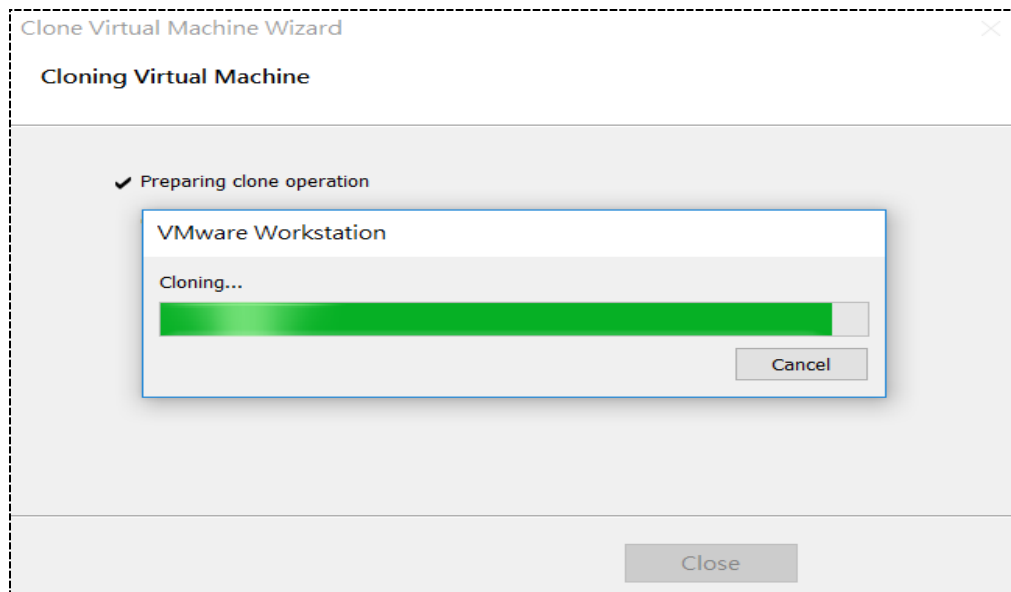
Unhealthy



89. This is an example for using VMware workstation snapshot to quickly clone and create new VM to skip guest OS installation:







BCK (G:) > VMware > VM > Ceph > CL > ceph-server06

名稱	修改日期	類型	大小
ceph-server06.vmx.lck	2018/7/23 下午 10:57	檔案資料夾	
ceph-server03-cl1.vmdk	2018/7/23 下午 10:49	VMDK File	1 KB
ceph-server03-cl1-s001.vmdk	2018/7/23 下午 10:49	VMDK File	194,752 KB
ceph-server03-cl1-s002.vmdk	2018/7/23 下午 10:49	VMDK File	1,510,848
ceph-server03-cl1-s003.vmdk	2018/7/23 下午 10:49	VMDK File	458,112 KB
ceph-server03-cl1-s004.vmdk	2018/7/23 下午 10:49	VMDK File	70,016 KB
ceph-server03-cl1-s005.vmdk	2018/7/23 下午 10:49	VMDK File	180,864 KB
ceph-server03-cl1-s006.vmdk	2018/7/23 下午 10:49	VMDK File	1,355,520
ceph-server03-cl1-s007.vmdk	2018/7/23 下午 10:49	VMDK File	585,280 KB
ceph-server03-cl1-s008.vmdk	2018/7/23 下午 10:49	VMDK File	467,392 KB
ceph-server03-cl1-s009.vmdk	2018/7/23 下午 10:44	VMDK File	64 KB
ceph-server06.nvram	2018/7/23 下午 10:44	VMware Virtual ...	9 KB
ceph-server06.vmsd	2018/7/23 下午 10:44	VMware snapsho...	0 KB
ceph-server06.vmx	2018/7/23 下午 10:49	VMX 檔案	3 KB
ceph-server06.vmx	2018/7/23 下午 10:49	VMware Team M...	1 KB