Red Hat Consulting

Openshift 4 Health Check Report

Red Hat Consulting

Table of Contents

1. Openshift Data Foundation . . . 1
1.1. Versions . . . 1
1.2. Dashboard Health status . . . 1
1.3. Ensure that the required storage classes are created . . . 2
1.4. Ensure required pods have been created . . . 3
1.5. Verify that Ceph Cluster health status is OK . . . 7
1.6. Ensure RBD and FS PVCs can be bound . . . 10
1.7. Ensure PVC expansion is possible . . . 11

Chapter 1. Openshift Data Foundation

1.1. Versions

Red Hat OpenShift Data Foundation Documentation

https://access.redhat.com/documentation/en-us/red_hat_openshift_data_foundation/4.9
Documentation

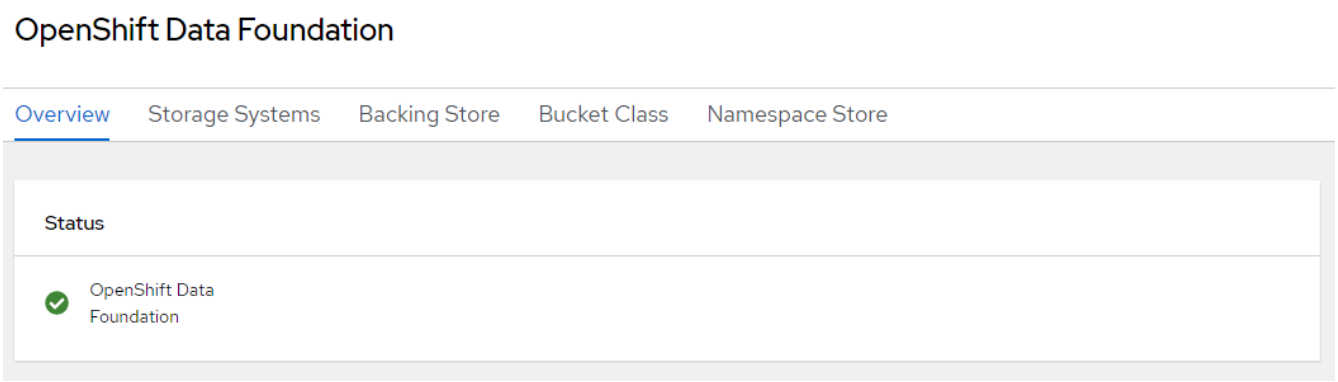
```
Client Version: 4.9.1
```

1.2. Dashboard Health status

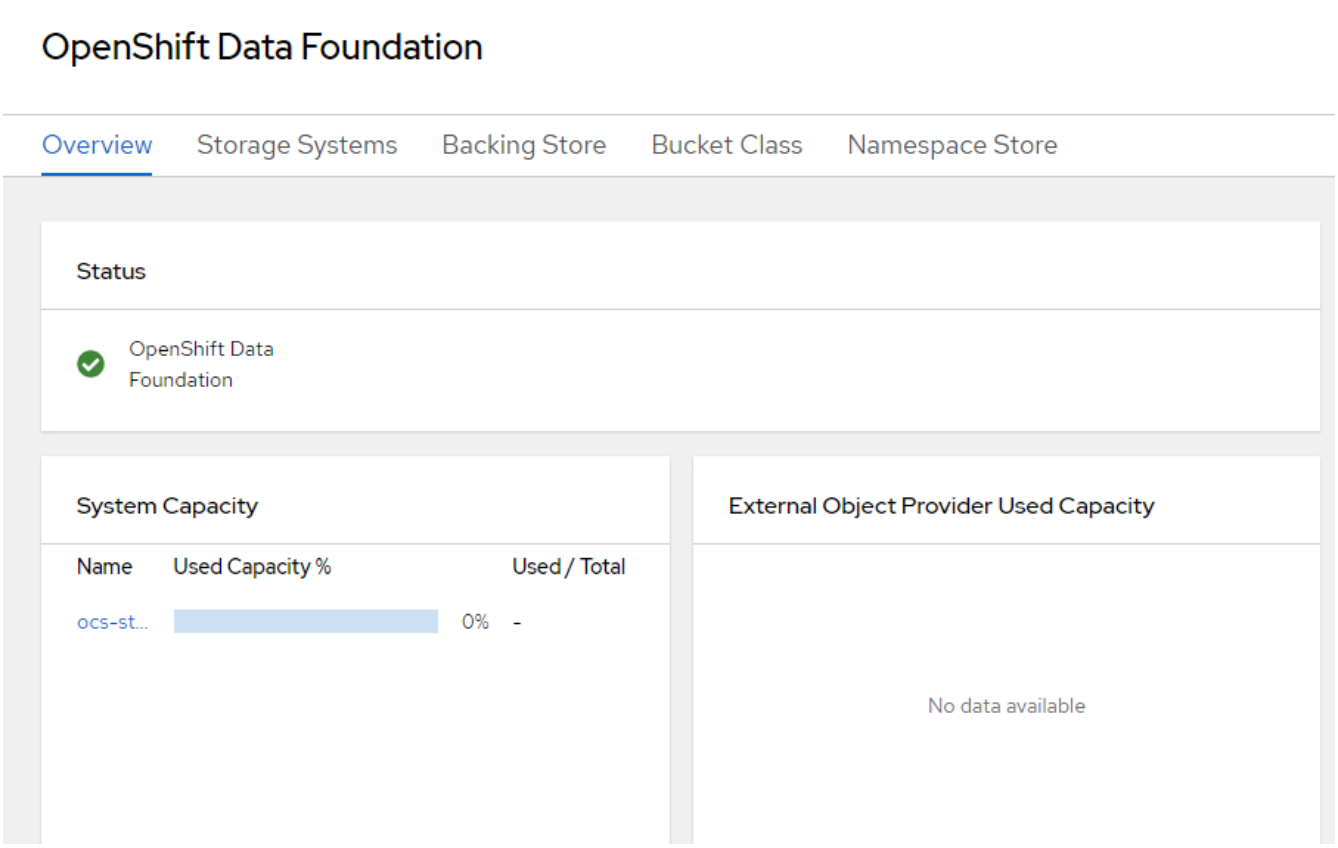
Dashboard Health in Production Cluster

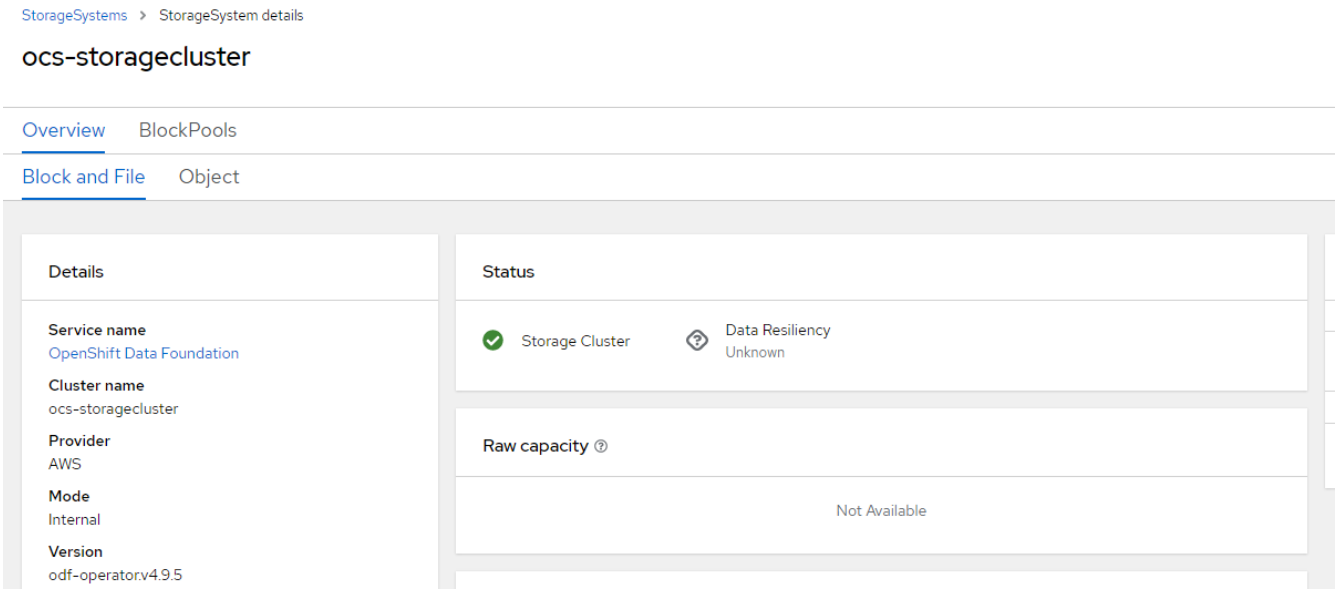
- Navigate to the Operators menu on the left and select Installed Operators.
- Verify that the final Status of the installed storage cluster shows as Phase: ready with a green tick mark
- Navigate to Storage → Overview and ensure Openshift Data Foundation show green tick marks
- Click on the Storage System tab and ensure that Block Storage shows a green tick mark

Non-Production Cluster



Production Cluster





1.3. Ensure that the required storage classes are created

- Go to Storage → Storage Classes from the left pane of the OpenShift Web Console and verify that the expected storage classes are created.
    - The default storage classes for ODF on AWS are cephfs,rbd, and noobaa

Listing 1. Non-Production Cluster

```
gp2
gp2-csi
gp3-basic-ebs-csi-aws
gp3-ebs-csi-aws (default)
io1
ocs-storagecluster-cephfs
ocs-storagecluster-ceph-rbd
openshift-storage.noobaa.io
```

Listing 2. Production Cluster

```
gp2
gp2-csi
gp3-ebs-csi-aws (default)
io1
ocs-storagecluster-cephfs
ocs-storagecluster-ceph-rbd
openshift-storage.noobaa.io
```

1.4. Ensure required pods have been created

- Go to Workloads → Pods from the left pane of the OpenShift Web Console and verify that the expected pods are created.

https://access.redhat.com/documentation/en-us/red_hat_openshift_data_foundation/4.9/html-single/deploying_openshift_data_foundation_using_amazon_web_services/index#pods-corresponding-to-storage-components-internal-mode Documentation

Non Prod Pods

```
$ oc get pods -n openshift-storage
NAME                                                              READY   STATUS    RESTARTS        AGE
csi-cephfsplugin-22dwx                                            3/3     Running   6               180d
csi-cephfsplugin-2mtf5                                            3/3     Running   6               196d
csi-cephfsplugin-44fh8                                            3/3     Running   3               135d
csi-cephfsplugin-4c6ns                                            3/3     Running   3               140d
csi-cephfsplugin-4s5kl                                            3/3     Running   3               90d
csi-cephfsplugin-5sn2g                                            3/3     Running   3               140d
csi-cephfsplugin-64hhc                                            3/3     Running   3               154d
csi-cephfsplugin-6nqz2                                            3/3     Running   0               35d
csi-cephfsplugin-6v44n                                            3/3     Running   0               35d
csi-cephfsplugin-6wcl4                                            3/3     Running   3               145d
csi-cephfsplugin-76gb6                                            3/3     Running   0               81d
csi-cephfsplugin-78v6z                                            3/3     Running   3               154d
csi-cephfsplugin-7chd5                                            3/3     Running   6               196d
csi-cephfsplugin-8lspp                                            3/3     Running   3               140d
csi-cephfsplugin-8t55l                                            3/3     Running   0               82d
csi-cephfsplugin-9pmwz                                            3/3     Running   3               140d
csi-cephfsplugin-9vskh                                            3/3     Running   3               145d
```

```
csi-cephfsplugin-b42qm                                  3/3     Running   3               146d
csi-cephfsplugin-bh2f4                                  3/3     Running   6               154d
csi-cephfsplugin-bhmqp                                  3/3     Running   3               154d
csi-cephfsplugin-c92s6                                  3/3     Running   3               142d
csi-cephfsplugin-dkqbm                                  3/3     Running   3               140d
csi-cephfsplugin-dnkp7                                  3/3     Running   6               180d
csi-cephfsplugin-fdxsw                                  3/3     Running   0               35d
csi-cephfsplugin-fg62w                                  3/3     Running   6               209d
csi-cephfsplugin-fgfwv                                  3/3     Running   6               209d
csi-cephfsplugin-fvt9x                                  3/3     Running   6               180d
csi-cephfsplugin-g4dcx                                  3/3     Running   3               154d
csi-cephfsplugin-gq8rd                                  3/3     Running   3               146d
csi-cephfsplugin-h524c                                  3/3     Running   3               142d
csi-cephfsplugin-jhtqp                                  3/3     Running   0               81d
csi-cephfsplugin-jhxrj                                  3/3     Running   6               180d
csi-cephfsplugin-jmppg                                  3/3     Running   6               209d
csi-cephfsplugin-k525p                                  3/3     Running   0               51d
csi-cephfsplugin-k8ltq                                  3/3     Running   0               51d
csi-cephfsplugin-l4cqx                                  3/3     Running   6               209d
csi-cephfsplugin-l8c4b                                  3/3     Running   6               180d
csi-cephfsplugin-lmm4g                                  3/3     Running   3               146d
csi-cephfsplugin-mbh7b                                  3/3     Running   6               180d
csi-cephfsplugin-mc74d                                  3/3     Running   3               145d
csi-cephfsplugin-ml68z                                  3/3     Running   6               209d
csi-cephfsplugin-n529q                                  3/3     Running   6               209d
csi-cephfsplugin-n8g5x                                  3/3     Running   3               126d
csi-cephfsplugin-p95br                                  3/3     Running   6               195d
csi-cephfsplugin-pcdqk                                  3/3     Running   6               180d
csi-cephfsplugin-provisioner-64595cbf6c-8h2jn           6/6     Running   8 (3d15h ago)   81d
csi-cephfsplugin-provisioner-64595cbf6c-n9bj7           6/6     Running   3 (71d ago)     81d
csi-cephfsplugin-psjl6                                  3/3     Running   0               34d
csi-cephfsplugin-pwg8z                                  3/3     Running   6               154d
csi-cephfsplugin-qjwxv                                  3/3     Running   3               146d
csi-cephfsplugin-rpz5c                                  3/3     Running   6               195d
csi-cephfsplugin-rvmf2                                  3/3     Running   3               145d
csi-cephfsplugin-tb982                                  3/3     Running   3               142d
csi-cephfsplugin-tpg6k                                  3/3     Running   0               78d
csi-cephfsplugin-v42lm                                  3/3     Running   6               180d
csi-cephfsplugin-vp9x8                                  3/3     Running   0               51d
csi-cephfsplugin-vw2rq                                  3/3     Running   6               180d
csi-cephfsplugin-w29jk                                  3/3     Running   6               180d
csi-cephfsplugin-w8c99                                  3/3     Running   0               78d
csi-cephfsplugin-ztt6q                                  3/3     Running   3               154d
csi-rbdplugin-226rd                                     3/3     Running   3               140d
csi-rbdplugin-22gvs                                     3/3     Running   6               180d
csi-rbdplugin-2tqh9                                     3/3     Running   3               146d
csi-rbdplugin-46ftj                                     3/3     Running   6               154d
csi-rbdplugin-4b57k                                     3/3     Running   3               140d
csi-rbdplugin-4jn22                                     3/3     Running   6               180d
csi-rbdplugin-4szvg                                     3/3     Running   3               142d
csi-rbdplugin-4tgxw                                     3/3     Running   6               180d
csi-rbdplugin-5tn2r                                     3/3     Running   6               154d
csi-rbdplugin-6bdkn                                     3/3     Running   3               154d
csi-rbdplugin-6fdhl                                     3/3     Running   6               209d
csi-rbdplugin-7cvzz                                     3/3     Running   0               35d
csi-rbdplugin-7nrz8                                     3/3     Running   0               81d
csi-rbdplugin-8fgpw                                     3/3     Running   0               82d
```

```
csi-rbdplugin-8vzq9                                               3/3     Running   3               135d
csi-rbdplugin-96jv9                                               3/3     Running   3               146d
csi-rbdplugin-96tf4                                               3/3     Running   3               154d
csi-rbdplugin-9l65z                                               3/3     Running   6               195d
csi-rbdplugin-9qpqm                                               3/3     Running   3               142d
csi-rbdplugin-9wt9s                                               3/3     Running   6               180d
csi-rbdplugin-b2t9t                                               3/3     Running   3               154d
csi-rbdplugin-bnbpf                                               3/3     Running   3               140d
csi-rbdplugin-bwbgj                                               3/3     Running   6               209d
csi-rbdplugin-c58jd                                               3/3     Running   0               51d
csi-rbdplugin-cjqtt                                               3/3     Running   6               209d
csi-rbdplugin-dpdxw                                               3/3     Running   0               35d
csi-rbdplugin-fj6x4                                               3/3     Running   3               145d
csi-rbdplugin-fpjjt                                               3/3     Running   6               180d
csi-rbdplugin-fvddm                                               3/3     Running   6               180d
csi-rbdplugin-g8cwq                                               3/3     Running   3               140d
csi-rbdplugin-gqpjp                                               3/3     Running   3               145d
csi-rbdplugin-h8nxr                                               3/3     Running   6               196d
csi-rbdplugin-hbg6k                                               3/3     Running   0               78d
csi-rbdplugin-hw9gm                                               3/3     Running   0               51d
csi-rbdplugin-hxbvm                                               3/3     Running   6               180d
csi-rbdplugin-jgcgp                                               3/3     Running   3               145d
csi-rbdplugin-jpwjt                                               3/3     Running   0               78d
csi-rbdplugin-kk5rv                                               3/3     Running   0               51d
csi-rbdplugin-lck27                                               3/3     Running   3               154d
csi-rbdplugin-mvsnb                                               3/3     Running   0               34d
csi-rbdplugin-n2z97                                               3/3     Running   3               140d
csi-rbdplugin-nqfcv                                               3/3     Running   3               154d
csi-rbdplugin-pcfk8                                               3/3     Running   6               209d
csi-rbdplugin-provisioner-5789fd5797-whxc9                        6/6     Running   7 (71d ago)     81d
csi-rbdplugin-provisioner-5789fd5797-x4js5                        6/6     Running   9 (74d ago)     81d
csi-rbdplugin-ptj6s                                               3/3     Running   0               81d
csi-rbdplugin-px8kc                                               3/3     Running   3               146d
csi-rbdplugin-q9n5h                                               3/3     Running   6               209d
csi-rbdplugin-qffn2                                               3/3     Running   6               180d
csi-rbdplugin-qkjw7                                               3/3     Running   6               196d
csi-rbdplugin-rphjz                                               3/3     Running   3               90d
csi-rbdplugin-sw8rt                                               3/3     Running   6               180d
csi-rbdplugin-vm7q6                                               3/3     Running   6               195d
csi-rbdplugin-vx8l7                                               3/3     Running   3               145d
csi-rbdplugin-w56kd                                               3/3     Running   6               180d
csi-rbdplugin-w5mm5                                               3/3     Running   3               126d
csi-rbdplugin-wjvzr                                               3/3     Running   0               35d
csi-rbdplugin-ws7m8                                               3/3     Running   3               146d
csi-rbdplugin-xdk8l                                               3/3     Running   6               209d
csi-rbdplugin-zvwhs                                               3/3     Running   3               142d
noobaa-core-0                                                     1/1     Running   0               81d
noobaa-db-pg-0                                                    1/1     Running   0               81d
noobaa-endpoint-7f89b65444-kkmjj                                  1/1     Running   0               81d
noobaa-operator-555dbc8b68-qnzn2                                  1/1     Running   0               81d
ocs-metrics-exporter-65986ffc9-xhh9t                              1/1     Running   0               81d
ocs-operator-696d5b4f5-2rkh9                                      1/1     Running   4 (3d15h ago)   81d
odf-console-69648dbc57-5t7gp                                      1/1     Running   0               81d
odf-operator-controller-manager-6df68d9696-g6qg7                  2/2     Running   3 (3d15h ago)   81d
rook-ceph-crashcollector-ip-172-18-56-242.saccap.int-7ddb5mspqm   1/1     Running   0               81d
rook-ceph-crashcollector-ip-172-18-57-121.saccap.int-7b4c6nmmpm   1/1     Running   0               81d
rook-ceph-crashcollector-ip-172-18-58-213.saccap.int-56dc4k8hs7   1/1     Running   0               81d
```

```
rook-ceph-mds-ocs-storagecluster-cephfilesystem-a-c9d984c5glwcj   2/2     Running   0              81d
rook-ceph-mds-ocs-storagecluster-cephfilesystem-b-c6b79c87rwc2n   2/2     Running   0              81d
rook-ceph-mgr-a-7c75cdb79d-jmjw4                                  2/2     Running   0              81d
rook-ceph-mon-a-846cb6fb4b-xp8j9                                  2/2     Running   0              2d3h
rook-ceph-mon-b-795989764c-6h5dk                                  2/2     Running   0              2d3h
rook-ceph-mon-c-6cdb89bdcb-4j4wn                                  2/2     Running   0              2d3h
rook-ceph-operator-6647b6999-h8wq5                                1/1     Running   0              81d
rook-ceph-osd-0-5bb59f4f4c-9b56r                                  2/2     Running   0              81d
rook-ceph-osd-1-84974c9d7c-87bml                                  2/2     Running   0              81d
rook-ceph-osd-2-57dd7bbbf6-4cnl7                                  2/2     Running   0              81d
rook-ceph-tools-7f66db4d9-sr82h                                   1/1     Running   0              2d3h
```

Prod

```
$ oc get pods -n openshift-storage
NAME                                                              READY   STATUS    RESTARTS        AGE
csi-cephfsplugin-4lpsj                                            3/3     Running   0               76d
csi-cephfsplugin-5gmtt                                            3/3     Running   0               70d
csi-cephfsplugin-76w8f                                            3/3     Running   6               126d
csi-cephfsplugin-798gf                                            3/3     Running   6               126d
csi-cephfsplugin-924r2                                            3/3     Running   6               126d
csi-cephfsplugin-9fcgd                                            3/3     Running   6               126d
csi-cephfsplugin-9t7l6                                            3/3     Running   6               126d
csi-cephfsplugin-9vmv2                                            3/3     Running   0               76d
csi-cephfsplugin-bkkqd                                            3/3     Running   0               70d
csi-cephfsplugin-hxrdg                                            3/3     Running   0               76d
csi-cephfsplugin-jhk7n                                            3/3     Running   6               118d
csi-cephfsplugin-jm4hc                                            3/3     Running   6               126d
csi-cephfsplugin-kc8b8                                            3/3     Running   0               76d
csi-cephfsplugin-l7d24                                            3/3     Running   0               76d
csi-cephfsplugin-lbflr                                            3/3     Running   6               124d
csi-cephfsplugin-n7jx2                                            3/3     Running   0               85d
csi-cephfsplugin-nhcz4                                            3/3     Running   0               76d
csi-cephfsplugin-ntqf8                                            3/3     Running   6               126d
csi-cephfsplugin-provisioner-6d9b4fdd89-5vrxd                     6/6     Running   0               85d
csi-cephfsplugin-provisioner-6d9b4fdd89-rzzt4                     6/6     Running   1 (3d10h ago)   85d
csi-cephfsplugin-tckc7                                            3/3     Running   6               118d
csi-cephfsplugin-v9gjk                                            3/3     Running   0               76d
csi-cephfsplugin-vlg96                                            3/3     Running   0               76d
csi-cephfsplugin-w5ckb                                            3/3     Running   6               118d
csi-cephfsplugin-w6g4t                                            3/3     Running   6               126d
csi-cephfsplugin-x8r6r                                            3/3     Running   6               126d
csi-cephfsplugin-xn6bg                                            3/3     Running   0               76d
csi-cephfsplugin-zl5p8                                            3/3     Running   0               70d
csi-cephfsplugin-zzp9f                                            3/3     Running   3               104d
csi-rbdplugin-26r2c                                               3/3     Running   6               126d
csi-rbdplugin-5ldkj                                               3/3     Running   0               76d
csi-rbdplugin-6kjmx                                               3/3     Running   6               124d
csi-rbdplugin-6w6cl                                               3/3     Running   6               118d
csi-rbdplugin-7xf4r                                               3/3     Running   6               126d
csi-rbdplugin-855rx                                               3/3     Running   0               70d
csi-rbdplugin-85grb                                               3/3     Running   0               76d
csi-rbdplugin-8t46n                                               3/3     Running   6               126d
csi-rbdplugin-8w4c9                                               3/3     Running   6               126d
csi-rbdplugin-b4fml                                               3/3     Running   0               85d
```

```
csi-rbdplugin-bwpdz                                               3/3     Running   6              118d
csi-rbdplugin-dhgxr                                               3/3     Running   6              118d
csi-rbdplugin-f5r5m                                               3/3     Running   0              76d
csi-rbdplugin-j2rnw                                               3/3     Running   0              76d
csi-rbdplugin-kb9bl                                               3/3     Running   6              126d
csi-rbdplugin-lnf5n                                               3/3     Running   6              126d
csi-rbdplugin-nlwlb                                               3/3     Running   0              76d
csi-rbdplugin-phght                                               3/3     Running   0              76d
csi-rbdplugin-provisioner-86db659c45-prjzw                        6/6     Running   0              85d
csi-rbdplugin-provisioner-86db659c45-tmtnp                        6/6     Running   1 (51d ago)    85d
csi-rbdplugin-q5tkx                                               3/3     Running   0              70d
csi-rbdplugin-q7hxn                                               3/3     Running   6              126d
csi-rbdplugin-rr9md                                               3/3     Running   6              126d
csi-rbdplugin-s6ljb                                               3/3     Running   0              76d
csi-rbdplugin-ss5zb                                               3/3     Running   6              126d
csi-rbdplugin-w4s67                                               3/3     Running   0              76d
csi-rbdplugin-wn88k                                               3/3     Running   3              104d
csi-rbdplugin-xb5nz                                               3/3     Running   0              76d
csi-rbdplugin-zsq85                                               3/3     Running   0              70d
noobaa-core-0                                                     1/1     Running   0              85d
noobaa-db-pg-0                                                    1/1     Running   0              85d
noobaa-endpoint-765df96b54-n2xqd                                  1/1     Running   0              85d
noobaa-operator-7f66d77867-vjb5x                                  1/1     Running   5 (9d ago)     85d
ocs-metrics-exporter-5bc85467fb-wgxvg                             1/1     Running   0              85d
ocs-operator-f64f657c6-m64nd                                      1/1     Running   0              85d
odf-console-6bfc49c6c4-tg84h                                      1/1     Running   0              85d
odf-operator-controller-manager-6c84bf9db6-kfqp7                  2/2     Running   0              85d
rook-ceph-crashcollector-ip-172-18-60-239.saccap.int-6bb8c8jz5m   1/1     Running   0              85d
rook-ceph-crashcollector-ip-172-18-61-115.saccap.int-75597nshwd   1/1     Running   0              85d
rook-ceph-crashcollector-ip-172-18-62-30.saccap.int-856568mp46s   1/1     Running   0              85d
rook-ceph-mds-ocs-storagecluster-cephfilesystem-a-5745c9f44v6dj   2/2     Running   0              85d
rook-ceph-mds-ocs-storagecluster-cephfilesystem-b-6ddfc5d7pm87c   2/2     Running   0              85d
rook-ceph-mgr-a-75f796f966-hjtx7                                  2/2     Running   0              85d
rook-ceph-mon-a-5dc94f7b7c-qqb4t                                  2/2     Running   0              85d
rook-ceph-mon-b-59b885d8cc-9z8r4                                  2/2     Running   0              85d
rook-ceph-mon-c-556986d775-27dcr                                  2/2     Running   0              85d
rook-ceph-operator-796c9f8494-z8sxk                               1/1     Running   0              85d
rook-ceph-osd-0-d88c5f797-sxbdn                                   2/2     Running   0              85d
rook-ceph-osd-1-b5b8c75f8-s4cp2                                   2/2     Running   0              85d
rook-ceph-osd-2-698f77d8c8-5jxzd                                  2/2     Running   0              85d
rook-ceph-tools-566f66f588-wssbl                                  1/1     Running   0              7d3h
```

1.5. Verify that Ceph Cluster health status is OK

Deploy the Rook-Ceph Toobox pod. This pod can access Ceph in a similar fasion to using ssh to access a Ceph node.

```
$ oc patch OCSInitialization ocsinit -n openshift-storage --type json --patch  '[{ "op": "replace",
"path": "/spec/enableCephTools", "value": true }]'
```

After the rook-ceph-tools pod is running, access the toolbox by running a remote shell in the pod:

```
$ TOOLS_POD=$(oc get pods -n openshift-storage -l app=rook-ceph-tools -o name)
$ oc rsh -n openshift-storage $TOOLS_POD
```

- In the ceph tool pod, run ceph status, ceph osd tree, and ceph df to ensure proper number of OSDs are present, and Health status is OK.
  - for this deployment, three 4TB osds are expected

Non-Production Cluster

```
[jm11846@uatue1ose001 ~]$ TOOLS_POD=$(oc get pods -n openshift-storage -l app=rook-ceph-tools -o name
rage $TOOLS_POD[jm11846@uatue1ose001 ~]$ oc rsh -n openshift-storage $TOOLS_POD
sh-4.4$
sh-4.4$
sh-4.4$ ceph status
  cluster:
    id:     8f2cdda2-3788-4080-b640-d85b9daa2400
    health: HEALTH_OK

  services:
    mon: 3 daemons, quorum a,b,c (age 5m)
    mgr: a(active, since 11w)
    mds: 1/1 daemons up, 1 hot standby
    osd: 3 osds: 3 up (since 11w), 3 in (since 6M)

  data:
    volumes: 1/1 healthy
    pools:   4 pools, 97 pgs
    objects: 107.52k objects, 8.2 GiB
    usage:   28 GiB used, 12 TiB / 12 TiB avail
    pgs:     97 active+clean

  io:
    client:   2.0 KiB/s rd, 938 B/s wr, 2 op/s rd, 0 op/s wr

sh-4.4$
```

```
sh-4.4$ ceph osd tree
ID   CLASS  WEIGHT    TYPE NAME                                                STATUS  REWEIGHT  PRI-AFF
 -1         12.00000  root default
 -5         12.00000      region us-east-1
-10          4.00000          zone us-east-1a
 -9          4.00000              host ocs-deviceset-gp3-ebs-csi-aws-2-data-0ftdfz
  1    ssd   4.00000                  osd.1                                        up   1.00000  1.00000
-14          4.00000          zone us-east-1b
-13          4.00000              host ocs-deviceset-gp3-ebs-csi-aws-1-data-0gr675
  2    ssd   4.00000                  osd.2                                        up   1.00000  1.00000
 -4          4.00000          zone us-east-1c
 -3          4.00000              host ocs-deviceset-gp3-ebs-csi-aws-0-data-0w854m
  0    ssd   4.00000                  osd.0                                        up   1.00000  1.00000
sh-4.4$
```

```
sh-4.4$ ceph df
--- RAW STORAGE ---
CLASS     SIZE    AVAIL     USED  RAW USED  %RAW USED
ssd     12 TiB   12 TiB   28 GiB    28 GiB       0.23
TOTAL   12 TiB   12 TiB   28 GiB    28 GiB       0.23

--- POOLS ---
POOL                                   ID  PGS   STORED  OBJECTS     USED  %USED  MAX AVAIL
ocs-storagecluster-cephblockpool        1   32  478 MiB      170  1.4 GiB   0.01    3.4 TiB
ocs-storagecluster-cephfilesystem-metadata   2   32  407 MiB   12.74k  1.2 GiB   0.01    3.4 TiB
device_health_metrics                   3    1  4.9 MiB        6   15 MiB      0    3.4 TiB
ocs-storagecluster-cephfilesystem-data0      4   32  7.3 GiB   94.61k   23 GiB   0.22    3.4 TiB
```

Production Cluster

```
pod/rook-ceph-tools-566f66f588-wss5l
[jm11846@prdue1ose001 ~]$  oc rsh -n openshift-storage ${TOOLS_POD}
sh-4.4$ ceph status
  cluster:
    id:     738dec23-4df9-4897-8f28-a953ecb1fad2
    health: HEALTH_OK

  services:
    mon: 3 daemons, quorum a,b,c (age 4d)
    mgr: a(active, since 11w)
    mds: 1/1 daemons up, 1 hot standby
    osd: 3 osds: 3 up (since 11w), 3 in (since 3M)

  data:
    volumes: 1/1 healthy
    pools:   4 pools, 97 pgs
    objects: 98.18k objects, 3.0 GiB
    usage:   12 GiB used, 12 TiB / 12 TiB avail
    pgs:     97 active+clean

  io:
    client:   1.2 KiB/s rd, 2.1 KiB/s wr, 1 op/s rd, 0 op/s wr
```

```
sh-4.4$  ceph osd tree
ID   CLASS  WEIGHT    TYPE NAME                                                STATUS  REWEIGHT  PRI-AFF
 -1         12.00000  root default
 -5         12.00000      region us-east-1
-14          4.00000          zone us-east-1a
-13          4.00000              host ocs-deviceset-gp3-ebs-csi-aws-2-data-0sp5tn
  2    ssd   4.00000                  osd.2                                        up   1.00000  1.00000
 -4          4.00000          zone us-east-1b
 -3          4.00000              host ocs-deviceset-gp3-ebs-csi-aws-0-data-0sqp5n
  0    ssd   4.00000                  osd.0                                        up   1.00000  1.00000
-10          4.00000          zone us-east-1c
 -9          4.00000              host ocs-deviceset-gp3-ebs-csi-aws-1-data-0pnnln
  1    ssd   4.00000                  osd.1                                        up   1.00000  1.00000
```

```
sh-4.4$ ceph df
--- RAW STORAGE ---
CLASS    SIZE   AVAIL    USED  RAW USED  %RAW USED
ssd    12 TiB  12 TiB  12 GiB    12 GiB       0.10
TOTAL  12 TiB  12 TiB  12 GiB    12 GiB       0.10

--- POOLS ---
POOL                                   ID  PGS   STORED  OBJECTS     USED  %USED  MAX AVAIL
ocs-storagecluster-cephblockpool        1   32  443 MiB      159  1.3 GiB   0.01    3.4 TiB
ocs-storagecluster-cephfilesystem-metadata  2   32  564 MiB   10.74k  1.7 GiB   0.02    3.4 TiB
ocs-storagecluster-cephfilesystem-data0     3   32  2.0 GiB   87.27k  6.8 GiB   0.07    3.4 TiB
device_health_metrics                   4    1  3.6 MiB        6   11 MiB      0    3.4 TiB
```

1.6. Ensure RBD and FS PVCs can be bound

Non-Production Cluster

```
[jm11846@uatue1ose001 ~]$ cat <<EOF | oc apply -f -
> ---
> apiVersion: v1
> kind: PersistentVolumeClaim
> metadata:
>   name: cephfs-pvc
> spec:
>   accessModes:
>   - ReadWriteMany
>   resources:
>     requests:
>       storage: 1Gi
>   storageClassName: ocs-storagecluster-cephfs
> EOF
persistentvolumeclaim/cephfs-pvc created
[jm11846@uatue1ose001 ~]$ oc get pvc | grep cephfs-pvc
cephfs-pvc                    Bound    pvc-11fe5b87-ab65-430c-8327-49846f4bcfa7   1Gi        RWX            ocs-storagecluster-cephfs     7s
```

```
[jm11846@uatue1ose001 ~]$ cat <<EOF | oc apply -f -
> ---
> apiVersion: v1
> kind: PersistentVolumeClaim
> metadata:
>   name: rbd-pvc
> spec:
>   accessModes:
>   - ReadWriteOnce
>   resources:
>     requests:
>       storage: 1Gi
>   storageClassName: ocs-storagecluster-ceph-rbd
> EOF
persistentvolumeclaim/rbd-pvc created
[jm11846@uatue1ose001 ~]$ oc get pvc | grep rbd-pvc
rbd-pvc                       Bound    pvc-d876ee4e-fe8c-4e2d-bcfb-04c3c212f6b3   1Gi        RWO            ocs-storagecluster-ceph-rbd   9s
[jm11846@uatue1ose001 ~]$ cat <<EOF | oc apply -f -
```

Production Cluster

```
> EOF
persistentvolumeclaim/rbd-pvc created
[jm11846@prdue1ose001 ~]$ oc get pvc | grep rbd-pvc
rbd-pvc    Bound    pvc-5947dde8-d1b3-4cb6-bc21-b32c953b1099   1Gi        RWO            ocs-storagecluster-ceph-rbd   36s
[jm11846@prdue1ose001 ~]$
```

```
persistentvolumeclaim/cephfs-pvc created
[jm11846@prdue1ose001 ~]$ oc get pvc | grep cephfs-pvc
cephfs-pvc   Bound    pvc-b4195ce6-c687-41c7-9659-5d689327e59e   1Gi        RWX            ocs-storagecluster-cephfs     4s
[jm11846@prdue1ose001 ~]$
```

1.7. Ensure PVC expansion is possible

Non-Production Cluster

```
TBD
```

Production Cluster image:::../pdf/images/odf/prod/prod_pvc_expanded.png[]