Dell Compellent Tech Tip

Title: Storage Center migrations with Linux and Live Volume
Compellent Product/Version: Storage Center 5.4 or greater
Non Compellent Product/Version: Linux Kernel 2.6.3x or greater

Document History:

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Description:

This Tech Tip is intended to be a guide for migrating volumes between Storage Centers using Linux, Live Volume, and Fiber Channel or iSCSI connectivity with absolutely no downtime. As with most Unix technologies, there is more than one way to accomplish any task, the steps outlined are merely an example of one way to do it.

In this Tech Tip, we will leverage the Linux Device Mapper's multipath functionality in order to allow a Linux server two "stand up" across two Storage Centers with a Live Volume in order to migrate the server from one Storage Center to another. In order to make this transition seamlessly, the server will need to have connectivity to both Storage Centers for the length of the migration.

It should be noted that this document will focus exclusively on the Linux command line. It is also strongly suggested that this tech tip be used in conjunction with the Dell Compellent Linux Best Practices document, Dell Compellent Storage Center Connectivity Guide, and Dell Compellent Storage Center Best Practices for Live Volume document.

Live Volume and Linux using iSCSI Connectivity:

To begin, we have a server with production data, using iSCSI for connectivity to its Storage Center. In this case, we will be moving the non-boot volume of “mpathprodmysql”:

```
# iscsiadm -m node
10.10.95.1:3260,0 iqn.2002-03.com.compellent:5000d3100002b90d
10.10.128.1:3260,0 iqn.2002-03.com.compellent:5000d3100002b90e
10.10.128.1:3260,0 iqn.2002-03.com.compellent:5000d3100002b918
10.10.95.1:3260,0 iqn.2002-03.com.compellent:5000d3100002b917
```

```
# multipath -ll
mpatha (36000d310000360000000000000000113f) dm-0 COMPELNT,Compellent Vol
 size=16G features='1 queue_if_no_path' hwhandler='0' wp=rw
 `-+ policy='round-robin 0' prio=1 status=active
  | 0:0:15:0 sda 8:0 active ready running
  `- 1:0:8:0 sdb 8:16 active ready running
mpathprodmysql (36000d3100002b9000000000000000008ba7) dm-5 COMPELNT,Compellent Vol
 size=500G features='1 queue_if_no_path' hwhandler='0' wp=rw
  `+- policy='round-robin 0' prio=1 status=active
   | 8:0:0:1 sdc 8:32 active ready running
   `- 9:0:0:1 sdd 8:48 active ready running
```
At this point, the Storage Center volume that “mpathprodmysql” is based on can be converted into a Live Volume between the original and destination Storage Centers. In order to create the server object in the destination Storage Center, we need to use the Open-iSCSI tool to target and login to the destination Storage Center:

```
# iscsiadm -m discovery -t st -p $IP-PER-PORT-OR-CONTROL-PORT
# iscsiadm -m node --login
```

* Note that you will need to run a discovery command per controller port, or if Control Ports have been configured, per control port.

Now the server object can be created in the destination storage center. When the server object has been created, it must then have the Live Volume mapped to it. One the Live Volume has been mapped to the server on the destination Storage Center, tell the server to rescan its known iSCSI targets:

```
# iscsiadm -m node -R
```

The discovery of the new paths to the volume through the destination Storage Center can be checked by asking multipath to print its known paths. This can be compared to the multipath listing printed earlier:

```
# multipath -ll
```

At this point, the server will be directing I/O down each path, which means that both the original and the destination Storage Center will be processing that Live Volume’s I/O. The next step is gracefully failing the paths to the original Storage Center with the multipathd command:

```
# multipathd fail path sdc
```

Confirm that the path was committed to a failed state:

```
# multipath -ll
```

Then the remaining path to the original Storage Center can be failed:

```
# multipathd fail path sdd
```
Once again, confirm the failure:

```bash
# multipath -ll
...
mpathprodmysql (36000d3100002b90000000000000008ba7) dm-5 COMPELNT,Compellent Vol
    size=500G features='1 queue_if_no_path' hwhandler='0' wp=rw
     `+- policy=round-robin 0' prio=1 status=active
        |- 8:0:0:1 sdc 8:32 failed ready running
        |- 9:0:0:1 sdd 8:48 failed ready running
        |- 17:0:0:1 sde 8:64 active ready running
        |- 12:0:0:1 sdf 8:80 active ready running
        |- 13:0:0:1 sdg 8:96 active ready running
     `- 16:0:0:1 sdh 8:112 active ready running
```

Now that the path original paths have been gracefully failed with no event, the paths can be deleted from the running multipath configuration:

```bash
# multipathd remove path sdc
ok
```

```bash
# multipath -ll
...
mpathprodmysql (36000d3100002b90000000000000008ba7) dm-5 COMPELNT,Compellent Vol
    size=500G features='1 queue_if_no_path' hwhandler='0' wp=rw
     `+- policy=round-robin 0' prio=1 status=active
        |- 17:0:0:1 sde 8:64 active ready running
        |- 12:0:0:1 sdf 8:80 active ready running
        |- 13:0:0:1 sdg 8:96 active ready running
     `- 16:0:0:1 sdh 8:112 active ready running
```

```bash
# multipathd remove path sdd
ok
```

```bash
# multipath -ll
...
mpathprodmysql (36000d3100002b90000000000000008ba7) dm-5 COMPELNT,Compellent Vol
    size=500G features='1 queue_if_no_path' hwhandler='0' wp=rw
     `+- policy=round-robin 0' prio=1 status=active
        |- 17:0:0:1 sde 8:64 active ready running
        |- 12:0:0:1 sdf 8:80 active ready running
        |- 13:0:0:1 sdg 8:96 active ready running
     `- 16:0:0:1 sdh 8:112 active ready running
```

At this point I/O will not be directed to the original Storage Center without specific human intervention. Because I/O is going only to the destination Storage Center, the Live Volume logic will (if it has not already) work to identify the destination Storage Center as the primary recipient of I/O, and will begin the process of making it the primary Storage Center for the Live Volume. Once the destination Storage Center has taken the primary responsibilities for the Live Volume, the server mappings on the original Storage Center can be removed, and the Live Volume could be returned to a regular volume and the migration considered complete. However if the server will no longer have any other reason to have iSCSI connectivity with the original Storage Center, it is a good idea to clean up the remaining iSCSI configuration options for that Storage Center.

For each iscsi entry associated with the old storage center, gracefully logout, remove the auto.login flag, and then delete the entry:

```bash
# iscsiadm -m node -T iqn.2002-03.com.compellent:5000d3100002b917 -p 10.10.95.1 --logout
# iscsiadm -m node -T iqn.2002-03.com.compellent:5000d3100002b917 -p 10.10.95.1 --op update -n node.startup -v manual
# iscsiadm -m node --op delete --targetname iqn.2002-03.com.compellent:5000d3100002b917
```
*Troubleshooting:

If at any point there is confusion about which path comes from which storage center, the use of the below command can help recreate a map of iscsi sessions to paths:

```
# iscsiadm -m session -P 3
```

**Live Volume and Linux using Fiber Channel Connectivity:**

To begin, we have a server with a boot partition using Fiber Channel connectivity to its Storage Center (i.e. Boot from SAN). In this case, we will be moving the boot volume “mpatha”:

```
# multipath -ll
mpatha (36000d310000069000000000000000d36) dm-0 COMPELNT,Compellent Vol
  size=16G features='1 queue_if_no_path' hwhandler='0' wp=rw
  |-+ policy='round-robin 0' prio=1 status=active
       |-+ 0:0:7:0 sda 8:0 active ready running
       |-+ 1:0:4:0 sdb 8:16 active ready running
```

```
# lsscsi
[0:0:7:0]    disk    COMPELNT Compellent Vol   0504  /dev/sda
[1:0:4:0]    disk    COMPELNT Compellent Vol   0504  /dev/sdb
```

At this point the volume that makes up “mpatha” can be converted into a Live Volume. Once that is done, the Linux server needs to rescan it’s HBAs in order to be visible during the server object creation process on the destination Storage Center. Note that this means the server must be able to reach both Storage Centers through the Fiber Channel fabric. To rescan the HBAs:

```
# echo "- - -" > /sys/class/scsi_host/host0/scan
# echo "- - -" > /sys/class/scsi_host/host1/scan
```

The WWN of the HBAs should now be visible within the Storage Center interface. To cross reference this, the Linux server can print the WWNs visible on the HBAs:

```
# cat /sys/class/scsi_host/host0/device/fc_host/host0/port_name
0x2100001b320fa28b
# cat /sys/class/scsi_host/host1/device/fc_host/host1/port_name
0x2101001b322fa28b
```

Once the server object is created, it can be mapped to the Live Volume. This mapping needs to use the “Advanced” mapping option of mapping it as Lun0, as this is the boot volume for the server, and will continue to be Lun0 on the new Storage Center. Once the mapping has been created, the HBAs need to be rescanned for the new paths to appear:
The addition of the new paths can be confirmed with the multipath command:

```bash
# multipath -ll
mpatha (36000d3100000690000000000000000d36) dm-0 COMPELNT,Compellent Vol
  size=16G features='1 queue_if_no_path' hwhandler='0' wp=rw
    `+- policy='round-robin 0' prio=1 status=active
       |  0:0:7:0 sda 8:0  active ready running
       |  1:0:4:0 sdb 8:16 active ready running
       |  0:0:1:0 sdc 8:32 active ready running
      `.- 1:0:2:0 sdd 8:48 active ready running

At this point, the server will be directing I/O down each path, which means that both the original and the destination Storage Center will be processing that server's I/O. The next step is gracefully failing the paths to the original Storage Center with the multipathd command:

```bash
# multipathd fail path sda
ok
```

Confirm that the path was committed to a failed state:

```bash
# multipath -ll
mpatha (36000d3100000690000000000000000d36) dm-0 COMPELNT,Compellent Vol
  size=16G features='1 queue_if_no_path' hwhandler='0' wp=rw
    `+- policy='round-robin 0' prio=1 status=active
       |  0:0:7:0 sda 8:0  failed ready running
       |  1:0:4:0 sdb 8:16 active ready running
       |  0:0:1:0 sdc 8:32 active ready running
      `.- 1:0:2:0 sdd 8:48 active ready running

Then fail the remaining path to the original Storage Center:

```bash
# multipathd fail path sdb
ok
```

And confirm the failure of that path:
At this point, all I/O will be sent to the destination Storage Center. Since the path original paths have been gracefully failed with no event, the paths can be deleted from the running multipath configuration:

```
# multipathd remove path sda
ok
```

Confirm the removal of the path:

```
# multipath -ll

mpatha (36000d3100000069000000000000000d36) dm-0 COMPELNT,Compellent Vol
size=16G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='round-robin 0' prio=1 status=active
 | 0:0:7:0 sda 8:0 failed ready running
 | 1:0:4:0 sdb 8:16 failed ready running
 | 0:0:1:0 sdc 8:32 active ready running
 `- 1:0:2:0 sdd 8:48 active ready running

Remove the final path to the original Storage Center:

```
# multipathd remove path sdb
ok
```

Confirm the removal of the final path:

```
# multipath -ll

mpatha (36000d3100000069000000000000000d36) dm-0 COMPELNT,Compellent Vol
size=16G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='round-robin 0' prio=1 status=active
 | 0:0:1:0 sdc 8:32 active ready running
 `- 1:0:2:0 sdd 8:48 active ready running

The current running configuration of the multipath device mapper is such that the paths to the original Storage Center will never be used. Now the drive objects that make up the original paths can be gracefully removed:

```
# echo 1 > /sys/block/sda/device/delete
# echo 1 > /sys/block/sdb/device/delete
```

Because I/O is going only to the destination Storage Center, the Live Volume logic will (if it has not already) work to identify the destination Storage Center as the primary recipient of I/O, and will begin the process of
making it the primary Storage Center for the Live Volume. Once the destination Storage Center has taken the primary responsibilities for the Live Volume, the server to volume mapping on the original Storage Center can be removed, and the Live Volume converted back to a regular volume. Once the mappings have been removed, the HBAs should be rescanned one final time:

```
# echo "- - -" > /sys/class/scsi_host/host0/scan
# echo "- - -" > /sys/class/scsi_host/host1/scan
```

The server can then be removed from the original Storage Centers fabric zone.