Beginners guide to Device Mapper (DM) multipathing

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Multipathing Overview

A path is a connection between a server and the underlying storage. The path can be severed due to many reasons like faulty HBA, faulty cable etc. To avoid such single point of failures, multipathing exists. Multipathing ensures that the system uses multiple physical paths to provide redundancy and increased throughput. There are many vendor specific multipathing implementations like EMC's powerpath and Symantecs VxDMP.

What is Device Mapper multipath

Device Mapper Multipathing (or DM-multipathing) is a Linux native multipath tool, which allows you to configure multiple I/O paths between server nodes and storage arrays into a single device. These I/O paths are physical SAN connections that can include separate cables, switches, and controllers. Multipathing aggregates the I/O paths, creating a new device that consists of the aggregated paths. Regardless of the vendor hardware in use, device mapper creates a block device under /dev/mapper/ for each LUN attached to the system.

Device Mapper components
The important components of Device Mapper multipathing are :

Component	Description
dm-multipath	kernel module responsible for making routing decisions under normal/failure conditions
multipath	Command used for viewing/listing multipath devices and for initial configuration
multipathd	daemon that moitors path, marks failed paths, reactivates restored paths, adds/removes device files as needed.
kpartx	command used to create device mapper entries for partitions on multipathed LUN. It is invoked automatically when multipath command is used.

How to verify if DMMP is installed and configured

1. Check whether device-mapper is installed.

```
# rpm -qa |grep device-mapper

device-mapper-1.02.39-1.el5
device-mapper-multipath-0.4.7-34.el5
device-mapper-1.02.39-1.el5
device-mapper-event-1.02.39-1.el5
```

2. Check that the following device mapper modules are loaded.

```
# lsmod |grep dm_multipath

dm_multipath           56921  2 dm_round_robin
scsi_dh                42177  2 scsi_dh_rdac,dm_multipath
```

```
dm_mod                101649  11 dm_mirror,dm_multipath,dm_raid45,dm_log
```

3. If above conditions are met, check whether the file /etc/multipath.conf is configured. Make sure the lines in bold are commented out in order to enable device mapper.

```
# This is a basic configuration file with some examples, for device mapper multipath
......

# Blacklist all devices by default. Remove this to enable multipathing
# on the default devices.
#blacklist {
#        devnode "*"
#}

......
```

4. Check whether multipathd is running.

```
# /etc/init.d/multipathd status
 "multipathd (pid  11405) is running..."
```

5. If yes, check any devices listed using the command below.

```
# multipath -v2 or # multipath -ll

mpath15 (3600a0b8000473abc0000bafc52fac127) dm-14 SUN,STK6580_6780
[size=10G][features=0][hwhandler=0][rw]
```

```
_ round-robin 0 [prio=1][enabled]
 _ 8:0:0:2  sds 65:32 [active][ready]
_ round-robin 0 [prio=0][enabled]
 _ 9:0:0:2  sdu 65:64 [active][faulty]

mpath13 (3600a0b8000473abc0000bb74530aa7da) dm-12 SUN,STK6580_6780
[size=931G][features=0][hwhandler=0][rw]
_ round-robin 0 [prio=1][enabled]
 _ 9:0:0:0  sdp 8:240 [active][ready]
_ round-robin 0 [prio=0][enabled]
 _ 8:0:0:0  sdo 8:224 [active][faulty]
```

If all the above steps succeed, the system is configured for DMMP.

Multipathing Configuration

Before starting to configure the multipathing, make sure the **device-mapper-multipath** package is installed. If not installed, install it using yum :

```
# yum -y install device-mapper-multipath
```

The device mapper multipathing uses the configuration file /etc/multipath.conf for the configuration. If you make any changes to this file the **multipath** command must be run in order to reconfigure the multipathed devices. The easiest way to create this file is to use the **mpathconf** utility. If there is an existing configuration file mpathconf will edit it, if no such file exists it will copy **/usr/share/doc/device-mapper-multipath-*/multipath.conf**.

```
# mpathconf --enable --with_multipathd y --with_chkconfig y
```

The configuration file consists of 5 major sections as below :

Section	Description
defaults	system-level default configuration
blacklist	Blacklisted devies. Devices that should not be configured under DMMP

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blacklist_exceptions	Exceptions to the blacklisted devices
devices	settings for individual storage controller devices
multipaths	fine-tune configuration of individual LUNs

Verifying Configuration

The **multipath** command can be used to verify the multipathinf configuration. To list the information about multipathed devices :

```
# multipath -ll

mpath0 (3600a0b8000473abc0000bafc52fac127) dm-14 SUN,STK6580_6780
[size=10G][features=0][hwhandler=0][rw]
_ round-robin 0 [prio=1][enabled]
 _ 8:0:0:2  sds 65:32 [active][ready]
_ round-robin 0 [prio=0][enabled]
 _ 9:0:0:2  sdu 65:64 [active][faulty]
```

The output shows a multipathed LUN, **mpath0**. The number following it is the **LUN's WWID**. The status **active/ready** indicates that the path is ready for I/O. If the path is showing **faulty/failed** then it needs to be repaired before using it for I/O. After the configuration is completed, we can start the multipathd persistently :

```
# /etc/init.d/multipathd start
# chkconfig multipathd on
```

User Friendly Device Names

In order to troubleshoot efficiently, device-mapper can be configured to have human readable, user friendly device names under **/dev/mapper** instead of using the WWIDs. The user friendly names like **/dev/mapper/mpath0** can be created by enabling the **user_friendly_names** option in /etc/multipath.conf file :

```
defaults {
    user_friendly_names yes
}
```

You can also control the name for a particular LUN by using the alias option :

```
multipaths {
    multipath {
            wwid     3600a0b8000473abc0000bafc52fac127
            alias    mdisk001
              }
}
```

Removing Multipath

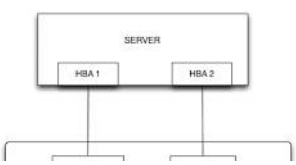
After removing the all the paths for a multipathed device, run the below command to remove the multipath device completely :

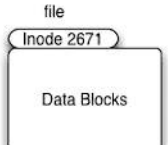
```
# multipath -f [device]
```

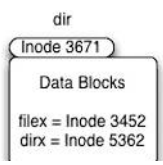
To flush all the multipathed device after stopping the multipahtd daemon :

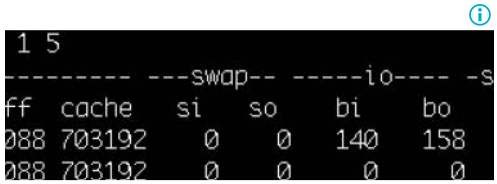
```
# multipath -F
```

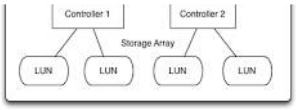

YOU MAY ALSO LIKE











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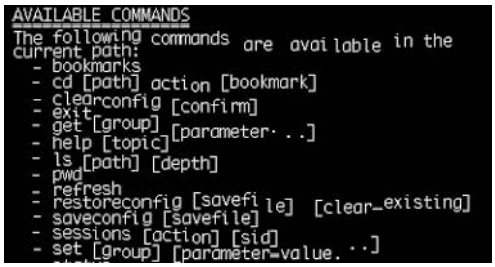

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CHEAT SHEETS

LDOMs (OVM for SPARC) Command line reference (https://www.thegeekdiary.com/ldoms-ovm-for-sparc-command-line-reference-cheat-sheet/)

Solaris Volume Manager (SVM) command line reference (https://www.thegeekdiary.com/solaris-volume-manager-svm-command-line-reference-cheat-sheet/)

Solaris ZFS command line reference (https://www.thegeekdiary.com/solaris-zfs-command-line-reference-cheat-sheet/)

RHEL 7 – RHCSA Notes (Cheat Sheets) (https://www.thegeekdiary.com/rhel-7-rhcsa-notes-cheat-sheets/)

CentOS / RHEL 7 : firewalld Cheat Sheet (https://www.thegeekdiary.com/centos-rhel-7-firewalld-command-line-reference-cheat-sheet/)

systemd command line reference (cheat sheet) (https://www.thegeekdiary.com/centos-rhel-7-systemd-command-line-reference-cheat-sheet/)

SOLARIS INTERVIEW QUESTIONS

The ultimate Solaris Volume Manager (SVM) interview questions (https://www.thegeekdiary.com/the-ultimate-solaris-volume-manager-svm-interview-questions/)

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