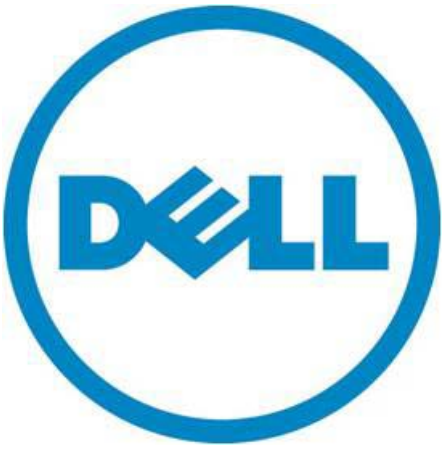
Linux DM Installation Details

A Dell Technical White Paper

PowerVault MD3200 and MD3200i Storage Arrays



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Device Manager Multipath Overview

This white paper provides steps to configure Device Mapper Multi-Path (DMMP) for the MD3200 and MD3200i series of DELL PowerVault Storage arrays. Device Mapper (DMMP) is a generic framework for block devices provided by Linux Operating System.

Features of Device Mapper Multipath:

- Provides a single block device node for a multipathed Logical Unit
- Ensures that I/O is re-routed to available paths during path failure event
- Reestablishes the priviously failed paths once they return
- Provides Device Mapper Multipath features support to newly added Logical Unit

Device Manager Multipath Stack Overview

The Linux DM stack that works with Dell MD3200/i arrays consists of three main components:

- DM multipath core: This is the generic multipath component to work with all storage devices
- RDAC device handler: This is the hardware interface between MD3200/i array and DM multipath core stack. It performs hardware specific tasks
- Multipath User space utility. It contains multipath daemon, *'kpartx'* utility and Dell-provided script *'rescan_dm_devs'*

Required Patches

The Dell PowerVault MD3200 and MD3200i series DM Driver Packages includes patches to DM multipath component and RDAC device handler that are required for full functionality.

The packages are included in the MD3200 and MD3200i series deployment DVD that is included with the product.

Operating System	Component	Minimum Version
SLES11 SP1	Native	Native
SLES11	Kernel Version	kernel-default-2.6.27.39-0.3.1
	Scsi_dh_rdac DKMS package	scsi_dh_rdac-1.5.0.2-1dkms.noarch.rpm
	multipath-tools	multipath-tools-0.4.8-40.6.1.rpm
SLES10.3	Scsi_dh_rdac DKMS package	scsi_dh_rdac-1.3.0.2-1dkms.noarch.rpm
RHEL 5.5	Native	Native
RHEL 5.4	Scsi_dh_rdac DKMS package	scsi_dh_rdac-1.4.0.2-1dkms.noarch.rpm

Details for scsi_dh_rdac package installation

With resource DVD that comes with MD3200/I storage arrays, RDAC device driver is automatically laid down as part of management software installation. Here are the details of what is happening for the installation for different OS's:

SLES11 Installation Steps:

1. Install SLES11 with the installation media provided by Novel

2. Install the errata kernel 2.6.27.39-0.1 available via Novell website for the architecture. Following are the steps for x86_64 architecture. Replace with packages specific to your architecture.

   #rpm -Uvh module-init-tools-3.4-70.7.1.x86_64.rpm

   #rpm -ivh kernel-default-base-2.6.27.39-0.3.1.x86_64.rpm

   #rpm -ivh kernel-default-2.6.27.39-0.3.1.x86_64.rpm

3. Reboot the system to boot up with 2.6.27.39-0.3.1 kernel.

4. Verify the version of the multipath tools package installed on the system. It can be verified using the command "rpm -qa |grep multipath-tools". . Package version should be multipath-tools-0.4.8-40.6.1 or above.

   Use the following commands to install the package.

   #rpm -Uvh multipath-tools-0.4.8-40.6.1.x86_64.rpm
   #rpm –Uvh udev-128-13.3.1.x86_64.rpm
   #rpm –Uvh kpartx-0.4.8-40.6.1.x86_64.rpm

5. Update /etc/multipath.conf configuration file. Add the following contents to /etc/multipath.conf:

```
defaults
{
    ...
      max_fds 8192
      user_friendly_names yes
    ...
}
blacklist {
...
device {
            vendor "*"
            product "Universal Xport"
    }
}
devices {
     device {
        vendor                          "DELL"
        product                         "MD32xxi"
        path_grouping_policy            group_by_prio
        prio                    rdac
```

```
        polling_interval        5
        path_checker                    rdac
        path_selector                   "round-robin 0"
        hardware_handler        "1 rdac"
        failback                        immediate
        features                        "2 pg_init_retries 50"
        no_path_retry                   30
        rr_min_io               100
        prio_callout "/sbin/mpath_prio_rdac /dev/%n"
    }
 device {
        vendor                          "DELL"
        product                         "MD32xx"
        path_grouping_policy            group_by_prio
        prio                    rdac
        polling_interval        5
        path_checker                    rdac
        path_selector                   "round-robin 0"
        hardware_handler        "1 rdac"
        failback                        immediate
        features                        "2 pg_init_retries 50"
        no_path_retry                   30
        rr_min_io               100
        prio_callout "/sbin/mpath_prio_rdac /dev/%n"
    }
}
```

6. Copy the file named 99-storage-policy-fixed-drives.fdi into /usr/share/hal/fdi/policy/10osvendor/:

```
<?xml version="1.0" encoding="UTF-8" ?>
    <!--  -*- SGML -*-  -->
      <deviceinfo version="0.2”>
    <device>
      <match key="@block.storage_device:storage.hotpluggable" bool="false">
       <match key="@block.storage_device:storage.removable" bool="false">
           <merge key="volume.ignore" type="bool">true</merge>
        </match>
     </match>
    </device>
   </deviceinfo>
```

7. Install DKMS package from the deployment DVD that was included with the PV array

```
#rpm –ivh dkms-2.1.2-1.noarch.rpm
```

8. Install scsi_dh_rdac driver package, version 1.5.0.2.

9. Add the following section to the end of /etc/init.d/boot.local

```
modprobe scsi_dh;
modprobe scsi_dh_rdac;
modprobe dm-multipath;
/etc/init.d/multipathd start;
```

10. Enable multipathd daemon using the command

#chkconfig multipathd on

11. Reboot the system and then refer to Owner's Menu for further usage information.

SLES10 SP3 Installation Steps:

1. Install DKMS package from the deployment DVD that was included with the PV array

#rpm –ivh dkms-2.1.2-1.noarch.rpm

2. Install scsi rdac dkms packages

#rpm –ivh scsi_dh_rdac-1.3-1dkms.noarch.rpm

3. Add the following contents into /etc/multipath.conf:

```
defaults
{
     ...
      max_fds 8192
      user_friendly_names yes
     ...
}
blacklist {
...
device {
            vendor "*"
            product "Universal Xport"
     }
...
}
devices {
      device {
         vendor                          "DELL"
         product                         "MD32xxi"
         path_grouping_policy            group_by_prio
         prio                    rdac
         polling_interval        5
         path_checker                    rdac
         path_selector                   "round-robin 0"
         hardware_handler        "1 rdac"
         failback                        immediate
         features                        "2 pg_init_retries 50"
         no_path_retry                   30
         rr_min_io               100
         prio_callout "/sbin/mpath_prio_rdac /dev/%n"
      }
  device {
         vendor                          "DELL"
         product                         "MD32xx"
         path_grouping_policy            group_by_prio
         prio                    rdac
```

```
        polling_interval        5
        path_checker                    rdac
        path_selector                   "round-robin 0"
        hardware_handler        "1 rdac"
        failback                        immediate
        features                        "2 pg_init_retries 50"
        no_path_retry                   30
        rr_min_io               100
        prio_callout "/sbin/mpath_prio_rdac /dev/%n"
    }
}
```

4. Add the following section to the end of /etc/init.d/boot.local

```
modprobe scsi_dh;
modprobe scsi_dh_rdac;
modprobe dm-multipath;
/etc/init.d/multipathd start;
```

5. Enable multipathd daemon using the command

#chkconfig multipathd on
This command will enable multipathd during the boot up.

6. Reboot the system and then refer to Owner's Menu for further usage information

RHEL 5.4 Installation Steps:

1. Install DKMS package from the deployment DVD that was included with the PV array

#rpm –ivh dkms-2.1.2-1.noarch.rpm

2. Lay down DKMS driver package, version 1.4.0.2.

NOTE: Using DKMS-created driver package, this step will include rebuilding RAMdisk image including dm-multipath and scsi_dh_rdac modules

3. Edit /etc/multipath.conf:

If the default "blacklist" section is not commented out, please comment out this section:

```
#blacklist {
#    Devnode "*"
#}
```

Add the following contents into /etc/multipath.conf:

```
defaults
{
        ...
        max_fds 8192
        user_friendly_names yes
        ...
```

```
        }
blacklist {
...
device {
            vendor "*"
            product "Universal Xport"
    }
...
}
devices {
      device {
         vendor                  "DELL"
         product                 "MD32xxi"
         path_grouping_policy    group_by_prio
         prio                    rdac
         polling_interval        5
         path_checker            rdac
         path_selector           "round-robin 0"
         hardware_handler        "1 rdac"
         failback                immediate
         features                "2 pg_init_retries 50"
         no_path_retry           30
         rr_min_io               100
         prio_callout "/sbin/mpath_prio_rdac /dev/%n"
      }
  device {
         vendor                  "DELL"
         product                 "MD32xx"
         path_grouping_policy    group_by_prio
         prio                    rdac
         polling_interval        5
         path_checker            rdac
         path_selector           "round-robin 0"
         hardware_handler        "1 rdac"
         failback                immediate
         features                "2 pg_init_retries 50"
         no_path_retry           30
         rr_min_io               100
         prio_callout "/sbin/mpath_prio_rdac /dev/%n"
      }
}
```

4. Comment out all lines in /etc/udev/rules.d/40-multipath.rules. Add the following lines at the end of the file:

```
# multipath wants the devmaps presented as meaninglful device names
# so name them after their devmap name
SUBSYSTEM!="block", GOTO="end_mpath"
# KERNEL!="dm-[0-9]*", ACTION=="add", PROGRAM=="/bin/bash -c '/sbin/lsmod | /bin/grep
^dm_multipath'", RUN+="/sbin/multipath -v0 %M:%m"
KERNEL!="dm-[0-9]*", GOTO="end_mpath"
PROGRAM!="/sbin/mpath_wait %M %m", GOTO="end_mpath"
PROGRAM!="/sbin/dmsetup info -c --noheadings -j %M -m %m", GOTO="end_mpath"
RESULT!="*:*:*:*:*:*:*:mpath-*", GOTO="kpartx_check"
```

```
PROGRAM=="/sbin/dmsetup info -c --noheadings -o name -j %M -m %m", RESULT=="?*", NAME="%k",
SYMLINK="mpath/%c", RUN+="/sbin/kpartx -a -p p /dev/mapper/%c"
OPTIONS="last_rule"
LABEL="kpartx_check"
RESULT!="*:*:*:*:*:*:*:part*-mpath-*", GOTO="end_mpath"
PROGRAM=="/sbin/dmsetup info -c --noheadings -o name -j %M -m %m", RESULT=="?*", NAME="%k",
SYMLINK="mpath/%c"
OPTIONS="last_rule"
LABEL="end_mpath"
```

5. Enable multipathd daemon using the command

#chkconfig multipathd on

This command will enable multipathd during the boot up.

6. Reboot the system and then refer to Owner's Menu for further usage information.

RHEL 5.5 & SLES11 SP1 Installation Steps:

1. Make the following editions to /etc/multipath.conf:

If the default "blacklist" section is not commented out, please comment out this section:

```
#blacklist {
#    Devnode "*"
#}
```

Add the following contents into /etc/multipath.conf:

```
defaults
{
     ...
       max_fds 8192
       user_friendly_names yes
     ...
          }
blacklist {
...
device {
            vendor "*"
            product "Universal Xport"
     }
...
}
devices {
      device {
         vendor                          "DELL"
         product                         "MD32xxi"
         path_grouping_policy            group_by_prio
         prio                    rdac
         polling_interval        5
         path_checker                    rdac
```

```
        path_selector                   "round-robin 0"
        hardware_handler        "1 rdac"
        failback                        immediate
        features                        "2 pg_init_retries 50"
        no_path_retry                   30
        rr_min_io               100
        prio_callout "/sbin/mpath_prio_rdac /dev/%n"
    }
 device {
        vendor                          "DELL"
        product                         "MD32xx"
        path_grouping_policy            group_by_prio
        prio                    rdac
        polling_interval        5
        path_checker                    rdac
        path_selector                   "round-robin 0"
        hardware_handler        "1 rdac"
        failback                        immediate
        features                        "2 pg_init_retries 50"
        no_path_retry                   30
        rr_min_io               100
        prio_callout "/sbin/mpath_prio_rdac /dev/%n"
    }
}
```

2. Enable multipathd daemon using the command

#chkconfig multipathd on

This command will enable multipathd during the boot up.

3. **SLES11 SP1 ONLY:**

Step1:

Copy file named 99-storage-policy-fixed-drives.fdi into /usr/share/hal/fdi/policy/10osvendor/:

```
<?xml version="1.0" encoding="UTF-8" ?>
    <!--  -*- SGML -*-  -->
      <deviceinfo version="0.2”>
    <device>
      <match key="@block.storage_device:storage.hotpluggable" bool="false">
       <match key="@block.storage_device:storage.removable" bool="false">
           <merge key="volume.ignore" type="bool">true</merge>
        </match>
     </match>
    </device>
   </deviceinfo>
```

Step 2:

Add the following section to the end of /etc/init.d/boot.local

modprobe scsi_dh;

```
modprobe scsi_dh_rdac;
modprobe dm-multipath;
/etc/init.d/multipathd start;
```

4. Reboot the system and then refer to Owner's Menu for further usage information

Oracle Cluster Parameters

In Oracle cluster configuration, to avoid LUN thrashing problem among multiple initiators, please set "failback" parameter, in MD32xx/I device section to "manual" in /etc/multipath.conf. This change will disable LUN failback. It ensures that LUN thrashing will not occur in cluster configuration.