Managing Backplane Split Mode on Dell 13th Generation PowerEdge Servers

This Dell Technical white paper provides detailed information about the Managing Backplane Split Mode feature using supported interfaces such as WS-MAN, RACADM and iDRAC GUI.

Dell Engineering
October 2014

Anish Kurunthil
Punita
Texas Roemer
# Contents

Executive Summary ......................................................................................................................... 4

1.1 Managing split mode .................................................................................................................. 4

1.2 Prerequisites ............................................................................................................................... 7

2 Use cases ........................................................................................................................................ 8

2.1 Using WS–MAN .......................................................................................................................... 8

2.1.1 Changing the backplane mode from Unified mode to Split mode ........................................ 8

2.1.2 Changing the backplane mode from Split mode to Unified mode ......................................... 13

2.2 Using RACADM ....................................................................................................................... 13

2.2.1 Changing the backplane mode from Unified mode to Split mode ........................................ 13

2.2.2 Changing the backplane mode from Split mode to Unified mode ......................................... 17

2.3 Using iDRAC GUI ...................................................................................................................... 18

2.3.1 Changing the backplane mode from Unified mode to Split mode ........................................ 18

2.3.2 Changing the backplane mode from Split mode to Unified mode ......................................... 22

2.4 Drive behavior with multiple controllers before and after backplane mode change ............... 22

2.4.1 Drives behavior when backplane is in unified mode ............................................................. 22

2.4.2 Drives behavior when backplane is in SplitMode ................................................................. 24

2.5 Error codes ............................................................................................................................... 26

3. Troubleshooting / Helpful Tips .................................................................................................... 27
Executive Summary

This white paper aims to provide detailed information about the Managing Split Mode feature using supported interfaces such as WS–MAN, RACADM and iDRAC GUI. This feature enables you to configure the backplane mode to Unified or Split mode in the Dell 13th generation PowerEdge server.

The 13th generation of Dell PowerEdge servers provide a new option to configure the backplane mode; either Unified or Split mode for high performance mode with no failover. Using this feature, one backplane can be split between two PowerEdge RAID(PERC) controllers(integrated and adapter). There is no need to purchase or install an external adapter or an external enclosure to separate drives and allow them to be assigned to a different controller. If a backplane is in Split Mode, IT admins have the option to choose to use the PowerEdge RAID Controller (PERC) in either RAID mode or HBA mode. This eliminates the need to buy and install an HBA card and external adapter and all the associated back end work processes that are associated with this process, such as migrating workloads/virtual machines, powering down, install, etc. This white paper provides detailed information about the Managing Split Mode feature using supported interfaces such as WS–MAN, RACADM and iDRAC GUI.

1.1 Managing split mode

This document describes the Split Mode features which enables creating a new internal storage topology where two storage controllers are connected to a set of internal drives using a single expander. This feature provides High Availability functionality where the expander splits that internal drive array between the two storage controllers. This feature is associated with backplanes and has the following settings – Unified and Split Mode.

In the Unified mode, the primary PERC controller (controller connected to backplane ports A0/B0) has access to all the drives connected to the backplane even if a second PERC controller is installed. In a Single Path Unified Mode (figure 1), you can daisy chain upto four enclosures to a single port in the controller card in the host server. In a Multipath Unified Mode (figure 2), the enclosure is connected to both the connectors on the host server and can be daisy chained to upto four enclosures.

In the Split mode, one controller has access to the first 12 drives while the second controller has access to the last 12 drives. The drives connected to the first controller are numbered 0-11 while the drives connected to the second controller are numbered 12-23. If you have only one controller installed and if the backplane is set to split mode, the controller detects only drives 0-11 (See figure 3).
Figure 1. Cabling Diagram in Unified Mode (Single Path)
Figure 2. Cabling Diagram in Unified Mode (Multi Path)
1.2 Prerequisites

Make sure that the following prerequisites are met before performing a Split Mode:

- Dell 13th generation PowerEdge enclosure or backplane with Split Mode capability. The following servers support Split Mode:
  - R730 x24
  - R620 x24
- A software license for Dell 13th generation and later PowerEdge servers. For more information about managing licenses using iDRAC web interface, click **Overview → Server → Licenses**. In the upper-right corner, click **Help** to view the **iDRAC Online Help**.
- The server must have a valid service tag (seven characters).
- Server must be powered on and in an idle state out of POST before setting the backplane split mode.
- You must have System Control privileges.
- Only PERC 9.1 firmware onwards support the Split Mode Capability.
2 Use cases

2.1 Using WS–MAN

You can use the `RAIDEnclosureRequestedCfgMode` and `RAIDEnclosureCurrentCfgMode` attributes under the `DCIM_RAIDEnumeration` class to configure the backplane mode. Use the `DCIM_RAIDService.SetAttribute()` method to set the `RAIDEnclosureRequestedCfgMode` attribute.

The `RAIDEnclosureCurrentCfgMode` attribute reads the current value of the backplane set using the `RAIDEnclosureRequestedCfgMode` attribute.

After setting the attribute, use the `DCIM_RAIDService.CreateTargetedConfigJob()` method to create a job to set the pending value in the `RAIDEnclosureRequestedCfgMode` attribute.

**Note:** Make sure that you pass the `Realtime=1` parameter while invoking the `CreateTargetedConfigJob()` method because setting backplane in Split mode must be executed in real time. You cannot stage the job (meaning, reboot the host and execute the task in Lifecycle Controller) or queue up with setting other RAID attributes.

A job ID is returned upon successful creation of the job. You must wait until the job completes successfully.

The new value in the `RAIDEnclosureCurrentCfgMode` attribute takes effect only after a host power cycle.

2.1.1 Changing the backplane mode from Unified mode to Split mode

1. Before configuring, read the current value of the `RAIDEnclosureCurrentCfgMode` attribute (default value is Unified Mode):

   **Command:**

   ```
   **Example Output:**
   ```

   ```
   DCIM_RAIDEnumeration
   
   AttributeName = RAIDEnclosureCurrentCfgMode
   
   CurrentValue = Unified Mode
   ```
FQDD = Enclosure.Internal.0-1:RAID.Integrated.1-1

InstanceID = Enclosure.Internal.0-1:RAID.Integrated.1-1:RAIDEnclosureCurrentCfgMode

IsReadOnly = true

PendingValue = null

PossibleValues = Unified Mode, Split Mode, None

2. Set the RAIDEnclosureRequestedCfgMode attribute to set the Pending Value to 'Split Mode':

Command:

```
```

Example Output:

```
SetAttributes_OUTPUT
Message = The command was successful for all attributes
MessageArguments = all attributes
MessageID = STOR001
RebootRequired = No
ReturnValue = 0
SetResult = Set Pending Value
```

3. Validate if the pending value of the RAIDEnclosureRequestedCfgMode attribute is set to Split Mode:

Command:

```
```

Example Output:
4. Create a real time target config job. The command returns the job ID (use the controller instance ID for Target parameter (If needed, run enum on DCIM_ControllerView class to get this value)):

**Command:**

```
```

**Example Output:**

CreateTargetedConfigJob_OUTPUT

Job

EndpointReference


ReferenceParameters


SelectorSet

Selector: InstanceID = JID_037215070553, __cimnamespace = root/dcim

ReturnValue = 4096
5. Check the status of the job and continue to query the job ID until it displays a status of **Completed**.

**Command:**

```
```

**Example Output:**

```
DCIM_LifecycleJob

ElapsedTimeSinceCompletion = 3
InstanceID = JID_037215070553
JobStartTime = TIME_NOW
JobStatus = Completed
JobUntilTime = TIME_NA
Message = Job completed successfully.
MessageArguments = NA
MessageID = PR19
Name = Config:RAID:RAID.Integrated.1-1
PercentComplete = 100
```

6. Validate if the current value of the **RAIDEnclosureRequestedCfgMode** attribute is set to **Split Mode**. Also, verify if the pending value is set as **null**.

**Command:**

```
```

**Example Output:**

```
DCIM_RAIDEnumeration

AttributeName = RAIDEnclosureRequestedCfgMode
CurrentValue = Split Mode
```
FQDD = Enclosure_Internal.0-1:RAID.Integrated.1-1

InstanceId = Enclosure_Internal.0-1:RAID.Integrated.1-1:RAIDEnclosureRequestedCfgMode

IsReadOnly = true

PendingValue = null

PossibleValues = Unified Mode, Split Mode, None

7. Use the following WS-MAN command to power cycle the server and complete the process of setting the backplane to Split mode.

**Command:**

```bash
winrm i RequestPowerStateChange
cimv2/root/dcim/DCIM_CSPowerManagementService?SystemCreationClassName=DCIM_SPComputerSystem+SystemName=systemmc+CreationClassName=DCIM_CSPowerManagementService+Name=pwrmgtsvc:1 @(PowerState="5") -u:<iDRAC user> -p:<iDRAC user password> -r:https://<iDRAC IP>/wsman:443 -SkipCNcheck -SkipCAcheck -encoding:utf-8 -a:basic
```

**Example Command Output:**

```
RequestPowerStateChange_OUTPUT
ReturnValue = 0
```

8. After the system completes the power cycle process (host has completed POST and Collecting Inventory if enabled), use the following WS-MAN command to view the current value of **RAIDEnclosureCurrentCfgMode** attribute.

**Command:**

```bash
```

**Example Output:**

```
DCIM_RAIDEnumeration

AttributeName = RAIDEnclosureCurrentCfgMode

CurrentValue = Split Mode

FQDD = Enclosure_Internal.0-1-1:RAID.Integrated.1-1
```
2.1.2 Changing the backplane mode from Split mode to Unified mode

To set the backplane from Split Mode to Unified Mode, follow the same workflow as listed above. The only difference is for step 2, set "AttributeValue = "Unified Mode"" for SetAttribute() method.

2.2 Using RACADM

You can use the BackplaneRequestedMode and the BackplaneCurrentMode attributes under the Storage.Enclosure.<index> to configure the split or unified mode in the backplane mode. Use the set command to set the BackplaneRequestedMode attribute to split or unified.

The BackplaneCurrentMode attribute reads the current value of backplane set by the BackplaneRequestedMode attribute.

After setting the attribute, use the jobqueue create command to create a job to set the pending value for the BackplaneRequestedMode.

**Note:** Make sure that you pass the "-realtime" parameter while executing the jobqueue create command because setting backplane in Split mode must be executed in real time. You cannot stage the job (meaning, reboot the host and execute the task in Lifecycle Controller) or queue up with setting other RAID attributes.

The job ID is returned after the job is successfully created. You must wait until the job is completed successfully.

The new value for BackplaneCurrentMode attribute takes effect only after a host power-cycle.

2.2.1 Changing the backplane mode from Unified mode to Split mode
1. From the RACADM prompt, type the following command to view the current backplane mode:

**Command Example Output:**

```
racadm>>get storage.enclosure 1 BackplaneCurrentMode
racadm get storage.enclosure.1.BackplaneCurrentMode

[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneCurrentMode=UnifiedMode
```

2. Type the following command to read the BackplaneRequestedMode. The current value must display as None.

**Command Example Output:**

```
racadm>>get storage.enclosure 1 BackplaneRequestedMode
racadm get storage.enclosure.1.BackplaneRequestedMode

[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneRequestedMode=None
```

3. Type set storage.enclosure 1 BackplaneRequestedMode SplitMode to set the pending value. This command displays a warning message and returns a success message.

**Command Example Output:**

```
racadm>>set storage.enclosure 1 BackplaneRequestedMode SplitMode
racadm set storage.enclosure.1.BackplaneRequestedMode SplitMode

[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
Warning: This setting will be applied after the server has been turned off and turned back on. This may result in physical disk drive(s) or virtual disk(s) being marked offline. Foreign physical disk drive(s) or virtual disk(s) can be imported or cleared.
```
STOR089: The storage configuration operation is successfully completed and the change is in pending state.

To apply the configuration operation immediately, create a configuration job using the --realtime option. To create the necessary real-time job, run the `jobqueue create` command. For more information about jobqueue command, run the `<racadm help jobqueue>` command.

```
2.4. Type `get storage.enclosure 1 BackplaneRequestedMode` to verify if the pending value is set as SplitMode:
```

**Command Example Output:**

```
get storage.enclosure 1 BackplaneRequestedMode
```

```
racadm get storage.enclosure.1.BackplaneRequestedMode
[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneRequestedMode=None (Pending Value=SplitMode)
```

```
3.5. Take the controller FQDD from physical disk FQDD and type `jobqueue create` to create a real-time job (replace "RAID.Integrated.1-1" with your controller instance ID if different). This command returns a success message along with a job ID.
```

**Command Example Output:**

```
jobqueue create RAID.Integrated.1-1 -s TIME_NOW --realtime
```

```
RAC1024: Successfully scheduled a job.
```

Verify the job status using "racadm jobqueue view -i JID_xxxxx" command.

```
Commit JID = JID_096392500540
```

```
4.6. Note down the job ID returned from the previous command and type `jobqueue view -i JID_xxxxxxxxx`. The status of the job is displayed as Running. Continue to query the job ID until the status is displayed as Completed.

**Command Example Output:**

```
racadm>>jobqueue view -i JID_096392500540
racadm jobqueue view -i JID_096392500540
------------------------------- JOB -----------------------------
[Job ID=JID_096392500540]
Job Name=Configure: RAID.Integrated.1-1
Status=Completed
Start Time=[Now]
Expiration Time=[Not Applicable]
Message=[PR19: Job completed successfully.]
Percent Complete=[100]
-------------------------------
racadm>>
```

5.7. Type `get storage.enclosure 1 BackplaneRequestedMode`. The value of the attribute is set to SplitMode:

**Command Example Output:**

```
racadm>>get storage.enclosure 1 BackplaneRequestedMode
racadm get storage.enclosure.1.BackplaneRequestedMode
[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneRequestedMode=SplitMode

BackplaneCurrentMode will continue to display UnifiedMode. Server Powercycle is
required to apply Split Mode to BackplaneCurrentMode

**Command Example Output:**

```bash
racadm>>get storage.enclosure 1 BackplaneCurrentMode
racadm get storage.enclosure.1.BackplaneCurrentMode
[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneCurrentMode=UnifiedMode

racadm>>
```

6.8. Type `serveraction powercycle` to power cycle the server to complete the process of setting the backplane. After the system completes POST/CSIOR (if enabled), type `get storage.enclosure.1.backplanerequestedmode` and verify if the attribute value displays as None:

**Command Example Output:**

```bash
racadm>>get storage.enclosure 1 BackplaneRequestedMode
racadm get storage.enclosure.1.BackplaneRequestedMode
[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneRequestedMode=None

racadm>>
```

7.9. Type `"get storage.enclosure 1 BackplaneCurrentMode"` and verify if the current value is displayed as SplitMode:

**Command Example Output:**

```bash
racadm>>get storage.enclosure 1 BackplaneCurrentMode
racadm get storage.enclosure.1.BackplaneCurrentMode
[Key=Enclosure.Internal.0-1:RAID.Integrated.1-1#Enclosure]
BackplaneCurrentMode=SplitMode

racadm>>
```

2.2.2 Changing the backplane mode from Split mode to Unified mode
To set the backplane from Split Mode to Unified Mode, follow the exact same workflow as listed above. The only difference is for step 3, set storage.enclosure 1 BackplaneRequestedMode Unified Mode.

2.3 Using iDRAC GUI

You can use the options available on the Storage -> Enclosures -> Setup tab in the iDRAC GUI to configure the Backplane Mode to Split or Unified.

After setting the backplane mode, a job is created. You can view the progress of the job on the Overview -> Job Queue page. The status of the job must display as Completed.

The new value for Backplane Mode attribute takes effect only after a host power cycle.

2.3.1 Changing the backplane mode from Unified mode to Split mode

1. Launch the iDRAC GUI any browser.
2. Click Storage -> Enclosures -> Setup tab.
3. From the Controller drop-down box, select the integrated controller (controller connected to backplane ports A0 / B0). The Current Value is displayed as Unified Mode.
4. From the Value drop-down box, select Split Mode and click Apply.
3. A pop-up message prompting you that the setting will be applied only after a system power cycle and may result in a storage configuration issue is displayed.

4. Click OK to continue with setting the backplane mode.

5. A success pop-up message with the job ID created for setting the backplane mode is displayed. Click Job Queue to view the Job Queue page.
6.7. The status of the job ID created is displayed as **Running**. Continue to refreshing the page to query the job until the status is as **Completed**.

7.8. Click **Storage -> Enclosure -> Setup**. The **Pending Value** is displayed as "**Split Mode (next power cycle)**". This means that the host requires a power cycle to complete setting the backplane mode.
8.9 Click Server -> Power/Thermal -> Power Configuration and select the **Power Cycle System (cold boot)** option and click **Apply** to power cycle the host.

9.10 After the system completes POST/CSIOR (if enabled), click **Storage -> Enclosure -> Setup**. The **Current Value** is displayed as **Split Mode**. You will also notice that **Pending Value** column is clear.
2.3.2 Changing the backplane mode from Split mode to Unified mode

You can use the options available on the Storage -> Enclosures -> Setup tab in the iDRAC GUI to configure the Backplane Mode to Split or Unified.

2.4 Drive behavior with multiple controllers before and after backplane mode change

The following examples describe the expected behavior of the drives when the backplane mode is set to split mode on a PowerEdge R730xd server with 24 drives and PERC H730 integrated and H730 adapter (installed in PCI slot 6) connected to the same internal backplane.

2.4.1 Drives behavior when backplane is in unified mode

When the backplane mode is set to Unified mode, the 24 drives appear only for the PERC H730 integrated controller. The drives do not appear for the PERC H730 adapter.

Inventory of controllers and drives associated with controller using RACADM

```
racadm>>storage get controllers

racadm storage get controllers

RAID.Integrated.1-1
```
RAID.Slot.6-1

```bash
racadm>>storage get pdisks
racadm storage get pdisks
Disk.Bay.15:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.0:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.1:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.2:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.3:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.4:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.5:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.6:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.7:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.8:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.9:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.10:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.11:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.16:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.18:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.20:Enclosure.Internal.0-1:RAID.Integrated.1-1
```
To view controllers and drives associated with controller using IDRAC GUI

2.4.2 Drives behavior when backplane is in SplitMode

After the backplane mode is set to split mode and the server has completed the power cycle and collecting inventory, on checking the drive inventory you will notice that drives 0-11 are assigned to the integrated controller and 12-23 to the adapter controller.

Inventory of controllers and drives associated with controller using RACADM:

```
racadm>>storage get pdisks
```
```
racadm storage get pdisks
Disk.Bay.0:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.1:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.2:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.3:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.4:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.5:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.6:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.7:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.8:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.9:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.10:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.11:Enclosure.Internal.0-1:RAID.Integrated.1-1
Disk.Bay.12:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.13:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.14:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.15:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.17:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.19:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.21:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.16:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.18:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.20:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.22:Enclosure.Internal.0-1:RAID.Slot.6-1
Disk.Bay.23:Enclosure.Internal.0-1:RAID.Slot.6-1
```
2.5 Error codes

This section explains messages displayed to you in case set on backplane mode fails and possible reason for failure.

STOR075: The operation cannot be performed because the enclosure configuration mode (Split or Unified) change request is pending.
Note: This error appears when backplane mode has pending value `SplitMode` or `UnifiedMode` and if you try to stack any other RAID configuration with it.

**STOR076**: Enclosure configuration mode (Split/Unified) cannot be changed because there are already pending operations.

Note: This error appears when another RAID configuration is already pending and you try to stack backplane mode change (to `SplitMode` or `UnifiedMode`) with it.

### 3. Troubleshooting / Helpful Tips

While changing backplane mode to “SplitMode” or “UnifiedMode” you may see behavior listed below. This section will explain possible reason for the behavior seen.

- **When setting the backplane mode,** make sure that you do not stack other RAID configuration with the config job. Similarly when other RAID configuration are pending you cannot stack backplane mode change config with it. Same is explained in section 2.5.
  
  Example: I want to set controller attribute BGI rate and backplane mode at the same time, create a target config job which will fail, not supported).

- **On a system with 24 drives,** one integrated storage controller, with a RAID 0 created using drives 0 and 23 and the backplane is in Unified mode, if you change current backplane mode to SplitMode VDs will appear offline on integrated controller and adapter controller will display foreign config. To bring the VD online on integrated controller, you must physically move the drive in bay 23 and swap it out with the drive in bays 1 through 11. Or you can set the backplane back to Unified mode and then bring the VD online.

- **While checking the backplane mode using RACADM or WS-MAN,** if the Current Value displays as NONE or NOT Applicable, then either iDRAC is refeshing or is in a bad state. If you are unable to see the correct current value after a few minutes, power cycle the host, allow the system to complete POST and collecting inventory and check the current value again. If the issue persists, try reset iDRAC using any interface.