



Creating RAID Using Lifecycle Controller

This Dell Technical White Paper provides the procedure to create RAID using Lifecycle Controller on the 12th generation servers and later of Dell.

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Balaji K

Bala Gupta

Vinod P S

Shravya Hebbar

Sheshadri P.R. Rao

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Executive Summary

This whitepaper provides information about the procedure to create RAID using Lifecycle Controller on the 12th generation of servers or later of Dell.



1 What is RAID?

RAID—Redundant Array of Inexpensive/Independent Disks is a storage technology that combines multiple hard disk drives (HDDs) into a logical unit. Data is distributed across the storage disk drives in one of the methods called "RAID levels", on the basis of level of redundancy and performance required.

There are multiple methods in which you can create RAID on PowerEdge servers of Dell. This whitepaper focuses only on the methods to create RAID using RAID configuration wizard in Lifecycle Controller GUI.

1.1 RAID Hardware Connection

The diagram here explains the connection between HDD, backplane and storage controller.

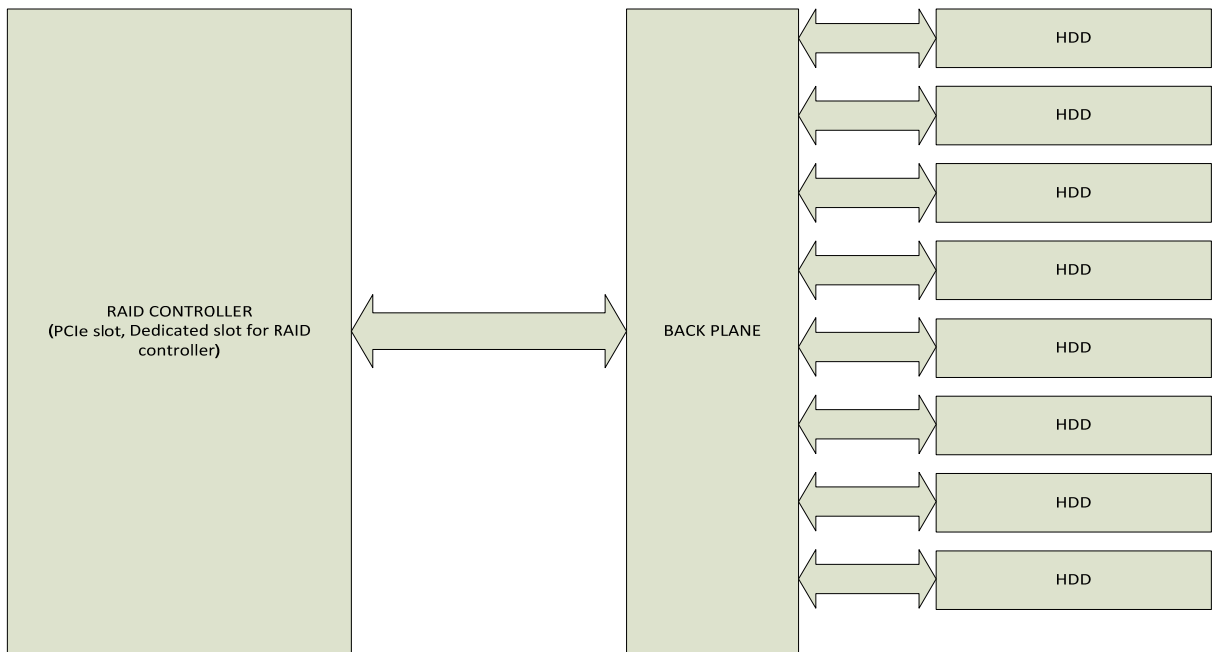


Figure 1 Connect HDDs to the RAID controller through backplane

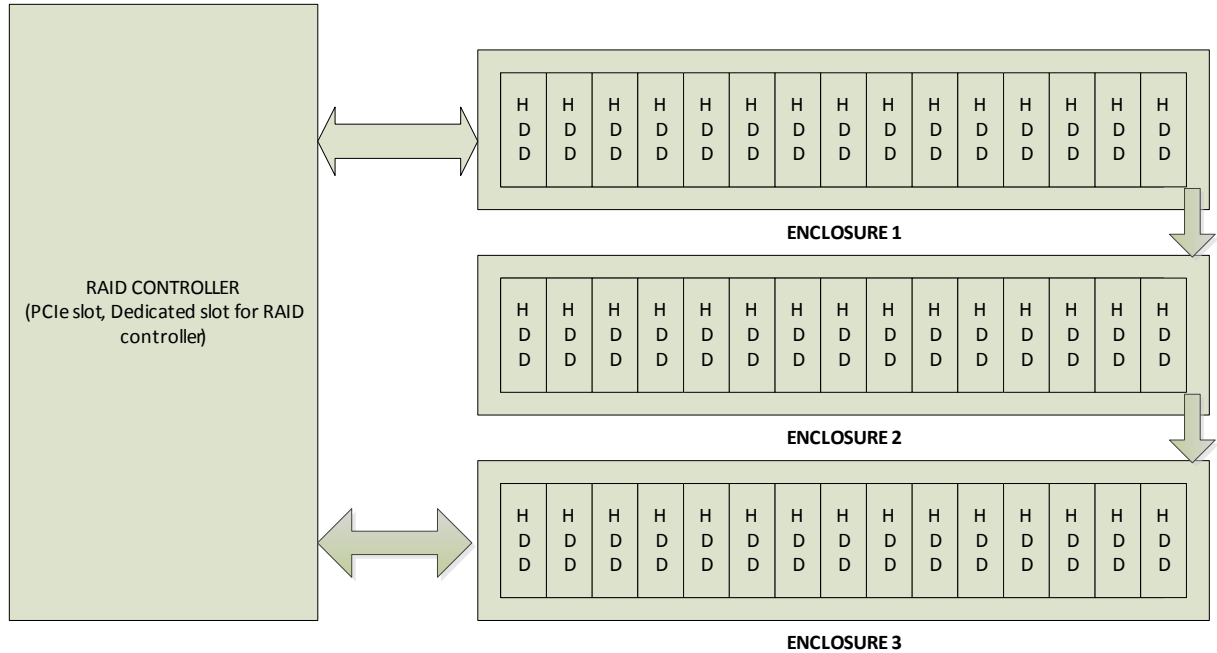


Figure 2 Connect an enclosure with HDD to the RAID controller

1.2 Pre-requisites

- At least one RAID controller is available on the server or software RAID is enabled.
- Minimum two HDDs are connected to the RAID controller through backplane or enclosure for hardware-based storage controller.
- Minimum two HDDs connected to the software RAID controller through backplane.

2 Creating RAID Using RAID Configuration Wizard

RAID configuration Wizard feature in Lifecycle Controller GUI provides an easy five-step solution for creating a RAID of your choice.

Step 1: Select the RAID controller on which RAID to be created.

- a. In the left pane, click **Hardware configuration**.

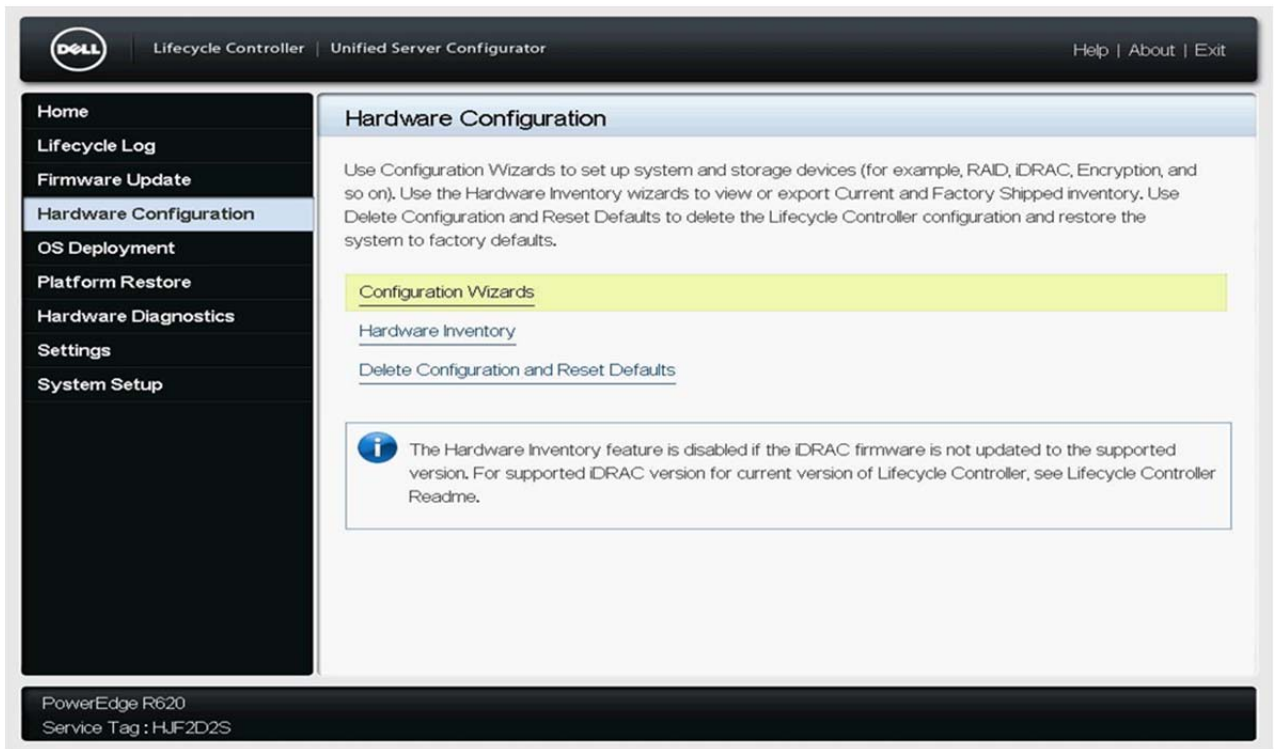


Figure 3 Hardware Configuration

Click Configuration wizards, and then select RAID Configuration Wizards.

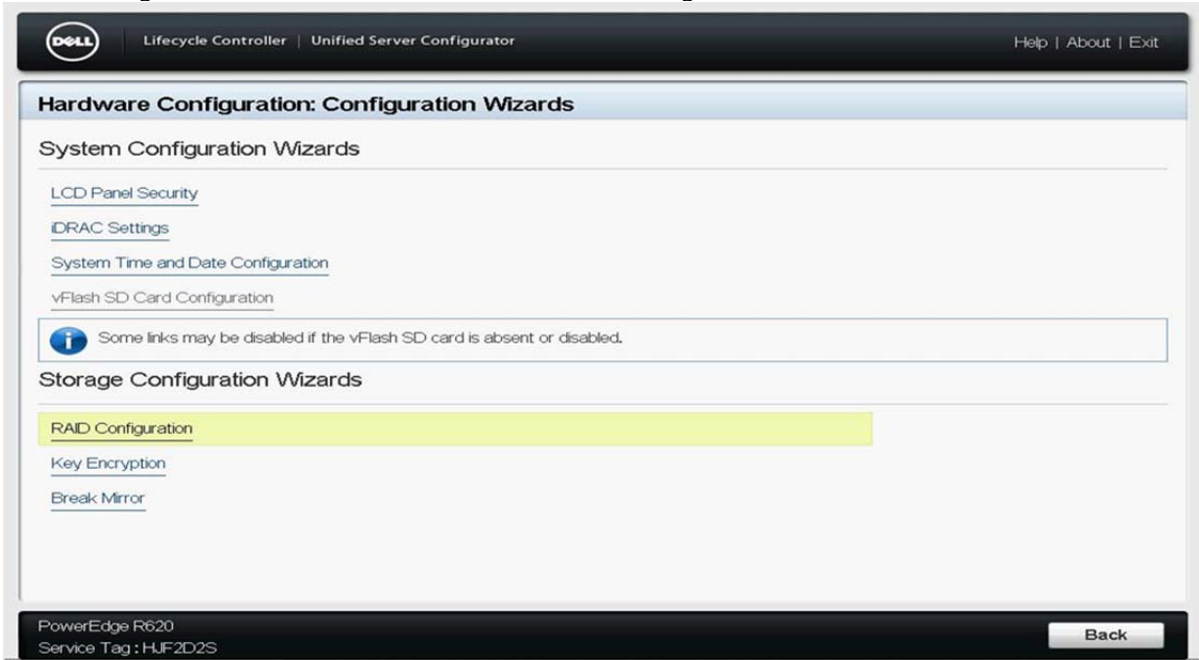


Figure 4 Configuration Wizards

The **Step 1** page of RAID configuration lists all the supported RAID controllers available on the server.

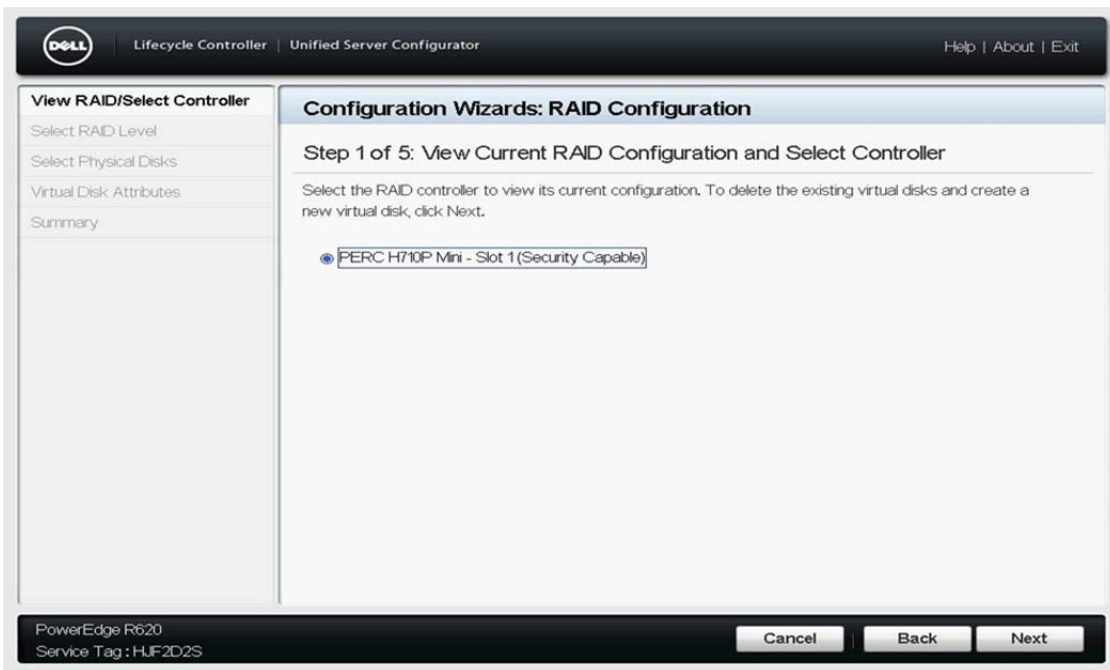


Figure 5 Step1 of RAID Configuration

- b. Select the RAID controller on which you want to have the RAID created. Details of any virtual disk(s) available on the selected controller will be shown in the table displayed on the page below the controller list.

Click **Next**, Step 1A page will be displayed if there are any foreign or uninitialized HDD(s) available on the server.

Step1a: Foreign HDDs and Uninitialized HDDs :

This step allows you to clear or ignore the foreign HDDs available on the server and provides an option to initialize the uninitialized disks.

- Clear foreign configuration clears all the foreign HDDs available on the RAID controller selected.
- Ignore foreign Configuration ignores the foreign HDDs available on the RAID controller while creating the RAID.

The table on the page lists all the non-RAID (uninitialized) HDDs. Select the HDDs you want to convert to RAID capable (initialize) and click **Next** to initialize them.

Select a corresponding option on the Configuration Wizards: RAID Configuration page and click **Next** to go to Step 2.

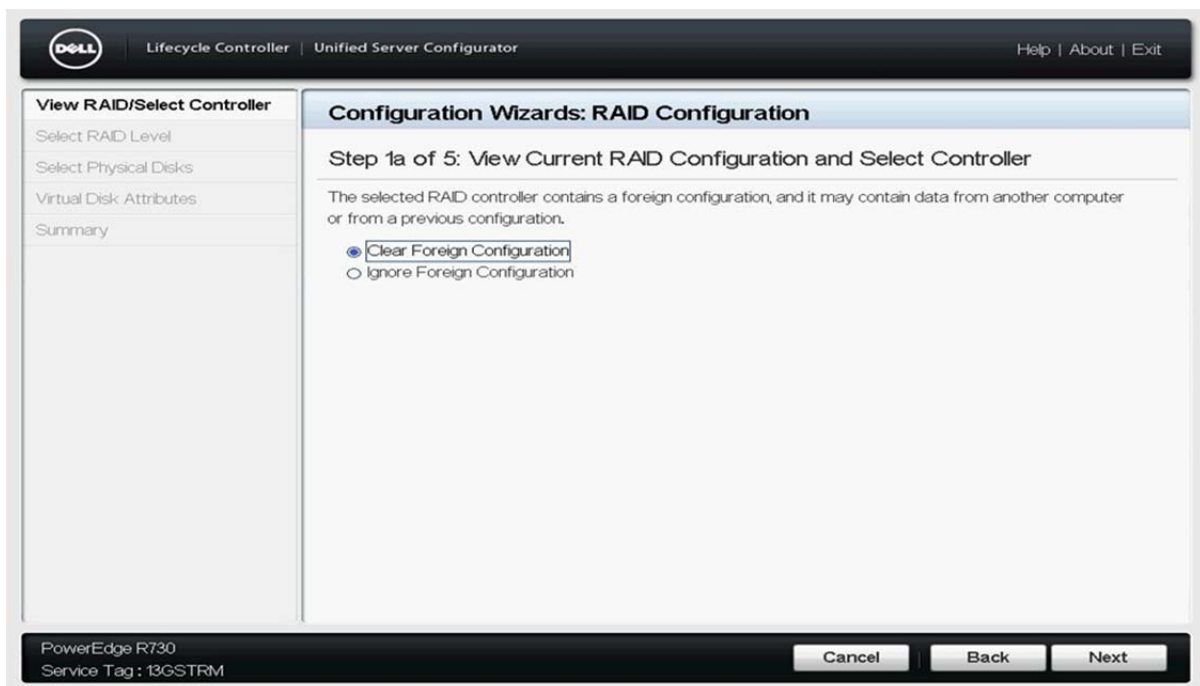


Figure 6 Step 1a of RAID Configuration



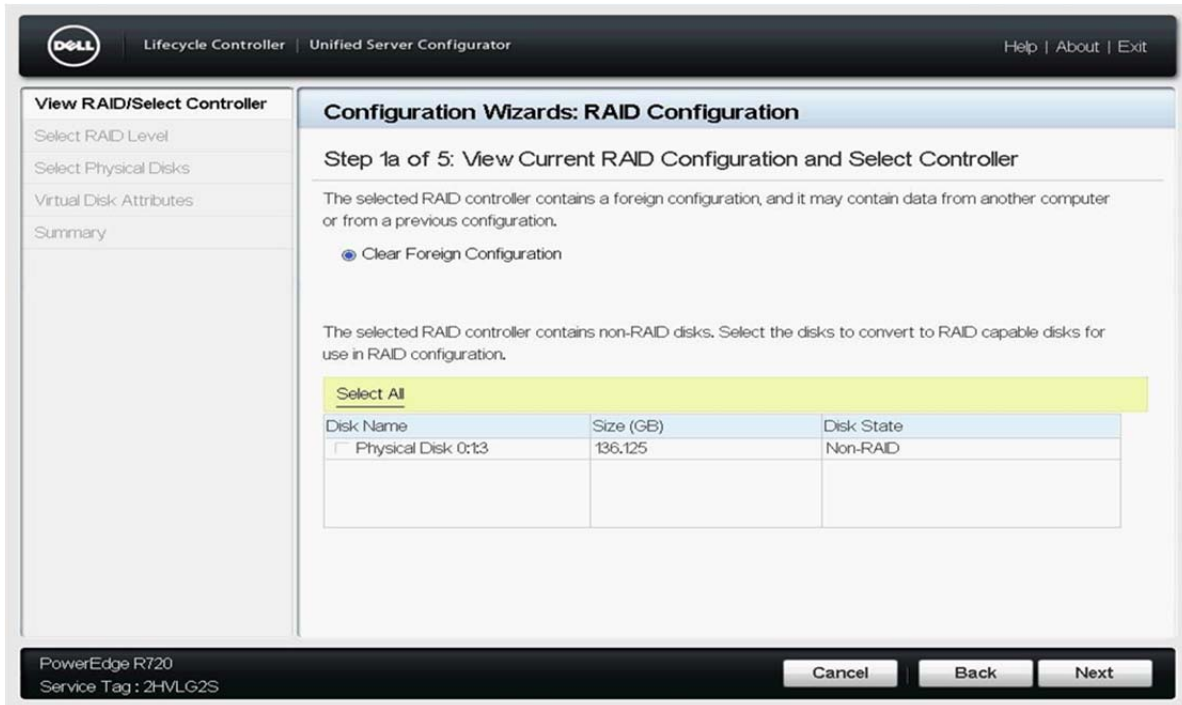


Figure 7 Step 1a of RAID Configuration displaying uninitialized HDDs

Step 2: Select RAID Level

The RAID levels are a basic set of RAID configurations that employs the techniques of striping, mirroring, or parity to create large reliable data stores from general-purpose computer HDDs. For more information about RAID levels, see the section "RAID Levels" in this document. Lifecycle Controller supports 7 RAID levels—RAID 0, RAID 1, RAID10, RAID 5, RAID 6, RAID 50 and RAID 60.

- Select the RAID level for the virtual disk and click **Next**.



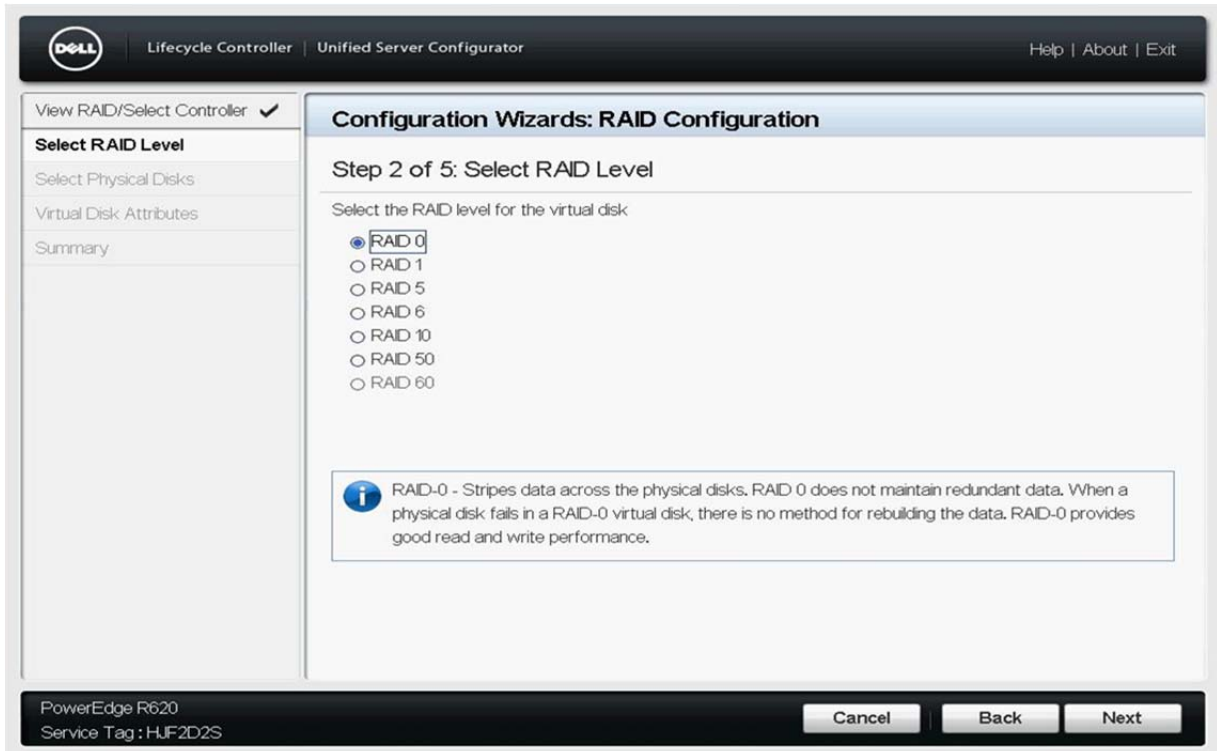


Figure 8 Step 2 of RAID Configuration displaying various RAID levels

Step 3: Select the HDDs to create RAID.

This page lists all the available HDDs connected to the RAID controller you have selected to create a RAID. The page shows the minimum and maximum number of HDDs required for the RAID level that you have selected to create RAID. Select the appropriate options for **Protocol**, **Media Type**, **Encryption Capability**, **Span length** to list the exact HDDs you want to be part of the RAID. Select the HDDs from the table **Select Physical Pool** and click **Next**.

NOTE: If the **Ignore foreign configuration** option is selected from **Step 1a**, the foreign HDDs are not displayed in Step 3.



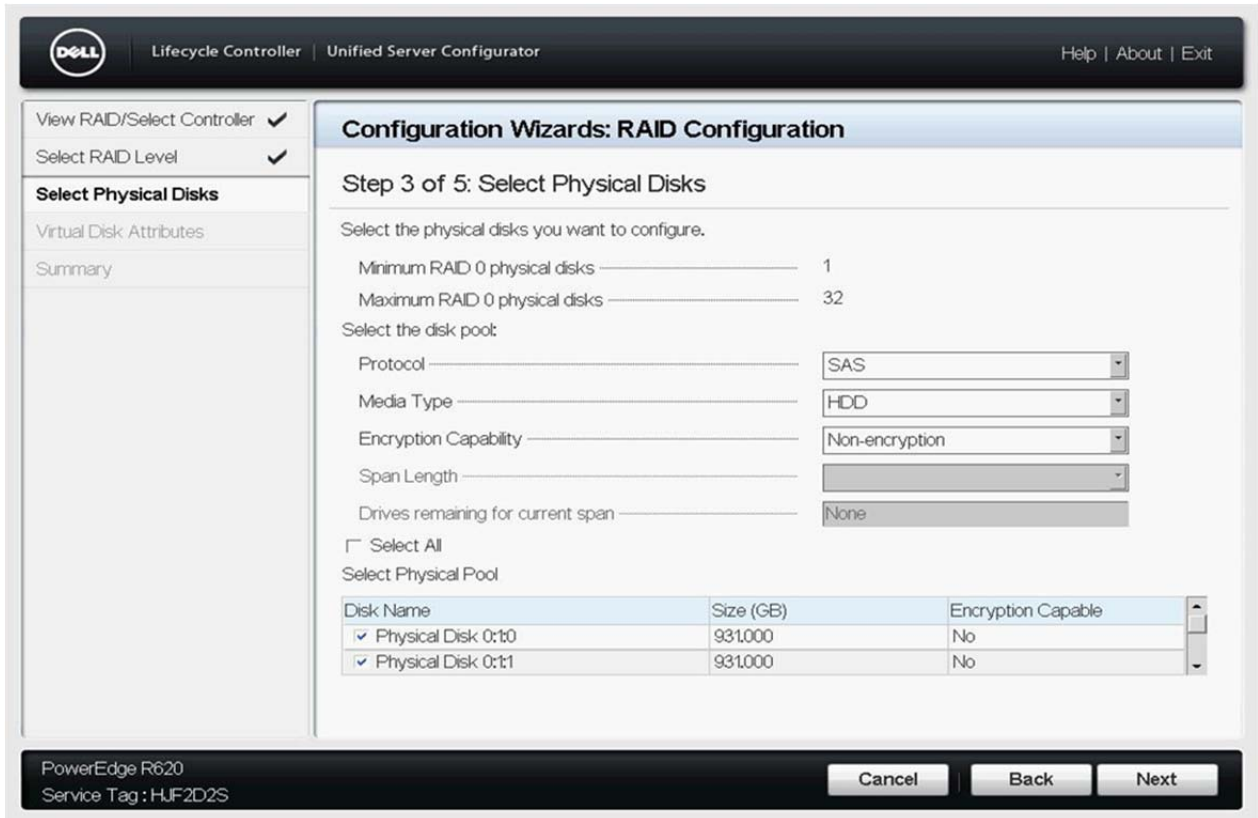


Figure 9 Step 3 of RAID Configuration – HDD Selection

Step 4: Select Virtual Disk name and attributes

This page gives options to select the name and size of a virtual disk.

1. In the **Virtual Disk Name** box, type the name of the virtual disk.
2. In the **Size** box, type the size of the virtual disk.
3. Select the relevant option from the **Read policy** and **Write policy** drop-down menu.
4. To assign a hot-spare disk, select the **Assign a Hot Spare Disk if available** option. From the **Hot Spare Disk** drop-down menu, select the available hot-spare HDD to be assigned. This option is enabled only when there are additional HDDs on the server that can be used as hot-spares.
5. To secure the virtual disk using key encryption feature, select the **the Secure Virtual Disk** option. This feature is supported only on encryption-capable HDDs.

For more information about Key encryption feature, see the “Key Encryption in Lifecycle Controller” white paper available at delltechcenter.com/lc.

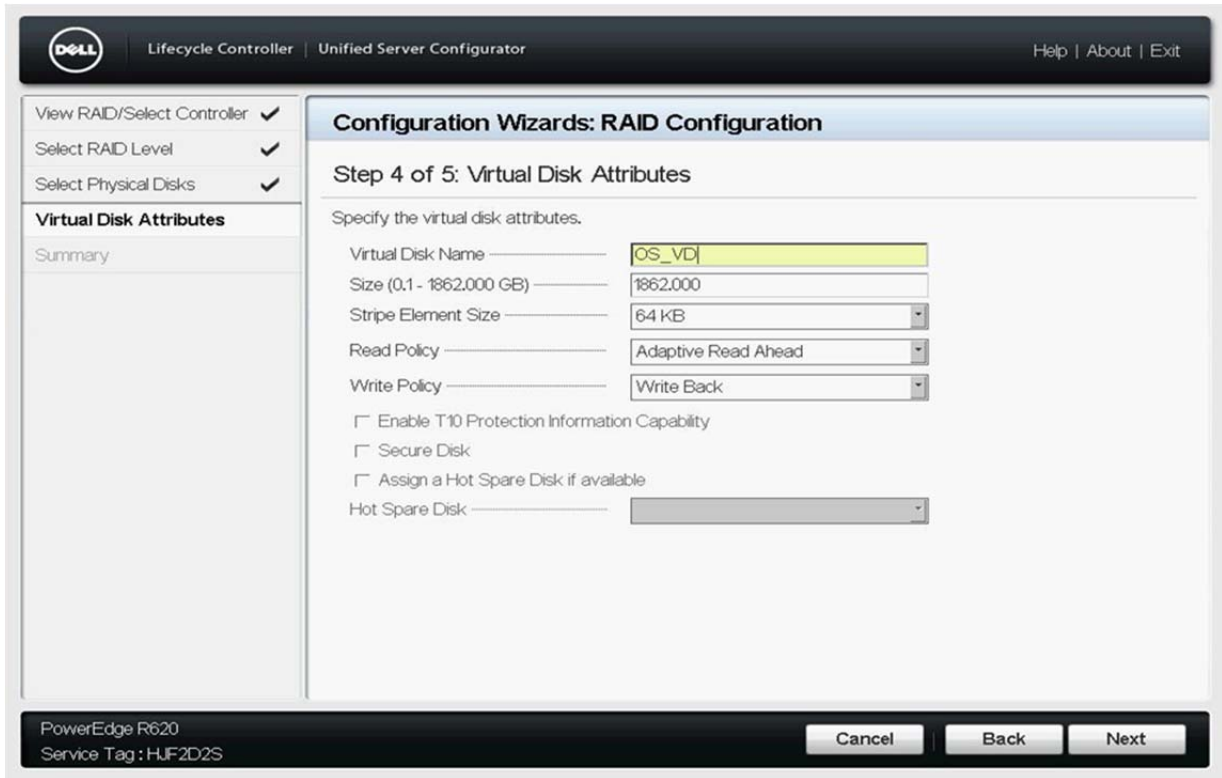


Figure 10 Step 4 of RAID Configuration displaying virtual disk attributes

Step 5: RAID configuration summary

This page displays the summary of all the settings you have made to create the RAID. Click **Back** to go back to the earlier pages to make any corrections in the settings. If the settings are correct then click **Finish** to create a RAID.





Figure 11 Summary of virtual disk settings

Lifecycle Controller displays a message to indicate that all the current data about the virtual disks available on the controller will be lost. Click **OK** to continue.



Figure 12 Message in Step 5



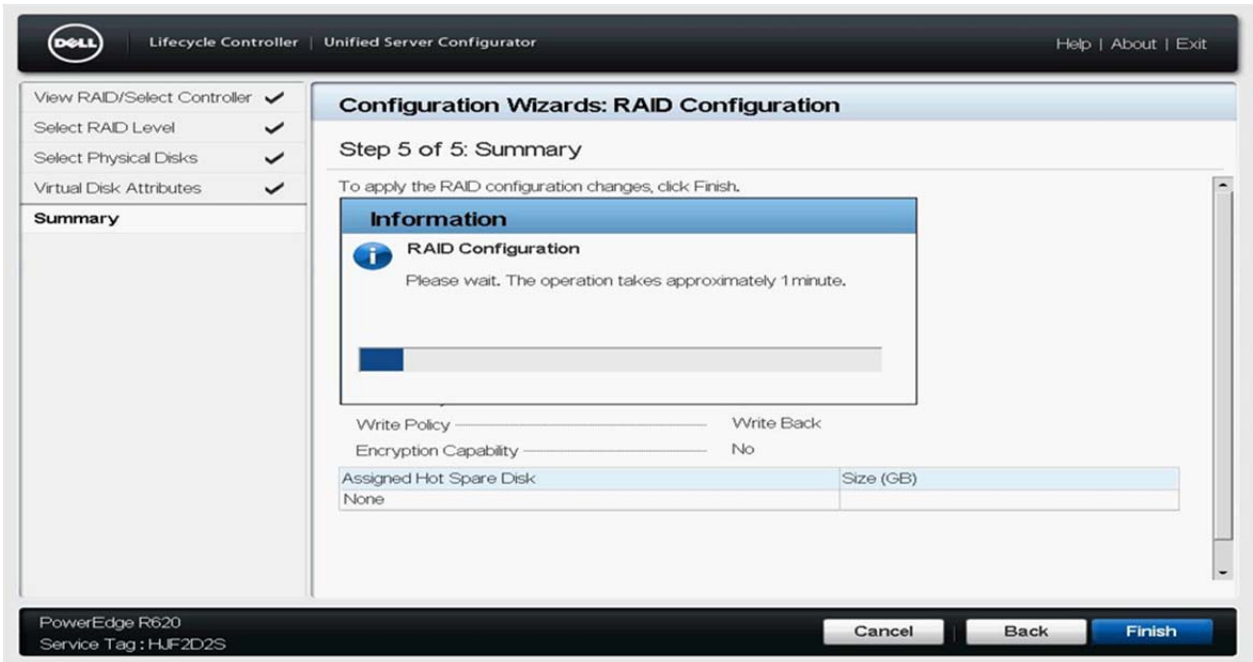


Figure 13 RAID Creation in progress

After the creation of RAID, Lifecycle Controller UI displays a message indicating that the RAID creation is successful.

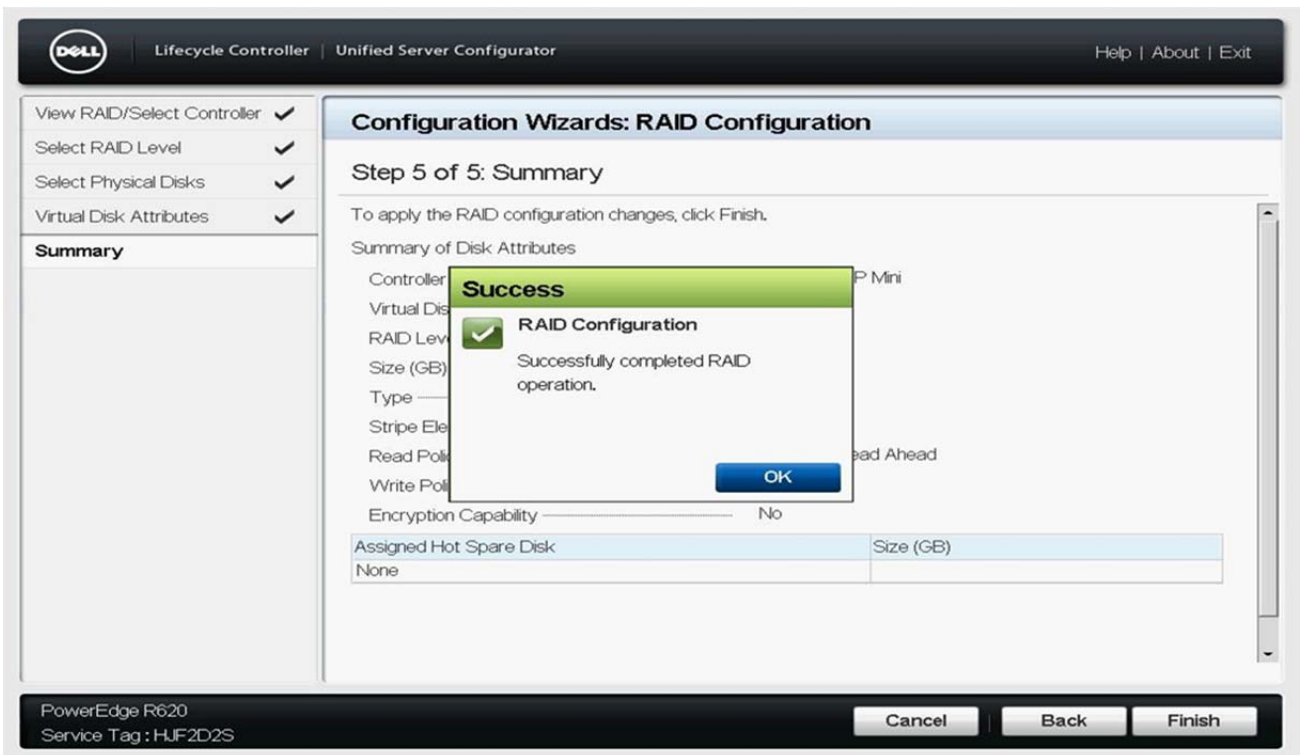


Figure 14 Message after creating RAID



2.1 Important Information

Lifecycle Controller GUI allows you to create only one virtual disk on a controller at anytime. When a new virtual disk is created from Lifecycle Controller, all the existing virtual disk configurations are lost.

2.2 Best Practices

- Make sure RAID controller is connected to the server and is detected in the POST operation.
- Make sure the HDDs are connected to the RAID controller correctly and RAID controller is able to detect them.
- To create a RAID, you must be sure about the RAID level you want to select and the number of HDDs to be used to create a RAID.

2.3 RAID Levels

The RAID levels are a basic set of RAID configurations that employ the techniques of striping, mirroring, or parity to create large reliable data stores from general purpose computer HDDs. The most common types are RAID 0 (striping), RAID 1 (mirroring), RAID 5 (distributed parity), and RAID 6 (distributed dual parity).

RAID levels supported by the Lifecycle Controller RAID Configuration feature are:

- RAID 0 — Striping
- RAID 1 — Mirroring
- RAID 5 — Distributed parity
- RAID 6 — Distributed dual parity
- RAID 10 — Combination of RAID0 and RAID1
- RAID 50 — Combination of RAID0 and RAID5
- RAID 60 — Combination of RAID0 and RAID6

NOTE: RAID levels are supported on the basis of the selected storage controller and the number of available HDDs connected to it.

2.4 Foreign HDD

An HDD moved from one controller to the other controller is considered as a foreign HDD on the second controller. Lifecycle controller RAID Configuration feature provides options to clear and ignore the foreign



configurations using which you can clear the foreign configurations or retain them as it is while creating a virtual disk.

2.5 Protocol

Protocol is a technology used for communication between HDDs and RAID controller. You can select any one of the following options from the **Protocol** drop-down menu:

- Serial Attached SCSI (SAS) – Used for high performance
- Serial ATA (SATA) – Used for cost-effective solutions

2.6 Media Type

The media type is the type of HDDs available in the server. HDD media are of two types:

- Hard Disk Drives (HDDs) – Uses traditional rotational magnetic media for data storage
- Solid State Drives (SSDs) – Flash memory implemented for storage of data

2.7 Encryption Capability

Select one of the following types of encryption capability for the HDD pool. These capabilities are the encryption type for the HDDs.

- Non-Encryption – HDDs are traditional disks
- Self-Encryption – Self-encryption-capable HDDs
- Both – Includes the HDDs capable of both non-encryption and self-encryption

2.8 Span Length

The span length value refers to the number of HDDs included in each span. Span length applies only to RAID 10, RAID 50, and RAID 60. This drop-down menu is enabled only if you have selected RAID level 10, RAID 50, or RAID 60. Else, it is greyed-out.

2.9 Drives Remaining for Current Span

Provides information about the remaining number of physical disk drives in a span, on the basis of the span length value selected by you. This is applicable only for RAID 10, RAID 50, and RAID 60, which can not be edited by you.

2.10 Virtual Disk Name

Type a virtual disk name of less than or equal to 32 characters.



2.11 Size

Type the size of a virtual disk. Minimum value must be 0.1GB and maximum value depends on the total number of HDDs selected, HDDs' sizes, and the RAID level.

2.12 Stripe Element Size

The stripe element size is the disk space a stripe uses on each HDD. Select the required stripe element size from the drop-down menu. Use the up- and down arrow keys to display all options.

2.13 Read Policy

This attribute provides you the following three options for the read policy:

- **Read Ahead** — The controller reads sequential sectors of the virtual disk when requesting for data. The Read Ahead policy may improve server performance if the data is written to sequential sectors of the virtual disk.
- **No Read Ahead** — The controller does not use the Read-Ahead policy. The No-Read-Ahead policy may improve server performance if the data is random and not written to sequential sectors.
- **Adaptive Read Ahead** — The controller initiates the Read-Ahead policy only if the most recently read requests access sequential sectors of the HDD. If the recently read requests access random sectors of a HDD, the controller uses the No Read Ahead policy.

2.14 Write Policy

This attribute provides you the following three options for the write policy:

- **Write Through** — The controller sends a write-request completion notification only after the data is written to the HDD. The Write-Through policy provides better data security than the Write-Back policy, because the server assumes the data is available only after it has been written to the HDD.
- **Write Back** — The controller sends a write-request completion notification after the data is in the controller cache, but has not yet been written to HDD. The Write-Back policy may provide faster 'write' performance, but this method also provides less data security because when server stops functioning, the data which is in the cache memory is lost and therefore data will not be written to the HDD.
- **Force Write Back** — The write cache is enabled regardless of whether or not the controller has an operational battery. If the controller does not have an operational battery, data loss may occur in the event of nonavailability of power.

2.15 Enable T10 Protection Information Capability

T10 Protection Information Capability also known as DIF (Data Integrity Fields) and the supporting HDDs are referred to as DIF drives. The T10-enabled HDDs are validated and store data integrity fields for each



block of data when you write to the HDD. It returns these values on a read request. When you read or write data to an HDD, the data is checked for errors.

Select this option to enable T10 Protection Information Capability on a virtual disk and select one of the following types of T10 protection information capabilities:

- **All** — Indicates both T10 Protection Information capable and non-T10 protection information-capable HDDs are selected.
- **T10 PI Capable** — Indicates that only T10 Protection Information Capable HDDs are selected.
- **Non-T10 PI Capable** — Indicates that only non-T10 Protection Information Capable HDDs are selected.

2.16 Secure Virtual Disk

Select this option to secure the virtual disk with the controller security key. The secure virtual disk is created only if the controller security key is created and the selected virtual disks are self-encryption-capable drives (SEDs).

2.17 Assign a Hot-Spare HDD (if Available)

Use this option to assign hot-spare HDD to a virtual disk.

A hot-spare is an unused backup HDD that is used to rebuild data from a redundant virtual disk in case of a HDD failure. A hot-spare can be used only with a redundant RAID level. Hot-spares also have requirements for HDD size. The hot-spare must have the same or higher disk space than the smallest HDD included in the virtual disk. If the RAID level and HDD availability do not meet these requirements, the **Assign Hot-spare** option is disabled.

2.18 Hot-spare HDD

Select an HDD that will be used as a hot-spare. Only one dedicated hot-spare is supported in Lifecycle Controller.

NOTE: RAID 0 does not provide data redundancy hence you cannot assign.

