Important Information

Latest Software
We recommend that you install the most recent software release to stay up-to-date with the latest functional improvements, stability fixes, security enhancements and protection against new and evolving attacks.

More Information

Latest Version of this Document
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Feedback
Check Point is engaged in a continuous effort to improve its documentation.
Please help us by sending your comments mailto:cp_techpub_feedback@checkpoint.com?subject=Feedback on Smart-1 Models 525, 5050 and 5150 RAID Configuration Administration Guide.

Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 February 2018</td>
<td>First release of this document.</td>
</tr>
</tbody>
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Redundant Arrays of Independent Disks (RAID) combine multiple storage devices into logical units to increase data reliability and disk performance through redundancy. In fault tolerant RAID configurations, one or more disk failures do not result in data loss.

RAID on Smart-1 525, Smart-1 5050, and Smart-1 5150 runs as a variety of storage solutions that range from mirrored disks to nested RAID. The nested RAID levels use two standard RAID modes for additional reliability and performance.

The RAID levels are set initially as defaults. Other supported RAID levels are optional.

You must configure RAID if you change:
- A default RAID level.
- The number of disks.

When a faulty disk is replaced, you do not need to configure RAID. The replacement disk synchronizes automatically.

This document shows how to:
- Change the RAID configuration from the default to a supported RAID level on Smart-1 5050 and Smart-1 5150.
- Change the RAID configuration to include new optional disks on Smart-1 5150.
- Monitor RAID status and synchronization.

### RAID Levels and Storage Options

#### RAID Levels and Disk Storage:

<table>
<thead>
<tr>
<th></th>
<th>Smart-1 525</th>
<th>Smart-1 5050</th>
<th>Smart-1 5150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default RAID Level</td>
<td>1</td>
<td>10</td>
<td>6 for 6, 8, 10 disks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60 for 12 disks</td>
</tr>
<tr>
<td>Supported RAID Levels</td>
<td>1</td>
<td>5, 10</td>
<td>5 for 6, 8, 10, 12 disks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6 for 6, 8, 10, 12 disks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 for 8, 12 disks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 for 6, 8, 10, 12 disks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60 for 8, 10, 12 disks</td>
</tr>
<tr>
<td>Default Storage</td>
<td>2 x 4TB disks</td>
<td>4 x 4TB disks</td>
<td>6 x 4TB disks</td>
</tr>
<tr>
<td>Optional Storage</td>
<td>N/A</td>
<td>N/A</td>
<td>+2, +4, +6 x 4TB disks</td>
</tr>
</tbody>
</table>

**Important** - If you configure RAID, these are the only supported combinations.
Numbering of the Disk Slots on the Front Panel:

- **Smart-1 525**

| Slot 0: Disk | Slot 1: Disk | Slot 2: Empty | Slot 3: Empty |

**Note** - Only Slot 0 and Slot 1 are supported in Smart-1 525. Do not install a disk in Slot 2 or Slot 3. If you do so, your appliance will show this error: *Disk slot occupation mismatch!!* Only use of slot 0 and 1 is supported.

- **Smart-1 5050**

| Slot 0: Disk | Slot 1: Disk | Slot 2: Disk | Slot 3: Disk |

**Note** - See the slot numbers below the bottom row of disk slots on the appliance.

- **Smart-1 5150**

| Slot 0: Disk | Slot 3: Disk | Slot 6: Optional | Slot 9: Optional |
| Slot 1: Disk | Slot 4: Disk | Slot 7: Optional | Slot 10: Optional |
| Slot 2: Disk | Slot 5: Disk | Slot 8: Optional | Slot 11: Optional |

**Note** - See the slot numbers below the bottom row of disk slots on the appliance.

---

**Configuring RAID on Smart-1 525**

There is no need to configure RAID on the Smart-1 525.

A mirrored disk set is the default configuration from the appliance operating system. The operating system synchronizes the software RAID array automatically if you replace one of the disks.
Configuring RAID on Smart-1 5050 and Smart-1 5150

You must configure RAID if you change a RAID level in Smart-1 5050 or Smart-1 5150 and if you add optional disks to the Smart-1 5150. If you replace a faulty disk in a hardware RAID array in Smart-1 5050 or Smart-1 5150, the new disk synchronizes automatically.

Default and Supported RAID Levels for Smart-1 5050:

- The Smart-1 5050 has 4 disks.
- The hardware RAID array has the default configuration of RAID level 10 with RAID level 5 as an alternative.
- The available usable storage space for the RAID level options on Smart-1 5050:

<table>
<thead>
<tr>
<th>RAID Level</th>
<th>Number of Disks</th>
<th>Available Usable Storage (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>10.8</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Default and Supported RAID Levels and Storage Options for Smart-1 5150:

- The Smart-1 5150 has 6 disks by default. Another 2, 4, or 6 disks are optional.
- The hardware RAID array has two default RAID configurations:
  - RAID level 6 is the default for 6, 8, or 10 disks.
  - RAID level 60 is the default for 12 disks.
- The available usable storage space for all the RAID level options on Smart-1 5150:

<table>
<thead>
<tr>
<th>RAID Level</th>
<th>Number of Disks</th>
<th>Available Usable Storage (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>25.2</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>32.4</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>39.6</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>14.4</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>21.6</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>28.8</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>14.4</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>21.6</td>
</tr>
<tr>
<td>RAID Level</td>
<td>Number of Disks</td>
<td>Available Usable Storage (TB)</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>14.4</td>
</tr>
<tr>
<td>50</td>
<td>8</td>
<td>21.6</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>28.8</td>
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<tr>
<td>50</td>
<td>12</td>
<td>36</td>
</tr>
<tr>
<td>60</td>
<td>8</td>
<td>14.4</td>
</tr>
<tr>
<td>60</td>
<td>10</td>
<td>21.6</td>
</tr>
<tr>
<td>60</td>
<td>12</td>
<td>28.8</td>
</tr>
</tbody>
</table>

**Important** -
- If you change a RAID level after the Smart-1 5050 or the Smart-1 5150 goes into operation, the data is lost and you must install it from backups after the change.
- If you change to a new RAID level with more redundancy, you must make sure that your backup data fits in your new RAID array’s available usable storage space.
- If you change to a new RAID level, the combinations shown in RAID Levels and Storage Options (on page 5) are the only supported arrays.

**Virtual Disk and RAID Array on Smart-1 5050 and Smart-1 5150**

The virtual disk is a software component that emulates a physical disk to the appliance operating system.

Create only one virtual disk, regardless of the RAID level.

The RAID level must use a maximum of two physical disk spans, except RAID 10 which defaults to mirrored pairs. RAID arrays have equal numbers of physical disks in each horizontal span. Two physical disk spans are the most space-efficient configuration.

The physical disks per span for a nested RAID 50 or 60 array are half the total of the array’s physical disks.

The PD per Span field (in the screens below) is N/A for nested RAID 10. It uses the RAID 10 default (mirrored pairs).

**Important** - If you change to an optional RAID level or change your RAID level to add optional disks, operational data is lost. Your current virtual disk and RAID array are deleted. Your backups must restore data to a new virtual disk and RAID array.

**For Instructions on How to Add Storage Devices to Smart-1 5150:**

Creating a Virtual Disk and RAID Array on Smart-1 5050 and Smart-1 5150

To configure RAID on the Smart-1 5050 and the Smart-1 5150, you must connect to the RAID Configuration Utility and delete the existing RAID array. Then you must create a new virtual disk with a new RAID array.

**Important** - Configuring RAID erases all the data on the disks.

1. Press **CTRL R** to run the Configuration Utility when the appliance starts.

If you miss this screen, start the appliance again.

---

Virtual Disk Management shows information about your current virtual disk and RAID array.
2. Use the up or down arrows to highlight your virtual disk. Press **F2** to see a list of options.

3. Use the down arrow to highlight **Delete VD** and press **Enter**.

![Virtual Disk Management](image1)

4. To create a new virtual disk, **Tab** to **YES** and then press **Enter**.

![Virtual Disk Management](image2)

Virtual Disk Management shows **No Configuration Present**.
5. Use the up or down arrows to highlight **No Configuration Present**. Press **F2** to show the available actions.

6. Use the arrows to highlight **Create New VD** and press **Enter**.

The **Create New VD** window shows the RAID options.

7. Use the down arrow to highlight a RAID level and press **Enter**.
8. **Tab** to the **PD per Span** field if your new RAID array is a nested RAID 50 or 60.
   If you create nested RAID levels 50 or 60 on Smart-1 5150, you must enter the physical disks per span. Enter the number that is half the total of the physical disks in the array. This sets an equal number of disks in two spans.
   If you create a RAID 10 array on Smart-1 5050 or Smart-1 5150, the **PD per Span** field is **N/A**. This is the default for RAID 10 (mirrored pairs).

9. **Tab** to the physical disk list and use the down arrow to highlight a physical disk. Press **Spacebar** or **Enter** to select the disk.

10. Use the down arrow to select each physical disk. You must select all the disks.

11. **Tab** to the **Basic Settings** fields. **Optional** - The virtual disk size is set automatically but you can create a **VD Name**.

12. **Tab** to **Advanced** and press **Enter** to see the **Create Virtual Disk - Advanced** screen.

13. **Tab** to select **Initialize** and press **Enter**.
14. **Tab** to **OK** and press **Enter**.

15. The "**Initialization destroys data on the virtual disk**" message shows.

16. To start the initialization, **Tab** to **OK** and press **Enter**.

The "**Virtual disk is successfully created and initialized**" message shows.
17. **Virtual Disk Management** shows your new virtual disk.

### Monitoring RAID Status and Synchronization

To monitor the RAID status of the disks - CLI:

1. Connect to the command line on the appliance.
2. To monitor the RAID status of the disks, run:
   - `raid_diagnostic`

   This command shows data about RAID and the disks on a Smart-1 5150 when the RAID array is optimal. If a disk synchronizes, it shows what percent is complete.

```
$[Smart-1]> raid_diagnostic
Read status:    
DiskId0 DiskNumber:0 Vendor:W42M4 ProductID:DEL2/F1/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId1 DiskNumber:1 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId2 DiskNumber:2 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId3 DiskNumber:3 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId4 DiskNumber:4 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId5 DiskNumber:5 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId6 DiskNumber:6 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId7 DiskNumber:7 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId8 DiskNumber:8 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId9 DiskNumber:9 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId10 DiskNumber:10 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
DiskId11 DiskNumber:11 Vendor:W42M4 ProductID:DEL2/1F/4000/M1/6GB-2CE007 Revision: Size:72GB State:ONLINE Flags:NONE
[Smart-1]> 
```
• `cpstat os -f raidInfo`

This command shows the RAID array status on a Smart-1 5150 in tabular format.

```
Volume list
Volume id|Volume type|Number of disks|Max LBA|Volume state|Volume flags|Volume size (GB)
---|---|---|---|---|---|---
1 |01 |61 |121 |01 |01 |04 |14GB!
```

```
Disk list.
Volume id|Disk slot|Disk vendor|Disk product id|Disk revision|Disk size|Disk state|Disk flags|Disk sync%
---|---|---|---|---|---|---|---|---
1 |01 |01 |11B8KNN |Z1C2B7Q5ST4... |3725GB |01 |01 |01
1 |01 |01 |11B8KNN |Z1C2B7Q5ST4... |3725GB |01 |01 |01
1 |01 |01 |11B8KNN |Z1C2B7Q5ST4... |3725GB |01 |01 |01
1 |01 |01 |11B8KNN |Z1C2B7Q5ST4... |3725GB |01 |01 |01
1 |01 |01 |11B8KNN |Z1C2B7Q5ST4... |3725GB |01 |01 |01
```

To monitor the RAID status of the disks - Portal:

In the Gaia Portal, go to Maintenance -> RAID Monitoring.

• This shows a RAID 10 array on a Smart-1 5050 in the degraded state while a disk rebuilds. The disk’s synchronization is at 2%.

```
RAID Volumes

RAID Volume Disks

State | Id | Number | Vendor | Product | Revision | Size | Flags | Sync state
--- | --- | --- | --- | --- | --- | --- | --- | ---
ONLINE | 0 | 0 | UNKNOWN | Z1C2B7Q5ST4... | 3725GB | NONE | 100%
ONLINE | 1 | 1 | UNKNOWN | Z1C2B7Q5ST4... | 3725GB | NONE | 100%
ONLINE | 2 | 2 | UNKNOWN | Z1C2B7Q5ST4... | 3725GB | NONE | 100%
REBUILD | 3 | 3 | UNKNOWN | Z1C2B7Q5ST4... | 3725GB | OUT_OF_SYNC | 2%
```

• This shows a RAID 10 array on a Smart-1 5050 after the disk rebuild. The RAID array’s state is now optimal.
NV Cache on Smart-1 5050 and Smart-1 5150

The RAID controller cards on the Smart-1 5050 and the Smart-1 5150 contain non-volatile caches and battery backups. If there is a power failure, cached items move to flash memory.

The RAID controllers’ firmware monitors and maintains the batteries.