Intel® Virtual RAID on CPU (Intel® VROC) for Windows*

Release Notes for Fishhawk Falls (FHF)

Revision 001

May 2023

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Version	Description	Date
001	Initial public release	May 2023

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1 Introduction

1.1 Overview

The Intel® Virtual RAID on CPU (Intel® VROC) family of products provide enterprise RAID solutions for both NVMe SSD and SATA devices for the enterprise servers, workstations, and some high-end desktops.

1. Intel® Virtual RAID on CPU (Intel® VROC) provides an enterprise RAID solution on platforms that supports Intel® Volume Management Device (Intel® VMD) on Intel® Xeon® Scalable Processors.
2. Intel® Virtual RAID on CPU (Intel® VROC) SATA RAID provides an enterprise RAID solution for SATA devices connected to all SATA controllers on the Intel® Platform Control Hub (Intel® PCH) configured for RAID.

Intel® VROC is a high-level blanket product reference for Intel® VROC (VMD NVMe RAID) and Intel® VROC (SATA RAID).

Note: The Intel® VROC 8.0.0.3483 release package and this Release Notes documentation is targeted for Fishhawk Falls (FHF) Sapphire Rapids workstation-based platforms only. Running on other platforms may result in undesirable behaviors.

1.2 Terminology

Table 1-1. Terminology

Term	Description
AHCI	Advanced Host Controller Interface
API	Application Programming Interface
ASM	Intel® Accelerated Storage Manager (Intel® ASM)
BIOS	Basic Input/Output System
GB	Gigabyte
GUI	Graphical User Interface
HII	Human Interface Infrastructure
Hot-Plug	The unannounced removal and insertion of a drive while the system is powered on.
I/O	Input/Output
KB	Kilobyte

Term	Description
Matrix RAID	Two independent RAID volumes within a single RAID array.
MB	Megabyte
Member Disk	An NVMe drive used within a RAID array.
NVMe	Non-volatile Memory Express
OS	Operating System
POST	Power On Self-Test
PreOS	The Intel VROC images incorporated into the platform BIOS to access the drives and providing the interface to configure Intel VROC UEFI Drivers.
RAID	Redundant Array of Independent Disks: allows data to be distributed across multiple drives to provide data redundancy or to enhance data storage performance.
RAID 0 (striping)	The data in the RAID volume is striped across the array's members. Striping divides data into units and distributes those units across the members without creating data redundancy but improving read/write performance.
RAID 1 (mirroring)	The data in the RAID volume is mirrored across the RAID array's members. Mirroring is the term used to describe the key feature of RAID 1, which writes duplicate data from one drive to another; therefore, creating data redundancy and increasing fault tolerance.
RAID 5 (striping with parity)	The data in the RAID volume and parity are striped across the array's members. Parity information is written with the data in a rotating sequence across the members of the array. This RAID level is a preferred configuration for efficiency, fault-tolerance, and performance.
RAID 10 (striping and mirroring)	The RAID level where information is striped across two drive arrays for system performance. Each of the drive in the array has a mirror for fault tolerance. RAID 10 provides the performance benefits of RAID 0 and the redundancy of RAID 1. However, it requires four hard drives so it’s the least cost effective.
RAID Array	A logical grouping of physical drives.
RAID Volume	A fixed amount of space across a RAID array that appears as a single physical drive to the operating system. Each RAID volume is created with a specific RAID level to provide data redundancy or to enhance data storage performance.
Spare	The drive that is the designated target drive in a RAID Volume recovery. The Spare drive is a global setting (not designated to a specific RAID volume). Spare drives on a SATA Controller are not available on the sSATA Controller (and visa-versa). Spare drives designated on Intel VROC (VMD NVMe RAID) are exposed and available on all Intel VMD domains.
Strip	The size of the data block that is to be written in each write cycle across the RAID array.

Term	Description
Stripe	Block size that is assigned to evenly distribute portions of the stripe across a designated number of drives within a RAID array. A collection of Strips is called a Stripe
Intel® RSTe	Intel® Rapid Storage Technology enterprise.
RWH	RAID Write Hole
SSD	Solid State Drive
TB	Terabyte
UEFI Mode	*Unified Extensible Firmware Interface*. Refers to the system setting in the BIOS
Intel® VMD	Intel® Volume Management Device
Intel® VROC	Intel® Virtual RAID on CPU

1.3 Reference OEM Platform Documentation

Refer to your OEM for a full list of available feature sets. If any of the information in this document conflicts with the support information provided by the platform OEM, the platform documentation and configurations take precedence.

Customers should always contact the place of purchase or system/software manufacturer with support questions about their specific hardware or software configuration.

1.4 Supported Platforms, Chipsets and SKUs

The Intel® VROC package was designed to work on customer platforms that are based on the following Intel reference platforms:

Table 1-2. Supported Platforms for Intel® VROC (VMD NVMe RAID)

CPU	Platform	VMD 2.0/3.0 Device ID	# Of VMD
Intel® Xeon® Scalable Processor Family – W	Intel® Xeon® Scalable Processor family workstation†	28C0	5 per CPU

† Unless otherwise specified in the Release Notes.

Table 1-3. Supported Chipsets for Intel® VROC (SATA RAID)

Chipset	Platform	RAID controller Device ID	# Of Ports
Intel® W790 series chipset	Platforms containing the Intel® W790 chipset†	2826 (SATA)	N/A

† Unless otherwise specified in the Release Notes.

1.5 Supported Operating Systems

The latest version of Intel® VROC family of products was designed to work with, tested and validated on the following Windows* operating systems.

Note: Only 64-bit Windows* operating system support is available.

Table 1-4. Supported Operating Systems for Intel® VROC

Platform†	Windows*10 (RS3, RS4, RS5††, 19H1, 19H2, 20H1, 20H2)	Windows* 11 (Cobalt, SV2)
Intel® Xeon® Processor with Intel® W790 chipset	Y	Y

†Only 64-bit OS is supported on all platforms.
†† Introduces/Includes WinPE support for this version.

1.6 Supported PCIe NVMe SSDs

All shipping Intel® NVMe SSDs are supported by the latest version of Intel® VROC, except dual port NVMe SSDs. For the latest list of supported Non-Intel PCIe NVMe SSDs, refer to Intel® Virtual RAID on CPU (Intel® VROC) Supported Configurations.

Platform providers are now allowed to self-validate their own list of NVMe SSDs for use with Intel® VROC (VMD NVMe RAID). For more details, contact your platform provider.

1.7 Intel SSD Only VROC Upgrade Key

Intel SSD Only keys will no longer be supported on new platforms starting with 4th Gen Intel® Xeon® Scalable Processors based platforms. This feature has not been disabled due to legacy platform support. Any issues against 4th Gen Intel® Xeon® Scalable Processors based platforms using *Intel SSD Only* keys will not be supported.

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2 New Features

2.1 New Features Introduced with Intel® VROC 8.0.0.3483 Release for Fishhawk Falls (FHF)

2.1.1 LED Management on PCH-VMD

There are two PCIe ports designed and controlled under PCH, Emmitsburg, and this feature with LED management is implemented in the circuit and the on-board secondary CPLD. Designers need to implement the same or similar logic control as this CPLD does to control two LEDs designed on-board to represent the RAID status.

2.1.2 Physical Drive Location Information in UEFI

When the Intel® VROC product displays how the Intel® VMD controller enumerate the drives, the drive information is showing in VROC HII like in the below figure. The information is not straightforward and not easy to interpret. To present the drive location information in a user-friendly manner, Intel® VROC offers a protocol that will allow customers to report how the drives are connected and how customers would like the information reported in the customer platform.

Figure 2-1. Physical Drive Location Information in UEFI

2.2 New Features Introduced with Intel® VROC 7.7 Release

2.2.1 Firmware Management Protocol Support

Intel® VROC 7.7 introduces limited support for the *UEFI Firmware Management Protocol (FMP)* as outlined in the UEFI Specification version 2.9. The Intel® VROC UEFI drivers will provide support for updating the drive firmware (through UEFI FMP) when the drive is managed by Intel® VROC. This includes both Intel® VROC (VMD NVMe RAID) and Intel® VROC (SATA RAID). The Intel® VROC UEFI driver has implemented a subset of protocol functions defined in the UEFI Specification, which is reflected in the below table.

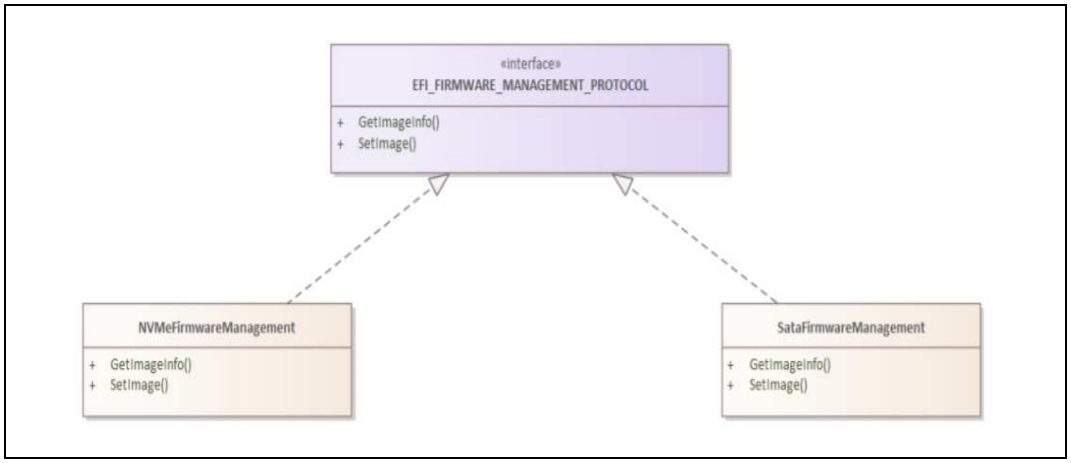
Table 2-1. Firmware Management Protocol Support

EFI Firmware Management Protocol Functions	Intel® VROC UEFI Implementation
`GetImageInfo`	Supported

EFI Firmware Management Protocol Functions	Intel® VROC UEFI Implementation
`SetImage`	Supported

The following diagram highlights the process flow to support both NVMe and SATA drives.

Figure 2-2. Firmware Management Protocol Support Flow



2.2.2 Intel® VROC (SATA RAID) Support of EFI_ATA_PASS_THRU_Protocol

The Intel® VROC 7.7 release package introduces limited support for **`EFI_ATA_PASS_THRU_PROTOCOL`** commands to provide information on the SATA drives managed by Intel® VROC (SATA RAID).

2.2.3 Disable *Locate LED* within Intel® VROC LED Management

Intel® VROC provides support for the OEM/ODMs to disable the *Locate LED* functionality within the Intel® VROC LED Management. By enabling the feature, the OEM/ODM can use their own tools to initiate a *Locate LED* functionality within their platform.

2.3 New Features Introduced in the Intel® VROC 7.6 Release

The Intel® VROC 7.6 release package introduces two new features. These two features are the *Intel® VROC PreOS Failed RAID Volume (limited) Recovery* as well as the *UEFI ATA Passthrough Protocol Support* for Intel® VROC (SATA RAID).

2.3.1 Intel® VROC PreOS Environment RAID Volume Failure Recovery

Intel® VROC 7.6 introduces a new feature in the VROC HII page that will allow the user to attempt to recover from a failed RAID volume. When a failed RAID volume is encountered during boot, the option is made available in the VROC HII page for which the user can select. This is a multi-step process.

The first step is to select the RAID volume in 'Failed' state and then select the option to force it to 'Degraded' state. This will expose the next option to specify the drive to enable this action.

Once the RAID volume is changed to 'Degraded' state, the standard RAID volume recovery process initiates the rebuilding process.

Note: Intel makes no guarantee of successful recovery from a failed state using this option. This must be treated as a last chance effort and there is no guarantee that there won't be some data loss. Intel always recommends recovering a failed RAID volume by recreating the RAID volume from scratch and restore the data from the latest platform image backup.

2.3.2 Intel® VROC (SATA RAID) UEFI Support for EFI_ATA _PASSTHRU

Intel® VROC 7.6 (SATA RAID) introduces support for **`EFI_ATA_PASS_THRU`** protocol by the Intel® VROC (SATA RAID) UEFI driver. The following specific options are supported in Intel® VROC 7.6:

- **`PassThru;`**
  - **`IDENTIFY`**
  - **`ATA_READ_LOG_EXT`**
- **`GetNextPort;`**
- **`GetNextDevice;`**
- **`BuildDevicePath;`**
- **`GetDevice;`**

2.4 New Features Introduced in the Intel® VROC 7.5 Release

The Intel® VROC 7.5 release package introduces several new features to support the latest Intel® platforms as well as improve the user experience. The key new features introduced are:

- Intel® VMD 2.0 support which includes:
  - Increase in MSIX vectors to 64.
  - Intel® VMD support for NVMe devices attached to the Platform Controller Hub (PCH).
  - Increase in the number of PCI-E lanes that can be controlled by VMD from 48 to 64.
  - Increase in the number of VMD devices from 3 to 5.

2.4.1 Intel® VMD 2.0 Features

2.4.1.1 Increasing MSIX Vectors to 64

Intel® VROC 7.5 introduces support for customer configurations that can support 64 MSIX vectors. On platforms that support Intel® VMD 1.0, the MSIX support is limited to 32 MSIX vectors. For these (Intel® VMD 1.0) platforms, a single VMD domain can support up to 24 NVMe SSDs. This means that those 24 NVMe SSDs will share a single Intel® VMD MSIX vector. As the number of vectors, in newer NVMe devices, increase beyond 32, this can result in a platform performance impact. With the introduction of Intel® VMD 2.0, and Intel® VROC 7.5, this increases to 64 MSIX vectors which should help to alleviate this problem. This is because the average dual socket server will have between 48 and 64 cores, which limits the number of MSIX vectors on a given NVMe SSD to 64, for optimal usage.

2.4.1.2 Intel® VMD (PCH) Support

Intel® VROC 7.5 introduces support for the Intel® VROC (VMD NVMe RAID) management of NVMe SSDs connected to the Platform Controller Hub (PCH). Utilizing the Flex-IO capabilities of the PCH, Intel® VMD 2.0 technology can now take ownership of two of the slots allowing Intel® VROC (VMD NVMe RAID) to control and manage the NVMe SSDs attached to those slots. This is accomplished by utilizing the Function Level Assignment of the PCH PCI functions. Utilizing the BIOS setup menus, the user will be able to enable Intel® VMD on the designated slots, or PCH functions (depending on the BIOS implementation) and the PCH functions will be reassigned to an Intel® VMD (PCH) controller. To be able to accomplish this, there must be NVMe SSDs present on the slot(s) and the slots used must support Slot Implemented Capabilities. Otherwise, Intel® VMD (PCH) cannot be enabled.

When this feature is fully enabled, it will reassign sSATA ports 2-5 to be PCIe lanes managed by Intel® VMD (PCH). This is translated into PCIe root ports 8-11 and Flex I/O ports 14-17. The general configuration is 2 - X2 PCIe lanes.

This feature is intended for supporting a simple RAID 1 boot using two NVMe SSDs attached directly to the PCH. However, if the platform supports expanded configurations, using retimer or switch Add-In-Cards (AIC), full Intel® VROC (VMD NVMe RAID) support can be obtained. Intel® VROC (VMD NVMe RAID) was only validated with two NVMe SSDs directly attached to the PCH. Any configurations beyond two directly attached NVMe drives is not recommended.

Note: With this new functionality, when Intel® VMD is enabled, a DUMMY function/device will be seen in the Windows* Device Manager as a “Yellow Bang”. This function is the result of a PCIe requirement for a device with multiple functions. Once the Intel® VROC installation process is complete this DUMMY function/device will be hidden in the list of system functions.

2.4.1.2.1 Intel® VMD (PCH) PreOS Support

Intel® VMD (PCH) PreOS support is included in the Intel® VROC (VMD NVMe RAID) PreOS images, which is part of the Intel® VROC release package. There are no other PreOS images required.

2.4.1.2.2 Intel® VMD (PCH) Pass-Thru Boot Support

Intel® VROC 7.5 provides Intel® VROC (VMD NVMe RAID) PreOS support for NVMe SSDs attached to the PCH when Intel® VMD (PCH) is enabled. This will allow an OS to be installed onto and boot from an NVMe device managed by Intel® VROC (VMD NVMe RAID). No Intel® VROC upgrade key is required to utilize this feature.

2.4.1.2.3 Intel® VMD (PCH) RAID Boot Support

Intel® VROC 7.5 provides Intel® VROC (VMD NVMe RAID) PreOS support for NVMe SSDs attached to the PCH when Intel® VMD (PCH) is enabled. When an Intel® VROC upgrade key is present and Intel® VMD (PCH) is enabled, the user will be able to use the Intel® VROC (VMD NVMe RAID) PreOS HII to setup and manage a RAID volume using the NVMe SSDs attached to the PCH. This will allow an OS to be installed onto and boot from an Intel® VROC (VMD NVMe RAID) volume attached to Intel® VMD (PCH).

2.4.1.2.4 Intel® VMD (PCH) RAID Data Volume Spanning

Once Intel® VMD (PCH) is enabled, Intel® VROC (VMD NVMe RAID) will treat it like any other Intel® VMD controller. Spanning data RAID volumes are supported as they are currently outlined in this document. This applies to the Intel® VROC PreOS tools, the Windows* OS GUI and the CLI tool. The option to span VMD controllers is supported, but not recommended.

Note: This is supported but not recommended due to a performance penalty using the PCH.

Note: Boot volume spanning is not supported. All devices used to create a boot volume must reside on the same controller (Intel® VMD controller domain or SATA controller).

2.4.1.2.5 Intel® VMD (PCH) Designations

The Intel® VROC (VMD NVMe RAID) management tools (PreOS tools, Windows* GUI and CLI tool) are used to manage devices attached to the Intel® VMD (PCH) controller, the corresponding information displayed will indicate 'PCH' with any device or controller associated with Intel® VMD (PCH).

2.4.1.2.6 Intel® VMD (PCH) Hot Plug Support

Intel® VROC does not support Hot Plug when NVMe SSDs are attached to the Intel® VMD (PCH) controller.

2.4.2 Number of Intel® VMD Increased

Intel® VMD 2.0 technology increased the number of PCIe lanes controlled by the Intel® VMD from 48 to 64. This, along with the Intel® VMD (PCH) support, increases the total amount of Intel® VMDs to 5.

- 4 Intel® VMDs off the CPU.
- 1 Intel® VMD of the PCH (Intel® VMD (PCH)).

2.4.3 Native PCIe Enclosure Management (NPEM)

Intel® VROC 7.5 introduces support for the *Native PCIe Encloser Management (NPEM)* standard for LED management in a PCIe 4.0 based environment. This capability is discoverable in each switch-downstream-port. If it is discovered to be present, the Intel® VROC LED utility will use NPEM control, capability, and status registers to visually indicate the various drive and volume states.

2.4.4 Limited Out of Band Support

Intel® VROC 7.5 introduces limited Out of Band support.

2.4.5 Limited Self-Encrypted Drives

Intel® VROC 7.5 introduces Self-Encrypting Drive (SED) key management support. The implementation of key management is only in the UEFI environment but allows secure booting with SEDs into all Intel® VROC OS environments.

2.4.6 Intel® VROC 7.5 GUI UWD Upgrade Limitations

Due to some updates required by the Intel® VROC 7.5 GUI, a platform with Intel® VROC 7.0 based drivers or Intel® VROC 6.x based driver won't be able to upgrade to the Intel® VROC 7.5 GUI, from the Microsoft* App Store, until after the drivers have been updated. This is due to the potential of not being able to properly manage the Intel® VROC RAID volumes already established in the system after the upgrade. Once the platform is upgraded to the Intel® VROC 7.5 drivers, the GUI can be updated.

2.4.7 Intel® VROC 7.5 CLI

Intel® VROC 7.5 CLI tool now supports the creation of a RAID volume size down to two digits after the decimal point.

2.4.8 Unsupported Drives

When an unsupported drive is encountered by the Intel® VROC 7.5 GUI and/or CLI, the displayed information will show the usage as 'Pass Through'.

2.5 New Features Introduced in the Intel® VROC 7.0 Release

2.5.1 Removal of AHCI Mode Support

With the release of the Intel® VROC 7.0 package, the package will no longer include drivers to support the PCH configured for AHCI mode. All support for this configuration will be via the Microsoft* inbox AHCI driver.

- For fresh clean (OS installation) configurations, the Intel® VROC 7.0 installer will bypass the PCH if it is in AHCI mode.

- For existing platforms that has Intel® VROC AHCI driver installed, running the Intel® VROC 7.0 installer will remove/uninstall the Intel® VROC AHCI driver so the Microsoft* inbox AHCI driver can be used. A message will be displayed to inform the user of the upcoming change.

2.5.2 Removal of Legacy Option ROM Support

With the release of the Intel® VROC 7.0 package, the package will no longer include the Intel® VROC (SATA RAID) Legacy Option ROM PreOS components. All PreOS support for Intel® VROC (SATA RAID) will only be through the UEFI environment. If Intel® VROC (SATA RAID) support, through the Legacy Option ROM environment, is required continue using the Intel® VROC 6.3 release package.

2.5.3 Removal of Windows* 7 Support

With the release of the Intel® VROC 7.0 package, the package will no longer include support for Windows* 7. All components and support for Windows* 7 (Windows* drivers and PreOS components) have been removed. If Windows* 7 support is required, continue using the Intel® VROC 6.3 release package.

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3 Drivers, Images and Utilities

The latest Intel® VROC release package for Fishhawk Falls (FHF) is constructed of several components. The following is the list of those components and their corresponding version numbers.

Note: Due to the components being different entities (but are required for the product to work properly), the component version number may not match and will be different from the package version number.

Table 3-1. Components of the latest Intel® VROC Release Package for Fishhawk Falls (FHF)

Feature	Notes

Intel® UEFI Drivers	• Intel® VROC UEFI Driver version 8.0.0.1396
	  ○ VMDVROC_1.efi (HW key enforcement in effect)
	• Intel® VMD UEFI version 3.0.0.1006
	  ○ VMDVROC_3.efi
	Note: All these images are required and intended to support Intel® VMD and Intel® VROC (SATA RAID) functionality as a combined installed package.
	• Intel® VROC (SATA RAID) SATA / sSATA UEFI Driver version 8.0.0.3482
	  ○ SataDriver.efi
	  ○ sSataDriver.efi

Intel® VROC Windows* Drivers	• Intel® VROC Windows GUI version 8.0.0.3483
	• Intel® VROC Windows Installer Package version 8.0-1.0.10.0
	  ○ SetupVROC.exe (Multi-lingual)
	• Intel® VROC (VMD NVMe RAID) Windows F6 Driver version 8.0.0.3483 Win10
	  ○ \IntelVROC_f6_iaStorE_win10_64.8.0.0.3482\iaVROC
	• Intel® VROC (SATA RAID) Windows F6 Driver version 8.0.0.3483 Win10
	  ○ \IntelVROC_f6_iaStorE_win10_64.8.0.0.3482\iaStorE (SATA)
	  ○ \IntelVROC_f6_iaStorE_win10_64.64bit.8.0.0.3482\iaStorB (sSATA)
	• Intel® VROC CLI version 8.0.0.3462

UEFI Based RAID Configuration Utility	• Intel® VROC version 8.0.0.1396
	  ○ RCfgVROC.efi
	• Intel® VROC SATA / sSATA version 8.0.0.1396
	  ○ RCfgSata.efi
	  ○ RCfgsSata.efi
	Note: Secure Boot must be disabled to use this tool.

UEFI Based Comply Utility	• Intel® VROC version 8.0.0.1396
	  ○ RcmpVROC.efi
	• Intel® VROC SATA / sSATA version 8.0.0.1396
	  ○ RCmpSata.efi
	  ○ RCmpsSata.efi
	Note: Secure Boot must be disabled to use this tool.

Feature	Notes

UEFI based SATA SGPIO/LED Test utility	• Intel® VROC SATA / sSATA version 8.0.0.1396
	  ○ LedToolSata.efi
	  ○ LedToolsSata.efi
	Note: Secure Boot must be disabled to use this tool.

UEFI based Intel® VROC LED Test utility	• Intel® VROC version 8.0.0.1396 ○ LedToolVROC.efi **Note:** This tool can be used to exercise LEDs for NVMe disks behind VMD.

UEFI Based Clear Metadata Utility	• Intel® VROC SATA / sSATA version 8.0.0.1396
	  ○ RClrSata.efi
	  ○ RClrsSata.efi

UEFI Based Intel® VROC HW Key Checker	• Intel® VROC Activation Key Checker version 8.0.0.1396 ○ HWKeyCheckVROC.efi **Note:** This tool will check for the presence and type of the HW key.

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4 Intel® VROC Limitations

4.1 Microsoft .NET Framework Removal

The Intel® VROC product installation application does not include Microsoft .NET Framework. Visit Microsoft to download the latest version. Intel® VROC installation may not complete successfully without this feature.

4.2 Surprise Hot Plug Limitations

Due to Microsoft Windows* time restrictions for resuming from S3 and S4, and Intel® VMD device identification requirements, Hot Plug of Intel® VMD enabled NVMe devices is not supported during S3 and S4 states.

Surprise removal of multiple NVMe SSDs at one time are not supported. The user must wait until a device is reflected as removed/inserted in device manager for spacing surprise hot plug of Intel® VMD enabled PCIe NVMe SSDs in Microsoft Windows*.

Due to these limitations, Intel strongly discourages performing Hot Plugs during an S3 power state change.

4.3 Expect Longer Rebuild Times for RAID 5

On a RAID 5 volume, disk cache is being turned off when a volume is degraded. Due to this, the rebuilding times have increased expectedly until the rebuild is completed, and disk cache is enabled again.

This extends to drives being added to a RAID 5 volume as well.

4.4 Intel® VROC Command Line Interface (CLI)

The Intel® VROC Command Line Interface (CLI) does not support the RAID volume name beginning with blank space.

4.5 Intel® VROC Trial Version Limitations

Note: While it's possible to use bootable RAID volumes, it is highly recommended to use only data RAID volumes during the trial period. Having the operating system in a bootable RAID volume may cause users to be locked out completely from their system if the trial period runs out.

Note: During trial period, it's highly recommended to use data RAID volumes on same make/model of NVMe devices. This is the suggested configuration leading to less potential issues, although it's possible to create volumes with different make/model drives.

Once an Intel® VROC upgrade key has been inserted into the system, the trial version is concluded. Removing the upgrade key does not re-enable the trial version. As a result, any existing RAID volumes present while the upgrade key was installed, won't be seen and could be in an unknown state.

When creating a RAID volume using the trial version, don't mix SSD NVMe vendors. Mixing vendors may result in unexpected behavior.

4.6 Intel® VROC PreOS UEFI Driver Uninstall Limitations

The Intel® VROC UEFI RAID drivers comply with the UEFI Specifications for PCI Driver Model for PCI Device Drivers (Section 13.3.3) and may return the status code "access denied" from the **`UninstallProtocolInterface`** routine from boot services (spec. 6.3). This is expected behavior.

4.7 Intel® NVMe Wear Leveling Recommendations

NVMe SSD Wear Leveling refers to techniques used to prolong the service life of NVMe drives. This section outlines the recommended configurations (number of drives vs strip size) to maximize Wear Leveling on Intel NVMe SSDs when configured as part of RAID 5 volume. When creating an Intel® VROC (VMD NVMe RAID) RAID 5 volume, several configuration parameters can be selected, and the number of drives used along with the strip size chosen can have an impact on the wear leveling. The following table outlines the different options for number of drives vs strip size to achieve the optimal wear leveling on Intel® NVMe SSDs.

Table 4-1. Recommended Strip Size for Intel® NVMe SSDs for Optimal Wear Leveling

Drives \ Strip Size	4	8	16	32	64	128
3	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
4	Optimal	Optimal	Optimal	Optimal	Suboptimal	Suboptimal
5	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
6	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal
7	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
8	Optimal	Optimal	Optimal	Suboptimal	Suboptimal	Suboptimal
9	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
10	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal
11	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
12	Optimal	Optimal	Optimal	Optimal	Suboptimal	Suboptimal
13	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
14	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal
15	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
16	Optimal	Optimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal
17	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
18	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal
19	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
20	Optimal	Optimal	Optimal	Optimal	Suboptimal	Suboptimal
21	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
22	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal
23	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal
24	Optimal	Optimal	Optimal	Suboptimal	Suboptimal	Suboptimal

Note: It is left to the customer to determine the most effective combination of parameters (number of drives vs strip size) to achieve their desired performance goals, usage models and drive endurance.

Note: If a RAID volume is being migrated to RAID 5 (or a new RAID 5 volume is being created), the strip size chosen should be based off the most optimal performance as defined in the above table.

4.8 Must Use F6 Install Method

The use of the included Intel® VROC F6 drivers are required to install an OS onto an Intel® VROC managed device(s). There is no Microsoft inbox driver that supports Intel® VROC 8.0.

The supported Microsoft operating systems for this product include inbox drivers that support the Intel® C620 and C422 series chipset Platform Controller Hub (PCH) when configured for RAID mode. It is strongly recommended that the Intel® VROC (SATA RAID) F6 drivers included in this release are used instead of the available Microsoft inbox driver. The provided inbox driver is intended only for those customers who may not have the Intel® VROC (SATA RAID) F6 drivers readily available and ONLY for installing to a single drive (NOT to a RAID volume). Once the OS is installed, it is strongly recommended for proper Intel® VROC support that the Intel® VROC 8.0 installer package is installed immediately. At that point, it will be safe to migrate the SATA system disk into a RAID volume (using the Intel® VROC GUI).

4.9 Intel® C620 and C422 Series Chipset Port Limitations

This limitation is in reference to platforms having a PCH that supports more than 6 SATA ports. The Intel® C620 and C422 series chipset SATA controller supports 8 SATA ports. As referenced above, the Microsoft Windows* operating systems that contain the inbox drivers for the Intel® C620 and C422 series chipset Platform Controller Hub (PCH) when configured for RAID mode, only support 6 ports. Drives on ports 7 and/or 8 are not enumerated. For this reason, Intel recommends not using these 2 ports as part of the Windows* OS boot installation (as a pass-thru drive or as part of a RAID volume). However, if you do need to use these ports as part of your Windows* boot volume, the steps below can be used as a workaround.

Note: You will need a USB drive with the Intel® VROC IntelVROCCLI.exe utility.

Step 1: After you have created the desired RAID volume that includes ports 7 and/or 8 (which you intend to use as your Windows* boot volume) in the PreOS environment, begin the Windows* installation process. **Make note of the RAID volume name.**

Step 2: Navigate to the Windows* disk selection window. At this point, select the *Load Driver* button and install the Intel® VROC F6 driver (included in this package).

Step 3: Attempt to continue installing the Windows* OS onto the RAID volume. If the installation process does not continue, this error has been encountered.

Step 4: Press F10 to invoke a CMD window.

Step 5: If you have not already done so, insert the USB drive into the system. Navigate to your USB drive with the RSTCLI.exe utility.

Step 6: Run command: **`IntelVROCCLI.exe --manage --normal-volume <volumeName>`**

Step 7: This will reset the volume to a normal state.

Step 8: Close the CMD window.

Step 9: In the Windows* disk selection window, reload the Intel® VROC F6 driver.

Step 10: Once completed, Windows* should allow the installation on the RAID volume.

4.10 Intel® VROC Key Removal/Upgrade Limitation

With Microsoft Windows* 10 and Windows* 11, *Fast Startup* is enabled by default. Disable *Fast Startup* prior to removing/upgrading the Intel® VROC hardware key, or alternatively, perform a complete reboot when removing/inserting a Intel® VROC hardware key when *Fast Startup* is enabled.

4.11 NVMe Port Assignment by Intel® VROC

In Windows* and UEFI, the port number shown in the Intel® VROC interfaces depends on the disk enumeration order by the Intel® VMD-enabled NVMe driver, which can be different on each platform. The port numbers shown does not reflect the physical PCIe slot. After each hot plug, there is an enumeration process which is NOT fixed.

4.12 Windows* 10 RS5 & Windows* Server 2019

4.12.1 Idle Power Increased

Installing Intel® VROC 8.0 onto a platform running Windows* 10 RS5, in Windows* and UEFI, the port number shown in the Intel® VROC interfaces depends on the disk enumeration order by the Intel® VMD-enabled NVMe driver, which can be different on each platform. The port numbers shown does not reflect the physical PCIe slot. After each hot plug, there is an enumeration process which is NOT fixed.

4.12.2 Intel® VROC Support for Windows* 10 RS5 & Windows* Server 2019

Intel® RSTe 5.5.0.2013 introduces support for Windows* 10 RS5 and Windows* Server 2019.

Note: There is a known issue trying to install Windows* 10 RS5 or Windows* Server 2019. Installing Windows* 10 RS5 or Windows* Server 2019 onto an Intel® VMD managed device is limited to a single CPU. For more information, see the *Known Issues* section in this document.

Note: This limitation only applies to Intel® RSTe 5.5 and earlier releases. Intel® VROC 6.x and newer are not impacted.

4.13 Intel® VROC SATA LED Management

When designing a Hot Swap Backplane (HSBP) into a new platform, make sure that the backplane design supports the platform's external design document specification for HSBP support.

Note: Fishhawk Falls (FHF) does not support HSBP.

The sSATA controller on the Intel® Cooper City and Wilson City Customer Reference Boards (CRBs) have very limited support for using and/or testing backplane

management. Make sure to review all Intel® Cooper City or Wilson City CRB design documentation to understand how the sSATA controller is laid out.

4.14 Intel® VROC Creation Volume Sizes

When creating a RAID volume, there will be a volume size difference seen when comparing a RAID volume created using the Intel® VROC PreOS HII environment and volumes created in the OS. This has to do with the way the size information is displayed and computed between the two environments.

4.15 MCERR/P_CATERR/Bus Uncorrectable Error with Intel® VMD Enabled

When CTO occurs, Intel® VMD must be chosen to handle these conditions when the root port of the Intel® VMD controller is enabled. This is accomplished by disabling IOMCA on the x16 Intel® VMD enabled lanes.

4.16 NVMe Drive Model Number Does Not Display Properly in Device Manager

The NVMe device name in Device Manager is created by Microsoft. Within Device Manager, the model number of NVMe devices may not be completely displayed once Intel® VMD is enabled. A workaround with a new parameter in **`UnitControl`**, **`ScsiUnitRichDescription`** to show all model number in the device name. The workaround can only solve the problem when the drives have the same model number but different sizes.

4.17 Intel® VROC RAID Driver is not Producing AtaPassThru Protocol

When using **`AtaPassThru`** protocol to get information on attached devices from the Intel® VROC PreOS, the value of **`GetNextTargetLun`** may not be successful. A workaround is to set the value of the "Timeout" field inside "Packet" to a larger value (e.g., 3 seconds).

4.18 Intel® VROC 8.0 New GUI Design

4.18.1 Warning Message Displayed When GUI and Driver Version is Mismatching

When this warning message condition is detected from one major version or two minor versions difference, the Intel® VROC GUI will not allow to manage the storage controller but can provide a set of functionalities corresponding to the lowest driver version. The Intel® VROC GUI still can start even if there is no driver installed.

4.19 Pre-Boot DMA Feature Needs to be Disabled

RAID creations could not be done after enabling *Pre-Boot DMA Protection* and *DMA Control Opt-In Flag*. This feature enablement is targeted to be corrected by Eagle Stream Refresh (EGS-R) timeframe.

4.20 Intel® Virtual RAID on CPU (VROC): Intel® VROC (SATA RAID) Compatibility Issue with Microsoft Windows* Operating System Versions Released After June 2022

Beginning with Microsoft Windows* 11 SV2 release timeframe, Microsoft has implemented a correctness fix to address a potential race condition that could result in a system failure (bugcheck). The issue corrected was in the device PnP removal process. This correctness fix has been backported to Microsoft Windows* 11 SV from 2021.10C, Windows* Server 2022 from 2021.08C and Windows* 10 22H2. As a result of this Microsoft correction, one of the Windows inbox RAID drivers; the Intel® Rapid Storage Technology (Intel® RST) driver now fails the device PnP removal process. This process failure blocks the Intel® RST driver from being properly removed. As a result, a replacement driver cannot be installed. Long-term solutions to resolve this issue has been brought up to Microsoft to enact corrective measures.

4.21 RAID TRIM Disabled for This Version

A potential silent data loss/corruption condition exists in all Intel® Rapid Storage Technology enterprise (Intel® RSTe) Windows* drivers, beginning with version 5.4.0.1465, as well as all Intel® Virtual RAID on CPU (Intel® VROC) Windows* driver versions (until Intel® VROC 7.x). This potential silent data loss/corruption condition occurs on Intel® VROC managed RAID 5 volumes, consisting of at least one SSD that supports TRIM/UNMAP commands, by methods other than the use of zeros.

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5 Intel® VROC Issues

This section outlines the issues reported and internally found that customers need to be aware of. The issues are broken down into known issues and resolved issues.

5.1 Known Issues in Intel® VROC 8.0 Release

Table 5-1. Known Issues in Intel® VROC 8.0 Release

Issue ID	Description
14015389340	When using **`AtaPassThru`** protocol to get information on attached devices from the Intel® VROC PreOS, the value of **`GetNextTargetLun`** may not be successful.
18015334984	Warning message: "*Warning: The AHCI driver will be updated to the latest Microsoft AHCI driver in the system*" does not occur when installing Intel® VROC in AHCI mode using installer.
18020541368	While within SED Manager, unencrypted drives that are unplugged and then are selected to have a security key to be setup may experience a platform hang.
18020894568	Migrating OS from a RAID 0 volume to a RAID 5 may result in unexpected error messages in both CLI and GUI interfaces.
15010088464	When SATA controller is switched to RAID mode, SATA drive information will be displayed in VROC SATA HII instead. User can reference the device information in VROC SATA HII.
18016767645	Within Intel® VROC SED Manager, a physical drive may appear in twice.
1805900436	Intel® VROC F6 drivers may not properly load, and a refresh may be required.
15011986293	When booting the platform with a degraded Intel® VROC RAID 1 data volume, the Intel® VROC 8.0 GUI may not properly display the RAID volume.
18012869559	Intel® VROC GUI and CLI may not forbid performing operations that use self-encrypting drives in locked state. Creating RAID volume with locked member may result in failed volume state.
18021555907	The "Increase Size" button within the Intel® VROC GUI may experience issues refreshing incorrectly.
18022812016	When the OS performs a TRIM command onto an Intel® VROC RAID 1 or RAID 10 comprised of drives that perform TRIM activities in different ways may encounter a data inconsistency on those areas that had been TRIMed.
15012192390	Intel® VROC SATA HDD may have a problem unlocking after sending the 0xf2 command.

Issue ID	Description
18024185962	A RAID volume may become degraded after the initialization process completes, if two of the drives encounter a bad block condition in the same sector.

5.2 Resolved Issues in Intel® VROC 8.0 Release

Table 5-2. Resolved Issues in Intel® VROC 8.0 Release

Issue ID	Description
18015582447	When attempting to rebuild a degraded RAID 10 matrix (second RAID volume is a RAID 5) with 2 drive failures (RAID 10 - Degraded; RAID 5 - Fail), the Intel® VROC driver may become unresponsive.
1808018122	Trying to clear a SMART event from a drive after a RAID volume is rebuilt (to another drive), may show up as a unknown disk.
18010986194	Intel® VROC PreOS may not properly show a boot RAID volume as bootable after the RAID volume encounters a FAIL condition.
18012964787	Number of media errors reported in Intel® VROC GUI may be different than expected after performing *Verify and Fix* on RAID 1.
18016591025	I/O may become unresponsive with NVMe VROC for Windows* under heavy I/O while using matrix RAID.
14014436257	Exceptional boot delay with WD Gold HDD used as SATA data drive attached to RAID mode port, but not in a RAID volume.
18011148984	Intel® VROC GUI may not indicate which drives are connected to PCH for pass through system drives and system RAID volumes.
18016453364	When using the Intel® VROC HII to create a RAID volume, the warning message that all data on the member disks will be lost, may not be displayed.
18023331378	Intel® VROC Bad Block Management (BBM) logging may report the wrong drive serial number when logging BBM events.
1808094827	The Intel® VROC (VMD NVMe RAID) PreOS environment may only show 32 NVMe SSDs in the Intel® VROC HII.
18012896024	Intel® VROC GUI may not report proper number of media errors encountered during initialization of RAID 5.
18010956435	Output may not appear in Intel® VROC CLI after attempting to create RAID 1 volume from two parts of x8 drive.
1508749788	A second RAID volume may not rebuild to the hot-spare drive after resetting one member disk to non-RAID.

Issue ID	Description
18015729524	Intel® VROC OOB Management may report wrong error message during the attempt to create RAID volume from third party vendor drives when using *Intel SSD Only* key.

5.3 Resolved Issues in Intel® VROC 7.7 Release

Table 5-3. Resolved Issues in Intel® VROC 7.7 Release

Issue ID	Description
18016058101	Intel® VROC bad block management process may take (3 to 4 times) longer than in previous versions.
18014127243	Performing an Intel® VROC (SDATA RAID) RAID 5 write hole recovery on a degraded SATA RAID 5 volume may not complete successfully.
14014598311	Intel® VROC SATA/sSATA RAID volumes may degrade or fail under high I/O load if an ATA pass through command is issued.
14013794942	The Intel® VROC CLI tool may terminate operation with an error if the user attempts to use the command with `-M` option, with a drive volume that does not exist.
14013356415	[CPX-6] Install Protocol Interface failure message after loading VMD UEFI driver.
1508964983	This issue is caused by unsigned iaNullVMD.inf.
1508793548	Fail to install Windows* Server 2019 with QWMB CPU.
1508747791	Hot removal of a matrix RAID member may result in a system failure.
22011598177	NVMe drives connected to certain Icelake CPU SKU may not be accessible by Intel® VROC when VMD is enabled.
18016895347	Intel® VROC (SATA RAID) PreOS Health Protocol may not properly report the driver/controller information.
18015474102	Trying to clear a SMART event from a drive after a RAID volume is rebuilt (to another drive), may show up as a unknown disk.
18014791546	Using the Intel® VROC CLI tool to remove the metadata on all the specified drives may not complete successfully on drives identified as "unknown".
18014524336	When using the Intel® VROC CLI tool to identify the attached devices on the SATA/sSATA controller, attached ATAPI devices may not be properly reported.

Issue ID	Description
18013439721	When running in a matrix RAID configuration (two RAID volumes in a single RAID array), the bad block management process may not properly detect bad blocks.
18011530136	The Intel® VROC RCfg tool may not properly display the warning message when trying to rebuild a volume to a drive that is at least 10% bigger than the largest member drive.
1806564424	System may fail to start after an unexpected power loss.
18012842292	An incorrect error message ("*REQUEST_FAILED: Request is formatted correctly but failed to execute.*") may be reported by the Intel® VROC CLI tool when trying to perform a migration to unsupported RAID level.
18012255612	The Intel® VROC CLI tool may return the wrong error message ("*INVALID_DEVICE: Request not formatted correctly; device does not exist.*") when trying to rebuild degraded RAID volume to drive in an incompatible state.
18012236043	The Intel® VROC CLI tool may report wrong error message ("*REQUEST_FAILED: Request is formatted correctly but failed to execute.*") when trying to remove member drive of system RAID volume.
18011483476	When using the Intel® VROC HII to create a RAID volume, the warning message that all data on the member disks will be lost, may not be displayed.
1808963497	RAID initialization may not be automatically performed when *Verify* or *Verify and Repair* is initiated by the Intel® VROC CLI tool on an uninitialized volume.
18018934449	On Wolfpass platform, NVMe RAID submenu is not available and RCFG needs to be used to manage RAID functionalities in UEFI.
22011592946	Intel® VROC (SATA RAID) PreOS Health Protocol may not properly report the driver/controller information.
18016174423	Performance issue may occur after switching from legacy to MSI-X interrupts mode on SATA RAID.

5.4 Resolved Issues in Intel® VROC 7.6 Release

Table 5-4. Resolved Issues in Intel® VROC 7.6 Release

Issue ID	Description
22012232430	Using the Intel® VROC CLI tool with the **-R** option may not properly result in the RAID volume rebuild occurring.
14013209937	Intel® VROC bad block management process may take (3 to 4 times) longer than in previous versions.

Issue ID	Description
1508906750	[VROC] Drive failure messages seen on initiating IO.
14012975200 **1508768056** **22011598177**	Not able to install Windows* on Intel® VROC-managed NVMe or may not be able to access NVMe drives behind VMD with certain Icelake CPU SKUs.
22011073918	A potential silent data loss condition exists in both the Intel® VROC (SATA RAID) and the Intel® RSTe Windows-based products. The potential silent data loss condition exists when the Intel® VROC Read Patrol feature is enabled for redundant SATA RAID volumes (RAID 1, 5 or 10) and one of the RAID member drives is found to have a bad block condition. The Read Patrol process, of using the redundant data to correct the bad block, can result in invalid data being written.
1509073224	The Intel® VROC 7.5 installation application may not properly install the Null Driver to support Device ID 0x09AB.
18016160241	This issue is caused by unsigned iaNullVMD.inf.
14012975200	NVMe drives connected to certain Icelake CPU SKU may not be accessible by Intel® VROC when VMD is enabled.
1508793548	Fail to install Windows* Server 2019 with QWMB CPU.
1507753655	when running stress testing on M.2 slots managed by the sSATA controller, an **`isStorB`** error may be logged.

5.5 Resolved Issues in Intel® VROC 7.5 Release

Table 5-5. Resolved Issues in Intel® VROC 7.5 Release

Issue ID	Description
22011196948	Intel® VROC may not properly calculate the LBA locations when performing the Read Patrol Bad Block Recovery process, inadvertently missing some bad blocks.
22011073918	A potential silent data loss condition exists in both the Intel® VROC (SATA RAID) and the Intel® RSTe Windows-based products. The potential silent data loss condition exists when the Intel® VROC Read Patrol feature is enabled for redundant SATA RAID volumes (RAID 1, 5 or 10) and one of the RAID member drives is found to have a bad block condition. The Read Patrol process, of using the redundant data to correct the bad block, can result in invalid data being written.
14012886123	Intel® VROC RAID Write Hole parity calculation may be computed incorrectly.
22011547837	NVMe drives listed in the Intel® VROC BIOS HII page may state incorrect CPU on which it is connected to.

Issue ID	Description
22010691032	Intel® VROC Installer Help Dialog does not contain all available setup options.
14011249412	Activate LED option may not work for non-Intel drives when using *Intel SSD Only* license.
14011049937	The order of the SATA drives attached to the sSATA controller may not match that of how they may be reported in the SATA controller
1808275753	The wrong RAID volume state may be displayed after a dirty shutdown.
1507753655	When running stress testing on M.2 slots managed by the sSATA controller, an **`isStorB`** error may be logged. Expected under such heavy I/O loads.
18012678098	When installing Intel® VROC using installer with option **`-nodrv`** all drivers are uninstalled, and no driver is installed in replacement. This option may break operating system and it shall not be used.
18011258092	Clearing RAID metadata using the RCfg tool may result in a platform hang in UEFI and an ASSERT.
18010905203	Creating a RAID volume in Intel® VROC (VMD NVMe RAID) PreOS from drives connected through a JBOF may not succeed and result in error message: "*Create volume failed! Cannot write to disk*".
1806564424	System may fail to start after an unexpected power loss.
1508007585	Intel® VROC HII may display the RAID volume capacity improperly when it is larger than 10000GB.
1507520073	Uninstall the Intel® VROC Windows* driver may encounter an error when it is installed and uninstalled multiple times.
1306412122	Setting LED Configuration of Empty Slot as Fail may not show Fail when slot is empty.
22011382393	Locate LED may not work properly in VROC HII when using PCIe switch with NPEM support.

5.6 Resolved Issues in Intel® VROC 7.0.2 Release

Table 5-6. Resolved Issues in Intel® VROC 7.0.2 Release

Issue ID	Description
22011071259	With Read Patrol is enabled, recovering from a bad block could result in a data loss condition.

5.7 Resolved Issues in Intel® VROC 7.0 Release

Table 5-7. Resolved Issues in Intel® VROC 7.0 Release

Issue ID	Description
14010261577	Intel® VROC IAStorIcon Scheduled Task may be inadvertently removed during a package upgrade.
22010314523	Migration of one RAID 10 volume to a RAID 5 volume may cause another RAID 10 volume, in the system, to automatically re-initialize.
18011792455	When using a Hot Spare Back Plane from a Whitley platform in Cedar Island platform, the SATA LEDs may not work properly. This is not an Intel® VROC issue.
14010852023	Intel® VROC HII may not display RAID volume information correctly when the raid volume is greater than 10 Terabytes.
1808514953	Booting a platform with 48 NVMe drives may result in a system failure.
1808389290	The Intel® VROC Rebuild LED behavior may not operate properly when customized to blink all LEDs during a RAID rebuild.
1806994368	Performing Hot Plug drive replacement on a degraded RAID volume, with Rebuild on Hot Insert enabled, may not properly initiate an automatic RAID rebuild.
1507501583	When resuming from and S3 power state change, the "System" label may not be displayed properly in the Intel® VROC GUI.
1409667894	LED Locate from the HII BIOS VROC Menu causes page to exit prematurely.
1808703820	When Using the Intel® VROC CLI tool to add a drive to an existing array, the volume strip size may not be displayed properly.
1808580403	when performing a drive Hot Plug, the event logger may show other drives (not involved in the Hot Plug) having encountered hot plug events.
1807170210	An Intel® VROC GUI volume creation warning message may overlay on top of a submenu.
1806564426	Event Lot may not properly show "*RAID volume {VolumeName} is normal*" message after a rebuild completes.
18011690000	Activate LED Option may not work in Intel® VROC CLI and GUI, when using the *Intel SSD Only* license.

5.8 Resolved Issues in Intel® VROC 6.3 Release

Table 5-8. Resolved Issues in Intel® VROC 6.3 Release

Issue ID	Description
14010267807	Performing a Drive Surprise Hot Remove from a Matrix raid array may result in a platform failure.
1507649523	Using the **CC_CSMI_SAS_GET_DRIVER_INFO** command may not report correct drive and driver information.
18010792702	Intel® VROC IAStorIcon Scheduled Task may be inadvertently removed during a package upgrade.
1809577436	An Intel® VROC spanned RAID 10 volume may not start rebuilding automatically after a rebuild on hot insert condition.
1806397184	In Intel® RSTe NVMe Pre-Purley platform with 48 NVMe drives and max volumes, degraded RAID volume may encounter a system failure while booting.
1507369786	Migrating a single NVMe boot drive to an Intel® VROC (VMD NVMe RAID) volume and perform a system sleep power state change may result in a system crash.
1806411891	RAID volume may become degraded after reboot.
1806397164	Intel® RSTe NVMe Pre-Purley Platform with 48 NVMe drives and 24 volumes may encounter a boot failure.
1507522222	Intel® VROC LED Management may illuminate the Locate LED option during another RAID operation and may not stop when the operation completes.
1806930160	An error message in event viewer "*The driver detected a controller error.*" may be displayed when performing platform power state changes with Intel® VROC installed.
1806419240	Intel® VROC (VMD RAID) NVMe drive may be marked as available after removal.

5.9 Resolved Issues in Intel® VROC 6.2 Release

Table 5-9. Resolved Issues in Intel® VROC 6.2 Release

Issue ID	Description
1606900429	System crash may occur when load Intel® VROC (VMD NVMe RAID) F6 driver while the Intel® VROC RAID is under an initialize state.

Issue ID	Description
1409230595	Intel® VROC UEFI may not properly report the VMD controller BDF in the HII.
1409017125	UEFI driver hangs when the metadata is malformed.
1408968353	Intel® VROC (VMD NVMe RAID) UEFI HII Menu may cause the BIOS Setup Menu to be improperly displayed.
1409194760	Activity LED is not blinking when SATA drive in RAID mode.
1808452676	A system, with the OS installed onto a RAID volume, may not properly resume after several hybrid sleeps.
1808377588	A system running Intel® VROC, with the OS installed onto a RAID volume, may not properly resume from a hybrid sleep state, after performing multiple hybrid sleeps.
1808060543	The Intel® VROC 6.2 UWD UI application may not properly function on a platform with Intel® VROC 6.0 driver package. Make sure that when using the Intel® VROC UWD UI application, that the UI version matches the driver package (i.e. both should be Intel® VROC 6.0 or both should be Intel® VROC 6.2).
1807345165	The Intel® VROC CLI tool may not properly expand existing RAID volumes.
1807107325	When using the Intel® VROC CLI tool to create RAID volumes one of the disks may show a disk size of 0GB after the volume creation completes.
1806677977	Bad blocks may not be properly reported in a RAID 5 volume.
1806534894	The Intel® VROC CLI tool may allow data migration with a smaller drive.
1806503629	Creating a RAID 1 volume from an existing drive may result in a failed RAID volume.
1507222187	The Intel® VROC icon is missing in system tray in Windows* 10.
1409784946	Hot Removal of a RAID 5 Write Hole (RWH) Journaling Drive may cause the platform to become unstable and may cause a system failure system instability and BSODs.
1409371408	Intel® VROC GUI may require the "Proceed with deleting data" box be selected when not expected.

Issue ID	Description
1407853994	Degraded SATA RAID 5 may not boot if disk on SATA controller port 0 is removed or fails.
1407801045	The Intel® VROC RWH policy may inadvertently change from Journaling to Distributed if one member drive is missing.
1407219909	New VMDVROC_1.efi and VMDVROC_2.efi drivers will increase boot time around 4 seconds.
1806782204	Intel® VROC GUI may not properly open unless "Run as Administrator".
1506398660	RAID 10, hot-plug two member disks, re-plugged second disk can't rebuild.
1409584095	Event log error 4156/4155 seen during stress testing.
1807977956	The platform may encounter a system failure as a result of performing a hybrid sleep cycle on an Intel® VROC RAID 5 volume (the first hybrid sleep after running the Intel® VROC installation application).
1807962656	The Intel® VROC PreOS UEFI may not properly display the full serial number of a removed/offline volume member drive in the UEFI Health Protocol information.
1807158496	The Intel® VROC RWH policy may change from Journaling to Distributed after a Drive Hot Unplug.
1806564409	Platform may not properly boot after a dirty shutdown with I/O on a RAID 5 volume (RWH Distributed).

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