

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

Release Notes for Intel® VROC 9.4PV

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*Revision 011*

*March 2026*

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## Revision History

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Version	Description	Date
001	Initial public release	May 2023
002	Updated for Intel® VROC 8.2 Release	October 2023
003	Updated for Intel® VROC 8.5 Release	November 2023
004	Updated for Intel® VROC 8.6 Release	March 2024
005	Updated for Intel® VROC 9.0 Release	June 2024
006	Updated for Intel® VROC 9.0PV2 Release	October 2024
007	Updated for Intel® VROC 9.1 Release	January 2025
008	Updated for Intel® VROC 9.2 Release	June 2025
009	Updated for Intel® VROC 9.2PV2 Release	September 2025
010	Updated for Intel® VROC 9.3 Release	October 2025
011	Updated for Intel® VROC 9.4 Release	February 2026

# 1 Introduction

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## 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).

## 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
Matrix RAID	Two independent RAID volumes within a single RAID array.
MB	Megabyte

Term	Description
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.
RDC	The Resource & Documentation Center (RDC) is a section of Intel's Developer Zone where users can find technical collateral, software, tools, and other developer resources. Within the RDC, content is organized into collections based on topic, tool, product, or platform.
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	<i>Unified Extensible Firmware Interface</i> . Refers to the system setting in the BIOS
Intel® VMD	Intel® Volume Management Device
Intel® VROC	Intel® Virtual RAID on CPU
PEI	Pre-EFI Initialization

### 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 1.0 Device ID	VMD 2.0/3.0/4.0 Device ID	# Of VMD
Intel® Xeon® Scalable Processor Family – W	Intel® Xeon® Scalable Processor family workstation†	201D	N/A	3 per CPU
Intel® Xeon® Scalable Processor Family – SP	Intel® Xeon® Scalable Processor family server and workstation†	201D	28C0	4 per CPU

CPU	Platform	VMD 1.0 Device ID	VMD 2.0/3.0/4.0 Device ID	# Of VMD
Intel® Xeon® Processor D Product Family	Intel® Xeon® Processor D Product Family based platform†	201D	28C0	3 per CPU
Intel® Xeon® Processor Scalable Memory Family	Intel® Xeon® Scalable Processor family server and workstation†	201D	28C0	3 per CPU (VMD 1.0) 4 per CPU / 1 for PCH (VMD 2.0/3.0/4.0)
Intel® X299 High End Desktop	Intel® Xeon® Scalable Processor family server and workstation†	201D	N/A	3 per CPU

† Unless otherwise specified in the Release Notes.

**Note:** Intel® VROC (VMD NVMe RAID) support on the Intel® X299 High End Desktop platforms is restricted to Intel® NVMe SSDs only. This is a platform limitation. As a result, when Intel® VROC is installed onto an Intel® X299 High End Desktop platform, the customer will only see Intel® NVMe SSDs plugged into the platform.

**Note:** Intel® VROC (Non-VMD NVMe RAID) is no longer included in the Intel® VROC package. If support for this product is required refer to the Intel® VROC 7.x based family of products.

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

Chipset	Platform	RAID controller Device ID	# Of Ports
Intel® C610 series chipset	Platforms containing the Intel® C610 series chipset†	2826 (SATA) 2827 (sSATA)	6 SATA 4 sSATA
Intel® C610 series chipset	Platforms Refreshes containing the Intel® C610 series chipset†	2826 (SATA) 2827 (sSATA)	8 SATA 6 sSATA
Intel® C220 series chipset	Platforms containing the Intel® C220 series chipset†	2826 (SATA)	6 SATA
Intel® C230 series chipset	Platforms containing the Intel® C230 series chipset Platform†	2826 (SATA)	8 SATA
Intel® C240 series chipset	Platforms containing the Intel® C240 Series Chipset†	2826 (SATA)	8 SATA
Intel® C620 series chipset	Platforms containing the Intel® 620 series chipset†	2826 (SATA) 2827 (sSATA)	8 SATA 6 sSATA
Intel® C422 series chipset	Platforms containing the Intel® C422 series chipset†	2826 (SATA)	8 SATA
Intel® C741 series chipset	Platforms containing the Intel® C741 series chipset†	2826 (SATA) 2827 (sSATA) 282F (tSATA)	8 SATA 6 sSATA 6 tSATA

† Unless otherwise specified in the Release Notes.

## 1.5 Supported Operating Systems

Please navigate to the following link to view the latest support matrix for operating systems with Intel® VROC. [Intel® Virtual RAID on CPU \(Intel® VROC\) Operating Systems Support List](#)

## 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 4<sup>th</sup> Gen Intel® Xeon® Scalable Processors based platforms. This feature has not been disabled due to legacy platform support. Any issues against 4<sup>th</sup> Gen Intel® Xeon® Scalable Processors based platforms using *Intel SSD Only* keys will not be supported.

## 2 *New Features*

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### 2.1 **New Features Introduced with Intel® VROC 9.4 Release**

Review the [Intel® Virtual RAID on CPU \(Intel® VROC\) Technical Product Specification for Windows\\*](#) for the details on the latest features and updates.

**Note:** These new features will not be addressed in this version of the Release Notes.

## 3 Drivers, Images and Utilities

The latest Intel® VROC release package 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.

The number convention has also changed starting in VROC Version 9.4 PV, please see the TPS for more details.

**Table 3-1. Components of the latest Intel® VROC Release Package**

Feature	Notes
<b>Intel® UEFI Drivers</b>	<ul style="list-style-type: none"> <li>Intel® VROC UEFI Driver version 9.4.0.1052 <ul style="list-style-type: none"> <li>VMDVROC_1.efi (HW key enforcement in effect)</li> </ul> </li> <li>Intel® VMD UEFI version 4.1.0.1009 <ul style="list-style-type: none"> <li>VMDVROC_2.efi</li> </ul> </li> </ul> <p><b>Note:</b> All these images are required and intended to support Intel® VMD and Intel® VROC (SATA RAID) functionality as a combined installed package.</p> <ul style="list-style-type: none"> <li>Intel® VROC (SATA RAID) SATA / sSATA UEFI Driver version 9.4.0.10037 <ul style="list-style-type: none"> <li>SataDriver.efi</li> <li>sSataDriver.efi</li> </ul> </li> </ul>
<b>Intel® VROC Windows* Drivers</b>	<ul style="list-style-type: none"> <li>Intel® VROC Windows* GUI version 9.4.0.10037</li> <li>Intel® VROC Windows* Installer Package version 9.1 - 9.1.5.0 <ul style="list-style-type: none"> <li>UI ver VROC_9.4.0.10037 <ul style="list-style-type: none"> <li>SetupVROC.exe (Multi-lingual)</li> </ul> </li> </ul> </li> <li>Intel® VROC (VMD NVMe RAID) Windows F6 Driver version 9.4.0.10038 Win10</li> <li>Intel® VROC CLI version 9.4.0.10037</li> </ul>
<b>UEFI Based RAID Configuration Utility</b>	<ul style="list-style-type: none"> <li>Intel® VROC version 9.4.0.10037</li> <li>Intel® VROC SATA / sSATA version 9.4.0.10037</li> </ul> <p><b>Note:</b> Secure Boot must be disabled to use this tool.</p>
<b>UEFI Based Comply Utility</b>	<ul style="list-style-type: none"> <li>Intel® VROC version 9.4.0.10037</li> <li>Intel® VROC SATA / sSATA version 9.4.0.10037</li> </ul> <p><b>Note:</b> Secure Boot must be disabled to use this tool.</p>
<b>UEFI based SATA SGPIO/LED Test utility</b>	<ul style="list-style-type: none"> <li>Intel® VROC SATA / sSATA version 9.4.0.10037</li> </ul> <p><b>Note:</b> Secure Boot must be disabled to use this tool.</p>
<b>UEFI based Intel® VROC LED Test utility</b>	<ul style="list-style-type: none"> <li>Intel® VROC version 9.4.0.10037</li> </ul> <p><b>Note:</b> This tool can be used to exercise LEDs for NVMe disks behind VMD.</p>
<b>UEFI Based Clear Metadata Utility</b>	<ul style="list-style-type: none"> <li>Intel® VROC SATA / sSATA version 9.4.0.10037</li> </ul>

## 4 Intel® VROC Limitations

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### 4.1 Cannot Delete Non-System RAID Volume Behind Intel® VMD

When a RAID volume is created with a drive that has an operating system on it (the system drive) and then migration is in progress, if a separate RAID volume is created shortly after, this new non-system RAID volume cannot be deleted within the Intel® VROC GUI or CLI tool. The user who attempts to do so will be greeted with an error pop-up in the Intel® VROC GUI or an error message: *Request is formatted correctly but failed to execute*, within the CLI tool.

### 4.2 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.

### 4.3 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.

### 4.4 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.

### 4.5 Intel® VROC Command Line Interface (CLI)

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

## 4.6 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.

## 4.7 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.

## 4.8 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**

Strip Size \ Drives	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.

## 4.9 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, C422 and C741 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 required 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).

## 4.10 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.

## 4.11 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.

## 4.12 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.

## 4.13 Windows\* 10 RS5 & Windows\* Server 2019

### 4.13.1 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.

### 4.13.2 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.

## 4.14 Intel® VMD Support on 8 Socket Platforms

Due to restrictions on NVM Express implementations that reside behind PCI compliant bridges, address space is limited to 32 bit assigned base address registers (for non-prefetchable memory). This means that there is only 4 Gigabytes of addressable (non-prefetchable) memory space available. This memory space must be shared between the entire platform. As a result, there is a limitation on the number of Intel® VMD controllers that can be enabled (due to these resource constraints). The following two configurations can be used without encountering memory restriction errors:

1. Three Intel® VMDs can be enabled on CPU0 up to CPU6. Intel® VMDs on CPU7 need to remain disabled. This results in a maximum of 21 Intel® VMDs that can be enabled in this configuration.
2. No more than two Intel® VMDs can be enabled on each CPU in an 8-socket platform. This results in a total of 16 Intel® VMD domains.

**Note:** This limitation does not apply to 1, 2 or 4 socket platforms.

## 4.15 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.

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.

## 4.16 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.

## 4.17 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.

## 4.18 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.

## 4.19 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).

## 4.20 Intel® VROC 8.0 New GUI Design

### 4.20.1 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.

## 4.21 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.

## 4.22 RAID 5 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.

## 4.23 RAID 5 Boot or Data Volume in Rebuild State

A potential silent data loss/corruption condition (SDC) exists in all Intel® Virtual RAID on CPU (Intel® VROC) Windows\* driver versions beginning with the release package version 7.0.0.2291. The issue has been root caused to a very small timing window where a particular

sequence of event occurs. A customer may be exposed to this SDC condition when all the following conditions have been met:

- The platform is configured with a RAID 5 volume, and it is in a Rebuild state.
- The platform is under very heavy I/O.
- The I/O operation generates a WRITE operation to a RAID volume stripe that is not being rebuilt yet.
- The I/O operation generates a READ operation to the RAID volume, in which the READ address range overlaps with two stripes: the stripe that is being rebuilt, and the next stripe that has yet to be rebuild.

If these conditions have been encountered in an operational environment, the platform may encounter the SDC condition.

Intel strongly recommends that customers, who may be exposed to this silent data loss condition, immediately update to the Intel® VROC 8.2 release package version.

# 5 Intel® VROC Issues

This chapter 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 Resolved Issues in Intel® VROC 9.4 Release

**Table 5-1. Known Issues in Intel® VROC 9.4 Release**

Issue ID	Description
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.
15012192390	Intel® VROC SATA HDD may have a problem unlocking after sending the 0xf2 command.
15016690395	Customers running Intel® VROC under a Microsoft Windows* environment, using Gen5 NVMe SSDs, may not see the expected performance benefits when running in a RAID 0 configuration. Customers generally utilize a RAID 0 configuration to achieve (and expect to see) a linear scaling of the aggregate bandwidth of the RAID member drives. Running in this configuration, customers may see approximately 60% of that value.
VA1-I332	Within the Intel® VROC GUI there may be a possibility of seeing 0.0.0.0' as the version number for the Secure Deployment Version.
VA1-I317	A change introduced in the VROC Windows driver between versions 9.0 and 9.3 introduced a potential issue in which the Windows Recovery Environment (WinRE) "Reset PC" option may not function correctly on systems with low core-count CPUs.

## 5.2 Known Issues in Intel® VROC 9.4 Release

Table 5-2. Known Issues in Intel® VROC 9.4 Release

Issue ID	Description
14015389340	When using <b>AtaPassThru</b> protocol to get information on attached devices from the Intel® VROC PreOS, the value of <b>GetNextTargetLun</b> may not be successful.
18015334984	Warning Message " <i>Warning: The AHCI driver will be updated to the latest Microsoft AHCI driver in the system</i> " 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.
15010088464	When SATA controller is switched to RAID mode, SATA drive information will be displayed in Intel® VROC SATA HII instead. So, user can reference the device information in Intel® VROC SATA HII.
18016767645	Within Intel® VROC SED Manager, a physical drive may appear in twice.
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.
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.
15013821671	Windows GUI did not show "rebuilding" event as disk hot-plug and inserted when RAID member only 100 MB.
18029487344	Intel® VROC OS interfaces (Windows* GUI CLI, Linux* <i>mdadm</i> , Linux*/Windows* OOB) may not forbid performing operations that use self-encrypting drives in locked/foreign state. RAID volume operations with locked / foreign device will be failed (e.g. RAID volume creation will be failed).
18040635664	There is a possibility that certain platforms may not reboot as expected after product installation using "-s -b" parameters during the GUI installation process.
18037794909	The installation may unexpectedly start with flag -ver and additional parameters during the VROC GUI installation process.
15017580021	Due to potential changes made by Microsoft in the new Windows installer introduced with Windows 2025, there is a possibility issue where the VROC NVMe RAID volume may not be recognized after loading the F6 driver during the Windows 2025 OS installation. This issue can occur with any Windows 2025 build, regardless of the VROC driver version or the specific version of Windows 2025. The current workaround is to click "Refresh" five to ten seconds after initially loading the VROC driver.
15018073505	Post sleep cycle during re-enumeration may take longer than expected for certain drives to enumerate.
14024524599	Potential for when a standard or premium VROC hardware keys to show in "pass-thru" mode.
14025503954	Locating a drive within the BIOS' HII menu may result in abnormal LED patterns such as continual blinking even though the "locate LED" functionality was turned off.