Intel® Virtual RAID on CPU (Intel® VROC) 6.0 PV Release

Customer Release Notes

January 2019

Revision 1.0

Revision History

Revision	Description	Date
1.0	Intel VROC 6.0 PV Initial Release	January 2019

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Contents

1 Introduction

1.1 Overview

The Intel Virtual RAID on CPU (Intel VROC) 6.0 Production Version (PV) release package is intended for all customers designing platforms that are based off of Intel's Purley Refresh design.

The Intel VROC 6.0 family of products provide enterprise RAID solutions for both NVMe SSD and SATA devices for enterprise servers and workstations. The product family includes the following three products.

1. Intel VROC (VMD NVMe RAID) – This product provides an enterprise RAID solution on Intel® Xeon® Scalable Family Platforms that support the Intel VMD technology.
2. Intel VROC (SATA RAID) – This product provides an enterprise RAID solution for SATA devices connected to SATA/sSATA the Intel Platform Control Hub (PCH) configured for RAID mode.
3. Intel VROC (NonVMD NVMe RAID) – This product provides an enterprise RAID solution for Intel NVMe SSDs attached to PCIe slots managed by the Platform CPU. Intel VROC (NonVMD NVMe RAID) is not intended for, nor supports:
    a. Non-Intel NVMe SSDs.
    b. Platforms that have on Intel® Xeon® Scalable Family Platforms CPUs that contain Intel VMD technology (weather enabled or disabled).

Note: Intel VROC 6.0 is a high level blanket product reference for Intel VROC (VMD NVMe RAID), Intel VROC (SATA RAID) and Intel VROC (NonVMD NVMe RAID).

Along with the above mentioned packages, included in this PC package are the Intel VROC 6.0 Pre-OS environment

1. Intel VROC (VMD NVMe RAID) UEFI drivers
2. Intel VROC (SATA RAID) UEFI drivers
3. Intel VROC (SATA RAID) Legacy OROM images are included.

Please see the ***Supported Platforms*** section for additional information on older platforms supported with this release.

Note: It is always recommended to update your system BIOS to the included PV release of Pre-OS drivers to take advantage of the most optimal and updated features of each Production Version release.

1.2 Defect Submission Support

With this release, Intel will accept and process issues reported by customers via the Intel Premier Support (IPS) portal.

To submit an issue, please use the Intel Premier Support (IPS) tool. Information, training and details can be found at the below website. Your local FAE can also provide you the necessary

requirements to enable you to submit an IPS issue (also known as a “case”) including an account setup if you do not already have one.

http://www.intel.com/content/www/us/en/design/support/ips/training/welcome.html

When submitting a case, please include the following Fields in order to flag Intel VROC AE support for Intel® Xeon® Scalable platforms.

- Case Information -> Product = Purley
- Case Details -> Subject= <Add short title summary of issue>
- Case Details -> Case Description = <add description and how to reproduce error)
- Case Details -> Case Type = <fill in type of request>
- Case Details -> Severity = <fill in severity of issue>
- Case Details -> End Customer = <name of OEM>
- Case Details -> Issue Source = IPS Cloud
- Case Details -> Severity
- Product/Project Info -> Case Category = TechnologyInitiative
- Product/Project Info -> Case Subcategory = Intel® Virtual RAID on CPU (Intel ® VROC)
- Environment Details -> Purley-PCH = lbg-4
- Environment Details -> Purley-CPU = skx-2s (or skx 4s)
- Environment Details -> BKC or SW Version = 5.5

1.3 Supported Operating Systems

Only 64bit OS support is available for the following OS versions

- Windows* Server 2012 R2 Enterprise (supported on Server platform only)
- Windows* 10 RS3 / RS4 / RS5 (supported on Workstations platforms only)
- Windows* Server 2016 Enterprise (supported on Server platform only)
- Windows* Server 2019 Enterprise (supported on Server platform only)

Note: Microsoft* Windows* 7 will not be supported in future releases

1.4 Operating Systems Not Supported In This Release

- Windows* Vista (Support/Updates concluded with 4.1.2.1011)
- Windows* Server 2003 (Support/Updates concluded with 4.0.2.1019)
- Windows* Server 2008 (Support/Updates concluded with 4.0.2.1019)
- Windows* 8 (Support/Updates concluded with 4.2.2.1005)
- Windows* Server 2012 (Support/Updates concluded with 4.2.2.1005)
- Windows* 8.1 (Support/Updates concluded with 4.7 PV)
- Windows* Server 2008 R2 (Support/Updates concluded with 4.7 PV)
- Windows* 10 RS1 / RS2 (Support / Updates concluded with 5.4 PV)
- Windows* 7 SP2 (supported on Workstations only) (Support / Updates concluded with 5.5 PV)

Intel C600 series chipset support/updates concluded with 4.5 PV

Any Showstopper issues reported in any of the above configurations will be addressed in their corresponding (identified) baselines.

1.5 Supported Platforms

Intel® Xeon® Scalable Platforms

- Intel® C620 series chipset
- Intel® C422 series chipset family

Intel® Xeon® Processor D-2100 Product Family

Intel VROC (NonVMD NVMe RAID) support on the following platforms:

- Intel® Xeon® Processor E5 v3, v4 Families with the Intel® C610 series chipset
- Intel® Xeon® Processor Families with the Intel® C220 series chipset
- Intel® Xeon® Processor E3 v5 Families with the Intel® C230 series chipset
- Intel® Xeon® E Processor Family with the Intel® C240 series Chipset

Note: It is strongly recommended to update your system BIOS to the 6.0 Pre-OS.

Please see the Intel VROC Technical Product Specification included in this release for specific details

Note: For answers to questions concerning the Intel PCH series chipsets support and/or to obtain other technical collateral, please contact your local Intel FAE.

2 Intel VROC Limitations

2.1 Intel VROC (NonNVMe NVMe RAID) Support

Intel VROC (NonVMD NVMe RAID) support is included in the Intel VROC 6.0 release package. This package supports only Intel NVMe SSDs and does not support (nor can be installed on) platforms that support Intel VMD. Intel VROC (NonVMD NVMe RAID) supports DATA RAID. Boot support is not available. For more information, please refer to the Intel VROC TPS included with this package.

NOTE: This functionality is not supported on Purley Refresh platforms

2.2 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*.

2.3 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.

2.4 Intel VROC Trial Version Limitations

Data RAID Only (No Boot Support)
Data RAID must be installed on same make/model of NVMe devices

Please refer to the Intel VROC Trial Version section in the Intel VROC Technical Product Specification for 5.4PV for more details

2.5 Intel VROC PreOS UEFI Driver Uninstall limitations

The Intel VROC UEFI RAID drivers comply with UEFI Specifications for PCI Driver Model for PCI Device Drivers (Section 13.3.3) and may return Status Code “access denied” from UninstallProtocolInterface routine from Boot services (spec. 6.3). This is expected behavior.

2.6 Intel NVMe Wear Leveling Recommendations

NVMe SSD Wear Leveling refers to techniques used to prolong the service life of NVMe drives. This section outlines recommendations to maximize Wear Leveling on RAID 5 volumes.

Strip Size No of 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.

2.7 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 6.0.

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 be used instead of the available "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 that the Intel VROC 6.0 installer package be installed immediately. At that point, it will be safe to migrate the SATA system disk into a RAID Volume (using the Intel VROC GUI).

2.8 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.

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.***
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).
3. Attempt to continue installing the Windows OS onto the RAID volume. If the installation process does not continue, this error has been encountered.
4. Press f10 to invoke a CMD window.
5. If you have not already done so, please insert the USB drive into the system. Navigate to your USB drive with the RstCLI.exe utility.
6. Run command: IntelVROCCLI.exe --manage --normal-volume <volumeName>
7. This will reset the volume to a normal state.
8. Close the CMD window.
9. In the Windows* disk selection window, reload the Intel VROC f6 driver.
10. Once completed, Windows* should allow installation on the RAID volume.

2.9 Intel VROC Key Removal/Upgrade Limitation

With Microsoft* Windows* 10, Fast Startup is enabled by default. Disable Fast Startup prior to removing/upgrading the Intel VROC HW key. OR, perform a complete reboot when removing/inserting a HW key when Fast Startup is enabled.

2.10 NVMe Port Assignment by Intel VROC

In Windows and UEFI, the port number shown in the Intel VROC interfaces depends on 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.

Please see the **Intel® VROC Windows Technical Product Specification** for information on the new Intel VROC UEFI Device Info Protocol for unique NVMe physical slot locations.

2.11 Windows* 10 RS5/Server 2019

2.11.1 Idle Power increased

Installing Intel VROC 6.0 PV onto a platform running Windows* 10 RS5. In Windows and UEFI, the port number shown in the Intel VROC interfaces depends on 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.

Please see the **Intel® VROC for Windows Technical Product Specification** for information on the new Intel VROC UEFI Device Info Protocol for unique NVMe physical slot locations.

2.11.2 Intel VROC Support for Windows 10 RS5 / Server 2019

Intel VROC 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 / Server 2019. Installing Windows* 10 RS5 or Server 2019 onto an Intel VMD managed device is limited to a single CPU. For more information please see the Known Issues section below.

2.12 Intel VROC 6.0 on Windows* Server 2012 R2

When installing Intel VROC 6.0 onto Windows* Server 2012 R2, the following Microsoft* updates must first be applied:

1. KB4054566
2. KB2999226
3. KB2919355
4. KB3172729

3 Supported PCIe NVMe SSDs List

All shipping Intel® Data Center and Professional NVMe* SSDs are supported by Intel® VROC 6.0 PV, except dual port NVMe* SSDs.

3.1 Non-Intel PCIe NVMe SSDs supported in Intel 6.0:

Vendor	Model
Lenovo*	Atsani
Huawei*	ES3600P
Samsung*	SM951
Samsung*	SM961
Samsung*	PM961
Samsung*	PM953
Samsung*	PM963
Samsung*	PM983
Toshiba*	PX04PMB
Toshiba*	XG3
Toshiba*	XG5
Micron*	9100 Series
Micron*	9200 Series
Western Digital*	PC SN720

4 New In VROC 6.0 PC

4.1 Introduced in Intel® VROC 6.0 is the support for the Purley Refresh platform

This section features Intel's commitment to excellence; always improving and listening to our customers' needs.

4.2 Intel RSTe Name Changes

The Intel VROC 6.0 family of products provide enterprise RAID solutions for both NVMe SSD and SATA devices for enterprise servers and workstations. The product family includes the following three products.

1. Intel VROC (VMD NVMe RAID) – This product provides an enterprise RAID solution on Intel® Xeon® Scalable Family Platforms that support the Intel VMD technology. In previous releases, this was simply referred to as Intel VROC.
2. Intel VROC (SATA RAID) – This product provides an enterprise RAID solution for SATA devices connected to SATA/sSATA the Intel Platform Control Hub (PCH) configured for RAID mode. In previous releases, this was simply referred to as Intel Rapid Storage Technology enterprise (Intel RSTe).
3. Intel VROC (NonVMD NVMe RAID) – This product provides an enterprise RAID solution for Intel NVMe SSDs attached to PCIe slots managed by the Platform CPU. Intel VROC (NonVMD NVMe RAID) is not intended for, nor supports:
    a. Non-Intel NVMe SSDs.
    b. Platforms that have on Intel® Xeon® Scalable Family Platforms CPUs that contain Intel VMD technology (weather enabled or disabled).

    In previous releases, this was simply referred to as Intel RSTe NVMe.

4.3 Intel VROC Support for Windows 10 RS5 / Server 2019

Intel VROC 6.0.0.1357 release package includes support for Windows* 10 RS5 and Windows* Server 2019.

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

Note: It may be noticed that installing Intel VROC 6.0 when installing or using Windows* 10 RS5 /Server 2019 that installation may take longer than previous OS versions. This is being investigated.

5 Features Introduced In Intel RSTe 5.5

5.1 Intel VROC and Intel RSTe SATA LED Management in HII BIOS

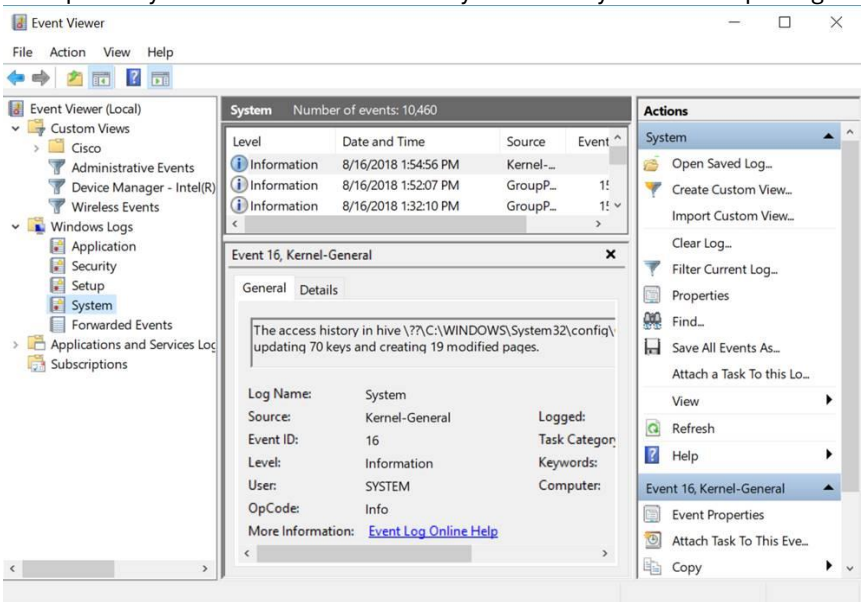
LED management support is now available in the Intel Virtual RAID on CPU UEFI HII BIOS Menu and in the PCH Intel RSTe HII BIOS menu. The LOCATE option is functional for each NVMe SSD with VMD enabled on its root port. A list of drives behind VMD is visible in a table to the user. The desired device can be selected to blink the LOCATE LED.
When the drive is deselected, then the Blink pattern for this drive will be OFF.
Upon boot into the RSTe UEFI BIOS HII, each drive discovered by the driver should be ON. Otherwise, the indicator LED should be OFF.

5.2 Intel VMD Advanced Error Reporting (AER) Logging for Windows

The Intel VMD component of the Intel VROC Windows Driver will log the following Non-fatal (0b) AER Errors:

- Poisoned TLP
- Completion Timeout
- Completer Abort
- Unexpected Completion
- ECRC Error
- Unsupported Request Error
- ACS Violation
- MC Blocked TLP
- Atomic Op Egress Blocked
- TLP Prefix Blocked

Example: Windows event viewer –> Windows Logs -> System, and choose to save all events to a file. Optionally choose to filter on “iavroc.sys” to see any VMD AER reporting events.



5.3 New Fields added for UEFI Intel VROC Device Info Protocol

Intel VROC UEFI Drivers add the following new fields to the UEFI Intel VROC Device Info Protocol to assist in device recognition during factory process when Intel VMD root port is enabled on NVMe SSDs.

- DeviceId
- SubsystemVendorId
- SubsystemId
- ClassCode
- RevisionId
- FirmwareRev
- OptionROMBar
- RootPortBusNum
- RootPortDeviceNum
- RootPortFunctionNum
- SegmentNum

Please see the ***Intel(R) _VROC_UEFI_DEVICE_INFO_PROTOCOL.pdf*** for implementation details and API.

5.4 Support of Older Platforms

Beginning with Intel RSTe version 5.5 PV, support for older platforms has been introduced. With the exception of platforms with the Intel C600 or C200 series chipset and includes the support for the Intel RSTe NVMe product as well.

Please see the Intel RSTe TPS for more details.

5.5 Intel Accelerated Storage Manager (Intel® ASM) REST API Plug in Availability

The Intel ASM Plug In is only available on Intel® Xeon® Scalable Family Platforms with Intel VROC capability. This RESTful API offers storage management through a web based interface configured as standalone or distributed across multiple servers.

The Intel ASM can be installed on Intel® Xeon® Scalable Family Platforms using the Intel RSTe 5.5 OS installer (SetupRSTe.exe).
For more details: refer to the Intel RSTe Technical Product Spec and the “Intel Accelerated Storage Manager Windows Administration Guide.pdf” included in this package.

5.6 Intel VROC UEFI Driver Backward Compatibility for Microsoft* Windows* 8.1 and newer OS

Beginning with this Intel VROC 5.5PV package, older UEFI Driver versions of 5.X will be compatible with Intel VROC Windows 5.5PV and newer. The exception will be Microsoft* Windows* 7, which must use the Intel VROC UEFI driver version 5.4 or newer on Intel Xeon® Scalable Platforms with switch attached NVMe SSDs.

5.7 Ability to Change Controller Default Values

This release of Intel RSTe 5.5PV introduces the ability to change controller default values for the following settings:

- Read Patrol
- Rebuild on hot insert

5.8 Warning Message added for RAID Volume Creation

Intel RSTe 5.5PV introduces a warning message if a RAID volume is created when:

- Drive size differences are greater than 10%
- Volume includes mix of SSDs and HDDs

5.9 Support for UEFI Driver Health Protocol

In the UEFI environment, the Intel VROC and Intel RSTe SATA UEFI drivers will support warning messages during system boot through UEFI Driver Health Protocol, when at least one of the following conditions is met:

- At least one RAID volume is degraded
- At least one RAID volume is failed
- At least one drive is in 'RAID unsupported' state (Intel VROC UEFI only)
- At least one drive is in 'Incompatible' state
- At least one drive is in 'Offline' state
- At least one drive is in 'Unknown' state

6 Features Introduced In Intel RSTe 5.4

6.1 Intel VMD and Intel VROC Surprise Hot Plug for Microsoft* Windows* Operating Systems

Intel VMD surprise hot plug for Windows enhancements in this Intel VROC 5.4 release will see improved times for hot insertion and hot removal for Intel VMD enabled NVMe devices. It is recommended to wait until device is reflected as removed / inserted in device manager for spacing surprise hot plug of devices in Windows.

6.2 Continuous IO during Hot Plug

With this release of Intel VROC 5.4 users will see that IO is continuous during hot plug when using Windows performance tools. When an NVMe device is removed or inserted, IO will be continuous to the remaining VMD enabled NVMe devices.

6.3 Increase the number of NVMe devices supported to 48

Intel VROC 5.4 will increase the number of devices supported on one platform from 24 to 48 NVMe devices supported. Please refer to the Intel VROC Technical Product Specification for changes to RAID volume and RAID arrays allowed with this change.

6.4 New API for the Private UEFI Intel VROC Device Info Protocol with new field for BLOCKIO Protocol for Pass Thru devices

Allows UEFI applications to retrieve information about each NVMe device on Intel VMD-enabled lanes

- Bus/device/function
- Socket Number
- VMD Domain
- Root Port Number
- Slot Number
- Vendor Id
- Serial Number
- Model Number
- Total Blocks
- Block Size
- Raid Device Member
- Root Port Offset
- **BLOCKIO Protocol (NEW in Intel VROC 5.4)**

Please refer to the Intel VROC UEFI Device Info Protocol document for structure API changes, included in the Intel VROC 5.4 release kit.

6.5 Customizable LED Management

Customers can customize LED management by modifying registry keys to change behavior for the following Blinking patterns:

- Locate – Blinking pattern time can be lengthened or shortened (default 12 seconds)
- FAIL – Blinking pattern can continue until another good drive is inserted, or stop when failed drive is removed (default is 0 – stop when drive is removed)
- Rebuild initializing - Blinking pattern on all drives in RAID volume (until initialization/verify/verify and fix finishes) – enable (0x1 default) or disable
- Rebuild – Blinking pattern on 1 drive or all drives in RAID volume – 0x0(default – 1 drive) or 0x1
- Rebuild Migration– Blinking pattern on all drives when migration occurs from one RAID type to another RAID type – enable (default = 0x01) or disable

Note: Please reference the Intel® VROC Technical Product Specification for details

6.6 Performance Improvements for 4K Queue Depth

Intel VROC has optimized performance for 4K queue depth by adding Storage Request Block for performance improvement in Intel VROC 5.4 release.

Intel VROC supports both STORAGE_REQUEST_BLOCKs and SCSI_REQUEST_BLOCKs. This is designed for implementation on windows OS >= Microsoft* Windows* 8, and allows device queue depth to 4k; delivering better performance for massive workloads with many concurrent workers.

7 Features Introduced In Intel RSTe 5.3

The release of Intel RSTe 5.3 PV Release introduces the following:

7.1 New API for the Private UEFI Intel VROC Device Information Protocol with new fields

Allows UEFI applications to retrieve information about each NVMe device on Intel VMD-enabled lanes

- Bus/device/function
- Socket Number
- VMD Domain
- Root Port Number
- Slot Number
- Vendor Id
- Serial Number
- Model Number
- Total Blocks
- Block Size
- **Raid Device Member (NEW)**
- **Root Port Offset (NEW)**

Please refer to the Intel VROC UEFI Device Info Protocol document for structure API changes, included in this Intel VROC 5.3 release kit.

7.2 New UEFI Intel VROC Private Volume Info Protocol

Enables Intel VROC and Intel RSTe SATA RAID Volume information retrieval in the UEFI environment for the following parameters for RAID volumes.

- Vendor ID
- Product ID
- Name of RAID volume
- Total block size of volume
- Logical block size in bytes
- RAID Level
- Volume Type (i.e. VROC, SATA, or sSATA

Please refer to the Intel VROC UEFI Volume Info Protocol document for structure API implementation details, included in this Intel VROC 5.3 release kit.

7.3 New Windows IOCTL for NVMe Device Information

Most structures of IOCTLs used to send NVMe pass-through IOCTL and access RAID members are the same as past releases.

The differences in Intel VROC 5.3 are:

- The Intel VROC UEFI 5.3 PV package must be used for full functionality of retrieving device information from NVMe devices on VMD enabled PCIe lanes.
- The NVME_MEMBER_DISK_INFORMATION structure has been extended and therefore the output buffer for the IOCTLs that return information about drives must be bigger
- The NVME_DISK_INFORMATION Data structure has also changed to include:
    - Socket Number
    - VMD Controller Number
    - Root Port Offset
    - Slot Number

  Please refer to the Intel® VROC IOCTLs 1.3 Document for structure API changes included in this Intel VROC 5.3 release Kit

7.4 Intel VROC Premium SKU and HW Activation Key Enforcement

Beginning with Intel RSTe and Intel VROC 5.0 PV releases, **we no longer provide a version of the Intel VROC PreOS UEFI driver package that by-passes HW activation key enforcement (Super SKU).** You will need to connect either an ES or QS Intel VROC Premium/Standard key on the board to test standard or premium features that support RAID technology.

7.5 Intel VROC Pass-thru mode

Intel VROC Pass-thru mode was introduced in Intel VROC 5.1 and provides 3rd party NVMe support for devices behind VMD-enabled lanes without the need for an Intel VROC Hardware activation key. Pass-Thru mode is limited to the following:

1. NVMe Pass Thru non-RAID support as a single data drive
2. NVMe Pass Thru support as a single Bootable device
3. Requires Intel VROC UEFI drivers from this Intel VROC 5.2 PV release (not backward compatible) listed in section 2.5

NOTE: There is no RAID support included with Intel VROC Pass-Thru.

8 Drivers, Images and Utilities

List of Modules supported on Intel® Xeon® based platforms delivered with Intel® VROC for this release

Feature	Notes

Intel UEFI Drivers	• Intel® VROC UEFI Driver version 6.0.0.1024
	  ○ VMDVROC_1.efi (HW key enforcement in effect)
	• Intel® VMD UEFI version 1.6.0.1001
	  ○ VMDVROC_2.efi
	Note: All of 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 6.0.0.1024
	  ○ SataDriver.efi
	  ○ sSataDriver.efi

Legacy OROM Images	• Intel® VROC (SATA RAID) SATA OROM pre-OS image version 6.0.0.1024
	  ○ SataOrom.bin
	  ○ sSataOrom.bin

Intel® VROC Windows* Drivers	• Intel® VROC Windows GUI version 6.0.0.1356
	• Intel® VROC Windows Installer Package version 6.0_4.0.12
	  ○ SetupVROC.exe (Multi-lingual)
	• Intel® VROC Windows F6 Driver version 6.0.0.1342 – Win8
	Includes Intel VMD Driver version 1.6.0.1003
	  ○ iaVROC.sys
	• Intel® VROC (SATA RAID) Windows F6 Driver version 6.0.0.1342
	  ○ iaStorE.sys (SATA)
	  ○ iaStorB.sys (sSATA)
	• Intel VROC (NonVMD NVMe RAID) drivers version 6.0.0.1342
	• ASM version 2.0.0.62
	• Intel VROC CLI version 6.0.0.1357

UEFI Based RAID Configuration Utility	• Intel® VROC version 6.0.0.0.1024
	  ○ RCfgVROC.efi
	• Intel® VROC SATA / sSATA version 6.0.0.1024
	  ○ RCfgSata.efi
	  ○ RCfgsSata.efi
	Note: Secure Boot must be disabled to use this tool

DOS Based RAID Configuration Utility	• Intel® VROC SATA / sSATA version 6.0.0.1024
	  ○ RCfgSata.exe
	  ○ RCfgsSata.exe

Feature	Notes

UEFI Based Comply Utility	• Intel® VROC version 6.0.0.1024
	  ○ RcmpVROC.efi
	• Intel® VROC SATA / sSATA version 6.0.0.1024
	  ○ RCmpSata.efi
	  ○ RCmpsSata.efi
	Note: Secure Boot must be disabled to use this tool

DOS Based Comply Utility	• Intel® VROC SATA / sSATA version 6.0.0.1024
	  ○ RCmpSata.exe
	  ○ RCmpsSata.exe

UEFI based SATA SGPIO/LED Test utility	• Intel® VROC SATA / sSATA version 6.0.0.1024
	  ○ LedToolSata.efi
	  ○ LedToolsSata.efi
	Note: Secure Boot must be disabled to use this tool

UEFI based Intel VROC LED Test utility	• Intel® VROC version 6.0.0.1024 ○ 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 6.0.0.1024
	  ○ RClrSata.efi
	  ○ RClrsSata.efi

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

9 Known Issues in this Release

This section outlines the known issues that are being actively worked on with the Intel VROC 6.0 PV release

Title	**Installing Windows 10 RS5/Server2019 onto an Intel VROC managed NVMe SSD May Encounter A System Crash When Loading the F6 Driver**
Ext/Int Reference#	00387598/2205545633
Version	Intel RSTe NVMe 5.5 PV
Issue Description	When installing Windows 10 RS5 / Server 2019 onto an Intel VROC managed NVMe SSD drive (Pass-through or Intel VROC RAID Volume), when there are multiple Intel VMD Controllers enabled, may result in a system failure when the Intel VROC F6 driver is being loaded.
Workaround	1. Identify the CPU that is involved in the OS Install/Update (This is the CPU with the VMDs the OS system drive(s) are/will be attached too). 2. Disable all Intel VMD Controllers on any other CPUs in the system (before performing the install/update). 3. Perform the installation of (or upgrade to) Windows 10 RS5/Server2019. 4. Once the OS is installed/upgraded, run the Intel RSTe installation application to install the Intel RSTe GUI. 5. Once this process is complete, the remaining Intel VMD controllers can be enabled.

Title	The Intel RSTe Upgrade (Uninstall/re-install) Process May Encounter a System Crash
Ext/Int Reference#	1408610353
Version	Intel RSTe 5.5 PV
Issue Description	When upgrading the Intel RSTe package, by using the latest installation application, the process will begin by uninstalling of the current version. After which the installation of the new package can begin. If package installation process occurs immediately after the uninstall completes, the installer may report a critical error. Rebooting after this critical error occurs may result in a system crash.
Workaround	To avoid this failure, please reboot the system after the uninstallation process completed. 1. Uninstall the previous Intel RSTe package 2. Reboot the system 3. Install the new Intel RSTe package 4. Reboot the system when prompted.

Title	When VMD is Disabled NVMe Devices Do Not Show
Ext/Int Reference#	1408267854 / 2206128914
Version	Intel VROC/VMD UEFI 5.5 PV
Issue Description	When VMD is enabled, and system is booted, NVMe SSDs behind VMD are exposed. When the user then disables VMD in the BIOS, the devices no longer show up.
Workaround	None At This Time.

Title	**Creating a RAID 1 Volume from an Existing Drive May Result in a Failed RAID Volume**
Ext/Int Reference#	1806503629 (Internal discovery)
Version	Intel VROC 6.0
Issue Description	When using either the CLI tool or Intel VROC GUI to create a RAID 1 volume from an existing drive may result in the RAID volume being reported as Failed.
Workaround	Verify that all of the disks are healthy before beginning the process. No other workarounds at this time.

Title	**Bad Blocks May Not be Properly Reported in a RAID 5 Volume**
Ext/Int Reference#	1806677977 (Internal discovery)
Version	Intel VROC 6.0
Issue Description	When running in a RAID 5 configuration and a Bad Block is encountered, the Intel VROC GUI and the Event log may not properly show that a bad block has been encountered.
Workaround	None at this time.

Title	**Installing the OS onto a RAID5 volume May Result in a Degraded Volume**
Ext/Int Reference#	1806559207 (internal discovery)
Version	Intel VROC 6.0
Issue Description	When attempting to install an OS onto a RAID5 volume (using the F6 driver), may not complete successfully because the volume is unable to be selected.
Workaround	None at this time.

Title	The Intel VROC CLI Tool May Allow Data Migration With a Smaller Drive
Ext/Int Reference#	1806534894 (internal discovery)
Version	Intel VROC 6.0
Issue Description	When using the IntelVROCCLI tool to create a RAID Volume (with data retention) and the source drive is larger than the destination drive, the CLI may not properly block this operation.
Workaround	Please verify that both drives are the same size or the destination drive is larger than the source drive. Other than that, there are no current workarounds.

Title	RAID Volume May Become Degraded After Reboot
Ext/Int Reference#	1806411891 (Internally found)
Version	Intel RSTe 5.5
Issue Description	When running in a configuration with 24 NVMe drives with an Intel VROC (VMD RAID) Volume configured, rebooting the system may result in the RAID volume becoming degraded.
Workaround	None at this time.

Title	Event Lot May Not Properly Show "RAID volume {VolumeName} is normal" Message after a Rebuild Completes
Ext/Int Reference#	1806564426 (Internally found)
Version	Intel VROC 6.0
Issue Description	When running in a configuration were a RAID volume is being rebuilt, upon completion of the rebuild process the expected Event may not be properly logged. The expected Event is Event ID 4149: "RAID volume VolumeName is normal."
Workaround	None at this time.

Title	System May Fail to Start After an Unexpected Power Loss
Ext/Int Reference#	1806564424 (Internally found)
Version	Intel VROC 6.0 PV
Issue Description	When running I/O to an Intel VROC RAID 5 volume and the platform experiences an unexpected power loss, the platform may fail to restart.
Workaround	None at this time.

Title	Platform May Not Properly Boot After a Dirty Shutdown with I/O on a RAID 4 volume (RWH Distributed)
Ext/Int Reference#	1806564409 (Internally found)
Version	Intel VROC 6.0
Issue Description	When running I/O to a 4 disk RAID 5 volume (configured with RIAD Write Hold - Distributed enabled) and the system encounters a surprise power loss, the system may not properly reboot.
Workaround	None at this time.

Title	Drive Hot Insert May Report the Drive was Removed Followed by Detection
Ext/Int Reference#	806522520 (Internal found)
Version	Intel VROC 6.0
Issue Description	When attempting to perform a Hot Insert of a disk, the first pop up informs that the disk was removed but the second message informs that disk was detected.
Workaround	None at this time.

Title	**Intel VROC (VMD RAID) NVMe Drive May be Marked as Available After Removal**
Ext/Int Reference#	1806419240 (Internally found)
Version	Intel VROC 6.0
Issue Description	When running in a configuration with multiple NVMe drives, if one of the drives is Hot-Removed from the system, the Intel VROC GUI may still show that drive as available.
Workaround	None at this time.

Title	**Intel VROC RAID Volumes May Not Properly Show in the BIOS**
Ext/Int Reference#	00387136 / 2205536705 /1407931496
Version	Intel VROC 5.5
Issue Description	When running in a configuration with 4 or more Intel VRCO RAID volumes, during a system boot, some of the RAID volumes may not properly be displayed in Some RAID volume do not show array disk in BIOS when there are more than 4 or 5 volumes created in the system. The last crated RAID volume do not show array disk information
Workaround	None at this time.

Title	**RAID10, hot-plug two member disks, re-plugged second disk can't rebuilding.**
Ext/Int Reference#	1506398660 / 1909229214 / 00281938
Version	5.4PV
Issue Description	RAID 10 will not rebuild to the second re-installed NVMe device when 2 devices are hot removed.
Workaround	None at this time

Title	**Intel RSTe RCfgRSTeRS.efi Disk IDs information reported may not be consistent between different commands**
Ext/Int Reference#	2204209433 / 1407347823 / 00266468
Version	Intel VROC Windows 5.4PV
Issue Description	When attempting to use the Intel RCfgRSTeRS.efi tool, the Disk ID information reported may not be consistent between different commands.
Workaround	None at this time.

Title	**RSTe SATA boot times does not meet expected values for Microsoft* Windows* ADK test**
Ext/Int Reference#	1506118519 / 2204049117 / 2204052421 / 00248645 / 00248705
Version	Intel VROC 5.4PV
Issue Description	Fast Start boot times may exceeding the Microsoft* Windows* ADK test recommendations
Workaround	None at this time.

Title	**Intel VROC F6 Drivers May Not Properly Load**
Ext/Int Reference#	1805900436
Version	Intel VROC 5.4PV
Issue Description	When running in a configuration with 16 or more NVMe SSDs, loading the Intel VROC F6 driver may not succeed while installing the OS.
Workaround	Install the OS with fewer than 16 drives attached and then add them after the OS installation has completed.

Title	**Intel RSTe NVMe Pre-Purley Platform with 48 NVMe Drives and Max Volumes. Degraded RAID Volume May Encounter a System Failure While Booting**
Ext/Int Reference#	1806397184 –Internal Validation
Version	Intel RSTe NVMe 5.5
Issue Description	When running on an Intel RSTe NVMe pre-Purley system with 48 drives in dual RAID volumes (Matrix RAID) using every 2 drives until the maximum supported has been reached. After shutting down the platform and pulling 1 member drive of a RAID 1 volume, the platform may encounter a system failure
Workaround	None at this time

10 Issues Resolved in 6.0 PV

Title	**A System Crash May Occur After Loading F6 Driver During Win10 RS5 Installation**
Ext/Int Reference#	1407931617/22205545633/1606761987
Version	Intel RSTe 5.5 / Intel VROC 6.0
Issue Description	When attempting to install Microsoft* Windows 10 RS5/Server 2019 onto an Intel VROC (VMD RAID) volume, a system crash may be encountered.
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**Can Not Disable All RAID Levels in BIOS Setup**
Ext/Int Reference#	1504750338 / 2202554596 / 00223047
Version	Intel VROC 5.4PV
Issue Description	In the BIOS, under SATA Mode Options, RAID options can be disabled, but RAID can still be created after save and reboot.
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**Intel VROC Negotiated Link Rate Reported May Not be Accurate**
Ext/Int Reference#	1506077912/ 2204069094 / 2203912146 / 00247186 / 00249189
Version	Intel VROC 5.4
Issue Description	When running in an Intel VROC configuration, the Negotiated Link rate for the NVMe drive connected may not be reported accurately in the device properties window pane in the Intel VROC GUI. In some cased, the Negotiated value may be 0.
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**Intel VROC mismatch error after changing RAID 5 RWH Values in BIOS setup**
Ext/Int Reference#	2204422221, 00276220, 1506226285
Version	Intel VROC 5.4
Issue Description	In VROC HII BIOS menu, After creating RAID 5 and setting the RWH value to Disable, if the value is changed to Journaling Drive, the BIOS returns an error mismatch message
Workaround	Resolved in Intel VROC 6.0 Beta Release.

Title	**Intel RSTe NVMe 5.5 on a Windows 7 64-bit Platform May Report the Incorrect Filter Driver Version Number**
Ext/Int Reference#	1806420960 -internal
Version	Intel RSTe NVMe 5.5 PV
Issue Description	When installing Intel RSTe NVMe 5.5 onto a platform running Windows 7 64-bit, the device driver version reported for the filter driver, iaRNVMeF.sys, may report 8.8.8.8888 instead of the correct version
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**Intel RSTe NVMe Pre-Purley Platform with 48 NVMe Drives and Maximum Volumes May Encounter a boot Failure**
Ext/Int Reference#	1806397164 –Internal Validation
Version	Intel RSTe NVMe 5.5
Issue Description	When running Intel RSTe NVMe in a Pre-Purley platform with 48 drives that are configured in dual RAID 1/0 matrix array volumes duplicated until the maximum number of Arrays/Volumes is reached, rebooting the system may encounter a system failure.
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**NVMe LED blinking Issue on RAID when Locate sent after Rebuild**
Ext/Int Reference#	1406945370 / 2202661732 / 00225547
Version	Intel VROC 5.4
Issue Description	After Re-build operation is complete, if a Further “LOCATE” Operation is done on the same drive, after the LOCATE LED Blinking completes (10s), the Rebuild LED state comes back even though there is really no Re-build Operation indicated
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**Intel VROC Driver Upgrade May Mark Volume as Initialized**
Ext/Int Reference#	1805474763
Version	Intel VROC 5.4PV
Issue Description	When upgrading to Intel VROC 5.4 from an older driver version may result in an existing RAID volume being incorrectly marked as "Initialized".
Workaround	Issue resolved in the Intel VROC 6.0 PV release package.

Title	**VMDVROC_1.efi / VMDVROC_2.efi driver will increase boot time around 4 seconds when VMD is disabled**
Ext/Int Reference#	1407351453 / 2203744674 / 00246717 /
Version	5.4PV
Issue Description	VROC UEFI driver will poll for the hardware key even when VMD is disabled. This is adding increased boot times of up to 4 seconds when VMD is disabled.
Workaround	Workaround: DEPEX file included in Intel VROC 6.0 Beta Release Kit

11 Issues Resolved in Intel VROC 5.5PV

Title	**Intel Firmware Upgrade Tool Does Not Support SATA RSTe RAID FW Update**
Ext/Int Reference#	1407473581 / 2201652464 - Internal
Version	Intel RSTe UEFI SATA / sSATA 5.4
Issue Description	In the UEFI environment SATA RAID does not support Firmware Updates. This affects the Intel Firmware Upgrade Tool (FUT) used by customers when SATA RAID volumes cannot be updated to latest firmware.
Workaround	Issue Resolved in Intel RSTe SATA UEFI version 5.5 PV

Title	**Protocol Errors May Cause a Drive to Inadvertently be Marked as Failed**
Ext/Int Reference#	2204785529 / 2204785528
Version	Intel RSTe SATA Windows 5.4 / Intel RSTe 4.7.0.1098
Issue Description	When running in a platform where protocol errors (e.g. R_ERRs) can be encountered during I/O, Intel RSTe may inadvertently mark the drive, corresponding to the connection that encountered the error, as Failed when the drive is operational.
Workaround	Fixed in 5.5 PV Intel RSTe SATA driver

Title	Unresponsive HDD May Prevent OS Boot
Ext/Int Reference#	220705531
Version	Intel RSTe 4.X based products.
Issue Description	In the case where Windows* 2008 R2 operating system is installed on a SATA device on the SATA or sSATA controller managed by RSTe and a HDD disk is unresponsive on the SCU (SAS) controller also managed by RSTe, the operating system may fail to boot until the unresponsive disk is removed.
Workaround	Fixed in Intel RSTe 5.5 PV package release.

Title	Performing an S4 on a degraded RAID 5 Volume May Result in a System Crash
Ext/Int Reference#	1805624457
Version	Intel RSTe 5.4
Issue Description	When attempting to resume from an S4 power state with a degraded 3 drive RAID5 volume (as a result of a filed drive), may result in a system failure. Workaround: Try to avoid performing S4/Hibernates while a degraded RAID 5 volume and expedite the rebuild process.
Workaround	Fixed in Intel RSTe 5.5 PV package release.

Title	RSTe 5.5 VC Drop - All Applications are gone after resume from S4
Ext/Int Reference#	1506414153 / 2205084140 / 00290919
Version	RSTe SATA Windows 5.5 VC
Issue Description	With Windows 10 RS5 and RSTe SATA driver installed, the system does not resume from S4 correctly
Workaround	Fixed in 5.5 PV Intel RSTe SATA driver

Title	CC_CSMI_SAS_GET_RAID_CONFIG cannot return correct information about RAID
Ext/Int Reference#	1504716895 / 2202001958 / 00216590
Version	RSTe SATA Windows 5.4 PV
Issue Description	CSMI command to retrieve RAID information on SATA returns byte-swapped and truncated data
Workaround	Fixed in 5.5 PV Intel RSTe SATA driver

Title	Request VROC backward compatibility support(5.5 driver + 5.3 PreOS)
Ext/Int Reference#	1506183326 / 1209358254
Version	VROC Windows 5.4 PV
Issue Description	VROC UEFI Drivers are not Backward compatible
Workaround	Resolved in Intel VROC 5.5 PV Release. Or, Use UEFI driver and Windows Driver from matching release versions

Title	System Disk not Marked as System Volume in RSTe GUI
Ext/Int Reference#	00259697 / 2204148065 / 1407320372
Version	VROC Windows 5.4 PV
Issue Description	Having Windows installed on a 4-disk RAID 10 on the SATA controller managed by the RSTe driver, the disk or volume with the operation system may not be marked as the system volume. Consequently, the option to delete the volume is present. Deleting the system volume will cause a blue screen and delete any data on that volume.
Workaround	Resolved in Intel VROC 5.5 PV Release

Title	**Windows 2016 stuck when hot-plug one of member drive on RAID5**
Ext/Int Reference#	00229224 / 2202860567 / 2202849002 / 1806296595
Version	VROC Windows 5.4 PV
Issue Description	Windows may stuck when one of the RAID5 member drive hot-removal during the RAID5 rebuilding
Workaround	Resolved in Intel VROC 5.5 PV Release

Title	**DiskID information is incorrect when using 5.3 PreOS + 5.4 driver/CLI tool**
Ext/Int Reference#	1504790853 / 2202810056 / 00229000
Version	VROC Windows 5.4 PV
Issue Description	Changes in UEFI 5.4 VMD Scan Code Require 5.4 VMD Windows version. No backward compatibility for Pre-OS.
Workaround	Resolved in Intel VROC 5.5 PV Release

Title	**Windows 7 BSE When ODD is attached Resuming from S3/S4**
Ext/Int Reference#	00168685 / 1209887655 / 1805245743
Version	VROC Windows 4.6 PV
Issue Description	On Microsoft Windows 7 64 bit operating system, if both power states S3 (sleep) and S4 (hibernate) are set to be initiated in that order, a blue screen may occur when Windows attempts to resume from S4.
Workaround	Resolved in Intel VROC 5.5 PV Release

Title	DiskID information is incorrect when using 5.3 PreOS + 5.4 driver/CLI tool
Ext/Int Reference#	1504790853 / 2202810056 / 00229000
Version	VROC Windows 5.4PV
Issue Description	Changes in UEFI 5.4 VMD Scan Code Require 5.4 VMD Windows version. No backward compatibility for Pre-OS.
Workaround	Fixed in VROC 5.5 PV Windows Driver

Title	Intel P905 NVMe SSD drive can't be recognized by 5.4 CLI tool
Ext/Int Reference#	1505203256 / 2203177980 / 00238409
Version	Intel VROC Windows RSTCLi64.exe 5.4PV
Issue Description	Using 5.4 VROC RSTCli64.exe tool in WinPE environment, the device cannot be seen
Workaround	Fixed in VROC RSTCLi64.exe tool in 5.5PV

Title	System May Reset When Running a Stress I/O While RAID Volume is Rebuilding
Ext/Int Reference#	2201077392/1406579985/00201604
Version	Intel VROC Windows 5.3PV
Issue Description	When running in a configuration where a RAID volume is in a Rebuild state and an I/O stress test is running to that rebuilding RAID volume, the system may reboot.
Workaround	Avoid running heavy I/O to the RAID volume until the rebuild process is complete/ Fixed in VROC 5.5PV

Title	SATA Disk May Disappear after S3 When OS Installed on NVMe
Ext/Int Reference#	1407138251 / 1806252583 / 2203529172 1406977947 / 2202608709 / 00239590
Version	Intel VROC Windows 5.4PV
Issue Description	In a configuration that includes both SATA and NVMe disks connected to the platform, a SATA disk may appear to have disappeared from both Windows* Disk Management and the RSTe GUI after resuming from sleep state S3. This issue was reproduced when Windows* 10 64 bit is installed on an NVMe disk connected to PCIe and VMD is not enabled; although it may not be limited to this exact configuration.
Workaround	Resolved in 5.5 PV

Title	Hot Inserting a Drive into a RAID Volume with many ECC Errors May Cause a RAID Volume to Fail
Ext/Int Reference#	1406654647 / 2201671565 / 180293244
Version	4.7 VROC Windows PV
Issue Description	When running in a 2 drive RAID 1 configuration where drive A has encountered many ECC error, removing Drive B and hot inserting a new Drive B can result in drive A becoming Failed (due to the number of Back Blocks) causing the RAID volume to fail. Drive A may then become inaccessible.
Workaround	Issue Resolved in RSTe 5.5 release.

Title	**Intel SSD will have two duplicated HII entry created in F1 setup "System Settings -> Storage" page**
Ext/Int Reference#	2203448525 / 2203446631 / 1407232270 / 1806182995 / 2004074679
Version	5.4 VROC Windows PV
Issue Description	Certain Intel NVMe Devices with custom firmware versions display double device entries in the HII menu
Workaround	Resolved in VROC 5.5PV

Title	**Intel VROC UEFI HII Menu Should not Appear in BIOS when VMD is Disabled**
Ext/Int Reference#	1407167497 / 1806217727 / 1407167490
Version	Intel VROC 5.4PV
Issue Description	When VMD is disabled, Intel Virtual Raid on CPU menu option should not be visible in BIOS HII menu.
Workaround	Resolved in VROC 5.5PV

Title	**Black screen and 0x1E BSOD entering s4 via S3**
Ext/Int Reference#	1504685173 / 2201671739 / 1806008505
Version	Intel VROC 5.3PV
Issue Description	System power states testing S3 and enter S4 using power button to wake from S4 causes black screen hang up and sometimes get 0x1E BSOD.
Workaround	Fixed in Intel VROC 5.5 PV

Title	**Removing a Drive from a Spanned RAID Volume May Not be Properly Handled**
Ext/Int Reference#	2202036761 / 1604699889 / 00217373
Version	Intel VROC 5.3PV
Issue Description	When running in a configuration where an Intel VROC RAID volume is spanning Intel VMD controllers, if one of the drives is removed the information of the drive being removed may not be properly propagated throughout the platform. Running a tool like "list disk" may still report the missing drive.
Workaround	Resolved in VROC 5.5PV

Title	**RSTe CLI Fails to Create SATA RAID correctly After Using Create Command**
Ext/Int Reference#	1407122652 / 2202778780 / 00228764/ 1406915644 / 1505288506 / 00238095 / 00221057
Version	Intel VROC 5.4PV
Issue Description	When using the RSTe CLI tool in a WinPE environment or opening a command window within a Windows* pre-install process using "Shift-F10", after using the RAID create command to create any RAID array using SATA disks on the SATA or sSATA controller, executing the RSTe CLI information command may fail to return any disk information.
Workaround	The issue is not present if using the RSTe CLI tool in any supported Windows* operating system, excluding WinPE. Fixed in VROC 5.5PV

Title	Intel VMD Windows - NVMe SSD is missing after Hot plug
Ext/Int Reference#	2202096618/1504752233/00218414/1505476921/ 00238314
Version	Intel VMD Windows 1.4 VROC 5.4 PV
Issue Description	Some systems do not update the SlotStatus register PresenceDetectedState bit to indicate a hot plug has occurred. Intel VMD driver gets the interrupt when this Slot Status register is set. This does not occur in Linux because the PCIe Hot plug driver uses LinkStatus DataLinkLayerActive first and then SlotStatus PresenceDetectedState second, so this incorrect setting for the SlotStatus PresenceDetectedState register is ignored.
Workaround	Intel VMD to also Check LinkSatus DataLinkLayerActive first and then SlotStatus PresenceDetectedState second. This fix is part of Intel VROC 5.5PV

Title	Unresponsive HDD May Prevent OS Boot
Ext/Int Reference#	1406906731 / 2202461264 / 1806062892 1806147004 / 1806147003
Version	Intel RSTe 4.5 and 4.6PV; RSTe 5.5.0.1116
Issue Description	In the case where Windows* 2008 R2 operating system is installed on a SATA device on the SATA or sSATA controller managed by RSTe and a HDD disk is unresponsive on the SCU (SAS) controller also managed by RSTe, the operating system may fail to boot until the unresponsive disk is removed.
Workaround	Fixed in RSTe 4.5PV; VROC 5.5 Windows PV

Title	**Repeated System Restarts May Result in a 0x9F System Error**
Ext/Int Reference#	1406789629 / 2202060843 / 00217891
Version	Intel VROC 5.3PV
Issue Description	When running on a system with Windows Server 2016, in a configuration where the system may repeatedly restart, a 0x9F System Error may be encountered.
Workaround	Fixed in VROC Windows 5.5PV

Title	**Intel NVMe SSD may have duplicate HII entry and cause boot hang condition**
Ext/Int Reference#	2204074679 / 00239322 / 2203446631/ 1806182995
Version	VMD 1.4 / VROC 5.4 PV
Issue Description	There are two entries on some customer platforms and when booting, the system may hang.
Workaround	Fixed in VMD 1.5.0.1005 and VROC 5.5 UEFI PV

Title	**Platform May Hang Entering S4 If eSATA Device Connected**
Ext/Int Reference#	1305232413 / 220418523
Version	Intel VROC 5.4PV UEFI
Issue Description	On a platform that has HDD devices connected to the SATA controller and Windows* 10 RS3 operating system installed on either a single HDD or multiple in a RAID volume made up of those HDD devices, the platform may hang when entering S4 hibernate sleep state if there is also an eSATA device connected to the same SATA controller.
Workaround	Fixed in VROC 5.5 PV

Title	**Intel VROC UEFI Driver Returns Incorrect Value for SCT HII Test Case**
Ext/Int Reference#	1806088107 / 1806193628 / 1806126418
Version	Intel VROC 5.4PV UEFI
Issue Description	Intel VROC UEFI driver is returning unexpected values for RouteConfig Conformance and ExtractConfigFunction for SCT 2.6 version UEFI Test cases.
Workaround	Fixed in VROC 5.5 PV UEFI Driver

Title	**NVMe System Disk can be Selected as RAID 5 RWH Journaling Disk Drive After Hotplug**
Ext/Int Reference#	1805901301 / 1805971826
Version	Intel VROC Windows 5.4PV
Issue Description	In Windows OS with RAID 5, a new NVMe device is hot inserted and the UI allows user to select "Change mode" in RWH mode property and choose the system disk as Journaling Drive to Close RAID Write Hole. System Disk should never be allowed.
Workaround	Fixed in the Intel VMD and Intel VROC 5.5PV Release

12 Issues Fixed in Intel VROC 5.4 PV

Title	**The RSTe GUI May Not Properly Start if OS is Installed on 3rd Party RAID controller**
Ext/Int Reference#	1406924883 / 2202556070
Version	Intel VROC 5.4PV
Issue Description	If Windows* Server 2012-R2 operating system is installed on a single disk or a RAID volume that is managed by a 3rd party RAID adapter and there is 1 or more SATA disks on the platform SATA and/or sSATA controller which is managed by the RSTe driver, the RSTe GUI may not open properly.
Workaround	Fixed in VROC 5.4 PV

Title	**RSTe RSTCLI tool cannot Report SATA Disks if VMD is Disabled**
Ext/Int Reference#	1504705930 / 2201930368 / 00214273
Version	Intel VROC 5.4PV
Issue Description	When running RSTCLI tool in WINPE, the tool will not report SATA disk information when VMD is disabled
Workaround	Fixed in RSTe 5.4

Title	**Intel RSTe GUI May Not Start when OS is on an NVMe drive not managed by Intel VMD**
Ext/Int Reference#	1406932725 / 2202568186 / 00223640
Version	Intel VROC Windows 5.3 PV
Issue Description	When running in a configuration where the OS has been installed on an NVMe device that is not managed Intel VMD (VMD is disabled), the Intel RSTe GUI may not start properly.
Workaround	Fixed in Intel VROC 5.4PV

Title	**Windows 7 install stops during preload process when M.2 NVMe as OS disk and RAID0 SATA data**
Ext/Int Reference#	1406760853 / 2201973361 / 00215585
Version	Intel VROC Windows 5.3PV
Issue Description	M.2 to a VMD enabled domain. Enable RAID mode on the SATA controller Begin the process of installing Win7 64bit to M.2 drive and error occurs
Workaround	Fixed in Intel VROC 5.4PV

Title	**Intel VMD Error Happens in Windows* 7 OS installation**
Ext/Int Reference#	1504702455, 2201907333
Version	Intel VROC Windows 5.3PV UEFI VROC
Issue Description	With VMD enabled, during Windows 7 installation a reboot occurs and an error message is displayed.
Workaround	Fixed in Intel VROC 5.4PV

Title	**The definition of "Rebuild on Hot Insert" is incorrect in Windows RSTe Help page**
Ext/Int Reference#	1504681226 / 2201632844 / 00208129
Version	Intel VROC Windows 5.3PV
Issue Description	In Windows RSTe Help page, "Enabling Rebuild on Hot Insert" section states hot-plugging a compatible disk in the same location as the failed or missing array disk, which is incorrect, because ROHI can start automatically when hot-plugging a compatible disk to other locations within the same VMD domain.
Workaround	Fixed in Intel VROC 5.4PV

Title	VMD Windows Hotplug Does not Work on Certain Switch attached NVMe
Ext/Int Reference#	2202053506 / 2201988291 / 00216064
Version	Intel VROC Windows 5.3PV
Issue Description	Certain Switches check the PCIe Command bit 10 to see if it is set to explicitly disable INTx legacy interrupts, and do not subsequently check the MSIx capabilities for the slot. VMD only supports MSIx and this bit is optional.
Workaround	Fixed in Intel VROC 5.4PV

Title	SUT hangs at the second logo after change CPU Multi Core value to 1 in BIOS setup
Ext/Int Reference#	220578769 / 220561678 / 00188745 / 220992184 00189529 / 1504562166 / 1604433815 /
Version	Intel VROC Windows 5.3PV
Issue Description	When setting the CPU Multi Core value to 1, the system hangs at reboot
Workaround	Fixed in Intel VROC 5.4PV

Title	VROC Windows RAID 5 hangs during "Scan for and attempt recovery"
Ext/Int Reference#	1805878310 / 2201093027 / 00202046
Version	Intel VROC Windows 5.3PV
Issue Description	Windows 7 is allowing the user to choose "Scan for and attempt recovery of Bad Sectors" on a system RAID 5 and the RAID is degraded when scan completes.
Workaround	Fixed in Intel VROC 5.4PV

Title	**Windows 7 System Sporadic BSE during S3/S4 cycling VMD enabled**
Ext/Int Reference#	1504529906 / 220395193 / 00183835
Version	Intel VROC Windows 5.3PV
Issue Description	BSE while performing power states on a customer specific configuration
Workaround	Fixed in Intel VROC 5.4PV

Title	**Created RAID volume spanned across VMD controllers showed as Bootable**
Ext/Int Reference#	1504621769 / 220743520 / 00193878
Version	Intel VROC Windows 5.3PV
Issue Description	When creating VROC RAID spanning VMD controllers, the RAID volume is shown as "Bootable Volume: Yes"
Workaround	Fixed in Intel VROC 5.4PV

Title	**Intel VMD Windows BSOD 0x50 Win Server 2012 R2**
Ext/Int Reference#	2202032535 / 00217206 / 1406789610
Version	Intel VROC Windows 5.3PV
Issue Description	Intel VMD Windows caused a 0x50 BSOD during Power cycle testing
Workaround	Fixed in Intel VROC 5.4PV

Title	SATA Hot Unplug in Windows causes RAID disk in failed state
Ext/Int Reference#	1504691800 / 1504648956 / 1504594387 / 220808435 / 00195696 / 2201220074 / 00203743
Version	Intel VROC Windows 5.3PV
Issue Description	Hot unplug of SATA RAID1 array disk in Windows will cause the RAID1 array disk in a FAILED state and rebuild will not start automatically when hot plugging back original disk.
Workaround	Fixed in Intel VROC 5.4PV

Title	Non-Intel SSD disk info shows status as Unsupported in Intel VROC HII page
Ext/Int Reference#	2201660851 / 00208880 / 1406651325
Version	Intel VROC Windows 5.3PV
Issue Description	When the Intel VROC Key is not inserted in the system, and a non-Intel SSD that is supported is installed in the system, the Intel VROC HII page is showing status as “unsupported”. Change request is to reflect the status as VROC Pass Thru mode (RAID unsupported).
Workaround	Fixed in Intel VROC 5.4PV

Title	RSTCLI stop working when set a non-existent disk as spare
Ext/Int Reference#	1504644095 / 220191660 / 00201930
Version	Intel VROC Windows 5.3PV
Issue Description	Run the rstcli to set a non-existent disk as spare disk. The tool pop-out warning windows and stop working.
Workaround	Fixed in Intel VROC 5.4PV

Title	**The System may not properly boot into the OS when the platform has an 18 Core CPU.**
Ext/Int Reference#	1504659653 / 2201210081 / 00203373
Version	Intel VROC Windows 5.3PV
Issue Description	With specific cpu sku, system RAID degraded or failed during S4 stress test. System might report error message: operating system not found. This issue is fixed on the stability of VROC Key authentication mechanism.
Workaround	Fixed in Intel VROC 5.4PV

Title	**RSTCLI Mange Locate LED Function Does Not Work**
Ext/Int Reference#	1805778949
Version	Intel VROC Windows 5.3PV
Issue Description	command to blink amber LED with rstcli.exe execute command "rstcli.exe --manage --locate diskID" (e.g. "2-0-0-0") fails with an error message
Workaround	Fixed in Intel VROC 5.4PV

Title	**Intel VMDVROC_2.efi driver does not assign enough resources for P4800 devices**
Ext/Int Reference#	NSD-3092, 00197664, 220881760
Version	5.3PV UEFI VMDVROC_2.efi
Issue Description	Some NVMe SSDs request both prefetchable (controller memory buffer) and non- prefetchable memory. For these cases, Intel VMD must assign more resources. When enough resources are not available, not all devices can be enumerated.
Workaround	Fixed in Intel VROC 5.4PV

Title	**VROC RAID can't create a RAID 1 volume on certain 3.2TB 3rd Party Device**
Ext/Int Reference#	NSD-3360, 1504645681, 2201182518, 00203170
Version	Intel VROC Windows 5.3PV
Issue Description	On certain 3.2TB 3rd Party NVMe device, an invalid opcode is returned from device firmware when sending the flush command upon creation of a RAID 1 volume
Workaround	Fixed in Intel VROC 5.4PV

Title	**Intel VMDVROC_2.efi driver gets Assert When Loading**
Ext/Int Reference#	NSD-3175
Version	5.3PV UEFI VMDVROC_2.efi
Issue Description	When VMDVROC_2.efi driver is loading an assert occurs
Workaround	Fixed in Intel VROC 5.4PV

Title	**Intel VMDVROC_2.efi driver does not assign enough resources for P4800 devices**
Ext/Int Reference#	NSD-3175,
Version	
Issue Description	Some NVMe SSDs request both prefetchable (controller memory buffer) and non- prefetchable memory. For these cases, Intel VMD must assign more resources. When enough resources are not available, not all devices can be enumerated.
Workaround	Fixed in Intel VROC 5.4PV

Title	Intel VROC GUI may show Option to Rebuild Volume to Duplicates of the Same Device
Ext/Int Reference#	1406523199
Version	5.4PV UI
Issue Description	When choosing to Select a Disk to Rebuild a RAID 1 volume, there are multiple selections of the same device to choose from
Workaround	Fixed in Intel VROC 5.4PV

Title	Hot removal cause system BSOD
Ext/Int Reference#	1504593125 / 220768508/ 00194991
Version	Intel VROC 5.3PV Windows 2012
Issue Description	Hot removal non-system NVMe drive sequentially may cause the system BSOD
Workaround	Fixed in Intel VROC 5.4PV

Title	Intel RSTe AHCI Driver May Not Properly Resume from a System Sleep State
Ext/Int Reference#	220211859 / 117883
Version	Intel VROC 5.2
Issue Description	After installing the Windows 10 RS2 OS with the PCH controller in AHCI mode, using the Intel RSTe AHCI driver, the system may not properly resume from a system sleep state (S3).
Workaround	Fixed in Intel VROC 5.4PV

Title	Adding Disk to a 6 Disk RAID 0 May Not Add The Disk
Ext/Int Reference#	1805245779 / 220262518 / 00179962
Version	Intel VROC 5.1
Issue Description	Using the "Add disk" option in the RSTe GUI to add a disk to an existing SATA RAID 0 volume as the system boot device may result in an unknown error. Consequently, the disk will not actually be added to the volume.
Workaround	Fixed in Intel VROC 5.4PV

Title	Intel VROC may Display Incorrect Slot Numbers in UEFI/HII/rstcli
Ext/Int Reference#	NSD-3071
Version	Intel VROC 5.3PV
Issue Description	With limited configurations, the slot number may be returned as an incorrect value
Workaround	Fixed in Intel VROC 5.4PV

Title	Naming for the RAID in BIOS allows Special Characters
Ext/Int Reference#	1504555607 / 220561616 / 00188722
Version	Intel VROC 5.3
Issue Description	While setting name for the NVMe RAID in the Intel VROC HII, the interface prompts “...has no special characters...”. However, when we use special characters to name the RAID, their name still can be created.
Workaround	Fixed in Intel VROC 5.4PV

Title	BSE D1 When cycling S4 during RAID Migration
Ext/Int Reference#	1805976874
Version	Intel VROC 5.3
Issue Description	After starting a RAID migration and cycling S4, a BSE D1 occurs. The root cause is a null pointer dereferenced from internal IO request from the NVMe driver.
Workaround	Fixed in Intel VROC 5.4PV

Title	Non-Intel SSD disk Status Should Not show status as Unsupported in VROC HII page
Ext/Int Reference#	2201660851 / 00208880
Version	Intel VROC 5.3
Issue Description	With no Intel VROC Hardware Key in the system, supported 3rd party NVMe SSDs will show up in the VROC HII page as “unsupported”
Workaround	Fixed in Intel VROC 5.4PV

13 Issues Fixed in Intel VROC 5.3 PV

Title	**Vroc+M.2NVMe+RAID causing system hang during the factory process**
Ext/Int Reference#	1406382169 / 220567693 / 00189032
Version	Intel VROC 5.2
Issue Description	Incomplete PNP request is causing a system hang during boot
Workaround	Fixed in Intel VROC 5.3PV

Title	**Create NVMe RAID volume in BIOS, then do “Reset to Non-RAID” causes member disk state to be “unknown”**
Ext/Int Reference#	1504603829 / 220864368 / 00197212
Version	Intel VROC 5.3
Issue Description	Create RAID volume in BIOS, then do “Reset to Non-RAID”, the status of member disk will turn to “unknown”.
Workaround	Fixed in Intel VROC 5.3PV

Title:	**Intel VROC uses popup message which is not compatible with HII browser environment, causes prompt message not visible**
Ext/Int Reference#	1406322052 / 220272647 / 00180483
Version	Intel VROC UEFI 5.2
Issue Description	Intel VROC UEFI tries to display a warning message for spanned volumes, but message is not visible and system appears hung.
Workaround	Fixed in Intel VROC UEFI 5.3PV

Title:	**Installing a Windows OS on to RAID 5 Volume May Take a Longer than a non-RAID 5 configuration**
Ext/Int Reference#	1805245749 / 00174805 / 00182164
Version	Intel RSTe 5.2
Issue Description	When installing a Windows OS onto a RAID 5 volume, the installation process may take longer than on a pass-thru drive or other RAID levels may take.
Workaround	Fixed in Intel RSTe 5.3PV

Title:	RSTE Service fails to start
Ext/Int Reference#	1406488392 / 00196573 / 220845714
Version	Intel RSTe 5.2
Issue Description	The RSTE Application failing to start and the RSTE Service itself fails to start when we perform an Out of Box Experience test. For the application, the application gives a failure message of "Multiple Users cannot run the application".
Workaround	Fixed in Intel RSTe 5.3PV

Title:	**Typically the drive on SATA 0 or sSATA 0 is the last drive enumerated Win10 RS2 and Win7x64**
Ext/Int Reference#	1805245760 / 00175977 / 220146906
Version	Intel RSTe 5.1
Issue Description	Typically the drive on SATA 0 or sSATA 0 is being enumerated by the OS as the last drive in the list.
Workaround	Fixed in Intel RSTe 5.3PV

Title:	**RSTe 5.2.0.1082 device write cache mismatch after deleting 3x SSD RAID 5 Win10 RS2**
Ext/Int Reference#	1406368392 / 00182654
Version	Intel VROC 5.2
Issue Description	After deleting a RAID 5 the Intel GUI and disk properties in MS Windows sometimes don't agree on write cache policy.
Workaround	Fixed in Intel VROC 5.3PV

Title:	**VMD Pre-OS driver GP faults during Start**
Ext/Int Reference#	1406442772 / 20620659 / 00190284
Version	Intel VMD 1.2
Issue Description	During Start(), the VMD driver will dereference a NULL pointer and when it tries to use the garbage as an address it will GP fault.
Workaround	Fixed in Intel VROC 5.3PV

Title:	**Some 3rd Party M.2 NVMe SSDs cannot show up after loading RSTe F6 driver during OS installation**
Ext/Int Reference#	1504549367 / 220434759 / 00185292
Version	Intel VMD 1.2
Issue Description	When installing OS on some 3rd Party M.2 NVME SSD, load latest RSTe F6 driver during OS installation, the M.2 NVME SSD cannot show up, and still does not show up when selecting "Refresh" in Windows install UI.
Workaround	Fixed in Intel VROC 5.3PV

Title:	**Information for An ODD Device Connected to the SATA Controller Managed by RSTe may be Missing From The RSTe System Report**
Ext/Int Reference#	1406402969/ 220569591 / 00189054
Version	Intel RSTe 5.2.0.1194 SATA
Issue Description	When an ODD device is connected to the SATA controller and the RSTe driver is installed for that controller, the information pertaining to that ODD and the port it is connected to may be missing from the RSTe System Report.
Workaround	Fixed in Intel RSTe SATA Windows 5.3PV

Title:	**RSTe GUI May Not Open if HW RAID Adapter is Presently Enabled**
Ext/Int Reference#	1406384641/ 220568514 / 00189041/2006655974
Version	Intel VROC 5.2
Issue Description	When a configuration where a HW RAID adapter is connected to the system and enabled in the OS is used, the RSTe GUI may not open properly.
Workaround	Fixed in Intel VMD Windows 5.3PV

Title:	**BSE 0x7E iaVROC.sys occurred during warm reboot with Win7 VMD RAID1 OS**
Ext/Int Reference#	1209828082/ 1805245735 / 00167225
Version	Intel VMD 1.2PV
Issue Description	BSE 0x7E(iaVROC.sys)occurred during warm reboot with Win7 VMD RAID1 OS at the 107th loop
Workaround	Fixed in Intel VMD Windows 5.3PV

Title	System Cannot Enter S4 Under VMD Mode
Ext/Int Reference#	220614090 / 00190029
Version	Intel VMD 1.2PV
Issue Description	Windows OS cannot enter S4 and CATERROR when VT'd + VMD is enabled
Workaround	Disable VT'd, Fixed in Intel VMD for Intel VROC 5.3PV

Title	HII show CPU255 when NVMe drive connect to CPU2_3
Ext/Int Reference#	00185882/ 220448266 / 1504542627 / NSD-2942
Version	Intel VMD 1.2PV
Issue Description	HII is displaying the incorrect CPU number when there are more than 2 Processors on the system
Workaround	Fixed in Intel VROC 5.3

Title	VMD Windows – Huawei ES3600P devices are loaded under other devices for Windows 2012R2
Ext/Int Reference#	NSD-3031
Version	Intel VROC 5.2PV
Issue Description	In Windows Device Manager the Huawei ES3600P Device is listed under "Other device" and not listed under "Disk Drive"
Workaround	Disable VT'd, Fixed in Intel VROC 5.3

Title	Incorrect LED blink behavior on after active LED/remove disk then re-plug in
Ext/Int Reference#	1504544175 / 00187433 / 00187526 / 00189819 / 00185028 / NSD-2936
Version	Intel VROC 5.2PV
Issue Description	1. With Intel VROC and UI, after click "active LED", the LED will continue to blink about two minutes, it doesn't match with help description (twelve seconds). 2. When re-plug NVMe SSD the LED will keep blink can't stop
Workaround	Fixed in Intel VROC 5.3

Title	Unknown error occurs in UI when operating VROC RAID
Ext/Int Reference#	1406341428 / 1209769762 / 00165947
Version	Intel VMD UEFI Driver 5.2 PV
Issue Description	"Add disk" option shouldn't be visible when any array volume was busy (initialization, verification etc.). When selecting, an unknown UI error occurs.
Workaround	Fixed in Intel VROC UEFI 5.3

Title	System Hangs At POST code “D5” with VMD Enabled
Ext/Int Reference#	NSD-2871 / 1504537359 / 220419948 / 00184847
Version	Intel VMD UEFI Driver 5.2 PV
Issue Description	With certain configurations, the UEFI VMD driver will cause system to hang. Issue presented in 5.2PV
Workaround	Fixed in Intel VROC UEFI 5.3

Title	VMD UEFI – M.2 U.2 Drive not showing up in Boot Menu
Ext/Int Reference#	NSD-2824 / 00185292 /
Version	Intel VMD UEFI Driver 5.2 PV
Issue Description	When 2 NVMe U.2 + 2 NVMe M.2 are connected, M.2 devices do not show up and system hangs.
Workaround	Disable VT'd, Fixed in Intel VROC 5.3

Title	NVMe hot plug in different CPU take longer time to update in device manager
Ext/Int Reference#	1209670442 / 115303
Version	Intel VROC 5.2
Issue Description	When there is NVMe drive connect in different CPU and do hot-plug/removal with one drive. Windows device manager refresh disk status with longer delay than VROC UI.
Workaround	Fixed in 5.3 PV

Title	System and Spare Disk May be Selectable as Journaling Drive
Ext/Int Reference#	220154328 / 00176358 / 117412
Version	Intel VROC 5.2
Issue Description	Having Windows OS installed on a single disk, when using the RSTe GUI to create a RAID volume and checking the RAID Write Hole option in the advanced tab, the System disk may be selectable as the journaling drive. If a disk is set as a spare, it too may also be selectable.
Workaround	Fixed in Intel VROC 5.3PV

Title	Reinstalling an OS on a System May Result in a System Failure
Ext/Int Reference#	110013
Version	Intel VROC 5.2
Issue Description	When running in a system with a Windows OS install on the SATA RAID volume and that volume is deleted in the UEFI HII in order to install an OS onto a VROC RAID volume, the system may encounter a BSOD on the installation's second reset.
Workaround	Fixed in Intel VROC 5.3PV

Title	LedToolSata.efi is not working on port6 and port7 for SATA controller
Ext/Int Reference#	1209740406/ 115541
Version	Intel RSTe UEFI 5.1
Issue Description	This issue is about LED test tool in Shell. Issue has been fixed. The SGPIO signal for port6 and port7 can be triggered with LedToolSata.efi correctly.
Workaround	Fixed in RSTe UEFI 5.3

Title	**Hot Removing NVMe Disks May Take Longer Than Expected to Show in Windows Disk Management**
Ext/Int Reference#	220174495 / 00176995 / 117410
Version	Intel VROC 5.2
Issue Description	In the Windows operating system, after removing an NVMe disk, the Windows Disk Management or Device Manager may take 45 seconds to a minute to reflect the change. The RSTe GUI reflects the change within 10 seconds so it is not effected.
Workaround	Fixed in Intel VROC 5.3

Title	**RSTe UI show incorrect Negotiated link rate**
Ext/Int Reference#	220302619 / 220327398 / 00182348 / 117410
Version	Intel VROC 5.2
Issue Description	RSTe UI may show incorrect Negotiated link rate when first NVMe hot-plug into the system after boot. Symptom is not reproduce when there is no hot-plug for NVMe drive.
Workaround	fixed

Title	**Creating/Deleting a RAID Volume in the UEFI HII May Result in a Platform Hang**
Ext/Int Reference#	1209582891/ 22803 / 1805245447
Version	Intel VROC UEFI 5.2
Issue Description	When attempting to create or delete a RAID volume in the UEFI HII may result in a system hang that requiring a system power cycle.
Workaround	Fix will be in Intel VROC UEFI 5.3 Release

Title	**Huawei ES3600P NVMe SSDs are not visible in Windows OS 2012R2 with VMD enabled**
Ext/Int Reference#	NSD-2821
Version	Intel VROC 5.2
Issue Description	When VMD is enabled, Huawei devices are not visible in Windows Device Manager, but they are visible in BIOS and Linux
Workaround	Fixed in Intel VROC 5.3

Title	**Windows* Device Manager May not Detect Hot-removing of RSTe Managed NVMe Disks**
Ext/Int Reference#	1209618853/ 00161319 / 117421
Version	RSTe_5.0.0.2192
Issue Description	On a Windows* system, when hot-removing Intel VROC managed NVMe disks, Device Manager may not show the disks as removed without performing a rescan.
Workaround	Fixed in Intel VROC 5.3

Title	**Uncorrectable error occurred during shutdown when enable VTd+VMD on Windows* 10**
Ext/Int Reference#	220184299 / 00177422 / 00172660 / NSD-2755
Version	Intel VMD 1.2 Intel VROC 5.2
Issue Description	On a Windows* 10 system with VMD and VT'd enabled in the BIOS, system will give CATERR on shutdown
Workaround	Fixed in Intel VROC 5.3