



# INTEL® VIRTUAL RAID ON CPU (INTEL® VROC) AND INTEL VOLUME MANAGEMENT DEVICE (INTEL® VMD)

## SUPPORTED CONFIGURATIONS

### Intel® VROC 7.5

This document covers the solid state drives (SSD), operating systems (OS), and configurations supported by Intel® Virtual RAID on CPU (Intel® VROC). If any of this information conflicts with the support information provided by a platform OEM or ODM, the platform documentation and configurations should take precedent.

The support guidance is dependent on the Intel® VROC version being used. This document is for Intel® VROC 7.5. If you are using another Intel® VROC version, please reference the Supported Configurations guide for that version.

Intel® VROC includes functional sub-products for (VMD NVMe RAID), (SATA RAID), and (non-VMD NVMe RAID). Most of this document covers Intel VROC (VMD NVMe RAID) and (SATA RAID). Please refer the Intel® VROC User Guide and Intel® VROC Name Change documents on the support page for more detail.

Intel® VROC is supported on X299 HEDT platforms, but on a more limited scope than presented in this document. Please refer to Intel® VROC X299 documentation on the support page for more detail. Some clarifying notes added below as well.

## INTEL® XEON SUPPORT LIST FOR INTEL VMD AND INTEL VROC (VMD NVMe RAID)

Intel® VROC has a hardware dependency on an Intel® Xeon feature known as Intel® Volume Management Device (Intel® VMD). Therefore, Intel® VROC is only supported on CPUs with this Intel® VMD technology. The below list of Intel Processor families supports Intel® VROC and Intel® VMD:

### Intel® Xeon Processor Families that Support Intel® VROC with Intel VMD Generations

- Generation 1 Intel® Xeon Scalable Processors (-SP, -D, -W)
  - Intel® VMD 1.0 on all SKUs
- Generation 2 Intel® Xeon Scalable Processors (-SP, -D, -W)
  - Intel® VMD 1.0 on all SKUs
- Generation 3 Intel® Xeon Scalable Processors (-SP, -D, -W)
  - Intel VMD 1.0 on all 4S/8S SKUs (-H)
  - Intel VMD 2.0 on all 1S/2S SKUs

All SKU Levels: Platinum, Gold, Silver, and Bronze

This list identifies the processors that support Intel® VROC, but this functionality must be enabled by the OEM or ODM at the platform level. Just because a processor from one of these families is used, does no guarantee that the platform supports Intel® VROC. Please confirm with platform provider.

Intel® VROC on X299 platforms only supports Intel® VROC Pass-thru and Intel® VROC Intel SSD Only License SKUs.



## INTEL® PLATFORM SUPPORT MATRIX<sup>1</sup>

Intel Xeon	VMD Generation	Chipset	Platform Type	Platform Codename	Intel VROC Supporting Release <sup>2</sup>	VMD NVMe RAID	SATA RAID	Non-VMD NVMe RAID
Generation 1 Intel® Xeon -SP	1.0	C620 Series	Mainstream	Purley	Intel VROC 5.3	X	X	
Generation 2 Intel® Xeon -SP	1.0	C620 Series	Mainstream	Purley R	Intel VROC 6.0	X	X	
Generation 3 Intel® Xeon -SP 4S/8S (-H)	1.0	C620 Series	Mainstream	Cedar Island	Intel VROC 7.0	X	X	
Generation 3 Intel® Xeon -SP 1S/2S	2.0	C620 Series	Mainstream	Whitley	Intel VROC 7.5	X	X	
Intel Xeon -W	1.0	C420 Series	Workstation	Basin Falls	Intel VROC 5.3	X	X	
Intel Xeon _D-2100	1.0		SOC	Bakerville	Intel VROC 5.3	X	X	
Intel Xeon -E	NA	C240 Series	Entry	Mehlow	Intel VROC 5.3		X	X

<sup>1</sup>This matrix only covers platforms launched since Intel VROC (VMD NVMe RAID) became available on Generation 1 Intel® Xeon Scalable processors in 2017. Some legacy platforms prior to this were supported with the previous Intel RAID product: Intel® Rapid Storage Technology enterprise (Intel® RSTe). This support has been grandfathered into Intel® VROC but is not listed here.

<sup>2</sup>Intel VROC Supporting Release explains the Intel VROC Release number that introduced support for the platform on the corresponding row. Releases prior to that number, will not support that platform. All releases are backward compatible, so any release after the listed number, will support the platform.

Sub-Product	NVMe SSD RAID	SATA RAID	Bootable RAID	Hot-Plug/ Surprise Removal	LED Management	3 <sup>rd</sup> Party Drive Support
Intel® VROC (VMD NVMe RAID)	X		X	X	X	X
Intel® VROC (SATA RAID)		X	X	X	X	X
Intel® VROC (non-VMD NVMe RAID)	X					



## INTEL® VROC SKU AND LICENSING DETAIL

Intel VROC (VMD NVMe RAID) is enabled on a platform through a license mechanism that is implemented by the platform provider. The license SKU used mainly impacts the RAID level available and which NVMe SSDs can be managed in RAID arrays. The below Intel® VROC License SKUs are available:

Intel® VROC License SKUs
<p>Intel® VROC Pass-Thru</p> <ul style="list-style-type: none"><li>• No license needed</li><li>• No RAID Supported, only Pass-thru devices connected to Intel® VMD</li></ul>
<p>Intel® VROC Standard</p> <ul style="list-style-type: none"><li>• STANDARD License needed</li><li>• RAID 0/1/10 supported</li><li>• Intel and 3<sup>rd</sup> Party NVMe SSD Support (per below SSD Support list)</li></ul>
<p>Intel® VROC Premium</p> <ul style="list-style-type: none"><li>• PREMIUM License needed</li><li>• RAID 0/1/10/5 Supported</li><li>• Intel and 3<sup>rd</sup> Party NVMe SSD Support (per below SSD Support List)</li><li>• Intel VROC Integrated Caching</li><li>• Self-Encrypting Drive Key Management</li></ul>
<p>Intel® VROC Intel® SSD Only</p> <ul style="list-style-type: none"><li>• INTEL SSD ONLY License needed</li><li>• RAID 0/1/10/5 supported</li><li>• Intel NVMe SSD Support only (per below SSD Support list)</li><li>• 3<sup>rd</sup> Party NVMe SSDs in Pass-thru mode only (not in RAID arrays)</li><li>• Intel VROC Integrated Caching</li><li>• Self-Encrypting Drive Key Management</li></ul>

No licensing is needed for Intel VROC (SATA RAID) or (nonVMD NVMe RAID). Functionality is included with Intel® Xeon and chipset purchase.



## NVMe SSD SUPPORT LIST

This section covers the SSDs that are supported on the product Intel® Virtual RAID on CPU. This includes Intel® SSDs and third-party SSDs from other vendors. Drives are listed below by product name/family and support will exist for any Form Factor (e.g. M.2 or U.2) within that product name/family. In addition, third-party SSDs not listed below may still function with Intel VROC software, but support is not provided. Therefore, the drives may or may not show up in relevant management tools and use of those drives is at the risk of the user.

The following list is Form Factor independent. Any drive listed is supported as a family, which includes any Form Factor available for that drive. However, any platform level or Form Factor level limitations supersedes Intel VROC functionality. For example, M.2 Devices do not support hot-plug or LED management, therefore, these Intel® VROC features are not support with M.2 devices.

Intel® SSDs	Third Party Vendor SSDs
<p>All Intel® SSDs for Data Center with NVMe (including but not limited to):</p> <ul style="list-style-type: none"> <li>• Intel® SSD DC P3100</li> <li>• Intel® SSD DC P3500</li> <li>• Intel® SSD DC P3520</li> <li>• Intel® SSD DC P3600</li> <li>• Intel® SSD DC P3700</li> <li>• Intel® SSD DC P4101</li> <li>• Intel® SSD DC P4500</li> <li>• Intel® SSD DC P4501</li> <li>• Intel® SSD DC P4510</li> <li>• Intel® SSD DC P4511</li> <li>• Intel® SSD DC P4600</li> <li>• Intel® SSD DC P4601</li> <li>• Intel® SSD DC P4610</li> <li>• Intel® SSD D5-P4320</li> <li>• Intel® SSD D5-P4326</li> <li>• Intel® SSD D5-P4420</li> <li>• Intel® SSD D7-P5500</li> <li>• Intel® SSD D7-P5510</li> <li>• <b>Intel® Optane™ SSD DC P4800X</b></li> <li>• <b>Intel® Optane™ SSD DC P4801X</b></li> <li>• <b>Intel® Optane™ SSD DC P5800X</b></li> </ul> <p>All Intel® Professional NVMe SSDs:</p> <ul style="list-style-type: none"> <li>• Intel® SSD Pro 7600p</li> <li>• Intel® SSD Pro 6000p</li> </ul> <p>Other select Intel® SSD Series:</p> <ul style="list-style-type: none"> <li>• Intel® Optane™ SSD 900P</li> <li>• Intel® Optane™ SSD 905P</li> </ul> <p>X8 Intel® NVMe SSDs (RAID0 Support only)</p> <ul style="list-style-type: none"> <li>• Intel® SSD DC P3608</li> <li>• Intel® SSD DC P4608</li> <li>• Intel® SSD DC P4618</li> </ul> <p><b>Bold devices are supported as caching device with Intel VROC Integrated caching (Intel Optane SSDs only)</b></p>	<p>This third-party vendor SSD list is supported on any Intel® VROC capable platform. <b>Additional SSDs may be supported at the OEM or platform provider level.</b> Please contact your OEM or platform provider for a full list of third-party vendor SSDs for a given platform.</p> <p>Huawei</p> <ul style="list-style-type: none"> <li>• ES3500P</li> <li>• ES3600P</li> </ul> <p>Micron</p> <ul style="list-style-type: none"> <li>• 9100 Series</li> <li>• 9200 Series</li> </ul> <p>Samsung</p> <ul style="list-style-type: none"> <li>• SM951</li> <li>• SM961</li> <li>• PM953</li> <li>• PM961</li> <li>• PM963</li> <li>• PM983</li> </ul> <p>Toshiba</p> <ul style="list-style-type: none"> <li>• XG3</li> <li>• XG5</li> </ul> <p>Lenovo</p> <ul style="list-style-type: none"> <li>• Atsani</li> </ul> <p>Western Digital</p> <ul style="list-style-type: none"> <li>• SN720</li> <li>• SN200</li> </ul> <p>UNIC</p> <ul style="list-style-type: none"> <li>• P8160 E/M</li> </ul>

Intel® VROC on X299 platforms only supports the Intel SSDs list above. The Third Party Vendor SSDs List is NOT supported by Intel® VROC on X299 platforms.



## INTEL VROC OS SUPPORT LISTS

This section covers the operating systems that are supported by the product Intel® Virtual RAID on CPU. This means the OS release can run on platforms with the given generation of Intel VMD. Other CPU level or OEM level limitations may apply that supersede this product level OS support.

For Platforms with VMD1.0
<b>Linux</b>
<p>Intel® VROC for Linux is mostly delivered through open source OS kernel and user space tool, with no additional software download required for specific Linux distribution releases. It is up to specific OSV's to pull-in Intel® VROC features and patches. The distributions below have Intel® VROC support, with newer releases being more complete.</p> <p>RedHat Enterprise Linux:</p> <ul style="list-style-type: none"><li>• RHEL 7.3 (Requires additional download. See platform provider for details)</li><li>• RHEL 7.4 (Requires additional download. See platform provider for details)</li><li>• RHEL 7.5</li><li>• RHEL 7.6</li><li>• RHEL 7.7</li><li>• RHEL 7.8</li><li>• RHEL 7.9</li><li>• RHEL 8.0</li><li>• RHEL 8.1</li><li>• RHEL 8.2</li><li>• RHEL 8.3</li></ul> <p>CentOS is a community supported OS and Intel VROC is limited in the support options for these distributions.</p> <ul style="list-style-type: none"><li>• CentOS is not a validated distribution for Intel VROC</li><li>• If CentOS issues can be reproduced using the corresponding RHEL release, then the issue can be addressed</li></ul> <p>SUSE Linux Enterprise:</p> <ul style="list-style-type: none"><li>• SLES 12 SP3</li><li>• SLES 12 SP4</li><li>• SLES 12 SP5</li><li>• SLES 15</li><li>• SLES 15 SP1</li><li>• SLES 15 SP2</li></ul> <p>Ubuntu Server:</p> <ul style="list-style-type: none"><li>• Ubuntu 18.04.3</li><li>• Ubuntu 18.04.4</li><li>• Ubuntu 18.04.5</li><li>• Ubuntu 20.04.0</li><li>• Ubuntu 20.04.1</li></ul> <p>See below link for full implementation details.</p> <ul style="list-style-type: none"><li>• <a href="https://www.intel.com/content/www/us/en/support/articles/000056229.html">https://www.intel.com/content/www/us/en/support/articles/000056229.html</a></li></ul>



## Windows

Intel® VROC for Windows is delivered through separate software download (not in OS). Please reference platform provider download resources for access.

- Windows 10 (RS3/RS4/RS5/19H1)
- Windows 2012 R2
- Windows 2016
- Windows 2019

For Windows 7, Intel® VROC 5.6 was the last driver that supports this OS. The Intel VROC5.6 package for Windows 7 will be delivered through the newest Intel VROC6.X installer, but the build is in sustaining mode. In the future with Intel VROC7.5, this Windows 7 driver will no longer be included.

## VMWare

The VMWare ecosystem is supported with the same pre-OS driver that is used for Intel VROC. In the OS/Hypervisor, only Intel VMD is support plus additional support for RAID1 for boot volumes. No data RAID is supported:

- ESXi6.5 and update packages
- ESXi6.7 and update packages
- ESXi7.0 and update packages

**Note:** Exception to this list is applied for platforms based on Generation 3 Intel® Xeon 4S/8S (-H), platform codename Cedar Island. This contains VMD1.0 technology, but only supports ESXi7.0 and update packages

There are in-box and async driver options available for Intel VMD in VMware. For the latest features and bug-fixes, please get the async driver from either VMWare or your platform provider.



## For Platforms with VMD2.0

### Linux

Intel® VROC for Linux is mostly delivered through open source OS kernel and user space tool, with no additional software download required for specific Linux distribution releases. It is up to specific OSV's to pull-in Intel® VROC features and patches. The distributions below have Intel® VROC support, with newer releases being more complete.

RedHat Enterprise Linux:

- RHEL 7.8
- RHEL 7.9
- RHEL 8.1
- RHEL 8.2
- RHEL 8.3

CentOS is a community supported OS and Intel VROC is limited in the support options for these distributions.

- CentOS is not a validated distribution for Intel VROC
- If CentOS issues can be reproduced using the corresponding RHEL release, then the issue can be addressed

SUSE Linux Enterprise:

- SLES 12 SP5
- SLES 15 SP2

Ubuntu Server:

- Ubuntu 18.04.4
- Ubuntu 18.04.5
- Ubuntu 20.04.0
- Ubuntu 20.04.1

See below link for full implementation details.

- <https://www.intel.com/content/www/us/en/support/articles/000056229.html>

### Windows

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- Windows 10 (RS3/RS4/RS5/19H1)
- Windows 2012 R2
- Windows 2016
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- ESXi7.0 and update packages

There are in-box and async driver options available for Intel VMD in VMware. For the latest features and bug-fixes, please get the async driver from either VMWare or your platform provider.



## SUPPORTED HW CONFIGURATIONS

This section covers the configurations and platform limitations supported on the product Intel® Virtual RAID on CPU. This information covers what the Intel® VROC software can support. Platform level constraints may supersede the below:

Configurations	
<p>Maximum x4 PCIe SSD Totals Supported:</p> <ul style="list-style-type: none"><li>• 4 Direct Attached SSDs per Intel® VMD domain</li><li>• 24 SSDs per single Intel® VMD Controller when using switches</li><li>• 24 SSDs per RAID 0/5 array</li><li>• 4 SSDs per RAID10 array</li><li>• 2 SSDs per RAID1 array</li><li>• 48 SSDs per platform (may require switches)</li></ul>	<p>Platform Considerations:</p> <ul style="list-style-type: none"><li>• Up to 2 levels of switches</li><li>• Up to 2 RAID volumes per array</li><li>• Data volumes are supported to span across 1 or more Intel® Volume Management Device domain and CPUs</li></ul> <p>Boot volumes may function when spanning Intel® Volume Management Device controllers, but this configuration is not supported</p>

## SWITCH SUPPORT LIST

Intel has engaged with the switch vendors listed below in order to support Intel® VMD and therefore Intel® VROC functionality, such as NVMe SSD LED management with RAID. Contact your respective switch vendor to confirm the make/models that support Intel VMD.

Supporting Switch Vendors
<ul style="list-style-type: none"><li>• Broadcom</li><li>• Microsemi</li><li>• Pericom</li><li>• Semtech</li></ul>

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

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