

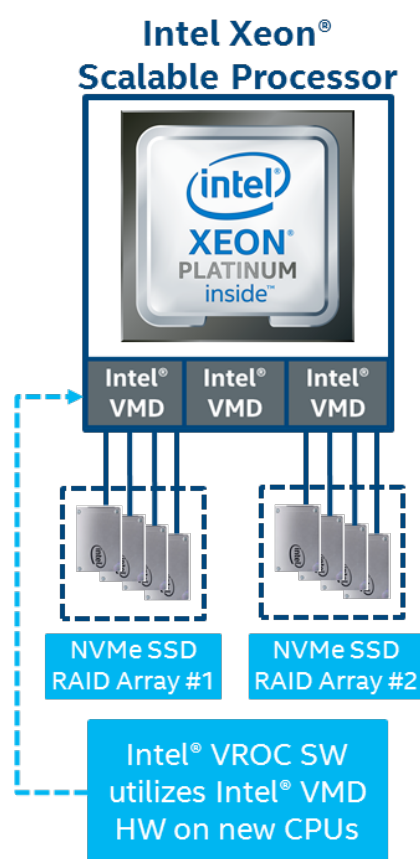
## PRODUCT BRIEF

Intel® Virtual RAID on CPU (Intel® VROC)  
Industry: Data Center



# Scalable RAID Designed for CPU Attached NVMe\* SSDs

**Intel® Virtual RAID on CPU (Intel® VROC) – an enterprise RAID solution for NVMe\* SSDs directly attached to Intel® Xeon™ Scalable processors.**



**Over 2.5M  
Read IOPS  
in 4-Disk RAID 0<sup>1</sup>**

Today's data hungry business processes need access to data quicker than ever. Quicker access to data means faster decision making, better productivity, and quicker ROI on IT infrastructure. Therefore, Enterprise data storage solutions are migrating to higher bandwidth and lower latency NVMe\*-based SSDs to address the performance bottlenecks of legacy SATA/SAS interfaces. With this transition, enterprises also require RAID data protection for NVMe SSDs.

Intel® Virtual RAID on CPU (Intel® VROC) is a new enterprise RAID solution specifically designed for NVMe SSDs that provides expected reliability, while unleashing the performance of NVMe SSDs. This is made possible by a new feature in next-generation Intel® Xeon™ Scalable processors called Intel® Volume Management Device (Intel® VMD), an integrated controller inside the CPU PCIe\* root complex. Because the NVMe SSDs are directly connected to the CPU, the full performance potential of reduced latency and increased bandwidth can be realized. Intel VROC enables this benefit without the complexity, cost and power consumption of traditional hardware RAID HBA cards placed between the drives and the CPU.

### Scalable RAID for Growth on Demand

A single Intel Xeon Scalable processor using Intel VROC is capable of supporting up to 12 NVMe SSDs directly attached to the CPU, and up to 6 RAID arrays.<sup>2</sup> On dual-socket system configurations, that amount doubles. In addition, Intel VROC supports both boot volumes and data volumes, enabling the flexibility to use one array for both system and data volumes, or separating the arrays respectively. Although a boot RAID array needs to be within a VMD controller, data RAID arrays can span across multiple Intel VMD controllers, or even span across different processors on the same system. With a multitude of supported configurations, Intel VROC allows NVMe RAID solutions to start small, then scale simply and cost effectively.

### Rich Management Tools for Easy Maintenance

Intel VROC management tools support today's modernized data center infrastructure. Intel VROC allows data center administrators to create and delete RAID volumes in both pre-OS and OS environments. RAID settings can be configured using either a user interface or command line, plus the arrays can be managed locally or remotely through a web-based RESTful agent.

NVMe-based SSD management has never been easier. There is no need to reboot the server to replace a failed drive any longer because surprise hot-plug is supported. Using the status indicator LED, administrators can visually identify the RAID status (i.e. normal, initialization, degraded, or fail), as well as locate a particular drive in hundreds of SSDs. Email notification will alert administrator, should any alarming events occur.

Reliable RAID for Data Protection

For enterprise, it's critical to protect data when power loss occurs unexpectedly. Intel VROC takes that a step further. The data will even be safe when RAID 5 is in degraded state and power loss occurs at same time. Most RAID solutions avoid this problem by requiring a backup power unit, which adds additional cost. Intel VROC solves this double fault challenge using a patent-pending journaling process without the need of backup power unit.

**Note:** Intel® VROC RAID 5 double fault protection feature depends on state-of-the-art data center NVMe SSDs with power loss protection.

Unleash the Power of NVMe SSDs Today

Quicker access to data means a more efficient business and upgrading to NVMe SSDs is the first step to a faster storage solution. Unleash the full power of these NVMe SSDs with Intel Virtual RAID on CPU, a complete RAID solution that enables the unprecedented speed of NVMe SSDs, while knowing that your data is protected for enterprise applications.

| FEATURES AT A GLANCE     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Platform       | Platforms with Intel® Xeon® Processor Scalable family processors, Intel® Xeon® W processors, or Intel® Xeon® D processors                                                                                                                                                                                                                                                                                                                                                                                                       |
| Supported Configurations | For current list of supported NVMe SSDs, Operating Systems, and configurations, please reference the Intel® VROC Support page at: <a href="https://www.intel.com/content/www/us/en/support/articles/000030310/memory-and-storage/ssd-software.html">https://www.intel.com/content/www/us/en/support/articles/000030310/memory-and-storage/ssd-software.html</a>                                                                                                                                                                 |
| SKUs Available           | Intel VROC Standard: RAID 0/1/10; 3rd Party SSD Support<br>Intel VROC Premium: RAID 0/1/5/10; 3rd Party SSD Support<br>Intel VROC Intel SSD Only: RAID 0/1/5/10; No 3rd Party SSD Support                                                                                                                                                                                                                                                                                                                                       |
| Key Features             | <ul style="list-style-type: none"><li>• Bootable RAID</li><li>• RAID controller spanning for data volumes</li><li>• Management Tools (UEFI CLI, UEFI HII, OS CLI, GUI, Remote Webpage)</li><li>• Surprise Hot-plug</li><li>• Status LED Indication</li><li>• Hot Spare and Auto-rebuild</li><li>• Email Notifications for RAID events</li><li>• RAID 5 Power Loss Protection for Degraded Volume (Double Fault Protection)</li><li>• Bad Block Management</li><li>• Various Strip Sizes (4k, 8k, 16k, 32k, 64k, 128k)</li></ul> |



Learn more at [intel.com/VROC](https://intel.com/VROC)  
Register and download the VROC software at: [intel.com/downloadVROC](https://intel.com/downloadVROC)  
Learn more about Intel® SSDs at [intel.com/ssd](https://intel.com/ssd)

1 System configuration: Intel® Server Board S2600WFT family, Intel® Xeon® 8170 Series Processors, 26cores@ 2.1GHz, RAM 192GB, BIOS Release 07/09/2018, BIOS Version: SE5C620.8 6B.00.01.0014.070920180847; OS: RedHat® Linux 7.4, kernel- 3.10.0-693.33.1.el7.x86\_64, mdadm - v4.0 - 2018-01-26 Intel build: RSTe\_5.4\_WW4.5, Intel® VROC Pre-OS version 5.4.0.1039, 4x Intel® SSD DC P4510 Series 2TB drive firmware: VDV10120, Retimer; BIOS setting: Hyper-threading enabled, Package C-State set to C6(non retention state) and Processor C6 set to enabled, P-States set to default and SpeedStep and Turbo are enabled; Workload Generator: FIO 3.6, RANDOM: Workers-24, IOdepth- 256, No Filesystem, CPU Affinitized; Pass-Thru Baseline: 1x Intel® SSD DC P4510 Series, 2 TB, Firmware: VDV10120, SSDPE2KX020T8; Performance results are based on testing as of August 31, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure

2. The availability of the number of NVMe® connections will vary with the OEM system designs

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.

Benchmark results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown". Implementation of these updates may make these results inapplicable to your device or system.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase.

No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document.

The products described may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

Intel, Xeon, Intel Optane, and the Intel logo are trademarks of Intel Corporation in the U.S. and/or other countries. \*Other names and brands may be claimed as the property of others.

© 2018 Intel Corporation 1018/RA/JG 336156-007

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Intel:

[VROCISSDMOD](#) [VROCPREMMOD](#) [VROCSTANMOD](#)



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.