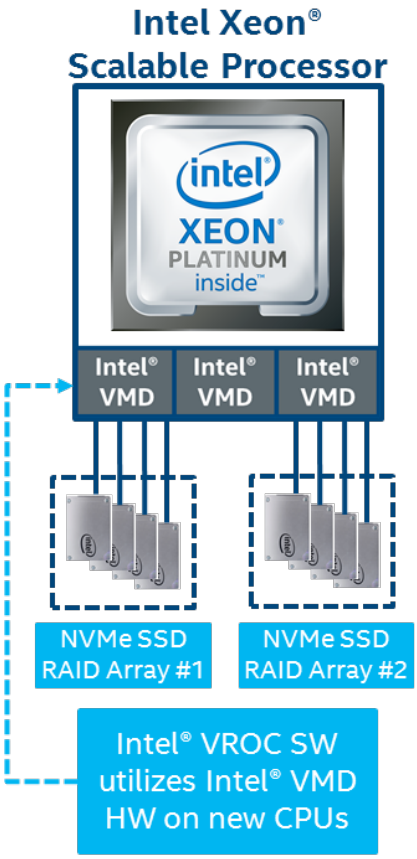
PRODUCT BRIEF

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 2.4M Read IOPS in 4-Disk RAID 0[1]

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.[2] 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
Supported Operating Systems	Windows* 2016, Windows* 2012 R2, Windows* 10, Windows* 7 Red Hat Enterprise Linux* 7.3, 7.4 SUSE Linux Enterprise* 12 SP3
Supported NVMe-based SSDs	All Intel® SSDs for Data Center and Professional, with NVMe (Non-Volatile Memory Express) 3rd party SSDs: • Samsung* SM951, SM961, PM953, PM961, PM963 • Toshiba* XG3, PX04PMB • Micron* 9100 Series • Lenovo* Atsani • Huawei* ES3600P
Supported Configurations	• Up to 24 SSDs per Intel® VMD controller, per RAID array • Up to 48 SSDs per system • Up to 12 arrays per system • Up to 2 RAID volumes per array • Up to 2 levels of switches • Data volume can span across Intel VMD controllers, boot volume cannot span
SKUs Available	Intel VROC Standard: RAID 0/1//10; 3rd Party SSD Support Intel VROC Premium: RAID 0/1/5/10; 3rd Party SSD Support Intel VROC Intel SSD Only: RAID 0/1/5/10; No 3rd Party SSD Support
Key Features	• Bootable RAID • RAID controller spanning for data volumes • Management Tools (UEFI CLI, UEFI HII, OS CLI, GUI, Remote Webpage) • Surprise Hot-plug • Status LED Indication • Hot Spare and Auto-rebuild • Email Notifications for RAID events • RAID 5 Power Loss Protection for Degraded Volume (Double Fault Protection) • Bad Block Management • Various Strip Sizes (4k, 8k, 16k, 32k, 64k, 128k)

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

1 System configuration: Intel Server System S2600WFQ family, Intel® Xeon® 8170 Series Processors, 26 cores@ 2.1GHz, 192GB , BIOS Release 12/22/2017; OS: Red Hat Enterprise Linux 7.4*, 4x Intel® SSD DC P4510 2TB, drive firmware: VDV10120; BIOS: Hyper-threading enabled, Turbo/SpeedStep enabled, Package C-state set to C6, Processor C6 set to enabled, P-states set to default.

Intel® VROC-5.3.0; workload generator: FIO version- 3.3, random read: workers-16, I/Odepth-256, no filesystem, CPU Affinitized.

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.

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.

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