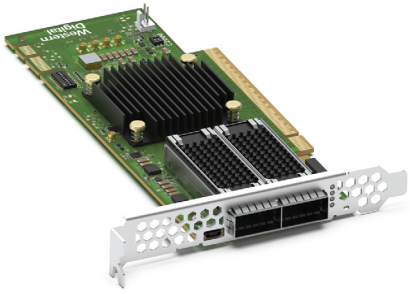
Western Digital.

Solution Brief

Present Disaggregated SSDs as Local Namespaces Using Western Digital RapidFlex™ C2000 with RapidFlex vDrive



Highlights

- **Breakthrough Economics:** Offers a cost-effective solution connecting servers to disaggregated storage using 100GbE and NVMe-oF
- **Simplified Connectivity**: Uses industry standard NVMe driver provided in enterprise operating systems without the need to install any NIC or fabrics drivers
- **Power Optimized**: At less than 15W per card, RapidFlex C2000 with RapidFlex vDrive is an extremely power efficient way to connect to SSDs disaggregated over Ethernet

NVMe® SSDs accelerate your most demanding applications, but what do you do when your data set grows beyond the capacity of a single server?

When your applications are dependent on best-in-class latency or I/O's per second, NVMe SSDs can be counted upon to deliver the best results. Adding NVMe SSDs to many server models is quite simple and proven. When your fast data becomes a big data set, you cannot continue to rely on just a single server for your NVMe SSDs. Your choices are to cluster more servers together or to disaggregate your storage using NVMe-oF™.

Disaggregation provides advantages over clustering

There is no doubt that clustering solutions are available, but the complexity surrounding getting the cluster configured and running, then rightsizing it to the application and individual performance needs can be overwhelming. Disaggregation on the other hand can be setup relatively quickly, and can grow as your application requires. Starting with a disaggregated number of drives that fits your needs today, then adding additional storage, servers, and switching capability when demands require it optimizes your CapEx and OpEx over time.

Disaggregation also decouples your upgrade cadence of CPU and storage. Committing your valuable NVMe SSDs to a server means that those SSDs fall victim to the "server upgrade cadence." Every CPU or PCIe® generation drives the release of new server platforms. While your application may require the newest CPUs, your storage requirements may not change. Disaggregation enables independent upgrade of CPU and SSD when application requirements dictate, rather than having them tied together.

Challenges

- **Accelerate your most demanding workloads**: NVMe SSDs are proven to accelerate your workloads throttled by bottlenecks in I/O per second performance. Sharing data among multiple servers when, your SSDs are in one of them, is challenging. SSDs disaggregated over Ethernet enable multiple servers to easily connect to a shared data set powered by NVMe SSDs. Western Digital RapidFlex C2000 with RapidFlex vDrive in each server accelerates these workloads while optimizing cost and power consumption.
- **Operating System Support:** Typical NICs configured to execute NVMe-oF connectivity require a driver specific to that NIC and Operating system (OS). Performance can even be impacted by varying Linux® kernel versions. RapidFlex C2000 with vDrive only requires the NVMe driver native to the OS to enable disaggregated storage connectivity, providing a simplified configuration experience and consistent performance.
- **Minimizing your carbon footprint**: Power to a data center is a resource that must be optimized. RapidFlex C2000 with vDrive consumes less than 15W while providing 2x100GbE ports to your disaggregated storage. Why consume more power than you need to with your NVMe-oF NIC? Save that consumption for processing and storage activities.

Solution

Accelerate your most demanding workloads by sharing data among multiple servers and connecting to that data using RapidFlex C2000 with vDrive and NVMe-oF. RapidFlex C2000 with vDrive utilizes the OS native NVMe driver to enumerate virtual local namespaces that are actually disaggregated in an NVMe-oF connected JBOF. Get the simplicity of direct attach storage and the flexibility and the ability to share disaggregated storage.

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NVMe-oF is the clear choice for flash disaggregation

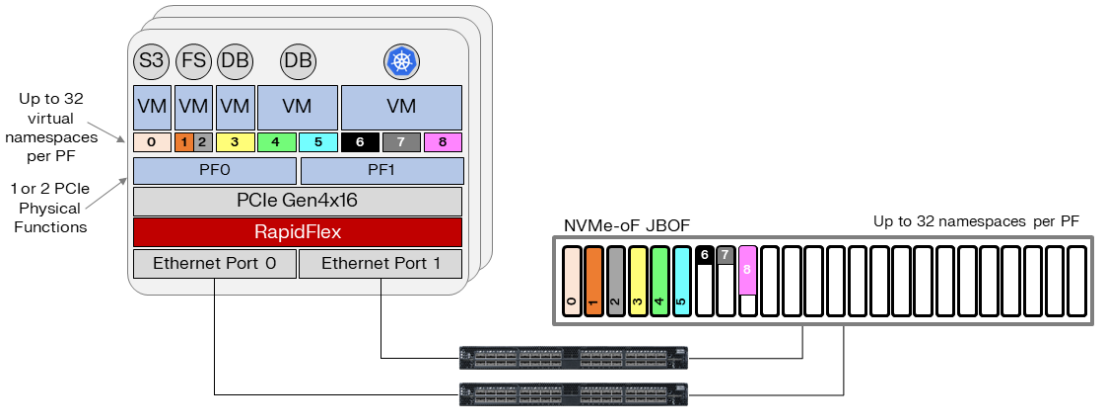
Standardized in 2016, NVMe-oF is the clear choice when disaggregating NVMe SSDs. The key attributes of NVMe, low-latency and high-performance are preserved when using NVMe-oF to disaggregate storage. While latency is incrementally greater when accessing the fabric, it is often such a small increment that application performance is not noticeably different. IOPs and throughput (GB/s) are not significantly impacted and tend to be a function of the server's PCIe architecture and fabric speed.

Ethernet as the fabric for NVMe-oF

Western Digital's RapidFlex product line is developed around Ethernet as the fabric. The high bandwidth and low latency available with data center implementations of 100Gb and faster Ethernet infrastructure enable game-changing performance with your application. The broadly supported ecosystem of Ethernet means you have ample choices of NIC, switch, cable, and storage vendors. Ethernet also boasts high performing future connectivity out through 800Gb/s.

What makes RapidFlex vDrive different?

There are many vendors and options for 100GbE Network Interface Controllers available in the market today. So, what makes RapidFlex vDrive stand out from the competition? RapidFlex vDrive is purpose-built for NVMe-oF. The state machine-based architecture means that all data paths are optimized for performance. No embedded processing stands in the way of data flowing from the Ethernet to the PCI interfaces.



Another advantage of the state machine-based architecture is power optimization. While many competing NICs use embedded CPUs and firmware to implement NVMe-oF translation, RapidFlex vDrive's state machines can do the job with lower power consumption.

And finally we come to the "v" in RapidFlex vDrive. SSDs attached to the RapidFlex vDrive are virtualized as local SSDs to the server and operating system. SSDs connected to RapidFlex vDrive are scanned and detected as though they are local to the PCIe Root Complex and operating system. No fabrics driver is required. Even operating systems that do not provide an in-box NVMe-oF driver can utilize RapidFlex vDrive as long as they support local NVMe.

- One or Two physical functions per vDrive adapter are presented to the PCIe Root Complex
- Up to 32 virtual namespaces per physical function
- One virtual namespace per attached SSD

Optimize your disaggregated NVMe SSDs with RapidFlex vDrive

Disaggregating your NVMe SSDs provides great application performance while also providing a data set that can be shared with multiple servers. Disaggregation also decouples the refresh cycle of CPU and storage, allowing you to upgrade each when needed rather than simultaneously.

RapidFlex vDrive provides a high-performance virtualization of disaggregated SSDs to the operating system. SSDs appear to be local, providing maximum interoperability with file systems, operating systems, and your applications.

Get Started

Contact your Western Digital sales professional to arrange for a product demonstration and a sample. Product information is also available on westerndigital.com.

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February 2025 / 02