

# All-Flash NVMe™ Storage Spaces Direct with Western Digital and Mellanox



## Solution Overview

- All-NVMe Microsoft® Storage Spaces Direct
- High performance for converged workloads
- High Availability
- Up to 2M IOPS at 4K random read
- Up to 35 GB/s read bandwidth
- Outstanding IOPS/\$ and IOPS/W metrics

## Best Uses

- AFA SAN or NAS replacement
- High-performance database
- Hyper-V Virtualization
- Business Analytics

## Components

- Western Digital Ultrastar® DC SN630 NVMe SSD
- Mellanox® ConnectX®-5 100G RoCE Converged Adapter
- Mellanox Spectrum® SN2100 100G Open Ethernet Switch with RDMA support
- Microsoft Storage Spaces Direct
- Windows Server® 2016 or later

Mellanox and Western Digital present a high performance, all-flash storage system combining the performance of NVMe™ with 100G converged Ethernet.

Storage in the enterprise used to be confined to large and expensive centralized SANs, initially built with massive arrays of hard drives and later constructed with SAS SSDs and connected to the rest of the network over Fibre Channel interfaces. But as the volume of data grows in these centralized SANs, and performance needs increase, these centralized SAN configurations become very expensive and inefficient.

Enterprises have migrated from the centralized SAN architecture to a distributed, Software Defined Storage (SDS) architecture. Instead of placing storage in a single SAN with limited connectivity and high network latency, storage is instead distributed among industry standard servers connected to each other and the rest of the network with ultra-high-speed Ethernet. This also allows for newer technologies to provide even better solutions. One of the most popular options available is Microsoft's Storage Spaces Direct (S2D).

Building a high-performance Storage Spaces Direct system can be complicated. Servers need to be matched with the fastest SSD technology to ensure data can be accessed at high speeds, and that means NVMe. They also need to communicate within the S2D cluster and the rest of the network at the highest possible speeds, and that means 100G Ethernet with RoCE RDMA support.



## All-Flash Storage Spaces Direct with NVMe over 100G

Western Digital and Mellanox have collaborated to develop an all-flash, performance-oriented Storage Spaces Direct solution that combines NVMe-based Ultrastar DC SN630 SSDs with the Mellanox ConnectX-5 100G Converged Ethernet adapters and Mellanox Spectrum SN2100 100G switch. While this highly-available storage solution requires only four single socket AMD EPYC™-processor powered servers, it can deliver nearly 2M 4K random read IOPS and up to 35 GB/s of read bandwidth to data-hungry applications like databases or business intelligence systems. This kind of performance can happen only through the combination of the latest technologies: NVMe and Converged 100G Ethernet.

### Ultrastar DC SN630 NVMe SSD

The Ultrastar DC SN630 is an enterprise class NVMe SSD optimized for balanced price and performance cloud storage. NVMe was developed to connect high performance flash memory to compute resources over native PCIe links. It eliminates the legacy SCSI command stack and direct-attached storage (DAS) bottlenecks associated with traditional



Ultrastar DC SN630 NVMe SSD

SATA and SAS. The Ultrastar DC SN630 is available in capacities from 960GB to 7.68TB<sup>1</sup> in a standard, front-loading 2.5" U.2 form factor. Utilizing 64-layer 3D NAND, it delivers high performance with excellent QoS and at a great IOPS-per-dollar and IOPS-per-Watt metrics. The Ultrastar DC SN630 provides a building block software defined storage architects can use for the highest performance solutions.

## Western Digital.

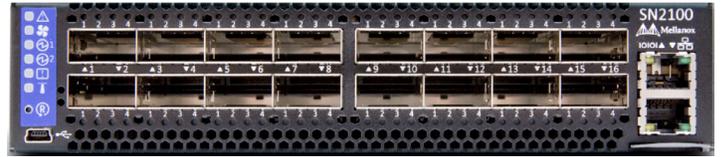
5601 Great Oaks Parkway  
San Jose, CA 95119, USA  
**US (Toll-Free):** 800.801.4618  
**International:** 408.717.6000

[www.westerndigital.com](http://www.westerndigital.com)

©2019 Western Digital Corporation or its affiliates. All rights reserved. Western Digital, the Western Digital logo, and Ultrastar are registered trademarks or trademarks of Western Digital Corporation or its affiliates in the US and/or other countries. Mellanox, ConnectX and Mellanox Spectrum are registered trademarks of Mellanox Technologies, Ltd. The NVMe word marks is a trademark of NVM Express, Inc. AMD, the AMD logo, EPYC, and combinations thereof are trademarks of Advanced Micro Devices, Inc. All other marks are the property of their respective owners.

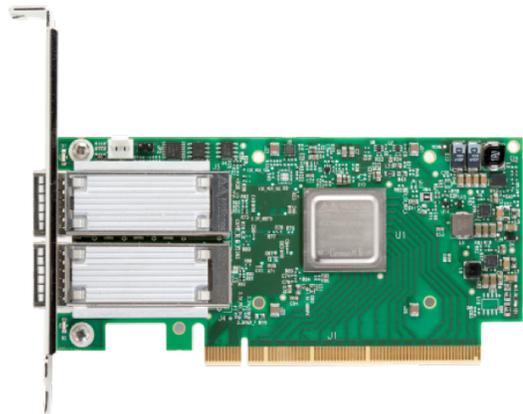
<sup>1</sup>One gigabyte (GB) is equal to 1,000MB (one billion bytes) and one terabyte (TB) is equal to 1,000GB (one trillion bytes) when referring to solid-state capacity. Accessible capacity will vary from the stated capacity due to operating environment.

## ConnectX-5 NIC RoCE and Spectrum SN2100 Switch



Spectrum SN2100 Switch

The introduction of 100G Ethernet is a game-changer in the networking space, eliminating the network bottlenecks common in hyperconverged systems. With the addition of RDMA, in the form of RoCE (RDMA over Converged Ethernet), overhead in shared storage systems can be dramatically minimized, freeing up CPU cycles for advanced data services in shared storage systems like Microsoft's Storage Spaces Direct.



ConnectX-5 NIC

The ConnectX-5 provides two ports of 100Gb/s Ethernet connectivity, sub-700 nanosecond latency, very high message rates, plus PCIe switch and NVMe-over-Fabric offloads. These enable the highest performance and most flexible solution for the most demanding applications and markets.

Spectrum SN2100 switches are ideal for leaf and spine data center network solutions, allowing maximum flexibility, with port speeds spanning from 10Gb/s up to 100Gb/s per port and port density that enables full rack connectivity to any server at any speed.

Learn more at <https://www.westerndigital.com/products/data-center-drives/ultrastar-nvme-series-ssd> and [http://www.mellanox.com/page/products\\_overview](http://www.mellanox.com/page/products_overview).