Modular Building Block for Open, Composable IT Infrastructure

With the exponential growth in data, along with the increasing diversity of workflows and demands on IT infrastructure, businesses need to increase speed, agility, and time-to-value for their customers. Emerging as a solution for this, composable infrastructure is a new architectural approach that—using NVMe™-over-Fabrics—will vastly improve compute and storage utilization, performance, and agility in the data center.

Enabling Fast Data to Live Outside the Server

NVMe-over-Fabrics, or NVMe-oF™, is a networked storage protocol that allows storage to be disaggregated from compute to make that storage widely available to multiple applications and servers. By enabling applications to share a common pool of storage capacity data can be easily shared between applications or needed capacity can be allocated to an application regardless of location.

Exploiting NVMe device-level performance, NVMe-oF promises to deliver the lowest end-to-end latency from application to shared storage. NVMe-oF enables composable infrastructures to deliver the data locality benefits of NVMe DAS (low latency, high performance) while providing the agility and flexibility of sharing storage and compute.

Multiple Storage Tiers over the Same Wire—Disk and Flash Accessed via NVMe-oF

In addition to enabling NAND flash media access using NVMe-oF, Western Digital has also enabled disks to be accessed via NVMe-oF so that all data center storage can be addressed in the same way. The Western Digital NVMe-oF architecture is a huge step towards the software-defined data center—allowing storage to be assigned to applications without regard for where it is physically located. This is the essence of "composable infrastructure" where physical resources (compute, networking, storage) can be logically and dynamically configured and treated as a resource for a specific application without the need for physical configuration.

Western Digital will initially offer two composable storage options—flash for high-performance, mission-critical apps, and data as well as disk for high-capacity tiering, data protection, and disaster recovery.
## Specifications

### OpenFlex F3100 Fabric Device

<table>
<thead>
<tr>
<th>CRU P/N</th>
<th>1EX2413</th>
<th>1EX2414</th>
<th>1EX2415</th>
<th>1EX2416</th>
<th>1EX2417</th>
<th>1EX2418</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity/Endurance</td>
<td>12.8TB 2DWPD</td>
<td>25.6TB 2DWPD</td>
<td>51.2TB 2DWPD</td>
<td>15.4TB 0.8DWPD</td>
<td>30.7TB 0.8DWPD</td>
<td>61.4TB 0.8DWPD</td>
</tr>
<tr>
<td>Random Read (4KB, QD=1024)</td>
<td>2199K IOPs</td>
<td>2164k IOPs</td>
<td>2176k IOPs</td>
<td>2111k IOPs</td>
<td>2160k IOPs</td>
<td>2191k IOPs</td>
</tr>
<tr>
<td>Random Write (4KB, QD=1024)</td>
<td>1493K IOPs</td>
<td>1431k IOPs</td>
<td>1464 IOPs</td>
<td>1433k IOPs</td>
<td>1397k IOPs</td>
<td>1400k IOPs</td>
</tr>
<tr>
<td>Random 70R/30W (4KB, QD=1024)</td>
<td>2199K IOPs</td>
<td>2183k IOPs</td>
<td>2227K IOPs</td>
<td>2137k IOPs</td>
<td>2188k IOPs</td>
<td>2251k IOPs</td>
</tr>
<tr>
<td>Sequential Read (128KB, QD=320)</td>
<td>11.8 GB/s</td>
<td>11.7 GB/s</td>
<td>11.7 GB/s</td>
<td>11.7 GB/s</td>
<td>11.7 GB/s</td>
<td>11.7 GB/s</td>
</tr>
<tr>
<td>Sequential Write (128KB, QD=320)</td>
<td>9.9 GB/s</td>
<td>9.9 GB/s</td>
<td>9.4 GB/s</td>
<td>9.9 GB/s</td>
<td>9.4 GB/s</td>
<td>9.9 GB/s</td>
</tr>
<tr>
<td>Random Write Latency (4KB, QD=1, 99.99%)</td>
<td>33.9 us</td>
<td>33.7us</td>
<td>33.7us</td>
<td>33.7 us</td>
<td>33.9 us</td>
<td>33.5 us</td>
</tr>
</tbody>
</table>

1 Que depth for 61.4TB device optimized at 1536, not 1024 as stated for other capacities

Latency measured through a single Mellanox SN2700 switch

K IOPs = IOPs x 1000

Devices pre-conditioned with 2 full sequential fills

---

### OpenFlex E3000 Fabric Enclosure with up to 10 OpenFlex F3100 Series Fabric Devices

- Max. # of Devices: 10 Dual-port fabric device bays
- Weight: Product fully populated: 68.5kg (151.0 lbs)
- Fabric/Network Interface: Dual QSFP28 per Device
- Management: RJ45 10Gbps connector, Open Composable API (in band or out of band via RJ45)³
- LED Indicators: Power/Activity, Locate and Fault
- Physical Dimensions: Height 131mm (5.16"), Width 447mm (17.61"), Depth 828mm (32.60")
- Power: 220V, Dual 1600W Power Supplies with fans
- Serviceability: Hot-swappable power supplies, fans, and fabric devices

### Other Details

- For more information on the OpenFlex Architecture and Open Composability, visit: [http://www.wdc.com/nvmf](http://www.wdc.com/nvmf)
- One MB is equal to one million bytes, one GB is equal to one billion bytes and one TB equals 1,000GB (one trillion bytes) when referring to storage capacity. Accessible capacity will vary from the stated capacity due to formatting and partitioning of the drives, the operating system and other factors.

---

**OpenFlex F3100 Series Fabric Device**

- Protocol: Ethernet
- Media: NAND Flash
- Ports: Dual QSFP28 (2×50GbE)
- Bandwidth: 12GB/s
- Power: 140 W
- Endurance: 1 DWPD
- Formatted Capacity (TB): 15.3, 30.7, 61.4, 12.8, 25.6

---

**OpenFlex E3000 Fabric Enclosure with up to 10 OpenFlex F3100 Series Fabric Devices**

- Max. # of Devices: 10 Dual-port fabric device bays
- Weight: Product fully populated: 68.5kg (151.0 lbs)
- Fabric/Network Interface: Dual QSFP28 per Device
- Management: RJ45 10Gbps connector, Open Composable API (in band or out of band via RJ45)³
- LED Indicators: Power/Activity, Locate and Fault
- Physical Dimensions: Height 131mm (5.16"), Width 447mm (17.61"), Depth 828mm (32.60")
- Power: 220V, Dual 1600W Power Supplies with fans
- Serviceability: Hot-swappable power supplies, fans, and fabric devices

---

**Protocol**

- Ethernet

**Media**

- NAND Flash

**Ports**

- Dual QSFP28 (2×50GbE)

**Bandwidth**

- 12GB/s

**Power**

- 140 W

**Endurance**

- 1 DWPD

**Formatted Capacity (TB)**

- 15.3, 30.7, 61.4, 12.8, 25.6

---

**OpenFlex E3000 Fabric Enclosure with up to 10 OpenFlex F3100 Series Fabric Devices**

- Max. # of Devices: 10 Dual-port fabric device bays
- Weight: Product fully populated: 68.5kg (151.0 lbs)
- Fabric/Network Interface: Dual QSFP28 per Device
- Management: RJ45 10Gbps connector, Open Composable API (in band or out of band via RJ45)³
- LED Indicators: Power/Activity, Locate and Fault
- Physical Dimensions: Height 131mm (5.16"), Width 447mm (17.61"), Depth 828mm (32.60")
- Power: 220V, Dual 1600W Power Supplies with fans
- Serviceability: Hot-swappable power supplies, fans, and fabric devices

---

### Notes

1. Projected specifications subject to change without notice

2. For more information on the OpenFlex Architecture and Open Composability, visit: [http://www.wdc.com/nvmf](http://www.wdc.com/nvmf)

3. One MB is equal to one million bytes, one GB is equal to one billion bytes and one TB equals 1,000GB (one trillion bytes) when referring to storage capacity. Accessible capacity will vary from the stated capacity due to formatting and partitioning of the drives, the operating system and other factors.

---

**Western Digital.**

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

© 2019 Western Digital Corporation or its affiliates. Produced 10/19. All rights reserved. Western Digital, the Western Digital logo, and OpenFlex are registered trademarks or trademarks of Western Digital Corporation or its affiliates in the US and/or other countries. The NVMe word mark is a trademark of NVM Express, Inc. All other marks are the property of their respective owners. References in this publication to Western Digital products, programs, or services do not imply that they will be made available in all countries. Product specifications provided are sample specifications and do not constitute a warranty. Actual specifications for unique part numbers may vary. Please visit the Support section of our website, [http://www.wdc.com/dc-platforms](http://www.wdc.com/dc-platforms), for additional information on product specifications. Pictures shown may vary from actual products.