



# Nebula™

## 2U NVMe Expansion Storage System



Nebula is an NVMe-based, all flash array product in a single 2U enclosure. Supporting up to 24 U.2 dual port NVMe drives, Nebula is a high performance, low latency, resource sharing and high availability hardware solution.

### Ultra-Fast NVMe JBOF

In 2016, Celestica announced Nebula - the industry's first storage expansion enclosure (JBOF) using ultra-fast Non-Volatile Memory Express (NVMe) SSDs. Nebula is a hardware solution dedicated to the rapidly expanding Flash market. It features 24 U.2 NVMe SSDs in a 2U storage enclosure and delivers extremely high performance for those applications that require low latency and high data rates.

### High Availability Solution

Nebula features 24 NVMe drives with dual redundant PCIe-based expansion modules, power supplies and an HBA (host bus adapter) for connection to the host. It provides redundant data access to all of the hot swappable drives and with redundant hot swappable power supplies.

### Out of Box Capacity at In the Box Speed

NVMe-based SSDs represent the latest emerging solid state storage technology. NVMe is based upon Flash technology, which utilizes PCIe, the same ultra-high speed interface that communicates directly with the CPUs in all servers. Combining NAND Flash with a high-speed interface virtually eliminates latency between the storage enclosure and processor, resulting in extremely high performance. Applications such as OLTP (on-line transaction processing) where low latency is a must, gain significant performance advantages.

### Queue Depth

NVMe is architected to provide significantly greater number of queues than SAS Architecture. Achieving up to 65,000 queues and 65,000 command queue depths are possible.

### No Waiting for SAS Interfaces

Traditional enclosures have relied on HDD technology for their storage expansion capabilities, limiting data rates to roughly 3Gbp. This results in milliseconds of latency delay waiting for the media to spin under the head. With HDDs, the latency delay from SAS was tolerable, however, with SSD transfer rates, these latencies are unacceptable. Using NVMe avoids complexity and software overhead from the SCSI protocol.

### Reliability

Nebula is based on an existing high-reliability 2U platform that has been in use for five years, with a field population of more than 500,000 units. By adapting an existing solution, Celestica delivers lower total cost with faster time to market. Microsemi, the leading supplier of both PCIe switch and SAS technology, worked jointly with Celestica to develop the Nebula solution, delivering yet another first-to-market for a Storage technology. Early access customers have reported revolutionary performance gains using the Nebula platform.



**Enterprise-Class Quality. Cloud Economics.**

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## FEATURES

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All flash array, NVMe technology

2U height, rack mount

Up to 24 U.2 NVMe SSDs supported

- 8Gbps PCIe
- Dual port, x2 + x2 PCIe lanes for each SSD

Enclosure Management

- In-band Management Interface
- Enclosure Health Monitor
- Enclosure Cooling Control
- System Event Log
- On-line Firmware Update
- SSD Hot-Plug Management
- Domain Configuration

Dual Expansion Storage Module (ESM)  
to support 1+1 redundant

- 8 port ESM, SFF-8644 connector

Supports hot-swappable ESMs, PSUs and SSDs

Supports LED indicators and rail kits

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## POWER AND COOLING

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900W, 80 plus gold, 1+1 redundant, hot swap PSU

89-264V AC input, auto ranging, 47-63Hz

Four high performance fan modules integrated  
in each PSU, front to rear system cooling

Fan speed controlled by system software

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## PHYSICAL DIMENSIONS

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Height: 87.4 mm (3.44")

Width: 446 mm (17.56")

Depth: 536 mm (21.10")

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## ENVIRONMENTAL

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Operating Temperature: 5°C to 40°C

Non-Operating Temperature: -30°C to 60°C

Humidity: 8% to 80% RH

Operating Altitude: 950 m at 40°C

Sound Pressure: (23+/-2°C) <6.5 Bels

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## APPROVALS

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EMC: EN 55022 Class A, EN55024, EN 61000-3-2,  
EN 61000-3-3, FCC part 15 Class, VCCI Class A,  
ICES-003 Class A, GB9254 Class A

Safety: IEC/EN/UL/CSA 60950-1, GB4943,  
CB/cUL/CCC/CE

Environment: RoHS

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*Note: All specifications and figures are subject to change  
without prior notice.*