

# Unlock the Potential of Tomorrow's Technologies, Today

Celestica's Hardware Platform Solutions





# Innovative, Flexible Solutions for Datacenter and IT Infrastructure Markets

Celestica's mission is to enable the world's best businesses to turn their vision into reality. We build trusted relationships and solve complex technology challenges to help our customers realize greater value, potential and outcomes.

At Celestica, we bring over 25 years of experience in manufacturing and supply chain, a simplified and optimized global network, and our world-class design and engineering expertise together with a single goal in mind – to find the way for our customers to succeed in achieving their business goals.

Celestica is a global technology partner with market-led investments in the design, production and service of innovative connectivity and cloud solutions. By leveraging our robust, leading-edge portfolio of Hardware Platform Solutions, we enable our customers to deploy high quality, innovative products to their markets faster, while lowering R&D and production costs. Our cutting-edge compute, storage, networking and converged solutions deliver flexibility and customization for today's challenging datacenter and IT infrastructure markets.



**\$5.8B**  
in 2019 revenue



**24,500**  
employees worldwide



**36** locations in **14**  
countries, headquartered  
in North America

## Enabling the Technologies of Tomorrow, Today

Machine learning, A.I., edge computing and 5G are pushing the boundaries of what's possible, forcing businesses to keep up with increasing demands and an accelerating pace of innovation. With hardware solutions across the technology stack and strong ties to the software and silicon ecosystem, Celestica is enabling our customers to unlock the potential of tomorrow's technologies, today.

Celestica's comprehensive portfolio of hardware platform solutions can be leveraged to efficiently support the growing demands of today's evolving markets.

### Highlights of our leading-edge solutions include:



#### **CONVERGED** **Athena+™**

Powerful 2U  
Rackmount Platform  
Supporting NVMe  
All-Flash Array  
Dual-port SSD



#### **ACCELERATOR CARD** **VCAC-A Card**

Power-efficient  
Visual Cloud Solution  
for AI Inference  
and Media Analytics  
Applications at the Edge



#### **NETWORKING** **Silverstone™**

Industry-leading  
400GbE Datacenter  
Infrastructure Switch



#### **NETWORKING** **Edgestone™**

Cutting-edge  
100GbE Switch for  
Edge Computing  
Deployments with  
Limited Rack Space

### Upcoming Hardware Platform Solutions include:

#### **CONVERGED**

##### **Athena Gen2**

Featuring:

- Dual Intel Ice Lake CPUs
- Dual Broadcom PCIe-Gen4 switches
- 4 PCIe slots per node
- Redfish supported

#### **STORAGE**

##### **Nebula Gen2**

High performance all flash array  
NVMe JBOF platform supporting  
24 dual-port SSD

Featuring:

- PCI-Gen4

#### **STORAGE**

##### **Euclid Gen2**

Leading-edge all flash array  
NVMeoF JBOF platform  
supporting 24 dual-port SSD

Featuring:

- PCI-Gen4

#### **STORAGE/SERVER**

##### **Titan JBOD Gen2**

High density 4U JBOD storage  
platform with 90 HDD



Featuring:


- SAS-4 (24Gb/s)

# Compute, Storage and Networking Technology Solutions

## Proven, Invested Hardware Platform Solutions

Our robust portfolio provides innovative solutions across the technology stack.

 COMPUTE			 STORAGE		
Edge	Rack Optimized	Other	Storage Expansion	Controller	Bulk Storage
1U Server	1U Rack Optimized Server	2U4N Server	2U NVMe JBOD 2U NVMeoF	High-end Controller	60-Bay 3.5-Drive
2U Server (concept)	2U Rack Optimized Server	4U 8-GPU Server (concept)	2U SAS/SATA JBOD	Mid-range Storage Controller	90-Bay 3.5-Drive

 NETWORKING						
Management Switch	Top of Rack, Leaf/Spine Switch	Modular/ Core Switch	Deep Buffer Switch/Router	Datacenter Interconnect	Campus/ Enterprise	Carrier/ Telecom
1G/10G, Layer 2+	10G/25G/100G	100G/200G/ 400G	100G/400G fixed	Fixed Coherent Transponder	Layer 2+ Fixed	Virtual PON Access, uCPE
1G/10G, Layer 3	25G/100G/ 400G	400G/800G	100G/400G Modular/ Scalable	Modular Coherent Transponder	Layer 3 Premium	Backhaul, Edge

## Flexible end-to-end solutions

- Established Compute, Storage and Networking partner, delivering hardware solutions to the market for Tier 1 Enterprise and Service Provider customers
- High availability compute roadmap supporting NVMe/SAS/SATA drives
- Comprehensive storage roadmap featuring Flash and NVMeoF platforms
- Evolving our technology roadmap from 12G to 24G SAS, PCIe Gen3/4/5
- High performance, competitive networking roadmap in 100G/400G/800G fixed and modular platforms
- Proven On-Board Optics (OBO) and Pluggable Interface Module (PIM) solutions
- Full architecture turnkey product development
- Deep engagement with the technology ecosystem and marketplace, including strong support for a variety of underlying software abstractions
- Global scale combined with the customer focus of a specialized partner
- Industry-leading engineering capability with a reputation for innovation and thought leadership

## Complete Lifecycle Solutions

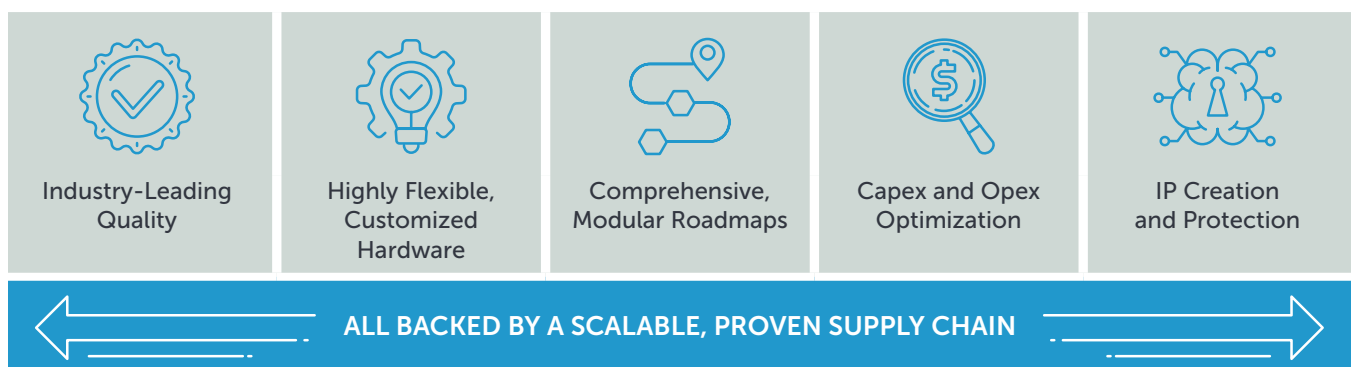
Celestica provides a complete range of lifecycle services. From the drawing board to full-scale production and after-market services, we deliver expertise, insight and innovation at every stage of the product development process. Our flexible engagement models enable joint design, customized hardware solutions or fully-realized, ready-now hardware for your business.

We tailor your product development, launch process, and after-market care programs to align to your specific needs – providing complete end-to-end solutions.

With cutting-edge Hardware Platform Solutions designed for efficiency, performance and re-use, as well as our industry-leading supply chain and after-market care programs, we enable our customers to focus on their markets and build a better future.



## Delivering Value Throughout the Product Lifecycle:








# Celestica's Global Services Offerings

## Capture untapped value across the post-fulfillment lifecycle

- 1 **Extend life.** Keep your equipment in a high value state of use for as long as possible through certified repair, upgrade, remanufacture and redeployment.
- 2 **Maintain performance.** Extend datacenter and hardware support to maintain continuous levels of capacity, performance and availability.
- 3 **Transform value.** Give your end-of-use equipment transformational value and new life through creative upcycling and redistribution.

Our unique approach helps you extract the greatest value and utilization from your hardware infrastructure while minimizing total cost of ownership and environmental impact.

 LIFECYCLE EXTENSION SERVICES	 AFTERMARKET SUPPORT SERVICES	 DECOMMISSION & UPCYCLING SERVICES	 MANAGED LOGISTICS SERVICES
<ul style="list-style-type: none"><li>• Certified repair and refurbishment</li><li>• Advanced CTO remanufacturing and product design</li><li>• Hardware upgrades onsite and offsite</li><li>• Redeployment and re-kitting</li></ul>	<ul style="list-style-type: none"><li>• Datacenter maintenance</li><li>• 24/7 field services</li><li>• Depot services</li><li>• Service contract and service level agreement mgmt</li></ul>	<ul style="list-style-type: none"><li>• Asset recovery and onsite services</li><li>• Remanufacturing and redistribution</li><li>• Lease return, OEM trade-in and hardware takeback</li><li>• Global remarketing for E&amp;O equipment, parts and components</li><li>• Advanced recycling, material harvesting and reclamation</li><li>• Facility shutdown and migration services</li></ul>	<ul style="list-style-type: none"><li>• Global carrier mgmt with real-time visibility and centralized data repository</li><li>• Optimized forward and reverse logistics for freight savings of 10%-30%</li><li>• Transportation management</li><li>• Onsite inventory reconciliation, packing and palletizing</li></ul>
<div> Celestica's SpectrumPro manages all process steps, analytics and reporting for our Global Services business. As an industry-leading proprietary software, SpectrumPro is fully customizable and enables customers to view their repair status and inventory information 24/7.</div>			



# Celestica's Compute, Storage and Converged Solutions



## Storage Solutions Features

STORAGE		Athena+	Nebula	Euclid	El Lobo	Titan JBOD	Titan Storage Controller	Titan Server	Rainbow
MODEL #		P2522	XF2024	XF2024	X2012 X2024	XD4090	P4511	P4521	X4060
DESCRIPTION		High availability, dual-node flash storage platform, supports 24 NVMe dual ported SSD	NVMe JBOF supporting 24 dual-port SSD	NVMeoF JBOF supporting 24 dual-port SSD	2U SBB2.0 JBOD enclosure supporting LFF/SFF SAS/SATA/SDD drives	High density 4U JBOD with 90 HDD	High density 4U enclosure with fully redundant storage controllers	High density 4U enclosure with fully redundant dual socket servers	Dense 4U JBOD with 60 HDD
USE CASE	Cloud Storage	✓	✓	✓	✓	✓	✓	✓	✓
	Video Surveillance	-	-	-	✓	✓	✓	✓	✓
	Object Storage	✓	✓	✓	✓	✓	✓	✓	✓
	External Storage	✓	✓	✓	✓	✓	✓	✓	✓
	All Flash	✓	✓	✓	✓	-	-	-	-
CONFIG		2U HA Controller	2U HA JBOF	2U HA JBOF	2U HA JBOD	4U HA JBOD	4U HA Controller	4U HA Server	4U HA JBOD
CPU/DIMM		x2 Intel Xeon/2nd Gen Intel Xeon x24 DIMM	N/A	N/A	N/A	N/A	x1 Intel Xeon/2nd Gen Intel Xeon x6 DIMM	x2 Intel Xeon/2nd Gen Intel Xeon x12 DIMM	N/A
I/O PORT		2x USB3.0 per node 4x 10G LAN per node	8xMini SAS HD	2x100G Ethernet	6x Mini SAS-3 HD	8xMini SAS-3 HD	4 x1G RJ45 8xMini SAS-3 HD	4 x1G RJ45 8xMini SAS-3 HD	4x Mini SAS-3 HD
MGMT INTERFACE		BMC	SES	BMC	SES	SES or BMC	SES & BMC	SES & BMC	SES
EXPANSION SLOTS		3X PCIE x16 slots per node	N/A	N/A	N/A	N/A	1x16 per node	x1 OCP x1 Qual SFP+	N/A
NTB		Two x8	N/A	N/A	N/A	N/A	x8	x8	N/A
DRIVE FORM-FACTOR		2.5"	2.5"	2.5"	2.5"/3.5"	2.5"/3.5"	2.5"/3.5"	2.5"/3.5"	2.5"/3.5"
DRIVE COUNT		24	24	24	12/24	90	90	90	60
DRIVE TYPE		NVMe	NVMe	NVMe	SAS/SATA	SAS/SATA	SAS/SATA	SAS/SATA	SAS/SATA
POWER LOSS PROTECTION		BBU	N/A	N/A	N/A	N/A	BBU	N/A	N/A
POWER		2000W	900W	900W/1200W	600W	1200W	1600W	1300W	1200W
DIMENSION H*W*D MM		87.6*446*821	87.4*446*536	87.4*446*536	87.4*446*531	175*446*1006	175.3*446*1025	175.3*446*1175	175.4*424*848
WEIGHT		42 kg	22 kg	26 kg	22 kg	135 kg	145 kg	145 kg	90 kg



## Compute and Converged Solutions Features

COMPUTE/CONVERGED		Thor	Loki	Tyr SE	Heimdall	Ares
MODEL #		S2422	S1122	S2123	S111D2	S111D2
DESCRIPTION		Multi-node Xeon SP 2U rack server with all NVMe capability ideal for hyper-converged	All-purpose Enterprise and Cloud 1U Xeon SP rack server with all NVMe capability	All-purpose Enterprise and Cloud 2U Xeon SP rack server with all NVMe and GPGPU support	1U Xeon-D MEC server with NVMe SSD, ideal for edge computing and 5G	1U Xeon-D OTII MEC server with NVMe SSD, ideal for edge computing and 5G
USE CASE	HPC	✓	✓	✓	-	-
	HCI	✓	-	-	-	-
	SDS	-	✓	✓	-	-
	BigData	✓	✓	✓	-	-
	Cloud Computing	✓	✓	✓	✓	✓
CONFIG		2U-4 Node	1U-1 Node	2U-1 Node	1U-1 Node	1U-1 Node
CPU		Intel Xeon/2nd Gen Intel Xeon	Intel Xeon/2nd Gen Intel Xeon	Intel Xeon/2nd Gen Intel Xeon	Intel Xeon D 2100	Intel Xeon D 2100
CPU PER NODE		2	2	2	1	1
ONBOARD IO		2x1G RJ45	1 BMC MGMT	1 BMC MGMT	2x1G RJ45, 4x10G SFP+	2x1G RJ45, 4x10G SFP+
EXPANSION SLOTS		Up to 3 per node	Up to 2 +1xOCP	Up to 8 +1xOCP	2x PCIe x16	2x PCIe x16 +1xOCP
DIMM SLOTS		24	24	24	4	4
DRIVE FORM-FACTOR		2.5"	2.5"	2.5"/3.5"	2.5"	2.5"
DRIVE COUNT		24	10	24/12 +2 rear	2	2
DRIVE TYPE		SAS/SATA/NVMe	SAS/SATA/NVMe	SAS/SATA/NVMe	SATA/NVMe	SATA/NVMe
BOOT DEVICE		2xM.2 SATA/NVMe	2xM.2 SATA	2xM.2 SATA	2x M.2 SATA/NVMe	2x M.2 SATA/NVMe
POWER		1600W/ 2000W	550W/ 800W	800W/ 1200W	550W	550W
DIMENSION H*W*D MM		87.1*446*860	43*448*760	87*448*760	43.6*438*410	43.6*438*410
WEIGHT		58 kg	16 kg	26 kg	8 kg	8 kg

# Athena+™

## 2U Rackmount High Performance NVMe Platform



**Athena+ is a high availability, dual-node flash storage platform that supports 24 PCIe NVMe dual ported solid state drives (SSD). Both nodes utilize a pair of the new Intel® Xeon® Scalable Processors for excellent Software Defined Storage capabilities.**

### **Analytics**

Ideal for use in data analytics applications, Athena+ combines 24 dual ported NVMe SSDs in the same platform as a pair of compute nodes with dual Intel® Xeon® Scalable Processors, giving it high performance with extremely low latency.

### **Software Defined Architecture**

Athena+ is an excellent hardware platform for OEMs to deploy their software-defined intelligence. In doing so, Athena+ has the flexibility to work for converged infrastructure applications or more malleable composable applications, depending on the needs of the OEM's target customers.

### **High Availability Solution**

Dual redundant controller nodes deliver an effective HA solution. Features like dual redundant hot swappable power supplies plus optional battery backup units provide redundant data access to all of the hot swappable NVMe modules.

### **Flexibility**

Athena+'s base 2U Rackmount platform supports 24 PCIe NVMe dual-port solid state drives (SSD). With its two redundant computing nodes, Athena+ can be tailored to provide powerful compute or storage workloads. Four native 10GbE ports, plus 3 PCIe expansion slots per node enable further tuning to the required application, such as All Flash Arrays and High Performance Compute.

### **Reliability**

Athena+ is the 4th generation Storage platform Celestica has delivered to OEM customers. Hundreds of thousands of platforms are currently in use worldwide, with extremely low failure rates. Modular design methodology and reuse by the seasoned engineering team ensures the same enterprise quality the industry has come to expect from Celestica.

## FEATURES

2U chassis, fits 19" rack  
2x hot-swap computing nodes  
24x PCIe NVMe SSDs  
Dual redundant power supplies  
3 PCIe (x16) low profile slots per node  
Optional on-board BBUs available for node power in the event of AC power loss

## NODE FEATURES

Dual Intel Xeon/2nd Gen Intel Xeon Scalable Processors  
24x DDR4 DIMMs support RDIMM/LRDIMM  
Support BMC (ASPEED AST2500)  
3 PCIe x16 slots  
4x 10Gb LAN (RJ45)

## POWER AND COOLING

Two 2000W 80 plus Platinum, off-the-shelf CRPS  
200-240Vac, 47-63 Hz  
1+1 redundant, hot-swappable  
Ten 40x56 FAN, hot-swapped with Compute node (5 per node)

## PHYSICAL DIMENSIONS

Height: 87.3 mm (3.44")  
Width: 447 mm (17.6")  
Depth: 825 mm (32.48")

## ENVIRONMENTAL: OPERATING

Temperature: 5°C to 35°C  
Humidity: 8% to 85% RH  
Altitude: 0 to 950 m (De-rate temperature 1°C per 300 m above 950 m)  
Shock: 10G, 5ms half sine pulse width  
Vibration: 0.278 Grms; 5-500Hz;  
Random Vibration Spectrum

## ENVIRONMENTAL: NON-OPERATING

Temperature: -40°C to 60°C  
Humidity: 8% to 95% RH  
Altitude: 0 to 12,000 m  
Shock: 35G, 152 in/sec; Trapezoidal Shock  
Vibration: 1.04 Grms with Power Spectrum;  
1-200 Hz; (transit)

## APPLICATION TOPOLOGY

Address mainstream applications with dual Intel Xeon® Scalable processors per node  
Extremely low latency and high bandwidth  
Delivers 184TB using 7.68TB NVMe SSD  
3 PCIe x16 slots available in 3HHHL or 1FHHL + 2HHHL configurations  
2x USB 3.0  
VGA  
4 10Gb LAN connectors

## APPROVALS

EMC: EMI Class A, FCC, ICES-003, CE, VCCI  
Safety: CB Scheme, cUL, IEC/UL62368  
Environment: RoHS, REACH, WEEE

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



# 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.

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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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# Euclid™

## 2U NVMeoF JBOF



Euclid is an all flash array NVMe over Fabric (NVMeoF) system in a 2U enclosure, supporting 24 2.5" dual port NVMe drives. Euclid is a high performance solution, delivering low latency and high availability.

### FEATURES

- All flash array, NVMe technology
- 2U rack mount enclosure
- Up to 24 2.5" NVMe SSDs supported
  - Dual port, x2 + x2 PCIe lanes for each SSD
- Dual Canister to support 1+1 redundant
- Planned Canister SKUs
  - Base canister with no COMe/Card
  - COMe + Mellanox CX5 RNIC
  - Single Broadcom Stingray
  - Dual Broadcom Stingray
  - Single Mellanox Bluefield
- Fabric Interface:
  - Up to four 100Gb Ethernet ports per system
  - Up to four PCIe slots per system
  - Support RoCE v2
- BMC (AST2500)
  - Supports IPMI
  - KVM and Virtual Media
  - Supports Remote Boot
- Enclosure Management
  - PCIe In-band Management Interface
  - Enclosure Health Monitor
  - Enclosure Cooling Control
  - System Event Log
  - On-line Firmware Update
- Hot-Swappable Canisters, PSUs and SSDs

### POWER AND COOLING

- 900W/1200W, 80 plus Platinum, 1+1 redundant, hot swap PSU
- 89-264V AC input, auto ranging, 47-63Hz
- Four high-performance fan modules integrated in each PSU providing front to rear system cooling
- Fan speed control by system software

### PHYSICAL DIMENSIONS

- Height: 87.4 mm (3.44")
- Width: 446 mm (17.56")
- Depth: 536 mm (21.10")

### ENVIRONMENTAL

- Operating Temperature: 5°C to 35°C
- Non-Operating Temperature: -40°C to 60°C
- Humidity: 8% to 85% RH
- Operating Altitude: 950 m
- Acoustic: (23+/-2°C) <6.6 Bels

### APPROVALS

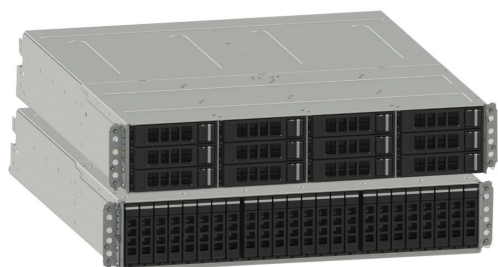
- EMC: EN 55032 Class A, EN55024, EN 61000-3-2, EN 61000-3-3, FCC part 15 Class, VCCI Class A, ICES-003 Class A, GB9254 Class A,
- Safety: IEC/EN/UL/CSA 60950-1, GB4943
- Environment: RoHS

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# El Lobo JBOD™

## 2U SBB Storage Enclosure JBOD System



El Lobo is a 2U SBB2.0 JBOD enclosure supporting LFF/SFF SAS/SATA/SDD drives providing excellent performance and high availability.

### ENCLOSURE

Supports SAS 6/12 Gbps  
Up to 12 3.5" SAS/SATA HDD hot-swap drives  
Up to 24 2.5" SAS/SATA HDD/SSD hot-swap drives  
Supports HA and non-HA configurations  
SBB2.0

### PHYSICAL DIMENSIONS

Height: 87.4 mm (3.49")  
Width: 446 mm (17.6")  
Depth: 531 mm (20.9")  
Weight: approx. 22 Kg (without drives)

### ESM CANISTER

Three mini-SAS HD ports  
Microsemi Expanders (PM8054)  
Supports SCSI enclosure management  
One UART via 3.5 mm jack

### POWER SUPPLY

Standard

- 1U 600W peak, hotswap and redundant
- 90-264VAC auto-ranging, 47 Hz-63 Hz input
- Integrated N+1, redundant system cooling

### ENVIRONMENTAL: OPERATING

Temperature: 5°C to 40°C  
Humidity: 8% to 85% (Non-condensing)  
Altitude: 0-3050 m, 950 m @40 °C; 3050 m @28 °C  
Note: Maximum temperature is reduced by 1°C/175 meter (1°F/319 feet) above 950 meters (3,117 feet)  
Shock: 3g,11 ms, half sine shock  
Vibration: 0.15Grms, 5-100Hz  
Acoustic: <6.5Bels LwA @23 °C

### ENVIRONMENTAL: NON-OPERATING

Temperature: -40°C to 60°C  
Humidity: 5% to 95% (Non-condensing)  
Altitude: 0-3050m (0 to 12,000')  
Shock: 35G, 142inch/sec, trapezoidal shock  
Vibration: 1.04Grms, 2~200Hz, without packaged

### APPROVALS

EMC: EN 55022 Class A, EN55024, EN 61000-3-2, EN 61000-3-3, FCC part 15 Class A, VCCI Class A, ICES-003 Class A  
Safety: IEC/EN/UL/CSA 60950-1, CB/cUL/CE  
Environment: RoHS

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

# Titan™

## 4U High-Density JBOD



Titan is a high density JBOD storage product that supports up to 90 3.5"/2.5" SAS/SATA/SSD drives in 4U enclosure with excellent performance and high availability.

### FEATURES

- 4U enclosure designed to fit in standard 19" wide rack
- Cable management assembly (CMA)
- Supports up to 90 3.5" or 2.5" drives
- SCSI Enclosure Service
- 13W max drive power at 35C
- Power control for 12G SAS drive via pin3
- Dual redundant ESMs, hot-swappable
- ESM (Expansion SAS Module)
  - Four mini-SAS HD ports per ESM
  - One UART via 3.5mm jack
  - LED: Power LED (green), ESM Fault LED (amber), UID LED (blue)
  - Button: Power button

### POWER AND COOLING

- 1200W 80 plus Platinum PSU, 2+2 redundant, hot swap
- 100-127,200-240V AC input, auto ranging, 47~63Hz
- 5 x 80 mm back to back fans, hot-pluggable from the top

### PHYSICAL DIMENSIONS

- Height: 175.3 mm (6.9")
- Width: 448 mm (17.64")
- Depth: 1070 mm (42.12") w/CMA

### ENVIRONMENTAL

- Operating Temperature: 5°C to 35°C
- Non-operating Temperature: -40°C to 60°C
- Humidity: 8% to 85% RH
- Operating Altitude: 950 m (35°C)~ 3,048 m (28°C)
- Sound Power: (23+/-2°C) <8.0Bel

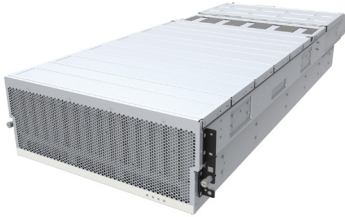
### APPROVALS

- EMC: EN 55032, CISPR-32 Class A, EN 55024, EN 61000-3-2, EN 61000-3-3, FCC 47 Part 15 Class A, VCCI V-3 2014 Class A, ICES-003, Issue-004 Class A, EN300386
- Safety: IEC/EN/UL/ CAN/CSA 60950-1, 62368-1
- Environment: RoHS, REACH, WEEE

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

# Titan Storage Controller™

## 4U High-Density Storage Controller



The Titan Storage Controller is a high-density storage platform with redundant 1U single-socket storage controllers and BBUs. The 4U chassis supports up to 90 3.5" or 2.5" SAS/SATA/SSD drives with excellent performance and high availability.

### FEATURES

- 4U enclosure designed to fit in 19" wide, 1200 mm deep standard rack
- Cable management assembly (CMA)
- Supports up to 90 3.5" or 2.5" drives
- 11W max drive power at 35C
- Power control for 12G SAS drive via pin3
- Dual redundant storage controllers, hot-swappable
- Storage Controller
  - Single socket Intel Xeon/2nd Gen Intel Xeon up to 140W
  - 6 DDR4 DIMMs
  - 1 x16 LP PCIe Slot, 1 x8 OCP Mezz
  - BMC: AST2500
  - Legacy I/O: VGA, 2xUSB3, 2x 1GbE, 1xRJ45 for BMC
  - X8 PCIe NTB
  - Battery backup (BBU)
- ESM (Expansion SAS Module)
  - Dual redundant and hot-swappable
  - Four mini-SAS HD ports per ESM
  - Legacy I/O: one UART via 3.5mm jack for debug
  - LED: Power LED (green), ESM Fault LED (amber), UID LED (blue)

### POWER AND COOLING

- 1300W 80 plus Platinum PSU, 2+2 redundant, hot swap
- 100-127,200-240V AC input, auto ranging, 47-63Hz
- 5 x 80 mm back to back fans, hot-pluggable from the top

### PHYSICAL DIMENSIONS

- Height: 175.3 mm (6.9", 4U)
- Width: 448 mm (17.64")
- Depth: 1175 mm (46.26") w/CMA

### ENVIRONMENTAL

- Operating Temperature: 5°C to 35°C
- Non-Operating Temperature: -40°C to 60°C
- Humidity: 8% to 85% RH
- Operating Altitude: 950 m (35°C) to 3,048 m (28°C)
- Sound Power: (23+/-2°C) <8.0Bel

### APPROVALS

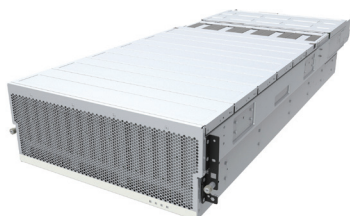
- EMC: EN 55032, CISPR-32 Class A, EN 55024, EN 61000-3-2, EN 61000-3-3, FCC 47 Part 15 Class A, VCCI V-3 2014 Class A, ICES-003, Issue-004 Class A, EN300386
- Safety: IEC/EN/UL/ CAN/CSA 60950-1, 62368-1
- Environment: RoHS, REACH, WEEE

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



# Titan Server™

## 4U High-Density Storage Server



The Titan Server is a high-density storage platform with redundant 1U dual-socket servers. The 4U chassis supports up to 90 3.5" or 2.5" SAS/SATA/SSD drives with excellent performance and high availability.

### FEATURES

- 4U enclosure designed to fit in 19" wide, 1200 mm deep standard rack
- Cable management assembly (CMA)
- Supports up to 90 3.5" or 2.5" dual ported drives
- 11W max drive power at 35C
- Power control for 12G SAS drive via pin3
- Dual 1U servers, hot-swappable
- Server
  - Dual sockets Intel Xeon/2nd Gen Intel Xeon up to 125W
  - 12 DDR4 DIMMs
  - 1 x OCP Mezz
  - 1 x Custom 4 ports(SFP+) 10GbE Card
  - BMC: AST2500
  - Legacy I/O: VGA, 2xUSB3, 2x 1GbE, 1xRJ45 for BMC
  - Dual M.2 SSD for boot device
  - x16 12G SAS connection to ESM for drive connection
- ESM (Expansion SAS Module)
  - Dual redundant and hot-swappable
  - Four mini-SAS HD ports per ESM for expansion
  - Legacy I/O: one UART via 3.5 mm jack for debug
  - LED: Power LED (green), ESM Fault LED (amber),UID LED (blue)
  - Button: Power button

### POWER AND COOLING

- 1300W 80 plus Platinum PSU, 2+2 redundant, hot swap
- 100-127,200-240V AC input, auto ranging, 47-63Hz
- 5 x 80 mm back to back fans, hot-pluggable from top

### PHYSICAL DIMENSIONS

- Height: 175.3 mm (6.9")
- Width: 448 mm (17.64")
- Depth: 1175 mm (46.26") w/CMA

### ENVIRONMENTAL

- Operating Temperature: 5°C to 35°C
- Non-operating Temperature: -40°C to 60°C
- Humidity: 8% to 85% RH
- Operating Altitude: 950 m (35°C) to 3,048 m (28°C)
- Sound Power: (23+/-2°C) <8.0Bel

### APPROVALS

- EMC: EN 55032, CISPR-32 Class A, EN 55024, EN 61000-3-2, EN 61000-3-3, FCC 47 Part 15 Class A, VCCI V-3 2014 Class A, ICES-003, Issue-004 Class A
- Safety: IEC/EN/UL/ CAN/CSA 60950-1, 62368-1
- Environment: RoHS, REACH, WEEE

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

# Rainbow™

## 4U High Density JBOD



Rainbow is a JBOD storage enclosure product based on SAS 12G technologies. It is a high density bulk storage system, housing two Expansion Storage Modules (ESMs) in one 4U chassis. Rainbow supports up to 60 3.5" or 2.5" SAS drives, including SSDs and HDDs, with excellent performance and high availability.

### FEATURES

Two (2) Mini SAS HD ports per ESM for upstream/downstream connection

12G SAS technology

Up to 60 2.5" or 3.5" drives supported

- 7.2K/10K/15K RPM SAS HDD
- SAS SSD
- 12Gbps/6Gbps/3Gbps drives
- Supports up to 13.5W max drive power

SCSI Enclosure Service (SES)

- Enclosure Health Monitor
- Enclosure Cooling Control
- Drive Spin Up Control
- SAS Zoning Management
- System Event Log
- Online Firmware Update

Supports hot-swappable ESM, PSU and drives

Supports LED indicator, CMA and rail kits

### POWER AND COOLING

1200W, 80 plus gold, 1+1 redundant, hot swap PSU

100-240V AC input, auto ranging, 47-63Hz

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

Fan speed tuning by software

### PHYSICAL DIMENSIONS

Height: 175.4 mm (6.9")

Width: 424 mm (16.69")

Depth: 848 mm (33.38")

### ENVIRONMENTAL: OPERATING

Temperature: 5°C to 40°C

Humidity: 8% to 85% RH non-condensing

Altitude: 950 m at 40°C; 3,048 m at 28°C

Note: Derate maximum allowable dry-bulb temperature 1°C/175 m above 950 m

Sound Power: (23+/-2°C) <7.5Bels

### ENVIRONMENTAL: NON-OPERATING

Temperature: -40°C to 60°C

Humidity: 8% to 93% RH non-condensing

### APPROVALS

EMC: EN 55032 ClassA; EN55024; EN 61000-3-2; EN 61000-3-3; FCC part 15 Class; VCCI Class A; ICES-003 Class A

Safety: IEC/EN/UL/CSA 60950-1

Environment: RoHS

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

# Thor™

## 2U Four Node Dense Server Solution



Thor is an industry-leading, high performance dense server, optimized for hyperconverged and traditional server applications. Thor incorporates Intel Xeon® and 2nd Generation Intel Xeon Scalable Processors with the support for pure NVMe and the flexibility to mix different storage technologies. This unique feature set enables unparalleled performance and flexibility for the next generation of hyperconverged and traditional server applications.

### Ultra-Powerful Server Nodes

Thor features dual socket Intel Xeon server nodes with support for up to 24 DDR4 DIMM sockets, including support for Intel Apache Pass and standard NVDIMMs. This provides the power necessary for the most demanding, memory intensive applications.

### Flexible Hybrid Storage Options

The six 2.5" hot swappable drive bays per node support two hybrid drive slots for mixing any of the NVMe, SATA, or SAS drives. This enables leading edge flexibility to leverage the right mix of storage for the applications.

### Standards-Based Enterprise-Class Manageability

Each Thor node integrates a base board management controller, which includes management software supporting both the IPMI and Redfish management standards.

Additionally, Thor provides two redundant, hot swappable management ports per node, providing the most dependable enterprise management implementation in the market today.

### Unmatched Performance, Flexibility, and Density

Thor's combination of powerful computing, flexible hybrid storage options and dense memory sets it apart from the competition. Thor is on the leading edge of emerging hyperconverged solutions.

### Simplified Serviceability

Servicing Thor couldn't be easier. Requiring no slide rails, Thor fits within a 1000mm rack with sufficient space for cable management. The Thor nodes hot plug from the front of the chassis, while the power supplies, fans and I/O modules hot plug from the rear of the chassis, without the need to slide the Thor enclosure out of the rack. Thor is optimized for quick service to minimize down time and service costs.

### Multiple I/O Options

Up to three dedicated PCIe slots per node (for a total of 12 PCIe slots), one internal SAS mezzanine card per node, and two redundant I/O modules shared by all four nodes provide the flexibility to support many different I/O configurations.



## FEATURES

2U chassis, fits 19" rack

4x hot-swap computing nodes, front service

In each node:

- Dual (2) Intel Xeon CPU up to 140W
- 16x/24x DDR4 DIMMs support RDIMM/LRDIMM
- 6x 2.5" SATA/SAS/NVMe drives, hot-swappable
- 2x 2280 or 2x 22110 M.2 Boot SSD
- SAS mezzanine card (Optional)
- TPM2.0 (Optional)

4x I/O Expansion Module, rear service.

In each module:

- One x16 HHHL PCIe slot
- One x8 HHHL PCIe slot
- One x8 PCIe slot or x4 KR slot with Quad port 10GbE

2x redundant share I/O module with 1GbE (w/NCSI to BMC), rear service

Rear VGA/USB KVM function switching among 4 nodes

## POWER AND COOLING

Two CRPS Platinum PSUs, 1200/1600/2000W

200-240V, AC input

1+1 redundant, hot-swappable

Five 60x76 FAN, hot-swapped with rear I/O module

## ENVIRONMENTAL: OPERATING

Temperature: 10°C to 35°C

Humidity: 20% to 80% RH

Altitude: 0 to 3050 m (De-rate temperature 1°C per 300 m above 950 m)

Shock: 10G, 5ms half sine pulse width

Vibration: Random 0.27 Grms 5-500Hz

Acoustics: 7.5 Bels LwAd @ 23 +/- 2°C

## ENVIRONMENTAL: NON-OPERATING

Temperature: -40°C to 60°C

Humidity: 5% to 90% RH

Altitude: 0 to 12,000 m

Shock: 20G, 7ms half sine pulse

Vibration: Random 1.04 Grms 2-200Hz package (transit)

## APPLICATION TOPOLOGY

Performance-packed computing

- Address mainstream applications with the latest Intel Intel Xeon/2nd Gen Intel Xeon Scalable Processors
- The high-density design of Thor (2-socket configuration with up to 24 DDR4 RDIMM/LRDIMM) supports both consolidated and virtualized environments

Enormous storage capacity

- Twenty-four 2.5" storage bays support extensive local storage to quickly access and process vast amounts of data in midsize and large enterprise datacenters

Advanced I/O capabilities

- Balanced, scalable I/O capabilities, including integrated PCI-Express (PCIe) Gen 3.0-capable expansion slots

## PHYSICAL DIMENSIONS

Height: 87.1 mm (3.43")

Width: 446 mm (17.56")

Depth: 860 mm (33.88") without Ear cover;  
884.4 mm (34.85") with Ear cover

## APPROVALS

EMC: Class A, CISPR 22, FCC, ICES-003, CE, VCCI

Safety: CB Scheme, UL, cUL, CE

Environment: RoHS

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

# Loki™

## 1U Server



Loki is a high performance server product with Intel® Xeon® Scalable Processors. The 1U chassis supports up to 10 2.5" SAS/SATA/NVMe with excellent performance and high reliability.

### FEATURES

- Dual sockets Intel Xeon/2nd Gen Intel Xeon up to 165W
- 24 DDR4 RDIMM/LRDIMM up to 1.5TB Cache  
NVDIMM is supported
- One Internal x8 PCIe Slot for HBA
- Up to 2 PCIe Slots for Expansion
  - 2x16 FHHL or 2x8 FHHL
- 1 OCP2.0 card, Connector A+C, Type1
  - 4/2 10GbE SFP+ Ports Card
  - 4/2 1GbE RJ45 Ports Card
- Up to 2 Internal M.2 Slots
- Up to 10 2.5" drives are supported
  - SAS/SATA/NVMe
  - 12Gbps/6Gbps drives
- BMC Management (AST2500)
  - Standard IPMI2.0
  - Dedicated RJ45 for BMC management
  - KVM/Virtual Media and SOL
  - Cooling management
- Hot-swappable PSU and drives

### POWER AND COOLING

- 550W/800W 80 plus Platinum, 1+1 redundant, hot swap PSU
- 100-127,200-240V AC or HVDC input, auto ranging, 47-63Hz
- 6x 4038 FAN for system cooling

### PHYSICAL DIMENSIONS

- Height: 43.0 mm (1.69", 1U)
- Width: 448 mm (17.64")
- Depth: 760 mm (29.92")

### ENVIRONMENTAL

- Operating Temperature: 5°C to 35°C
- Non-Operating Temperature: -30°C to 60°C
- Humidity: 8% to 80% RH
- Operating Altitude: 1,000 m at 35°C
- Sound Pressure: (23+/-2°C) <65dBA

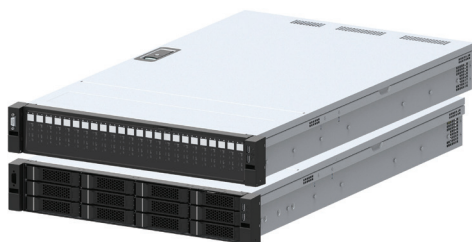
### APPROVALS

- EMC: Class A, CISPR 22, FCC, ICES-003, CE, CQC, VCCI, C-Tic, BSMI
- Safety: CB Scheme, UL, cUL, CE, CQC, BSMI, LVD
- Environment: RoHS

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

# Tyr™

## 2U Server



### FEATURES

- Dual sockets Intel Xeon/2nd Gen Intel Xeon up to 205W
- 24 DDR4 RDIMM/LRDIMM up to 1.5TB Cache
- NVDIMM is supported
- 1x Internal PCIe Slot
- Up to 8 PCIe Slots for Expansion
  - 4x8 FHFL, 2x8 FHHL, 2x8 HHHL
  - 2x16 FHFL, 2x8 FHHL, 2x8 HHHL
- 1 OCP2.0 card, Connector A+C, Type1
  - 4/2 10GbE SFP+ Ports Card
  - 4/2 1GbE RJ45 Ports Card
- Up to 2 Internal M.2 Slots
- 2 2.5" SATA slots in the rear
- Up to 24 2.5" drives are supported
  - SAS/SATA/NVMe
  - 12Gbps/6Gbps drives
- BMC Management (AST2500)
  - Standard IPMI2.0
  - Dedicated Management LAN and Shared NCSI LAN
  - KVM/Virtual Media and SOL
  - Cooling management
- Hot-swappable PSU, Fan and drives

Tyr is a high performance server product with Intel® Xeon® Scalable Processors. The 2U chassis supports up to 12 3.5" or 24 2.5" SAS/ SATA/NVMe drives with excellent performance and high reliability.

### POWER AND COOLING

- 800W/1200W 80 plus Platinum, 1+1 redundant, hot swap PSU
- 100-127,200-240V AC input, auto ranging, 47-63Hz
- 6x 6038 FAN for system cooling

### PHYSICAL DIMENSIONS

- Height: 87.0 mm (3.4", 2U)
- Width: 448 mm (17.64")
- Depth: 760 mm (29.92")

### ENVIRONMENTAL

- Operating Temperature: 5°C to 35°C
- Non-Operating Temperature: -30°C to 60°C
- Humidity: 8% to 80% RH
- Operating Altitude: 1,000 m at 35°C
- Sound Pressure: (23+/-2°C) <65dBA

### APPROVALS

- EMC: Class A, CISPR 22, FCC, ICES-003, CE, CQC, VCCI, C-Tic, BSMI
- Safety: CB Scheme, UL, cUL, CE, CQC, BSMI, LVD
- Environment: RoHS

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

# Heimdall

## 1U Mobile Edge Compute (MEC) Server



Heimdall is a single processor edge computing server product based on Intel Xeon D 2100 processors.

The 1U chassis supports up to 2x U.2 SSD and 2x PCIe slots for expansion, combining the benefits of high performance, power efficiency and small size.

### FEATURES

- Single Intel Xeon D 2100 processor, up to 110W
- 4x DDR4 RDIMM/LRDIMM, up to 256GB
- 2x M.2 SATA/PCIe
- 2x PCIe Slots for Expansion
  - 1x16 FHFL
  - 1x16 FHFL (if supporting 2x hot swap 2.5" NVMe, x8 PCIe slot only)
- Ethernet IO Ports
  - 4x 10GbE SFP+
  - 2x 1GbE RJ45
- 2x USB3.0 ports
- 2x 2.5" SSD, Hot-swap Support
  - SATA
  - NVMe
- BMC Management (AST2500)
  - Standard IPMI2.0
  - Dedicated management LAN and shared NCSI LAN
  - KVM/Virtual Media and SOL
  - Cooling management
- 1588v2 Support

### POWER AND COOLING

- 550W 80 plus Platinum, 1+1 redundant, hot swap PSU
- 100-127,200-240V AC input / -48V DC Input
- 6x 4028 FAN for system cooling

### PHYSICAL DIMENSIONS

- Height: 43.6 mm (1U)
- Width: 438 mm
- Depth: 410 mm

### ENVIRONMENTAL

- Operating Temperature: -5°C to 55°C
- Non-Operating Temperature: -30°C to 60°C
- Humidity: 8% to 85% RH
- Operating Altitude: 3,050 m
- Acoustic: <70dB, 25°C

### APPROVALS

- EMC: Class A, CISPR 22, FCC, ICES-003, CE, CQC, VCCI
- Safety: CB Scheme, UL, cUL, CE, CCC
- Environment: RoHS

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



# Ares OTII MEC Server



Ares is a 1U OTII compliant MEC server based on the Intel Xeon-D CPU. It provides an OCP slot and two PCIe slots for expansion in order to achieve the best balance of performance, power consumption and size.

## FEATURES

1x Xeon-D 2177NT CPU, TDP 105W

- 14 cores, 28 threads
- 1.9 GHz Base Frequency
- 3.0 GHz Max Turbo Frequency
- 19 MB Cache

4x 16GB RDIMM, DDR4-2666, total 64GB

1x M.2 SATA 256GB SSD

1x M.2 SATA/PCIE x2

2x 2.5Inch SATA SSD support hot-plug

PCIe Expansion

- 1x PCIe Gen3 x16 Slot, FHFL
- 1x PCIe Gen3 x16 Slot FHFL ( 8 of 16 PCIe lanes mixed with OCP2.0 card)

IO Card

- 1x OCP2.0 card Type-A PCIe Gen3 x8(Optional)

Front IO Ports

- 2x USB 3.0 Ports
- 4x 10GbE SFP+ / 2x 10GbE SFP+(Optional)
- 2x 1GbE RJ45
- 1x VGA port
- 1x Audio Jack UART

1588v2 Support

Onboard PLL to meet Network high-precision clock

TPM module Support (Optional)

BMC Management

- Standard IPMI2.0
- Management LAN
- SOL
- Cooling management

## POWER AND COOLING

550W 80 plus Platinum, 1+1 redundant, hot swap PSU

100-127, 200-300V AC input / -48V DC Input

6x 4028 Fan for system cooling

## PHYSICAL DIMENSIONS

Height: 43.6 mm (1U)

Width: 438 mm

Depth: 410 mm

## ENVIRONMENTAL

Operating Temperature: -5°C to 55°C

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

Humidity: 5% to 85% RH

Operating Altitude: 1362 m

Acoustic: <70dB, 25°C

## APPROVALS

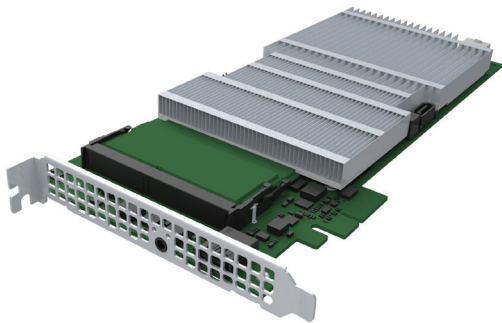
EMC: Class B, CISPR 22, FCC, ICES-003, CE, CQC, VCCI

Safety: CB Scheme, UL, cUL, CE, CCC

Environment: RoHS

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

# VCAC-A Accelerator Card



Visual Cloud Accelerator Card for Analytics (VCAC-A) is a standard PCIe form factor with a low-power Intel® Core™ i3 CPU (integrated Intel® HD Graphics 620) and 12x of Intel Movidius™ Myriad™ X VPUs. This accelerator card provides a power-efficient, cost-effective visual cloud solution for the emerging AI market for inference and media analytics applications at the Edge.

## FEATURES

Intel Core™ i3-7100U processor

- Dual Core
- 2.4 GHz base frequency
- 3MB Intel Smart Cache
- TDP 15W

2x 4GB DDR4 SODIMM Memory, Total 8GB

12x Myriad X MA2485 VPU

- 700MHz operation frequency
- 16x VLIW 128bit floating-point vector processor
- 2x 32-bit RISC processor
- 4Gbit LPDDR4 Memory in package

PCIe Gen3 x4 Host Interface

## POWER AND COOLING

Passive Cooling

MAX 75W

## PHYSICAL DIMENSIONS

Height: Full Height 126 mm

Width: ¾ Length 254 mm

Single Slot Width

## ENVIRONMENTAL

Operating Temperature: 0°C to 55°C @ 15CFM

Non-Operating Temperature: -20°C to 70°C

Humidity: 8% to 85% RH

Operating Altitude: 3,050m

## APPROVALS

EMC: Class A, CISPR 22, FCC, CE

Safety: CB Scheme, UL, cUL, CE

Environment: RoHS

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

# Celestica's Networking Solutions





## Networking Solutions Features

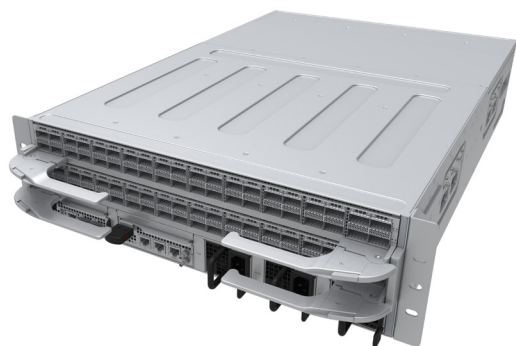
Switches		CloverstoneDP DX510	Edgestone DX032	Haliburton E1031
PERFORMANCE	Switching Capacity	16.0Tbps	6.4Tbps	176 Gpbs
	Forwarding Capacity (Mpps)	2 Bpps	2003.4	-
	Buffer Size	up to 8GB	32.0MB	4.0MB
	Latency	-	< 900ns	-
	MTBF	>= 150K Hours	>= 150K Hours	>=150K Hours
PORTS	10/100/1000 Mbps RJ-45 Ports	-	-	48
	10 GbE SFP+ Ports	2	2	4
	25 GbE SFP28 Ports	-	-	-
	40 Gbps QSFP+ Ports	-	-	-
	50Gbps QSFP56 Ports	-	-	-
	100Gbps QSFP28 Ports	80	32	-
	200Gbps QSFP28 Ports	-	-	-
	400Gbps QSFP56-DD Ports	-	-	-
MECHANICAL	Form Factor	3RU	2RU	1RU
	Height/Width/Depth	132 x 438 x 650 mm	87 x 442 x 288 mm	43.8 x 434 x 320 mm
	Weight	-	-	<6 kg
POWER AND COOLING	Hot-Swappable Power Supplies	2+ 1 Redundant	1+ 1 Redundant	2+ 1 Redundant
	Power Supply Unit Scale	1500W	550W	150w
	Power Supply Input	AC 110-240V DC 40-72V	100-240VAC, 48V DC	100-240VAC
	Hot-Swappable FAN Module	4 + 1 Redundant	5 + 1 Redundant	2 + 1 Redundant
	Airflow	Front to Back	Front to Back	Front to Back/Back to front
	Max Power Consumption (w/o optical module)	< 3000 W	550W	<150W
SYSTEM CONTROL INTERFACE	Console Port	RJ45	RJ45	RJ45
	Management Port	10/100/1000 Mbps RJ-45	10/100/1000 Mbps RJ-45	10/100/1000 Mbps RJ-45
	USB Port	Type A	Type A	Type A
ENVIRONMENTAL	Operating Temperature (F2B @ sea level)	0°C to 40°C	0°C to 45°C	0°C to 45°C
	Operating Temperature (B2F @ sea level)	-	-	0°C to 45°C
	Humidity	5% to 90%	5% to 90%	5% to 85%
	Altitude	6000ft	950m	10,000ft
CERTIFICATION	Safety	IEC/EN/UL, CB	UL/CSA, CB, GB4943, CCC, IEC60950-1	IEC60950-1, GB4943, UL/CSA, CB, CCC
	EMC	CE EMC, CISPR 22/24, ETSI EN300 386, FCC, VCCI, IEC	CN(GB9254), FCC, CE, VCCI, CCC	CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC
FEATURES	CPU	Standard Form Factor COM-E Intel Xeon D 6C	Standard Form Factor COM-E Intel Xeon D 12C	1.7Ghz Rangeley x86 Dual Core
	Memory	32GB DDR4	32GB DDR4	2/4GB DRAM
	Storage	Dual up to 128GB M.2 SSD	Dual 256MB M.2 SSD	64Mbit NOR Flash, 8GB mSATA
	Industry-standard CLI	Y	Y	Y
	MAC Entries	710K	288K	Unified MAC up to 96K
	L3 Host Table IPv4/IPv6	-	IPv4 168K IPv6: 100K	VLAN/L3 hosts up to 96K
	L3 LPM Table IPv4/IPv6	IPv4 forwarding: 1.5M IPv6 forwarding: 750K	IPv4: 128K IPv6/64: 40K IPv6/128: 10K	16K for 32-bit IPv4 8K for 64-bit IPv6 4K for 128-bit IPv6
	Link Aggregation	up to 16K group	2K	-
	Jumbo Frames	5450 Bytes	9416 Bytes	12000 Bytes



Ivystone D7010	Questone2 D3030	Seastone2 DX030	Silverstone DX400	SilverstoneDP DX500
12.8T	4.0Tbps	2.56Tbps	25.6Tbps	19.2Tbps
-	2003.4	2003.4	-	2 Bpps
64.0MB	32.0MB	32.0MB	64.0MB	up to 8GB
< 500ns	< 500ns	< 500ns	< 500ns	-
>= 150K Hours	>= 150K Hours	>= 150K Hours	>= 150K Hours	>= 150K Hours
-	-	-	-	-
-	-	2	2	2
-	48	-	-	-
-	-	32	-	-
-	-	-	-	-
128	8	-	-	24
-	-	-	-	-
-	-	-	32	6
4RU	1RU	1RU	1RU	1RU
173.6 x 446 x 750 mm	44 x 442 x 521 mm	44 x 442 x 521 mm	44 x 438 x 656 mm	44 x 439 x 675 mm
-	-	-	-	-
2 + 2 Redundant	1+ 1 Redundant	1+ 1 Redundant	1+ 1 Redundant	1+ 1 Redundant
1100w	550W	800W	1500W	1500 W
100-240VAC/ 240 HVDCVDC	100-240VAC 180-300VDC, 48V DC	100-240VAC 280VDC (180-300V)	100-240VAC 180-300VDC	100-240VAC 180-300VDC, 48V DC
4 + 1 Redundant	3 + 1 Redundant	3 + 1 Redundant	5 + 1 Redundant	6 + 1 Redundant
Front to Back	Front to Back/Back to Front	Front to Back/Back to Front	Front to Back	Front to Back
2000W	<550W	800W	1100W	1100W
RJ45	RJ45	RJ45	RJ45	RJ45
10/100/1000 Mbps RJ-45	10/100/1000 Mbps RJ-45	10/100/1000 Mbps RJ-45	10/100/1000 Mbps RJ-45	10/100/1000 Mbps RJ-45
Type A	Type A	Type A	Type A	Type A
0°C to 40°C	0°C to 45°C	0°C to 45°C	0°C to 45°C	0°C to 45°C
-	0°C to 45°C	0°C to 45°C	-	-
10% to 90%	5% to 90%	5% to 90%	5% to 90%	5% to 90%
1500m	10,000ft	10,000ft	960m	960 m
UL, CB, CCC	UL/CSA, CB, CCC, IEC, GB4943	UL/CSA, IEC CB, CCC, IEC, GB4943	UL/CSA, IEC CB, CCC, IEC60950	UL/CSA/IEC/EN 60950
CE EMC, VCCI, FCC, ICES003	CE, FCC, VCCI, CCC,CN (GB9254)	CE, FCC, VCCI, CCC,CN (GB9254)	CE, FCC, VCCI, CCC,CN (GB9254)	CE, FCC, VCCI, CCC,CN (GB9254)
Standard Form Factor COM-E Intel Xeon D 4C/8C/16C	Compact Form Factor COM-E Denverton 2C/4C/8C	Compact Form Factor COM-E Denverton 2C/4C/8C	Standard Form Factor COM-E Intel Xeon D 2C/4C/8C/16C	Standard Form Factor COM-E Intel Xeon D 2C/4C/8C/16C
4G/8G/16G DDR4 per slot two DDR4 Slots	4G-32GB DDR4	4G-32GB DDR4	4G - 32GB DDR4	4G-32GB DDR4
240GB to 1TB	Dual 256MB M.2 SSD	16G - 1TB SSD	16G - 1TB SSD	16G - 1TB SSD
Y	Y	Y	Y	Y
Y	288K	288K	64K	710K
IPv4 UC:16K IPv4 MC:8K IPv6 UC:8K IPv6 MC:4K	IPv4 168K IPv6: 100K	IPv4 168K IPv6: 100K	IPv4 UC:16K IPv4 MC:8K IPv6 UC:8K IPv6 MC:4K	-
IPv4: 4K IPv6/64: 2K IPv6/128: 1K	IPv4: 128K IPv6/64: 40K IPv6/128: 10K	IPv4: 128K IPv6/64: 40K IPv6/128: 10K	IPv4: 4K IPv6/64: 2K IPv6/128: 1K	IPv4 forwarding: 1.5M IPv6 forwarding: 750K
-	2K	2K	-	up to 16K group
9416 Bytes	9416 Bytes	9416 Bytes	9416 Bytes	5450 Bytes

# CloverstoneDP™ DX510

## Modular Scalable 80 port 100GbE 3U Switch/Router



**CloverstoneDP DX510 is a compact router in 3U form factor with high levels of serviceability. The system provides 80 ports 100G by default but is both modular and scalable to multiple chassis which provides a variety of future port configurations and densities ideal for different routing applications and workloads.**

The DX510 offers programmable data plane innovation and can support port level configuration of sub-rates between 10GbE and 100GbE. It provides deep buffering capability with optional extensible TCAM configuration. DX510 can provide field serviceable IO line cards, control plan and management plan cards, as well as redundant serviceable fan and PSU modules. An innovative rear access backplane cabling solution enables multiple chassis to interconnect for up to four line cards in mesh, or with fabric plane elements to much larger configurations.

CloverstoneDP DX510 supports current and future network requirements, including an Intel Xeon D processor COM-E based modular control plane, BMC based management plane and an ONIE installer to support 3rd party network operating systems.

### FEATURES

**Line Card:** System supports one or two 4.8Tbps line cards connected as mesh. Each line card supports 40 QSFP28 100GbE Ports – 16 ports MACSec capable, extensible KBP (TCAM), FRUable.

**System Control Module:** COMe based Intel Xeon D 2-12 Core, 32-128GB ECC DDR4, 32GB-1TB M.2 SSD, Dual SFP+ 10GbE ports, RJ45 GbE, RJ45 Console, USB Type A, FRUable.

**Chassis Control Module:** BMC based controller, 1GB DDR4, 32MB Flash, RJ45 GbE, RJ45 Console, USB Type A, Optional Timing module with 1PPS/10Mhz DIN and 1PPS/TOD RF45, FRUable

**Datacenter:** Ethernet Ver.2, IEEE802.2 LLC and IEEE802.2 SNAP, Packets without standard physical layer, IEEE 802.1Q, Metro Ethernet, Enterprise and Datacenter, PPPoE, Ethernet Bridging, IPv4/IPv6 Routing, IPv6 Segment Routing, MPLS, MPLS Segment Routing, VPLS(L2VPN), L3VPN, EVPN, IEEE 802.1ah(PBB, MAC-in-MAC), BIER, FCoE, IP Tunnels, VxLAN, NV-GRE, Geneve, RIOT, Ethernet OAM, BFD, RFC6374, MPLS-TP OAM

**Routing Tables:** MDB profiles: Up to 1M(Balanced)/1M(L2-XL)/300K(L3-XL)/2M+ (External KBP) MPLS ILM, 1.5M(Balanced)/64K(L2-XL)/2.6M(L3-XL)/12M(External KBP) IPv4 LPM, 750K(Balanced)/32K(L2-XL)/1.3M(L3-XL)/6M(External KBP) IPv6 LPM

**Content Aware Processing:** Layer 2-7 packet classification, FCoE

**Transceivers:** QSFP28 up to 5W power, SR to 300m, LR to 10km, DAC (to 3m passive)

## LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

## LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSPF, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS/MPLS, L2/L3 VPN  
Hardware Based Tunneling: IPv4/v6, MiM  
VxLAN, NV-GRE, Geneve  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP  
Instrumentation Applications: sFlow, Inband Network Telemetry (INT)  
OAM

## TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Ingress/Egress Traffic Manger: OCB SRAM 128Mb, DRAM 32Gb, 64K queues VOQs/FMQs/EFQs, 8 UC/MC per OTM port  
Ingress/Egress credit scheduler: Scheduling/Shaping (MEF, IETF DiffServ, TR-059 compliant), 96k scheduler flows  
Fabric adaptor: VSC256.v2 cell format, 256K multicast groups, Packet cell packing  
Counter, Meter, Statistics  
WRED, PFC, ETS flow control

## POWER AND COOLING

Under <3000W peak consumption with maximum optics, 2+1 redundant, hot swap front access PSUs  
100-240VAC auto-ranging, 47-63Hz or  
180-300VDC auto input, 1500W PSUs  
4+1 redundant fans, front to back system cooling

## DIMENSIONS

Height: 132.4 mm (5.21") 3 EIA unit  
Width: 438 mm (17.24")  
Depth: 650 mm (25.59")

## ENVIRONMENTAL: OPERATING

Temperature: 0°C to 40°C  
Humidity: 5% to 90% non-condensing

## APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC  
Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC

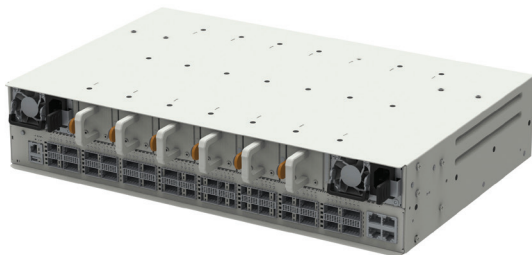
## ORDER INFORMATION

**DX510-4C32G128-F2B** - 4CORE BDE CPU 32GB RAM / 128GB SSD, BMC, FRONT TO BACK, AC

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

# Edgestone™ DX032

## Short Form Factor 100GbE Switch for Edge Applications



**Celestica's Edgestone DX032 32 port 100GbE switch is a short depth, all front access switch in 2U form factor that is ideally suited for edge computing deployments with limited rack space.**

The DX032 provides programmable data plane innovation and can support port level configuration of sub-rates between 10GbE and 50GbE. System maximum of 128 10/25GbE, or 64 50GbE, or 32 100GbE are supported with breakout cables to provide superior large radix switch for TOR or CLOS connectivity. It provides superior low latency and power efficiency in a clean PHYless design, while offering high reliability features such as redundant and hot swappable power supplies and fans in forward and reverse airflow configurations.

Key innovations on the DX032 are its all front access IO, power supplies and fans in a NEBS compliant 288 mm deep chassis. Edgestone DX032 supports current and future network requirements, including dual port access to both the COM-E modular x86-based control plane and the BMC management plane. An ONIE installer is also provided to support third party network operating systems.

### FEATURES

Interfaces: 32 QSFP28 100GbE Ports (128 available sub-rate ports), Dual RJ45 CPU Management, Dual RJ45 BMC Management ports, and Console (RJ45) ports, USB (Type A)

Switching Capacity: 3.2Tbps IO Bandwidth, 32M Byte Buffer

Latency: Less than 900ns port to port (cut-through mode, FEC disabled)

IEEE: 802.3az

Datacenter: Dedicated FCoE forwarding engine, IEEE 802.1Qbg and 802.1Qbh, VPLAG, SPB, L2GRE, NVGRE and VXLAN

Telemetry: Improved Instrumentation with Transient Capture Buffer, Packet Timestamp and Buffer Statistics

CPU: Intel Xeon D 1.5Ghz 12-core, 32GB ECC DDR4, Dual 256GB M.2 SSD

Routing Tables: Unified Forwarding Tables: upto 48K MPLS labels, 324K IPv4/208K IPv6 LPM, 128K ACL

Content Aware Processing: Layer 2-7 packet classification, FCoE

Transceivers: QSFP28 upto 4.5W power, SR to 300m, LR to 10km, DAC (to 5m passive)

### IEEE1588 & SYNC E TIMING OPTION

Supports IEEE1588

Supports TC and BC mode

Supports SyncE recovery



### BMC SYSTEM MANAGEMENT OPTION

DDR4 1GB/SPI 32MB Flash  
Two separate GbE management ports  
Serial over LAN (SOL) enabled  
Supports remote (BIOS/firmware) online upgrading  
IPMI 2.0

### LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

### LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSFP, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS, MPLS  
Hardware Based Tunneling: IPv4/v6, GRE, MiM  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP

### TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Flexible QoS Queuing for UC Packets  
Separate QoS Queues for UC and MC Packets (10 each/port)  
SAFC, PFC flow control  
SP, WRR, WDRR Queuing  
ECN, WRED congestion control  
Per-Port DSCP  
ACL, ICAP, ECAP, VCAP

### POWER AND COOLING

Under 550W peak consumption with maximum optics, 1+1 redundant, hot swap PSUs  
100-240VAC auto-ranging, 47-63Hz, or 40-58VDC Power supply options  
5+1 redundant fans, front to back system cooling

### DIMENSIONS

Height: 87 mm (3.42") 2 EIA unit  
Width: 442 mm (17.3")  
Depth: 288 mm (11.3")

### ENVIRONMENTAL

Operating Temperature: 0°C to 45°C  
Humidity: 5% to 95% non-condensing

### APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC  
Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC  
Environmental: EU RoHS, SVHC requirements of REACH, China RoHS, NEBS Level 3

## ORDER INFORMATION

**DX032-12C32G512-F2B** - 12CORE BDE CPU 32GB RAM / 512GB SSD, BMC, FRONT TO BACK, AC/HVDC

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

# Haliburton™ E1031

## GbE Enterprise or Datacenter Switch



**Celestica's Haliburton E1031 is a 48 port GbE Layer3 switch in a compact 1U form factor, suited for both Enterprise and Datacenter environments.**

The E1031 provides 48 10-BaseT/100-BaseTX/1000-BaseT ports and 4 1G/10G SFP+ ports and offers advanced DCB features. The system includes high reliability features, such as redundant and hot swappable power supplies and fans in forward and reverse airflow configurations.

The Haliburton E1031 supports current and future datacenter requirements, including an x86-based control plane for easier integration of automation tools, and an ONIE installer for 3rd party network operating systems and compatibility with Software Defined Networks.

### FEATURES

Interfaces: 48 RJ45 GbE Ports, 4 SFP+ 10GbE Ports, Management (1000Base-T), Console Ports RJ45 and USB2.0 (Type A)

Switching Capacity: 176 Gpbs, 4MB Packet Buffer

Datacenter: DCB, TRILL, Virtual Port (VM) Switching

CPU: 1.7Ghz Rangeley x86 Dual Core, 2/4GB DRAM, 64Mbit NOR Flash, 8GB mSATA

Routing Tables: Unified MAC/VLAN/L3 hosts up to 96K, LPM 16K IPv4

Jumbo Packet: 12K bytes

Content Aware Processing: Layer 2-7 packet classification

### LAYER TWO HARDWARE SUPPORTED

IEEE DCB protocol support, such as PFC, QCN, ETS

Virtual machine switching with VNTag/E-Tag support

802.3ad LACP

802.1D STP, 802.1w RSTP, 802.1s MSTP

802.1Q VLAN 4096, SVLAN, PVLAN

802.1 Q-in-Q double-tagged VLAN

802.1P L2 Prioritization

802.1AB LLDP

802.1x

IGMP/MLD Snooping

PBB/PBB-TE

Mirroring

Storm Control

#### LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward

Full IPv4 and IPv6 routing support with ECMP, WCMP, VRF, and uRPF support

Hardware based tunneling including enhanced MPLS PWE, L3 MPLS, MPLS-TP, GRE, ISATAP, PBB, PBB-TE and SPBm

IGMPv1/v2/v3

IP Multicast: PIM-SM, PIM-DM, PIM-SSM

#### TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Flexible QoS queuing for UC Packets

2-rate, 3-color policing

SP, WRR, WDRR Queuing

256K ACL for Layer2-4 packet classification, shaping and scheduling

DSCP

Hardware OAM support for IEEE 802.1ag, IEEE 802.3ah and Y.1731

Ring and linear protection switching

IEEE 1588 one-step and two-step time stamping support

ICAP/ECAP handling

#### POWER AND COOLING

Less than 150W consumption, 1+1 redundant, hot swap PSUs

100-240VAC Auto-ranging, 47-63Hz Auto input

2+1 redundant individual fans, front to back, or back to front system cooling

#### PHYSICAL DIMENSIONS

Height: 43.8 mm (1.73") 1 EIA unit

Width: 434 mm (17.09")

Depth: 320 mm (12.6")

#### ENVIRONMENTAL: OPERATING

Temperature: 0°C to 45°C

Humidity: 5% to 85% non-condensing

#### APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC

Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC

### ORDER INFORMATION

**E1031-2C2G8-F2B** - Rangeley 2Core 1.7Ghz Front to Back Airflow AC

**E1031-2C2G8-F2B** - Rangeley 2Core 1.7Ghz Back to Front Airflow AC

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

# Ivystone™ D7010

## 100GbE High Density Aggregation Data Center Switch



**Ivystone D7010 is 128 port 100GbE fixed IO switch in a cost competitive 4U form factor that provides 12.8Tbps bandwidth ideal for fabric aggregation and end of row applications.**

The D7010 provides programmable data plane innovation and can support port level configuration of sub-rates between 10GbE and 50GbE. System maximum of 144 10/25/50GbE sub-rate ports using breakout cables to provide superior large radix switch for TOR or CLOS connectivity. It provides superior low latency and power efficiency, while offering high reliability features such as redundant and hot swappable power supplies and fans in forward and reverse airflow configurations.

Ivystone D7010 supports current and future network requirements, including an Intel Xeon D processor COM-E based modular control plane including BMC management plane. An ONIE installer is also provided to support 3rd party network operating systems.

### FEATURES

Interfaces: 128 QSFP28 100GbE Ports, Shared RJ45 GbE Management and Console ports to both CPU and BMC, USB (Type A)

Switching Capacity: 12.8Tbps IO Bandwidth, 64M Byte Buffer

Datacenter: DCB, TRILL, Virtual Port (VM) Switching, L2 GRE, NVGRE and VXLAN (encap/decap TEP)

CPU: Intel Xeon D 2.2Ghz Dual-core (up to 16-core), 4-32GB ECC DDR4, 64GB up to 1TB M.2 SSD

Routing Tables: Unified Forwarding Tables: 512K, Configurable, ECMP: 64K, L3 LPM: 960K, LAG: 2014, Virtual Ports: 16.7M (VXLAN)

Content Aware Processing: Layer 2-7 packet classification, FCoE

Transceivers: QSFP28 up to 4.5W power, SR to 300m, LR to 10km, DAC (to 5m passive)

### BMC SYSTEM MANAGEMENT OPTION

DDR4 1Gb~4Gb/SPI 8Mb~64Mb Flash for dual boot

NC-SI shared management port

Serial over LAN (SOL) enabled

Supports remote (BIOS/firmware) online upgrading

IPMI 2.0



#### LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP, TRILL  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

#### LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSPF, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS, L3 VPN  
Hardware Based Tunneling: IPv4/v6, GRE, MiM  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP  
Enhanced IPF width and keys for SDN

#### TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Flexible QoS Queuing for UC Packets  
Separate QoS Queues for UC  
and MC Packets (10 each/port)  
2-Rate, 3-Color Policing  
SP, WRR, WDRR Queuing  
DCBX (ETS, PFC, CN/QCN)  
Per-Port DSCP  
Per-Port Oversubscription

#### POWER AND COOLING

Under 2000W peak consumption with maximum  
optics, 2+2 redundant, hot swap PSUs  
100 - 240VAC auto-ranging, 47-63Hz or 180-  
300VDC auto input, 1100W PSU  
4 + 1 redundant fans, front to back system cooling

#### DIMENSIONS

Height: 173.6 mm (6.83") 4 EIA unit  
Width: 446 mm (17.56")  
Depth: 750 mm (29.53")

#### ENVIRONMENTAL: OPERATING

Temperature: 0°C to 40°C  
Humidity: 10% to 90% non-condensing

#### APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024),  
FCC, VCCI, CCC  
Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC

### ORDER INFORMATION

**D7010-2C8G64-F2B** – 2 CORE BDE CPU 8GB RAM /  
64GB SSD, BMC, FRONT TO BACK, AC

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

# Questone2™ D3030

## 25GbE Top of Rack Datacenter Switch



**Celestica's Questone2 D3030 is a 48 port 25GbE and 8 port 100GbE switch in a compact 1U form factor that provides 2.0Tbps Bandwidth, ideally suited for Datacenter top of rack deployments.**

The D3030 provides programmable data plane innovation and can support port level configuration of 10GbE or 25GbE with 8 100GbE QSFP28 uplink ports. It provides superior low latency and power efficiency in a clean PHYless design, while offering high reliability features such as redundant and hot swappable power supplies and fans in forward and reverse airflow configurations.

The Questone2 D3030 supports current and future network requirements, including a COM-E modular x86-based control plane with BMC Management Plan and Precision Timing options for easier integration of automation tools familiar to server administrators, and an ONIE installer to support 3rd party network operating systems.

### FEATURES

Interfaces: 48 SFP28 25GbE ports, 8 QSFP28 ports, Rear CPU/BMC shared Management (RJ45) and Console (RJ45) ports, USB (Type A)

Switching Capacity: 2.0Tbps IO Bandwidth, 32M Byte Buffer

Latency: Less than 500ns port to port (cut-through mode)

EEE: 802.3az

Datacenter: DCB, TRILL, Virtual Port (VM) Switching, L2 GRE, NVGRE and VXLAN (encap/decap TEP)

Telemetry: Improved Instrumentation with Transient Capture Buffer, Packet Timestamp and Buffer Statistics

CPU: Intel Atom C 1.6Ghz Dual-core (up to 8-core), 4-32GB ECC DDR4, 16GB up to 1TB M.2 SSD

Routing Tables: Unified Forwarding Tables: upto 354K MPLS labels, 350K LPM, 128K ACL

Content Aware Processing: Layer 2-7 packet classification, FCoE

Transceivers: SFP28 upto 2W, QSFP28 upto 4.5W power, SR to 300m, LR to 10km, DAC (to 5m passive)

### IEEE1588 & SYNC E TIMING OPTION

Supports IEEE1588 1-step and 2-step time stamping

Supports TC and BC mode

Supports SyncE recovery

### BMC SYSTEM MANAGEMENT OPTION

DDR3 1Gb-4Gb/SPI 8Mb-64Mb Flash for dual boot

NC-SI shared management port

Serial over LAN (SOL) enabled

Supports remote (BIOS/firmware) online upgrading

IPMI 2.0

## LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP, TRILL  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

## LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSPF, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS, L3 VPN  
Hardware Based Tunneling: IPv4/v6, GRE, MiM  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP  
Enhanced IPF width and keys for SDN

## TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Flexible QoS Queuing for UC Packets  
Separate QoS Queues for UC and MC Packets (10 each/port)  
2-Rate, 3-Color Policing  
SP, WRR, WDRR Queuing  
DCBX (ETS, PFC, CN/QCN)  
Per-Port DSCP  
Per-Port Oversubscription

## POWER AND COOLING

Under 550W peak consumption with maximum optics, 1+1 redundant, hot swap PSUs  
100-240VAC auto-ranging, 47-63Hz or, 180-300VDC auto input  
48V PSU option available  
3+1 redundant fans, front to back and back to front system cooling

## DIMENSIONS

Height: 43.8 mm (1.73") 1 EIA unit  
Width: 442 mm (17.3")  
Depth: 521 mm (20.5")

## ENVIRONMENTAL: OPERATING

Temperature: 0°C to 45°C  
Humidity: 5% to 90% non-condensing

## APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC  
Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC

## ORDER INFORMATION

**D3030-2C4G16-F2B** - 2Core Intel Atom C CPU, 4GB RAM, 16 GB SSD, BMC, Front to Back Airflow, Dual AC/HVDC PSU

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

# Seastone2™ DX030

## 100GbE BMC Enabled Datacenter Fabric Switch



**Seastone2 DX030 is Celestica's 2nd generation 32 port 100GbE switch in a compact 1U form factor, ideally suited for Datacenter environments in either Leaf or Spine deployments.**

The DX030 provides programmable data plane innovation and can support port level configuration of sub-rates between 10GbE and 50GbE. System maximums of 128 10/25GbE, or 64 50GbE, or 32 40GbE are supported with breakout cables to provide superior large radix switch for TOR or CLOS connectivity. It provides superior low latency and power efficiency in a clean PHYless design, while offering high reliability features such as redundant and hot swappable power supplies and fans in forward and reverse airflow configurations.

Seastone2 DX030 supports current and future network requirements, including a COM-E modular x86-based control plane with BMC Management Plan and Precision Timing options for easier integration of automation tools familiar to server administrators, and an ONIE installer to support 3rd party network operating systems.

### FEATURES

Interfaces: 32 QSFP28 100GbE Ports (128 available sub-rate ports), 2 SFP+ 10G, Rear CPU/BMC shared Management (RJ45) and Console (RJ45) ports, USB (Type A)

Switching Capacity: 3.2Tbps IO Bandwidth, 32M Byte Buffer

Latency: Less than 500ns port to port (cut-through mode)

EEE: 802.3az

Datacenter: DCB, TRILL, Virtual Port (VM) Switching, L2 GRE, NVGRE and VXLAN (encap/decap TEP)

Telemetry: Improved Instrumentation with Transient Capture Buffer, Packet Timestamp and Buffer Statistics

CPU: Intel Atom C 1.6Ghz Dual-core (up to 8-core), 4-32GB ECC DDR4, 16GB up to 1TB M.2 SSD

Routing Tables: Unified Forwarding Tables: up to 354K MPLS labels, 350K LPM, 128K ACL

Content Aware Processing: Layer 2-7 packet classification, FCoE

Transceivers: QSFP28 upto 4.5W power, SR to 300m, LR to 10km, DAC (to 5m passive)

### IEEE1588 & SYNCE TIMING OPTION

Supports IEEE1588 1-step and 2-step time stamping

Supports TC and BC mode

Supports SyncE recovery

#### BMC SYSTEM MANAGEMENT OPTION

DDR3 1Gb~4Gb/SPI 8Mb~64Mb Flash for dual boot  
NC-SI shared management port  
Serial over LAN (SOL) enabled  
Supports remote (BIOS/firmware) online upgrading  
IPMI 2.0

#### LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP, TRILL  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

#### LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSPF, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS, L3 VPN  
Hardware Based Tunneling: IPv4/v6, GRE, MiM  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP  
Enhanced IPF width and keys for SDN

#### TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Flexible QoS Queuing for UC Packets  
Separate QoS Queues for UC and MC Packets (10 each/port)  
2-Rate, 3-Color Policing  
SP, WRR, WDRR Queuing  
DCBX (ETS, PFC, CN/QCN)  
Per-Port DSCP  
Per-Port Oversubscription

#### POWER AND COOLING

Under 800W peak consumption with maximum optics, 1+1 redundant, hot swap PSUs  
100-240VAC auto-ranging, 47-63Hz or 180-300VDC auto input  
3+1 redundant fans, front to back and back to front system cooling

#### PHYSICAL DIMENSIONS

Height: 43.8 mm (1.73") 1 EIA unit  
Width: 442 mm (17.3")  
Depth: 521 mm (20.5")

#### ENVIRONMENTAL: OPERATING

Temperature: 0°C to 45°C  
Humidity: 5% to 90% non-condensing

#### APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC  
Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC

## ORDER INFORMATION

**DX030-2C4G16-F2B** - 2Core DTN CPU 4GB RAM/  
16GB SSD, BMC, Front to Back, AC/HVDC

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



# Silverstone™ DX400

## 400GbE Datacenter Infrastructure Switch



**Celestica's Silverstone DX400 is an industry leading 32 QSFP-DD port 400GbE switch in a compact 1U form factor that provides 12.8Tbps Bandwidth for the most demanding Datacenter needs.**

The DX400 can support port level configuration of sub-rates between 10GbE and 100GbE. System maximum of 144 10/25/50GbE ports or 128 40/100GbE ports using breakout cables provides a superior fabric device for large radix CLOS networks. It provides superior low latency and power efficiency in a clean PHYless design, while offering high-reliability features such as redundant and hot swappable power supplies and fans.

The Silverstone DX400 supports current and future network requirements, including a COM-E modular x86-based control plane with BMC Management Plan and Precision Timing options for easier integration of automation tools familiar to server administrators, and an ONIE installer to support 3rd party network operating systems.

### FEATURES

Interfaces: 32 QSFP-DD 400GbE Ports (144 available sub-rate ports), CPU/BMC shared Management (RJ45) and Console (RJ45) ports, USB (Type A)

Switching Capacity: 12.8Tbps IO Bandwidth, 64M Byte Buffer

Latency: Less than 500ns port to port (cut-through mode)

EEE: 802.3az

Datacenter: DCB, TRILL, Virtual Port (VM) Switching, L2 GRE, NVGRE and VXLAN (encap/decap TEP)

CPU: Intel Xeon D 2.2Ghz Dual-core (up to 16-core), 4-32GB ECC DDR4, 64GB up to 1TB M.2 SSD

Routing Tables: Unified Forwarding Tables: 512K, Configurable, ECMP: 64K, L3 LPM: 960K, LAG: 2014, Virtual Ports: 16.7M (VXLAN)

Content Aware Processing: Layer 2-7 packet classification, FCoE

Transceivers: QSFP-DD (up to 12W)

### IEEE1588 & SYNC E TIMING OPTION

Supports IEEE1588 1-step and 2-step time stamping

Supports TC and BC mode

Supports SyncE recovery

### BMC SYSTEM MANAGEMENT OPTION

DDR3 1Gb-4Gb/SPI 8Mb-64Mb Flash for dual boot

NC-SI shared management port

Serial over LAN (SOL) enabled

Supports remote (BIOS/firmware) online upgrading

IPMI 2.0

## LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP, TRILL  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

## LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSPF, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS, L3 VPN  
Hardware Based Tunneling: IPv4/v6, GRE, MiM  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP  
Enhanced IPF width and keys for SDN

## TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Flexible QoS Queuing for UC Packets  
Separate QoS Queues for UC and MC Packets (10 each/port)  
2-Rate, 3-Color Policing  
SP, WRR, WDRR Queuing  
DCBX (ETS, PFC, CN/QCN)  
Per-Port DSCP  
Per-Port Oversubscription

## POWER AND COOLING

1100W peak consumption with 12W QSFP-DD,  
1+1 redundant, hot swap PSUs  
100-240VAC auto-ranging, 47-63Hz or  
180-300VDC auto input  
5+1 redundant fans, front to back system cooling

## PHYSICAL DIMENSIONS

Height: 43.8 mm (1.73") 1 EIA unit  
Width: 438 mm (17.3")  
Depth: 656 mm (25.8")

## ENVIRONMENTAL: OPERATING

Temperature: 0°C to 45°C  
Humidity: 5% to 90% non-condensing

## APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024),  
FCC, VCCI, CCC  
Safety: IEC60950-1, GB4943, UL/CSA, CB, CCC

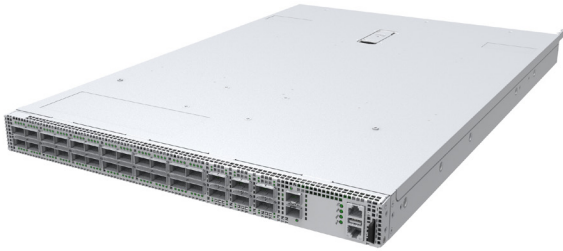
## ORDER INFORMATION

**DX400-2C4G16-BMC-F2B** - 2Core Intel Xeon D  
CPU, 4GB RAM, 16GB SSD, BMC, Front to Back,  
AC/HVDC PSU

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

# SilverstoneDP™ DX500

100GbE Deep Buffer Switch / Router with 400G Uplinks



**Celestica's SilverstoneDP™ DX500 provides 24 port 100GbE downlink, 6 port 400GbE uplink, in 1RU form factor that is ideally suited for Edge Switch/Router deployments such as datacenter interconnection application.**

The DX500 provides programmable data plane innovation and can support port level configuration of sub-rates of 4x10GbE, 40GbE, 4x25Gb, 2x50GbE for 100GbE port and 8x10G, 4x25G, 8x25G, 2x40G, 4x40G, 2x50G, 4x50G, 2x100G for 400GbE port. It provides superior low latency and power efficiency, while offering high reliability features such as redundant and hot swappable power supplies and fans.

Key features of the DX500 are its deep buffering capability, with optional external TCAM configuration, and stackable downlink/uplink configuration – making it ideal for edge switch/router applications and flexible CLOS connectivity. DX500 supports current and future network requirements, including multiplexed port access to both COM-E modular x86-based control plane and BMC management plane. An ONIE installer is also provided to support third party network operating systems.

## FEATURES

Interfaces: 24x QSFP28 100GbE Ports, 6x QSFP-DD 400GbE Ports, 1x RJ45 10/100/1000BaseT Management port, 1x RJ45 Console port, 1x USB2.0 (Type A)

Switching Capacity: 4.8Tbps IO Bandwidth, 32MB on die buffers, up to 8GB integrated HBM deep buffer

Latency: Sub-Microsecond Level Latency

Datacenter: Ethernet Ver.2, IEEE802.2 LLC and IEEE802.2 SNAP, Packets without standard physical layer, IEEE 802.1Q, Metro Ethernet, Enterprise and Data Center, PPPoE, Ethernet Bridging, IPv4/IPv6 Routing, IPv6 Segment Routing, MPLS, MPLS Segment Routing, VPLS(L2VPN), L3VPN, EVPN, IEEE 802.1ah(PBB, MAC-in-MAC), BIER, FCoE, IP Tunnels, VxLAN, NV-GRE, Geneve, RIOT, Ethernet OAM, BFD, RFC6374, MPLS-TP OAM

CPU: Intel Xeon D 2/4/8/16 core configurable, Up to 32GB ECC DDR4, Up to 1TB M.2 SSD

Routing Tables: MDB profiles: Up to 1M(Balanced)/1M(L2-XL)/300K(L3-XL)/2M+(External KBP) MPLS ILM, 1.5M(Balanced)/64K(L2-XL)/2.6M(L3-XL)/12M(External KBP) IPv4 LPM, 750K(Balanced)/32K(L2-XL)/1.3M(L3-XL)/6M(External KBP) IPv6 LPM

Transceivers: Up to 3.5W QSFP28 and up to 15W QSFP-DD, Up to 3M@AWG28 for QSFP28 without FEC, Up to 2.5M@AWG28 for QSFP-DD

### BMC SYSTEM MANAGEMENT OPTION

1GB DDR4  
Dual 32MB Flash for dual boot  
NC-SI shared management port  
Serial over LAN (SOL) enabled  
Supports remote (BIOS/firmware) online upgrading  
IPMI 2.0

### LAYER TWO HARDWARE SUPPORTED

802.3ad LACP  
802.1D STP, 802.1w RSTP, 802.1s MSTP  
802.1Q VLAN 4096, SVLAN, PVLAN  
802.1 Q-in-Q double-tagged VLAN  
802.1P L2 Prioritization  
802.1AB LLDP  
802.1x Network Access Control  
IGMP/MLD Snooping  
PBB/PBB-TE  
VM Switching/VEPA/VN-Tag/802.1Qbh  
Mirroring  
Storm Control

### LAYER THREE HARDWARE SUPPORTED

Hardware-based IP Forward  
IPv4/v6 Routing Protocols: OSFP, RIP, IS-IS, BGP  
VRF, ECMP/WCMP, VRRP  
VPWS, VPLS/MPLS, L2/L3 VPN  
Hardware Based Tunneling: IPv4/v6, MiM  
VxLAN, NV-GRE, Geneve  
IGMPv1/v2/v3  
IP Multicast: PIM-SM, PIM-DM, PIM-SSM  
Hierarchical ECMP  
Instrumentation Applications: sFlow, Inband Network Telemetry (INT)  
OAM

### TRAFFIC MANAGEMENT HARDWARE SUPPORTED

Ingress/Egress Traffic Manger: OCB SRAM 128Mb, DRAM 32Gb, 64K queues VOQs/FMQs/EFQs, 8 UC/MC per OTM port  
Ingress/Egress credit scheduler: Scheduling/ Shaping (MEF, IETF DiffServ, TR-059 compliant), 96k scheduler flows  
Fabric adaptor: VSC256.v2 cell format, 256K multicast groups, Packet cell packing  
Counter, Meter, Statistics  
WRED, PFC, ETS flow control

### POWER AND COOLING

Under 1100W peak consumption with maximum optics, 1+1 redundant, hot swap PSUs  
100-240VAC auto-ranging, 47-63Hz, or 180V-310V HVDC with same PSU  
Optional 48VDC Power supply options  
6+1 redundant fans, F2B (port side intake) system cooling

### DIMENSIONS

Height: 43.1 mm  
Width: 438.5 mm  
Depth: 657.5 mm

### ENVIRONMENTAL: OPERATING

Temperature: 0°C to 45°C @ 950 m  
Humidity: 5% to 90% non-condensing

### APPROVALS

EMC: CN(GB9254-2008), EU(EN55022, EN55024), FCC, VCCI, CCC  
Safety: UL/CSA/IEC/EN 60950-1/62368-1  
Environmental: EU RoHS, SVHC requirements of REACH, China RoHS

## ORDER INFORMATION

**DX500-4C16G32-F2B** – 8GB HBM, No TCAM, 4Core BDE CPU 16GB RAM / 32GB SSD, BMC, Front to Back, AC/HVDC

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



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