

# Pluribus Freedom E-Series Switches

## Datasheet for E68-M and E28Q-L switches

Built from the ground up using the Broadcom Trident 2 merchant silicon chipset and the Intel Xeon server-class CPU, the high performance E-series switches provide the best-in-class switching economics for Top-of-Rack and server class control plane Spine switches with the Pluribus Netvisor® Operating System.

### Freedom E-Series Switch Platforms powered by Netvisor® OS

The Pluribus Networks Freedom E-series switches provide best-in-class networking functionality including switching, routing, and unprecedented network visibility.

The E-Series switches are powered by the Netvisor® operating system (nvOS). nvOS delivers an open, standards-based, highly-available network operating system (OS) completely interoperable with existing networks.

As the foundation of nvOS, the Pluribus Virtualization-Centric Fabric (VCF™) architecture brings automation, programmability and virtualization capabilities to the fabric without any rip-and-replace.

Pluribus VCF is the foundation to deliver a variety of network services to increase the business relevance of the network. Among these services are: network visibility and analytics, segmentation and multitenancy, service insertion, data center interconnect and even Layer 1 virtual wire services for lab automation and packet broker applications.

The Pluribus Freedom E68-M is an E-series switch suitable for Top-of-Rack applications and as a tap aggregation solution working in conjunction with the Pluribus VCFcenter™ solution to deliver network visibility and analytics.

The Pluribus Freedom E28Q-L high performance spine switch is ideal for multi-tenancy, network segmentation and service insertion.

#### Networking Performance

- E28Q-L 28x40 GE ports (up to 80x10 GE ports) and 2.24 Tbps
- E68-M 44x10 GE ports + 6x40 GE ports and 1.36 Tbps
- Layer-2 and Layer-3 forwarding at line rate
- Based on Broadcom Trident 2 switch chip

#### High Performance Control Plane

- E68-M: Xeon E3 (4 cores), 16GB RAM, 2x120GB SSD
- E28Q-L: 2x Xeon E5 (6 cores each, 64GB RAM, 2x300GB SSD)

### Netvisor Benefits

- Centralized CLI or RESTful API to control the entire fabric.
- No external controllers or new protocols.
- Topology agnostic and fully interoperable with third party spine switches.
- vPort - End-point/VM level visibility with VMware vCenter integration.
- vFlow – service insertion and stateless traffic inspection for east-west traffic.
- Built-in connection flow visibility. IPFIX and sFlow.
- Network segmentation with overlapping subnets and independent control and management plane for each tenant.
- Advanced Data Center Interconnect capabilities.
- L1 virtual wire services for packet broker or lab automation. 100% transparent to the existing network.

### Licensing Packages

The Pluribus Netvisor operating system (nvOS) software licensing packages are designed for flexible customer consumption:

- The base feature set and fabric capability are included in the Enterprise Fabric license.
- The advanced feature set can be added on to the base license package.

All licenses are perpetual and support is purchased separately.

Each Pluribus device, feature and product within a fabric requires its own license. Licenses are independent of each other. If you want to use features that are covered by other licenses, you must install the appropriate license for those features. Licenses may be specific to a particular hardware platform.

Pluribus nvOS is available as follows:

- Enterprise Fabric license included with the switch:
  - Complete L2/L3/VXLAN stack
  - VCF Fabric
  - Network Visibility
  - Integration with Pluribus VCFcenter™
- Virtualization license (add-on, not included with the switch)
  - Multi-tenancy, segmentation
- L1 Virtual Wire (add-on, not included with the switch)
  - L1 transparent switch

## Enterprise Fabric License - Detailed Functionality

Functionality	Description
Operating System Install & Upgrade	<ul style="list-style-type: none"> <li>Offline Software Upgrade</li> <li>Online Software Upgrade</li> </ul>
Extensibility	<ul style="list-style-type: none"> <li>CLI</li> <li>RESTful, Java, and C API</li> <li>API and CLI install on any Linux server for centralized management and automation</li> <li>Ansible automation</li> </ul>
Layer 3 Features	<ul style="list-style-type: none"> <li>Quagga IPv4 routing suite including OSPFv2, BGPv4, and RIP</li> <li>Equal-Cost Multi-Path (ECMP)</li> <li>VRRP – with Active-Active data plane</li> <li>Bidirectional Forwarding Detection (BFD) for Static Routes, OSPFv2, &amp; BGPv4</li> <li>VRRPv6, OSPFv3, BGPv6</li> <li>Static Routes</li> <li>Loopback Interface</li> <li>DHCP Relay</li> <li>NAT (SW)</li> <li>Quagga Direct Access</li> <li>IPv6 Neighbor Discovery</li> </ul>
Layer 2 Features	<ul style="list-style-type: none"> <li>Bridge management with RSTP (IEEE 802.1w) and RSTP PortFast</li> <li>STP Cluster Awareness</li> <li>BPDU Guard, BPDU Filter</li> <li>VLANs, VLAN Trunks (IEEE 802.1q)</li> <li>LACP (IEEE 802.3ad)</li> <li>LLDP (IEEE 802.1ab)</li> <li>Link Aggregation Group (LAG)</li> <li>Multi-chassis LAG (vLAG)</li> <li>Storm control for Multicast and Broadcast</li> <li>IGMPv2/v3 snooping</li> <li>MLD Snooping</li> <li>Jumbo Frames</li> <li>MSTP (IEEE 802.1s)</li> </ul>
VxLAN Features	<ul style="list-style-type: none"> <li>vTEP</li> <li>vTEP HA</li> <li>DCI solution with single fabric across N sites</li> <li>Virtual Link Extension</li> <li>Egress Load balancing</li> </ul>
Management	<ul style="list-style-type: none"> <li>Linux Management Tools – Perl, Python, etc</li> <li>SSHv2 &amp; TLS 1.2</li> <li>IPv6 for Management</li> <li>High Availability (HA) Management Interfaces (E28 only)</li> <li>Banner &amp; MOTD</li> </ul>
Monitoring & Troubleshooting	<ul style="list-style-type: none"> <li>Traditional monitoring with SNMP v1, v2, and v3</li> <li>Network specific MIB, ACL-based counters</li> <li>Port mirroring</li> <li>Port Mirroring to Remote Host (PMRH)</li> <li>Encapsulated Port Mirroring to Remote Host (EPMRH)</li> <li>Troubleshooting with syslog, hardware inventory, and log files</li> <li>sFlow – based on sFlow standard (data sampling)</li> <li>IPFIX – based on RFC5103 for TCP bidirectional flows</li> <li>Traceroute</li> </ul>

Functionality	Description
Security Features	<ul style="list-style-type: none"> <li>MAC Security</li> <li>Control Plane Traffic Protection (CPTP)</li> <li>Flow level security (vFlow ACL with drop, log, mirror actions)</li> <li>TACACS+</li> <li>L2 and L3 ACL</li> <li>MD5 (BGPv4)</li> <li>vFlow – For security service insertion and policy enforcement</li> </ul>
QoS Features	<ul style="list-style-type: none"> <li>Layer 2 Class of Service (CoS) (IEEE 802.1p)</li> <li>Differentiated Services Code Point (DSCP)</li> <li>DSCP to CoS mapping</li> <li>CoS to DSCP mapping</li> <li>QoS Strict Priority Queue</li> <li>Egress per port rate limiting</li> <li>CoS-to-ToS/ToS-to-CoS mapping</li> </ul>
Fabric Automation	<ul style="list-style-type: none"> <li>Controller-less Fabric with single CLI/API for automation and operational simplification</li> <li>Fabric interoperability with third party Spine and/or Leaf Networks</li> <li>Fabric control plane over In-band and Out-of-band management network</li> <li>Fabric Over a Layer 3 Network</li> <li>Fabric-wide ARP suppression</li> <li>Zero Touch Replacement (ZTR) - Cluster nodes L2 Only</li> <li>Automatic Port Channeling (trunking)</li> <li>Zero Touch Provisioning (Ansible)</li> <li>L2/L3 Fabric Automation (Ansible)</li> </ul>
Fabric Visibility	<ul style="list-style-type: none"> <li>vPort - End-point/VM level visibility</li> <li>VMware vCenter integration with vPort for VM/host visibility</li> <li>Connection flow visibility</li> <li>IPFIX Connection Export</li> <li>sFlow</li> <li>VXLAN connection visibility</li> <li>Fabric-wide network traffic telemetry (packets, congestion, errors, etc.)</li> <li>Packet capture (PCAP format) for any flow</li> <li>FlowTrace to trace the path of any flow across the fabric</li> <li>Time Machine for connection, ports and vPort</li> </ul>

## Fabric Virtualization License – Detailed Functionality

Functionality	Description
Virtualization Features	Virtual Networks (vNETs) with overlapping VLAN/subnet Multiple Virtual Routers (HW accelerated vRouters) Role-based Access Management (RBAC) Virtual Network Services: Domain Name Services (DNS) PXE Server Network Time Protocol (NTP) Server OpenStack ML2 Neutron Plugin – Mirantis Certification

## Virtual Wire License – Detailed Functionality

Functionality	Description
Transparency	No impact to data traffic and control plane traffic from network switches CRC errors transparency Proprietary protocols transparency (e.g. Cisco FEX) Transparency to any network protocol including MPLS
Link Tracking	Bring up/down a virtual link across the fabric traversing multiple switches
Port mapping	One-to-one One-to-many for tools/services insertion
Management	Centralized CLI RESTful API 3 <sup>rd</sup> party GUI
Connectivity	Copper-to-fiber Fiber-to-copper 40G-10G Breakout cables 40G-to-10G 10G-to-1G 40G-to-1G

## nvOS Scalability – E-Series switches

Performance	E68-M	E28Q-L
MAC Addresses HW	288,000	288,000
MAC Addresses	1,200,000	1,200,000
IPv4 Routes	16,000	16,000
RSTP Instances	256	256
VLANs (without RSTP)	4,000	4,000
VLANs (with RSTP)	512	512
VLANs (with MSTP)	4,000	4,000
MST Instances	16	16
Link Aggregation Group (LAG)	32	32
Member ports per LAG	16	16
Multi-chassis LAG (vLAG)	64	86
Member ports per vLAG	16	16
IGMP Groups	4,000	4,000
MLD Groups	4,000	4,000
Traffic Mirroring	4 sessions	4 sessions
Jumbo Frames	9,216 bytes	9,216 bytes
ACL Entries	2,000	2,000
vNIC (SVI)	256	256
ECMP	16-way	16-way
VRRP groups	256	256
BFD sessions	128	128
IPv4 host table size	16,000	16,000
QoS Queues per port	8	8
VXLAN vTEP Tunnels	1,000	1,000
Open TCP Connections by nvOS	200,000	200,000
Total TCP Connections by nvOS	200,000	200,000
TCP Connection Track Rate	40,000/sec	30,000/sec
Total vPorts in Fabric	1,200,000	1,200,000
Total vFlows in a Fabric	2,000	2,000
vNETs Virtualization - Max	2	32
vRouters Virtualization - Max	16	16

## Enterprise Series Switches – Model Comparison

Capability	E68-M	E28Q-L
Ethernet Ports	44 x 10G/1G (SFP+) + 6 x 40G/4x10G (QSFP+)	28 x 40G (QSFP+) Or 8 x 40G (QSFP+) + 80 x10G (QSFP+)
Processors (Cores)	1 Xeon E3-1265v2 (4 Cores)	2 Xeon E5-2620 (12 Cores)
Memory	16 GB	64 GB
Storage Configuration	2 x 120GB SSD (internal)	2 x 240GB SSD (internal)
Storage Expansion Slots	N/A	2 x 2.5" SATA SSDs
CPU-Switch Chip Ethernet Bandwidth	4 x 1GE	4 x 10GE + 8G PCIe
Networking Chip	Broadcom Trident-2	Broadcom Trident-2
Power Supplies	2 x 650W	2 x 1000W

## Mechanical and Environmental Specifications

Specification	E68-M	E28Q-L
Width	17.00 in (43.2 cm)	16.93 in (43 cm)
Height	1.70 in (4.5 cm)	3.46 in (8.8 cm)
Depth	22.2 in (55.9 cm)	29.43 in (74.75 cm)
Weight	30 lb (14 kg)	55 lb (25 kg)
Power Supplies	2 x 500 W	2 x 1000 W
Power Draw – Max	400 W	1100 W
Airflow	Back-to-front	Back-to-front
Cooling Requirements – Max	2900 BTU/hr	4100 BTU/hr
Rack Mount Options	1RU or Solid Wall	2 RU or Solid Wall
Temperature – Operating	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)
Altitude Range – Operating	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)
Relative Humidity – Operating	10% to 85% (noncondensing)	10% to 85% (noncondensing)
Relative Humidity – Non-operating	5% to 95% (noncondensing)	5% to 95% (noncondensing)
Storage Temperature	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)
Management	1 Ethernet 10/100/1000, RJ-45, and IPMI	2 Ethernet 10/100/1000, RJ-45, and IPMI
Console	Console, VGA, and 2 USB ports	Console, VGA, and 4 USB ports

## nvOS Supported IEEE standards

IEEE Standards	Description
IEEE 802.1ab	LLDP
IEEE 802.1Qaz	Enhanced Transmission Selection
IEEE 802.1Qau	Congestion Notification
IEEE 802.1Qbg	Edge Virtual Bridging
IEEE 802.1Qbb	Priority-based Flow Control
IEEE 802.1D	Spanning Tree Protocol
IEEE 802.3ad	Link Aggregation Control Protocol (LACP)
IEEE 802.3ae	10 Gigabit Ethernet
IEEE 802.3ba	40 Gigabit Ethernet
IEEE 802.1p	CoS Prioritization
IEEE 802.1W	Rapid Spanning Tree Protocol
IEEE 802.1Q	VLAN Tagging
IEEE 802.1s	MSTP
IEEE 802.3z	Gigabit Ethernet

## nvOS Supported RFCs

Supported RFCs	Description
RFC 768	User Datagram Protocol (UDP)
RFC 783	Trivial File Transfer protocol (TFTP)
RFC 791	IP
RFC 792	Internet Control Message Protocol (ICMP)
RFC 793	TCP
RFC 826	ARP
RFC 854	Telnet
RFC 951	BootP
RFC 959	FTP
RFC 1305	Network Time Protocol (NTP) Version 3
RFC 1519	Classless Interdomain Routing (CIDR)
RFC 1542	BootP Relay
RFC 1591	Domain Name System (DNS) Client
RFC 1724	RIPv2 MIB Extension
RFC 1812	IPv4 Routers
RFC 2236	Internet Group Management Protocol
RFC 2328	OSPF Version 2
RFC 2453	RIP Version 2
RFC 2519	A Framework for Inter-Domain Route Aggregation
RFC 3101	OSPF Not-So-Stubby-Area (NSSA) Option
RFC 3137	OSPF Stub Router Advertisement
RFC 3376	Internet Group Management Protocol
RFC 3509	Alternative Implementations of OSPF Area Border Routers
RFC 3569	An Overview of SSM
RFC 3623	Graceful OSPF Restart
RFC 4271	BGPv4
RFC 4456	BGP Route Reflection
RFC 4486	Subcodes for BGP Cease Notification Message
RFC 4607	Source Specific Multicast for IP
RFC 4724	Graceful Restart Mechanism for BGP
RFC 4893	BGP Support For Four-Octet AS Number Space
RFC 7011	IP Flow Information Export (IPFIX)
RFC 5103	Bidirectional Flow Export Using IP Flow Information Export (IPFIX)
RFC 7348	Virtual Extensible LAN (VXLAN)

## nvOS Supported MIBs

Supported MIBs	Description
RFC 1155	SMI
RFC 1157	SNMPv1
RFC 1212, 1213, 1215	MIB-II, Ethernet-like MIB and TRAPs
RFC 1901	Introduction to Community-based SNMPv2
RFC 2011	SNMPv2 for Internet Protocol using SMIv2
RFC 2012	SNMPv2 for Transmission Control Protocol using SMIv2
RFC 2013	SNMPv2 for User Datagram Protocol using SMIv2
RFC 2233	The Interfaces Group MIB using SMIv2
RFC 2287	System Application Packages MIB
RFC 2570	Introduction to Version 3 of the Internet standard Network Management Framework
RFC 2571	An Architecture For Describing SNMP Management Frame works (read-only access)
RFC 2572	Message Processing and Dispatching for the SNMP (read only access)
RFC 2576	Coexistence between SNMP v1, v2, and v3
RFC 2578	SNMP Structure of Management Information MIB
RFC 2579	SNMP Textual Conventions for SMIv2
RFC 2580	Conformance Statements for SMIv2
RFC 2665	Ethernet like Interface MIB

## Regulatory Compliance

Functionality	Description
EMC Emissions	FCC 47CFR, Part 15 Class A (2009) USA Radiated Emissions EN 55022 Class A (2006) +A1 2007 European Radiated Emissions VCCI Class A (2007) Japanese Radiated Emissions BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions AS/NZS CISPR22:2009
RoHS	RoHS 5 compliant except for lead press-fit connectors
Power	Gold Power Supply Efficiency
Safety	CAN/CSA-C22.2 No. 60950-1 (2007) Information Technology Equipment– Safety UL 60950-1 (2nd Ed.) Information Technology Equipment – Safety EN 60950-1 (2005) Information Technology Equipment – Safety IEC 60950-1 (2005) Information Technology Equipment – Safety (all country deviations): CB Scheme report EN 60825-1 +A1+A2 (1994) Safety of Laser Products – Part 1: Equipment Classification

## Ordering Information

Chassis	
E68-M-NVOS	E68-M (1U) Switch with 44x10G SF + 6x40G QSFP front-to-back airflow, Netvisor Enterprise, Telemetry & Visibility and Fabric Automation
E68-MR-NVOS	E68-MR (1U) Switch with 44x10G SF + 6x40G QSFP back-to-front airflow, Netvisor Enterprise, Telemetry & Visibility and Fabric Automation
E28Q-L-NVOS	E28Q-L (2U) Hyper-Converged Switch with 28x40G QSFP (80x10G), front-to-back airflow, Netvisor Enterprise, Telemetry & Visibility and Fabric Automation
E28Q-LR-NVOS	E28Q-LR (2U) Hyper-Converged Switch with 28x40G QSFP (80x10G), back-to-front airflow, Netvisor Enterprise, Telemetry & Visibility and Fabric Automation
Software	
NVOS-E68M-V	E68-M Virtualization license with up to 2 vNET instances
NVOS-E28QL-V	E28Q-L Virtualization license
Support SKUs	
SVC-E68M-RTF-1YR	8 x 5 Software Support, E68M, RMA Return-to-Factory, 1-Year
SVC-E68M-RTF-3YR	8 x 5 Software Support, E68M, RMA Return-to-Factory, 3-Years
SVC-E68M-NBDS-1YR	24 x 7 Software Support, E68M, RMA Next Business Day Shipping, 1-Year
SVC-E68M-NDBS-3YR	24 x 7 Software Support, E68M, RMA Next Business Day Shipping, 3-Years
SVC-E68M-NBDA-1YR	24 x 7 Software Support, E68M, RMA Next Business Day Arrival, 1-Year
SVC-E68M-NDBA-3YR	24 x 7 Software Support, E68M, RMA Next Business Day Arrival, 3-Years
SVC-E68M-ADVOS-SPPT-1YR	Advanced Netvisor® Software Support for Virtualization license, E68M, 1-Year
SVC-E68M-ADVOS-SPPT-3YR	Advanced Netvisor® Software Support for Virtualization license, E68M, 3-Years
SVC- E28Q-NBDS-1YR	24 x 7 Software Support, E28Q, RMA Next Business Day Shipping, 1-Year
SVC- E28Q-NDBS-3YR	24 x 7 Software Support, E28Q, RMA Next Business Day Shipping, 3-Years
SVC- E28Q-NBDA-1YR	24 x 7 Software Support, E28Q, RMA Next Business Day Arrival, 1-Year
SVC- E28Q-NDBA-3YR	24 x 7 Software Support, E28Q, RMA Next Business Day Arrival, 3-Years
SVC- E28Q-ADVOS-SPPT-1YR	Advanced Netvisor® Software Support for Virtualization license, E28Q, 1-Year
SVC- E28Q-ADVOS-SPPT-3YR	Advanced Netvisor® Software Support for Virtualization license, E28Q, 3-Years
Services SKUs (E28Q-L Only)	
FDR-KIT	Time Machine (Network DVR) for Security Analysis, Audit and Compliance Kit (1x800G SSD)
VS-KIT	Virtualized Services Kit (2x300GB SSD)
External Storage	
E28Q-SD120	120GB MLC 2.5" SSD
E28Q-SD300	300GB MLC 2.5" SSD
E28Q-SD800	800GB MLC 2.5" SSD

## Ordering Information, continued

Cables and Transceivers	
<b>1G</b>	
SFP-T	1000BASE-T, Transceiver
SFP-SX	GE LC connector SX transceiver (MMF)
SFP-LX	GE LC connector LX/LH transceiver (SMF)
<b>10G Transceivers</b>	
SFP10-SR	SFP+, 10GbE, SR, 850nm Wavelength, 300 Meter, Transceiver
SFP10-LR	SFP+, 10GbE, LR, 1310nm Wavelength, 10 Kilometer, Transceiver
SFP10-ER	SFP+, 10GbE, ER, 1550nm Wavelength, 40 Kilometer, Transceiver
<b>10G Direct Attach Copper</b>	
SFP10-CU0P5M	SFP+, 10GbE, Passive Copper Direct Attach, 0.5 Meter, Cable
SFP10-CU1M	SFP+, 10GbE, Passive Copper Direct Attach, 1 Meter, Cable
SFP10-CU2M	SFP+, 10GbE, Passive Copper Direct Attach, 2 Meter, Cable
SFP10-CU3M*	SFP+, 10GbE, Passive Copper Direct Attach, 3 Meter, Cable
<b>10G Active Optical Cables</b>	
SFP10-AO3M	SFP+, 10GbE, Active Fiber Optic, 3 Meter, Cable
SFP10-AO5M	SFP+, 10GbE, Active Fiber Optic, 5 Meter, Cable
SFP10-AO7M	SFP+, 10GbE, Active Fiber Optic, 7 Meter, Cable
SFP10-AO10M	SFP+, 10GbE, Active Fiber Optic, 10 Meter, Cable
SFP10-AO20M	SFP+, 10GbE, Active Fiber Optic, 20 Meter, Cable
<b>40G Transceivers</b>	
QSFP40-SR4	QSFP+, 40GbE, SR4, 850nm Wavelength, 100 Meter over OM3 MMF or 150 Meter over OM4 MMF, Transceiver.
QSFP40-LR4	QSFP+, 40GbE, LR4, 10 Kilometer, Transceiver
QSFP40-UNIVLM4	QSFP+, 40GbE, LM4, Universal, 140m on OM3, 160m on OM4, and 1km on SMF, Transceiver
QSFP40-BIDI	QSFP+, 40GbE, Bi-Directional, Duplex LC, Transceiver
<b>40G Breakout Cables (4x10G)</b>	
QSFP10-CU1M	QSFP to 4x SFP+ Passive Copper Splitter, 1 Meter, Cable
QSFP10-CU2M	QSFP to 4x SFP+ Passive Copper Splitter, 2 Meter, Cable
QSFP10-CU3M*	QSFP to 4x SFP+ Passive Copper Splitter, 3 Meter, Cable
QSFP10-CU5M*	QSFP to 4x SFP+ Passive Copper Splitter, 5 Meter, Cable
QSFP10-AO3M	QSFP to 4x SFP+ Active Optical Splitter, 3 Meter, Cable
QSFP10-AO5M	QSFP to 4x SFP+ Active Optical Splitter, 5 Meter, Cable
QSFP10-AO10M	QSFP to 4x SFP+ Active Optical Splitter, 10 Meter, Cable
QSFP10-LC1M	QSFP to 4 pairs LC Optical Breakout, 1 Meter, Cable
<b>40G Direct Attach Copper</b>	
QSFP40-CU0P5M	QSFP, 40GbE, Passive Copper Direct Attach, 0.5 Meter, Cable
QSFP40-CU1M	QSFP, 40GbE, Passive Copper Direct Attach, 1 Meter, Cable
QSFP40-CU2M	QSFP, 40GbE, Passive Copper Direct Attach, 2 Meter, Cable
QSFP40-CU3M*	QSFP, 40GbE, Passive Copper Direct Attach, 3 Meter, Cable
QSFP40-CU5M*	QSFP, 40GbE, Passive Copper Direct Attach, 5 Meter, Cable

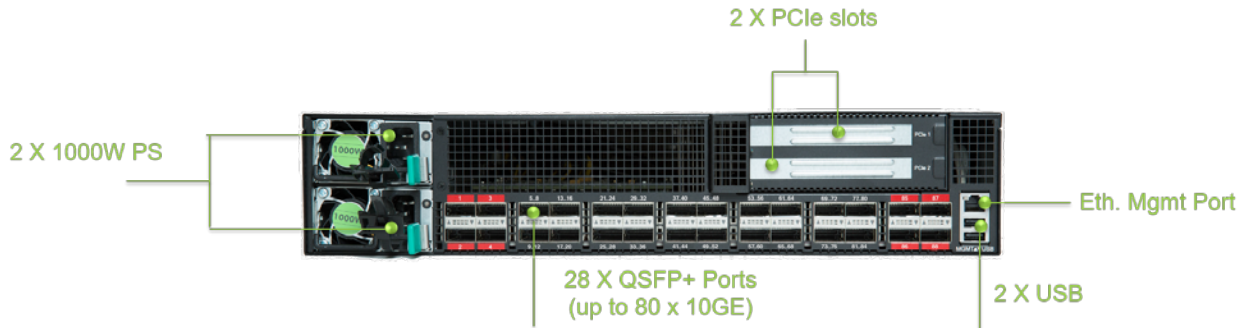
## Ordering Information, continued

40G Active Optical	
QSFP40-AO3M	QSFP, 40GbE, Active Fiber Optic, 3 Meter, Cable
QSFP40-AO5M	QSFP, 40GbE, Active Fiber Optic, 5 Meter, Cable
QSFP40-AO7M	QSFP, 40GbE, Active Fiber Optic, 7 Meter, Cable
QSFP40-AO10M	QSFP, 40GbE, Active Fiber Optic, 10 Meter, Cable
QSFP40-AO20M	QSFP, 40GbE, Active Fiber Optic, 20 Meter, Cable
Power Cords / Jumper Cables	
CAB-NA	AC Power Cord, North America (13A/125V, 10 Feet)
CAB-EU	AC Power Cord, Europe (10A/250V, 2.5 Meter)
CAB-UK	AC Power Cord, United Kingdom (10A/250V, 2.5 Meter)
CAB-IT	AC Power Cord, Italy (10A/250V, 2.5 Meter)
CAB-CH	AC Power Cord, Switzerland (10A/250V, 2.5 Meter)
CAB-JP	AC Power Cord, Japan (10A/250V, 2.5 Meter)
CAB-AU	AC Power Cord, Australia (10A/250V, 2.5 Meter)
CAB-CN	AC Power Cord, China (10A/250V, 2.5 Meter)
CAB-KR	AC Power Cord, Korea (10A/250V, 2.5 Meter)
CAB-BR	AC Power Cord, Brazil (10A/250V, 2.5 Meter)
CAB-SA	AC Power Cord, Saudi (10A/250V, 2.5 Meter)
CAB-ZA	AC Power Cord, South Africa (10A/250V, 2.5 Meter)
CAB-IN	AC Power Cord, India (10A/250V, 2.5 Meter)
CAB-AR	AC Power Cord, Argentina (10A/250V, 2.5 Meter)
CAB-JMPR	Cabinet Jumper Power Cord, C13 to C14, 250V/13A, 2.3FT/0.7M, Black
CAB-JMPR-1M	Cabinet Jumper Power Cord, C13 to C14, 250V/10A, 3.2FT/1M, Black
CAB-JMPR-1.5M	Cabinet Jumper Power Cord, C13 to C14, 250V/10A, 4.9FT/1.5M, Black
Accessories / Replacement Parts	
Rail Kits	
E28Q-RAIL-KIT	Freedom E28Q Rail Kit
E28Q-RAIL-EXT-KIT	Freedom Series Extender Rail Kit
E68-RAIL-KIT	Freedom E-line Rail Kit
Power Supplies/Fans	
E28Q-PSU	E28Q Power Supply Unit (AC 105-240V 50/60Hz)
E28Q-FAN	E28Q Fan Module
E28Q-FANR	E28Q-LR Fan Module, Reverse
E68-FAN	E68 Fan Module
E68-FANR	E68 Fan Module, RAF
E68-PSU	E68 Power Supply Unit (AC 105-240V 50/60Hz)
E68-PSUR	E68 Power Supply Unit (AC 105-240V 50/60Hz), RAF
Optical Patch Cable	
CAB-MMF-LC2M	LC-LC Male Fiber Optic Patch Cable; Multimode; 50/125; OM3; 2 meter
CAB-MMF-LC5M	LC-LC Male Fiber Optic Patch Cable; Multimode; 50/125; OM3; 5 meter
CAB-MMF-LC15M	LC-LC Male Fiber Optic Patch Cable; Multimode; 50/125; OM3; 15 meter

\*NOTE: The copper cables for more than 3 Meter SKUs apply to E28Q-L only. The E68-M switches support only up to 2 Meter copper cables



# Pluribus Freedom E28Q-L Spine Switch



## Network Performance

- 28x40GbE (Up to 80x10GbE) (Broadcom Trident 2)
- Up to 2.24 Tbps
- 1,680 million packets per second
- Wire speed L3 and L3 forwarding
- Latency ~500 nanoseconds
- Network processor with 150 Mpps (100G)
- 64K queues, shaping, 2GB packet buffer

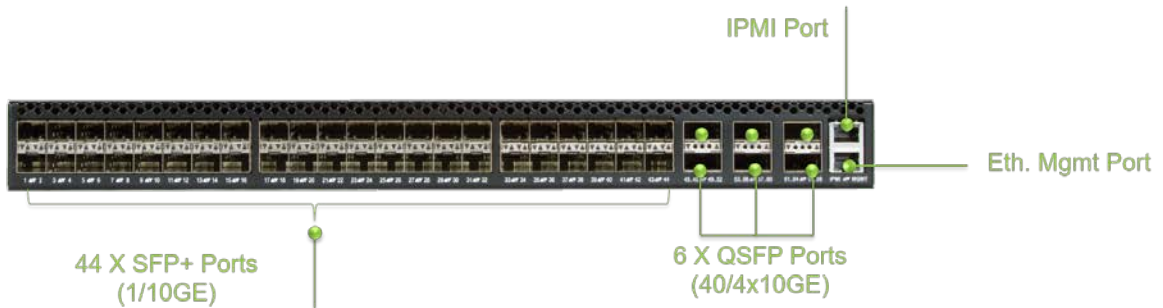
## High-Perf Control Plane

- Dual-socket Xeon E5 (12 cores)
- 64 GB RAM
- 2 x 240GB SSD – expansions up to 3+TB
- 8 Gbps PCIe control plane bandwidth
- 4x10GE NICs for L4-L7 services

## Applications

- Spine switching / Microserver TOR aggregation
  - Fabric Automation
  - Fabric Visibility
  - Fabric Virtualization\*
  - 3<sup>rd</sup> party VMs/services
- \* optional

# Pluribus Freedom E68-M Leaf Switch



## Network Performance

- 44x10GbE + 6x40GbE (Broadcom Trident 2)
- Up to 1.36 Tbps
- 1,020 million packets per second
- Wire speed L3 and L3 forwarding
- Latency ~500 nanoseconds

## High-Perf Control Plane

- Xeon E3 (4 cores)
- 16 GB RAM
- 240GB SSD
- 4x1GE NIC for services

## Applications

- Top-of-rack (leaf) switching / 10Gbe Aggregation
  - Optimized for economics
  - Fabric Automation
  - Fabric Visibility
  - Fabric Virtualization\* (up to 2 VNets)
- \* optional

# FreedomCare Support

	Warranty Support	FreedomCare Enterprise®	FreedomCare® NBD	FreedomCare® 4-Hour	FreedomCare® Premier
<b>Phone Support</b>					
Mon-Fri, 8 am-5 pm US PT	First 90-Days				
Mon-Fri, 12x5x365		✓			
24x7x365			✓	✓	✓
<b>On-Line Self-Service</b>					
Case Management	First 90-Days	✓	✓	✓	✓
Knowledge Base	First 90-Days	✓	✓	✓	✓
Asset Management	First 90-Days	✓	✓	✓	✓
<b>Software Distribution</b>					
Major Feature Releases		✓	✓	✓	✓
Maintenance & Patch Releases	✓	✓	✓	✓	✓
<b>Hardware Replacement</b>					
DOA Policy <sup>1</sup>	✓	✓	✓	✓	✓
RMA Service Level	Return for Repair <sup>2</sup>	Return for Repair <sup>2</sup>	Next Business Day <sup>3</sup>	4-Hours <sup>5</sup>	Next Business Day <sup>3</sup>
<b>Premier Services</b>					
Designated Support Engineer					✓
Quarterly Business Reviews					✓
On-site Network Audits					✓

## Service Program Notes

<sup>1</sup> 30-days from receiving the product, the replacement product ships next-business day after Pluribus Networks confirms the product is DOA. <sup>2</sup> Product ships 10-days after Pluribus Networks receipt of the RMA'ed hardware. <sup>3</sup> Next Business day hardware replacement is not available in all countries. Please consult with your reseller or Pluribus Networks Account Representative to confirm availability. <sup>4</sup> Discounted, multi-year support contracts exist for 2, 3, 4 and 5-year FreedomCare® support offerings. Please consult with your reseller or your Pluribus Networks Account Representative to obtain the most current discounting pricing offered service offering. <sup>5</sup> Not available in all regions. Please consult with your reseller or Pluribus Networks Representative to confirm availability. All features subject to change without prior notice

## About Pluribus Networks

Pluribus Networks provides fabric networking and analytics solutions that transform existing network infrastructures from being rigid, costly and complex, into a foundation for modern digital-centric businesses. Our fabric architecture provides unprecedented insight, agility and security to create the industry's only combined SDN and Network Performance Monitoring (NPM) offering.

Learn more at [www.pluribusnetworks.com](http://www.pluribusnetworks.com) and [@pluribusnet](https://twitter.com/pluribusnet).

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