The Dell EMC Networking MX9116n Fabric Switching Engine is a scalable, high-performance, low latency 25Gbps Ethernet switch purpose-built for the PowerEdge™ MX platform providing enhanced capabilities and cost-effectiveness for the enterprise, mid-market, Tier 2 cloud and NFV service providers with demanding compute and storage traffic environments.

Delivering industry leading performance in a modular switch, the non-blocking switching architecture in the MX9116n provides line-rate 25GbE L2 and L3 forwarding capacity to all connected servers with no oversubscription and a sub 450ns latency. In addition to 16 internal 25GbE ports, the MX9116n provides four QSFP28 100GbE ports for uplinks and twelve QSFP28-Double Density ports. These QSFP28-DD ports provide capacity for additional uplinks, ICLs, connections to rack servers at 10GbE or 25GbE via breakout cables, and fabric expansion connections for up to 9 additional MX7000 chassis.

Maximum performance and functionality
The Dell EMC Networking MX9116n is a high-performance, multifunction, 25GbE Fabric Switching Engine purpose-built for applications in demanding data center, cloud and computing environments. The MX9116n also supports the open source Open Network Install Environment (ONIE) for zero touch installation of alternate operating systems in future releases.

Built-in convergence capabilities
The MX9116n is fully IEEE data center bridging (DCB) compliant, supporting iSCSI, NAS, and FCoE transit. Two of the QSFP28 ports can support eight 32Gb Fibre Channel connections (4 per QSFP28), enabling direct attachment of a FC storage array and as a NPIV Proxy Gateway to an existing FC SAN.

MX Scalable Fabric Architecture
The MX Scalable Fabric Architecture allows the MX9116n to seamlessly support up to 80 MX compute sleds and 10 MX7000 chassis via the ultra-low latency MX7116n Fabric Expander Module.

SmartFabric OS10
The Dell EMC Networking SmartFabric OS10 is a Network Operating System supporting multiple architectures and environments. The networking world is moving from a monolithic stack to a pick-your-own-world. The OS10 solution is designed to allow multi-layered disaggregation of network functionality. While OS10 contributions to Open Source provide users freedom and flexibility to pick their own 3rd party networking, monitoring, management and orchestration applications, OS10 bundles an industry hardened networking stack featuring standard L2 and L3 protocols over a standard and well accepted CLI interface.

SmartFabric Services
Included in OS10, SmartFabric Services provides single pane of glass management and automation across every fabric in a PowerEdge MX deployment, up to the 20 chassis Multi-Chassis Management group limit*. SmartFabric Services key features include:

- I/O Aggregation to simplify connectivity to existing networks
- Integration of VLAN and automated QoS settings with Server Deployment Template
- Fabric-wide firmware upgrades and configuration consistency checks
- Automatic topology validation – detects physical topology misconfigurations and provides corrective guidance
- Automatically heals fabric upon failure condition removal
Key applications

- Organizations looking to enter the software-defined data center era with a choice of networking technologies designed to deliver the flexibility they need
- Native high-density 25 GbE server access in high-performance data center environments
- 25 GbE backward compatible to 10G and 1G for future proofing and data center server migration to faster uplink speeds
- Capability to support 25G and 10G rack mount servers
- iSCSI storage deployment including DCB converged lossless transactions
- Suitable as a ToR or Leaf switch in 100G leaf/spine CLOS Fabric implementations

Key features

- Up to 6.4Tbps of switching I/O bandwidth (full duplex) available and non-blocking switching fabric delivering line-rate performance under full load with sub 450ns latency
- Scalable L2 and L3 Ethernet switching with QoS and a full complement of standards-based IPv4 and IPv6 features, including OSPF and BGP routing support
- Up to eight 32Gb Fibre Channel connections supporting both NPG and Direct Attach FC configurations
- L2 multipath support via Virtual Link Trunking (VLT) and multiple VLT (mVLT) multi-chassis link aggregation technology
- NVMe-oF ready to support the next generation of high performance storage
- Jumbo frame support for large data transfers
- 128 link aggregation groups with up to sixteen members per group, using enhanced hashing
- Converged network support for DCB, with priority flow control
- (802.1Qbb), ETS (802.1Qaz), DCBx and iSCSI TLV support
- Supports Routable RoCE to enable convergence of compute and storage

Key features with OS10

- Consistent DevOps framework across compute, storage and networking elements
- Standard networking features, interfaces and scripting functions for legacy network operations integration
- Standards-based switching hardware abstraction via Switch Abstraction Interface (SAI)
- Pervasive, unrestricted developer environment via Control Plane Services (CPS)
- Open and programmatic management interface via Common Management Services (CMS)
- OS10 software enables Dell EMC layer 2 and 3 switching and routing protocols with integrated IP Services,
- Quality of Service, Manageability and Automation features
- Platform agnostic via standard hardware abstraction layer (OCP-SAI)
- Unmodified Linux kernel and unmodified Linux distribution
- Leverage common open source tools and best-practices (data models, commit rollbacks)
- Scalable L2 and L3 Ethernet Switching with QoS, ACL and a full complement of standards based IPv4 and IPv6 features including OSPF, BGP and PBR
- Enhanced mirroring capabilities including local mirroring, Remote Port Mirroring (RPM), and Encapsulated Remote Port Mirroring (ERPM)
- Converged network support for DCB, with priority flow control
- (802.1Qbb), ETS (802.1Qaz), DCBx and iSCSI TLV support
- Rogue NIC control provides hardware-based protection from NICS sending out excessive pause frames
Product Description

**Optics**

- Transceiver, 2x100/2x80GbE Multi-rate, 2SR4 QSFP28-DD
- Transceiver, 2x100GbE, 2SR4 QSFP28-DD
- Transceiver, 2x100GbE, 2SR4 QSFP28-DD
- Transceiver, 100GbE, SR4 QSFP28
- Transceiver, 100GbE, LR4 QSFP28
- Transceiver, 100GbE, ESR4 QSFP28
- Transceiver, 100GbE, BIDI optic QSFP28
- Transceiver, 40GbE, SR4 optic QSFP+
- Transceiver, 40GbE, eSR4 optic QSFP+
- Transceiver, 40GbE, LR4 optic QSFP+
- Transceiver, 40GbE, BIDI optic QSFP+
- Transceiver, 40GbE, PSM4 10Km QSFP+
- Transceiver, 40GbE, LM4 Duplex QSFP+
- Transceiver, 40GbE, SM4 Duplex QSFP+
- Transceiver, 4x32G FC SW optic QSFP28
- Transceiver, 4x16G FC SW optic QSFP+

**Cables**

- 2x 100GbE, QSFP28-DD to QSFP28-DD, active optical, passive DAC
- 2x 100GbE, QSFP28-DD to 2xQSFP28, active optical, passive DAC
- 2x 100GbE, QSFP28-DD to 8xSFP28 (8x10/25GbE), active optical, passive DAC
- 2x 100GbE, MPO12-DD to MPO12-DD optical
- 2x 100GbE, MPO12-DD to 2xMPO12 optical breakout
- 2x 100GbE, MPO12-DD to 8xLC optical breakout
- 2x 40GbE, QSFP28-DD to 2xQSFP+, active optical, passive DAC
- 2x 40GbE, QSFP28-DD to 8xSFP+ (8x10/10GbE), active optical, passive DAC
- 100GbE, QSFP28 to QSFP28, active optical, passive DAC
- 100GbE, MTP to MTP optical
- 100GbE, MTP to 4xLC optical breakout
- 40GbE, QSFP+ to QSFP+, active optical & passive DAC
- 40GbE, QSFP+ to 4xSFP+ (4x10GbE), active optical & passive DAC

**Software**

- SmartFabric OS10
- Select third-party operating system offerings (future)

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**Technical specifications**

**Physical**

- Full featured 25/100GE switch in PowerEdge MX Fabric A/B I/O sled form factor
- 1 USB 2.0 type A storage port
- 1 micro USB type B port for console/port access
- Power/Health LED
- ID LED
- Link/activity LEDs
- Size: 1.18”h x 17.11”w x 10.94”d
- Weight: 8.49lbs (3.95kg)
- Max. power consumption: 260 Watts w/5W
- Typ. power consumption: 237 Watts w/5W
- Max. operating specifications:
  - Standard Operating Temperature 10°C to 35°C (50°F to 95°F)
  - Operating Relative Humidity 5% to 85%, noncondensing
- Max. non-operating specifications:
  - Storage temperature: -40°C to 65°C (-40°F to 149°F)
  - Storage humidity: 5 to 95% (RH), noncondensing
- Expanded Operating Temperature, Continuous Operation: Not Supported

**Redundancy**

- Redundant Power and Cooling provided by Dell EMC PowerEdge MX7000 Chassis

**Performance**

- Switching I/O bandwidth: 6.4Tbps
- Forwarding capacity: 2380 Mpps
- Latency: Sub 450ns
- IPv4 Unicast routes: 130K
- IPv6 Unicast routes: 130K
- ARP entries: 48K
- Layer 2 VLANs: 80K P*V in Full Switch mode
- Layer 3 VLANs: 30K P*V in Full Switch mode
- PVST+: 128 instances
- MST: 32 instances
- Jumbo Frames: 9K

**IEEE Compliance**

- 802.1AB LLDP
- TIA-1057 LLDP-MED
- 802.3ad Link Aggregation
- 802.1D Bridging, STP
- 802.1p L2 Prioritization
- 802.1Q VLAN Tagging
- 802.1Qbb PFC
- 802.1Qaz ETS
- 802.1X Network Access Control
- 802.3ac Frame Extensions for VLAN Tagging

**RFC Compliance**

- 768 UDP
- 793 TCP
- 854 Telnet
- 959 FTP
- 1321 MD5
- 1350 TFTP
- 2474 Differentiated Services
- 2698 Two Rate Three Color Marker
- 3164 Syslog
- 4254 SSHv2

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### Technical specifications

#### General IPv4 Protocols
- 791 IPv4
- 792 ICMP
- 826 ARP
- 1027 Proxy ARP
- 1035 DNS (client)
- 1042 Ethernet Transmission
- 1191 Path MTU Discovery
- 1305 NTPv4
- 1519 CIDR
- 1812 Routers, Static Routes
- 1858 IPv4 Fragment Filtering
- 2131 DCHPv4 (server and relay)
- 5798 VRRPv3
- 3021 31-bit Prefixes
- 1812 Requirements for IPv4 Routers
- 1918 Address Allocation for Private Internets
- 2474 DiffServ Field in IPv4 and IPv6 Headers
- 3195 Reliable Delivery for Syslog
- 3246 Expedited Forwarding PHB Group

#### General IPv6 Protocols
- 1981 Path MTU for IPv6
- 2372 IPv6 Addressing
- 2460 IPv6 Protocol Specification
- 2461 Neighbor Discovery
- 2462 Stateless Address AutoConfig
- 2463 ICMPv6
- 2464 Ethernet Transmission
- 2675 IPv6 Jumbograms
- 3493 Basic Socket Interface
- 3542 Advanced Socket, API
- 3587 Global Unicast Address Format
- 3848 Default Address Selection
- 4291 IPv6 Addressing
- 3633 DHCPv6 Relay
- 4264 Transmission of IPv6 Packets over Ethernet Networks
- 2711 IPv6 Router Alert
- 4007 IPv6 Scoped Address Architecture
- 4213 Basic Transition Mechanisms for IPv6 Hosts and Routers

#### OSPF (v2/v3)
- 1745 OSPF/BGP interaction
- 1765 OSPF Database overflow
- 2154 OSPF with Digital Signatures
- 2328 OSPFv2
- 2370 Opaque LSA
- 3101 OSPF NSSA
- 4552 OSPFv3 Authentication

#### Multicast
- 2236 IGMPv2 Snooping
- 3810 MLDv2 Snooping

#### Security
- 1492 TACACS (Authentication, Accounting, Authorization)
- 2865 RADIUS
- 3162 RADIUS and IPv6
- 3579 RADIUS support for EAP
- 3580 802.1X with RADIUS
- 3826 AES Cipher in SNMP Control Plane, VTY ACLS
- 4249 Route Flap Damping
- 2545 BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing

#### BGP
- 1997 Communities
- 2385 MD5
- 2439 Route Flap Damping
- 2454 BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing

#### IPv6 Inter-Domain Routing
- 2545 BGP-4 Multiprotocol Extensions
- 5396 4-byte ASN Representation

#### Quality of Service
- 5549 BGP Unnumbered
- 5492 Capabilities Advertisement
- 5369 4-byte ASN

#### Data center bridging
- 2385 MD5
- 4291 IPv6 Addressing

#### Regulatory compliance

#### Safety
- 32:2015, Class A
- 32:2015, Class B
- 32:2015, Class C

#### Emissions & Immunity
- 300 386 V1.6.1 EMC for Network Equipment
- 55024:2010 (CISPR 24:2010), Class A
- 55024:2010 (CISPR 24:2010), Class B
- 55024:2010 (CISPR 24:2010), Class C
- 55024:2010 (CISPR 24:2010), Class D

#### RoHS compliance
- 50581:2012 All MX9116n components are EU RoHS compliant

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