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-DD 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, multi-function, 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.

OS10 Enterprise Edition

The Dell EMC Networking OS10 Enterprise Edition 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 Enterprise Edition 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 Enterprise Edition, 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 25GbE server access in high-performance data center environments
- 25GbE 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

* 10 at RTS
### 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 450ms 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 NPIV and Direct Attach FC configurations
- L2 multipath support via Virtual Link Trunking (VLT) and multiple VLT (mVLT) multi-chassis link aggregation technology
- VRF-lite enables sharing of networking infrastructure and provides L3 traffic isolation across tenants
- 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 Dell EMC Networking 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 Enterprise Edition 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
- Rogue NIC control provides hardware-based protection from NICS sending out excessive pause frames

### Product Description

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<th>Description</th>
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<td>MX9116n Fabric Switching Engine</td>
<td>Transceiver, 2x100GbE, 2SR4 QSFP28-DD</td>
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<td>Transceiver, 100GbE, SR4 QSFP28</td>
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<td>Transceiver, 40GbE, PSM4 10Km QSFP+</td>
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<td>Transceiver, 40GbE, LM4 Duplex QSFP+</td>
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<td>Transceiver, 4x32G FC SW optic QSFP28</td>
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<td>Transceiver, 4x16G FC SW optic QSFP28</td>
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Product: MX916n Fabric Switching Engine

### Description
- **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, MPO12DD to 8xLC optical breakout**
- **100GbE, QSFP28 to QSFP28, active optical, passive DAC**
- **100GbE, QSFP28 to 4xSFP28 (4x10GbE), 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**

### Cables

**Technical specifications**

**Physical**
- Full featured 25/100GE switch in PowerEdge MX
- 2 USB 2.0 type A storage port
- 1 micro USB type B port for console/management port access
- **Indicators:**
  - Power/Health LED
  - ID LED
  - Link/activity LEDs
- **Size:** 1.18" h x 17.11" w x 10.94" d
- **Weight:** 8.49lbs (3.85kg)
- **Max. power consumption:** 260 Watts w/5W QSFP28-DD Optics
- **Typ. power consumption:** 237 Watts w/5W QSFP28-DD Optics
- **Max. operating specifications:**
  - Standard Operating Temperature 10°C to 35°C (50°F to 95°F)
  - Operating Relative Humidity 5% to 85%, non-condensing
- **Max. non-operating specifications:**
  - Storage temperature: -40°C to 65°C (-40°F to 149°F)
  - Storage humidity: 5 to 95% (RH), non-condensing
- **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: 2390 Mpps
- Latency: Sub 450ns
- MAC addresses: 137K
- IPv4 Unicast routes: 130K
- IPv6 Unicast routes: 130K
- ARP entries: 48K
- Layer 2 VLANs: 4K
- Layer 3 VLANs: 500
- MST, 32 instances
- PVST+: 128 instances
- LAG: 128 groups, 16 members per LAG group
- ACL Entries-Layer 2 Egress: 1000
- ACL Entries-Layer 2 Ingress: 767
- ACL Entries-QSFP4 Egress: 767
- ACL Entries-QSFP4 Egress: 767
- ACL Entries-QSFP4 Egress: 767
- ACL Entries-IPV6 Egress: 767
- ACL Entries-IPV6 Egress: 767
- iSCSI Number of sessions: 256
- Jumbo Frames: 9K

**IEEE Compliance**
- 802.1AB: LLDP
- 802.1AD: Link Aggregation
- 802.1Q: VLAN Tagging
- 802.1Qbb: PFC
- 802.1Qaz: ETS
- 802.1X: Network Access Control
- 802.3ac: Frame Extensions for VLAN Tagging
- 802.3x: Flow Control

**RFC Compliance**
- 768: UDP
- 793: TCP
- 854: Telnet
- 959: FTP
- 1521: MDP
- 1350: TFTP
- 2474: Differentiated Services
- 2698: Two Rate Three Color Marker
- 3164: Syslog
- 4254: SSHv2

**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: IP Fragment Filtering
- 2121: DCHPv4 (server and relay)
- 5798: VRRPv3

**General IPv6 Protocols**
- 3021: 31-bit Prefixes
- 1812: Requirements for IPv4 Routers
- 1918: Address Allocation for Private Internets
- 2474: DiffServ Field in IPv4 and IPv6 Headers
- 2596: Assured Forwarding PHB Group
- 3195: Reliable Delivery for Syslog
- 3246: Expedited Forwarding PHB Group
- 1091: Path MTU for IPv6
- 2372: IPv6 Addressing
- 2460: IPv6 Protocol Specification
- 2461: Neighbor Discovery
- 2462: Stateless Address AutoConfig
- 2463: ICMPv6
- 2464: Ethernet Transmission
- 2467: IPv6 Jumbograms
- 3483: Basic Socket Interface
- 3542: Advanced Socket, API
- 3587: Global Unicast Address Format
- 3588: Default Address Selection
- 4291: IPv6 Addressing
- 4294: Transmission of IPv6 Packets over Ethernet Networks
- 2711: IPv6 Router Alert
- 4296: IPv6 Scoped Address Architecture
- 4213: Basic Transition Mechanisms for IPv6 Hosts and Routers

**OSPF (V2/V3)**
- 1145: OSPF/BGP interaction
- 1765: OSPF Database overflow
- 2154: OSPF with Digital Signatures
- 2328: OSPFv2
- 2370: Opaque LSA
- 3010: OSPF NSSA
- 4652: OSPFv3 Authentication

**Multicast**
- 2236: IGMPv2 Snooping
- 3810: MLDv2 Snooping

**Security**
- 1492: TACACS (Authentication)
- 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
- IP Access Control Lists

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