Dell EMC MX9116n Fabric Switching Engine

High-performance, scalable 25 Gigabit Ethernet fabric switch with multi-chassis fabric scaling capabilities for the PowerEdge MX platform

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
- Rogue NIC control provides hardware-based protection from NICS sending out excessive pause frames
# Dell EMC Networking MX9116n Spec Sheet

## Product Description

### MX9116n Fabric Switching Engine

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<td><strong>2x 100GbE, MTP to MTP optical</strong></td>
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<td><strong>100GbE, MTP to 4xLC optical breakout</strong></td>
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<tr>
<td>100GbE, MTP to 4xLC optical breakout</td>
<td><strong>100GbE, MTP to QSFP28, active optical, passive DAC</strong></td>
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<td>40GbE, QSFP+ to 4xSFP+ (4x10GbE), active optical &amp; passive DAC</td>
<td><strong>40GbE, QSFP+ to QSFP28, active optical, passive DAC</strong></td>
</tr>
</tbody>
</table>

### Software

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

## 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/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%, 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

**Layer2 Protocols**

- 802.1AB  LLDP
- 802.3ad  Link Aggregation
- 802.1D  Bridging, STP
- 802.1p  L2 Prioritization
- 802.1Q  VLAN Tagging
- 802.1s  MISTP
- 802.1t  RSTP
- 802.1q  PVST+

**VLT (Virtual Link Trunking)**

- VRRP Active/Active
- RSTP, MISTP, PVST+
- Port Mirroring on VLT ports
- DCB, iSCSI, FSB on VLT
- RPM/ERPM over VLT
- VLT Minloss upgrade
- VxLAN with VLT
- ICMP/MLD snooping over VLT
- PIM SM/SSM over VLT

**IEEE Compliance**

- 802.1AB  LLDP
- 802.1Q  VLAN Tagging
- 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
### 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**: IP Fragment Filtering
- **2131**: DCHIPv4 (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 AutoConfiguration
- **2463**: ICMPv6
- **2464**: Ethernet Transmission
- **2675**: IPv6 Jumbograms
- **3493**: Basic Socket Interface
- **3542**: Advanced Socket, API
- **3587**: Global Unicast Address Format
- **3648**: Default Address Selection
- **4291**: IPv6 Addressing
- **3633**: DHCPv6 Relay
- **IPv6 Static Routes**
- **2464**: 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
- **IP Access Control Lists**

#### BGP
- **1997**: Communities
- **2385**: MD5
- **2439**: Route Flap Damping
- **2545**: BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing

#### BGP Security
- **3rd party packages support on Docker Container**

#### Quality of Service
- **IPv6 Inter-Domain Routing**
- **BGP-4 Multiprotocol Extensions for Route Flap Damping**
- **MD5 Communities**
- **BGP Unnumbered**
- **BGPP ADD PATH**
- **BGP to OSPF route distribution**
- **BGP EVPN**
- **L2 & L3 Gateway with VxLAN Tunnels**
- **BGP EVPN Asymmetric IRB**
- **Symmetric IRB**
- **Type 5 Routes**
- **Linux Distribution**
  - Debian Linux version 8
  - Linux Kernel 3.16
- **RBIB**
  - BRIDGE-MIB
  - ENTITY-MIB
  - EtherLike-MIB
  - HOST-RESOURCES-V2-MIB
  - IEEE8021-PFC-MIB
  - IEEE8023-LAG-MIB
  - IF-MIB
  - IP-FORWARD-MIB
- **IPv6 Jumbograms**
- **IP-MIB**
- **LLDP-EXT-DOT1-MIB**
- **LLDP-EXT-DOT3-MIB**
- **LLDP-MIB**
- **OSPF-MIB**
- **OSPFV3-MIB**
- **Q-BRIDGE-MIB (Get)**
- **RFC1213-MIB**
- **SFLOW-MIB**
- **SNMP-FRAMEWORK-MIB**
- **SNMP-MPD-MIB**
- **SNMP-MP-MIB**
- **SNMP/V2-MIB**
- **TCP-MIB**
- **UDP-MIB**
- **SNMP-USER-BASED-SM-MIB**
- **SNMP-VIEW-BASED-ACM-MIB**
- **SNMP-TARGET-MIB**
- **Network Management and Monitoring**
  - SNMPv1/v2c/v3
  - IPv4/IPv6 Management support
  - (Telnet, FTP, TACACS, RADIUS, SSH, NTP)
  - Port Mirroring
  - RPM/ERPMP
  - 3176 SFLOW
  - Support Assist (Phone Home)
  - RestConf APIs, Auto-docs
  - XML Schema
  - CLI Commit (Scratchpad)
  - Uplink Failure Detection
  - Object Tracking
  - FarEnd Failure Detection
  - Bidirectional Forwarding Detection
  - (BFD) – BGPv4/6, OSPFv2/3, Static Routes
  - Streaming Telemetry
  - System, Buffers, Data monitoring
  - gRPC Transport with gPB encoding

#### Automation
- **Control Plane Services APIs**
- **Linux Utilities and Scripting Tools**
- **Ansible, Puppet, Chef, SaltStack**

#### Data center bridging
- **802.1Qaz Enhanced Transmission Selection (ETS)**
- **Explicit Congestion Notification**
- **Data Center Bridging eXchange (DCBx)**
- **Fibre Channel**
  - FIP Snooping

#### Regulatory compliance
- **Safety**
  - UL/CSA 60950-1, Second Edition
  - EN 60950-1, Second Edition
  - IEC 60950-1, Second Edition Including all National Deviations and Group Differences
  - FDA Regulation 21 CFR 1040.10 and 1040.11

#### Emissions & Immunity
- **Australia/New Zealand: AS/NZS CISPR 32:2015, Class A**
- **Canada: ICES-3/NMB-3, Class A**
- **Europe: EN 55024:2010 (CISPR 24:2010), Class A**
- **Japan: VCCI V-3/2010,04 Class A**
- **USA: FCC CFR 47 Part 15, Subpart B:2011, Class A Immunity**
- **EN 300 386 V1.6.1 EMC for Network Equipment**
- **EN 55024:2010**
- **EN 61000-3-2: Harmonic Current Emissions**
- **EN 61000-3-3: Voltage Fluctuations and Flicker**
- **EN 61000-3-4: Electromagnetic Compatibility and Emissions & Immunity**
- **FDA Regulation 21 CFR 1040.10 and 1040.11**

#### RoHS compliance
- **EN 50581:2012 All MX9116n components are RoHS compliant**
- **EU**
- **EN 50581:2012 All MX9116n components are RoHS compliant**
- **Japan**
  - VCCI V-3/2010,04 Class A
  - EN 55024:2010
  - EN 300 386 V1.6.1 EMC for Network Equipment
  - EN 55024:2010
  - EN 61000-3-2: Harmonic Current Emissions
  - EN 61000-3-3: Voltage Fluctuations and Flicker
  - EN 61000-3-4: Electromagnetic Compatibility and Emissions & Immunity
  - FDA Regulation 21 CFR 1040.10 and 1040.11
- **Australia/New Zealand: AS/NZS CISPR 32:2015, Class A**
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- **Japan: VCCI V-3/2010,04 Class A**
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#### BGP Features
- **Zero Touch Deployment (ZTD)**
- **Port Mirroring**
- **RPM/ERPMP**
- **3176 SFLOW**
- **Support Assist (Phone Home)**
- **RestConf APIs, Auto-docs**
- **XML Schema**
- **CLI Commit (Scratchpad)**
- **Uplink Failure Detection**
- **Object Tracking**
- **FarEnd Failure Detection**
- **Bidirectional Forwarding Detection (BFD) – BGPv4/6, OSPFv2/3, Static Routes**
- **Streaming Telemetry**
- **System, Buffers, Data monitoring**
- **gRPC Transport with gPB encoding**

### Regulatory compliance

#### Safety
UL/CSA 60950-1, Second Edition
EN 60950-1, Second Edition
IEC 60950-1, Second Edition

#### Emissions & Immunity
UL/CSA 60950-1, Second Edition
EN 60950-1, Second Edition
IEC 60950-1, Second Edition

#### RoHS compliance
EN 50581:2012 All MX9116n components are RoHS compliant
EU
IT Lifecycle Services for Networking

Experts, insights and ease
Our highly trained experts, with innovative tools and proven processes, help you transform your IT investments into strategic advantages.

Plan & Design
Let us analyze your multivendor environment and deliver a comprehensive report and action plan to build upon the existing network and improve performance.

Deploy & Integrate
Get new wired or wireless network technology installed and configured with ProDeploy. Reduce costs, save time, and get up and running fast.

Educate
Ensure your staff builds the right skills for long-term success. Get certified on Dell EMC Networking technology and learn how to increase performance and optimize infrastructure.

Manage & Support
Gain access to technical experts and quickly resolve multivendor networking challenges with ProSupport. Spend less time resolving network issues and more time innovating.

Optimize
Maximize performance for dynamic IT environments with Dell EMC Optimize. Benefit from in-depth predictive analysis, remote monitoring and a dedicated systems analyst for your network.

Retire
We can help you resell or retire excess hardware while meeting local regulatory guidelines and acting in an environmentally responsible way.

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