Quick Reference
## PowerEdge MX Ethernet I/O Modules

<table>
<thead>
<tr>
<th></th>
<th>MX9116n</th>
<th>MX5108n</th>
<th>MX7116n</th>
<th>25Gb Pass-Through</th>
<th>10GBT Pass-Through</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fabric Switching Engine</strong></td>
<td>High-performance, scalable L2/L3 25GbE fabric switch with multi-chassis fabric scaling capabilities</td>
<td>Basic Ethernet Switch</td>
<td>Fabric Expander Module</td>
<td>Direct connection</td>
<td>Direct connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Entry level, high-performance 25G Ethernet blade switch for single chassis configurations</td>
<td>Low latency 25GbE fabric expander that helps scale fabric bandwidth across multiple chassis</td>
<td>Transparently connect 8 MX compute sleds to the LAN of your choice at 25G or 10Gb speeds.</td>
<td>Transparently connect 8 MX compute sleds to the LAN of your choice using 10G-BaseT</td>
</tr>
</tbody>
</table>

### Performance
- **Uplink Speeds**
  - MX9116n: 10/25/40/50/100GbE
  - MX5108n: 10/25/40/50/100GbE
  - MX7116n: 25GbE
  - 25Gb Pass-Through: 10/25GbE
  - 10GBT Pass-Through: 10G-BaseT
- **Switch fabric capacity**
  - MX9116n: 6.4Tbps
  - MX5108n: 960Gbps
  - MX7116n: -
- **Forwarding capacity (Mpps)**
  - MX9116n: 2380Mpps
  - MX5108n: 363Mpps
  - MX7116n: -
- **Latency (Microseconds)**
  - MX9116n: <450ns
  - MX5108n: <800ns
  - MX7116n: <75ns
  - 25Gb Pass-Through: <100ns
  - 10GBT Pass-Through: <100ns

### Ports
- **Internal server ports (Speed)**
  - MX9116n: 16 (25GbE)
  - MX5108n: 8 (25GbE)
  - MX7116n: 16 (10/25GbE)
  - 25Gb Pass-Through: 16 (10/25GbE)
  - 10GBT Pass-Through: 16 (10GbE)
- **External QSFP28-DD Ports**
  - MX9116n: 12
  - MX5108n: 0
  - MX7116n: 0
  - 25Gb Pass-Through: 2
  - 10GBT Pass-Through: 0
- **External QSFP28 Ports**
  - MX9116n: 4
  - MX5108n: 0
  - MX7116n: 0
  - 25Gb Pass-Through: 0
  - 10GBT Pass-Through: 0
- **External QSFP+ Ports**
  - MX9116n: 0
  - MX5108n: 0
  - MX7116n: 0
  - 25Gb Pass-Through: 0
  - 10GBT Pass-Through: 0
- **External SFP28 Ports**
  - MX9116n: 0
  - MX5108n: 0
  - MX7116n: 0
  - 25Gb Pass-Through: 0
  - 10GBT Pass-Through: 0
- **External 10G-BaseT Ports**
  - MX9116n: 0
  - MX5108n: 0
  - MX7116n: 4
  - 25Gb Pass-Through: 0
  - 10GBT Pass-Through: 0

### Features
- **Native Fibre Channel support**
  - MX9116n: Yes
  - MX5108n: No
  - MX7116n: Yes (via MX9116n)
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **FCoE/FC**
  - MX9116n: FCoE transit, 8/16/32G Native FC
  - MX5108n: FCoE Transit
  - MX7116n: Yes (via MX9116n)
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **FC fabric services**
  - MX9116n: Zoning, F_Port, NPIV
  - MX5108n: No
  - MX7116n: Yes (via MX9116n)
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **Converged iSCSI (LAN and SAN)**
  - MX9116n: Yes
  - MX5108n: Yes
  - MX7116n: Yes (via MX9116n)
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **Optical transceivers supported**
  - MX5108n: QSFP28 (DAC, AOC, SR, LR)
  - MX7116n: QSFP28 –DD (DAC, AOC, SR), SFP28 (SR), SFP+ (SR)
- **Max VLANs (L2/L3) Full Switch Mode**
  - MX9116n: 180K/30K P*V
  - MX5108n: 45K/10K P*V
  - MX7116n: -
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **Link Aggregation (Groups/Members)**
  - MX9116n: 128/16
  - MX5108n: 128/16
  - MX7116n: -
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **Jumbo frames (Bytes)**
  - MX9116n: 9216
  - MX5108n: 9216
  - MX7116n: -
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **Max Routes (IPv4/IPv6)**
  - MX9116n: 16K/8K
  - MX5108n: 16K/8K
  - MX7116n: -
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **MAC Table**
  - MX9116n: 136K
  - MX5108n: 272K
  - MX7116n: -
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **PVST Total Instances**
  - MX9116n: 128
  - MX5108n: 128
  - MX7116n: -
  - 25Gb Pass-Through: -
  - 10GBT Pass-Through: -
- **Fresh Air Compliant**
  - MX9116n: No
  - MX5108n: Yes
  - MX7116n: Yes
  - 25Gb Pass-Through: Yes
  - 10GBT Pass-Through: Yes
## PowerEdge MX 100GbE I/O Module

### MX8116n

**Fabric Expander Module**
Low latency 100GbE fabric expander that helps scale fabric bandwidth across multiple chassis

### Performance

<table>
<thead>
<tr>
<th>UpLink Speeds</th>
<th>25/100GbE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch fabric capacity</td>
<td>-</td>
</tr>
<tr>
<td>Forwarding capacity (Bpps)</td>
<td>-</td>
</tr>
<tr>
<td>Latency (Microseconds)</td>
<td>-</td>
</tr>
</tbody>
</table>

### Ports

<table>
<thead>
<tr>
<th>Internal server ports (Speed)</th>
<th>8 (100GbE), 16(25GbE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>External QSFP56-DD Ports</td>
<td>2</td>
</tr>
<tr>
<td>External SFP+ Ports</td>
<td>0</td>
</tr>
</tbody>
</table>

### Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Fibre Channel support</td>
<td>No</td>
</tr>
<tr>
<td>FCoE/FC</td>
<td>No</td>
</tr>
<tr>
<td>FC fabric services</td>
<td>No</td>
</tr>
<tr>
<td>Converged iSCSI (LAN and SAN)</td>
<td>Yes (via Z9432F-ON)</td>
</tr>
<tr>
<td>Optical transceivers supported</td>
<td>QSFP56-DD (DAC, AOC, SR)</td>
</tr>
<tr>
<td></td>
<td>QSFP28-DD (DAC, AOC, SR)</td>
</tr>
<tr>
<td>Max VLANs (L2/L3) Full Switch Mode</td>
<td>-</td>
</tr>
</tbody>
</table>
### PowerEdge MX Fibre Channel I/O Module

#### MXG610s

32Gb FC Switch

- Designed for mission-critical applications and optimized for flash storage and highly virtualized server environments

### Performance

<table>
<thead>
<tr>
<th>Speeds</th>
<th>32Gbps (multi-speed 8, 16, or 32Gbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch capacity (Gbps)</td>
<td>1024 Gbps (32 * 32 Gbps) in Full Fabric Switch mode</td>
</tr>
<tr>
<td>Credit Buffers</td>
<td>2K, providing &gt;50 credits/port average</td>
</tr>
<tr>
<td>Latency (Microseconds)</td>
<td>&lt; 0.9 µs</td>
</tr>
<tr>
<td>Maximum frame size</td>
<td>2112-byte payload</td>
</tr>
</tbody>
</table>

### Ports

<table>
<thead>
<tr>
<th>Total ports</th>
<th>16 internal ports (16, or 32Gbps) 8 external SFP+ ports (8, 16, or 32Gbps) 2 external QSFP ports - 4 ports each (16, or 32Gbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port model options</td>
<td>16 ports included w/4 SFP+ transceivers 16 ports included w/8 SFP+ transceivers, Enterprise Software License (port count can be increased with on-demand license)</td>
</tr>
<tr>
<td>Port types</td>
<td>D_Port (Diagnostic Port), E_Port, F_Port, M_Port (Mirror Port); optional port type control in Brocade Access Gateway mode: NPIV-enabled N_Port</td>
</tr>
</tbody>
</table>

### Features

#### Security

- DH-CHAP (between switches and end devices), FCAP switch authentication; HTTPS, IPsec, IP filtering, LDAP with IPv6, OpenLDAP, Port Binding, RADIUS, TACACS+, User-defined Role-Based Access Control (RBAC), Secure Copy (SCP), Secure RPC, Secure Syslog, SFTP, SSH v2, SSL, Switch Binding, Trusted Switch

#### Management

- HTTP, SNMP v1/v2/v3 (FE MIB, FC Management MIB), SSH; Auditing, Syslog; Brocade Advanced Web Tools; Command Line Interface (CLI); SMI-S compliant; Administrative Domains; trial licenses for add-on capabilities; Integrated management through Dell OpenManage Enterprise-Modular

#### Enterprise Bundle (Optional)

- ISL Trunking, Fabric Vision, and Extended Fabric

#### Classes of service

- Class 2, Class 3, and Class F (inter-switch frames)

#### Brocade optical transceivers

- 16 and 32Gbps: SWL, LWL SFP+ 16 and 32Gbps: SWL, QSFP+ (supports 4x1 Breakout)

---

*Copyright 2022 Dell Inc*
# PowerEdge MX Ethernet Mezzanine Cards

<table>
<thead>
<tr>
<th>Vendor</th>
<th>QL41262</th>
<th>QL41232</th>
<th>XXV710</th>
<th>ConnectX-4 LX</th>
<th>57504</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ports</td>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>NIC Type</td>
<td>CNA</td>
<td>NIC</td>
<td></td>
<td>NIC</td>
<td></td>
</tr>
<tr>
<td>Dell PN</td>
<td>51G0W</td>
<td>51G0X</td>
<td>59NTY</td>
<td>WCHFY</td>
<td>DCWFP</td>
</tr>
<tr>
<td>SKU</td>
<td>543-BBDI</td>
<td>543-BBDJ</td>
<td>543-BBDH</td>
<td>543-BBDK</td>
<td>555-BGG</td>
</tr>
</tbody>
</table>

## General

- **NPAR (# Partitions)**: Yes (8/port – 16 total)
- **Secure Firmware Updates**: Yes
- **PTP: IEEE 1588**: Yes
- **DPDK**: Yes

## Network Boot

- **UEFI iSCSI Offload Boot**: Yes (boot, no offload)
- **UEFI FCoE Boot**: No
- **Legacy iSCSI iBF Boot**: No

## RDMA

- **RoCE v1**: Yes
- **RoCE v2**: Yes
- **iWarp**: Yes

## Offloads

- **iSCSI HW Offload**: Yes
- **FCoE HW Offload**: Yes (1 FCoE partition/port)
- **Large Receive Offload (LRO)**: Yes
- **TCP Segmentation Offload (TSO)**: Yes
- **Transmit-Side Scaling (TSS)**: Yes

## Network Virtualization Overlay

- **GENEVE**: Yes
- **VxLAN-GPE**: No
- **MPLS**: Yes

## NVMe-oF

- **NVMe-oF: TCP**: Yes
- **NVMe-oF: RDMA (RoCE v2)**: Yes

---

All NICs support the following:
- iDRAC Connection View
- Wake On LAN
- SR-IOV
- UEFI iSCSI iBF Boot
- UEFI PXE Boot
- Legacy PXE Boot
- NVGRE
- VxLAN
- IP, TCP, UDP checksum offloads
- Large Send Offload (LSO)
- Receive-Side Scaling (RSS)
- Giant Send Offload (GSO)

---

*Copyright 2022 Dell Inc*
### PowerEdge MX Ethernet Mezzanine Cards (cont.)

<table>
<thead>
<tr>
<th></th>
<th>57508</th>
<th>XXV810</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vendor</strong></td>
<td>Broadcom</td>
<td>Intel</td>
</tr>
<tr>
<td><strong>Max Speed</strong></td>
<td>25/100GbE</td>
<td>10/25GbE</td>
</tr>
<tr>
<td><strong>Ports</strong></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>NIC Type</strong></td>
<td>NIC</td>
<td>NIC</td>
</tr>
<tr>
<td><strong>Dell PN</strong></td>
<td>K9JTN</td>
<td>MR0H8</td>
</tr>
<tr>
<td><strong>SKU</strong></td>
<td>540-BDTV</td>
<td>540-BDMF</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NPAR (# Partitions)</strong></td>
<td>Yes (8/port – 16 total)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Secure Firmware Updates</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>PTP: IEEE 1588</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>DPDK</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Network Boot</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UEFI iSCSI Offload Boot</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>UEFI FCoE Boot</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Legacy iSCSI iBFT Boot</strong></td>
<td>Yes (UEFI &amp; PXE only)</td>
<td>No</td>
</tr>
<tr>
<td><strong>RDMA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RoCE v1</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>RoCE v2</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>iWarp</strong></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Offloads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>iSCSI HW Offload</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>FCoE HW Offload</strong></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Large Receive Offload (LRO)</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>TCP Segmentation Offload (TSO)</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Transmit-Side Scaling (TSS)</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Network Virtualization Overlay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GENEVE</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>VxLAN-GPE</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>MPLS</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>NVMe-oF: TCP</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>NVMe-oF: RDMA (RoCE v2)</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**All NICs support the following:**
- iDRAC Connection View
- Wake On LAN
- SR-IOV
- UEFI iSCSI iBFT Boot
- UEFI PXE Boot
- Legacy PXE Boot
- NVGRE
- VxLAN
- IP, TCP, UDP checksum offloads
- Large Send Offload (LSO)
- Receive-Side Scaling (RSS)
- Giant Send Offload (GSO)
## PowerEdge MX Fibre Channel Mezzanine Cards

<table>
<thead>
<tr>
<th></th>
<th>LPm31002-D</th>
<th>LPm32002-D</th>
<th>QME2692</th>
<th>QME2742</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vendor</strong></td>
<td>Broadcom (Emulex)</td>
<td>Broadcom (Emulex)</td>
<td>Marvell (QLogic)</td>
<td>Marvell (QLogic)</td>
</tr>
<tr>
<td><strong>Max Speed</strong></td>
<td>16GFC</td>
<td>32GFC</td>
<td>16GFC</td>
<td>32GFC</td>
</tr>
<tr>
<td><strong>Ports</strong></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>NIC Type</strong></td>
<td>HBA</td>
<td>HBA</td>
<td>HBA</td>
<td>HBA</td>
</tr>
<tr>
<td><strong>Dell PN</strong></td>
<td>17N63</td>
<td>31KFT</td>
<td>G620Y</td>
<td>PD8ND</td>
</tr>
<tr>
<td><strong>SKU</strong></td>
<td>544-BBCM</td>
<td>544-BBCN</td>
<td>544-BBCO</td>
<td>544-BBCP</td>
</tr>
</tbody>
</table>

### General

- Configuration through F10 and F2 consoles: Yes, Yes, Yes, Yes
- Out-of-band Firmware Updates: Yes, Yes, Yes, Yes
- Inventory and Configuration through iDRAC: Yes, Yes, Yes, Yes
- Secure Firmware Updates: Yes, Yes, No, No
- NVMe-oF: FC: Yes, Yes, Yes, Yes

**EOL**
MX7000 Overview
PowerEdge MX7000 chassis

Modular foundation to scale across multiple racks to suit a range of demanding use cases

Hosts flexible blocks of server and storage resources while providing outstanding efficiencies through shared power, cooling, networking, I/O and management within the chassis itself

Key Capabilities
  • 7U modular enclosure has 8 front-accessible, single-width bays that accommodates variety of compute and storage sleds
  • Support for 3 I/O fabrics, each with redundant modules
  • QuickSync2 (wireless), Touchscreen LCD and traditional crash cart at-the-box management options

HIGHLIGHTS
  • Support for at least three server processor microarchitecture generations and ready for 400Gb Ethernet and beyond
  • Non-disruptive upgrades; unique no mid-plane design makes for easier future technology upgrades
PowerEdge MX7000 chassis (front view)
7U chassis designed to support at least three future generations of server technologies

Compute Sleds
- No compromise design with up to eight 2-socket or four 4-socket options
- Up to eight drives plus M.2 boot option for greater storage options than ever before in large chassis

Storage Sleds
- Flexible, granular drive-level assignment; drives can be mapped to a server or shared
- Up to 16 SAS HDDs/SSDs
- 12 Gb/s direct attached SAS

Power and Cooling
- High efficiency 3 KW power supplies
- Grid and N+N redundancy
- Evenly distribute chassis-wide cooling
PowerEdge MX7000 chassis (rear view)

**Scalable Networking**
- Two redundant general-purpose fabrics
- MX Scalable Fabric Architecture for multi-chassis networking
- Future forward design

**Storage Networking**
- Redundant, highly available
- 32G Fibre Channel or 12G SAS storage fabric
# PowerEdge MX7000 generational comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>MX7000</th>
<th>M1000e</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTS</td>
<td>September 2018</td>
<td>Shipping since PowerEdge 10G (~ CY2008)</td>
</tr>
<tr>
<td>Rack Height</td>
<td>7U</td>
<td>10U</td>
</tr>
<tr>
<td>Sled Orientation</td>
<td>Vertical</td>
<td>Vertical</td>
</tr>
<tr>
<td>Sled Support</td>
<td>MX740c 2S standard-height, single-wide</td>
<td>M600/M605/M805/M905</td>
</tr>
<tr>
<td></td>
<td>MX750c 2S standard-height, single-wide</td>
<td>M610/M610X/M710/M710HD/M910/M915</td>
</tr>
<tr>
<td></td>
<td>MX760c 2S standard-height, single-wide</td>
<td>M420/M520/M620/M820</td>
</tr>
<tr>
<td></td>
<td>MX840c 4S standard-height, double-wide</td>
<td>M630/M830</td>
</tr>
<tr>
<td></td>
<td>MX5016s SAS storage sled (16 drives)</td>
<td>M640</td>
</tr>
<tr>
<td>No. of Blades</td>
<td>Up to 8 standard height (2S or storage sleds)</td>
<td>Up to 32 quarter-height (M420)</td>
</tr>
<tr>
<td></td>
<td>Up to 4 double-wide (4S)</td>
<td>Up to 16 half-height</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 8 full-height</td>
</tr>
<tr>
<td>I/O Module Bays</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Fabric Types Supported</td>
<td>2 general purpose (Ethernet, future technologies)</td>
<td>3 general purpose (Ethernet, Fibre Channel, InfiniBand)</td>
</tr>
<tr>
<td></td>
<td>1 storage specific (Fibre Channel, SAS)</td>
<td></td>
</tr>
<tr>
<td>Power Supplies</td>
<td>Up to 6 3000W PSUs</td>
<td>Up to 6 2360W, 2700W, or 3000W PSUs</td>
</tr>
<tr>
<td>System Management</td>
<td>OpenManage Enterprise - Modular (Redfish API)</td>
<td>CMC (CLI-RACADM)</td>
</tr>
<tr>
<td>Quick Sync</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>KVM</td>
<td>Integrated with Management Module</td>
<td>Discrete design</td>
</tr>
</tbody>
</table>
Network I/O Modules
PowerEdge MX9116n Fabric Switching Engine

High-performance, scalable 25G fabric switch
A comprehensive high-end L2/L3 switch with multi-chassis fabric scaling capabilities

Key Capabilities

• 16 x 25GbE server-facing ports, 2 x 100GbE Uplink ports, 2 x 100GbE/8 x 32G FC uplink ports, and 12 x Fabric Expansion/Uplink ports
• Each Fabric Expansion port can operate as 2 x 100GbE, 2 x 40GbE, 8 x 25GbE, 8 x 10GbE
• Supported in Fabrics A & B
• Supports all PowerEdge MX Ethernet Cards
• Supports Open Networking, Full Switch and SmartFabric operating modes
• < 450ns latency, 6.4 Tbps switching fabric
• NVMe over Fabric Ready

HIGHLIGHTS

• Optimum performance fabric switch providing high scalability at a low TCO
• Highly efficient embedded ToR functionality that reduces cost and improves performance & latency
• Industry’s first Open Networking fabric switch with ONIE and a choice of OS10 Enterprise Edition or select 3rd party OS
PowerEdge MX9116n Fabric Switching Engine

Typical Cable & Optic Options

[Diagram showing various cable and optic options]

- **Q28**
  - 128GFC
  - SW4 (4x32GFC Optic)
  - AND
  - CBL-MPO12DD-2MPO12-OM4-xM

- **AOC**
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM
  - OR
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM
  - OR
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM

- **DAC**
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM
  - OR
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM

- **QSFP**
  - 4SFp-10G-xM
  - OR
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM
  - OR
  - Q28DD-8S28-25G-xM
  - OR
  - Q28DD-2Q28-100G-xM

- **QSFP28**
  - 2Q28DD-80G/200G (Optic)
  - OR
  - Q28DD-100G-xM
  - OR
  - Q28DD-100G-xM
  - OR
  - Q28DD-100G-xM
  - OR
  - Q28DD-100G-xM

NOTE: Not every option is presented on this page. Please contact your account team for additional options.
Connecting to Non-Dell 10GbE or 25GbE uplink ports
For example: Cisco, Arista, Juniper

The same optics & cables work on the QSFP+/QSFP28 ports on the MX5108n
Connecting MX9116n to Fibre Channel Switch

Use this when connecting to SFP FC ports

Use this when connecting to QSFP FC ports

8/16/32G FC Optic (Vendor Specific)

CBL-MPO12-4LC-OM4-xM

Q28-128GFC-SW4 (8/16/32G)

16/32G QSFP FC Optic (Vendor Specific)

CBL-MPO12-OM4-xM
Each QSFP28-DD & QSFP28 socket is logically addressed as a port group. A port group is a logical descriptor given to one or more physical ports that supports one or more logical configurations. For example, port group 12 represents physical ports 39 and 40.
PowerEdge MX5108n Ethernet switch

Entry level, high performance, 25G Ethernet switch
Economical solution for single chassis configurations

Key Capabilities
• 8 x 25GbE server-facing ports, 2 x 100GbE uplink ports, 1 x 40GbE port and 4 x 10GBase-T ports
• Supported in Fabrics A & B
• Supports all PowerEdge MX Ethernet Cards except Broadcom 57504
• Supports Open Networking, Full Switch and SmartFabric operating modes
• < 800ns latency, 960Gbps switching fabric
• NVMe over Fabric Ready

HIGHLIGHTS
• High-performance, low-latency Ethernet switch for single chassis deployments
• Option of Dell Networking Linux-based OS10 Enterprise Edition OS
• Industry’s first Open Networking blade switch with ONIE and a choice of select 3rd party OS
When implementing a SmartFabric, a VLTI connection using ports 9 & 10 is **required** with both ports running at 40GE.

Because port 10 defaults to 100GE, use a **40GE QSFP+** optic/cable, not a 100GE QSFP28 optic/cable.

**NOTE:** Not every option is presented on this page. Contact your account team for additional options.

**QSFP28 ports are backwards compatible and support QSFP+ Optics and cables.**
PowerEdge MX7116n Fabric Expander Module

Low latency 25G fabric expander
Scales fabric bandwidth across multiple chassis

Key Capabilities

• 16 x 25GbE server-facing ports, 2x Fabric Expansion ports back to FSE
• Supported in Fabrics A & B
• Supports all PowerEdge MX Ethernet Cards
• No switching ASIC and no OS
• Sub ~75ns latency
• All switching done at FSE
• No port-to-port oversubscription
• Serves as a Pass-Through Module to select Dell Networking Ethernet switches (10GbE & 25GbE*)

HIGHLIGHTS

• Low latency fabric expander module for efficiently scaling fabric bandwidth across a multi-chassis environment
• One cable supports 8 x 25GbE connections back to the FSE
• Nothing to manage, no firmware to update

*Requires OpenManage Enterprise – Modular v1.20.00 or later
PowerEdge MX7116n Fabric Expander Module
Cable & Optic Options

NOTE:
- A QSFP28-DD cable between the MX7116n and MX9116n is **REQUIRED**. Using a QSFP28 cable is not supported.
- Breakout is supported only to Dell PowerSwitches.
- 10GbE Breakout requires OpenManage Enterprise Modular version 1.20.00 or higher.

To 2x QSFP28
- DAC-Q28DD-2Q28-100G-xM
  OR
- AOC-Q28DD-2Q28-100G-xM
  OR
- Q28DD-80G/200G-2SR4 (Optic)
  AND
- CBL-MPO12DD-2MPO12-OM4-xM

To 8x SFP28
- DAC-Q28DD-8S28-25G-xM
  OR
- AOC-Q28DD-8S28-25G-xM
  OR
- Q28DD-80G/200G-2SR4 (Optic)
  AND
- Corning Edge8 Cabling

To 2x QSFP+
- DAC-Q28DD-2Q28-100G-xM
  OR
- AOC-Q28DD-2Q-40G-xM
  OR
- Q28DD-80G/200G-2SR4 (Optic)
  AND
- CBL-MPO12DD-2MPO12-OM4-xM

To 8x SFP+
- DAC-Q28DD-8S28-25G-xM
  OR
- AOC-Q28DD-8SFP-10G-xM
  OR
- Q28DD-80G/200G-2SR4 (Optic)
  AND
- Corning Edge8 Cabling

Breakout 8x25GbE

Breakout 8x25GbE

Breakout 8x10GbE

Breakout 8x10GbE

To MX9116n
- DAC-Q28DD-200G-xM
  OR
- AOC-Q28DD-200G-xM
  OR
- Q28DD-80G/200G-2SR4 (Optic)
  AND
- CBL-MPO12DD-OM4-xM

NOTE:
- When using quad port NICs, both FEM ports must be connected to the same MX9116n FSE.
- If using the FEM as a Pass Through Module, the FEM ports can be connected to different ToR switches.
# Popular Ethernet SKUs

## Ethernet I/O Modules

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-AODD</td>
<td>210-AODC</td>
<td>Dell MX9116n 25GbE Fabric Switching Engine, 12x QSFP28-DD, 2x QSFP28 100GbE, 2 x QSFP28 100GbE/32GFC</td>
</tr>
<tr>
<td>210-ANZJ</td>
<td>210-ANZI</td>
<td>Dell MX5108n 25GbE Ethernet Switch, 4x10G-BaseT, 1x40GbE QSFP+, 2x100GbE QSFP28</td>
</tr>
<tr>
<td>210-ANUK</td>
<td>210-ANUJ</td>
<td>Dell MX7116n 25GbE Fabric Expander Module</td>
</tr>
</tbody>
</table>

## Fibre Channel Optics for MX9116n*

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>407-BBZE</td>
<td>407-BBZG</td>
<td>Dell Networking Transceiver, 32G QSFP28 SWL Fibre Channel QSFP (4x32GFC Supports 8/16/32 GFC)</td>
</tr>
</tbody>
</table>

*NOTE: These optics are NOT supported in the MXG610s FC switch*

## 4x Breakout Cables for Ethernet & FC QSFP to 4x LC connectors

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>470-ABOF</td>
<td>470-ABPH</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 1M</td>
</tr>
<tr>
<td>470-AFOG</td>
<td>470-ABPE</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 3M</td>
</tr>
<tr>
<td>470-ABOH</td>
<td>470-ABPG</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 5M</td>
</tr>
<tr>
<td>470-ABOI</td>
<td>470-ABPK</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 7M</td>
</tr>
</tbody>
</table>

Copyright 2022 Dell Inc
# QSFP28-DD Cables for FSE/FEM and FSE/FSE VLT Connections

## DAC & AOC Cables

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>470-ACTP</td>
<td>470-ACUI</td>
<td>Dell Networking 2x100GbE QSFP28-DD Passive Direct Attach Cable, No FEC, 0.5 Meter</td>
</tr>
<tr>
<td>470-ACTR</td>
<td>470-ACUL</td>
<td>Dell Networking 2x100GbE QSFP28-DD Passive Direct Attach Cable, No FEC, 1 Meter</td>
</tr>
<tr>
<td>470-ACTS</td>
<td>470-ACUN</td>
<td>Dell Networking 2x100GbE QSFP28-DD Passive Direct Attach Cable, No FEC, 2 Meter</td>
</tr>
<tr>
<td>470-ACYY</td>
<td>470-ACYV</td>
<td>Dell Networking 2x100GbE QSFP28-DD Passive Direct Attach Cable, No FEC, 3 Meter</td>
</tr>
<tr>
<td>470-ACTI</td>
<td>470-ACUB</td>
<td>Dell Networking 2x100GbE QSFP28-DD Active Optical Cable, No FEC, 5 Meter</td>
</tr>
<tr>
<td>470-ACTF</td>
<td>470-ACTX</td>
<td>Dell Networking 2x100GbE QSFP28-DD Active Optical Cable, No FEC, 10 Meter</td>
</tr>
<tr>
<td>470-ACTG</td>
<td>470-ACTY</td>
<td>Dell Networking 2x100GbE QSFP28-DD Active Optical Cable, No FEC, 20 Meter</td>
</tr>
</tbody>
</table>

### Optical Transceiver + MMF Fiber*

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>407-BCKE</td>
<td>407-BCKF</td>
<td>Dell Networking Transceiver, 2x100GbE/2x40GbE Dual Rate, QSFP28-DD, 2SR4, No FEC Capable, MPO, MMF</td>
</tr>
<tr>
<td>470-ADBF</td>
<td>470-ADCE</td>
<td>Dell Networking Cable, MPO12-DD to MPO12-DD, Fiber Cable, MMF, OM4, Optics Required, 1M</td>
</tr>
<tr>
<td>470-ADBK</td>
<td>470-ADBH</td>
<td>Dell Networking Cable, MPO12-DD to MPO12-DD, Fiber Cable, MMF, OM4, Optics Required, 3M</td>
</tr>
<tr>
<td>470-ABDI</td>
<td>470-ADCH</td>
<td>Dell Networking Cable, MPO12-DD to MPO12-DD, Fiber Cable, MMF, OM4, Optics Required, 5M</td>
</tr>
<tr>
<td>470-ADC1</td>
<td>470-ADBJ</td>
<td>Dell Networking Cable, MPO12-DD to MPO12-DD, Fiber Cable, MMF, OM4, Optics Required, 7M</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>Corning Edge8 Structured Cabling</td>
</tr>
</tbody>
</table>

---

**NOTE:** These optics & cables are NOT supported in QSFP28 or QSFP+ ports

*OS10.5.0.1 or higher is required to use optics & passive fiber for FSE/FEM connections
Speed Compatibility for Cables/Optics

- When configuring a port for a specific speed or breakout, a compatible cable/optic must be used.
- DAC cables are generally multi-speed
  - For example, a QSFP28 DAC cable can run at 100G, 4x25G, 40G, 4x10G
- AOC cables and optical transceivers are generally single speed
  - For example, a QSFP28 optic can run at 100G or 4x25G. It cannot run at 40G or 4x10G
- Use the table below to ensure that the correct cable/optic is being used

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Primary Speed</th>
<th>Port Type</th>
<th>2x100G</th>
<th>100G</th>
<th>2x40G</th>
<th>40G</th>
<th>8x25G</th>
<th>4x25G</th>
<th>8x10G</th>
<th>4X10G</th>
</tr>
</thead>
<tbody>
<tr>
<td>40G DAC</td>
<td>DAC</td>
<td>40G</td>
<td>QSFP+</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>100G DAC</td>
<td>DAC</td>
<td>100G</td>
<td>QSFP28</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4x25G breakout DAC</td>
<td>DAC</td>
<td>100G</td>
<td>QSFP28</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8x25G breakout DAC</td>
<td>DAC</td>
<td>100G</td>
<td>QSFP28-DD</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2x100G QSFP28-DD DAC</td>
<td>DAC</td>
<td>100G</td>
<td>QSFP28-DD</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>40G AOC or Transceiver</td>
<td>Optical</td>
<td>40G</td>
<td>QSFP+</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>100G AOC or Transceiver</td>
<td>Optical</td>
<td>100G</td>
<td>QSFP28</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2x100G/2x40G QSFP28-DD Transceiver</td>
<td>Optical</td>
<td>100G</td>
<td>QSFP28-DD</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2x100G QSFP28-DD AOC or Transceiver</td>
<td>Optical</td>
<td>100G</td>
<td>QSFP28-DD</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2x40G QSFP-DD AOC or Transceiver</td>
<td>Optical</td>
<td>40G</td>
<td>QSFP28-DD</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

The QSA28 Adapter is a QSFP form factor carrier that allows a SFP, SFP+, or SFP28 optic/cable to be inserted into a QSFP+, QSF28, or QSFP28-DD port. This provides the ability to support a single 1G, 10G, or 25G cable/optic...
PowerEdge MX Ethernet Pass-through Modules

Key Capabilities
- 16 x 25GbE server-facing ports
- 16 x SFP28 or 10G-BaseT external ports
- Supported in Fabrics A & B
- Supports all PowerEdge MX Ethernet Cards

HIGHLIGHTS
- Simple Ethernet pass through from compute sled to external switch
- One cable per compute sled
- Nothing to manage, no firmware to update
PowerEdge 25GbE Pass-Through Module

Cable & Optic Options

- **25G Uplink**
  - DAC-SFP28-25G-xM
  - OR
  - AOC-SFP28-25G-xM
  - OR
  - SFP28-25G-SR-NOF
  - AND
  - CBL-LC-OM4-xM

- **10G Uplink**
  - DAC-SFP-10G-xM
  - OR
  - DAC-SFP28-25G-xM*
  - OR
  - AOC-SFP-10G-xM
  - OR
  - SFP-10G-SR
  - AND
  - CBL-LC-OM4-xM

*DAC-SFP28-25G-xM supports 10GbE and 25GbE
Pass-Through Module Port Mapping – Dual Port NIC
PowerEdge MXG610s Fibre Channel Switch

High-performance, Brocade Gen 6 32G FC switch
The latest Fibre Channel technology for large scale Storage Area Networks

Key Capabilities
• 16 x 32G FC server-facing ports, 8 x 32G SFP FC ports, and 2 QSFP FC uplink ports (4 x 32G per QSFP)
• Supported in Fabric C Only
• Supports all MX Fibre Channel HBAs
• Designed for maximum flexibility and value with “pay-as-you-grow” scalability and Ports on Demand (PoD) licensing
• Compatible with Brocade and Cisco fabric/director class switches
• NVMe over Fabric Ready

HIGHLIGHTS
• High performance, non-blocking FC switch in a modular chassis platform for demanding all flash storage environments
• Ports on Demand licensing to “pay-as-you-grow”
• Simplified cable management using QSFP ports
PowerEdge MXG610s Fibre Channel Switch
Typical Cable & Optic Options

SFP+, LWL, 16Gb, BR (Optic)
OR
SFP+, LWL, 32Gb, BR (Optic)

16/32GFC (LWL)

SFP+, SWL, 16Gb, BR (Optic)
OR
SFP+, SWL, 32Gb, BR (Optic)
AND
CBL-LC-OM4-xM

16/32GFC (SWL)

Breakout 4x 16/32 GFC

QSFP+, SWL, 32Gb, BR (4x 32GFC Optic)
AND
CBL-MPO12-4LC-OM4-xM

NOTE: Not every option is presented on this page. Contact your account team for additional options
MXG610s Additional Information

- Must be ordered in pairs
- Supports all PowerEdge MX Fibre Channel HBAs
- 2 models available:
  - 16x activated ports & 4x FC32 SFP+ optics
  - 16x activated ports & 8x FC32 SFP+ optics, Enterprise Bundle
- Additional port licenses can be added
- Additional 16G FC and 32G FC optics can be purchased for activated ports

**NOTE:** A port license is consumed when that port is activated, regardless if port is internal or external (QSFP ports count as 4 licenses)

**NOTE:** While 32 licensed ports is technically possible, 24 ports is the maximum number of ports that are usable. Don’t purchase more than 24 port licenses

The Enterprise bundle includes ISL Trunking, Fabric Vision, and Extended Fabric licenses:

- **ISL Trunking:** Provides the ability to aggregate multiple physical links into one logical link for enhanced network performance and fault tolerance. Also enables Brocade Access Gateway ISL Trunking (N_port Trunking)
- **Fabric Vision:** Enables MAPS (Monitoring and Alerting Policy Suite), Flow Vision, IO Insight, VM Insight, and ClearLink (a.k.a. D_Port) to non-Brocade devices
  - MAPS enables rules based monitoring and alerting capabilities, provides comprehensive dashboards to quickly troubleshoot problems in Brocade SAN environments
  - Flow Vision enables host to LUN flow monitoring, application flow mirroring for offline capture and deeper analysis, and test traffic flow generation function for SAN infrastructure validation
  - IO Insight automatically detects degraded storage IO performance with integrated device latency and IOPS monitoring embedded in the hardware
  - ClearLink (D_Port) to non-Brocade devices allows extensive diagnostic testing of links to devices other than Brocade switches and adapters. (Functionality requires support by attached device, availability to be checked by the user)
- **Extended Fabric:** Provides greater than 10km of switched fabric connectivity at full bandwidth over long distances

**NOTE:** These features are only available in the Enterprise Bundle - individual feature licenses are not available
## MXG610s: Popular SKUs

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-AOCK</td>
<td>210-AOCJ</td>
<td>Dell MXG610S switch, includes 16 activated ports &amp; 4x FC32 SFP+ SWL optics</td>
</tr>
<tr>
<td>210-AOCM</td>
<td>210-AOCL</td>
<td>Dell MXG610S switch, includes 16 activated ports &amp; 8x FC32 SFP+ SWL optics, Enterprise Bundle</td>
</tr>
<tr>
<td>528-BFOY</td>
<td>528-BFOH</td>
<td>Dell MXG610S 8 Ports-On-Demand activation, no additional optics</td>
</tr>
<tr>
<td>528-BFOE</td>
<td>528-BFOS</td>
<td>Dell MXG610S ENT Feature License Bundle (Trunking, Extended Fabric, and Fabric Vision)</td>
</tr>
</tbody>
</table>

16 ports licensed = 8 servers & up to 8 external uplinks (any combination of SFP+ & QSFP ports)*
24 ports licensed = 8 servers & all 16 external uplinks

**NOTE**: If you need the enterprise bundle, purchase the SKU with the license included (210-AOCM). Do not purchase a different SKU and then add the stand-alone ENT license bundle

**NOTE**: QSFP ports use 4 activation licenses

**NOTE**: As of April 13th, 2023, Brocade software licenses are delivered digitally
# Fibre Channel Optics & Cables for MXG610s

## Brocade 16G SFP SWL Fibre Channel

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>407-BBCF</td>
<td>407-BBBB</td>
<td>Brocade 16G SFP SWL Fibre Channel, 1 pack, requires port license (Supports 8G/16G)</td>
</tr>
<tr>
<td>407-BBXJ</td>
<td>407-BBXM</td>
<td>Brocade 32G SFP SWL Fibre Channel, 1 pack, requires port license (Supports 8G/16G/32G)</td>
</tr>
<tr>
<td>407-BBXK</td>
<td>407-BBXL</td>
<td>Brocade 32G SFP SWL Fibre Channel, 8 pack, requires port license (Supports 8G/16G/32G)</td>
</tr>
<tr>
<td>407-BBXH</td>
<td>407-BBXO</td>
<td>Brocade 32G SFP LWL, 10Km SMF, 1 pack, requires port license</td>
</tr>
<tr>
<td>407-BBXI</td>
<td>407-BBXN</td>
<td>Brocade 32G SFP LWL, 10Km SMF, 8 pack, requires port license</td>
</tr>
<tr>
<td>407-BCBB</td>
<td>407-BCBC</td>
<td>Brocade 32G QSFP SWL Fibre Channel QSFP (4 x 32G), 1 pack, requires 4 port licenses (Supports 16G/32G)</td>
</tr>
</tbody>
</table>

**NOTE:** These optics are NOT supported in the MX9116n Fabric Switching Engine

## MMF LC/LC cables for SFP+ SWL optics

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>470-ACMB</td>
<td>470-ACLV</td>
<td>OM4 LC/LC Fiber Patch Cable 1 Meter</td>
</tr>
<tr>
<td>470-ACLS</td>
<td>470-ACLT</td>
<td>OM4 LC/LC Fiber Patch Cable 2 Meter</td>
</tr>
<tr>
<td>470-ACMF</td>
<td>470-ACMO</td>
<td>OM4 LC/LC Fiber Patch Cable 3 Meter</td>
</tr>
<tr>
<td>470-ACLK</td>
<td>470-ACLY</td>
<td>OM4 LC/LC Fiber Patch Cable 5 Meter</td>
</tr>
<tr>
<td>470-ACMH</td>
<td>470-ACMN</td>
<td>OM4 LC/LC Fiber Patch Cable 10 Meter</td>
</tr>
</tbody>
</table>

## Breakout cables for 4x32GFC QSFP optic

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>470-ABOF</td>
<td>470-ABPH</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 1M</td>
</tr>
<tr>
<td>470-ABOG</td>
<td>470-ABPE</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 3M</td>
</tr>
<tr>
<td>470-ABOH</td>
<td>470-ABPG</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 5M</td>
</tr>
<tr>
<td>470-ABOI</td>
<td>470-ABPK</td>
<td>Dell Networking Cable, MPO to 4xLC, Fiber Breakout Cable, MMF, OM4, Optics Required, 7M</td>
</tr>
</tbody>
</table>
IOM Placement Rules for Fabrics A & B

• Mixing MX9116n and MX7116n within the same fabric *IS* allowed

• No mixing of Ethernet switch and Pass-Through Modules within the same fabric on MX7000
  – For example, MX9116n in A1 and 25G PTM in A2 is not allowed

• No mixing of Pass-Through Module speeds within the same fabric on MX7000
  – For example, 10G-BaseT PTM in A1 and 25G PTM in A2 is not allowed

For the comprehensive table of recommended slot configurations for IOMs, see Appendix A in the Dell OpenManage Enterprise-Modular Edition Version 2.10.00 for PowerEdge MX7000 Chassis User's Guide
100GbE solution
External Fabric Switching Engine and IOM Fabric Expander Module
PowerEdge MX8116n Fabric Expander Module

Low latency 100G fabric expander
Scales fabric bandwidth across multiple chassis

Key Capabilities

- 8 x 100GbE server-facing ports, 2x Fabric Expansion ports back to FSE
- Supported in Fabrics A & B
- Supports PowerEdge MX Ethernet Cards – BCOM 57508, BCOM 57504, Intel XXV710, Intel XXV810, and Mellanox ConnectX-4 LX
- No switching ASIC
- Linux based BootOS
- All switching done at Z9432F-ON FSE
- No port-to-port oversubscription
- NVMe/TCP ready

HIGHLIGHTS

- Low latency fabric expander module for efficiently scaling fabric bandwidth across a multi-chassis environment
- One cable supports 4 x 100GbE, 8 x 25GbE, or 4 x 25GbE connections back to the FSE
- Nothing to manage
PowerEdge MX8116n Fabric Expander Module
Cable & Optic Options

Connection to Z9432F-ON

- DAC-Q56DD-400G-xM
- ACC-Q56DD-400G-xM
- AOC-Q56DD-400G-xM
- Q56DD-400G-SR4.2 (Optic)
- CBL-MPO12DD-OM4-xM

Port mode 4x100GbE

- DAC-Q28DD-100G-xM
- AOC-Q28DD-100G-xM
- Q28DD-80G/200G-2SR4 (Optic)
- CBL-MPO12DD-OM4-xM

Port mode 4x25GbE

- DAC-Q56DD-400G-xM
- DAC-Q28DD-2Q28-100G-xM

Port mode 8x25GbE

- ACC-Q56DD-4Q28-100G-xM

Port mode 1x100GbE

NOTE:
- A QSFP56-DD or QSFP28DD cable between the MX8116n and Z9432F-ON is REQUIRED. Using a QSFP28 cable is not supported.
- Breakout is supported only to Dell PowerSwitch.
- QSFP56-DD ports are backwards compatible and support QSFP28-DD Optics and cables.
PowerSwitch Z9432F-ON Fabric Switching Engine

High-performance, scalable 100/400G fabric switch
A comprehensive high-end L2/L3 switch with multi-chassis fabric scaling capabilities

Key Capabilities
- 32 x 400GbE Fabric Expansion/Uplink ports
- Port modes used with FEM are 4 x 100GbE, 8 x 25GbE, and 4 x 25GbE
- Additional port modes include 1 x 400GbE, 2 x 100GbE, 1 x 100GbE, 2 x 200GbE, 1 x 200GbE, 8 x 50GbE, 2 x 40GbE, 1 x 40GbE, 8 x 10GbE, and 4 x 10GbE.
- Supports PowerEdge MX Ethernet Cards – BCOM 57508, BCOM 57504, Intel XXV710, Intel XXV810, and Mellanox ConnectX-4 LX
- Supports Open Networking and Full Switch operating modes
- < 850ns latency, 25.6 Tbps switching fabric
- NVMe over Fabric Ready

HIGHLIGHTS
- Optimum performance fabric switch providing high scalability at a low TCO
- Highly efficient embedded ToR functionality that reduces cost and improves performance & latency
- Open Networking fabric switch with ONIE and a choice of OS10 Enterprise Edition or select 3rd party OS
PowerSwitch Z9432F-ON Fabric Switching Engine
Typical Cable & Optic Options

Connection to MX8116n

- DAC-Q56DD-400G-xM
  OR
  ACC-Q56DD-400G-xM
  OR
  AOC-Q56DD-400G-xM
  OR
  Q56DD-400G-SR4.2 (Optic)
  AND
  CBL-MPO12DD-OM4-xM

- DAC-Q28DD-100G-xM
  OR
  AOC-Q28DD-100G-xM
  OR
  Q28DD-80G/200G-2SR4 (Optic)
  AND
  CBL-MPO12DD-OM4-xM

- ACC-Q56DD-4Q28-100G-xM

Port mode 4x25GbE
Port mode 8x25GbE
Port mode 1x100GbE

1GbE and 10G-BaseT are supported via the QSA28 adapter

NOTE: Not every option is presented on this page. Please contact your account team for additional options

QSFP56-DD ports are backwards compatible and support QSFP28-DD Optics and cables

- A QSFP56-DD or QSFP28-DD cable between the MX8116n and Z9432F-ON is REQUIRED. Using a QSFP28 cable is not supported
- Breakout is supported only to Dell PowerSwitch
IOM Placement Rules for Fabrics A & B

• Single MX8116n in a fabric *IS* allowed

• No mixing of MX8116n and MX9116n/MX7116n within the same fabric on MX7000

• No mixing of Ethernet switch and Pass-Through Modules within the same fabric on MX7000
  – For example, MX8116n in A1 and 25G PTM in A2 is not allowed

• No mixing of Pass-Through Module speeds within the same fabric on MX7000
  – For example, 10G-BaseT PTM in A1 and 25G PTM in A2 is not allowed

For the comprehensive table of recommended slot configurations for IOMs, see Appendix A in the Dell OpenManage Enterprise-Modular Edition Version 2.10.00 for PowerEdge MX7000 Chassis User's Guide
Cables for QSFP56-DD ports-MX 100G Solution

<table>
<thead>
<tr>
<th>FI SKU</th>
<th>APOS SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>470-ADYO</td>
<td>470-ADYS</td>
<td>Dell Networking Cable, 400GbE Q56DD Passive Copper Direct Attach Cable, 0.5 Meter</td>
</tr>
<tr>
<td>470-ADXJ</td>
<td>470-ADYU</td>
<td>Dell Networking Cable, 400GbE Q56DD Passive Direct Attach Cable, No FEC, 1 Meter</td>
</tr>
<tr>
<td>470-ADYV</td>
<td>470-ADYT</td>
<td>Dell Networking Cable, 400GbE Q56DD Passive Copper Direct Attach Cable, 2 Meter</td>
</tr>
<tr>
<td>470-AEDO</td>
<td>470-AEDD</td>
<td>Dell Networking Cable, 400GbE QSFP56-DD to QSFP56-DD, Active Copper Cable, 3 Meter</td>
</tr>
<tr>
<td>470-AEDH</td>
<td>470-AEDG</td>
<td>Dell Networking Cable, 400GbE QSFP56-DD to QSFP56-DD, Active Copper Cable, 5 Meter</td>
</tr>
<tr>
<td>470-AEDI</td>
<td>470-AEDI</td>
<td>Dell Networking Cable, 400GbE QSFP56-DD to QSFP56-DD, Active Copper Cable, 7 Meter</td>
</tr>
<tr>
<td>470-BBGB</td>
<td>470-BBGC</td>
<td>Dell Networking Cable 400GbE QSFP56-DD to QSFP56-DD Active Optical Cable 10Meter,G2</td>
</tr>
<tr>
<td>470-BBGF</td>
<td>470-BBGG</td>
<td>Dell Networking Cable 400GbE QSFP56-DD to QSFP56-DD Active Optical Cable 15Meter,G2</td>
</tr>
<tr>
<td>470-BBGH</td>
<td>470-BBGD</td>
<td>Dell Networking Cable 400GbE QSFP56-DD to QSFP56-DD Active Optical Cable 30Meter,G2</td>
</tr>
</tbody>
</table>

QSFP56-DD Ethernet Optics for MX8116n and Z9432F-ON

<table>
<thead>
<tr>
<th>FI SKU</th>
<th>APOS SKU</th>
<th>Long Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>407-BCXF</td>
<td>407-BCXG</td>
<td>Dell Networking, Tcvr, 400GbE, Q56DD, SR4.2, GEN3, MPO, MMF, 1x400G p2p, 4x100G breakout to BIDI or SR1.2</td>
</tr>
</tbody>
</table>

**NOTE:** For the complete list of supported cables & optics, refer to the Interop matrix on the Sales Portal
## QSFP56-DD Breakout Cables

<table>
<thead>
<tr>
<th>FI SKU</th>
<th>APOS SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>470-AFPF</td>
<td>470-AFPH</td>
<td>Dell Networking Cable 400GbE Breakout, QSFP56-DD to 4xQSFP56 Depop SFF DAC 3 Meter</td>
</tr>
<tr>
<td>470-AEDM</td>
<td>470-AEDF</td>
<td>Dell Networking Cable, 400GbE QSFP56-DD to 4xQSFP28 100GbE, Active Copper Cable, Breakout, 3 Meter</td>
</tr>
<tr>
<td>470-AEDE</td>
<td>470-AEDL</td>
<td>Dell Networking Cable, 400GbE QSFP56-DD to 4xQSFP28 100GbE, Active Copper Cable, Breakout, 5 Meter</td>
</tr>
</tbody>
</table>
100GbE Ethernet SKUs

Ethernet I/O Modules

<table>
<thead>
<tr>
<th>Factory SKU</th>
<th>After Sale SKU</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-BFBJ</td>
<td>210-BFBI</td>
<td>Dell Networking MX8116n 100GbE Fabric Expander Module</td>
</tr>
</tbody>
</table>
Scalable Fabric Architecture
PowerEdge MX Scalable Fabric Architecture

How can multiple chassis behave like a single network?

**Legacy Modular Solutions**
- Ethernet switches in each chassis = **Latency**
- Multiple hops for east-west traffic = **Latency**
- Excessive cabling = **Cost**
- Multiple switches to manage = **Cost**

**Best-in-class Multi Chassis Ethernet**
- Aggregate 50GbE to 400GbE* bandwidth in each server
- \(<600\text{ns}\) “any-any” latency
- **No** server-to-server oversubscription
- Scales up to 10 chassis, 80 compute sleds
- 8x25Gbps over a single cable
- Cost effective, low TCO

*Requires Broadcom 57504 Quad Port Ethernet adapter
Scalable Fabric Architecture Topology – One Fabric

**Chassis 1:**
- Slot A1: MX9116n
- Slot A2: MX7116n

**Chassis 2:**
- Slot A1: MX7116n
- Slot A2: MX9116n

**Chassis 3:**
- Slot A1: MX7116n
- Slot A2: MX7116n

**Chassis 10:**
- Slot A1: MX7116n
- Slot A2: MX7116n

**NOTE:** If a Scalable Fabric has some chassis with Quad Port NICs and some with only Dual Port NICs, only the chassis with Quad Port NICs require the second FEM port to be connected.

**NOTE:** If a Scalable Fabric has some chassis with Quad Port NICs and some with only Dual Port NICs, only the chassis with Quad Port NICs require the second FEM port to be connected.

**NOTE:** The diagram does not show the VLTI connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTI Cables between MX9116n FSEs on Port 37 and 39.
NOTE: Fabric B is not required to be populated in every chassis.

NOTE: If a Scalable Fabric has some chassis with Quad Port NICs and some with only Dual Port NICs, only the chassis with Quad Port NICs require the second FEM port to be connected.

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode.
Supported Scalable Fabric Topologies*

**Dual Port NICs**

These topologies are for scenarios where two physical NICs per server are required but only one pair of MX9116n FSEs are desired.

---

**Single Chassis**

**Dual Chassis**

*These topologies are supported as of OME-M 2.00.00 and OS10.5.4.1 Full Switch and SmartFabric modes.

**NOTE:** The diagrams do not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.

Care must be taken to ensure proper cable placement.
Supported Scalable Fabric Topologies*

Dual Port NICs

These topologies are for scenarios where two physical NICs per server are required but only one pair of MX9116n FSEs are desired.

*These topologies are supported as of OME-M 2.00.00 and OS10.5.4.1 Full Switch and SmartFabric modes.

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.

Care must be taken to ensure proper cable placement.
Supported Scalable Fabric Topologies* 

Quad Port NICs

These topologies are for scenarios where two physical NICs per server are required but only one pair of MX9116n FSEs are desired.

Single Chassis

Dual Chassis

Care must be taken to ensure proper cable placement

*These topologies are supported as of OME-M 2.00.00 and OS10.5.4.1 Full Switch and SmartFabric modes

NOTE: The diagrams do not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Supported Scalable Fabric Topologies*

**Quad Port NICs**

These topologies are for scenarios where two physical NICs per server are required but only one pair of MX9116n FSEs are desired.

*These topologies are supported as of OME-M 2.00.00 and OS10.5.4.1 Full Switch and SmartFabric modes.

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.

Care must be taken to ensure proper cable placement.
Examples of **Unsupported** Scalable Fabric Topologies

These topologies are not supported
In order to provide optimal performance through the MX9116n FSE, it is recommended to connect the FEMs to the FSE in the following order:

**QSFP28-DD ports are backwards compatible and support QSFP28 and QSFP+ Optics and cables**

**QSFP28 ports are backwards compatible and support QSFP+ Optics and cables**

**Port Group 1 & 2**: Connect FEMs from first two chassis to Port-Group 1

**Port Group 3**: Connect FEM from Chassis 4 to Port-Group 2

**Port Group 4 & 5**: Connect FEM from Chassis 6 to Port-Group 3

**Port Group 6**: Connect FEM from Chassis 8 to Port-Group 4

**Port Group 7**: Connect FEM from Chassis 10 to Port-Group 5

**Port Group 8**: Connect FEM from Chassis 3 to Port-Group 7

**Port Group 9**: Connect FEM from Chassis 7 to Port-Group 9

**Port Group 10**: Connect FEM from Chassis 5 to Port-Group 8

**Port Group 11 & 12**: Connect FEM from Chassis 9 to Port-Group 10

QSFP28-DD ports not used for FEM connections can be utilized for additional uplinks, connections to rack servers, or VLT connections (VLT is required for SmartFabric Services) in both Full Switch and SmartFabric mode.
PowerEdge MX networking with Embedded Top of Rack switching

Rack servers and other Ethernet devices can be connected directly to the MX9116n FSE via the appropriate breakout cable

- Rack servers do not need to be connected to separate Top of Rack switches
- Communication between all devices is kept within the FSE
- Provides a single point of management and network security
- Reduces cost and improves performance and latency
- Supported in Full Switch and SmartFabric modes
Scalable Fabric Architecture
100GbE solution
Supported Scalable Fabric Topologies

These topologies are for scenarios for either 100GbE NICs or 25GbE NICs installed. Each individual chassis requires the same NIC model installed in each sled.

- **Single Chassis, Single Fabric**: Supports up to 14 Chassis
- **Single Chassis, Dual Fabric**: Supports up to 7 Chassis

**NOTE**: The diagrams do not show the VLTi connections recommended in Full switch mode.
Supported Scalable Fabric Topologies

• This topology is for a scenario for either 100GbE NICs or 25GbE NICs installed. Each individual chassis requires the same NIC model installed in each sled.

NOTE: The diagrams do not show the VLTi connections recommended in Full switch mode.
Supported Scalable Fabric Topologies

- This topology is for a scenario for either 100GbE NICs or 25GbE NICs installed. Each individual chassis requires the same NIC model installed in each sled.

NOTE: The diagrams do not show the VLTi connections recommended in Full switch mode.
Supported Scalable Fabric Topologies

These topologies are for scenarios for either 100GbE NICs and/or 25GbE NICs installed. Each individual chassis requires the same NIC model installed in each sled.

Multi Chassis, Single Fabric

NOTE: The diagrams do not show the VLTi connections recommended in Full switch mode.

Multi Chassis, Dual Fabric
Supported Scalable Fabric Topologies

These topologies are for scenarios for either 100GbE NICs and/or 25GbE NICs installed. Each individual chassis requires the same NIC model installed in each sled.

Multi Chassis, Dual Fabric, Separate networks

NOTE: The diagrams do not show the VLTi connections recommended in Full switch mode.
Supported Scalable Fabric Topologies

These topologies are for scenarios for a mixed deployment with the MX8116n and MX9116 in the same chassis. For **MX8116n Fabric**, each individual chassis requires the same NIC model installed in each sled.

**Single Chassis, Mixed deployment**

**NOTE**: The diagrams do not show the VLTI connections recommended in Full switch mode.

**Single Chassis, Mixed deployment, Separate networks**
Supported Scalable Fabric Topologies

These topologies are for scenarios for a mixed deployment with the MX8116n and MX9116 in the same chassis. For MX8116n Fabric, each individual chassis requires the same NIC model installed in each sled.

Multi Chassis, Mixed deployment

NOTE: The diagrams do not show the VLTi connections recommended in Full switch mode.

Multi Chassis, Mixed deployment, Separate networks
Example Topologies
## Cable & Optic Option Key

The sample topologies in the following slides will use different cable types depending on the use-case.

Additionally, the cable/optic type used will vary depending on the length required.

<table>
<thead>
<tr>
<th>Cable Option</th>
<th>Description</th>
<th>Connector</th>
<th>DAC (very short)</th>
<th>AOC (short-medium)</th>
<th>Optic (medium-long)</th>
<th>Fiber (Requires Optic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FSE/FEM Connection</td>
<td>QSFP28-DD</td>
<td>DAC-Q28DD-200G-xM</td>
<td>AOC-Q28DD-200G-xM</td>
<td>Q28DD-80G/200G-2SR4</td>
<td>CBL-MPO12DD-OM4-xM or Corning Edge8 Structured Cabling</td>
</tr>
<tr>
<td>2</td>
<td>100GbE Uplink</td>
<td>QSFP28</td>
<td>DAC-Q28-100G-xM</td>
<td>AOC-Q28-100G-xM</td>
<td>Q28-100G-SR4-NOF</td>
<td>CBL-MPO12-OM4-xM</td>
</tr>
<tr>
<td>3</td>
<td>40GbE Uplink</td>
<td>QSFP28/QSFP+</td>
<td>DAC-QSFP-40G-xM</td>
<td>AOC-QSFP-40G-xM</td>
<td>QSFP-40G-SR4</td>
<td>CBL-MPO12-OM4-xM</td>
</tr>
<tr>
<td>4</td>
<td>Breakout 2x100GbE</td>
<td>QSFP28-DD</td>
<td>DAC-Q28DD-2Q28-100G-xM</td>
<td>AOC-Q28DD-2Q28-100G-xM</td>
<td>Q28DD-80G/200G-2SR4</td>
<td>CBL-MPO12DD-2MPO12-OM4-xM</td>
</tr>
<tr>
<td>7</td>
<td>Breakout 4x25GbE</td>
<td>QSFP28</td>
<td>DAC-Q28-4S28-25G-xM</td>
<td>AOC-Q28-4S28-25G-xM</td>
<td>Q28-100G-SR4-NOF</td>
<td>CBL-MPO12-4LC-OM4-xM</td>
</tr>
<tr>
<td>8</td>
<td>Breakout 4x10GbE</td>
<td>QSFP28/QSFP+</td>
<td>DAC-QSFP-4SFP-10G-xM</td>
<td>AOC-QSFP-4SFP-10G-xM</td>
<td>QSFP-40G-SR4</td>
<td>CBL-MPO12-4LC-OM4-xM</td>
</tr>
<tr>
<td>9*</td>
<td>Breakout 4x16G FC</td>
<td>QSFP28/QSFP+</td>
<td>Not-Supported</td>
<td>Not-Supported</td>
<td>QSFP-64GFC-SW4</td>
<td>CBL-MPO12-4LC-OM4-xM</td>
</tr>
<tr>
<td>10</td>
<td>Breakout 4x8/16/32G FC</td>
<td>QSFP28</td>
<td>Not Supported</td>
<td>Not Supported</td>
<td>Q28-128GFC-SW4</td>
<td>CBL-MPO12-4LC-OM4-xM</td>
</tr>
<tr>
<td>11</td>
<td>Breakout 2x40GbE</td>
<td>QSFP28-DD</td>
<td>DAC-Q28DD-2Q28-100G-xM</td>
<td>AOC-Q28DD-2Q-40G-7M</td>
<td>Q28DD-80G/200G-2SR4</td>
<td>CBL-MPO12DD-2MPO12-OM4-xM</td>
</tr>
</tbody>
</table>

---

1. The QSFP-64GFC-SW4 (4x16GFC Optic) is EoL as of 15 October 2020. Use Q28-128GFC-SW4 (4x32GFC Optic) instead.
2. SR4 transceivers support distances up to 150M over OM4 fiber. The MX7000 management modules use 1G BASET cables with a distance limit of 100M, therefore the effective usable length for a SR4 optic is 100M over OM4 fiber.
Example Topologies
Scalable Fabric Wiring Diagram – 2 Chassis

Fabric A Populated

NOTE: The diagrams do not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.

Fabric A & B Populated

Cable Option 1
NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Example Topologies
Scalable Fabric Wiring Diagram – Rack Server Connectivity*

**NOTE**: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Example Topologies
MX9116n Standard Ethernet w/VLT – 2xMX9116n in same Chassis*

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Example Topologies
MX9116n Standard Ethernet w/VLT*

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Example Topologies
MX9116n Fibre Channel NPG*

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Example Topologies
MX9116n Direct Attached Fibre Channel

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.

Cable Option 10 (8/16/32G)
Example Topologies
MX5108n Standard Ethernet w/VLT: SFP28 Uplinks

Cable Option 3

ToR Switches

Cable Option 7 (25GbE) or Cable Option 8 (10GbE)

Copyright 2022 Dell Inc
Example Topologies

MX5108n Standard Ethernet w/VLT: 10G-BaseT Uplinks

ToR Switches

Cable Option 3

Cat 6A Copper
Example Topologies
MX7116n Fabric Expander Module as Pass-Through*

Set 100G ports to 4x25G
Set 40G ports to 4x10

**ToR Switches**

Cable Option 4 (25GbE)
Cable Option 11 (10GbE)

Cable Option 5 (25GbE)
Cable Option 6 (10GbE)

*Pass-Through to Dell Networking switches only. Non-Dell switches are not supported*
Example Topologies
Scalable Fabric Wiring Diagram – 2 Chassis with Quad Port NICs

Fabric A Populated

Fabric A & B Populated

NOTE: The diagrams do not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Example Topologies
Scalable Fabric Wiring Diagram – 3+ Chassis with Quad Port NICs

Cable Option 1

Chassis 1 & 2

Cable Option 1

Chassis 3-5

NOTE: The diagram does not show the VLTi connections required in SmartFabric mode and recommended in Full switch mode. Connect VLTi Cables between MX9116n FSEs on Port 37 and 39.
Unsupported Topologies in SmartFabric mode

While these topologies are supported in Full Switch Mode, SmartFabric Services currently requires both Ethernet switches to reside in slots A1/A2 or B1/B2.

It is not supported having one switch in Fabric A and the second in Fabric B.
Cable & Optic Information
### Cables & Connectors

There are four primary cable types used with optical connectors in PowerEdge MX Ethernet networking: DAC, AOC, MMF, SMF

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAC (Copper)</td>
<td>Direct Attach Copper &quot;TwinAx&quot; Copper wires &amp; shielding 2-wires/Channel</td>
</tr>
<tr>
<td>ACC (Copper)</td>
<td>Active Copper Cable</td>
</tr>
<tr>
<td>AOC (Optical)</td>
<td>Active Optical Cable</td>
</tr>
<tr>
<td>MMF (Optical)</td>
<td>Multi-Mode Fiber 50-um Large core fiber 100m (300m) reach Easy to attach components Transceiver are low cost Fiber 3x cost of SMF</td>
</tr>
<tr>
<td>SMF (Optical)</td>
<td>Single-Mode fiber 9-um Tiny core fiber 2/10Km reach Hard to attach components Transceivers are expensive SMF cost less than dental floss!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“SFP”</td>
<td>SFP = 1G</td>
</tr>
<tr>
<td></td>
<td>SFP+ = 10G</td>
</tr>
<tr>
<td></td>
<td>SFP28 = 25G</td>
</tr>
<tr>
<td></td>
<td>SFP56 = 50G</td>
</tr>
<tr>
<td></td>
<td>SFP112 = 100G</td>
</tr>
<tr>
<td>“QSFP”</td>
<td>QSFP+ = 40G</td>
</tr>
<tr>
<td></td>
<td>QSFP28 = 100G</td>
</tr>
<tr>
<td></td>
<td>QSFP56 = 200G</td>
</tr>
<tr>
<td>“QSFP-DD”</td>
<td>QSFP28-DD = 2x100G</td>
</tr>
<tr>
<td></td>
<td>QSFP56-DD = 2x200G</td>
</tr>
<tr>
<td></td>
<td>QSFP112-DD = 2x400G</td>
</tr>
</tbody>
</table>

There are three optical connectors used in PowerEdge MX Ethernet networking: SFP, QSFP, QSFP-DD

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“SFP”</td>
<td>Small FormFactor Pluggable 1 Channel 2 Fibers or wires 1-1.5W Duplex LC optical connector MMF or SMF</td>
</tr>
<tr>
<td>“QSFP”</td>
<td>Quad Small FormFactor Pluggable 4 Channels 8 Fibers or wires 3.5W-5W MPO12 8 fiber parallel optical connector</td>
</tr>
<tr>
<td>“QSFP-DD”</td>
<td>Quad Small FormFactor Pluggable – Double Density 8 Channels 16 Fibers or wires 10W MPO12DD 16 fiber parallel optical connector</td>
</tr>
</tbody>
</table>

For more information, see the Optic and Cable FAQ: [https://www.dell.com/support/kbdoc/000134129/faq-optics-and-cables](https://www.dell.com/support/kbdoc/000134129/faq-optics-and-cables)
## Cables & Connectors

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Copper</th>
<th>Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment</td>
<td>Already installed in many locations and its use is less expensive to connect devices to a network. Copper solutions can get bulky when bunched together as they are thicker than fiber</td>
<td>Less bulky than copper solutions and easy to utilize breakout units (structured cabling) to deconstruct multi-lane runs into lower capacity endpoints (i.e. 100G -&gt; 4x25G)</td>
</tr>
<tr>
<td>Signal Loss</td>
<td>Copper cables can only transmit information over relatively short distances</td>
<td>Fiber optic cables experience less signal loss than copper cabling and can support long distances</td>
</tr>
<tr>
<td>Electro-Magnetic Interference (EMI)</td>
<td>Susceptible</td>
<td>Impervious</td>
</tr>
<tr>
<td>Security</td>
<td>Copper solutions are easier to tap</td>
<td>Fiber is more difficult to tap. Some Federal and large enterprises mandate Fiber as a result</td>
</tr>
<tr>
<td>Cost</td>
<td>RJ45 ($) → DAC ($)</td>
<td>AOC ($$$) → Transceiver + Fiber ($$$)</td>
</tr>
</tbody>
</table>

[Copyright 2022 Dell Inc]
Introduction to QSFP28-DD
Quad Small Form Factor Pluggable Double Density

• Current QSFP28 optical modules support 40 and 100 Gigabit Ethernet applications. They feature four electrical lane pairs that can operate at 10 or 25 Gbps.

• QSFP28-DD is designed with eight lanes that operate at up to 25 Gbps via NRZ modulation (up to 200 Gbps aggregate)

• QSFP56-DD is designed with eight lanes that operate at up to 50 Gbps via PAM4 modulation (up to 400Gbps aggregate)

• QSFP-DD is backward compatible with QSFP+ and QSFP28 connectors

• Slightly deeper than QSFP28 with a second row of contacts

• Breakouts
  - QSFP-DD ↔ 2 × QSFP28 (100G)
  - QSFP-DD ↔ 4 × QSFP28 (50G as 2 × 25G, half-populated)
  - QSFP-DD ↔ 8 × SFP28 (25G)
QSFP28-DD in Depth

- Q28DD-200G-2SR4 optics require the use of 16-strand MPO cables. They will not function with MPO-12 cables used with Q28-100G-SR4 optics.
  - These cables can be described “MPO-12 Two Row” or “MPO-12DD” cables.

- Dell stocks MPO-12DD cables in lengths of 1, 3, 5, and 7 Meters.

- Implementations where Q28DD-200G-2SR4 optics are to be used with cable lengths expected to exceed 7 meters, please use Corning MPO-12DD cables. These cables are sourced with the “MPO-12 Two row” or “MPO-12DD” form factor.

Note the difference in the MPO-12/MPO-12DD diagram below, this shows two rows of 4 strands of transmit on a Q28DD-200G-2SR4 optic (each row of 8 strands operates as its own QSFP28-100G-SR4 link).
QSFP28-DD Breakout Cables

DAC-Q28DD-8S28-25G

DAC-Q28DD-2Q28-100G

CBL-MPO12DD-2MPO12-OM4
Corning Edge8® Structured Cabling
EDGE8® Fiber Solutions from Corning

- Dell Networking has a wide variety of Ethernet switches with ports that can be broken out into multiple lower speed ports. For example:
  - QSFP+ 40GbE can be decomposed to 4x10GbE or 4x1GbE
  - QSFP28 100GbE can be decomposed to 4x25GbE
  - QSFP28-DD 2x100GbE ports can be decomposed to 2x100GbE, 2x40GbE, 4x50GbE, 8x25GbE or 8x10GbE

- Why Structured Cabling?
  - Control cable sprawl
  - Organize, label and orchestrate a clean footprint so IT staff can quickly and predictably discern the purpose of each fiber run

- Dell has partnered with Corning Structured Cabling Solutions to provide an easy to customize structured cabling solution
  - Standard Dell ProDeploy and ProDeploy+ services do not include installation for Corning Structured Cabling Solutions. Contact your account team for options for a custom installation contract if needed

- This solution provides rack housings from 1U to 4U allowing for multiple cassette types in each enclosure. The system has cassettes to do the following:
  - QSFP breakout to 4xLC (MPO12 to 4xLC)
  - QSFP to QSFP extension (MPO12 to MPO12)
  - QSFP-DD to 2xQSFP28 (MPO12-DD to 2xMPO12)
  - QSFP-DD to 8xLC (MPO12-DD to two 4xLC cartridges)
  - QSFP-DD to QSFP-DD extension (MPO12-DD to MPO12-DD)
EDGE8® HD Housings

- EDGE8® HD housings include
  - Mountings for standard 19” racks and cabinets
  - Sliding drawers, enabling module or panel installation from the front or rear of the housing.
  - Integrated cable routing elements to make real structured patch cord management possible while providing finger access without the need for tools or any other accessories.
  - Side-routing guides for patch cord integration to the cabinet which provide flexible installation options for back-to-back or flush-mounting requirements.
  - Quick-mount capability making it quick and easy for one person to install the housing with little effort.
  - Easy labeling with a full-size mounting area on the inside of the front door.
  - An easily installable trunk mounting plate providing flexibility depending on your design (e.g., back-to-back) or application (e.g., reduced depth) concept.
  - 1U, 2U, and 4U housing options.
EDGE8® Modules & Adapter Panels

• EDGE8® Modules
  – The EDGE8® modules have an MPO interface on one side and four LC interfaces on the other.
  – All EDGE8® modules can be installed without tools from the front or the rear of any EDGE8® housing.
  – LC duplex adapters feature hinged shutters that move up and out of the way when the connector is inserted. Specially designed indents in the shutters ensure that the end faces of the connectors are never touched.
  – In addition, the shutters are visual fault locator (VFL) compatible to allow easy port identification while diffusing the VFL light to ensure adequate eye safety.

• EDGE8® MPO Adapter Panels
  – EDGE8® MPO adapter panels are pass-through panels that provide a simple interface to mate MPO connectors.
  – EDGE8® MPO adapter panels are available with one, two, and four 8-fiber adapters for multimode and single-mode applications. All panels feature unique shuttered reversible adapters at the front of the panel for on-site changes to manage field polarity, and visual port identification while defusing the VFL light to ensure adequate eye safety.
EDGE8® Patch, Trunk, and Jumper Cables

• EDGE8® Trunks
  – EDGE8® MPO trunks are used between patch panel housings and are pre-terminated cables with 8-fiber MPO connectors on both ends. All trunks have strain-relief clips and allow for tool-less installation in EDGE8® housings. These trunks conform to TIA-568 Type-B or Type-A polarity, depending on product selection. In addition, the trunks are standard with a pulling grip for easy handling during installation in cable tray or through fire wall pass throughs.

• EDGE8® MPO Patch Cords
  – EDGE8® 8-fiber MPO patch cords are typically used within racks between the device and an EDGE8® Module or Adapter panel. The EDGE8® MPO patch cord uses MTP® PRO connectors, which allows for a simple one-step, color-coded polarity change feature without removing the connector housing. The connector also provides the capability for field-friendly pinning configuration changes with safe handling of pins and easy color identification while maintaining product integrity.

• Reverse Polarity Uniboot Duplex Jumpers
  – EDGE™ reverse polarity uniboot duplex jumpers allow for the quick and easy conversion from a TIA-568 A-B polarity to a TIA-568 A-A polarity without exposing the fibers or needing any tools. The jumper comes with A-B polarity that can be leveraged for all described applications. This uniboot design allows one cable to carry both fibers, reducing jumper bulk when routing.
Example 1: MX7116n FEM to MX9116n FSE
MPO12-DD to MPO12-DD across DC

<table>
<thead>
<tr>
<th>Item</th>
<th>OM4 Part Number (NAFTA)</th>
<th>OM4 Part Number (EMEA and APJ)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HA6E616QPH-L4xxxM</td>
<td>HA6E616QLZ-L4xxxM</td>
<td>EDGE 16 F Y-Jumper, MPO-12DD (unpinned) to two MPO-12 (unpinned) MTPs, 36-in breakout leg length, Type-B polarity, 3.1 mm cable, xxxM</td>
</tr>
<tr>
<td>2</td>
<td>GE5E516QPNDUxxxM</td>
<td>GE5E516QLZDDUxxxM</td>
<td>EDGE8® MTP Trunk, 16 F, MPO-12 (pinned) to MPO-12 (pinned), TIA-568 standard Type-B polarity, pulling grip on first end only, 7.0 mm cable, xxxM</td>
</tr>
<tr>
<td>3</td>
<td>EDGE8-CP32-V3</td>
<td>EDGE8-CP32-V3</td>
<td>EDGE8 4-Port MPO Connector Panel</td>
</tr>
</tbody>
</table>

Note: NAFTA uses plenum cable and EMEA/APJ uses LSZH cable.
Example 2: QSFP28-DD Uplink to 2x40GbE/100GbE
MPO12-DD to MPO12 across DC

<table>
<thead>
<tr>
<th>Item</th>
<th>OM4 Part Number (NAFTA)</th>
<th>OM4 Part Number (EMEA and APJ)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HA6E616QPH-L4xxxM</td>
<td>HA6E616QLZ-L4xxxM</td>
<td>EDGE 16 F Y-Jumper, MPO-12DD (unpinned) to two MPO-12 (unpinned) MTPs, 36-in breakout leg length, Type-B polarity, 3.1 mm cable, xxxM</td>
</tr>
<tr>
<td>2</td>
<td>GE5E516QPNDDUxxxM</td>
<td>GE5E516QLZDDUxxxM</td>
<td>EDGE8® MTP Trunk, 16 F, MPO-12 (pinned) to MPO-12 (pinned), TIA-568 standard Type-B polarity, pulling grip on first end only, 7.0 mm cable, xxxM</td>
</tr>
<tr>
<td>3</td>
<td>EDGE8-CP32-V3</td>
<td>EDGE8-CP32-V3</td>
<td>EDGE8 4-Port MPO Connector Panel</td>
</tr>
<tr>
<td>4</td>
<td>JE6E608QE8-NBxxxM</td>
<td>JE6E608QEZ-NBxxxM</td>
<td>8-Fiber MTP Jumper, MPO-12 (unpinned) to MPO-12 (unpinned), Type-B polarity, 2.0 mm cable, xxxM</td>
</tr>
</tbody>
</table>

Note: NAFTA uses plenum cable and EMEA/APJ uses LSZH cable.
Example 3: QSFP28-DD to 8x Rack Servers
MPO12-DD to 8xLC Duplex Across DC

<table>
<thead>
<tr>
<th>Item</th>
<th>OM4 Part Number (NAFTA)</th>
<th>OM4 Part Number (EMEA and APJ)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HA6E616QPH-L4xxxM</td>
<td>HA6E616QLZ-L4xxxM</td>
<td>EDGE 16 F Y-Jumper, MPO-12DD (unpinned) to two MPO-12 (unpinned) MTPs, 36-in breakout leg length, Type-B polarity, 3.1 mm cable, xxxM</td>
</tr>
<tr>
<td>2</td>
<td>EDGE8-CP32-V3</td>
<td>EDGE8-CP32-V3</td>
<td>EDGE8 4-Port MPO Connector Panel</td>
</tr>
<tr>
<td>3</td>
<td>GE5E616QPNDDPxxxM</td>
<td>GE5E616QLZDDPxxxM</td>
<td>EDGE8 MPO Trunk, 16 F, MPO-12 (pinned) to MPO-12 (unpinned), TIA-568 Standard Type-A polarity, pulling grip on first end only, 7.0 mm cable, xxxM</td>
</tr>
<tr>
<td>4</td>
<td>ECM8-UM08-05-E5Q-ULL</td>
<td>ECM8-UM08-05-E5Q-ULL</td>
<td>EDGE8 Module, LC duplex to MPO-12 (pinned), 8 F, universal polarity</td>
</tr>
<tr>
<td>5</td>
<td>797902QD120xxxM</td>
<td>E797902QNZ20xxxM</td>
<td>EDGE Uniboot Duplex LC Jumper, LC UPC uniboot to LC UPC uniboot, 2.0 mm cable, xxxM</td>
</tr>
</tbody>
</table>

Note: NAFTA uses plenum cable and EMEA/APJ uses LSZH cable.
Corning EDGE8® Resources

- Corning EDGE8® General Information: www.corning.com/dellemc
- Corning EDGE8 Solutions brief (LAN-2480-AEN): Link
- Corning Choosing the correct Bill-of-Material (LAN-2495 AEN): Link
- Corning: EDGE8-01U-SP Housing Quick Guide
- Corning: EDGE8-02U- Housing Quick Guide
- Corning: EDGE8-04U Housing Quick Guide
- Corning: EDGE8 Standard Recommended Procedure
- Corning: Solutions Intro video
Additional Resources
## Reference Papers

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Description</td>
<td>URL</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>SmartFabric OS10 Solutions Support Matrix</td>
<td>Provides information on all supported versions of platform components in each PowerEdge MX Release</td>
<td><a href="https://infohub.delltechnologies.com/l/networking-support-matrix-1/networking-solutions-support-matrix-1">https://infohub.delltechnologies.com/l/networking-support-matrix-1/networking-solutions-support-matrix-1</a></td>
</tr>
<tr>
<td>Dell Networking MX9116n Spec Sheet</td>
<td>Dell Networking MX9116n Spec Sheet</td>
<td><a href="https://www.dell.com/learn/product_docs/dellemcnetworkingmx9116nspecsheet.pdf">https://www.dell.com/learn/product_docs/dellemcnetworkingmx9116nspecsheet.pdf</a></td>
</tr>
<tr>
<td>MXG610s Support Page</td>
<td></td>
<td><a href="https://www.dell.com/support/home/product-support/product/networking-mxg610s">https://www.dell.com/support/home/product-support/product/networking-mxg610s</a></td>
</tr>
</tbody>
</table>
## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept 25, 2018</td>
<td>1.1</td>
<td>Initial Public Release</td>
</tr>
<tr>
<td>Sept 26, 2018</td>
<td>1.1.2</td>
<td>Corrected FC Gateway Topology, Fixed headers, updated cable images, corrected NPAR support for Intel NICs</td>
</tr>
<tr>
<td>October 25, 2018</td>
<td>1.2</td>
<td>Updated PTM image. Added additional cables &amp; optics to 25G PTM. Scalable Fabric design for Dual Fabrics. Clarified supported 40G optics, updated Mellanox NIC information, added Additional Resources section, information on connecting to Cisco switches, unsupported topologies for Scalable Fabric and SmartFabric services</td>
</tr>
<tr>
<td>January, 2019</td>
<td>1.3</td>
<td>Clarified items on the switch Quick Reference page, added IOM slot matrix, corrected SKU numbers, updated Dell EMC 4x32G FC optic to reflect support for 4x 8G FC, corrected description of MXG610s on QRG page, updated list of white papers</td>
</tr>
<tr>
<td>May, 2019</td>
<td>1.4</td>
<td>Clarified cables/optics for VLTi on MX5108, updated NPAR support on NIC QRG, corrected SKU numbers, updated resources and whitepaper links, updated MX7116n QRG, Updated Layout/Template</td>
</tr>
<tr>
<td>September, 2019</td>
<td>1.5</td>
<td>Updated multiple slides to add new cables/optics supported with OS10.5.0, Added Slide for MX7116n FEM as Pass-Through Module, Updated &amp; Added whitepaper links, Added information about Corning Edge8 Structured Cabling</td>
</tr>
<tr>
<td>March, 2020</td>
<td>1.6</td>
<td>Updated Brocade SKUs, Minor other corrections, updated broken links</td>
</tr>
<tr>
<td>June 2020</td>
<td>1.7</td>
<td>Clarified MXG610s QRG, Updated Edge8 ProDeploy policy, clarified number of NPAR partitions for Marvell NICs, updated max supported VLANs for switches, updated MX7116n breakout options for 10G Support</td>
</tr>
<tr>
<td>August 2020</td>
<td>1.8</td>
<td>Added content for Broadcom 57504 quad port NICs, Added content for new Scalable Fabric topologies, Added example topology for direct attached FC, corrected broken links, additional information on QSFP28-DD cables, minor updates and corrections</td>
</tr>
<tr>
<td>October 2020</td>
<td>1.9</td>
<td>Updated FC Mezz QRG, Adjusted to account for EOL of QSFP-64GFC-SW4</td>
</tr>
<tr>
<td>April 2021</td>
<td>1.10</td>
<td>Added cable configuration for QSFP to QSFP FC optic connection, updated multiple Scalable Fabric and example topology slides, added cable/speed compatibility slide, added C&amp;O FAQ and C&amp;O spec sheet link to resources section, Updated DD optic references to Q28DD-80G/200G-2SR4 Dual-Rate optic</td>
</tr>
<tr>
<td>December 2021</td>
<td>1.11</td>
<td>Added new MSA types, updated brocade license SKUs, updated switch P*V limits, Updated Topologies, minor updates and corrections</td>
</tr>
<tr>
<td>May 2022</td>
<td>1.12</td>
<td>Updated QSFP28-DD in Depth, Updated MXG610 SKUs</td>
</tr>
<tr>
<td>August 2022</td>
<td>1.13</td>
<td>Updated MXG610 Licensing and SKUs, Notes and Link for MX Chassis Management Module Cabling</td>
</tr>
<tr>
<td>April 2023</td>
<td>1.14</td>
<td>Updated content with 100GbE MX8116n and Z9432F-ON solution</td>
</tr>
</tbody>
</table>