Storage Networking I/O Guide

I/O Connectivity Options for Dell Storage

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Saleem Muhammad, Product Management
NEW Dell.com/TechCenter/StorageNetworking

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<td>10GE</td>
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<td>8Gbps FC</td>
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<td>Up to 48</td>
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<td>4 slots and 2 choices: 12 port 1/10GbE or 12 port 10GbE/8Gbps FC</td>
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<td>Redundant power supplies</td>
<td>2 hot-swappable</td>
<td>1, fixed</td>
<td>1+1 hot-swappable</td>
<td>2 hot-swappable</td>
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<td>F&gt;B/B&gt;F hot-swappable</td>
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<td>F&gt;B/B&gt;F</td>
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<td>Storage technologies</td>
<td>FC, FCoE, RoCE, iSCSI</td>
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<td>Port types</td>
<td>F, E, NPIV N</td>
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<td>FL, E, M, NPIV N</td>
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<td>Link aggregation</td>
<td>Session based distribution</td>
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<td>ISL trunking</td>
<td>ISL trunking</td>
<td>ISL trunking</td>
<td>ISL trunking</td>
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<td>Fabric services</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
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# Blade switches for Dell Modular server enclosure

## Quick Reference Guide

<table>
<thead>
<tr>
<th>Models</th>
<th>Dell MXL</th>
<th>IO Aggregator</th>
<th>FN2210S</th>
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<tr>
<td>Overview</td>
<td>Fully modular converged switch to unify LAN and SAN</td>
<td>Converge infrastructure and connect easily to 3rd party networks</td>
<td>Simplified converged infrastructure</td>
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## Performance

<table>
<thead>
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<th>Dell MXL</th>
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<td>Switching capacity</td>
<td>1.28Tbps</td>
<td>240Gbps</td>
<td></td>
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<tr>
<td>Latency (micro sec)</td>
<td>0.8µs</td>
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## Ports

<table>
<thead>
<tr>
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<th>Dell MXL</th>
<th>IO Aggregator</th>
<th>FN2210S</th>
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<tr>
<td>Internal blade server ports</td>
<td>32 (10GbE)</td>
<td>8</td>
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<tr>
<td>External 1/10GbE</td>
<td>8 or 24 (with breakout)</td>
<td>4</td>
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<tr>
<td>40GE</td>
<td>Up to 6</td>
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<tr>
<td>8Gbps FC</td>
<td>Up to 8</td>
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<td>16Gbps FC</td>
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## Storage technologies

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<td>FC, FCoE, RoCE, iSCSI</td>
<td>FC, FCoE, RoCE, iSCSI</td>
<td>FC, FCoE, RoCE, iSCSI</td>
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## Port types

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<td>NPIV N, F</td>
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## Domain/fabric

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<th>IO Aggregator</th>
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## Hops/fabric

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<th>IO Aggregator</th>
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## Link aggregation

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<td>Session based distribution</td>
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## Fabric services

<table>
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<th>IO Aggregator</th>
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<tr>
<td>Zoning, F_Port, NPIV</td>
<td>Zoning, F_Port, NPIV</td>
<td>Zoning, F_Port, NPIV</td>
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Blade switches for Dell modular enclosure

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<tr>
<td>Internal blade server ports</td>
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<td>External 1/10GbE</td>
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<td>40GE</td>
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<tr>
<td>8Gbps FC</td>
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<td>16</td>
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<td>16Gbps FC</td>
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<td>FC</td>
<td>FC</td>
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<td>ISL trunking</td>
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<td>Fabric services</td>
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<td>-</td>
<td>Zoning, FSPF, NPIV, RSCN, SNS, frame filtering</td>
</tr>
</tbody>
</table>

- **RoCE**: RDMA over Converged Ethernet
- **ISL Trunking**: Brocade proprietary technology for link aggregation
- **SNS**: Enabled automated discovery, management and configuration of FC devices.
- **NPIV: N_Port ID Virtualization**: A Fibre Channel facility allowing multiple N_Port IDs to share a single physical N_Port
- **RSCN**: Registered state change notification (RSCN) is a Fibre Channel fabric's notification sent to all specified nodes in case of any major fabric changes
- **Frame filtering**: Brocade technology is the foundation of Brocade advanced performance monitoring
- **FSPF**: Routing protocol used in Fibre Channel networks

Visit Dell Storage Networking – definition of terms page for additional information
### Top-of-rack/access and blade switches

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<td>Deep buffer switch to smooth out traffic spikes</td>
<td>Powerful and economical switches providing layer 2 connectivity</td>
<td>Power efficient and resilient with advanced layer 2/3 features</td>
<td>Flexible layer 2/3 switch with dual expansion slots</td>
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<td><strong>Performance</strong></td>
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<td>Switching capacity (Gbps)</td>
<td>260</td>
<td>176</td>
<td>172 (24P) / 220 (48P)</td>
<td>212 (24P) / 260 (48P)</td>
<td>212 (24P) / 260 (48P)</td>
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<td>24 / 48</td>
<td>24/48/2 combo N3024F</td>
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<td>2 combo / 24 N3024F</td>
<td>24 (S3124F)</td>
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<td>10GbE (SFP+)</td>
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<td>1 slots and 2 choices: 2 port 10GbE SFP+ 2 port 10GBASE-T</td>
<td>1 slots and 2 choices: 2 port 10GbE SFP+ 2 port 10GBASE-T</td>
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<td>Redundant power supplies</td>
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<td><strong>Features</strong></td>
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<tr>
<td>Storage technologies</td>
<td>iSCSI aware (detect and prioritize iSCSI traffic into pre-defined QoS); iSCSI Auto-Configuration (switch configuration routine for automated setup and optimal performance with Dell EqualLogic or Compellent arrays)</td>
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<td>Stacking</td>
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## 1/10GbE ToR/access

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<th>M6220</th>
<th>M6348</th>
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<tbody>
<tr>
<td><strong>Overview</strong></td>
<td>Flexible layer 2/3 switch with dual expansion slots</td>
<td>Leverage existing Ethernet cabling to enable broader scalability in the data center</td>
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### Performance

<table>
<thead>
<tr>
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<th>M6220</th>
<th>M6348</th>
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<tbody>
<tr>
<td><strong>Switching capacity (Gbps)</strong></td>
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<td><strong>Latency (micro sec)</strong></td>
<td>6.3µs</td>
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<td><strong>Buffer size</strong></td>
<td>768KB</td>
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### Ports

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<tbody>
<tr>
<td><strong>10/100/1000BASE-T</strong></td>
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<td>16</td>
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<td><strong>1GbE (SFP) / 1GbE internal</strong></td>
<td>16 Internal</td>
<td>32 internal</td>
</tr>
<tr>
<td><strong>10GbE (SFP+)</strong></td>
<td>-</td>
<td>2 SFP+ and 2 CX4</td>
</tr>
<tr>
<td><strong>Expansion modules</strong></td>
<td>2 slots and 4 choices: 2 port 1/10GbE SFP+ 2 port 10GBASE-T 2 port CX4 1/10GbE 48Gbps Stacking module</td>
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### Power and cooling

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<tr>
<td><strong>Power options</strong></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Redundant power supplies</strong></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Air flow</strong></td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Features

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage technologies</strong></td>
<td>iSCSI aware (detect and prioritize iSCSI traffic into pre-defined QoS); iSCSI Auto-Configuration (switch configuration routine for automated setup and optimal performance with Dell EqualLogic or Compellent arrays)</td>
<td></td>
</tr>
<tr>
<td><strong>Stacking</strong></td>
<td>Up to 6</td>
<td>Up to 12</td>
</tr>
<tr>
<td><strong>Jumbo frames</strong></td>
<td>9,216</td>
<td>9,216</td>
</tr>
<tr>
<td><strong>Max MAC entries</strong></td>
<td>16K</td>
<td>16K</td>
</tr>
<tr>
<td><strong>VLT / MLAG</strong></td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
</tbody>
</table>
## Top-of-rack/access and blade switches

### Models

<table>
<thead>
<tr>
<th>Models</th>
<th>S4048-ON</th>
<th>S4820T</th>
<th>S5000</th>
<th>N4000</th>
<th>S6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>High-performance switches designed to deliver non-blocking throughput for dense traffic environments</td>
<td></td>
<td></td>
<td>Power-efficient, flexible, and cost effective</td>
<td>Maximum density for large scale environments</td>
</tr>
</tbody>
</table>

### Performance

<table>
<thead>
<tr>
<th>Switching capacity</th>
<th>1.44Tbps</th>
<th>1.28Tbps</th>
<th>640Gbps (24P) / 1.28Tbps (48P)</th>
<th>2.56Tbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency (micro sec)</td>
<td>0.6µs</td>
<td>3.3µs</td>
<td>0.8µs</td>
<td>0.6µs</td>
</tr>
<tr>
<td>Buffer size</td>
<td>12MB</td>
<td>9MB</td>
<td>9MB</td>
<td>12MB</td>
</tr>
</tbody>
</table>

### Ports

<table>
<thead>
<tr>
<th>1/10GE</th>
<th>48 SFP+</th>
<th>48 10GBASE-T</th>
<th>Up to 48 SFP+</th>
<th>48 SFP / 48 10GBASE-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>40GE</td>
<td>6³</td>
<td>4³</td>
<td>4³</td>
<td>3²</td>
</tr>
<tr>
<td>Expansion modules</td>
<td>-</td>
<td>-</td>
<td>4 slots and 2 choices: 12 port 1/10GbE or 2/4/8GbPs FC</td>
<td>1 slots and 3 choices: 4 port 10GbE SFP+ module or 2 port 40GbE QSFP+ module</td>
</tr>
</tbody>
</table>

### Power and cooling

<table>
<thead>
<tr>
<th>Power options</th>
<th>AC</th>
<th>AC or DC</th>
<th>AC or DC</th>
<th>AC</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundant power supplies</td>
<td>2 hot-swappable</td>
<td>2 hot-swappable</td>
<td>2 hot-swappable</td>
<td>2 hot-swappable</td>
<td>2 hot-swappable</td>
</tr>
<tr>
<td>Air flow²</td>
<td>F&gt;B/B&gt;F hot-swappable</td>
<td>F&gt;B/B&gt;F hot-swappable</td>
<td>F&gt;B/B&gt;F hot-swappable</td>
<td>F&gt;B hot-swappable</td>
<td>F&gt;B/B&gt;F hot-swappable</td>
</tr>
</tbody>
</table>

### Features

<table>
<thead>
<tr>
<th>Storage technologies</th>
<th>iSCSI aware (detect and prioritize iSCSI traffic into pre-defined QoS); iSCSI Auto-Configuration (switch configuration routine for automated setup and optimal performance with Dell EqualLogic or Compellent arrays)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCB</td>
<td>Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN. Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN. Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN. Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN.</td>
</tr>
<tr>
<td>DCBX (iSCSI TLV)</td>
<td>Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN. Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN. Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN. Supported (802.1Qbb and 802.1Qaz) for DCB to prioritize frames with high priority over those at lower priority levels. DCB also allows for the aggregation of multiple VLANs into a single 802.1Qbb or 802.1Qaz VLAN.</td>
</tr>
<tr>
<td>Stacking</td>
<td>Up to 6</td>
</tr>
<tr>
<td>VLT/MLAG</td>
<td>Supported</td>
</tr>
<tr>
<td>Jumbo frames</td>
<td>12K</td>
</tr>
</tbody>
</table>
## Quick Reference Guide

### 10/40GbE

**LAN/SAN converged or non-converged**

<table>
<thead>
<tr>
<th>Models</th>
<th>MXL</th>
<th>IO Aggregator</th>
<th>FN410S/FN410T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overview</strong></td>
<td>Fully modular converged switch to unify LAN and SAN</td>
<td>Converge infrastructure and connect easily to 3rd party networks</td>
<td>No fuss installation to converge LAN and SAN</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching capacity</td>
<td>1.28Tbps</td>
<td>-</td>
<td>240Gbps</td>
</tr>
<tr>
<td>Latency (micro sec)</td>
<td>0.68µs</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Buffer size</td>
<td>9MB</td>
<td>4MB</td>
<td>-</td>
</tr>
<tr>
<td><strong>Ports</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10GE</td>
<td>32 internal</td>
<td>8 internal, 4 external</td>
<td>-</td>
</tr>
<tr>
<td>40GE</td>
<td>23</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Expansion modules</td>
<td>2 slots and 3 choices:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 4 port 1/10GbE (RJ-45), maximum of one per switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 4 port 1/10GbE (SFP+)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 2 port 40GbE (QSFP+)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 4 port 2/4/8Gbps FC (SFP+)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• FN410S: 2 port 1/10GbE (SFP+)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• FN410T: 2 port 1/10GbE (RJ-45)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power and cooling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power options</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Redundant power supplies</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Air flow</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Features</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage technologies</td>
<td>SCSI aware (detect and prioritize iSCSI traffic into pre-defined QoS); iSCSI Auto-Configuration (switch configuration routine for automated setup and optimal performance with Dell EqualLogic or Compellent arrays)</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>DCB</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>DCBX (iSCSI TLV)</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Stacking</td>
<td>Up to 6</td>
<td>Up to 2 (via cli only)</td>
<td>Up to 6</td>
</tr>
<tr>
<td>VLT/MLAG</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Jumbo frames</td>
<td>12K</td>
<td>12K</td>
<td>-</td>
</tr>
</tbody>
</table>

### Notes

1. Varies depending upon the switch model. Check Dell sales representative for specifics.
2. F>B air flow represents I/O side to utility side airflow. B>F air flow represents utility side to I/O side airflow.
3. 40GbE QSFP+ ports can also be used as 10GbE ports using 40GbE to 4x10GbE breakout cables.
Storage networking products

LAN/SAN converged (FC/FCoE)
- FN2210S
- MXL
- PowerEdge M I/O Aggregator
- S5000

1Gb iSCSI & NAS
- M6348
- M6220
- S3048-ON
- S3100
- N2000
- N3000
- S60

10Gb iSCSI & NAS
- FN410S/FN410T
- MXL
- PowerEdge M I/O Aggregator
- S4048-ON
- N4000
- S4048-ON
- S4820T
- S5000
- S6000

Fibre Channel
- Brocade M6505
- Brocade M5424
- 8Gb FC Pass-Through
- Brocade 300
- Brocade 6505
- Brocade 6510
- Brocade 6520
- Brocade 8510
Storage Networking Portfolio Positioning

**FC and FCoE**

### Fabric switch

- **16Gb 6505**
- **8Gb 300**
- **16Gb 6510**
- **16Gb 6520**
- **16Gb 8510-4, 8510-8**

### Blade switch

- **8/4Gb FC Pass-through**
- **8Gb M5424**
- **10GbE & 2/4/8Gb IOA (converged)**
- **10GbE & 2/4/8Gb FN2210S (converged)**
- **10GbE & 2/4/8Gb MXL (converged)**

---

**Scalability & Capability**

- **Entry-level**
- **Mid-market**
- **Enterprise**
Storage Networking Portfolio Positioning

iSCSI and NAS

---

<table>
<thead>
<tr>
<th>Blade switch</th>
<th>Top-of-rack/fabric switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1GbE M6348</td>
<td>1GbE N2000</td>
</tr>
<tr>
<td>1GbE N2000</td>
<td>1GbE S3048-ON/N3048/S3100</td>
</tr>
<tr>
<td>1GbE N3024</td>
<td>1GbE N4064 (converged)</td>
</tr>
<tr>
<td>1GbE SS5</td>
<td>1GbE N4032 (converged)</td>
</tr>
<tr>
<td>1GbE M6220</td>
<td>1GbE M6348</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>10GbE FN410T (converged)</td>
<td>10/40GbE S6000 (converged)</td>
</tr>
<tr>
<td>10GbE FN410S (converged)</td>
<td>10/40GbE S5000 (converged)</td>
</tr>
<tr>
<td>10GbE MXL (converged)</td>
<td></td>
</tr>
</tbody>
</table>

---

Dell Storage Networking I/O Guide

13
LAN/SAN Converged (FC/FCoE*)

10/40Gb Switch S5000
10/40Gb Switch MXL
10Gb Plug & Play M-IoA
10Gb Switch FN2210S

* LAN/SAN convergence with iSCSI is supported on all 10GbE and 40GbE iSCSI qualified Dell switches listed in this document.
MXL – 10/40GbE blade

• Industry leading 56 port design:
  – 32x 10Gb internal server ports
  – Up to 6 external 40Gb ports
  – Up to 24 external 10Gb ports (6 QSFP+ ports with breakout cables)
• Two FlexIO bays enable choice (Modules can be different)
  – 2-port 40GbE QSFP+ module (can convert to 8-port 10GbE SFP+ using
    breakout cables)
  – 4-port 10GbE SFP+ module
  – 4-port 10GBASE-T module (If running Base-T module then second IO slot
    must be of different type due to power constraints)
  – 4-port FC module
• Stack up to 6 devices
• VLT
• PVST+ protocol for easy integration into Cisco environments
• Converged
  • Supports DCB (protocols PFC, ETC and DCBx)
  • Converged iSCSI with EqualLogic (supports iSCSI TLV)
  • Two FCoE Options
    • Native Fibre Channel uplinks with FC FlexIO module (FCoE on internal
      ports to the servers)
    • FCoE transit to top of rack switch with IOM acting as a FIP Snooping
      Bridge
• Industry standard CLI
• Enterprise class OS (FTOS)
MXL - 10/40GbE blade

Adapters

### 1G
- Broadcom 57712-k
- Brocade BR1741M-k
- Intel X520-xx/k
- QLogic QME8242-k

### 12G
- Brocade BR1741M-k
- Emulex OCM1402-U12-D
- Emulex OCM1402-U3-D
- Intel X710-k
- Mellanox CX4 DP 10GbE
- QLogic S7810S-k
- QLogic S7840S-k
- QLogic QME8262-k

### 13G
- Emulex OCM1402-U4-D
- Emulex OCM1402-U5-D
- Intel X710-k
- Mellanox CX4 DP 10GbE
- QLogic S7810S-k
- QLogic S7840S-k

Supports connectivity to 10Gb-KR adapters, all of which are notated with "-k." It does not provide connectivity to legacy 10Gb-XAUI NICs/CNAs.

If connected to 1Gb Ethernet Mezzanine cards or LOMs, device will auto-negotiate individual internal ports to 1Gb.

More details in Adapter Portfolio section

Designed for I/O bays

- A1/A2
- B1/B2
- C1/C2

FlexIO modules do not have to be the same

- 4 port SFP+ Module
- 4 port 10GBASE-T Module
- Limited to only one 10GBASE-T module. The other module bay can be populated
- 2 port QSFP+ Module

Two Integrated QSFP+ ports
- Ports are defaulted to stacking mode but mode can be changed

Secondary Management Serial Port
- (Cable included)
- USB Port

Optical Transceivers
- SFP+ 10Gb: SR, LR
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available)
- Can operate at 10Gb and 1Gb

RJ45 / Cat6a Copper
- 10Gb/1Gb
- (supports auto-negotiation)

Optical Transceivers
- SFP+ 8Gbps (will connect at 4/2 Gbps)
- SW 150m, LW 4km

QSFP+ to 4xSFP+ Breakout Cables
- 5m Passive Copper
- 40GBASE-CR4 10Gb

QSFP+ to QSFP+ Direct Attach
- 1m, and 5m, Passive Copper
- 40GBASE-CR4 40Gb

Optical Transceivers
- SFP+ 40Gb: SR only

QSFP+ to QSFP+ Fiber Cables

QSFP+ to 4xSFP+ Fiber Breakout Cables
PowerEdge M I/O Aggregator
Plug & Play

• Easy Deployment
  – Simplified layer 2 connectivity (no spanning tree)
  – Faster Deployment: All VLANs on all ports with the option to set VLANs
  – No touch DCB and no touch FCoE
    › DCB and FCoE settings detected from top of rack switch through DCBx protocol

• Simple GUI Integrated into Chassis Management Controller (CMC)
  (Note: CMC GUI will not function if the IOA is stacked. IOA must be managed through CLI when stacked. Maximum stacking capability is 2)

• High Port Count:
  – 32x 10GbE internal server ports
  – Up to 16 external 10GbE ports (4 QSFP+ ports with breakout cables)

• Two FlexIO bays enable choice
  – 2-port 40GbE QSFP+ module (converts to 8-port 10GbE SFP+ using breakout cables)
  – 4-port 10GbE SFP+ module
  – 4-port 10GBASE-T module
    (If running Base-T module then second IO slot must be of different type due to power constraints)
  – 4-port FC module

• Converged
  • Supports DCB (protocols PFC, ETC and DCBx)
  • Converged iSCSI with EqualLogic and Compellent
  • Two FCoE Options
    • Native Fibre Channel uplinks with FC FlexIO module (FCoE on internal ports to the servers)
    • FCoE transit to top of rack switch with IOM acting as a FIP Snooping Bridge

• Industry standard CLI. Standard troubleshooting commands via CLI
• VLT up to 2 devices
PowerEdge M I/O Aggregator

Adapters

11G
- Broadcom S7712-k
- Brocade BR1741M-k
- Intel X520-x/k
- QLogic QME8242-k

12G
- Brocade BR1741M-k
- Emulex OCm1402-U2-D
- Emulex OCm1402-U3-D
- Intel X710-k
- QLogic S7810S-k
- QLogic S7840S-k
- QLogic QME8262-k

13G
- Emulex OCm1402-U4-D
- Emulex OCm1402-U5-D
- Intel X710-k
- Mellanox CX-4 DP 10GbE
- QLogic S7810S-k
- QLogic S7840S-k

Supports connectivity to 10Gb-KR adapters, all of which are notated with "-k." It does not provide connectivity to legacy 10Gb-XAUI NICs/CNAs.
If connected to 1Gb Ethernet Mezzanine cards or LOMs, device will auto-negotiate individual internal ports to 1Gb.

More details in Adapter Portfolio section

Optical Transceivers
SFP+ 10Gb: SR, LR
SFP 1GbE: SX, LX

SFP to RJ45 converter
1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
(0.5m, 1m, 2m, 3m, 5m, 7m available)
Can operate at 10Gb and 1Gb

RJ45 / Cat6a Copper
10Gb/1Gb
(supports auto-negotiation)

Optical Transceivers
SFP+ 8Gbps (will connect at 4/2 Gbps)
SW 150m, LW 4km

QSFP+ to 4xSFP+ Breakout Cables
5m Passive Copper
40GBASE-CR4 10Gb

QSFP+ to QSFP+ Direct Attach
1m, and 5m. Passive Copper
40GBASE-CR4 40Gb

Optical Transceivers
SFP+ 40Gb: SR only

QSFP+ to QSFP+ Fiber Cables

QSFP+ to 4xSFP+ Fiber Breakout Cables
PowerEdge FN I/O Module

Enable LAN/SAN Convergence
- Full DCB, FCoE, and iSCSI optimization, enabling converged data and storage traffic.
- Use NPG mode to connect to Fibre Channel SAN switch or direct connect mode to directly connect to Fibre Channel arrays.

Simplify Network Deployment
- Simplifying cabling complexity through server port aggregation as much as 8:1.
- The unique plug-and-play networking switch gives the server admin access layer ownership.
- Dell Blade IO Manager GUI interface simplifies management for both standalone and full switch modes.

Optimize FX2 Performance
- High performance 10GbE throughput.
- Optimized “East-West” traffic within the FX2 enclosure, ensuring superior performance.
- OpenFlow 1.3 in full-switch mode for SDN applications.

Features
- 2 IOMs per FX2.
- 3 SKU options:
  - 4 x 10GbE SFP+
  - 4 x 10GbE Base-T
  - 2 x 10GbE SFP+ and 2 x 2/4/8G Fiber Channel Combo
- All SKUs have 8 x 10GbE internal ports.
- Virtual Link Trunking (VLT).
- Automatic/Zero-touch mode supports I/O aggregation.
- DCB/FCoE Snooping Bridge (FSB).
- NPIV Proxy Gateway (NPG).
- F_port capability to directly connect to Fiber Channel array.
- iSCSI TLV.
- Embedded Dell Blade IO Manager.

Four 10GBASE-T ports
Four 10GbE SFP+ ports
2 10GbE SFP+ ports
2 8Gbps FC ports
FN2210S - 10GbE + 8Gb FC Module

Adapters

13G
- Emulex OCm1402-U4-D
- Emulex OCm1402-U5-D
- Intel X710-k
- Qlogic 57810S-k
- Qlogic 57840S-k

Optical Transceivers
SFP+ 10Gb: SR, LR
SFP 1GbE: SX, LX

SFP to RJ45 converter
1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
(0.5m, 1m, 2m, 3m, 5m, 7m available)
Can operate at 10Gb and 1Gb

Optical Transceivers
SFP+ 8Gbps (will connect at 4/2 Gbps)
SW 150m, LW 4km

More details in Adapter Portfolio section

Secondary Management Serial Port (Cable included)

USB Port

2 port 10GbE SFP+

2 port 8/4/2Gb FC SFP+
FN410S/FN410T - 10GbE Module

Adapters

13G
- Emulex OCm1402-U4-D
- Emulex OCm1402-U5-D
- Intel X710-k
- Qlogic 57810S-k
- Qlogic 57840S-k

More details in Adapter Portfolio section

4 port 10GbE SFP+

USB Port

Secondary Management Serial Port (Cable included)

RJ45 / Cat6a Copper
10Gb/1Gb (supports auto-negotiation)

4 port 10BASE-T

Optical Transceivers
- SFP+ 10Gb: SR, LR
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available)
- Can operate at 10Gb and 1Gb

Converged

More details in Adapter Portfolio section
Dell Networking S5000 unified switch

Dell’s first fully modular 1RU top-of-rack and fabric switch

- **Pay-as-you-grow**, customizable modular unified switch
  - Up to 64 ports 10GbE; 4x40GbE
  - 2, 4, 8G Fibre Channel

- **Future-ready**, multi-stage design for next-gen I/O without rip & replace

- **Unified storage networking**, with complete support for iSCSI, RoCE, and FCoE with FC fabric services

- **Reduced management complexity**, Integrated automation, scripting and software programmability

- **Easy integration**, strong interoperability with major adapter, switch, & storage solutions
**S5000 - 10/40GbE Top-of-Rack**

### Adapters & storage
- Broadcom 57810S-k 2P NDC
- Broadcom 57840S-k 4P 10G NDC
- Broadcom 57840S 4P SFP+ 10G
- Broadcom 57800S 2P SFP+ 2P BT NDC
- Broadcom 57810S 2P SFP+ NIC
- QLogic QMD8262-k KR NDC
- QLogic QME8262-k KR Mezz
- QLogic QLE8262 SFP+ NIC
- QLogic QLE8242 SFP+ NIC
- QLogic QLE8362
- QLogic 2460/2462 4Gb HBA
- QLogic 2560/2562 8Gb HBA
- QLogic 2660/2662 16Gb HBA
- Brocade BR1020 SFP+ NIC
- Brocade BR1741M-k Mezz
- Intel X520-k 2P NDC
- Intel X520 2+2 SFP+ NDC
- Intel X520-k 2P Mezz
- Intel X520 2P SFP+ NIC
- Intel X540-T2
- Emulex OCe 14102
- Emulex OCM 14104
- Emulex LPe12000/12002 8Gb HBA
- Emulex LPe16000/16002 16Gb HBA
- Mellanox ConnectX-3 SFP+ 10G
- Mellanox ConnectX-3 QSF+ 40G
- Compellent SC8000 (iSCSI, FC)
- Compellent SC4020 (FC)
- EqualLogic PS (iSCSI)
- PowerVault MD (FC)
- EqualLogic FS8600 (iSCSI, FC)
- EqualLogic FS7610 (iSCSI)
- FluidCache for SAN

### More details in Product Sourcebook

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### Optical Transceivers
- **SFP+ 10Gb**: SR, LR, ER, LRM
- **SFP 1GbE**: SX, LX

### SFP to RJ45 converter
- 1000Base-T (only capable of 1Gbps)

### SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 3m, 5m, 7m available)
  - Can operate at 10Gb and 1Gb

### Optical Transceivers 8Gbps FC
- SW 150m, LW 4km

### QSFP+ to 4xSFP+ Breakout Cables
- 5m Passive Copper
- 40GBASE-CR4 10Gb

### QSFP+ to QSFP+ Direct Attach
- 1m, 5m Passive Copper
- 10m, 50m Active Fiber

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### I/O Panel
- 12-port SFP+ Module
  - Up to four modules.

### 12-port RJ-45 Module
- Up to four modules.

### 12-port Unified Port Module
- Limited to only one module in a switch.

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### Management Port (RJ-45 connector)
- (RJ-45 connector)

### Utility Panel
- Serial Port (RJ-45 connector)
- USB Type-A Port
- USB Type-B Port

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### I/O to Utility, Utility to I/O air-flow

### Two redundant fan modules

### Two redundant power supplies (AC, AC-R, DC)
1Gb Ethernet
iSCSI & NAS

1/10Gb High-density Dell N3000
1/10Gb High-density Dell S3048-ON
1/10Gb High-density Dell S60

1/10Gb High-density Dell N2000

1/10Gb High-density Dell S3100

1/10Gb High-density M6348

1/10Gb Basic M6220
M6348

High-density 1GbE copper with 10GbE uplinks

• Managed Layer 2/3 Gigabit Ethernet switch for M1000e blade enclosure

• Industry leading port availability
  • 32 internal (server) GbE ports; offering support of up to two ports per blade mezz card or Select Network Adapter (i.e. with quad-port 1GbE NICs)
  • 16 external fixed 10/100/1000Mb Ethernet RJ-45 ports
  • Up to four 10Gb uplink ports
    • 2x 10Gb Optical SFP+ (SR/LR) and/or SFP+ DAC
    • 2x 10Gb Copper CX4 or 32Gb stacking for M6348
  • Management console port

• Supports Dell Simple Switch Mode

• Stackable with rack-mount PowerConnect 7000 Series

• For optimized use (full internal-port utilization), pair with: Quad-port GbE mezz cards or Quad-port Fabric A adapters
Works with all 1Gb Mezzanine cards and LOMs. Optimal use is with quad-port 1Gb adapters.

Functions with all 10Gb Mezzanine cards and Select Network Adapters with the exception of the: Qlogic 8242-k, 8262-k, and Brocade BR1741M-k.

Dual port Mezzanine cards or LOMs/ Select Network Adapters will function and are fully supported with this IO module.

In such configurations, only half of the switch’s internal ports will be used since the dual port Mezzanine card only has one port out to each IO module.

More details in Adapter Portfolio section

Designed for I/O bays

- A¹/A²
- B¹/B²
- C¹/C²

10Gb Optical Transceivers
SR, LR, LRM

SFP+ Direct Attach Cable (Twinax)
(0.5m, 1m, 3m, 5m, 7m available)

CX4 Cables
for 10Gb uplinks or 32Gb M6348 stacking
(with other M6348 or rack-mount PC 7000 series switches)
(1m or 3m available)

Secondary Management Serial Port
(Cable included)
**M6220**

**Basic 1GbE copper with FlexIO & 10GbE uplinks**

- Gigabit Ethernet Layer 2/3 Switch
- Optional 10Gb uplinks & resilient stacking
- IPv6 support
- 24 port switch
  - 16 internal ports corresponding to 16 blade servers (1Gbps)
  - 4 external fixed RJ-45 connections (10/100/1000Mbps)
  - 2 FlexIO bays for:
    - 4 external 10Gbps uplink ports
    - or
    - 2 external 10Gbps uplink ports and 2 external stacking ports
- Same software image features as PowerConnect 6224/6248 switches
  - Routing protocols
  - Multicast routing protocols
  - Advanced QoS
  - Advanced Security
  - IPv6
- Supports Dell Simple Switch Mode

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4 x fixed 10/100/1000Mb (RJ-45)

2 FlexIO Bays for:

- 48Gb Stacking Module
- 2 x 10Gb Optical SFP+ Uplinks
- 2 x 10GBASE-T Copper Uplinks
- 2 x 10Gb Copper CX-4 Uplinks
M6220

Basic 1GbE copper with FlexIO & 10GbE uplinks

- Gigabit Ethernet Layer 2/3 Switch
- Optional 10Gb uplinks & resilient stacking
- IPv6 support
- 24 port switch
  - 16 internal ports corresponding to 16 blade servers (1Gbps)
  - 4 external fixed RJ-45 connections (10/100/1000Mbps)
  - 2 FlexIO bays for:
    - 4 external 10Gbps uplink ports
    - or
    - 2 external 10Gbps uplink ports and 2 external stacking ports
- Same software image features as PowerConnect 6224/6248 switches
  - Routing protocols
  - Multicast routing protocols
  - Advanced QoS
  - Advanced Security
  - IPv6
- Supports Dell Simple Switch Mode

4 x fixed 10/100/1000Mb (RJ-45)

2 FlexIO Bays for:
- 48Gb Stacking Module
- 2 x 10Gb Optical SFP+ Uplinks
- 2 x 10GBASE-T Copper Uplinks
- 2 x 10Gb Copper CX-4 Uplinks
Dell Networking N2000 Series
1 Gigabit Ethernet with Layer 2+ capabilities

Key features and innovations

• Up to 220 Gbps switch fabric capacity.
• Supports up to 48 line-rate 1GbE ports per switch and up to 600 1GbE ports in a twelve-unit stack
• Standard N-Series stacking cables and built-in ports for cost-effective high-performance stacking at up to 84 Gbps
• Up to 4,094 VLANs supported
• USB Rapid deployment expedites switch configuration
• Energy Efficient Ethernet (EEE) and lower power PHYs reduce power to inactive ports and idle links
• Fresh Air® compliant for high operating temperature environments

Energy efficient and cost effective

A powerful and economical 1 Gigabit Ethernet switching solution (with 10GbE uplink ports) for efficient Layer 2+ access for end user devices, entry-level servers, and network devices.
N2000 - 1GbE Top-of-Rack Switch
N2024 & N2048

Adapters & storage

- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

Integrated 1GbE Ports
10/100/1000MBASE-T ports: up to 24 (N2024) and up to 48 (N2048) – Cat5 cables

Optical Transceivers
SFP+ 10Gb: SR, LR, LRM, ER
SFP 1GbE: SX, LX

SFP to RJ45 converter
1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
(0.5m, 1m, 2m, 3m, 5m, 7m available)
Can operate at 10Gb and 1Gb

I/O Panel

2 integrated 10GbE SFP+ Ports

Utility Panel

2 integrated 21Gb Stacking Ports
- Cables 0.5m, 1m, 3m

Integrated fans
(I/O to Utility)

One external power supply for redundancy
- Model RPS720 supported on non-POE models
- One RPS720 supports up to three switches

Serial Port (RJ-45 connector)

More details in Product Sourcebook

Optical Transceivers
- SFP+ 10Gb: SR, LR, LRM, ER
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available)
  - Can operate at 10Gb and 1Gb
Dell Networking N3000 Series

1 Gigabit Ethernet with advanced Layer 3 capabilities

Key features and innovations

• Up to 260 Gbps switch fabric capacity
• Supports up to 48 line-rate 1GbE ports per switch and up to 624 1GbE ports in a twelve-unit stack
• Hot swap expansion module supporting dual SFP+ and dual 10GBaseT
• Standard N-Series stacking cables and built-in ports for cost-effective high-performance stacking at up to 84 Gbps.
• Advanced Layer 3 functionality included
• Dual 80PLUS-certified hot swappable power supplies, Energy Efficient Ethernet & lower power PHYs reduce power to inactive ports and idle links
• Tool-less ReadyRails™ significantly reduce rack installation time

Power efficient density for small-scale data center deployments

A power efficient and resilient 1 Gigabit Ethernet switching solution (with 10GbE for uplink ports) for small-scale data center. Dual hot-swappable 80Plus-certified power supplies add resiliency and the capacity to provide up to 48 ports in a 1RU footprint.
N3000 - 1GbE Top-of-Rack Switch
N3024 and N3024f

Adapters & storage
- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

More details in Product Sourcebook

Optical Transceivers
- SFP 1Gb: SX, LX, ZX, BASE-T
- SFP 100Mb: FX

24 integrated 1GbE Ports
- 1GbE SFP ports: up to 24 (N3024f)

24 integrated 1GbE Ports
- 10/100/1000MBASE-T ports: up to 24 – Cat5 cables

I/O Panel

Management Port
- (RJ-45 connector)

Serial Port
- (RJ-45 connector)

Utility Panel

Two redundant fans (I/O to Utility)
- Cat6a Cables

2 port SFP+ Module
- Optics: SR, LR, ER, LRM
- SFP+ to SFP+ Cables: 0.5m, 1m, 3m, 5m, 7m

2 port 10GBASE-T Module
- Cat6a Cables

Two redundant 21Gb Stacking Ports
- Cables 0.5m, 1m, 3m

Optical Transceivers
- SFP+ 10Gb: SR, LR, LRM, ER
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gb)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available), Can operate at 10Gb & 1Gb

Two redundant power supplies
- (AC)
N3000 - 1GbE Top-of-Rack Switch
N3048 only

Adapters & storage

- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

More details in Product Sourcebook

Optical Transceivers
- SFP 1Gb: SX, LX, ZX, BASE-T
- SFP 100Mb: FX

48 integrated 1GbE Ports
- 10/100/1000MBASE-T ports: up to 48 – Cat5 cables

I/O Panel
- 2 integrated 1GbE Combo Ports
  - N3048: 2x 1GbE SFP ports (shared with ports 47-48)
- Management Port (RJ-45 connector)
- Serial Port (RJ-45 connector)
- USB Type-A Port

Utility Panel
- 2 integrated 10GbE SFP+ Fiber Ports
- 2 port SFP+ Module
  - Optics: SR, LR, ER, LRM
  - SFP+ to SFP+ Cables: 0.5m, 1m, 3m, 5m, 7m
- 2 port 10GBASE-T Module
  - Cat6a Cables
- Two redundant fans (I/O to Utility)
- Two redundant 21Gb Stacking Ports
  - Cables 0.5m, 1m, 3m
- Two redundant power supplies (AC)

Optical Transceivers
- SFP+ 10Gb: SR, LR, LRM, ER
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gb)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available), Can operate at 10Gb & 1Gb

SFP+ to RJ45 converter
- 1000Base-T (only capable of 1Gb)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available), Can operate at 10Gb & 1Gb
Dell Networking S3048-ON Series
Next-generation switch for software defined data center

- Dell’s **latest generation** S-Series ultra-efficient 1/10GbE Top-of-Rack (ToR) switch
  - 48x1GBase-T & 4x10G-SFP ports
  - Built with the latest-generation merchant silicon for superior efficiency & performance
- Purpose-built for applications in high-performance data center and computing environments
  - Web/cloud service providers with Linux & OpenSource-heavy environments
  - Complete OS9 feature set including VLT, OpenFlow, Open Automation, Cloud Stack Integration (OpenStack/Microsoft/VMware/Docker) & more
- Key differentiators
  - Supports Open Networking Install Environment (ONIE)
  - Full support for with 3rd party OS and network virtualization solutions from Cumulus Networks, Microsoft, VMware and Midokura
  - Dell global support and services
**S3048-ON – 1GbE Layer 3 Switch**

**Adapters & storage**
- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

More details in Product Sourcebook

**I/O Panel**
- 48 integrated 10/100/1000MbE Ports
  - 10/100/1000MbE BASE-T ports: Up to 48
- RJ45 / Cat5 Copper 1Gb (supports auto-negotiation)

**Utility Panel**
- Three redundant fans
  - I/O to Utility, Utility to I/O air-flow

**Management Port** (RJ-45 connector)
- USB Type-B Port
- Serial Port (RJ-45 connector)

**Two Power Supplies**
- I/O to Utility, Utility to I/O air-flow
- AC, AC-R, DC, DC-R

**Optical Transceivers**
- SFP+ 10Gb: SR, LR, LRM, ER, ZR
- SFP 1GbE: SX, LX, ZX
- SFP 100MbE: FX

**SFP to RJ45 converter**
- 1000Base-T (only capable of 1Gb)

**SFP+ Direct Attach Cable (Twinax)**
- (0.5m, 1m, 3m, 5m, 7m available)
- Can operate at 10Gb & 1Gb

**SFP+ 10GbE SFP+ Fiber Ports**

**Dell Storage Networking I/O Guide**

**4 integrated 10GbE SFP+ Fiber Ports**

**More details in Product Sourcebook**
Dell Networking S3100 Series
Advanced 1GbE layer 3 switch

- **Up to 260 Gbps** switch fabric capacity
- Supports up to **48 line-rate 1GbE ports** per switch and up to 312 1GbE ports in a six-unit stack
- **Hot swap expansion module** supporting dual SFP+ and dual 10GBaseT
- Standard N-Series stacking cables and built-in ports for **cost-effective high-performance stacking** at up to 84 Gbps.
- **OS9 Software Base** ensures availability of VLT, VRF, Automation, SDN and L2/L3 features
- Energy Efficient Ethernet and lower power PHYs **reduce power** to inactive ports and idle links
- **Tool-less ReadyRails™** significantly reduce rack installation time
S3100 - 1GbE Top-of-Rack Switch
S3124 and S3124F

Adapters & storage
- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

More details in Product Sourcebook

Optical Transceivers
SFP 1Gb: SX, LX, ZR, BASE-T
SFP 100Mb: FX

24 integrated 1GbE Ports
1GbE SFP ports: up to 24 (N3024f)

24 integrated 1GbE Ports
10/100/1000MBASE-T ports: up to 24 – Cat5 cables

2 integrated 1GbE Combo Ports
N3024: 2x 1GbE SFP ports
N3024f: 2x 1GBASE-T ports (shared with ports 23-24)

Management Port (RJ-45 connector)

Serial Port (RJ-45 connector)

Utility Panel
2 port SFP+ Module
- Optics: SR, LR, ER, LRM
- SFP+ to SFP+ Cables: 0.5m, 1m, 3m, 5m, 7m

Two redundant fans (I/O to Utility)

2 integrated 21Gb Stacking Ports
- Cables 0.5m, 1m, 3m

I/O Panel

S3124F

S3124

Two redundant power supplies (AC)

1/10GbE

Optical Transceivers
SFP+ 10Gb: SR, LR, LRM, ER
SFP 1GbE: SX, LX

SFP to RJ45 converter
1000Base-T (only capable of 1Gb)

SFP+ Direct Attach Cable (Twinax)
(0.5m, 1m, 2m, 3m, 5m, 7m available), Can operate at 10Gb & 1Gb

2 integrated 10GbE SFP+ Fiber Ports
**Adapters & storage**

- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

**More details in Product Sourcebook**

**S3148P - 1GbE Top-of-Rack Switch**

- **48 integrated 1GbE Ports**
  - 10/100/1000MBASE-T ports: up to 48 – Cat5 cables

- **Management Port**
  - (RJ-45 connector)

- **Serial Port**
  - (RJ-45 connector)

- **2 integrated 1GbE Combo Ports**
  - N3048: 2x 1GbE SFP ports (shared with ports 47-48)

- **Optical Transceivers**
  - SFP 1Gb: SX, LX, ZX, BASE-T
  - SFP 100Mb: FX

- **Optical Transceivers**
  - SFP+ 10Gb: SR, LR, LRM, ER
  - SFP+ 1GbE: SX, LX

- **SFP to RJ45 converter**
  - 1000Base-T (only capable of 1Gb)

- **SFP+ Direct Attach Cable (Twinax)**
  - (0.5m, 1m, 2m, 3m, 5m, 7m available), Can operate at 10Gb & 1Gb

- **S3148P**

- **2 integrated 21Gb Stacking Ports**
  - Cables 0.5m, 1m, 3m

- **2 integrated 10GbE SFP+ Fiber Ports**

- **2 integrated 1GbE Combo Ports**
  - N3048: 2x 1GbE SFP ports (shared with ports 47-48)

- **2 integrated 1GbE Ports**
  - 10/100/1000MBASE-T ports: up to 48 – Cat5 cables

- **2 port SFP+ Module**
  - Optics: SR, LR, ER, LRM
  - SFP+ to SFP+ Cables: 0.5m, 1m, 3m, 5m, 7m

- **2 port 10GBASE-T Module**
  - Cat6a Cables

- **Two redundant fans (I/O to Utility)**
  - Cables 0.5m, 1m, 3m

- **Two redundant power supplies (AC)**

**Dell Storage Networking I/O Guide**
Dell Networking S60 Series
1 Gigabit Ethernet with advanced Layer 3 capabilities

Key features and innovations

• Up to 176 Gbps switch fabric capacity
• Low latency switching for high-performance iSCSI SANs
  • S60 offers deep buffer to help further optimize the performance
• Supports up to 48 line-rate 1GbE ports per switch and up to 624 1GbE ports in a twelve-unit stack
• expansion module supporting dual SFP+ and dual/single port 12Gbps Stacking
• Cost-effective high-performance stacking at up to 96 Gbps.
• Advanced Layer 3 functionality included

Power efficient density for small-scale data center deployments

A power efficient and resilient 1 Gigabit Ethernet switching solution (with 10GbE for uplink ports) for small-scale data center. Dual hot-swappable power supplies add resiliency and the capacity to provide up to 48 ports in a 1RU footprint.
S60 – 1GbE Layer 3 Switch

Adapters & storage

- Dell Storage PS (iSCSI)
- Dell Storage SC (iSCSI)
- Dell Storage MD (iSCSI)

More details in Product Sourcebook

I/O Panel

- 44 integrated 10/100/1000MbE Ports
  - 10/100/1000MbE BASE-T ports: Up to 44

- RJ45 / Cat5 Copper
  - 1Gb (supports auto-negotiation)

- Stacking Cables
  - 0.6m 12Gbps, 24Gbps
  - 4m 12Gbps, 24Gbps

- Optical Transceivers
  - SFP+ 10Gb: SR, LR, ER, LRM

Utility Panel

- 4 integrated 1GbE Ports
  - SFP 1GbE ports: Up to 4

- USB Type-B Port

- Management Port (RJ-45 connector)

- Serial Port (RJ-45 connector)

- Two Power Supplies with integrated fans
  - I/O to Utility, Utility to I/O air-flow
  - AC, AC-R, DC, DC-R

Optical Transceivers

- SFP 1Gb: SX, LX, ZX, BASE-T
- SFP 100Mb: FX

Optical Transceivers

- SFP+ 10Gb: SR, LR, ER, LRM

Stacking Cables

- 0.6m 12Gbps, 24Gbps
- 4m 12Gbps, 24Gbps
10/40Gb Ethernet iSCSI & NAS

10/40Gb Switch N4000

10/40Gb Switch S5000*

10/40Gb Switch S4048-ON

10/40Gb Switch S6000

10Gb Plug & Play M-IOA *

Dell Storage Networking I/O Guide

* Please go to “LAN/SAN converged (FC/FCoE) section for details on these switches.
Dell Networking N4000 Series
10 Gigabit Ethernet with advanced Layer 3 capabilities

Key features and innovations

• Up to 1.2Tbps switch fabric capacity
• Supports up to 64 line-rate 10GbE ports per switch and up to 672 10GbE ports in a twelve-unit stack with user port stacking at up to 320 Gbps
• Hot swap expansion module supporting dual QSFP+ (8 x 10GbE), Quad 10GBaseT, and Quad SFP+
• Plug-and-Play configuration with Dell EqualLogic™ and validated with Dell Compellent™ iSCSI storage arrays
• Energy Efficient Ethernet (EEE) and lower power PHYs reduce power to inactive ports and idle links
• Tool-less rails significantly reduce rack installation time
• Converged iSCSI with EqualLogic (supports iSCSI TLV)

Deliver more bandwidth in small-scale data center

A high density, power efficient, and flexible 1/10/40 Gigabit Ethernet switching solution for simple scalability and high density. Resilient stacking architecture delivers reliable network performance and amazing density for demanding network environments. Helps future-proof investments as enterprises migrate from 10GbE core deployments to 40GbE.
N4000 - 10GbE Top-of-Rack Switch

N4032 and N4032f

Adapters & storage

- EqualLogic PS (iSCSI)

More details in Product Sourcebook

Optical Transceivers
- SFP+ 10Gb: SR, LR, ER, LRM
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available)
- Can operate at 10Gb and 1Gb

24 integrated 10GbE Ports
- 1/10BASE-T ports: up to 24 (N4032) – Cat6a cables

24 integrated 10GbE Ports
- SFP+ 10GbE: Up to 24 (N4032F)

4 port SFP+ Module

4 port 10GBASE-T Module
- + Cat6a Cables

2 port QSFP+ Module

USB Type-A Port

Serial Port (RJ-45 connector)

Management Port (RJ-45 connector)

Two redundant fan modules (I/O to Utility)

Two redundant power supplies (AC)

Optical Transceivers
- QSFP+ to 4xSFP+ Breakout Cable
  - 5m Passive Copper
  - 40GBASE-CR4 10Gb

- QSFP+ to QSFP+ Direct Attach
  - 1m, and 5m, Passive Copper
  - 40GBASE-CR4 40Gb
  - 1m, 5m, 15m PSM4 MPO Pigtail

- Optical Transceivers
  - QSFP+ 40Gb: SR, ESR, LR4

4 port 10GBASE-T Module
- + Cat6a Cables

4 port SFP+ Module

2 port QSFP+ Module

EqualLogic PS (iSCSI)

More details in Product Sourcebook
N4064 and N4064f

Adapters & storage

Optical Transceivers
- SFP+ 10Gb: SR, LR, LRM, ER
- SFP 1GbE: SX, LX

SFP to RJ45 converter
- 1000Base-T (only capable of 1Gbps)

SFP+ Direct Attach Cable (Twinax)
- (0.5m, 1m, 2m, 3m, 5m, 7m available)
- Can operate at 10Gb and 1Gb

48 integrated 10GbE Ports
- 1/10GBASE-T ports: up to 48 (N4064) – Cat6a cables
- SFP+ 10GbE: Up to 48 (N4064f)

4 port SFP+ Module

4 port 10GBASE-T Module
- + Cat6a Cables

2 port QSFP+ Module

USB Type-A Port

Serial Port (RJ-45 connector)

Management Port (RJ-45 connector)

Two redundant fan modules
- (I/O to Utility)

Two redundant power supplies (AC)

More details in Product Sourcebook

EqualLogic PS (iSCSI)
Dell Networking S4820T switch

1/10/40GbE top-of-rack switch

Accelerate 1G to 10GbE migration

- Dell Networking Operating System 9
  - 48 x 1/10G
  - 4 x 40G fabric uplinks (or 16 x 10G)
- Built-in virtualization support (VMware, Citrix)
- Open Networking capable on select models
- Converged iSCSI with EqualLogic (supports iSCSI TLV)
- Integrated Open Automation, scripting and programmatic management

Great with Dell servers & storage
S4820-T - 10GbE Top-of-Rack Switch

Adapters & storage

- Intel X540 2P NIC
- EqualLogic PS (iSCSI)
- EqualLogic FS7610 (iSCSI)

More details in Product Sourcebook

Optical Transceivers
- QSFP+ 10Gb: SR, eSR, LR4
- QSFP+ to 4xSFP+ Breakout Cables
  - 5m Passive Copper
  - 40GBASE-CR4 10Gb

- QSFP+ to QSFP+ Direct Attach
  - 1m, 5m Passive Copper
  - 10m, 50m Active Fiber
  - 1m, 5m, 15m PSM MPO Cable

- QSFP+ to 4xSFP+ Breakout Cables
  - 5m Passive Copper

- 40GBASE-CR4 10Gb

- 10/40GbE

Intel X540 2P NIC
EqualLogic PS (iSCSI)
EqualLogic FS7610 (iSCSI)

48 integrated 10GbE (RJ-45) Ports
10GBASE-T ports: Up to 48

4 integrated 40GbE QSFP+ Ports
QSFP+ 40GbE: Up to 4
Each port can be used as 4x10GbE ports (Breakout cable required)

I/O Panel

Serial Port (RJ-45 connector)
Management Port (RJ-45 connector)

Utility Panel

Two redundant fan modules (I/O to Utility, Utility to I/O air-flow)
Two redundant power supplies (AC, AC-R, DC)
Dell Networking S6000 high-density switch

Purpose-built for the Virtual Era

- **High-throughput low-latency performance** for demanding workloads
- **Built-in virtualization** features to scale virtual machine deployment
- **Integrated** automation, scripting and programmatic management with **Open Automation Framework**
- **Energy-efficient**, low power solution, Fresh Air capable for chiller-less operation
- **Converged iSCSI with EqualLogic** (supports iSCSI TLV)

*Winner:
  - 2013 Innovative Products & Solutions’ award – China Network World
  - 2013 Product of the Year’ award - It168.com
S6000 - 40GbE Spine / 10GbE High-density ToR

Adapters & storage

- Broadcom 57840S 4P SFP+ 10G
- Broadcom 57810S 2P SFP+ NIC
- Broadcom 5720 SFP 1G
- Qlogic QLE8262 SFP+ NIC
- Emulex OCE 14102
- Mellanox ConnectX-3 SFP+ 40G
- FluidCache for SAN

More details in Product Sourcebook

Optical Transceivers
SFP+ 10Gb: SR, eSR

QSFP+ to 4xSFP+ Breakout Cables
5m Passive Copper
40GBASE-CR4 10Gb
40GBASE-QSA 1Gb

QSFP+ to QSFP+ Direct Attach
1m, 5m Passive Copper
10m, 50m Active Fiber

USB Type-A Port
USB Type-B Port
Serial Port (RJ-45 connector)
Management Port (RJ-45 connector)

I/O Panel

32 integrated 40GbE QSFP+ Ports
QSFP+ 40GbE: Up to 32
SFP+ 10GbE: Up to 104 (26x 40GbE ports with breakout cables)
Each port can be used as 4x10GbE ports (Breakout cable required)

Utility Panel

Three redundant fan modules (I/O to Utility, Utility to I/O air-flow)

Two redundant power supplies (AC, AC-R, DC)
See also the MXL, IOA, FN-IOM, and S5000 in the Converged Ethernet section.
Brocade M6505
16Gb switch

- 24 Fibre Channel ports
  - Up to 16 internal 16/8Gb server ports*
  - Up to 8 external 16/8/4Gb SAN ports**
  *The M6505 requires the enhanced midplane 1.1. The M6505 will not function with the original 1.0 midplane.
  **For connection to storage devices and/or other FC switches only

- Zero footprint, hot-pluggable design with no additional fans or power supplies

- Complete redundancy, up to 4 switches per chassis

- Dynamic Ports on Demand (PoD) and “pay-as-you-grow” port upgrades for 12-port configurations

- Heterogeneous SAN fabric interoperability

- Access Gateway (NPIV) or fabric switch connectivity

- Auto-sensing and speed-matching connections to 16/8/4 Gbps to Fibre Channel devices
Brocade M6505
16Gb switch

**Adapters**

12G & 13G
- Emulex LPe1205-M FC8
- Emulex LPM16002B FC16
- Qlogic QME2572 FC8
- Qlogic QME2662 FC16

*The M6505 requires the enhanced midplane (1.1). The switch will not function with the original midplane (1.0).*

Does not support 4Gb Mezzanine cards.

**Available Models** - Brocade M6505
- (16) internal and (8) SFP+ external FC16 ports with (8) FC16 SWL transceivers and Enterprise Performance Pack
- (16) internal and (8) SFP+ external FC16 ports with (4) FC16 SWL transceivers
- (8) internal and (4) SFP+ external FC16 ports with (2) FC16 SWL transceivers
(12 port model expands to 24 ports with on-demand license)
Brocade M5424
8Gb switch

• 8/4 Gbps Fibre Channel SAN solution
• Provides up to 24 8/4Gb FC ports
  – Up to 16 internal 8/4Gb server ports
  – Up to 8 external 8/4Gb SAN ports*
  *For connection to storage devices and/or other FC switches only
• One management console port
• Configurable as Brocade full fabric switch or Access Gateway Mode (NPIV) for multi-vendor interoperability
• Auto-negotiates between 4Gbps and 8Gbps based on linked mezzanine cards and top-of-rack switches
• Supports future FOS features and upgrades
Brocade M5424
8Gb switch

Adapters

12G & 13G
- Emulex LPe1205-M FC8
- Emulex LPe16002B FC16 (@ FC8 speeds)
- Qlogic QME2572 FC8
- Qlogic QME2662 FC16 (@FC8 speeds)

FC4 Mezzanine cards are also supported with this switch at 4Gbps.

Brocade Transceivers
Brocade SWL or LWL 8Gb SFP+ Optics
Brocade SWL, LWL or ELWL 4Gb SFP+ Optics
Note: Requires SFP LC connector

Available Models - Brocade M5424
- (16) internal and (8) SFP+ external FC8 ports with (8) FC8 SWL transceivers and Enterprise Performance Pack
- (16) internal and (8) SFP+ external FC8 ports with (4) FC8 SWL transceivers
- (8) internal and (4) SFP+ external FC8 ports with (2) FC8 SWL transceivers (12 port model expands to 24 ports with on-demand license)

Cables

Secondary Management Serial Port

Designed for I/O bays

B1/B2
C1/C2

More details in Adapter Portfolio section

53 Dell M-Series Blade I/O Guide
Dell 8/4Gbps FC Pass-Through

- 16 ports correspond to 16 server blades
- 8, 4, or 2 Gbps connections
- Transparent connection between SAN and server blades
- As an alternative to this FC8 Pass-Through, the **M IOA populated with FC Flex IO Modules** (NPIV aggregator) provides the simplicity of a pass-through with the aggregation/redundancy benefits of a switch.
Dell 8/4Gbps FC Pass-Through

Adapters

12G & 13G
- Emulex LPe1205-M FC8
- Qlogic QME2572 FC8

*FC4 Mezzanine cards will function with this pass-through. Doing so will cause the pass-through to run at 4Gbps rather than the full-capability 8Gbps.

More details in Adapter Portfolio section

Designed for I/O bays

B1/B2
C1/C2

Brocade Transceivers
16 pre-installed 8Gbps SWL SFP+ transceivers (one per port)

Fibre Channel

Cables
Brocade 300
8Gb switch

• Affordable, flexible foundation for entry-level SAN
  – Enables “pay-as-you-grow” scalability from 12 to 24 ports
  – Delivers 40 percent higher performance at a comparable cost compared to 10 GbE

• A simpler way to build your SAN
  – Installs in three easy steps using Brocade EZSwitchSetup
  – Leverages Brocade Access Gateway for simple server connectivity and SAN scalability

• Enterprise features at an entry-level price
  – Leverages Fibre Channel technology that is proven in 90 percent of Fortune 1000 data centers
  – Features enhanced diagnostics and RAS functionality to help minimize downtime
  – Maximizes availability with redundant, hot-pluggable components and non-disruptive software upgrades
300 - 8Gbps Fibre Channel Fabric Switch

Adapters

- Brocade 815/825 8GB HBA
- Qlogic 2460/2462 4Gb HBA
- Qlogic 2560/2562 8GB HBA
- Emulex 12000/12002 8Gb HBA
- Dell Storage SC9000 (FC)
- Compellent SC8000 (FC)
- Compellent SC4020 (FC)
- Dell Storage SCv2000 (FC)
- PowerVault MD (FC)

More details in Product Sourcebook

Brocade Transceivers
Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
Brocade SWL, LWL or ELWL 4Gb SFP+ Optics
Note: Requires SFP LC connector

USB Type-A Port

Management Port (RJ-45 connector)

24 integrated 8Gbps FC SFP+ Ports
SFP+ FC: Up to 24 ports, operates at 8Gbps, 4Gbps, 2Gbps, or 1Gbps
- 24 ports, ships with 24 8Gbps SFP+ optics
- 8* ports, ships with 8 8Gbps SFP+ optics (Expandable to 24 with POD licensees)

I/O Panel

Serial Port (RJ-45 connector)

One integrated power supply (AC)

Utility Panel

Integrated fans (Utility to I/O air-flow)
Brocade 6505
16Gb switch

• Flexibility to grow your business on your terms
  – Enables “pay-as-you-grow” scalability from 12 to 24 ports
• A simpler way to build your SAN
  – Installs in three easy steps using Brocade EZSwitchSetup
  – Leverages Brocade Access Gateway for simple server connectivity and SAN scalability
• Enterprise features at an entry-level price
  – Leverages Fibre Channel technology that is proven in 90 percent of Fortune 1000 data centers
  – Features enhanced diagnostics and RAS functionality to help minimize downtime
  – Maximizes availability with redundant, hot-pluggable components and non-disruptive software upgrades
6505 - 16Gbps Fibre Channel Fabric Switch

**Adapters**
- Brocade 815/825 8GB HBA
- Qlogic 2460/2462 4Gb HBA
- Qlogic 2560/2562 8GB HBA
- Emulex 12000/12002 8Gb HBA
- Emulex 16000/16002 16Gb HBA
- Dell Storage SC9000 (FC)
- Compellent SC8000 (FC)
- Compellent SC4020 (FC)
- Dell Storage SCv2000 (FC)
- PowerVault MD (FC)

**More details in Product Sourcebook**

**Brocade Transceivers**
- Brocade SWL, LWL or ELWL 16Gb SFP+ Optics
- Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
- Brocade SWL, LWL or ELWL 4Gb SFP+ Optics

Note: Requires SFP LC connector

**24 integrated 16Gbps FC SFP+ Ports**
- Up to 24 ports, operates at 16Gbps, 8Gbps, 4Gbps, or 2Gbps
  - 24 ports, ships with 24 16Gbps SFP+ optics
  - 12* ports, ships with 12 16Gbps SFP+ optics
  - 12* ports, ships with 12 8Gbps SFP+ optics
  (Expandable to 24 with POD licensees)

**Management Port (RJ-45 connector)**

**USB Type-A Port**

**Serial Port (RJ-45 connector)**

**Two redundant power supplies with integrated fans (AC)**
- Utility to I/O air-flow
- Ships with one power supply

**Cables**

- Brocade SWL, LWL or ELWL 16Gb SFP+ Optics
- Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
- Brocade SWL, LWL or ELWL 4Gb SFP+ Optics

Note: Requires SFP LC connector
Brocade 6510
16Gb switch

• Flexibility to grow your business on your terms
  – Enables “pay-as-you-grow” scalability from 24 to 48 ports
  – Multi-tenancy features such as virtual fabrics, QoS, and zoning
  – Small footprint for flexible deployments

• A simpler way to build your SAN
  – Installs in three easy steps using Brocade EZSwitchSetup
  – Easily connects servers to the fabric with automatic recognition and provisioning
  – Cable and optics diagnostics

• Optimized SAN Performance for CloudApps
  – Optimized for emerging workloads – VDI, shared storage, and SSD arrays
  – Configurable ports for 10Gbps metro optical connectivity
  – Industry-leading 128Gbps ISL Trunk
  – Extended distance support of native Fibre Channel up to 7500km at 2Gbps
6510 - 16Gbps Fibre Channel Fabric Switch

Adapters

- Brocade 815/825 8GB HBA
- Qlogic 2460/2462 4Gb HBA
- Qlogic 2560/2562 8GB HBA
- Emulex 12000/12002 8Gb HBA
- Emulex 16000/16002 16Gb HBA
- Dell Storage SC9000 (FC)
- Compellent SC8000 (FC)
- Compellent SC4020 (FC)
- Dell Storage SCv2000 (FC)
- PowerVault MD (FC)

More details in Product Sourcebook

Cables

Brocade Transceivers
Brocade SWL, LWL or ELWL 16Gb SFP+ Optics
Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
Brocade SWL, LWL or ELWL 4Gb SFP+ Optics

Note: Requires SFP LC connector

48 integrated 16Gbps FC SFP+ Ports
SFP+ FC: Up to 48 ports, operates at 16Gbps, 8Gbps, 4Gbps, or 2Gbps
- 48 ports, ships with 48 16Gbps SFP+ optics
- 24* ports, ships with 24 16Gbps SFP+ optics
- 24* ports, ships with 24 8Gbps SFP+ optics
(Expandable to 48 with POD licensees)

Management Port (RJ-45 connector)

USB Type-A Port

Serial Port (RJ-45 connector)

I/O Panel

Two redundant power supplies with integrated fans (AC)
- Utility to I/O air-flow, I/O to utility air-flow

Utility Panel

Dell Storage Networking I/O Guide

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**Brocade 6520**

16Gb switch

- **Flexibility to grow your business on your terms**
  - Enables “pay-as-you-grow” scalability from 48 to 96 ports

- **A simpler way to build your SAN**
  - Simplifies management through Brocade Fabric Vision technology, reducing operational costs and optimizing application performance
  - Leverages Brocade Access Gateway for simple server connectivity and SAN scalability

- **Enterprise features at an entry-level price**
  - Leverages Fibre Channel technology that is proven in 90 percent of Fortune 1000 data centers
  - Features enhanced diagnostics and RAS functionality to help minimize downtime
  - Maximizes availability with redundant, hot-pluggable components and non-disruptive software upgrades
6520 - 16Gbps Fibre Channel Fabric Switch

Adapters

- Brocade 815/825 8GB HBA
- Qlogic 2460/2462 4Gb HBA
- Qlogic 2560/2562 8GB HBA
- Emulex 12000/12002 8Gb HBA
- Emulex 16000/16002 16Gb HBA
- Dell Storage SC9000 (FC)
- Compellent SC8000 (FC)
- Compellent SC4020 (FC)
- Dell Storage SCv2000 (FC)
- PowerVault MD (FC)

More details in Product Sourcebook

Fibre Channel

Brocade Transceivers
Brocade SWL, LWL or ELWL 16Gb SFP+ Optics
Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
Brocade SWL, LWL or ELWL 4Gb SFP+ Optics

Note: Requires SFP LC connector

96 integrated 16Gbps FC SFP+ Ports
SFP+ FC: Up to 96 ports, operates at 16Gbps, 8Gbps, 4Gbps, or 2Gbps
- 96 ports, ships with 96 16Gbps SFP+ optics
- 48* ports, ships with 48 16Gbps SFP+ optics
- 48* ports, ships with 48 8Gbps SFP+ optics
(Expandable to 96 with POD licensees)

Serial Port (RJ-45 connector)

USB Type-A Port

Management Port (RJ-45 connector)

I/O Panel

Two redundant power supplies (AC)

Utility Panel

Three redundant fans (Utility to I/O air-flow, I/O to utility air-flow)
Brocade 8510
16Gb switch

• Industry’s most powerful SAN infrastructure
  – Reduce network complexity, management, and costs by enabling flatter, low-latency chassis connectivity
  – Integrated metro and global SAN extension enables flexible, high-speed business continuity and disaster recovery solutions

• A simpler way to build your SAN
  – Installs in three easy steps using Brocade EZSwitchSetup
  – Leverages Brocade Access Gateway for simple server connectivity and SAN scalability

• Enterprise features at an entry-level price
  – Leverages Fibre Channel technology that is proven in 90 percent of Fortune 1000 data centers
  – Features enhanced diagnostics and RAS functionality to help minimize downtime
  – Maximizes availability with redundant, hot-pluggable components and non-disruptive software upgrades
8510 - 16Gbps Fibre Channel Director

**Adapters**
- Brocade 815/825 8GB HBA
- Qlogic 2460/2462 4Gb HBA
- Qlogic 2560/2562 8Gb HBA
- Emulex 12000/12002 8Gb HBA
- Emulex 16000/16002 16Gb HBA
- Dell Storage SC9000 (FC)
- Compellent SC8000 (FC)
- Compellent SC4020 (FC)
- Dell Storage SCv2000 (FC)
- PowerVault MD (FC)

**More details in Product Sourcebook**

**Brocade Transceivers**
Brocade SWL, LWL or ELWL 16Gb SFP+ Optics
Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
Brocade SWL, LWL or ELWL 4Gb SFP+ Optics

Note: Requires SFP LC connector

**32 port 16Gbps Blade**

**48 port 16Gbps Blade**

**64 port 16Gbps Blade**

**64 port 8Gbps Blade**

**Cables**
Brocade Transceivers
Brocade SWL, LWL or ELWL 8Gb SFP+ Optics
Brocade SWL, LWL or ELWL 4Gb SFP+ Optics

**Cables (operates at 16Gbps, 8Gbps, or 4Gbps)**
QSFP (MPO/MTP) to QSFP (MPO/MTP) cable: 1m, 3m, 20m, 50m
QSFP (MPO/MTP) to 4x SFP+ (LC): 1m, 3m, 20m, 50m

**Three redundant fans**
- Two required for operation

**Four redundant power supplies with integrated fans (AC)**
- Utility to I/O air-flow
- Ships with two

**Two redundant Control Processor (CP) modules**

**Two redundant Control Switching (CR) modules**

**Two redundant fans**
- Two required for operation

**Four redundant power supplies with integrated fans (AC)**
- Utility to I/O air-flow
- Ships with two

**Eight modular I/O slots**

**Four modular I/O slots**

**Dell Storage Networking I/O Guide**
Storage Arrays Guide

Dell SC9000
Dell SC8000
Dell SC4020
Dell SC2000
Dell SC1000
Dell XC
Dell PS6210
Dell PS61x0/41x0
Dell PS6510/6500
Dell FS8600
Dell FS76x0
Dell MD3
Dell Storage SC9000

Ultimate in storage performance, efficiency, and scalability

- **Dual controller** system based on a 2U rack chassis with integrated Dell Remote Access Controller (iDRAC)
- Dell 13G server architecture, Dual 3.2GHz eight-core Intel® processors
- 4x system memory1, 12G SAS back-end, 40% more IOPS, 110% more throughput1
- Modular hot-swap design
- SAN and/or NAS storage from same pool, Multiprotocol networks (FC, iSCSI, FCoE)
- Self-optimizing, virtualized architecture lowers costs, keeps performance high
- RAID tiering and auto-provisioning
- Built-in Live Volume auto-failover and auto-repair
- Multi-array federation, with proactive Volume Advisor
- Compression on SSD or HDD tiers
SC9000 – Multi-protocol Storage Array

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Brocade M8428-k (iSCSI, FC)
- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-ON (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-ON (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

More details in Dell Storage Compatibility Matrix

SAS cards: 2 port 12Gb mini, 4 port 6Gb mini
FC cards: 2 port 16Gb (SWL SFP+)
iSCSI cards: 2 port 1/10GbE (RJ-45), 2 port 10GbE (SFP+), 2 port 10GbE (RJ-45)

Three low-profile PCIe Gen 3 I/O expansion slots

SAS cards: 2 port 12Gb, 4 port 6Gb
FC cards: 2 port 16Gb (SWL SFP+), 4 port 8Gb (SWL SFP+)
iSCSI cards: 2 port 1/10GbE (RJ-45), 2 port 10GbE (SFP+), 2 port 10GbE (RJ-45)
FCoE cards: 2 port 10GbE (RJ-45), 2 port 10GbE (SFP+)

Three full-height PCIe Gen 3 I/O slots

4GB Non-volatile write cache card
- Ships factory-installed with the system

Utility Panel

Dual-controller interconnect (IPC) port
- One integrated 10GbE RJ-45 port

Reserved 1GbE and 10GbE ports

Two redundant power supplies (AC, AC-R)

Management Port RJ45 connector

Four USB Type-A Ports

VGA Port (DE-15 connector)

iDRAC Port (RJ45 connector)

Serial Port (RS-232 connector)

Front Panel

Dell Storage Networking I/O Guide
Dell Storage SC8000

Enterprise storage for virtualized data centers and the cloud

- **Ultra-efficient, easy to manage** storage solution optimizes drive utilization dynamically

- **Dual controller** system based on a 2U rack chassis with integrated Dell Remote Access Controller (iDRAC)

- **Scales up** to 960 SAS drives per dual controller system, **scales-out** to multiple systems across multiple sites

- **Dell’s auto-tiering** enables multiple high-performance SSD tiers leveraging the best attributes of both right-intensive (SLC) and read-intensive (MLC) drives
SC8000 – Multi-protocol Storage Array

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Brocade M8428-k (iSCSI, FC)
- Brocade S5000 (iSCSI, FC with HBA and CNA)
- Brocade S4048-On (iSCSI)
- Brocade S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

More details in Dell Storage Compatibility Matrix

SAS cards: 4 port 6Gb mini
FC cards: 2 port 8Gb (SWL SFP+), 2 port 16Gb (SWL SFP+)
iSCSI cards: 2 port 1GbE (RJ-45), 2 port 10GbE (SFP+), 2 port 10GbE (RJ-45)
FCoE cards: 2 port 10GbE (RJ-45), 2 port 10GbE (SFP+)

Utility Panel

Three low-profile PCIe Gen 3 I/O expansion slots

Three full-height PCIe Gen 3 I/O slots

VGA Port (DE-15 connector)

Serial Port (RS-232 connector)

iDRAC Port (RJ45 connector)

Management Port (RJ-45 connector)

Four USB Type-A Ports

Reserved 10GbE ports

Dual-controller interconnect (IPC) port
- One integrated 10GbE RJ-45 port

512MB Non-volatile write cache card
- Ships factory-installed with the system

Two redundant power supplies (AC, AC-R)

Front Panel

Front Panel

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

Networking

- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-On (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell N3000 (iSCSI)
- Dell S3048-On (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)
Dell Storage SC4020

Intelligent, self-optimizing array in affordable, all-in-one form factor

- Extends the benefits of enterprise storage to small and mid-sized deployments
- Dual redundant controllers, 24 internal drive slots, and multi-protocol with support for iSCSI and Fibre Channel
- Expands beyond 24 drives by adding SC200 or SC220 enclosures for over 400TB total raw capacity
- Dell’s auto-tiering enables multiple high-performance SSD tiers leveraging the best attributes of both right-intensive (SLC) and read-intensive (MLC) drives
SC4020 – Multi-protocol all-in-one Storage

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Brocade M8428-k (iSCSI, FC)
- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-ON (iSCSI)
- Dell S6000 (iSCSI)
- MXL/IOA (iSCSI)
- Dell S3048-ON (iSCSI)
- Dell N3000 (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3100 (iSCSI)

More details in Dell Storage Compatibility Matrix

Host connectivity ports
- FC ports: 4 port 8Gb (SWL SFP+)
- iSCSI ports: 2 port 10GbE (SFP+)

Redundant pluggable controllers
- 8Gb FC, 6Gb SAS, 1GbE replication
- 10GbE iSCSI, 6Gb SAS, 1GbE replication
- 1GbE iSCSI, using management and replication ports of the 8Gb FC or 10GbE iSCSI controller (Both controllers must be of same type)

Two integrated 6Gb SAS ports

FC controller

iSCSI controller

Management Port (RJ45 connector)

USB Type-A Port

iSCSI Replication 1GbE Port (RJ45 connector)

Two redundant power supplies (AC, AC-R)

Dell Storage Networking I/O Guide

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Dell Storage SCv2000

Intelligent, entry-level solution providing better value in single-tier environments

- Extends the **SC series of SAN arrays** to entry-level customers
- **High performance**, superior performance for entry level storage
- **Future flexibility**, migrate data within SCv2000 series
- **Data protection**, exceptional number of snapshots and replication
- **Common Storage Center Management**, remote and local data protection, & Phone Home Services
SCv2000 & SCv2020 – Entry-level SC series storage

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade M6505 (FC)
- PowerConnect M8428-k (FC)
- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-ON (iSCSI)
- Dell S4820T (iSCSI)
- MXL/IOA (iSCSI)
- Dell S3048-ON (iSCSI)
- Dell S60
- Dell N2000 (iSCSI)
- Dell N3000 (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3048-ON (iSCSI)
- Dell S3100 (iSCSI)

More details in Dell Storage Compatibility Matrix

Host connectivity ports
- Fibre Channel, iSCSI, and SAS supported
- Need separate controller for each type of connectivity

Redundant pluggable controllers
- Single or dual controller
  (Both controllers must be of same type)
  - FC ports: 2 port 16Gb (SWL SFP+)
  - FC ports: 4 port 8Gb (SWL SFP+)
  - iSCSI ports: 4 port 1GbE (RJ-45)
  - iSCSI ports: 2 port 10GbE (RJ-45)
  - SAS ports: 2 port 12G

Utility Panel

USB Type-A Ports

Front Panel

2U, 6 - 12 3.5 inch hard drive chassis

2U 12 - 24 2.5 inch hard drive/SSD chassis

Management Port (RJ45 connector)

iSCSI Replication 1GbE Port (RJ45 connector)

Two integrated 6Gb SAS ports

Two redundant power supplies (AC, AC-R)
SCv2080 – Entry-level SC series storage

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade M6505 (FC)
- PowerConnect M8428-k (FC)
- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-ON (iSCSI)
- Dell S4820T (iSCSI)
- MXL/IOA (iSCSI)
- Dell S3048-ON (iSCSI)
- Dell S60
- Dell N2000 (iSCSI)
- Dell N3000 (iSCSI)
- Dell N4000 (iSCSI)
- Dell S3048-ON (iSCSI)
- Dell S3100 (iSCSI)

More details in Dell Storage Compatibility Matrix

Redundant pluggable controllers
- Dual controller only
  (Both controllers must be of same type)

- FC ports: 2 port 16Gb (SWL SFP+)
- FC ports: 4 port 8Gb (SWL SFP+)
- iSCSI ports: 4 port 1GbE (RJ-45)
- iSCSI ports: 2 port 10GbE (RJ-45)
- SAS ports: 2 port 12G

Host connectivity ports
- Fibre Channel, iSCSI, and SAS supported
- Need separate controller for each type of connectivity

- FC ports:
  - 2 port 16Gb (SWL SFP+)
  - 4 port 8Gb (SWL SFP+)
- iSCSI ports:
  - 4 port 1GbE (RJ-45)
  - 2 port 10GbE (RJ-45)
- SAS ports: 2 port 12G

Two redundant power supplies (AC, AC-R)

Utility Panel

iSCSI Replication 1GbE Port (RJ45 connector)

Management Port (RJ45 connector)

Two integrated 6Gb SAS ports

Front Panel

5U, 42 - 84 3.5 inch hard drive chassis

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Dell Storage XC Series

Built on the principles of web-scale

- Converge compute and storage
- **All intelligence in software**
- Distribute everything, Self Healing system
- Automation and rich analytics
- No single point of failure, always-on
- Linear, **predictable scale-out**
- Simple to deploy, maintain and manage
- **Multi-hypervisor support** – ESXi, Hyper-v, KVM
- Web-scale technology built in the Nutanix architecture
  - Apache Casandra – Distributed meta-data store with Paxos
  - Apache Zoo-keeper – Cluster configuration
  - MapReduce – cluster management and clean-up, tiering, deduplication
  - Data-Locality and Flash – Provides high performance
Dell XC730XD – web-scale converged appliance

### Networking

- Dell S4048-ON
- Dell S5000
- Dell S6000 (10GbE with breakout cables only)
- Dell N4000

#### Adapters
- Intel i350 + X520 dual 1G + dual 10G SFP+
- Intel X520 dual 10G SFP+
- Intel X540, 2 port 10GbE SFP+
- Intel i350 + X540 dual 1G + dual 10G Base-T
- Intel X540 dual 10G Base-T

#### Optics
- Intel branded SFP+ optics only

#### Cables
- All Dell TwinAx cables
- Standard Category 6 Ethernet cables

#### One optional 2-port 10GbE NIC

- Intel X520*
- Intel X540, 2 port 10GbE SFP+

* If using SFP+ optics, please use Intel branded optics only

#### Integrated adapter (one only)

- Intel i350 + X520*, 2 port 1GbE + 2 port 10GbE SFP+
- Intel i350 + X540, 2 port 1GbE + 2 port 10G Base-T

* If using SFP+ optics, please use Intel branded optics only

#### Utility Panel

- Two USB Type-A Ports
- Two redundant power supplies (AC, DC)

#### Management port / iDRAC

- Direct, USB 2.0 compliant Port

#### Front Panel

- 3.5 inch hard drive chassis
- 2.5 inch hard drive/SSD chassis
Dell XC630 – web-scale converged appliance

Networking

- Dell S4048-ON
- Dell S5500
- Dell S6000 (10GbE with breakout cables only)
- Dell N4000

Adapters
- Intel i350 + X520 dual 1G + dual 10G SFP+
- Intel X520 dual 10G SFP+
- Intel i350 + X540 dual 1G + dual 10G Base-T
- Intel X540 dual 10G Base-T

One optional 2-port 10GbE NIC
  - Intel X520*, 2 port 10GbE SFP+
  - Intel X540, 2 port 10G Base-T
  (Low profile or full height in any supporting slot)
  * If using SFP+ optics, please use Intel branded optics only

Optics
- Intel branded SFP+ optics only

Cables
- All Dell TwinAx cables
- Standard Category 6 Ethernet cables

Front Panel

Two USB Type-A Ports

Integrated adapter (one only)
  - Intel i350 + X520*, 2 port 1Gbe + 2 port 10GbE SFP+
  - Intel i350 + X540, 2 port 1Gbe + 2 port 10G Base-T
  * If using SFP+ optics, please use Intel branded optics only

Utility Panel

Management port / iDRAC Direct, USB 2.0 compliant Port

Two redundant power supplies (AC, DC)

2.5 inch hard drive/SSD chassis
Dell Storage FS8600

Intelligent, self-optimizing array in affordable, all-in-one form factor

- **Unifies block and file storage** on one Compellent platform
  - Shared back-end infrastructure eliminates need to carve spindles separately
  - Single platform avoids the added cost and complexity of separate solutions

- **Extends efficiency of Compellent architecture** to NAS environment
  - Data Progression lowers costs by migrating inactive data to less expensive drives
  - Dynamic Capacity enables space-efficient over allocation of NAS capacity
  - Policy-driven dedupe and compression

- **Provides customers with a scale-out NAS** solution
  - 2PB Single namespace scales non-disruptively across up to four appliances
  - Load-balancing continually optimizes performance as FS8600 system scales
FS8600 – Dell Fluid File System Appliance

Networking

- Brocade 300 (FC)
- Dell S5000 (iSCSI, FC with HBA and CNA)
- Dell S4048-ON
- Dell S4048-ON (iSCSI)
- Dell N4000 (iSCSI)

More details in Dell Storage Compatibility Matrix

Adapters for Backend connectivity
- Fibre Channel: 1x 2 port 8Gb HBA (SWL SFP+) in each controller (Direct connect to SAN is not supported)
- iSCSI: 1x 2 port 10GbE (SFP+) NIC in each controller
- iSCSI: 1x 2 port 10GbE (RJ-45) NIC in each controller

Adapters for Frontend and Interconnect connectivity
- 1GbE: 2x quad-port (RJ-45) NIC in each controller
- 10GbE: 2x dual-port 10GbE (SFP+) NIC in each controller

Utility Panel

- Serial Port (mini-USB connector)
- Two USB Type-A Ports
- VGA Port (DE-15 connector)
- Management Port (RJ45 connector)

Two redundant power supplies (AC, AC-R)

Two active-active, hot-swappable controllers
Dell EqualLogic PS6210 arrays

Higher performance for virtual and data-intensive environments

- Next-generation **10GbE arrays**

- Faster, redesigned controller unlocks the power of flash
  - 16GB of memory/controller
  - 2 active 10GbE ports
    - Either SFP+ or 10GBASE-T
    - Can auto-negotiate to 1GbE with 10GBASE-T
- **24 hot-pluggable drives**, including SSD, SAS, NL-SAS and SED (2.5” or 3.5”)
- Up to 96TB per array
- **Streamlined management** with Array Software 7.0
- New battery backup for cache-to-flash
PS6210 – Dell EqualLogic Arrays

Networking

- Dell N3000 (1GbE only)
- Dell N2000 (1GbE only)
- Dell S55/S60 (1GbE only)
- PowerConnect 8024-k
- PowerConnect 8428-k
- MXL
- Dell S5000
- Dell S4048-ON
- Dell S4820T
- Dell S6000
- Dell Z9500
- Dell N4000

More details in Dell Storage Compatibility Matrix

Front Panel

- Dell Storage Networking I/O Guide

Two redundant power supplies with integrated fans (AC)

PS6210E, PS6210XV 3.5"

Two active-standby hot-swappable controllers

Type15 Controller

Four integrated 10GbE combo ports in each controller

- iSCSI: 2x 10GbE (SFP+) ports in each controller
- iSCSI: 2x 1/10GbE (RJ-45) ports in each controller

- Either SFP+ or RJ-45 ports can be used at a time
- For optimum results, must use same media type ports on both controllers

Optical Transceivers

SFP+ 10GbE: SR

SFP+ Direct Attach Cable (Twinax)

- 0.5m, 1m, 3m, 5m, 7m copper
- 0.5m, 1m, 3m, 5m, 7m optical

RJ45 / Cat6a 10GbE Copper
(supports auto-negotiation)

Utility Panel

Management Port
10/100MbE (RJ45 connector)
- 1x in each controller

Serial Port (RS-232 connector)
- 1x in each controller

PS6210E, PS6210XV, PS6210S, PS6210XS

PS6210X, PS6210XV, PS6210S, PS6210XS
Dell EqualLogic PS61x0/PS41x0 arrays

Exceptional density and capacity with 10GbE and 1GbE throughput

- Next-generation **10GbE and 1GbE arrays** that make the most of your SAN investment
- Choose either 10GBASE-T or traditional SFP+ port on 10GbE arrays
- **Streamlined management** with Array Software 7.0
- Leverage all-inclusive software, peer scalability and ease-of-use
- Scale capacity and performance
PS6100 – Dell EqualLogic Arrays

Networking

- Dell N3000 (PS4100)
- Dell N2000 (PS4100)
- Dell S55/S60 (PS4100)
- PowerConnect 8024-k (PS4110)
- PowerConnect 8428-k (PS4110)
- MXL (PS4110)
- Dell S5000 (PS4110)
- Dell S4048-ON
- Dell S4820T (PS4110)
- Dell S6000 (PS4110)
- Dell Z9500 (PS4110)
- Dell N4000 (PS4110)

More details in Dell Storage Compatibility Matrix

Two redundant power supplies with integrated fans (AC)

Utility Panel

Management Port
10/100Mbe (RJ45 connector)
- 1x in each controller

Serial Port (RS-232 connector)
- 1x in each controller

Type 11 Controller

- Two active-standby hot-swappable controllers
- Same controller is used in all models of PS6100 arrays

Type 14 Controller

- Two active-standby hot-swappable controllers
- Same controller is used in all models of PS6110 arrays

Two integrated 10GbE combo ports in each controller
- iSCSI: 1x 10GbE (SFP+ connector) ports in each controller
- iSCSI: 1x 10GbE (RJ-45 connector) ports in each controller

- Either SFP+ or RJ-45 ports can be used at a time
- For optimum results, must use same media type ports on both controllers

Optical Transceivers
SFP+ 10GbE: SR

SFP+ Direct Attach Cable (Twinax)
- 0.5m, 1m, 3m, 5m, 7m copper
- 0.5m, 1m, 3m, 5m, 7m optical

RJ45 / Cat6a 10GbE Copper
**PS41x0 – Dell EqualLogic Arrays**

**Networking**

- Dell N3000 (PS4100)
- Dell N2000 (PS4100)
- Dell S55/S60 (PS4100)
- PowerConnect 8024-k (PS4110)
- PowerConnect 8428-k (PS4110)
- MXL (PS4110)
- Dell S5000 (PS4110)
- Dell S4048-ON (PS4110)
- Dell S4820T (PS4110)
- Dell S6000 (PS4110)
- Dell Z9500 (PS4110)
- Dell N4000 (PS4110)

More details in Dell Storage Compatibility Matrix

**Front Panel**

- PS41x0E, PS41x0X, PS41x0XV, PS41x0XV 3.5"

**Utility Panel**

- Two integrated 1000BASE-T ports in each controller
  - iSCSI: 2x 1GbE (RJ-45 connector) ports in each controller

- Serial Port (RS-232)
  - 1x in each controller

- Management Port
  - 10/100MbR (RJ-45 connector)
  - 1x in each controller

- Two integrated 10GBE combo ports in each controller
  - iSCSI: 1x 10GbE (SFP+ connector) ports in each controller
  - iSCSI: 1x 10GbE (RJ-45 connector) ports in each controller
  - Either SFP+ or RJ-45 ports can be used at a time
  - For optimum results, must use same media type ports on both controllers
  - Operates at 10GbE only.

**Optical Transceivers**

- SFP+ 10GbE: SR
  - SFP+ Direct Attach Cable (Twinax)
    - 0.5m, 1m, 3m, 5m, 7m copper
    - 0.5m, 1m, 3m, 5m, 7m optical

- RJ45 / Cat6a 10GbE Copper
Dell EqualLogic PS6510/6500 arrays

Consolidate multiple workloads within a single, powerful array

- **Highly available and** reliable storage for capacity-demanding deployments
- Virtualized scale-out architecture, ideal for server virtualization and storage consolidation
- Increased throughput performance from **10GbE technology** on the PS6510
- Robust backup and recovery through application integration and automation
- Scalable, **self-managing storage** that grows your business
- Enhanced security with Self-Encrypting Drives (SEDS)
- **Streamlined management** with Array Software 7.0
PS65x0 – Dell EqualLogic Arrays

Networking

- MXL (PS6510)
- PowerConnect 8024-k (PS6510)
- PowerConnect 8248-k (PS6510)
- Dell N3000 (PS6500)
- Dell N2000 (PS6500)
- Dell S55/S60 (PS6500)
- Dell S5000 (PS6510)
- Dell S4048-ON (PS6510)
- Dell S4820T (PS6510)
- Dell S6000 (PS6510)
- Dell Z9500 (PS6510)

More details in Dell Storage Compatibility Matrix

Three power supplies with integrated fans (AC)
- 2 are required for normal operation

Utility Panel

PS6500E, PS6500X, PS6500ES

Serial Port (RS-232 connector)
- 1x in each controller

Management Port (RJ45 connector)
- 1x in each controller

Four integrated 1000BASE-T ports in each controller
- iSCSI: 4x 1GbE (RJ-45 connector) ports in each controller

Two active-standby hot-swappable controllers
- Same controller is used in all models of PS6500 arrays

Two active-standby hot-swappable controllers
- Same controller is used in all models of PS6510 arrays

Type 7 Controller

Type 10 Controller

Two integrated 10GbE ports in each controller
- iSCSI: 2x 10GbE (SFP+ connector) ports in each controller
- Operates at 10GbE only

Optical Transceivers
SFP+ 10GbE: SR

SFP+ Direct Attach Cable (Twinax)
- 0.5m, 1m, 3m, 5m, 7m copper
- 0.5m, 1m, 3m, 5m, 7m optical

RJ45 / Cat6a 10GbE Copper

Front Panel

PS6500E, PS6500X, PS6500ES, PS6510E, PS6510X, PS6510ES
Dell EqualLogic FS76x0 NAS Appliances

Scale-out unified storage

- Consolidates application servers and Windows/Linux file servers on a single unified storage platform
- Enables file storage via CIFS/NFS protocols in addition to iSCSI block storage via PS Series arrays
- Expands as your needs grow: scale capacity and/or performance without disruption
- Provides management interface to manage file and block storage
- Utilizes 1GbE and 10GbE connectivity
- Offers deduplication and compression with FluidFS v3, reducing the capacity required for common data by 48%*
- Growing ecosystem of third-party certifications
FS76x0 – Dell Fluid File System Appliance

Networking

Frontend connectivity
- 2x 10GbE (SFP+ connector) ports in each controller

Backend connectivity
- iSCSI: 2x 10GbE (SFP+ connector) ports in each controller (Direct connect to SAN is not supported)

Frontend connectivity
- 4x 1GbE (RJ-45 connector) ports in each controller

Backend connectivity
- iSCSI: 4x 1GbE (RJ-45 connector) ports in each controller (Direct connect to SAN is not supported)

Networking

- Dell S4048-ON (FS7610)
- Dell S4820T (FS7610)
- Dell N4000 (FS7610)
- Dell S3048-ON (FS7600)
- Dell N3000 (FS7600)
- Dell S3048-ON (iSCSI)
- Dell S3100 (iSCSI)

More details in Dell Storage Compatibility Matrix

Utility Panel

Management Port (RJ45 connector)

VGA Port (DE-15 connector)

Two USB Type-A Ports

Serial Port (mini-USB connector)

Two redundant power supplies (AC)

Two active-active hot-swappable controllers
- 3x PCIe slots each, ships with 2x cards

Front Panel

Two active-active hot-swappable controllers
- 3x PCIe slots each, ships with 2x cards

Networking

Backend connectivity
- 4x 1GbE (RJ-45 connector) ports in each controller (Direct connect to SAN is not supported)

Utility Panel

Management Port (RJ45 connector)

VGA Port (DE-15 connector)

Two USB Type-A Ports

Serial Port (mini-USB connector)

Front Panel

Two redundant power supplies (AC)

Networking

Frontend connectivity
- 2x 10GbE (SFP+ connector) ports in each controller

Backend connectivity
- iSCSI: 2x 10GbE (SFP+ connector) ports in each controller (Direct connect to SAN is not supported)

Networking

- Dell S4048-ON (FS7610)
- Dell S4820T (FS7610)
- Dell N4000 (FS7610)
- Dell S3048-ON (FS7600)
- Dell N3000 (FS7600)
- Dell S3048-ON (iSCSI)
- Dell S3100 (iSCSI)

Front Panel

Two active-active hot-swappable controllers
- 3x PCIe slots each, ships with 2x cards

Networking

Utility Panel

Management Port (RJ45 connector)

VGA Port (DE-15 connector)

Two USB Type-A Ports

Serial Port (mini-USB connector)

Front Panel

Two redundant power supplies (AC)
Dell PowerVault MD3 storage arrays

Delivering the latest technology

• Affordable storage
  • Modular design allows for flexible and custom design with sacrificing performance
  • Designed to scale as your business grows
  • Enterprise-class capabilities

• Reliable data protection
  • Proven track record of reliable storage
  • Dynamic Disk Pools provides a simple option to standard RAID configuration
  • Premium features offer software and firmware data protection options

• Versatile options
  • Choose what you want, when you want it
  • Non-disruptively scale to meet application demands
  • Software licenses that you can try for 90 days before you purchase
MD32xx/36xx 2U – Dell PowerVault Arrays

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Dell 8/4Gbps FC Pass through (FC)
- Dell S5000 (FC)

More details in Dell Storage Compatibility Matrix

- Two power supplies with integrated fans (AC)
  - 2 are required for normal operation

- Front Panel

- Utility Panel

MD3200, MD3200i, MD3400, MD3600i, MD3600f, MD3800i, MD3800f

MD3220, MD3220i, MD3620i, MD3620f

MD3600i, MD3620i

MD3600f, MD3620f

4x 1GbE RJ-45 ports (iSCSI) for host connectivity
1x 6Gb SAS for drive enclosure expansion
1x 10/100MbE Management port (RJ-45)
1x serial port (PS/2)

4x 6Gb SAS ports for host connectivity
1x 6Gb SAS for drive enclosure expansion
1x 10/100MbE Management port (RJ-45)
1x serial port (PS/2)

4x 8Gb ports (FC) for host connectivity
1x 6Gb SAS for drive enclosure expansion
1x 10/100MbE Management port (RJ-45)
1x serial port (PS/2)

Two active-active controllers
MD34xx/38xx 2U – Dell PowerVault Arrays

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Dell 8/4Gbps FC Pass through (FC)
- Dell S5000 (FC)

More details in Dell Storage Compatibility Matrix

Two active-active controllers

- 2 are required for normal operation

Utility Panel

Front Panel

MD3200, MD3200i, MD3600i, MD3600f, MD3400, MD3800i, MD3800f

MD3220, MD3220i, MD3620i, MD3620f, MD3420, MD3820i, MD3820f

Networking Details:

- 4x 12Gb SAS ports for host connectivity
- 2x 12Gb SAS ports for drive enclosure expansion
- 1x 100/1000MbE Management port (RJ-45)
- 1x serial port (PS/2)
- Reserved ports

MD3400, MD3420

- 2x 10GbE RJ-45 ports (iSCSI) for host connectivity
- 2x 12Gb SAS ports for drive enclosure expansion
- 1x 100/1000MbE Management port (RJ-45)
- 1x serial port (PS/2)
- Reserved ports
- 2x 12Gb SAS ports for host connectivity

MD3800i, MD3820i

- 4x 16Gb ports (FC) for host connectivity
- 2x 12Gb SAS for drive enclosure expansion
- 1x 10/100 Management port (RJ-45)
- 1x serial port (PS/2)
- Reserved ports
- 2x 12Gb SAS ports for host connectivity

MD3800f, MD3820f

Networking Details:

MD3200, MD3200i, MD3600i, MD3600f, MD3400, MD3800i, MD3800f

MD3220, MD3220i, MD3620i, MD3620f, MD3420, MD3820i, MD3820f

MD3200, MD3200i, MD3600i, MD3600f, MD3400, MD3800i, MD3800f

MD3220, MD3220i, MD3620i, MD3620f, MD3420, MD3820i, MD3820f

MD3200, MD3200i, MD3600i, MD3600f, MD3400, MD3800i, MD3800f

MD3220, MD3220i, MD3620i, MD3620f, MD3420, MD3820i, MD3820f
MD34xx/38xx 4U – Dell PowerVault Arrays

**Networking**

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Dell 8/4Gbps FC Pass through (FC)
- Dell S5000 (FC)

**More details in Dell Storage Compatibility Matrix**

- **MD3400, MD3420**
  - 4x 12Gb SAS ports for host connectivity
  - 2x 12Gb SAS ports for drive enclosure expansion
  - 1x 100/1000MbE Management port (RJ-45)
  - 1x serial port (PS/2)
  - Reserved ports

- **MD3800i, MD3820i**
  - 2x 10GbE RJ-45 ports (iSCSI) for host connectivity
  - 2x 12Gb SAS ports for drive enclosure expansion
  - 1x 100/1000MbE Management port (RJ-45)
  - 1x serial port (PS/2)
  - Reserved ports
  - 2x 12Gb SAS ports for host connectivity

- **MD3800f, MD3820f**
  - 4x 16Gb ports (FC) for host connectivity
  - 2x 12Gb SAS for drive enclosure expansion
  - 1x 10/100 Management port (RJ-45)
  - 1x serial port (PS/2)
  - Reserved ports
  - 2x 12Gb SAS ports for host connectivity

- **MD3460, MD3860i, MD3860f**
  - Two redundant power supplies
  - Two active-active controllers
  - Two fan modules

- Front Panel
- Utility Panel

- Two redundant power supplies
- Two active-active controllers
- Two fan modules

- More details in Dell Storage Compatibility Matrix
MD32xx/36xx 4U – Dell PowerVault Arrays

Networking

- Brocade 300 (FC)
- Brocade 6505 (FC)
- Brocade 6510 (FC)
- Brocade 6520 (FC)
- Brocade 8510 (FC)
- Brocade M5424 (FC)
- Brocade M6505 (FC)
- Dell 8/4Gbps FC Pass through (FC)
- Dell S5000 (FC)

More details in Dell Storage Compatibility Matrix

- 4x 6Gb SAS ports for host connectivity
- 1x 6Gb SAS ports for drive enclosure expansion
- 1x 10/100/1000MbE Management port (RJ-45)
- 1x serial port (PS/2)

MD3260

- 2x 10GbE RJ-45 ports (iSCSI) for host connectivity
- 1x 6Gb SAS ports for drive enclosure expansion
- 1x 100/1000MbE Management port (RJ-45)
- 1x serial port (PS/2)

MD3260i

- 4x 8Gb ports (FC) for host connectivity
- 1x 6Gb SAS for drive enclosure expansion
- 1x 10/100 Management port (RJ-45)
- 1x serial port (PS/2)

MD3660f

MD3260, MD3260i, MD3660i, MD3660f
Dell Storage Networking I/O Interoperability guide
## Dell Storage Networking I/O Interoperability

<table>
<thead>
<tr>
<th>Connectivity Type</th>
<th>Product</th>
<th>PowerVault MD3</th>
<th>Compellent</th>
<th>EqualLogic</th>
<th>Dell File Sharing Appliances</th>
<th>Dell FluidCache</th>
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# Dell Storage Networking I/O Interoperability

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<tr>
<th>Dell Block Storage Arrays</th>
<th>Dell File Sharing Appliances</th>
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<tr>
<td><strong>Connectivity Type</strong></td>
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<tr>
<td>16Gbps FC</td>
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<td>6505</td>
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<td>6510</td>
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<td>8510</td>
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<tr>
<td>8Gbps FC</td>
<td>S5000</td>
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<td>M5424</td>
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<td></td>
<td>MXL (FC FlexIO)</td>
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<td>IOA (FC FlexIO)</td>
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<td>MB428-k</td>
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<td>300</td>
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<td>8Gbps FC (NPIV Proxy Gateway)</td>
<td>S5000</td>
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<td>IOA (FC FlexIO)</td>
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<tr>
<td></td>
<td>FN-IOM</td>
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</table>

**Notes:**
1. NPIV Proxy Gateway (NPG) test and validation is performed by Dell Networking. Dell Storage certification is only applicable to directly connected switches. Since NPG switches typically do not connect to storage arrays directly (there must be a fabric switch between NPG switches and storage array), direct certification of NPG is not mandatory for storage arrays. As long as NPG switch and storage array are certified with the fabric switch, the fabric will be supported.

**Dell Storage (Compellent and EqualLogic) Compatibility Matrix**

**Supported:** Certified by Dell storage or Dell networking (in the case of NPIV Proxy Gateways)

**N/A:** The combination is not possible

**NCV:** Not a commercially viable solution

**Empty cells:** Valid connectivity option but not tested

**Dell Storage Networking Switches**

**Notes:**
1. NPIV Proxy Gateway (NPG) test and validation is performed by Dell Networking. Dell Storage certification is only applicable to directly connected switches. Since NPG switches typically do not connect to storage arrays directly (there must be a fabric switch between NPG switches and storage array), direct certification of NPG is not mandatory for storage arrays. As long as NPG switch and storage array are certified with the fabric switch, the fabric will be supported.

**Dell Storage (Compellent and EqualLogic) Compatibility Matrix**
Deployment and Technical Guides

For Additional Information

Visit: Dell.com/TechCenter/StorageNetworking
Dell Services - Enterprise Storage Networking
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<th>ProSupport Plus</th>
<th>ProSupport Flex for Data Center</th>
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<tr>
<td>Technical support through tools, online, chat and phone</td>
<td>9x5</td>
<td>24x7</td>
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<tr>
<td>Service delivery for hardware repair</td>
<td>Next Business Day</td>
<td>Next Business Day or Mission Critical</td>
<td>Next Business Day or Mission Critical</td>
<td>Flexible</td>
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<tr>
<td>Self-service case management &amp; parts dispatch through TechDirect</td>
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<td>✔</td>
<td>✔</td>
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<td>Remote monitoring by SupportAssist</td>
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<td>✔</td>
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<tr>
<td>Automated issue detection and notification by SupportAssist</td>
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<td>Dispatch monitoring and crisis management</td>
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<td>Support for up to 7 years</td>
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<tr>
<td>Automated case creation for issue resolution by SupportAssist</td>
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<td>Case Management API for helpdesk integration</td>
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<td>Direct access to elite ProSupport Plus &amp; ProSupport Flex engineers</td>
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ProDeploy Enterprise Suite
Get more out of technology starting on day one

**Basic Deployment**
- Expert deployment technicians
- Onsite rack, stack cable and label
- Packaging material disposal
- Consistent hardware installation

**ProDeploy**
- Single point of project management
- Install and configure system software
- Implementation planning
- Site readiness review

**ProDeploy Plus**
- Tool driven environment mapping
- Multivendor integration for networking
- Storage data migration recommendation
- 30-days of post-deployment configuration assistance

**Training and Certification**
- Dell Deployment training
- Recognition with online badge
- Industry recognized 3rd party Deployment Certification

---

**Experts**

**Insights**

**Ease**
# ProDeploy Enterprise Suite feature comparison

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<th>Basic Deployment</th>
<th>ProDeploy</th>
<th>ProDeploy Plus</th>
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<td>Site readiness review</td>
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<td>Implementation planning</td>
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<td>Technical Account Manager engagement for ProSupport Plus entitlement</td>
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<td>Deployment service hours</td>
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<td>Install and configure operating system, firmware, and hypervisor</td>
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<td>Data migration analysis and recommendation for storage</td>
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<td>Multivendor integration testing for networking</td>
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<td>Project documentation with knowledge transfer</td>
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## ProDeploy Suite product availability

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## Storage Networking
### Training and certification learning paths

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<th>PS Series</th>
<th>Networking</th>
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<tr>
<td><strong>Recommended core courses</strong>&lt;sup&gt;*&lt;/sup&gt;</td>
<td><strong>Recommended core courses</strong>&lt;sup&gt;*&lt;/sup&gt;</td>
<td><strong>Recommended core courses</strong>&lt;sup&gt;*&lt;/sup&gt;</td>
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<tr>
<td>Dell SC Series Installation&lt;sup&gt;1&lt;/sup&gt; (ILT 4 days + 6 hrs online)</td>
<td>Dell PS Series Installation (VILT 3 days + 4 hrs online)</td>
<td>Dell Networking Installation and Configuration (VILT 5 days)</td>
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<tr>
<td>Dell SC Series Planning (VILT ½ day + 9 hrs online)</td>
<td>Dell PS Series Planning (VILT ½ day + 9 hrs online)</td>
<td>Dell Networking Planning (VILT 3 days)</td>
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<td><strong>Required exam</strong></td>
<td><strong>Required exam</strong></td>
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<tr>
<td>Dell SC Series Storage Professional Deployment exam</td>
<td>Dell PS Series Storage Professional Deployment exam</td>
<td>Dell Networking Professional Deployment exam</td>
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</tbody>
</table>

* Recommended core courses are not required.
1- Dell SC Series course only available as instructor-led training in the following locations: Edina, MN; Panama; Bracknell, England; and Singapore. All other courses are delivered as virtual instructor-led training.
Feedback

We encourage readers of this publication to provide feedback on the quality and usefulness of this information by sending an email to:

- Storagenetworking@dell.com
- Saleem Muhammad (Saleem_Muhammad@dell.com)