Build cost-efficient HPC networking at any scale with Dell Networking H-Series Fabric

The Dell difference

Dell helps you choose the networking products and services that best fit your HPC needs and deliver on speed-to-value:

• Scale quickly and efficiently to meet growing user and business demands
• Maximize your HPC investment, from financing to configuration, installation, cluster management, and recycling
• Leverage plug and play building blocks to grow capacity, capability as needed

Today’s rapid advances in processor and storage performance provide new opportunities for every organization that relies on high performance computing (HPC). Yet an HPC cluster is only as powerful as its weakest link. Compute, storage, and networking resources must be balanced to avoid bottlenecks that reduce performance and efficiency of the entire cluster. Dell Networking H-Series Fabric, based on Intel’s® Omni-Path Architecture, is purpose-built for HPC, delivering more networking bandwidth, lower end-to-end latency, higher message rates and better fabric resiliency, while reducing capital and operational costs.

Barriers to growth in high performance computing

As HPC requirements continue to grow, organizations across almost every scientific and engineering discipline want faster access to high quality results. Meeting these needs requires new HPC solutions that are not only more powerful and scalable, but also more cost-effective so organizations can harness more computing power without over-extending their budgets.

Rising core counts and increased use of accelerators and co-processors help address these challenges by delivering greater compute density at lower cost and with lower power consumption. However, advances in core density and compute performance need to be balanced by complementary improvements in memory, I/O, fabric and storage performance.

Build networking fabric engineered for HPC performance at any scale

Dell Networking H-Series Fabric can overcome these barriers by providing organizations with a comprehensive fabric solution that includes host adapters, edge and director class switches, cabling and complete software and management tools.

This end-to-end fabric solution delivers 100 GB/s port bandwidth, while providing low latency that stays low even at extreme scale. Optimized packet protocols, dynamic traffic shaping, and advanced quality of service (QoS) deliver efficient support for diverse traffic types, with high throughput, high packet integrity, and low, deterministic latency for critical MPI messaging.
Optimized protocols provide low latency that stays low even at extreme scale. These optimizations also provide fast and efficient file system throughput, high packet reliability, and low deterministic latency for high priority communications. Advanced software features extend these advantages to deliver even higher levels of performance, scalability, and resiliency.

Dell Networking H-Series Fabric provides a number of benefits:

- **Low latency and high efficiency.** Connection address information is maintained in-host memory so all inbound packets “hit” and can be processed with deterministic latency. Adapter cache misses are eliminated and routing pathways can be optimized during runtime to make better use of fabric resources.

- **Excellent performance scaling.** Packet throughput scales with the number of cores in the host system, which will allow fabric performance to improve automatically as core densities increase in future Intel® Xeon™ processors and Intel® Xeon Phi™ coprocessors.

- **High performance, reliable, and cost-effective host fabric interface.** Reduce bottlenecks and maximize performance at full 100 Gb/s line rate with advanced quality-of-service features for more efficient wire transfer. Dell Networking H-Series switches can make extremely granular switching decisions to optimize latency, throughput and resiliency for all traffic types.

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### Intel Omni-Path Fabric’s 48 Radix Chip

It’s more than just a 33% increase in port count over a traditional 36 Radix chip.

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<table>
<thead>
<tr>
<th>Feature</th>
<th>Intel True Scale Fabric</th>
<th>Intel Omni-Path Architecture</th>
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</thead>
<tbody>
<tr>
<td>Speed and throughput</td>
<td></td>
<td></td>
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<tr>
<td>Link bandwidth (lane bandwidth)</td>
<td>40/Gb/s (10 Gb/s)</td>
<td>100 Gb/s (25 Gb/s)</td>
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<tr>
<td>Port latency</td>
<td>140 ns</td>
<td>100-110 ns</td>
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<tr>
<td>Message rate (per port)</td>
<td>40M pp/s</td>
<td>195M pp/s</td>
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Architectural enhancements

| Edge switch size         | 18/36                   | 24/48                       |
| Director port counts     | 72/216/384/648          | 192/768                     |
| Switch leaf size         | 18                      | 32                          |
| Max compute nodes with 5-hop fabric | 11,664                | 27,628                      |
| MTU size                 | Up to 4K                | Up to 10K                   |

Intel Omni-Path Architecture’s 48 Radix Chip provides an increase of 33% in port count over a traditional 36 Radix chip.
Build your Omni-Path-based HPC system with confidence. We provide complete end-to-end HPC systems featuring tested and validated hardware, networking, software and services that help you optimize system efficiencies to improve total cost of ownership, and enable a cost-effective path for future growth.

Services can be provided by Dell or by Dell partners who have expertise in high performance computing and industry verticals, and who can supplement their services with additional services and support from Dell.

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3. Rack space based on Mellanox CS7500 Director Switch (28U, 648 ports) and Mellanox SB7700/SB7790 Edge switch (1U, 36 ports) product briefs posted on [www.mellanox.com](http://www.mellanox.com) as of November 1, 2015. Intel® OPA Edge Switch 100 Series and Intel® OPA Director Class Switch 100 Series product briefs posted on [www.intel.com](http://www.intel.com), November 2015.

4. Latency data based on Mellanox CS7500 Director Switch (sub-500ns) and Mellanox SB7700/SB7790 Edge switch (90ns) product briefs posted on [www.mellanox.com](http://www.mellanox.com) as of November 1, 2015. Intel® OPA Edge Switch 100 Series and Intel® OPA Director Class Switch 100 Series product briefs posted on [www.intel.com](http://www.intel.com), November 2015.

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For more information on Dell HPC Solutions, visit [http://www.Dell.com/hpc](http://www.Dell.com/hpc) and [www.HPCatDell.com](http://www.HPCatDell.com) (Dell Tech Center)