

DELL EMC NETWORKING H-SERIES OMNI-PATH FABRIC FOR HPC DIGITAL MANUFACTURING



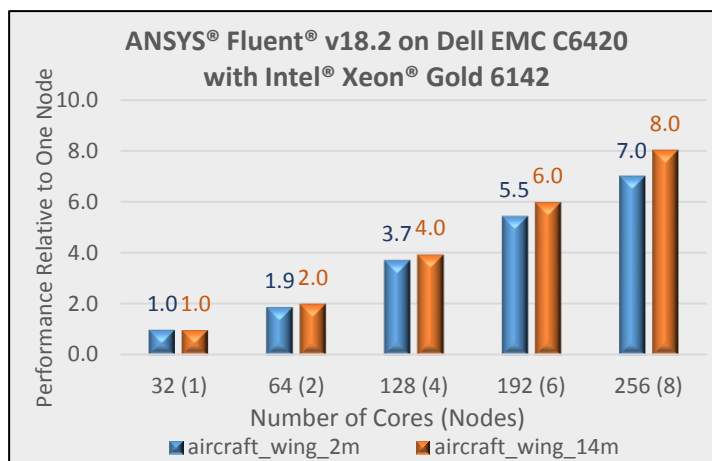
Today's rapid advances in processor and storage performance provide new opportunities for organizations to better integrate high performance computing (HPC) into their mainstream digital manufacturing environments. Exploitation of HPC for virtual product development within the digital manufacturing realm is a critical marketplace differentiator in the ever more complex globalized marketplace, where quickly introducing products to the marketplace is a key for success. 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 of the entire cluster. Dell H-series Networking 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.

The Dell EMC difference

Dell EMC delivers the networking products and services which best fit customer's HPC needs and deliver speed-to-value:

- Scale quickly and efficiently to meet growing user and business demands
- Leverage a building block approach to grow capacity as needed
- Maximizes HPC investment, such as financing, configuration, installation, cluster management, and recycling

Growing High Performance Computing



As HPC requirements continue to grow, meeting these needs requires new solutions that are not only more powerful and scalable, but also more cost-effective, enabling organizations to harness more computing power without over-extending their budgets.

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

Dell EMC Omni-Path Solutions Built for Any Scale

Dell EMC H-Series Networking Fabric can enhance HPC environments by providing organizations with a comprehensive fabric solution. This powerful solution includes host fabric adapters, edge and director class switches, cabling, and open source software management tools.



This end-to-end fabric solution delivers 100Gbps 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 outstanding and efficient support for diverse traffic types, with high throughput, high packet integrity, and low, deterministic latency for critical MPI messaging.

These optimizations also provide fast and efficient file system throughput, high packet reliability, and low deterministic latency for high priority communications. Advanced traffic shaping features extend these advantages to deliver even greater levels of performance, scalability, and resiliency.

Dell EMC Networking H-Series Fabric Provides Multiple 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.

Simpler, more cost-effective host fabric interface (HFIs). Shifting compute-intensive elements of the workload to the host processors reduces HFI processing and power requirements. Designs are simpler, the potential for bottlenecks is reduced, and the need for packet processing firmware is eliminated.

OpenFabrics Alliance (OFA)-compliant. The vast majority of open source, OFA-compliant software should work with no major code changes required. Open Fabrics Enterprise Distribution (OFED) is the open source software that has been created based on the Open Fabrics Alliance specifications and is the interface that most HPC Independent Software Vendors (ISVs) use to enable their applications to run in a switched fabric environment. Intel Omni-Path Architecture was built to leverage the OFED software, thus enabling the ecosystem of InfiniBand-based software to easily run on a cluster using Intel Omni-Path Fabric without recoding. This helps minimize transition risks and costs, making it easier to adapt, innovate, and control infrastructure.

Intel® Fabric Suite Overview. The Intel® Fabric Suite software provides comprehensive control of administrative functions using a mature Fabric Manager software. With advanced routing algorithms, powerful diagnostic tools, and failover capabilities. The Fabric Manager simplifies subnet, fabric, and individual component management, easing the deployment and optimization of large fabrics. This powerful software suite is included with Dell EMC Omni-Path switches.

Key Features of the Intel® Fabric Suite:

- Designed and optimized for large fabric support
- Integrated with both Adaptive and Dispersive Routing systems
- Congestion control architecture (CCA)
- Virtual Fabrics provides both QoS and Security features
- Robust failover of subnet management
- Path/route management
- Fabric/chassis management
- Fabric initialization in seconds
- Performance and fabric error monitoring
- Support for advanced Intel® OPA resiliency, security, scalability, and diagnostic features

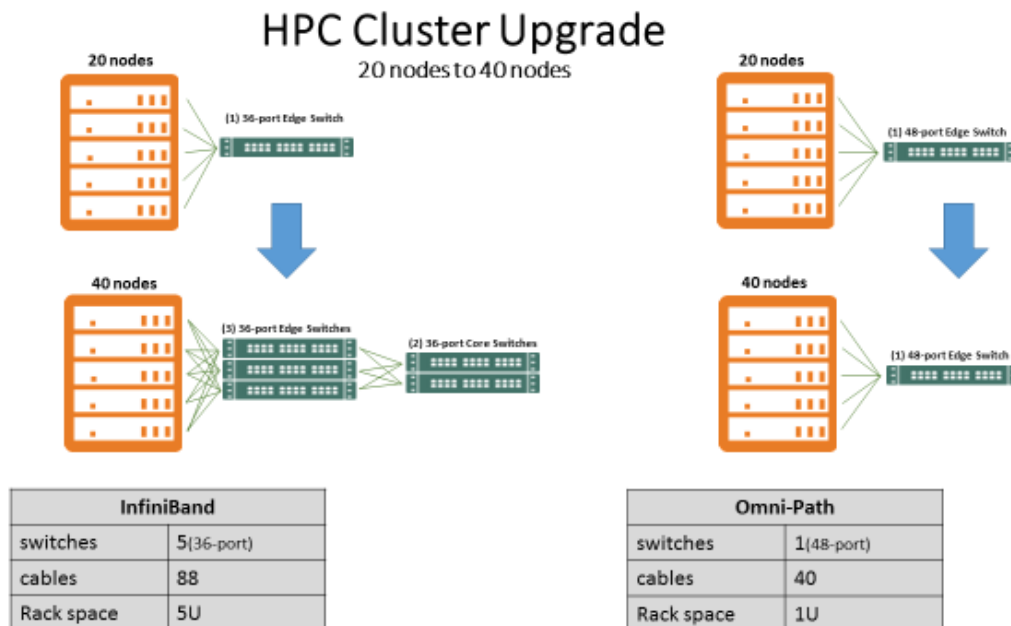
Dell EMC Omni-Path Solutions Built for Any Scale

Intel® continues to drive all aspect of HPC with its comprehensive and integrated solutions from Intel® Xeon® Scalable Processors, Intel® Xeon Phi™ Processors, memory, solid state storage, network, and software technologies. To this end, Intel is working with system technology providers, such as Dell EMC, and leading digital manufacturing ISVs to ensure optimal overall system performance.

“ANSYS works closely with Intel and Dell EMC to ensure that its applications are optimized and validated on Dell EMC Networking H Series switches based on Intel® Omni-Path Architecture to deliver outstanding performance and value to HPC customers relying on ANSYS software”
– Dr. Wim Slagter, director of HPC and cloud alliances, ANSYS

Get more system performance for your HPC budget

With the Dell EMC high performance networking fabric, you can build better networks for less, saving space and budget. This allows you to reduce power and cooling costs, and reduce equipment sprawl without oversubscription as systems are scaled out. The high port densities of the silicon that enables this end-to-end HPC fabric solution help to drive down the cost of deploying and scaling HPC fabric. These cost savings are much needed, since fabric infrastructure can account for as much as 20 to 40 percent of total cluster costs.ⁱⁱ By integrating Dell H-Series Networking Fabric into an HPC system, investments can be shifted to purchase more compute power and achieve higher over-all cluster performance. While the benefit of Omni-Path network fabrics for reducing the complexity with large cluster is intrinsic, it is also beneficial for building and expanding a modest sized cluster. As an example, a client wishing to double the size of their 20-node cluster would require substantially less additional new networking hardware.



Get more system performance for your HPC budget

Build your Omni-Path-based HPC system with confidence. Dell EMC provides 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 delivered 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.

For more information on Dell HPC Solutions, visit <http://www.dell.com/hpc>; www.HPCatDell.com (Dell Tech Center); and <http://www.ansys.com/about-ansys/partner-ecosystem/high-performance-computing-partners/dell> (ANSYS partner page)

i. Low latency at scale based on preliminary simulations for Intel® Omni-Path Host Fabric Interface (HFI) and switches, which utilize the same connectionless messaging implementation as Intel® True Scale. See the following Intel® True Scale white paper for more details: <http://www.intel.com/content/dam/www/public/us/en/documents/white-papers/true-scale-architecture-three-labs-white-paper.pdf>. Messaging rate based on Intel simulations using Intel® Xeon® processors populated with Intel® Omni-Path Architecture Adapters, connected with Intel® Omni-Path Architecture Switch products, compared to a comparable configuration utilizing shipping Intel® True Scale Fabric adapters and switches.

ii. Intel internal analysis based on a 256-node to 2048-node clusters configured with Mellanox FDR and EDR InfiniBand products. Mellanox component pricing from www.kernelsoftware.com Prices as of Nov. 3, 2015. Compute node pricing based on Dell PowerEdge™ R730 server from www.dell.com. Prices as of May 26, 2015. Intel® OPA (x8) utilizes a 2-1 over-subscribed Fabric. Intel® OPA pricing based on estimated reseller pricing using Intel MSRP pricing on ark.intel.com as of November 2015.

 [Learn more](#) about Dell H-Series Omni-Path Fabric For HPC Digital Manufacturing EMC Ready Bundles
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