MEGWARE HPC Clusters, an Intel® Select Solution for Simulation and Modeling

Leverage MEGWARE's Decades of Experience and Deep Expertise in High Performance Computing to Build your Next-Generation Cluster for Simulation and Modeling Applications

Simulation and modeling applications, such as computer-aided engineering (CAE) and computational fluid dynamics (CFD), are designed to run on scalable, high-performance clusters. To support those applications at scale, modern high-performance computing (HPC) systems require multi-core processors, high-bandwidth fabrics, and broad input/output (I/O) capabilities.

Because of the complexity and variety of technologies available on the market, assembling an HPC system can be time-consuming, requiring additional effort for research, evaluation, and deployment. In addition, integration and configuration of selected components can impact the performance of the solution. The level of expertise required to properly configure the combined solution can intimidate small and medium organizations. Even larger enterprises considering the benefits of HPC clusters must weigh the time and effort it takes to ramp up capabilities. These barriers slow down adoption of HPC clusters even though the return on the investment (ROI) can be significant.

MEGWARE HPC Simulation and Modeling Solution accelerates the process of defining and deploying an HPC cluster for these advanced applications. Benefits include:

- Performance-optimized for highly scalable simulation and modeling applications that use Message Passing Interface (MPI) libraries.
- Reduces the time required to evaluate, select, purchase, deploy, configure, and support a workload-appropriate solution.
- Improves delivery and uptime through simplified deployment and advanced diagnostics tools.
- Compatible with other HPC applications listed in the Intel® Scalable System Framework (Intel® SSF) application catalog.

MEGWARE – A Trusted Intel Partner

MEGWARE, known across Europe for its turn-key HPC solutions, has been building computing systems for customers since the 1990s. MEGWARE engineers design, configure, and install systems in close collaboration with customers to fully satisfy their specific demands for optimized HPC performance.

MEGWARE plans, designs, delivers, and installs entire cluster solutions—racks, servers, PDUs, network equipment, storage as well as software. MEGWARE brings long-standing expertise to customers from academia to industrial clients who want to have a full-service package, including premium level support over multiple years.

In addition to design, building, and installing custom systems, MEGWARE offers its own hardware and software components for optimized HPC performance and management, such as MEGWARE ColdCon® cooling technology, SlideSX® server chassis, and ClustWare® management software, plus other products. These technologies can complement the overall HPC cluster management and operation.

Simplify and Accelerate Building of Simulation and Modeling Clusters

MEGWARE's typical configuration for its Intel® Select Solution for Simulation and Modeling provides a fast path for purchasing and deploying a cluster for advanced MPI workloads. MEGWARE's configuration consists of a pre-validated selection of components designed to meet the demands of HPC applications and workflows. Their design provides the capabilities and agility needed to support a range of different workloads and reduce or eliminate the need for multiple single-purpose systems. In addition, the performance of key system characteristics is verified for an Intel® Select Solution for Simulation and Modeling at both the node and cluster level.

Choosing MEGWARE HPC Simulation and Modeling Solution takes the guesswork out of buying and deploying a cluster, and it puts the focus squarely where it needs to be: on using the cluster for higher productivity and better performance.

Inside the MEGWARE Solution

The MEGWARE HPC Simulation and Modeling Solution comprises several key hardware and software components: Intel® Xeon® Scalable processors, the Intel® Omni-Path Architecture (Intel® OPA) HPC fabric, and other Intel® technologies that benefit HPC applications. Component choices deliver optimized performance for MPI-based simulation and modeling applications. Supportability is also addressed with the inclusion of Intel® Cluster Checker, which provides expert systems advice for administrators to use in keeping a cluster functioning.

Compute

The MEGWARE HPC Simulation and Modeling Solution configuration uses the Intel® Xeon® Gold 6148 processor (or a higher number Intel® Xeon® processor). Intel® Xeon® Gold 6148 processors offer 20 cores to deliver exceptional performance for compute and data-intensive workloads. Optionally, Intel® Xeon® Platinum processors—with up to 28 cores—can be used to meet the most challenging compute needs.[1]

Intel® Xeon® Scalable processors feature significant enhancements that benefit HPC applications, including improvements in I/O, memory, fabric integration, and Intel® Advanced Vector Instructions 512 (Intel® AVX-512).

Fabric

Intel OPA provides 100 gigabits per second (Gbps) bandwidth and a low-latency, next-generation fabric for HPC clusters. The 48-port switch chip delivers a 33 percent increase in density over the traditional 36-port switch ASIC historically used for InfiniBand* networking, which reduces the number of required switches. Intel OPA also reduces cabling-related costs, power consumption, space requirements, and ongoing system maintenance requirements. These advancements can lower fabric costs by up to 61 percent.[2]

Select Solution Configuration

Hardware Configuration

Table 1 lists the basic hardware of the MEGWARE HPC Simulation and Modeling Solution.

Technology Selections

In addition to the Intel® Xeon® processor-based hardware foundation and Intel OPA, other technologies provide further performance gains:

Intel AVX-512: Boosts performance for the most demanding computational workloads, with up to double the number of floating point operations per second (FLOPS) per clock cycle, compared to previous-generation Intel® processors.

INGREDIENT	Intel® Select Solutions For Simulation And Modeling Cluster Configuration Details
PLATFORM	MEGWARE MiriQuid® Compute Node
PROCESSOR	2 x Intel® Xeon® Gold 6148 processors at 2.40 GHz, 20 cores/40 threads
MEMORY	192 GB (12 x 16 GB 2666 MHz DDR4) 4 GB memory per processor core and all memory channels populated
LOCAL STORAGE	256 GB Enterprise SSD
MESSAGING FABRIC	1x Intel® Omni-Path single-port PCIe* 3.0 x16 adapter with 100 Gbps
MANAGEMENT NETWORK	Integrated 1 gigabit Ethernet (GbE)
SOFTWARE	Linux* operating system (RHEL, CentOS, SLES) Intel® Parallel Studio XE 2018 Cluster Edition Intel® Cluster Checker 2018 MEGWARE ClustWare®
COOLING	1. Standard air cooling 2. TCO-optimized with MEGWARE's extremely efficient ColdCon® direct liquid cooling technology, supporting high coolant inlet temperatures of up to 50°C

Table 1. MEGWARE HPC Simulation and Modeling Solution Typical Configuration

Intel Cluster Checker: Inspects more than 100 characteristics related to cluster health. Intel Cluster Checker examines the system at both the node and cluster level, making sure all components work together to deliver optimal performance. It assesses firmware, kernel, storage, and network settings and conducts high-level tests of node and network performance using the Intel® MPI Library benchmarks, STREAM*, the High-Performance LINPACK* (HPL*) benchmark, the High Performance Conjugate Gradients* (HPCG*) benchmark, and other benchmarks. Intel Cluster Checker can be extended with custom tests, and its functionality can be embedded into other software.

Intel® Cluster Runtimes: Supplies key software runtime elements that are required on each cluster to ensure optimal performance paths for applications. Intel runtime performance libraries, including Intel® Math Kernel Library (Intel® MKL) and Intel MPI Library, deliver excellent performance optimized for clusters based on Intel® architecture.

Converged parallel programming for Intel® Xeon® Scalable processors and Intel® Xeon Phi™ processors: Enables the creation of a highly integrated portfolio of powerful technologies, software tools, and libraries. Intel® Xeon® Scalable processors offer an unparalleled flexible framework, based on a common programming model, which supports code modernization initiatives across artificial intelligence (AI) frameworks.

MEGWARE ClustWare®: A comprehensive management and monitoring tool for HPC clusters of all sizes. This combined solution, comprising hardware and software modules, allows you to centrally control the cluster system and read specific performance parameters. That is why an ever-increasing number of HPC system administrators rely on ClustWare® to optimize their cluster administration processes.

Intel® Xeon® Scalable Processors:

- Offer high scalability for enterprise data centers
- Deliver performance gains for virtualized infrastructure compared to previous-generation processors
- Achieve exceptional resource utilization and agility
- Enable improved data and workload integrity and regulatory compliance for data center solutions

The family includes Intel® Xeon® Bronze processors, Intel® Xeon® Silver processors, Intel® Xeon® Gold processors, and Intel® Xeon® Platinum processors.

MEGWARE's expertise and choice of hardware deliver optimized performance for MPI-based simulation and modeling applications in a single comprehensive, verified solution. For more information, visit MEGWARE at **megware.com/en/solutions/specials/megware-hpc-clusters-an-intelr-select-solution-for-simulation-and-modeling.html**.

For more information on Intel Select Solutions, visit **intel.com/selectsolutions**.

[1] Intel. "Performance Benchmarks and Configuration Details for Intel® Xeon® Scalable Processors." intel.com/content/www/us/en/benchmarks/xeon-scalable-benchmark.html.

[2] Configuration assumes a 750-node cluster, and the number of switch chips required is based on a full bisection bandwidth (FBB) fat-tree configuration. Intel® Omni-Path Architecture uses one fully populated 768-port director switch; the Mellanox EDR* solution uses a combination of 648-port director switches and 36-port edge switches. Intel and Mellanox component pricing is from kernelsoftware.com, with prices as of May 2016. Compute node pricing is based on the Dell PowerEdge R730* server from dell.com, with prices as of November 2015. Intel Omni-Path Architecture pricing is based on estimated reseller pricing, which is based on projected Intel manufacturer's suggested retail price (MSRP) pricing at time of launch.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase. For more complete information about performance and benchmark results, visit intel.com/benchmarks.

Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

For more complete information about performance and benchmark results, visit intel.com/benchmarks.

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