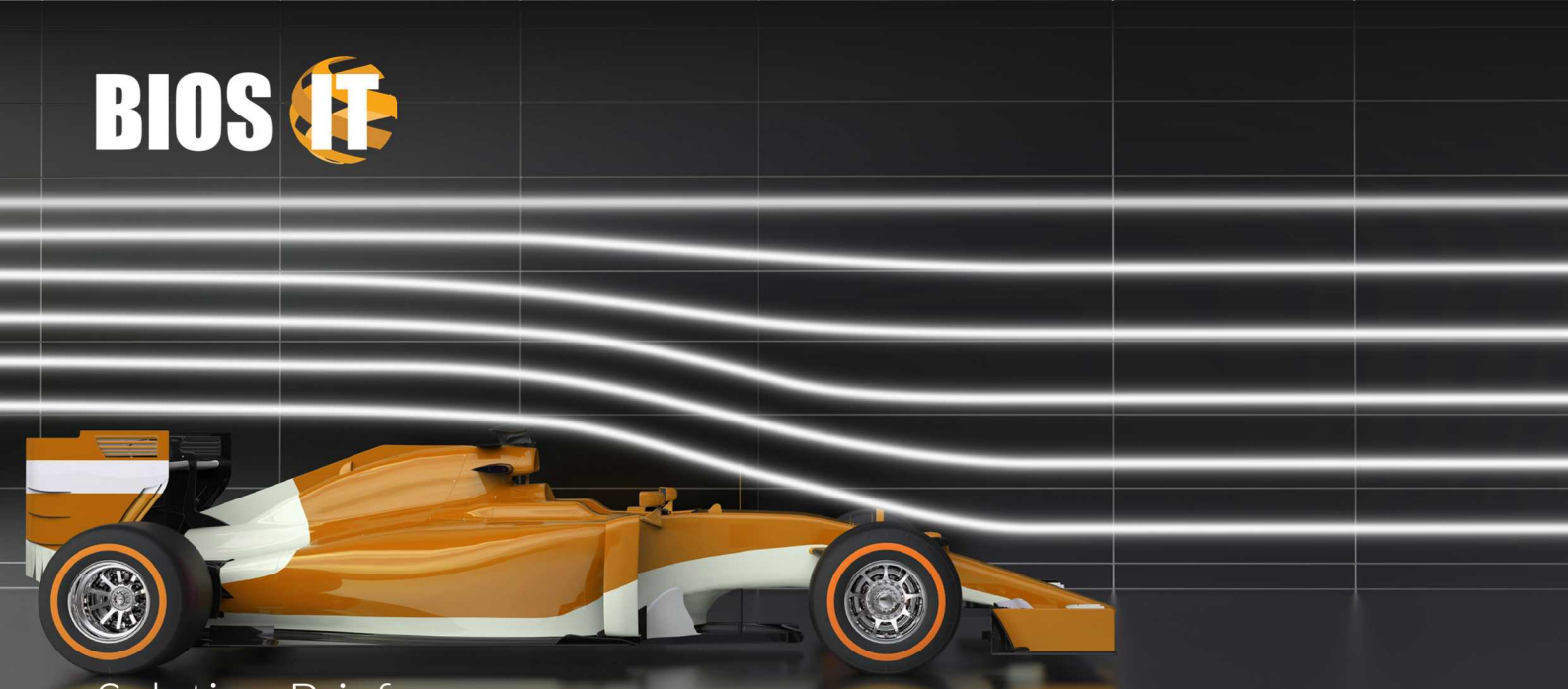
BIOS IT



Solution Brief:

Advance Science Discovery with Intel® Select Solutions for Simulation and Modeling from BIOS IT

BIOS IT'S HIGH PERFORMANCE COMPUTING CLUSTERS DELIVER THE SCALABLE PERFORMANCE USED ACROSS ACADEMIA AND INDUSTRY

Many simulation and modeling workloads within academia and industry rely on computational fluid dynamics (CFD), computer-aided engineering (CAE), and Monte-Carlo, among others. These are designed to run on scalable, high-performance clusters. To support them, 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. Often, institutions turn to trusted, qualified experts to accelerate deployment of their needed HPC solution. Intel has helped simplify the selection of HPC solutions through Intel® Select Solutions for Simulation and Modeling, providing verified high-performance clusters built by trusted partners in the IT industry.

TAILORED CONFIGURATION
FOR COMPLEX WORKLOADS

OPTIMIZED PERFORMANCE
FOR SPEED & EFFICIENCY

March 2019
www.bios-it.com

intel select solution

BIOS IT—A KNOWLEDGEABLE, TRUSTED PARTNER FOR INTEL SELECT SOLUTIONS FOR SIMULATION AND MODELING

BIOS IT, located in the United Kingdom, is a global HPC consultancy and solution provider, focused on delivering the latest high-performance, power-efficient solutions for simulation and modeling. From fully built clusters with liquid-cooled, overclocked servers to cloud and managed services, BIOS IT delivers and supports customized solutions tailored to meet customers' exact HPC requirements. Having served a number of the world's leading academic institutions, such as Northumbria University, and research centers, BIOS IT solutions have enhanced the speed of scientific discovery.

HPC solutions are serious investments that often need to be matched to a customer's specific requirements. Institutions need a knowledgeable, trusted partner to customize a system for their particular workloads and scientific or industrial applications. BIOS IT's highly experienced staff combines a deep knowledge in HPC design and build with a history of working closely with customers to help ensure the system is designed, deployed, and employed successfully.

Working with a leading ecosystem of partners in both hardware and software from across the industry, BIOS IT is positioned to design and create the most innovative HPC systems optimized for speed and efficiency, providing an imperative edge in today's competitive business environment. Their world class designs come perfectly balanced with leading edge hardware and application-specific software stacks.

INTEL SELECT SOLUTIONS FOR SIMULATION AND MODELING

Intel Select Solutions for Simulation and Modeling are built on the Intel® HPC Platform which combines Intel® Xeon® Scalable processors with other Intel® technologies and open source resources from OpenHPC* (openhpc.community). The solutions deliver optimized performance for Message Passing Interface (MPI)-based applications and provide a fast path for purchasing and deploying a cluster for simulation and modeling workloads.

Intel® Select Solutions consist of pre-validated components designed to meet the demands of HPC applications and workflows. These systems provide the capabilities and agility needed to support a range of scientific and industrial applications, such as CFD and CAE. Intel Select Solutions for Simulation and Modeling take the guesswork out of buying and deploying, and they put the focus squarely where it needs to be: on using the cluster for higher productivity and better performance.

Supportability is addressed with the inclusion of tools, such as Intel® Cluster Checker, which provides expert systems advice for administrators to use in keeping a cluster functioning.

COMPONENTS

Intel Select Solutions for Simulation and Modeling from BIOS IT comprise several key hardware and software components.

Compute

Solutions use the Intel® Xeon® Gold 6148 processor or a higher number Intel Xeon Scalable 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.[2]

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® Omni-Path Architecture (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.[1]

Configurations for Intel Select Solutions for Simulation and Modeling from BIOS IT

Table 1 shows a sample configuration of Intel Select Solutions for Simulation and Modeling from BIOS IT.

INGREDIENT	INTEL® SELECT SOLUTIONS FOR SIMULATION AND MODELING CLUSTER CONFIGURATION
PLATFORM	Supermicro* Dual-socket Server-based Cluster
PROCESSOR	2 x Intel® Xeon® Gold 6148 processors at 2.40-3.37 GHz, 20 cores/40 threads
MEMORY	384 GB DDR4
LOCAL STORAGE	- Intel® Solid-State Drive (SSD) Data Center (DC) Family** for local scratch storage - Preferably PCIe* NVMe protocol for performance - Intel® SSD DC Family storage to augment parallel file system storage
MESSAGING FABRIC	Intel® Omni-Path Architecture, single-port PCIe* 3.0 x16 adapter, 100 Gbps
MANAGEMENT NETWORK	Integrated 1 gigabit Ethernet (GbE)**
SOFTWARE	- Linux* operating system - Intel® Cluster Checker - Intel® Parallel Studio XE Cluster Edition**

Table 1. Sample node configuration for Intel® Select Solutions for Simulation and Modeling from BIOS IT.

TECHNOLOGY SELECTIONS FOR INTEL SELECT SOLUTIONS FOR SIMULATION AND MODELING FROM BIOS IT

In addition to the Intel® Xeon® processor–based hardware foundation, 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.

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® 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.

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: 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, that supports code modernization initiatives across artificial intelligence (AI) frameworks.

OpenHPC: Provides a community-driven, open source software stack that includes a number of common ingredients required to deploy and manage HPC Linux* clusters. The package includes provisioning tools, resource management, I/O clients, development tools, and a variety of scientific libraries.

Learn More

BIOS IT:
https://bios-it.com

Intel Select Solutions:
https://intel.com/selectsolutions

Intel Xeon Scalable processors:
https://intel.com/xeonscalable

Intel Omni-Path Architecture:
https://intel.com/omnipath

Intel Cluster Checker:
https://software.intel.com/intel-cluster-checker

Intel Parallel Studio XE:
https://software.intel.com/parallel-studio-xe

Intel Scalable System Framework:
https://intel.com/ssf

Intel Select Solutions are supported by Intel® Builders:
http://builders.intel.com

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

   Performance estimates were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown." Implementation of these updates may make these results inapplicable to your device or system.

   Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of the product when combined with other products. For more complete information, visit http://www.intel.com/performance.

   Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered in this notice. Notice Revision #20110804

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