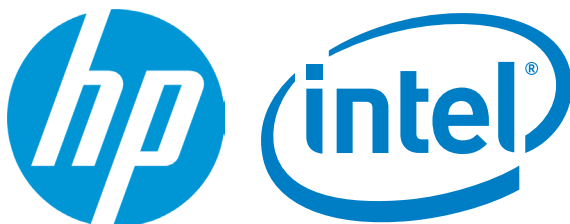**DESKTOP ENGINEERING** WITH HP & INTEL ON:

Partnerships Remove Complexity from HPC Clusters

The right value-added reseller partner can help you navigate the complexities of HPC cluster deployment and achieve quicker time to value with simulation-driven design workflows.

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The secret sauce in today's product development playbook is simulation-driven design regardless of whether you're building a jetliner or a consumer electronics device. In light of increasing product complexity and time-to-market pressures, engineering departments are looking to fully exploit the power of simulation to bolster innovation and gain a competitive edge.

Simulation-driven design, as part of a broader virtual prototyping campaign, has become essential to the engineering workflow because of its ability to optimize product designs and help companies meet rigorous cost, performance and time-to-market targets. Yet as products increase in complexity, simulations are following suit. The large model sizes and multi-disciplinary workloads can be too demanding for existing hardware, including those high-performance workstations specifically calibrated for engineering software.

As computer-aided engineering (CAE) specialists bump up against the limits of their desktop systems, many have set their sights on high-performance computing (HPC) as a way to scale compute power to better accommodate the escalating demands of simulation software. While the significant expense and specialized expertise required to run HPC systems have traditionally limited their use to only the largest companies and research organizations, the introduction of HPC clusters has made the technology much more affordable and accessible to small- and mid-size (SMEs) enterprises.

Clusters are well positioned to drive HPC horsepower downstream, but there are still deployment challenges that the average small- to mid-size shop can't handle without assistance. For example, proper configuration of an HPC cluster entails far more than choosing the right processor and core count or specifying enough memory. On the hardware front alone, there are many decisions to be made, from weighing the benefits of a CPU-centric architecture to building out a system that has a greater reliance on GPU technology and memory, just to name a few.

Beyond the hardware, there are considerations around network computing and storage resources in addition to what kind of communications bus can best support the target CAE applications and workloads. Additionally, there are requirements specific to HPC environments—for example, the proper configuration and on-going management of the job scheduling software along with workload management applications that ensure the environment runs at peak performance.

Getting the HPC hardware properly matched to the specific run-time characteristics of the simulation software can be another test for SMEs because the area is typically beyond the scope of their domain expertise. Many HPC environments are Linux-based, which can also be unfamiliar territory. With their limited IT resources, most smaller companies have few, if any, experts in any one specific HPC discipline, let alone across the broad spectrum. With IT departments over capacity in general work, many don't have the bandwidth to get up to speed on HPC clusters, leaving engineering departments to choose between forgoing the technology or attempting to deploy it on their own.

"With HPC, there are all these knobs to twist and turn," notes Chris Sasso, senior vice president of technology at Dasher Technologies, a data center solution provider and a partner with Hewlett-Packard Co. (HP) in deploying HPC cluster environments. "Simulation work has been classically done on one large server and in that environment, there aren't as many questions to ask."

2X

The amount that product complexity increased between 1997 and 2012 across all industries. More complex products require more advanced simulations, which in turn require the scalable processing power of high-performance computing clusters.[†]

† Source: "Mastering Product Complexity," Roland Berger strategy consultants.

VARS: A TRUSTED THIRD-PARTY RESOURCE

Being able to ask—and answer—the right set of questions is central to ensuring a successful HPC cluster roll out. With SMEs driving about 80% of product design in their role as suppliers and design partners to larger shops, it's critical that this group gets the proper guidance and assistance to scale an existing workstation infrastructure to an HPC cluster environment in order to wring the most out of simulation-driven design workflows.

24%

The percentage by which the average product lifecycle was shortened between 1997 and 2012.[†]

† Source: "Mastering Product Complexity," Roland Berger strategy consultants

HPC hardware vendors remain a critical asset for matching a company's simulation workloads to the proper HPC hardware configuration. Similarly, simulation software providers are instrumental in working with the HPC hardware companies to establish reference architectures that specify the best configuration for getting optimal performance from their software.

To that end, HP sponsors a number of programs as part of its HP-Intel Innovation Initiative to simplify the configuration and deployment of HPC environments. In addition to HPC Starter Kits, which offer an optimized, turnkey hardware/software platform available from select reseller partners, HP works with its simulation software partners on Solution Reference Architectures (SRAs) for leading CAE applications. These SRAs, available for simulation programs such as ANSYS and Dassault Systemes' SIMULIA, provide guidance on optimal cluster designs based on performance testing at HP's in-house Benchmark Centers as well as from input from the external software developers.

HP also enlists a number of specialized value added reseller (VAR) and system integration partners, including Dasher Technologies, to assist SMEs in their HPC cluster deployment efforts. Rather than working separately with both the cluster provider and CAE software vendor and then coordinating the individual efforts, these independent channel partners provide cross-discipline expertise that transcends a hardware or software focus. By addressing the HPC cluster deployment as an integrated solution and by providing services to support each stage of the lifecycle, from purchase all the way through on-going management, SMEs are assured of a painless HPC cluster deployment and more importantly, fast time to value with simulation-driven design.

COVERING ALL THE BASES

Removing the complexity from HPC deployments is a key charter at Nor-Tech, a systems integrator partner with HP. Nor-Tech specializes in delivering turn-key HPC solutions aimed at SMEs that don't have the experience internally to deploy and manage cluster environments, according to Bob Dreis, Nor-Tech account manager.

Companies typically seek out HPC cluster deployment assistance because they lack knowledge of HPC technology and specifically, how to integrate the various components, Dreis says. "Installing an application on your workstation is one thing, but installing a simulation appli-

80%

The percentage of product design decisions that small- and medium-sized businesses are responsible for in their role as suppliers to larger corporations, according to some industry accounts.

cation in a distributed, parallel environment is a whole different game," he explains. "We try to eliminate the complexity and give engineers what they want, which is processing power to do simulation."

Nor-Tech accomplishes that by seamlessly integrating the core components of a customer's environment, essentially turning the HPC cluster into a turnkey appliance. "We don't care if it's a two-node cluster or a 100-node cluster—we provide the same appliance approach to ensure seamless integration," he says. "With that process in place, we can get an organization up and running on the software within hours once the HPC cluster is deployed to the facility."

The process starts with an exhaustive intake session to get the complete picture of a customer's environment, including where the HPC cluster would physically be located and what specific applications are going to be deployed in the environment. Every factor, from the number of solvers to the kind of simulation at play, is critical to determining an optimal HPC cluster configuration. "There are a multitude of questions to ask in trying to isolate and figure out what the optimal configuration is," Dreis explains. "Simulation models don't all behave the same and once you throw in different applications and solvers, it becomes fairly complex in how they all interact."

The ability to expertly map the attributes of the solvers to the optimal cluster configuration is crucial to maximizing an HPC investment. Not all simulation applications and models are candidates for the parallel processing capabilities of HPC so without the proper guidance, a company risks overinvesting in technology it doesn't actually need. At the other extreme, a company might invest in an HPC cluster platform that is underpowered for its specific workloads, undermining the value it can achieve through simulation-led design.

PROCESS MAKES PERFECT

Professional Process

HP value-added reseller partners like Nor-Tech and Dasher Technologies follow a formal set of processes through each stage of deployment.

1. Following the customer assessment, the VAR will make a recommendation for a specific HP HPC cluster design.

2. That cluster design will then be put through its paces in a modified test environment to determine if it's the optimal configuration for that particular environment.

3. From there, the integration process kicks off to ensure all the pieces are working seamlessly before shipping the turnkey HP HPC cluster out to the customer site.

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Dasher Technologies' High-Performance Computing Starter Kit for the ANSYS environment is one example of a turnkey HPC solution that caters to SME customers' needs. The bundle based on a choice of the HP Proliant SL2500 server or the new HP Apollo 2000 System, is delivered pre-configured with the proper set of ANSYS applications installed and optimized for the compute nodes. The HPC Starter Kit is also integrated into a customer's network, ensuring easy access to the cluster for engineers and CAE analysts. The package can be tailored to include on-site installation and start-up services, including training. Dasher

Technologies also offers a managed services program, which covers the proactive monitoring and remediation of the HPC system, including installation of updates as well as quarterly system reviews.

"The customer might be great at simulation modeling, but not so great at installing software or monitoring cluster hardware and software alerts," explains Dasher Technologies' Sasso. With the ManagedHPC Service, provided by Dasher and its partner X-ISS, experienced personnel are available for turnkey, remote cluster management, freeing up engineers to focus on critical design work, not specialized IT management tasks.

The combination of managed services and implementation expertise helped one recent Dasher SME customer move from individual workstations to an HP HPC cluster in a matter of weeks. The customer was looking to scale its ANSYS environment to a more powerful HPC platform to improve simulation performance as part of an effort to reduce time-to-market and time-to-revenue for a new product launch.

While the customer had a general idea about HPC clusters, they were unsure how to get started building a cluster and they lacked the expertise to set up the environment so models could be visualized remotely and the workflow remained similar to the workstation environment. Based on the use of multiple ANSYS applications, including Mechanical and Fluid Dynamics, the Dasher Technologies team came up with a best practice architecture that included a balanced combination of CPU core count, RAM per core, GPU acceleration, and solid state drives.

Since the client lacked certain areas of expertise—around Linux, on-going HPC management and remote access—the managed services solution was a natural fit. Dasher Technologies' ManagedHPC Service includes quarterly client briefings to report on the health of the cluster, all firmware and software updates and remote management capabilities to address on-going operational issues. As part of the deployment, Dasher, in partnership with X-ISS, provided knowledge transfer and training, helping the SME get more familiar with HPC cluster technology.

"The client needed a turnkey solution that was set up and ready to go quickly and that could scale with their future growth requirements," says Dasher's Sasso. "The managed service offering will help them plan for growth because the client will have the metrics they need to make informed business decisions going forward."

HPC clusters provide a powerful path to more powerful simulation studies, but not every company has the internal know-how to benefit from that journey without an expert guide. Specially trained VARs, working in partnership with key HPC providers like HP and CAE software specialists, can deliver a fully integrated solution in conjunction with support services that reduce HPC complexity and allow engineers to focus on what they do best—innovating great products.

The new HP Apollo 2000 System is a dense multi-server Gen9 platform that packs a lot of performance and workload capability into a small amount of datacenter space delivering twice the density of traditional 1U servers at a comparable price. The new system offers the configuration flexibility to support a wide variety of scale out workloads, which makes it well suited for an SME customer's first HPC cluster. *Image courtesy of HP and ANSYS.*

To learn more about HP's HPC Innovation Initiative go to www.hp.com/go/compete.