

A Simpler Path to Accelerating Research and Design

The HPC Advisory Council and Intel® Cluster Ready are making it easier to design, build, use, and maintain a high performance computing (HPC) cluster



Hardware and software solutions for simulation and analysis are undergoing a transformation. They are becoming easier to use and less expensive, so research and design teams can achieve better results faster and with less need for specialized expertise in high performance computing (HPC) and advanced analytics. Small and medium sized businesses can now take advantage of readily available applications and affordable computing clusters to accelerate product design cycles. Larger businesses and research organizations can also progress faster and get higher returns on their HPC investments.

Access to the most current and reliable information and the latest cluster technology can be critical to success for HPC users. A standards-based cluster built to the Intel Cluster Ready specification – combined with resources from the HPC Advisory Council – can simplify design, deployment, and maintenance to improve return on investment. Even the most experienced HPC professionals can benefit from sharing information and best practices with colleagues facing similar challenges.

Intel Cluster Ready and the HPC Advisory Council offer resources that can help users at all levels, by making it easier to design, build, optimize, use, and maintain HPC applications and clusters.

- **The HPC Advisory Council** brings together more than 200 leading HPC vendors and end-user organizations to share information and document best practices. The resulting resources help users deploy and use clusters more easily and affordably and with better results. By making these resources widely available, the HPC Advisory Council is bridging a critical gap between the capability and value of HPC today and its enormous potential going forward.
- **The Intel Cluster Ready architecture** fills another critical gap in HPC by establishing a standards-based hardware and software architecture for clustered computing systems. This common architecture fuels innovation by simplifying vendor integration and collaboration. It also helps to reduce cost, risk, and complexity for end users by assuring that registered applications will run reliably on any certified cluster right out of the box. Intel also provides Intel® Cluster Checker software, which helps vendors and end-users increase their return on investment by making it easier and less time-consuming for them to build, test, certify, and maintain a cluster.

Intel and the HPC Advisory Council – working together to deliver better value.

“With our resources and the Intel Cluster Ready architecture, HPC is getting simpler, more powerful, and more affordable for users at every level. It’s an exciting time.”

*Gilad Shainer
Chairman
HPC Advisory Council*

Since Intel and the HPC Advisory Council share the common goal of simplifying and improving HPC technologies and solutions, they have been working together to deliver better value to their constituents. The HPC Advisory Council and many of its members take advantage of the Intel Cluster Ready architecture and tools to increase the benefits of their own HPC implementations. In return, they provide feedback that helps Intel refine the architecture and tools so they continue to deliver optimized value as needs and technologies evolve.

The HPC Advisory Council – A Wealth of Resources for HPC Users

The HPC Advisory Council was founded in May 2008, and has been growing rapidly ever since. Its 200-plus member organizations include many of the industry’s most respected hardware, software, and solution providers and some of the world’s leading research organizations. The value provided by the council is reflected not only in the extensive participation of its members, but also in the many thousands of non-members around the world who access their website on a regular basis to gather information and tap into HPC resources.

According to Gilad Shainer, Chairman of the HPC Advisory Council, “We fill a real need in the HPC community. Member response has been enthusiastic right from the start. The number of website visitors, downloads, and conference attendees has increased steadily. Our first workshop in China had 100 participants. Our most recent had 300.”

The HPC Advisory Council is dedicated to maintaining a collaborative environment where members can work together to share information and advance the state-of-the-art in HPC. Member feedback and participation help to ensure that ongoing efforts deliver value where it is most needed. High-level decisions are made by a governing board that includes an even mix of vendor representatives and users to ensure resources are allocated appropriately to deliver value to the entire community.

Intel was an early member of the HPC Advisory Council and remains a strong supporter. According to Shainer, “Intel and Intel Cluster Ready are valued partners. They support us with hardware and tools, help sponsor our conferences, participate in our end-user outreach and education programs, and work directly with our engineers to produce many of the resources we offer to the HPC community.”

Best Practices and Application Installation Guides

The HPC Advisory Council works with members to publish HPC best practice recommendations and step-by-step application installation guides that help users achieve desired results more quickly and with less effort. These projects focus on the latest usage models, and are conducted using the most recent hardware and application versions. They are always run using real-world data sets to provide results that reflect the practical requirements of today’s research and design teams.

The Intel Cluster Ready architecture adds to the value of these efforts. By ensuring a consistent hardware and software environment across test environments and compliant end-user implementations, it helps to ensure that application installation and optimization techniques are consistent and repeatable. Engineering teams can provide specific, step-by-step guides with confidence they will work as expected for end users.

A typical engagement takes about a week. The application and any other required components are installed and configured and Intel Cluster Checker is run to make sure everything is functioning properly. Benchmarks are then run across multiple configuration options (compilers, flags, etc.) to measure performance and create a profile of resource utilization. Processes and results are reviewed with users and vendors, including Intel and HPC Advisory Council engineering teams. Novice users can take advantage of the documented results to setup and run their applications quickly and reliably. More sophisticated users can implement advanced optimizations to ensure they're getting the most out of their HPC investment.

The current focus is on creating installation guides for open source applications, since these applications are typically not supported by ISVs and documentation is often sparse or nonexistent. Guides are currently available for Adaptive Mesh Refinement, BQCD, CPMD, Espresso, Himeno, LAMMPS, NAMD, NWChem, OpenFOAM, and WRF. Work is underway to create guides for additional applications, and users are encouraged to contact the HPC Advisory Council if they want to recommend applications for future projects.

Freely Accessible Cluster Resources

The HPC Advisory Council maintains a variety of clusters that can be accessed by users and vendors either on-site or over the Internet. ISVs and open source developers use these clusters to test, optimize, benchmark, and qualify their applications; end-users use them to perform research, optimize in-house applications, and explore cluster performance and component characteristics prior to purchase decisions. The HPC Advisory Council also uses these clusters to create the best practices and installation guides described in the previous section.

The majority of the clusters operated by the HPC Advisory Council are Intel Cluster Ready certified. A number of the clusters were deployed before the Intel Cluster Ready architecture was released, but engineering staff found it relatively easy to bring them into compliance by using Intel Cluster Checker to quickly identify hardware and software issues. Intel Cluster Checker is also used to perform periodic health checks. Maintenance teams can verify compliance and quickly identify issues affecting performance or reliability, such as a failed or under-performing hardware component or a missing or out-of-date software component.

According to Shainer, "Our clusters are in high demand 24 x 7, and Intel Cluster Checker helps us build clusters faster and keep them running optimally with a lot less management overhead. It used to take us about a week to bring a new cluster online. Now we can usually do it in less than a day. Intel Cluster Checker also allows us to restore our certified environments very quickly when they are out of compliance, so we don't mind changing configurations for special tasks. That gives us – and our members – a lot more flexibility than we had in the past."

Expert Training, Advice, and Information Sharing

Whether end users are exploring the value of cluster computing for the first time or looking to solve tough technical challenges in their supercomputing environment, the HPC Advisory Council provides access to valuable information and resources.

- **Network of Excellence** – End users and vendors can connect with each other in this online forum to ask questions, discuss challenges, and share information and best practices. This is a great way to leverage the knowledge and experience of other HPC professionals to get unbiased information quickly and without wasted effort.
- **Conferences and Workshops** – The HPC Advisory Council sponsors regular conferences and five to seven workshops each year in various locations around the world. HPC users and potential users can get hands-on training in building, using, and managing an HPC cluster, and they can learn about best practices and the latest technologies from leading companies, research organizations, and vendors. Intel is a leading supporter of these efforts and often conducts workshops focusing on Intel Cluster Ready and other Intel technology advances. Users can learn how to best use the latest Intel processors and software development tools to get the most out of their HPC investments.
- **Centers of Excellence** – The HPC Advisory Council maintains offices and HPC resources in the United States, China, and Switzerland. These centers support local efforts and offer vendors and users on-site access to cluster resources and engineering support.

Moving HPC into the Cloud and Beyond

Intel and the HPC Advisory Council are constantly working to advance the capability and value of HPC through new technologies, strategies, and support programs. A key focus is on exploring challenges and solutions for delivering on-demand, pay-per-use HPC resources using cloud computing models. According to Shainer, "Cloud computing has the potential to make HPC a cost-effective option for everyone, even for individual designers and researchers. We're working with Intel and other members to explore, assess, and minimize the performance overhead of HPC applications running over high speed networks in virtual machines and cloud environments."

Shainer also notes the potential value of Intel Cluster Ready architecture in enabling HPC in the cloud. "It will be important to maintain a consistent hardware and software environment, so users can upload and run their applications with minimal effort. That requirement could well make Intel Cluster Ready architecture even more valuable in cloud environments than it is for standalone clusters."

Cloud computing is just one avenue of growth for cluster computing. According to IDC, HPC is one of the fastest-growing IT markets in recent years and clusters are responsible for more than 65 percent of HPC related server sales.¹ Ongoing improvements in capability, value, and ease-of-use will be important for continuing this rapid expansion of cluster computing into new areas of business and research.

Intel and the HPC Advisory Council will continue to play a central role in this evolution. "Our members are doing some amazing things, and it's great to be in a position to help them," says Shainer. "With our resources and the Intel Cluster Ready architecture, HPC is getting simpler, more powerful, and more affordable for users at every level. It's an exciting time."

For more information and resources, visit the following websites:

HPC Advisory Council
www.hpcadvisorycouncil.com

Intel Cluster Ready
intel.com/go/cluster

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¹ Source: Intel Cluster Ready Program Builds HPC Momentum, an IDC white paper sponsored by Intel Corporation, November, 2008. <http://software.intel.com/file/14462>

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