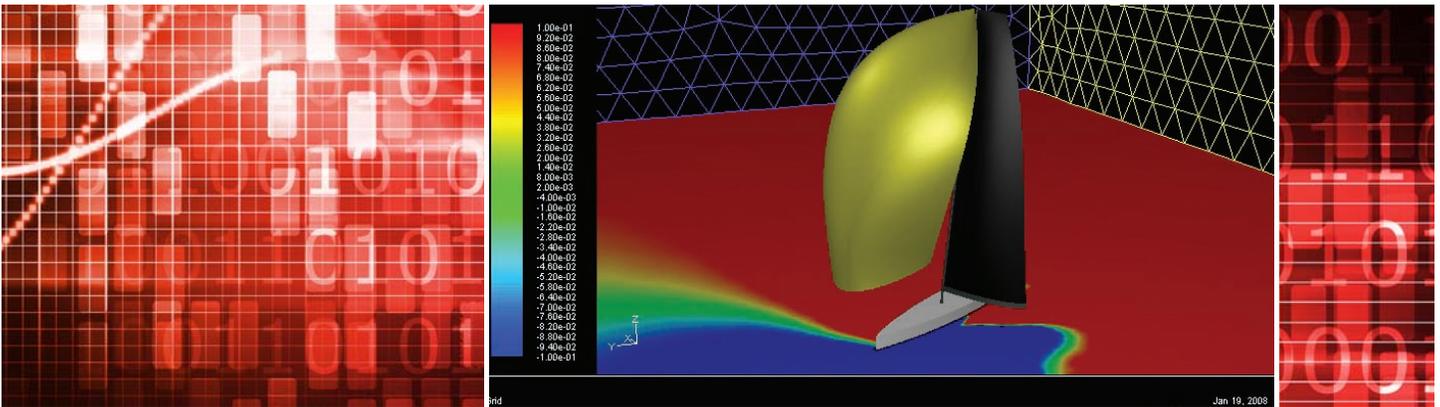


Managing 30 Teraflops of Compute Power: PBS Professional at Italy's CILEA Consortium



Key Highlights

Industry

Research and Development

Challenge

To have a workload manager with robustness and flexibility needed, with an excellent price/performance ratio.

Altair Solution

PBS Professional with its powerful and flexible scheduling policies.

Benefits

- Allows CILEA to keep their policies working at maximum levels
- Easy to use, with a very short learning curve

Customer Profile

In 1974, five universities in Italy's Lombardy region formed a technical consortium called CILEA. Its main purpose was to provide computing cycles for research. Since then another five universities have joined CILEA, and the consortium has many more strings to its bow. The Italian Ministry of University and Research is also represented within CILEA. Its ITC services include a large digital library, e-learning courses, database development, networking, technical support for libraries, universities, and other institutions, and consulting help for its users.

With 30 teraflops of peak computing power, it has ranked as high as 135th among the Top 500 high performance computing centers. PBS Professional® keeps CILEA's processors humming.

Coping with the Growth Curve

Researchers and engineers – 400 registered users – come to CILEA from government, industry and academia with a massive variety of disciplines, projects and applications. If CILEA can be said to have a specialty, it would be computational fluid dynamics (CFD). A team of in-house researchers is collaborating with the Technical University of Milan on a range of CFD projects. An America's Cup contender (anonymously, of course) is optimizing hull designs for racing yachts. And significant work is being done in CFD on the dynamics of the cardiovascular system.

Compute-intensive projects like these have driven the demand for CILEA's facilities into a steep growth curve. CILEA has responded by doubling its staff over three years. Building up CILEA's HPC resources to handle the

CILEA Success Story

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Dr. Claudio Arlandini,
Technical Manager, HPC Competence Group, CILEA

processing tsunami is the responsibility of Dr. Claudio Arlandini, who is also involved in CILEA's major projects as an astrophysicist, researcher, and project manager.

“It is always our goal to be one of the most advanced computing center in Europe,” says Arlandini. “We have a policy of continually renewing our computing platforms to stay in the Top 500 list. For that reason we have just put into service a powerful new HP compute server with HPC BladeSystem technology, optimized for HPC environments.”

CILEA's new HPC cluster is named after Joseph-Louis Lagrange, a brilliant 19th century Italian mathematician. It is a 208-blade HP cluster with a double data rate (DDR) Infiniband interconnect. Each of the blade servers contains two Intel quad-core 3.16GHz Xeon processors, for a total of 1,664 cores.

Lagrange alone gives CILEA 22 teraflops of peak computing power. Combining Lagrange

with two AMD Opteron clusters and a 64-CPU HP Superdome SMP system gives CILEA peak computing power of 30 teraflops from roughly 2,500 CPUs, all managed by PBS Professional® workload management software.

PBS Professional: Keeping 2,500 Processors Busy

In 2004, CILEA's HPC resources consisted of the HP SuperDome SMP system and a smaller system. The center was using LSF as a scheduler.

“We weren't completely satisfied with LSF, particularly from an economic point of view,” says Arlandini. “So when we bought our first cluster, we evaluated all the scheduling systems on the market. In the end we chose PBS Professional, particularly because it had the robustness and flexibility we needed, with an excellent price/performance ratio. In the four years we've been using it, Altair has added interesting features and made it even

more robust. We've never questioned our choice of PBS Professional.”

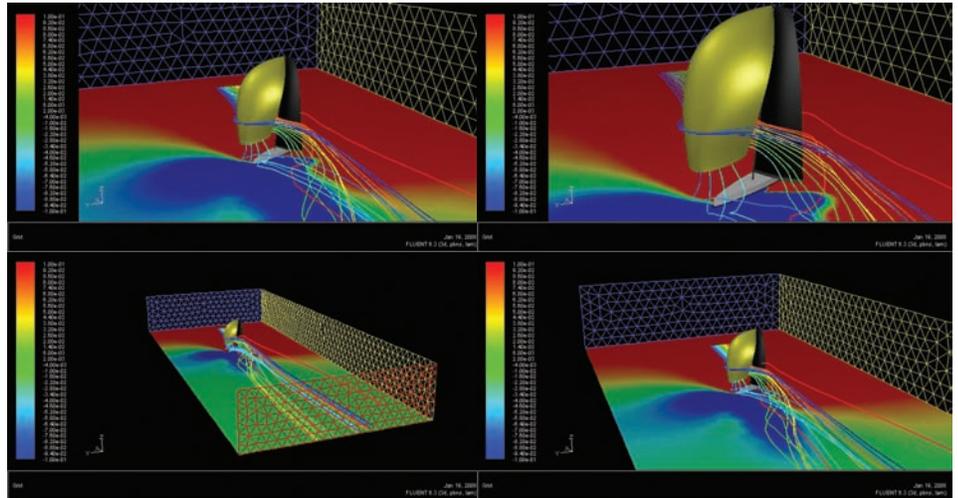
CILEA now has PBS Professional licenses for all 2,500 processors in its HPC environment. One of the two Opteron clusters is available to the full list of CILEA clients. The other is dedicated to a project of the Italian Laboratory for Bioinformatics.

Policies, priorities, and filling users' needs are a significant part of managing CILEA's compute resources, and Arlandini leans heavily on PBS Professional to achieve high levels of utilization.

“PBS Professional is powerful and flexible when it comes to scheduling policies, and this has definitely improved in its latest versions,” says Arlandini. “It allows us to keep our policies working at maximum levels. All our users are very happy with their share of our compute resources, but without PBS Professional it would be difficult to keep them that way. Our user community is very heterogeneous.

Optimized for HPC Environments

CILEA looked at several excellent proposals, and chose Hewlett Packard as they considered their blade solution technically superior amongst the competitors.



Some are expert, some are not, and they come from all kinds of scientific areas.

“Our users are very satisfied with PBS Professional, because it’s very easy to use and the learning curve is very short, even for undergraduates and engineers from small enterprises. And keep in mind that the first time these users sit down to work with our resources, it’s usually the first time they’ve ever sat in front of any high performance computing system.”

Most users access CILEA’s HPC resources remotely. Expert clients access PBS Professional through an SSH shell using optimized scripts provided by CILEA. For less-expert users, CILEA provides a web interface.

Growing as a Research Center

When Arlandini first came to CILEA, computer assisted engineering (CAE), primarily for the Italian automotive industry, was its core business. Now Arlandini estimates that 80%

of users are in the compute-intensive fields of chemistry, life sciences, and materials science. CILEA’s scientific and engineering application experts help its customers to use compilers, parallelize and optimize code, and turn concepts into software. Users can also draw on CILEA’s portfolio of third-party open-source and commercial software for studies in engineering analysis, thermodynamics, chemistry, bioinformatics, and other disciplines.

“We help customers develop models and solve simulation problems,” says Arlandini. “That’s one reason why we have a long-standing partnership with Altair Engineering. We work with them to develop simulations in their RADIOSS and HyperWorks software suites, especially for our faithful customers in the automotive industry.”

Looking ahead, a key goal for CILEA is to encourage the use of simulation and HPC techniques in science and engineering.

“We want to expand our influence in industry,

and our new HP server and PBS Professional will enable us to do that,” says Arlandini. “Small and medium-sized companies are not investing in simulation the way they could. We need to convince them that they need a partner to develop more innovative production cycles, and that we are the right partner.

“To do this I think we need not only PBS Professional – a very easy-to-use tool for non-expert users – but also a number of other Altair Engineering tools. It was very interesting to see a demonstration of the HiQube business intelligence tool. We’ll be trying it out in the next few weeks. I think its insights will be very interesting for what we want to do with the Italian industry.”

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About Altair

Altair empowers client innovation and decision-making through technology that optimizes the analysis, management and visualization of business and engineering information. Privately held with more than 1,800 employees, Altair has offices throughout North America, South America, Europe and Asia/Pacific. With a 27-year-plus track record for high-end software and consulting services for engineering, computing and enterprise analytics, Altair consistently delivers a competitive advantage to customers in a broad range of industries. Altair has more than 3,000 corporate clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the electronics, architecture engineering and construction, and energy markets.

About PBS Works

PBS Works™, Altair's suite of on-demand cloud computing technologies, allows enterprises to maximize ROI on existing infrastructure assets. PBS Works is the most widely implemented software environment for managing grid, cloud, and cluster computing resources worldwide. The suite's flagship product, PBS Professional®, allows enterprises to easily share distributed computing resources across geographic boundaries. With additional tools for portal-based submission, analytics, and data management, the PBS Works suite is a comprehensive solution for optimizing HPC environments. Leveraging a revolutionary "pay-for-use" unit-based business model, PBS Works delivers increased value and flexibility over conventional software-licensing models.

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