



Maui High Performance Computing Center

The Maui High Performance Computing Center (MHPCC) is part of the Air Force Maui Optical & Supercomputing (AMOS) site based in Hawaii. Managed by the University of Hawaii, MHPCC provides critical computational support for high-priority Department of Defense activities, including simulating turbulent flows around aircraft and modeling laser beam qualities. MHPCC is chartered to serve a broad base of Department of Defense, government, academic and commercial research.

Background

The Maui High Performance Computing Center (MHPCC) stands at the forefront of high performance computing and provides more than 21 million hours of computing time annually to vital defense and scientific research, development and test programs. The center provides access to parallel supercomputing hardware, advanced software applications, high bandwidth communications and high performance storage technologies. It supports vital projects such as the study of high-power radio frequency energy weapons, the development of lasers and testing of unmanned aircraft.

Case Summary

Location: University of Hawaii, Maui, Hawaii

Products/Services:

- Liebert Deluxe Precision Air Conditioners
- Liebert Series 610 UPS modules with System Control Cabinet
- Liebert Power Distribution Units
- Liebert Chiller
- Preventive Maintenance Services

Critical Needs: Ensure high availability of supercomputer center providing complex computing capabilities to the U.S. Department of Defense and other government agencies.

Results

- Twelve years of uninterrupted operation at one of the world's top supercomputer centers, despite operating in an environment subject to earthquakes and tropical storms.
- Peace of mind delivered by reliable equipment operation and fast service response times.
- Dynamic system architecture enables continued expansion without abandoning initial investment.



The Situation

Since the Maui High Performance Computing Center was commissioned in 1993, its high-performance computing resources—including a Cray XD1 supercomputer with AMD Opteron™ processors, IBM Power3 and Power4 configurations, and large Linux clusters—have been housed in a 6,000-square-foot data center protected by Liebert power and precision cooling equipment. Relying on Liebert technology for environmental control and power protection has allowed the center to achieve high availability while continually adding the cutting-edge technology required to stay at the forefront of supercomputing technology.

In 2006, the center addressed the need for greater computational capacity by developing plans to implement a Terascale High Performance Computing platform from Dell. The 5,120-processor Dell PowerEdge 1955 system would increase the computational capability of the center's High Performance Computing platform to 60 Teraflops (60×10^{12} Floating Point Operations Per Second), ranking it among the fastest supercomputers in the world.

The new system represented the biggest single investment in the center's history, and required a new 8,000-square-foot data center to house the system. Because planned upgrades will increase overall computational capability to 120 Teraflops within two years, the new facility required a dynamic power and cooling infrastructure that could scale to handle the added power demands and heat load.

As a national resource for vital government research, MHPCC has a business-critical continuity goal of 100 percent availability. This lofty expectation is consistently threatened by geographic conditions



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Maui High Performance Computing Center***

as MHPCC is located in a remote area that experiences frequent loss of commercial power and is subject to earthquakes and tropical storms.

"Our entire business is information technology and the necessity for maintaining operational capability is absolute," says Carl Shelton, MHPCC facility manager.

The Solution

In designing the new facility, MHPCC turned to the Liebert specialists at Emerson Network Power.

"We continue to build our critical infrastructure on Liebert power and cooling solutions because of their proven track record of providing the reliability and flexibility it takes to keep our world-class facility running smoothly," Shelton says. "In 12 years of

operation with Liebert technology, we've never experienced a single problem related to power or cooling."

Shelton worked with local Liebert Representatives from Power Protection Services to specify and install the new equipment. "Their customer service is outstanding," he says. "The nature of our research is very high priority and fast-paced. When we call with a question, they have an answer within hours if not right away. Other vendors often take days or even weeks to get back to us."

Inside the New Facility

Within the walls of MHPCC's new data center, the Dell PowerEdge servers occupy 40 racks arranged in four rows in a hot aisle/cold aisle configuration. The room has a 36-inch raised floor to promote ample air flow and pressure. After the Liebert specialists calculated the projected heat load, they specified 12 Liebert Deluxe units rated at a combined 360 tons of air conditioning capacity to provide precise, reliable control of room temperature, humidity and air flow. A Liebert chiller connects the precision cooling units to the facility's chilled water system.

Since its introduction more than 40 years ago, the Liebert Deluxe precision cooling system has established an unmatched record of reliability. Used in the most demanding, mission-critical applications in the world, it protects more Fortune 500 and large government data centers than any other system.

To provide reliable, backup power for the new supercomputer, MHPCC deployed a multi-module UPS designed to balance reliability and scalability, using Liebert Series 610 UPS with a combined capacity of 850 kVA of power protection. The UPS



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modules are connected through a Liebert System Control Cabinet. The enhanced fault current management capabilities of the Liebert Series 610 provide immediate response to utility outages with high overload capacity. Four Liebert PPC precision power centers provide grounding, custom electrical distribution, monitoring and expansion capabilities. A 1.5 MW generator provides backup power for extended outages.

"Between the UPSs and the generator, we've been able to weather commercial power outages without incident," Shelton says.

Because of the facility's remote location on Maui, fast response to maintenance issues was an important factor. The service business of Emerson Network Power delivered a four-hour emergency response time plan and provides regular preventive maintenance services to ensure systems remain in peak operating condition.

The Results

MHPCC met its project deadline for installation of power and precision cooling equipment and launching the new supercomputing system, which became operational in September 2006. The added capacity complements the Department of Defense High Performance Computing Modernization Program's array of high performance computing resources. Nicknamed "Jaws," it is the largest supercomputer in the Department of Defense research program.

In initial testing, the new system delivered a clock speed of 42.39 teraflops, ranking it as the 11th-fastest supercomputer in the world on the November 2006 list of Top 500 Supercomputer Sites (as compiled by researchers from the University of Tennessee and the University of Mannheim).

Shelton says he was especially impressed with the responsiveness of Emerson Network Power and willingness to work within a demanding development schedule. "When we said we needed equipment within a few weeks, we didn't hear any push-back or excuses. They just went to work and started manufacturing it," he says. "Other vendors quoted us timing based on inflexible manufacturing schedules."

Power and cooling systems have performed flawlessly, supporting continuous operation of the system despite a 6.7 magnitude earthquake in 2006 that caused \$200 million dollars of damage on several Hawaiian Islands. "We lost commercial power for about 10 hours, but our UPS and generator kicked in seamlessly and kept us online," Shelton recalls.

Looking ahead, he is confident that the data center has the dynamic power and cooling infrastructure to meet his business-critical IT infrastructure needs and accommodate planned expansion to the projected computational speed of 120 Teraflops. And, when it comes to any potential service issues, Shelton knows he has a partner close by to help out.

"Other vendors quoted us a 24-hour response time for service," he says. "Emerson Network Power responds within four hours, day or night, quickly handling any maintenance issues concerning our power and precision cooling equipment. The service is impeccable."

For more information on Liebert technology, visit www.Liebert.com.

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