

Platform™

U.S. Navy Relies on SGI and Platform LSF® to Execute Complex Weather Prediction Models

Overview

To support U.S. Naval operations, FNMOC needed to provide quicker, more accurate and more detailed information and maps predicting weather and ocean conditions.

Challenge

Implement a new high performance computing environment that can execute complex weather prediction models, easily scale up to handle larger volumes of data and increasingly sophisticated models, and comply with stringent security requirements.

Solution

- Platform LSF® software
- SGI® Origin® 3000 Series supercomputers
- SGI® Trusted IRIX™ operating system

Results

- A complex process involving millions of meteorological and oceanographic observations and thousands of interdependent analysis and modeling tasks is executed reliably every day;
- FNMOC meets stringent military requirements for operating a secure environment that supports both classified and unclassified jobs and data;
- FNMOC sees Platform and SGI as effective partners working with them to solve unique problems and help them push the envelope on technology performance.

Using millions of observations collected daily from satellites, ships, aircraft and other sources around the world, the U.S. Navy's Fleet Numerical Meteorology and Oceanography Center (FNMOC) in Monterey, California employs sophisticated Numerical Weather Prediction (NWP) models to predict global weather and ocean conditions. FNMOC is the U.S. Department of Defense's primary site for creating weather maps for use by the country's Navy in planning and conducting air and sea missions.

FNMOC's production process operates on a very tight schedule and consists of thousands of interdependent and time-critical job executions every day. In addition, Naval operators and other U.S. war-fighters seeking to maintain 'information superiority' are constantly demanding more accurate and more detailed weather predictions – and faster.

To keep up with these demands, FNMOC is continuously implementing more advanced scientific techniques, increasingly sophisticated prediction models and improved data distribution technology. To orchestrate the sequencing and execution of the thousands of complex analysis and modeling jobs, and to operate effectively in the highly secure environment that characterizes Naval operations, FNMOC relies on high performance SGI® Origin® 3000 Series supercomputers running SGI's Trusted IRIX™ secure operating system, along with efficient and reliable job scheduling and workload management provided by Platform LSF® software.

Business Challenge

Through a sophisticated mathematical process called "data assimilation", FNMOC ingests about seven million atmospheric pressure, temperature, humidity and wind observations every day from sources around the world, including satellites, stationary and drifting buoys, Navy and merchant ships, aircraft and weather balloons. This information is used by complex numerical analysis and prediction models to predict weather and ocean conditions, and create the maps and products that help the Navy prepare and execute safe and effective missions.

To provide the computing power required for these data- and compute-intensive processes, and to meet the increasing demand to provide more accurate and more detailed predictions faster, FNMOC needed to enhance its existing computer environment to provide higher capacity and reliable performance. In addition to being able to easily scale up to accommodate increasing amounts of data and increasingly sophisticated software applications, the system had to comply with tough Navy security requirements due to the military data involved in FNMOC operations. The new system would also need to manage the complex choreography and sequencing of the thousands of jobs comprising the FNMOC Ops Run each day.

"The Platform LSF software is an underpinning technology that plays a fundamental part in how we make our complex operation work day after day. We have very tight time constraints on our modeling tasks, and LSF helps us ensure it works consistently and reliably."

Mike Clancy

Chief Scientist and Deputy Technical Director



Solution

FNMOC needed a more effective computing platform for its primary Analysis & Modeling Subsystem (AMS) – one that could easily expand to accommodate more advanced techniques and models continuously being developed by its supporting R&D organization, the Naval Research Laboratory. They chose to replace a legacy Cray system, which was using Cray's NQE job scheduler, with an SGI supercomputing system running Platform LSF software.

The new SGI Origin 3000 Series supercomputing cluster consists of 512-, 256- and 128-processor systems using SGI's patented NUMAflex™ technology that uses standard, modular building blocks called "bricks", which can be added as needed to tailor a system with the capabilities required by specific applications, allowing the system to scale very easily. And because FNMOC uses classified data from Navy ships, aircraft and other military assets such as weather observers operating covertly in the world's hot spots, their systems run SGI's Trusted IRIX multi-level secure operating system. This enables FNMOC to operate an environment that supports both classified and unclassified jobs and data, thus complying with stringent military security requirements. To manage the workload across the cluster, and to ensure that the right amount of processing power is assigned to each task, FNMOC runs Platform LSF intelligent workload management software.

"We looked at several solutions before choosing Platform LSF," says Mike Clancy at FNMOC, "but LSF was the best workload management software that was compatible with SGI's Trusted IRIX operating system."

FNMOC also considered an open-source workload management solution, but rejected it when they realized they were looking for much more than just a 'product'. They needed a partner that could work closely with them on an ongoing basis to solve problems. And with the tight time constraints they are under, FNMOC needed fast, reliable support.

Moving forward, a new initiative has been defined using Platform LSF MultiCluster software as a tool to enable grid computing. In particular, FNMOC, along with its Department of Defense (DoD) weather prediction partner, the Air Force Weather Agency (AFWA), will explore the use of grid computing to pool geographically distributed, high performance computing assets into a single, logical super-cluster to provide even greater levels of computing power for DoD NWP applications.

Customer Site

Fleet Numerical Meteorology and Oceanography Center (FNMOC)



With a broad portfolio of products and services supporting tens of thousands of customers worldwide, FNMOC is recognized internationally as one of the world's premier Numerical Weather Prediction centers. FNMOC operates at the leading edge of science and technology; and is well known for its long and productive track record of implementing, evaluating, operating, maintaining and improving complex NWP models specifically to meet the needs of the U.S. Department of Defense.

FNMOC employs about 250 highly skilled military, civilian and contractor personnel in the Monterey area, with experience mainly in the areas of meteorology, oceanography, satellite data processing and information technology.

About Platform Computing

Platform Computing's intelligent, practical enterprise grid software solutions help organizations optimize IT resources to Accelerate Intelligence™. We plan, build, run and manage grids that link IT to core business objectives, and help our customers improve service levels, reduce costs and enhance business performance. With industry-leading partnerships and a strong commitment to standards, we are at the forefront of grid software development, propelling over 1,600 clients toward powerful insights that create real, tangible business value. For more please visit www.platform.com.



World Headquarters

Platform Computing Inc.
3760 14th Avenue
Markham, Ontario
L3R 3T7 Canada
Tel: 905 948 8448
Fax: 905 948 9975
Toll-free tel: 877 528 3676
info@platform.com

United States

Boston: 781 685 4966
Detroit: 248 359 7820
Reston: 703 251 4850
Newport Beach: 949 798 5654
New York: 212 672 1770
San Jose: 408 392 4900

Asia-Pacific

Beijing: +86 10 62381125
Hong Kong: +852 2869 5687
Tokyo: +81 3 5326 3105

Europe

Düsseldorf: +49 (0) 2102 610390
London: +44 (0) 1256 370500
Paris: +33 (0) 1 41 10 09 20

For more information, visit www.platform.com/contactus

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