Fall 2000

The Resource

U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER NEWSLETTER

Highlights of . . .

Users Group Conference 2000

. . . New Technologies

ERDC MSRC Major Shared Resource Center

From the Director's chair

I have previously written about the massive change that is related to the word "modernization." We included this word in the title of our program when it was formulated in the early 1990s because that is what we set out to do—modernize our infrastructure, modernize our users, even modernize our leader's vision with respect to high performance computing (HPC) and its importance in the Department of Defense (DoD).

Almost a decade later, I can honestly say that the HPC Modernization Program (HPCMP) has had a tremendous positive impact on the DoD Research and Development (R&D) and Test and Evaluation (T&E) communities. However, that does not mean we can now rest on our success. We must now focus on not only keeping pace but also leading…yes, leading.

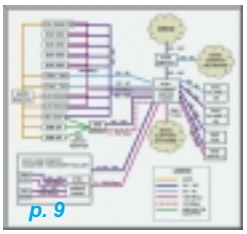
We must continue to foster innovation within the DoD community as well as contribute to our Nation's infrastructure and expertise. This means more change. We probably will not change the name of the program, but rest assured the program will continue to change. We are currently formulating the next generation Programming Environment and Training (PET) program; a new and improved approach to the Common High Performance Computing Software Support Initiative (CHSSI) is being phased in; significant upgrades to the Defense Research and Engineering Network (DREN) and the computing centers are underway; metacomputing is under investigation; and we continually enhance security measures.

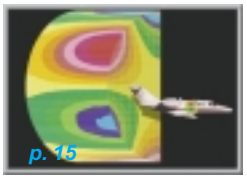
We strive for a delicate balance between providing leading edge capabilities and keeping productivity high within the user community. So once again, I ask the user community to continue to work with us through these times of constant change. If things get stressed, let us all take a deep breath and remember that we are a privileged group of people who have the honor to serve our country…and the duty to ensure continued peace throughout the world.

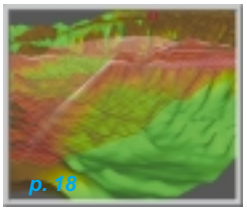
Bradley M. Comes
Director, ERDC MSRC

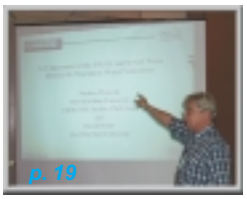
About the Cover:
Highlights of Users Group Conference 2000. The tenth annual HPC Users Group Conference was held on June 5-8, 2000, in Albuquerque, NM. Pictured are the User Feedback Panel and the opening plenary session (see story, page 18).
New Technologies. The SGI Origin 3800 is being installed this fall at the ERDC MSRC (see story, page 4). Several technology updates at the ERDC MSRC are presented beginning on page 8.

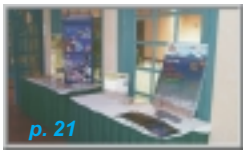
Features











Departments

New Director of ERDC Supports High Performance Computing

On June 4, 2000, Dr. James R. Houston became the first Director of the U.S. Army Engineer Research and Development Center (ERDC). Dr. Houston is the former Director of the ERDC Coastal and Hydraulics Laboratory at the U.S. Army Engineer Waterways Experiment Station (WES). The WES is now part of the ERDC and is the site of the ERDC command headquarters.

"High performance computing is very important to the Corps of Engineers, the Army, and the DoD to ensure that the U.S. warfighter has the advantage on the battlefield of the future. The ERDC MSRC, located in the ERDC Information Technology Laboratory, plays a major role in helping us provide this advantage," says Dr. Houston.

All of the technical aspects and programs of the U.S. Army Corps of Engineers (USACE) research and development laboratories are the responsibility of the ERDC Director. The ERDC consists of the Cold Regions Research Laboratory in Hanover, NH; the Topographic Engineering Center in Alexandria, VA; the Construction Engineering Research Laboratory in Champaign, IL; and the Coastal and Hydraulics, Environmental, Geotechnical and Structures, and Information Technology Laboratories at Vicksburg, MS. The ERDC has over 2,600 personnel, including 1,250 engineers and scientists. Dr. Houston is responsible for an annual research program of over $450 million and over $1.3 billion in facilities and equipment.

Dr. Houston received a bachelor's degree in physics in 1969 from the University of California (Berkeley), a master's degree in physics in 1970 from the University of Chicago, a master's degree in coastal and oceanographic engineering in 1974 from the University of Florida, and a doctorate in engineering sciences in 1978 from the University of Florida.

ERDC MSRC Team Member Involved with ERDC Graduate Institute

Dr. Thomas Oppe, ERDC MSRC, served as an instructor for the Spring and Summer 2000 sessions of the ERDC Graduate Institute located in Vicksburg, MS. The courses he taught were Numerical Analysis I and II for the ERDC Graduate Institute. Dr. Oppe is an adjunct professor for Mississippi State University (MSU).

The Graduate Institute is an association of universities and ERDC through which academic credit and graduate degrees can be earned from member universities. Louisiana State University, MSU, and Texas A&M University are the member universities affiliated with the Institute. Dr. C. H. Pennington is the Director of the Graduate Institute.

Dr. Oppe (standing) is shown with class members (left to right) Robert Fuller, Senior Engineer, Mechanical Systems, Grand Gulf Nuclear Plant; Javier Cortes, Chemical Engineer, ERDC Environmental Laboratory; and Vincent P. Chiarito, Research Structural Engineer, ERDC Geotechnical and Structures Laboratory.

Newest CAC Team Members

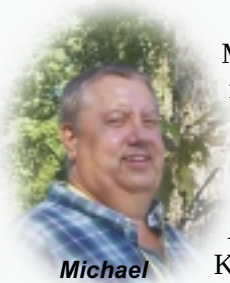
To continue to serve our customers with excellence, the ERDC MSRC Customer Assistance Center (CAC) has added three new members—Ms. Pinkie Lee Johnson, Mr. William A. (Bill) Renaud, and Mr. Michael A. Mahoney. The ERDC MSRC continues to make customer service a priority, and these new CAC team members are ready to provide customer support on the myriad issues regarding accounts, applications, and systems.

Pinkie Johnson

Pinkie Johnson received her B.S. degree in computer science from Belhaven College, Jackson, MS, in May of this year. In addition to providing technical support to the ERDC MSRC users, she serves as the backup accounts administrator and is responsible for all aspects of accounts administration from creation to deletion. She will play a vital role in both the annual accounts renewal process and the ongoing implementation and refinement of the ERDC MSRC's Accounts, Allocations, and Utilization account management system. Pinkie's outside interests include watching videos and surfing the Internet.

Bill Renaud

Providing technical assistance to ERDC MSRC customers is Bill Renaud's primary duty. Bill says he enjoys working in CAC not only because he is able to assist users with their problems, but also because their questions help him learn more about the ERDC MSRC and HPC. Bill graduated summa cum laude in May 2000 from MSU with a B.S. degree in computer science. While attending MSU, he worked in the summers of 1996-1999 at the ERDC Geotechnical and Information Technology Laboratories maintaining databases and upgrading hardware and software for networking systems. Away from work, Bill referees soccer matches, participates in other sports, and plans to take flying lessons.



Michael Mahoney

Michael Mahoney is a graduate of MSU. He has double undergraduate degrees in business statistics and data processing, as well as having his MBA. In addition to being a certified public accountant, he is also certified in management accounting, internal auditing, information systems auditing, data processing, and financial systems auditing. After graduating from MSU, Michael worked on a team that helped develop a Trust Automatic Package written in Assembly Language. His outside interest is in Shotokan Karate, where he is a first Dan Black Belt.

ERDC MSRC Team Member Declared Telly Award Finalist

Mr. Randy Kleinman was declared a Telly Award finalist for 1999 for the outstanding animation that he created for a video for the U.S. Army Engineer District, New England, entitled "Minimizing the Risk—The Story of DAMOS" (Disposal Area Monitoring System). Although this work was done for the ERDC Information Technology Laboratory, Randy is a valued team member of the ERDC MSRC Scientific Visualization Center and has produced many equal quality animations for the DoD HPCMP.

The Telly Awards, founded in 1980, showcase outstanding cable commercials, film and video, and non-network productions. The Telly is a highly respected national competition and has become a much sought after award in the television, commercial, and video industry.

Randy Kleinman, ERDC MSRC, receives a trophy and certificate for being declared Telly Award Finalist for 1999

ERDC MSRC Names Program Manager

Mr. Douglas Walker joined the Computer Sciences Corporation (CSC) Nichols Team at the ERDC MSRC as Program Manager effective July 5, 2000. He has over 35 years of experience in information technology and 14 years in the management of high performance computer environments.

Doug is a graduate of Florida State University with a B.S. in Geology. After graduation, he worked for the Federal Power Commission in Washington DC. In 1962, Doug took a job as a petroleum engineer with Consumers Power Company in Jackson, MI, where he got his first experience in information technology. He spent one year in Operations Research with Beaunit Fiber in North Carolina. After retiring from General Electric with 29 years of service, he joined Nichols Research Corporation in July of 1996 as Deputy Program Manager at the Aeronautical Systems Center (ASC). A year later, he was promoted to Program Manager of the ASC MSRC and served there until his recent move to ERDC.

New Partnership Tests Advanced Supercomputing System

A project to test one of the most advanced shared-memory computing technologies available is being initiated this fall with the installation of a new 512-processor supercomputer by a unique partnership of academic, government, and industry collaborators.

The ERDC MSRC, the Arctic Region Supercomputing Center at the University of Alaska, Fairbanks, and SGI have entered into a collaborative effort to build and evaluate a 512-processor single-system image, using the newest NUMAflex modular technology. The SGI Origin 3800 series machine is being installed at the ERDC MSRC and provides access to authorized researchers via high-speed networks from anywhere in the Nation, including Alaska.

SGI Origin 3800

"The installation of this 512-processor system gives government and academic researchers across the country access to the most advanced NUMA shared-memory computing architecture available today. A partnership like this across academia, government, and industry enhances opportunities for information exchange, which can only help the scientists do better research," says Mr. Brad Comes, ERDC MSRC Director.

The ERDC MSRC has a long-term contractural relationship with CSC to perform integration services, including installation, integration, and testing of this specialized system configuration. CSC has extensive experience with SGI's existing Origin 2000 technology as a major systems integrator and will continue to provide that expertise toward the success of this project.

SC2000

David Stinson

The ERDC MSRC is this year's lead agency for the DoD HPCMP exhibition at SC2000 to be held in Dallas, TX, November 4-10. The DoD booth will include an interactive video presentation of the HPCMP, posters describing the HPCMP, posters featuring research going on in the various computational technology areas, and handouts from the shared resource centers. Current plans are to deploy two Web cameras on the DoD booth this year. For more information, go to the SC2000 Web site at *http://www.sc2000.org* or the ERDC Web page at *http://www.wes.hpc.mil*.

DoD's participation will be notable in this year's conference. The overall Conference Chair is Dr. Louis Turcotte, formerly at the ERDC MSRC. The Conference Vice Chair for Exhibits is Dr. Joe McCaffrey, MSU, with Virginia To, High Performance Technologies, Inc., serving as Research Exhibits Chair. Brad Comes, ERDC MSRC Director, serves on the Tutorials Committee. ERDC MSRC team members Stephen Jones and John West are Co-Chairs of ESCAPE 2000. ESCAPE 2000 will demonstrate leveraging wireless connectivity, large bandwidth, and reliability with HPC to do "HPC Anywhere." Participants will demonstrate applications and technologies that they feel best illustrate how being able to reach "HPC Anywhere" will impact supercomputer users and technology. In addition to staffing the DoD booth, DoD workers will be serving in the Network Operations Center and other key areas of the conference.

Stop by the DoD HPCMP booth, No. R397, located in the Research Exhibit Area behind the HP and Compaq booths at the Dallas Convention Center. This year's booth has a new look and feel. For questions or comments about this year's DoD exhibition, contact David Stinson, DoD HPCMP Booth Chairman for SC2000 at 601-634-2188 or *stinsod@wes.army.mil*. See you there.

Summer Intern from Clark Atlanta

Dr. Wayne Mastin

Mr. Richard Anderson, a senior computer science major at Clark Atlanta University, returned on 1 June 2000 to spend his second summer as an ERDC MSRC summer intern. While at Clark Atlanta, Richard served as a teachers aide and worked in the library teaching students how to use the Internet and how to obtain information from the Georgia Library Learning Online (GALILEO) databases. While serving in the U.S. Army as a Combat Life Saver, Richard received the Army Achievement Medal in 1995.

Richard has been instrumental in the PET program at the ERDC MSRC. Last summer he developed a Web-enabled database of all training material accumulated since the beginning of the PET program in 1996. This summer he researched various Web conferencing tools and services that can be used for meetings and presentations to remote sites and for distance education and training. The success of his effort will lead the PET program to the next level in achieving the goal of providing training to users at "any time, any place, any pace."

After completing his studies at Clark Atlanta University in May 2001, Richard plans to seek a position in management information systems with an information technology firm. He also plans to attend graduate school.

Clark Atlanta University summer intern at ERDC, Richard Anderson, doing research on Web conferencing tools

Jackson State University HPC Summer Institute

Dr. Wayne Mastin

Students attending the Jackson State University 2000 HPC Summer Institute shown in a class with Dr. Wayne Mastin, ERDC MSRC (back far left), Professor Willie Brown, JSU (standing center), and Brenda Rascoe, JSU (back right)

The fifth Jackson State University (JSU) Summer Institute on High Performance Computing was held on 12-23 June 2000. The summer institutes are sponsored by the ERDC MSRC PET program to expose college students to research activities and the use of HPC. This summer's institute focused on the topics of scientific visualization and computational fluid dynamics. Scientists and engineers from JSU and MSU, both ERDC MSRC PET partners, presented lectures and demonstrations. A highlight of the institute was a trip to the Engineering Research Center at MSU and the research laboratories at ERDC for a first-hand experience in seeing how researchers from various disciplines are working together to solve problems of national significance to the DoD. The visits included an ERDC Command Briefing followed by visits to the Ship and Tow Simulator, the Environmental Chemistry Laboratory, the Army Centrifuge Research Center, and the Information Technology Laboratory. Mr. Brad Comes, ERDC MSRC Director, gave a brief address to the students during a luncheon in the ERDC Main Conference Room. The purpose of the summer institutes is to foster interest in careers in high performance computing and in the DoD in particular. To quote a student from Rust College, "It was something new. It gave me a better insight on the many different career opportunities."

Nineteen students from six Historically Black Colleges and Universities in Mississippi, Louisiana, and Oklahoma attended the summer institute

Professor Willie Brown, JSU, organized the summer institute, with the assistance of Mr. Chuck Patrick and Ms. Brenda Rascoe, also from JSU. Professor Bharat Soni, MSU, arranged the visit to the Engineering Research Center and the tutorials on computational fluid dynamics at JSU. Dr. Wayne Mastin, ERDC MSRC, escorted the students on the ERDC tour.

Brad Comes addresses the Jackson State University 2000 HPC Summer Institute class at a luncheon in the ERDC Main Conference Room

ERDC MSRC Conference Participation

Workshop on OpenMP Applications and Tools

Drs. Clay Breshears and Phu Luong participated in the 2000 Workshop on OpenMP Applications and Tools (WOMPAT) in San Diego, CA, on July 6-7, 2000, and presented a paper entitled "Comparison of OpenMP and Pthreads within a Coastal Ocean Circulation Model Code." The paper analyzed the two threads programming models, OpenMP and Pthreads, and compared the models in terms of code performance, ease of programming, and parallelization capabilities.

Conference on Parallel and Distributed Computing Systems

Drs. Clay Breshears and Phu Luong participated in the 13th International Conference on Parallel and Distributed Computing Systems in Las Vegas, NV, on August 8-10, 2000, and presented a paper entitled "Application of Multiblock Grids and Dual-Level Parallelism in Coastal Ocean Circulation Modeling." They also reported on the continuation of their work on mixed OpenMP/MPI programming in the Princeton Ocean Model and the advantage of dual-level parallelism in large-scale HPC problems.

HPCMP Distributed Center Working Group Meeting and Advanced Parallel Software Development and Tuning Workshop

Dr. Thomas Oppe participated in the HPCMP Distributed Center Working Group Meeting and the Advanced Parallel Software Development and Tuning Workshop held at the Maui High Performance Center, Kihei, HI, on August 15-18, 2000. He presented a paper entitled "SARA-3D: A Case Study in Dual-Level Parallelism." SARA-3D is a finite/infinite element code used to solve problems in structural acoustics, structural vibrations, radiation, scattering, and electroelasticity by modeling the frequency response of a structure to incident waves traveling through a fluid.

MAPINT Symposium on Multidisciplinary Applications and Interoperable Computing

Dr. Clay Breshears co-chaired the metacomputing sessions at the fourth Symposium on Multidisciplinary Applications and Interoperable Computing (MAPINT 2000) sponsored by the ASC PET program in Dayton, OH, on August 15-17, 2000. The MAPINT symposiums provide a platform from which strategic DoD, industrial, and academic researchers may communicate their ideas and achievements to support the development of multidisciplinary frameworks and environments aimed at more realistic simulations.

Metacomputing, a Different Kind of Grid

Stephen Jones

The idea of metacomputing has been around for at least a decade. While there are a number of definitions for metacomputing, the most fundamental aspect is one of presenting a single view of multiple computing resources. This could be as simple as providing a single job submission capability to multiple computers, or as complex as running a single job across geographically distributed heterogeneous resources, be they computers, instrumentation, or storage devices. Over the past couple of years, a new term has arisen for identifying the infrastructure for providing transparent access to networked resources, the Computational Grid, or Grid, for short.

Researchers in academia and national laboratories are developing the infrastructure necessary to support a highly interoperable, transparent computing environment that is similar in concept to the national power grid. Ubiquitous access from any location, combined with resource discovery and effective security mechanisms, will dramatically change the computing landscape. Planners within the DoD HPCMP recognize the advantages such an environment could have for the user community.

If a Grid were a homogeneous environment, locating, scheduling, and managing resources would be *relatively* easy. In reality, the Grid is a heterogeneous environment composed of many diverse hardware and software products as well as unique operating environments. One of the primary goals of the Grid is to provide an intuitive, easy-to-use interface that hides the complexities inherent in a heterogeneous environment. The ability to directly manage local resources allows participating centers to effectively utilize existing systems, software, and expertise while offering users a more consistent view of the DoD's computational and storage resources.

There are two primary projects developing the middleware infrastructure necessary to enable a grid environment. They are Globus and Legion. Their designs display fundamental philosophical differences—Globus is a component toolkit, while Legion is more of a monolithic system. Each incorporates a security model that supports Kerberos or digital certificates, which are part of a Public Key Infrastructure.

In order to evaluate the available middleware and examine the feasibility of building a Grid, a testbed involving a number of shared resource centers will be designed and deployed within the HPCMP. This work will be accomplished under the auspices of the HPCMP Metacomputing Working Group.

Next Generation Network for the ERDC MSRC

Stephen Jones

As part of Performance Level 3 (PL3), the ERDC MSRC will be significantly enhancing its internal network infrastructure. This upgrade will provide an order of magnitude increase in communication capability and capacity across the MSRC's backbone and a sixfold increase to remote users on the DREN. This article will describe some of the key components of this upgrade and the impact it will have on the user community.

There are two interconnected aspects of the network infrastructure, the MSRC's internal network, and its external connection to the DREN. Until April 2000, the MSRC enjoyed an Optical Carrier-3 (OC-3c) connection to the DREN. On the ERDC side of the DREN Service Distribution Point (SDP), the Asynchronous Transfer Mode (ATM) traffic was converted to Fiber Distributed Data Interface (FDDI) traffic. Ignoring overhead and conversion issues and looking at peak speed, the DREN fed 155 Mbps into a 100-Mbps network. The primary reason for using FDDI at the network ingress point was security; the available Network Intrusion Detection Systems (NIDS) were FDDI-based.

However, the existing infrastructure, which is based primarily on FDDI for interactive access

and the High Performance Parallel Interface (HiPPI) for internal data transfers, was being overwhelmed. Data growth due to user applications was exceeding 1 TB per month. In the fall of 1999, we began limited deployment of Gigabit Ethernet (GigE) as a possible internal backbone technology. We were also aware that DREN upgrades would likely be occurring in the first half of FY00.

An enhanced network architecture, see Figure 1, was developed and approved in July 2000. Gigabit Ethernet will become the MSRC's backbone technology. There are several reasons for moving to GigE. GigE is cost-effective, proven technology; it positions us for a future upgrade to Ten-Gigabit Ethernet, and network vendor support for HiPPI has declined sharply. HiPPI will continue to be available, though it will be relegated to a secondary role.

In April 2000, the ERDC MSRC's DREN connection was upgraded to OC-12c (622 Mbps). With the delivery of an OC-3c NIDS, and soon an OC-12c NIDS, FDDI will be phased-out and ATM will become the primary interface for interactive access. There will be ATM connectivity directly from the DREN to all of the HPC and mass storage systems, as well as the majority of scientific visualization systems. The increased bandwidth will immediately benefit users transferring large volumes of data or doing remote visualization and will enable new applications like distributed backup and metacomputing.

The ERDC MSRC boasts a remote disaster/ recovery system, with both OC-12c and GigE connectivity. This facility has a direct (i.e., no intermediate routers) OC-12c connection to the DREN, making it a viable facility for remote

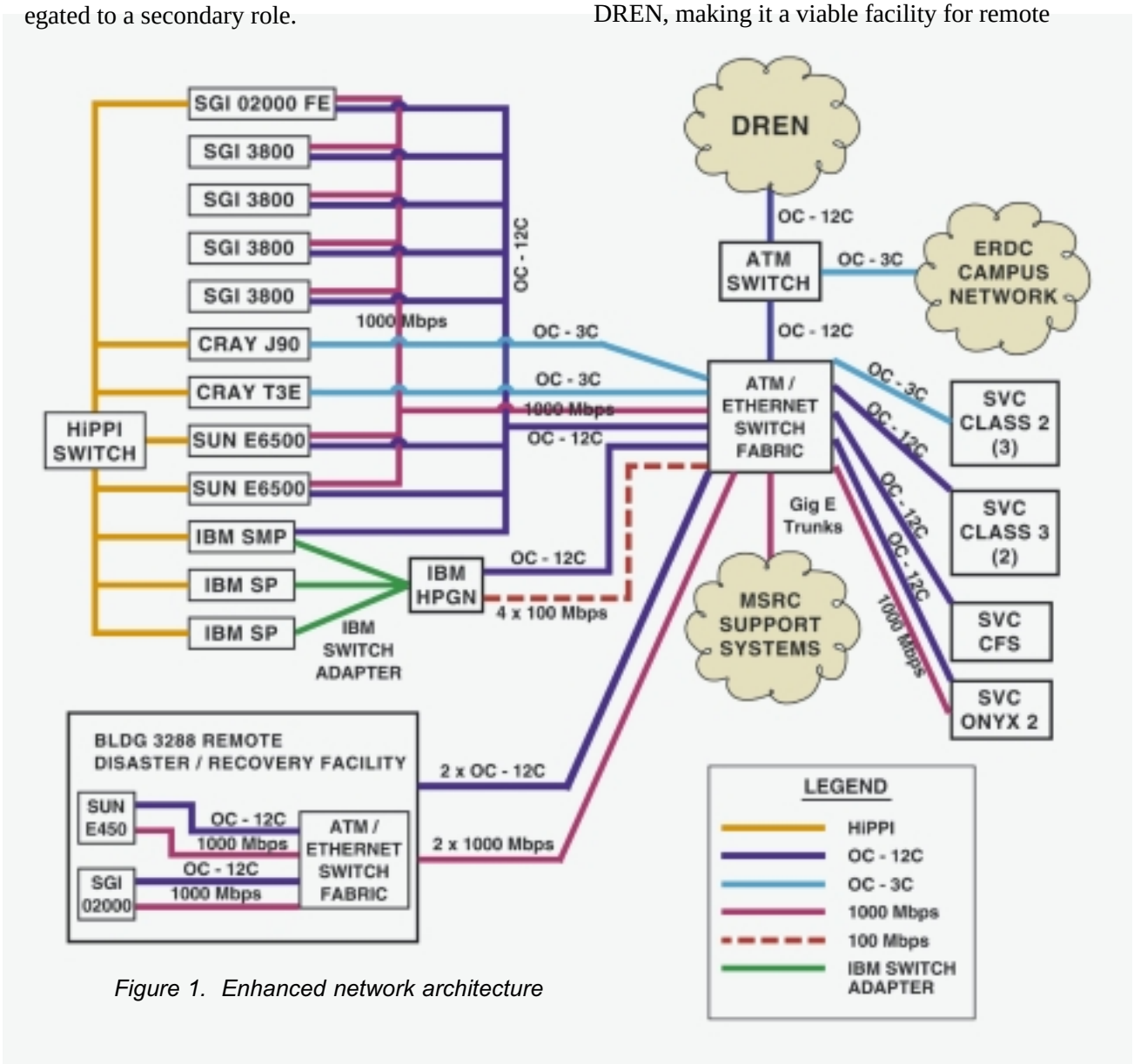


Figure 1. Enhanced network architecture

backups from other HPCMP sites. The mass storage environment is similar to that used at the other MSRCs, Sun servers and SAM-FS from LSC.

In conjunction with the network upgrade, the ERDC MSRC will be re-addressing all of its systems, from the desktop to the HPC systems, and transitioning from the wes.hpc.mil domain to the ***erdc.hpc.mil*** domain. Advantages of the IP address change include more efficient routing, a more robust security environment, and fewer complications when new HPC systems are installed. The ***erdc.hpc.mil*** domain better aligns the MSRC with the new structure of its parent organization, the ERDC.

From a user perspective, the most significant impact should be dramatically improved network performance. As long as the domain name system (DNS) is used to resolve host names, as opposed to host entries in local configuration files, the IP address change should not pose any significant problems. In addition, we will continue to support the wes.hpc.mil domain name to ease the transition to our new, official domain name. The ERDC Kerberos realm, WES.HPC.MIL, will not be affected by the domain name change, eliminating the need to modify thousands of Kerberos configuration files across the HPCMP.

Future Benchmarking of DoD HPC Systems

Dr. William A. Ward, Jr., and Dr. Daniel Duffy

The DoD, like other large corporate users of computer systems, requires tools to evaluate the performance of installed systems for comparison to future systems' capabilities. The ERDC MSRC is constructing a new generation software test package to fill that requirement in the area of HPC.

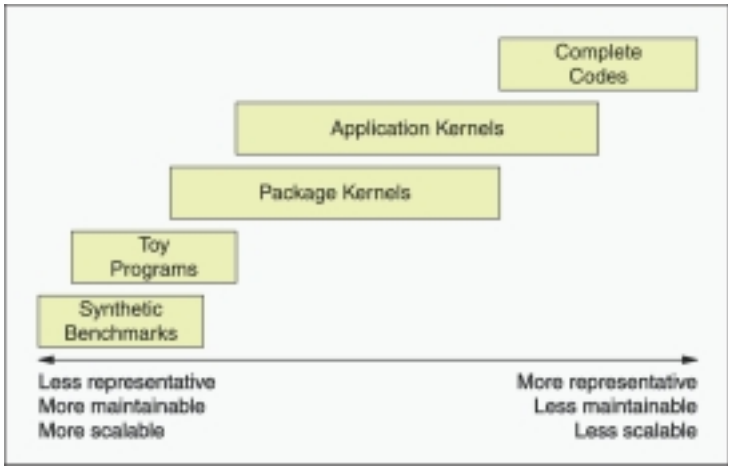
Benchmark test packages typically contain codes chosen from one or more of the following types: (a) relatively short synthetic programs, such as Whetstone and Streams; (b) toy benchmarks, such as Quicksort and Prime Sieve; (c) widely used off-the-shelf codes or package kernels, such as Linpack and ScaLAPACK; (d) application kernels, that is, sections of code extracted from actual application programs that perform a significant fraction of work; and (e) complete applications. The decision as to which types of codes to include in a test package must be made based on the following important characteristics that serve as goals for the test constructor. Most importantly, the benchmark must be *representative* of the current and projected workload on DoD HPC systems. The types, patterns, and rates of computation, communication, and input/output of the programs in the test package must match that of the programs actually in use to as great a degree as practical. Furthermore, the programs in the test package must be imposed on the system under test in a manner similar to that in practice. Second, the test package must be *maintainable*; the size of the test package must be kept to a minimum and constructed in a modular, easy-to-modify fashion. Furthermore, like any other software product, it must be designed and implemented according to standard software engineering practices. Third, and this is particularly important for any HPC benchmark, the test package must be *scalable*; it must be possible to vary the number of processors to be used and the size of the test problem to be solved. The combination of the above three features makes the test package durable.

The figure on the adjacent page shows where each type of candidate test component falls in the spectrum of specified goals. Unfortunately, these goals are inherently conflicting so that completely reaching some prevents full accomplishment of others. The challenge for the Computational Migration Group (CMG) at the ERDC MSRC is to construct a test package that, in aggregate, best achieves all the goals. Hence, the focus is to construct a test package consisting of kernels and complete codes.

By means of a two-part survey and through use of detailed system utilization data from all four MSRCs to DoD HPC leaders and users, the CMG is working to identify a set of packages and applications that are candidates for either kernel extraction or inclusion as complete codes. This

most difficult part of the kernel construction process is that the extracted code must be modified to generate its own input data for problems of arbitrary size (scalability). As part of a feasibility study, an application kernel has already been extracted from FEMWATER, a code used to model groundwater contaminant transport. Preliminary tests show that this kernel successfully tracks the performance of the actual applications for varying numbers of processors. Other codes, for example, CTH, GAMESS, and NLOM, will be included in their entirety.

The HPCMP views the development of the test package as one of its most important activities and as an ongoing effort. The CMG is continuing to add components to the package with a goal of having a usable test suite by late fall/early winter.



Each type of candidate test component falls in the spectrum of specified goals

The Switch

Jay Cliburn

Early in 2000, the ERDC MSRC added a 64-node IBM Power3 symmetric multiprocessor (SMP) to the computing lineup. The machine, named "Cobalt," consists of 64 nodes containing eight processors each, for a total of 512 central processing units (CPUs). Each node runs its own copy of the AIX operating system.

The interconnection fabric that binds the individual nodes into a cooperative whole is called the *SP switch*, or simply "the switch." Whenever a parallel process needs to pass information to a cooperating process on another node, the information is passed over the switch. The specific mechanism employed by each process to effect the information transfer is called a *switch window*. Switch windows are assigned to processes at job start-up time. Even though there are eight processors available per node, hardware and software constraints of the current SP switch limit a job on Cobalt to a maximum of four switch windows per node. Ideally, each CPU would have access to a switch window, for a total of eight windows.

The upshot of this condition is that any given Cobalt node can support a maximum of four simultaneous message-passage interfaces or serial processes, confined to a maximum of four CPUs. Threaded and OpenMP codes can use all eight processors per node, since these codes do not necessarily require switch windows in order to function.

The switch window deficit will be eliminated with the installation of IBM's follow-on SP switch, called the *SP Switch2*. Installation of the SP Switch2 at the ERDC MSRC is planned for the fall/early winter of 2000. The SP Switch2 increases the maximum number of switch windows per node from four to sixteen, meaning that each of the eight CPUs on Cobalt nodes will have access to a switch window, with a surplus of eight windows for future growth. Users of the IBM SMP (Cobalt) at the ERDC MSRC can expect to see immediate and noticeable improvements in available processing power when the SP Switch2 is integrated into Cobalt.

The Mass Storage Facility—Then and Now

Jay Cliburn

In an effort to improve usability and reliability, the Mass Storage Facility (MSF) at the ERDC MSRC has undergone multiple changes in the past few years, and there are more changes to come. The changes are necessitated primarily by increases in both size and number of files produced and archived by users, and by technological advances in the mass storage industry segment. The ERDC MSRC is committed to providing reliable, robust, and convenient access to the mass storage facilities, and this article is intended to describe the MSF, its past, present, and future.

Prior to mid-1999, the MSF consisted of a Cray J90 connected to a StorageTek four-silo tape farm (Figure 1). The J90 contained a 200-GB disk array and used Cray's Data Migration Facility (DMF) to archive data to tape based upon a migration algorithm. Users who needed to archive files did so by invoking a set of ERDC MSRC-developed utilities called collectively the "msf commands." By far the most widely used of these commands were `msfput` and `msfget`, which moved files to and from the MSF, respectively. Users were allowed to log into the MSF directly and manipulate files. The ERDC MSRC mass storage philosophy has been that users log into an HPC host, retrieve needed files from the MSF into a workspace disk area, run the job, then move the job output data back to the MSF, making room in the workspace area for the next job. With current and future MSF configurations, this philosophy remains in place and is not expected to change.

Much of the infrastructure described in the previous paragraph remains in place today, but has been augmented by important hardware and software additions. In the past year, it became clear that 200 GB of usable archival disk space on the MSF was insufficient to handle the needs of ever expanding data set sizes, especially those of large challenge project-related jobs. Also, the ERDC MSRC came to recognize the critical need to provide a capability to restore archived user data in the event of a catastrophic loss of the MSF. Even though each file stored on the MSF was and is duplicated within the tape silos, if the MSF were to be destroyed by some calamitous weather event, fire, or flood, user data might be irretrievably lost. To mitigate this risk, the ERDC MSRC established an offsite disaster recovery archival facility. That facility is in operation today.

The current MSF (Figure 2) incorporates an SGI Origin high availability file server (HAFS) that, in addition to providing home directories for HPC machines, offers over 500 GB of usable archival disk space. The J90 remains part of the MSF. The archival portion of the HAFS is where files are sent if users execute an `msfput` command today. The HAFS is also now a figurative tee in the data pipe between the HPC machines and the MSF. The tee copies all files destined for the MSF to the remote disaster recovery site. The ERDC MSRC relocated one of the original four tape silos to the remote site and added a small Origin deskside machine as the front-end. Files are still duplicated within the MSF tape silos, but an additional copy is now made on the remote disaster recovery site.

The migration strategy from the "old" MSF to the "new" MSF is non-intrusive. That is, users are required to take no action to accomplish the migration. When a user invokes `msfget`, the new MSF is checked first. If the requested file is found, it is transferred. If it is not found, then the old MSF is checked. When a user executes `msfput`, the file is copied onto the new MSF only. In this manner, over time all archived files will eventually be written to the new MSF, and hence, to the remote disaster recovery site. At

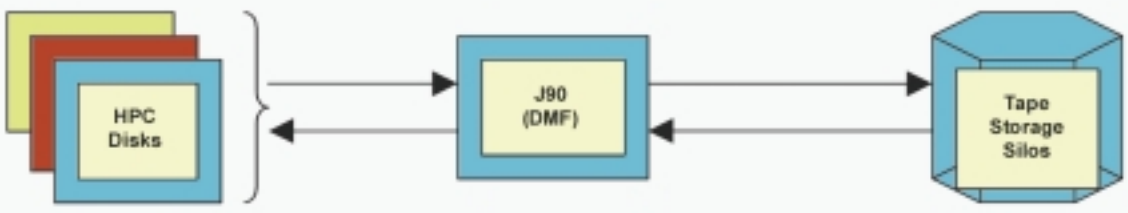


Figure 1. Original mass storage facility

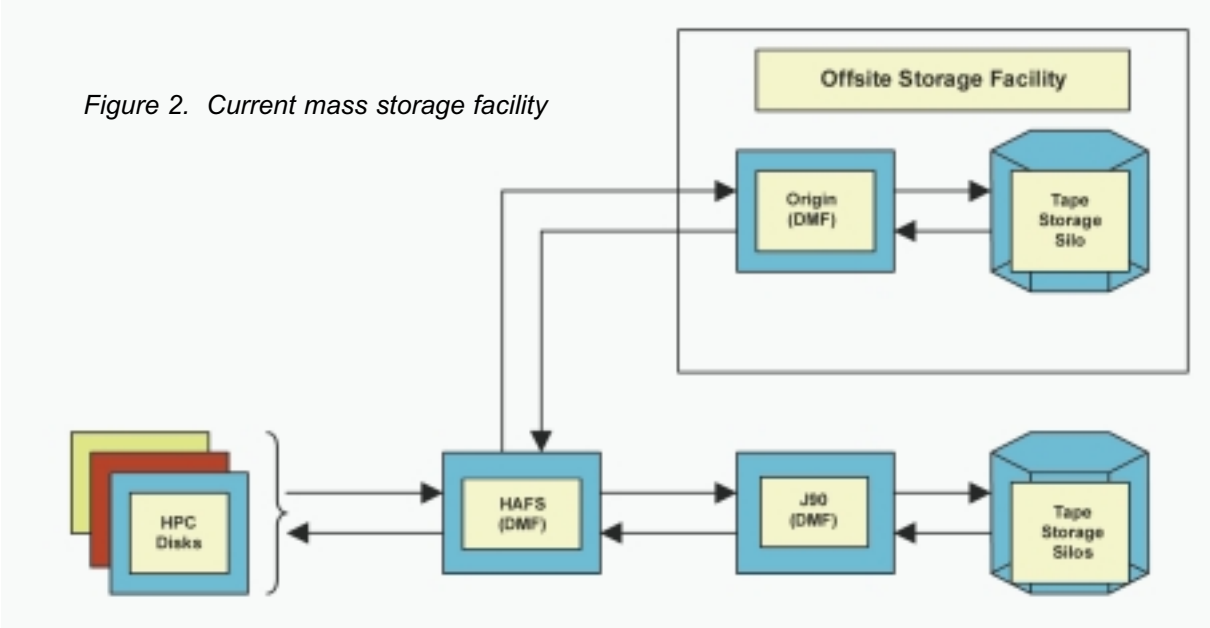


Figure 2. Current mass storage facility

some point in the future, the ERDC MSRC staff will manually transfer all remaining files from the old MSF to the new MSF.

The ERDC MSRC is currently working on a sweeping upgrade to the MSF. See Figure 3. The end-state of this system will consist of a pair of Sun Enterprise 6500 file servers attached to 3.2 terabytes of RAID disk and new tape drives in the existing tape silo enclosures. The offsite disaster recovery facility receives a similar upgrade, but with a smaller Sun E450 server attached to 1.3 terabytes of disk. In both cases, DMF is replaced with Veritas Volume Manager, Veritas Cluster Server, and STK's Archive and Storage Manager (an OEM version of LSC's SAM-FS). The ERDC MSRC will perform the migration of archived user data from the existing MSF to the new MSF. Users can expect faster data access times and more reliable and robust service as data storage needs continue to expand into the new century.

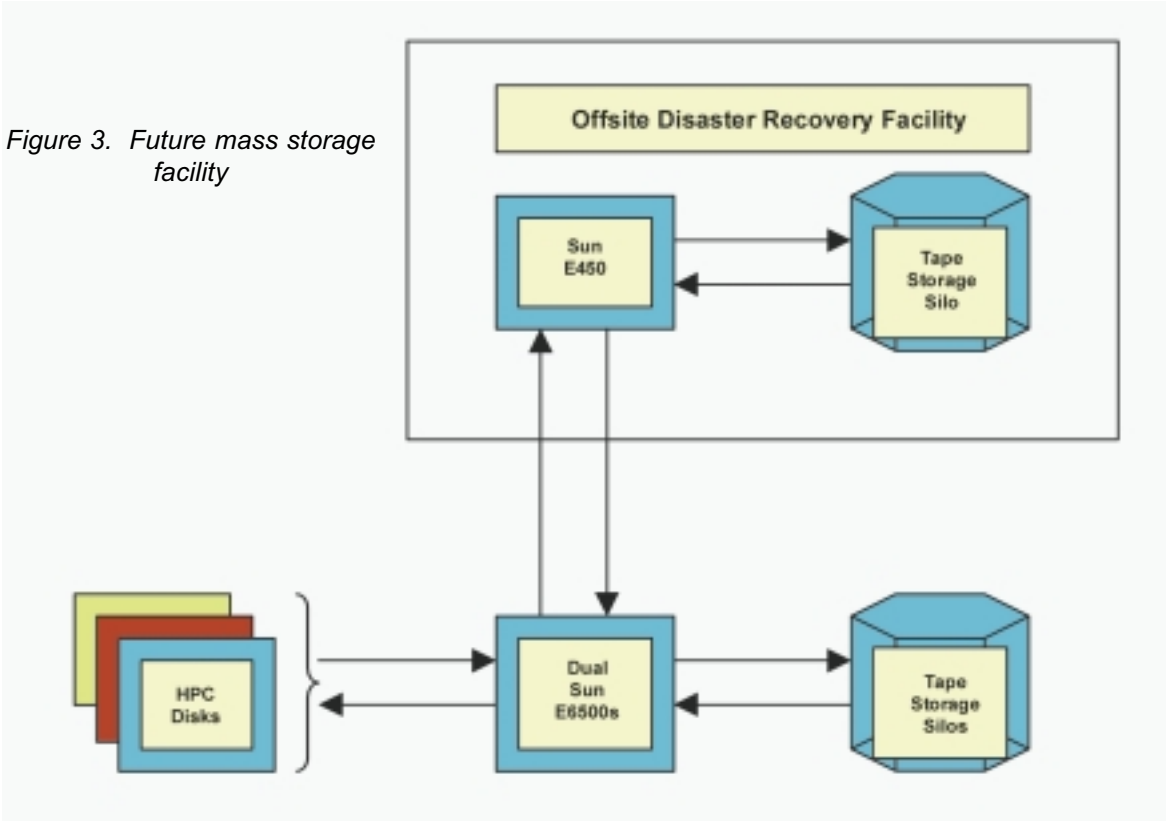


Figure 3. Future mass storage facility

Parallelization of SARA-3D

Dr. Tom Oppe

The Computational Migration Group at the ERDC MSRC has recently completed work in porting a structural acoustics code called SARA-3D to several parallel-processing platforms, including the SGI Origin 2000, the Cray T3E, the IBM SP2, and the IBM Power3 SMP.

When using the Origin 2000 and the IBM Power3 SMP, the code exhibits dual-level parallelism, with message-passing interface (MPI) being used to parallelize coarse-grain computations and OpenMP being used to parallelize several fine-grain computations within each MPI process.

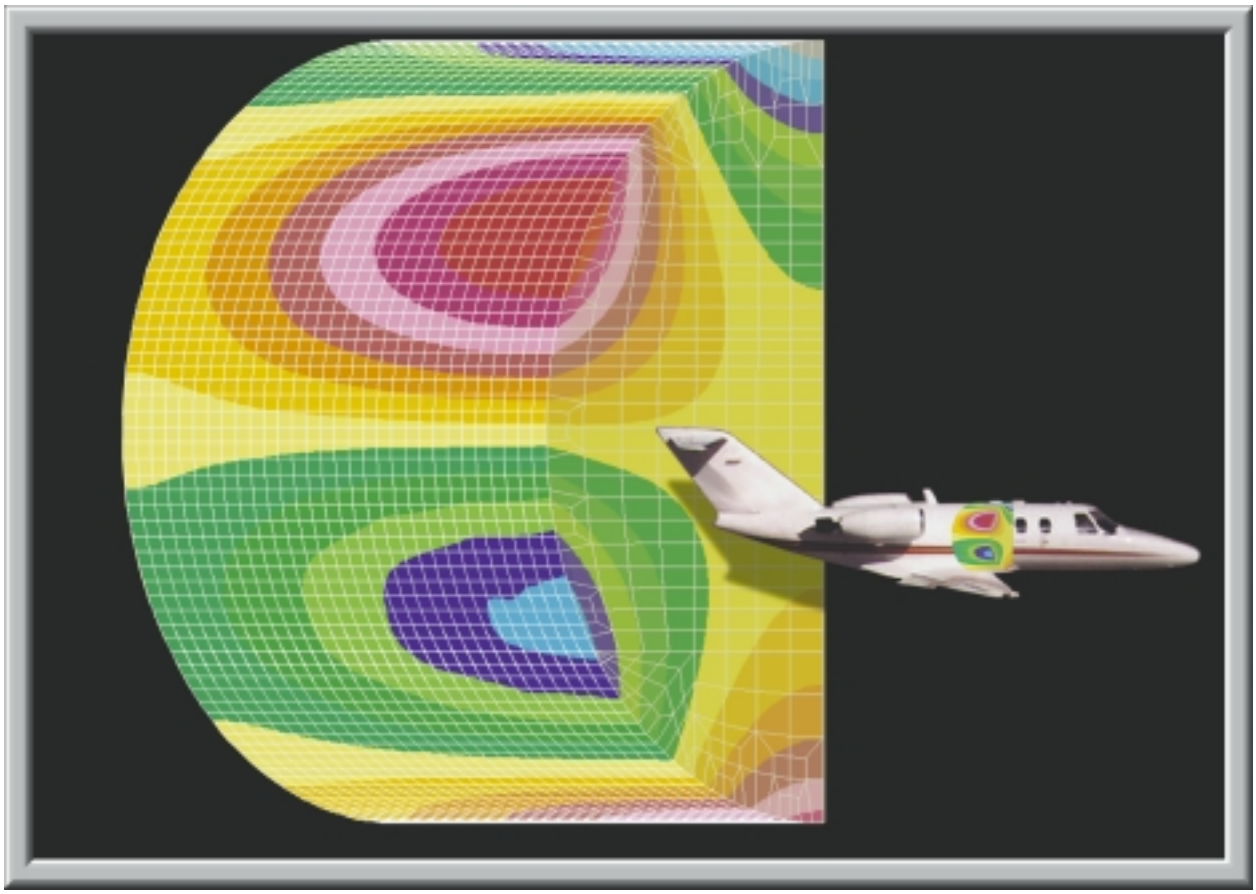
SARA-3D is a finite/infinite element code used to solve problems in structural acoustics, structural vibrations, radiation, scattering, and electroelasticity by modeling the frequency response of a structure to incident waves traveling through a fluid. SARA is used to predict vibration and sound levels for a wide variety of naval underwater acoustics problems. SARA-3D can also be used in the design of airplanes with a goal of reducing the level of noise inside the cabin.

Before SARA, structural acoustics problems were solved using finite elements for the structure and boundary elements for the fluid. Unfortunately, the resulting matrices associated with the system of linear equations when using this approach are dense (i.e., fully populated with nonzero elements). This fact severely limited the size of problems that could be treated since memory, disk space, and CPU time requirements were all growing rapidly as a function of the number of degrees of freedom (i.e., variables) in the model. SARA was the first production code to use finite and infinite elements for the fluid, which leads to banded matrices for the linear equations and hence permitting much larger problem sizes. There are now other programs that use infinite elements, but none are as widely used in the Navy community.

SARA-3D employs an inherently parallel algorithm in which the effects on a structure of incident waves of varying frequencies are modeled. This modeling results in a different linear system of equations to be solved for each frequency, and the work for each frequency is independent from the work for all other frequencies. The part of the code that cycles through the user-specified frequencies, called the "frequency loop," was parallelized using MPI, with each MPI process handling a different set of frequencies. To achieve load balancing, a "boss-worker" strategy was employed in which one MPI process, the "boss," assigns a new frequency to the next available "worker" MPI process that has completed its work for a prior frequency. Once the last frequency has been processed, all MPI processes except one are terminated in preparation for the postprocessing phase.

During the frequency loop phase, there is substantial computation within each MPI process that was parallelized using OpenMP and threads. For a particular frequency, the computations associated with the linear system solver (known as a "frontal" solver within the finite element community) were very significant. A frontal solver is a specialized form of Gaussian elimination that organizes the elements of the mesh along a series of computational wavefronts selected in such a way that the front "width," or maximum population of nodes in a front, is minimized. This process is analogous to reordering the rows and columns of a matrix to reduce its bandwidth, which in turn reduces the memory and number of operations required by Gaussian elimination. The grouping of nodes into fronts allows their elimination once they have been fully "assembled," or formed, using information from neighboring nodes in the front. The global linear system is never completely assembled in memory, but is instead assembled element by element along a front and factored, with the factors written to disk in a scratch file. These factors are read later in the back substitution phase when the nodes (and fronts) must be accessed in reverse order.

A version of the frontal solver was effectively parallelized for 6-8 processors using OpenMP by partitioning the matrix and right-hand-side information along a particular front into nearly equal pieces and assigning the work to different processors. In addition, some "prefront" calculations, used to symbolically factorize the matrix prior to numerical factorization, were parallelized. Finally, the postprocessing involving the construction of pressure or velocity contours was parallelized using OpenMP.



SARA-3D was used in the analysis of a section of an aircraft fuselage model for the purpose of quieting the interior. This is the plot of the interior pressure from a point load at the top of the fuselage section. The load frequency used was 86 Hz. The resonance is a consequence of a compliant region in the fuselage, namely the windows, which happen to be near the bright red spot in the picture (The red color represents 9.8 mPa, and the lightest blue color represents -10.7 mPa.)

During the course of a SARA-3D run, several files are written to disk, and their use had to be coordinated among the MPI processes. Most files were guarded so that only MPI process "0" could write to them. Many of these files, however, were internal binary "write/read" files that needed to be subsequently read by all the MPI processes. Thus, some amount of synchronization was necessary to prevent the reading of an incompletely written file. The largest file is the internal binary scratch file needed by the frontal solver. Each "worker" MPI process needed its own version of this file, since each one was generating and solving its own set of linear systems. The size of these frontal solver scratch files effectively limits the number of MPI processes that can be used in a large run, and thus arose the need to parallelize the computations within each MPI process. This "dual-level" parallelism allowed each MPI process to complete its work more quickly, allowing the processing of more frequencies in a given time without using more MPI processes and thus more disk space.

Tables 1 and 2 are timing statistics for runs on the ERDC MSRC Origin 2000 and IBM Power3 SMP computers, respectively, for a finite element model involving 14,280 elements, 53,850 nodes, and 187,571 degrees of freedom. In this run, 11 frequencies were processed. The model was run first sequentially and then using 12 MPI processes and four OpenMP threads per MPI process. Recall that the load-balancing model used in SARA-3D requires one MPI process to be the "boss," so using 12 MPI processes allowed each of the 11 frequencies to be processed in parallel by the remaining 11 MPI processes.

The effect of the OpenMP parallelization using four threads is shown in the tables in the front optimization, problem setup, prefront, and contour postprocessing phases, each of which was a

Table 1. Origin 2000 Timings			
Phase	**Serial, sec**	**Parallel, sec**	**Speedup**
Front Optimization	52.95	20.73	2.55
Problem Setup	307.63	213.62	1.44
Frequency Sweep	18,344.75	1,794.72	10.22
Prefront	3,399.42	861.37	3.95
Solution	14,871.19	807.81	18.41
Contour Postprocessing	112.31	30.13	3.73
Total Time	18,765.24	2,039.06	9.20

Table 2. IBM Power3 SMP Timings			
Phase	**Serial, sec**	**Parallel, sec**	**Speedup**
Front Optimization	69.26	22.85	3.03
Problem Setup	264.63	147.63	1.79
Frequency Sweep	16,832.49	1,602.37	10.50
Prefront	3,306.86	850.98	3.89
Solution	13,459.71	704.89	19.09
Contour Postprocessing	176.68	47.45	3.79
Total Time	17,277.29	1,800.76	9.59

one-time operation for each MPI process, and thus limited to a speedup of four. The frequency sweep and solution phases show the effects of both MPI and OpenMP parallelism.

Collaboration with personnel at BBN Technologies and the Naval Research Laboratory is continuing with SARA-3D code optimization and checkout. This collaboration has also included a “Bring Your Own Code” workshop emphasizing MPI and OpenMP. In addition, there have been two visits to the ERDC MSRC by the SARA-3D developers to plan future optimization strategies. We encourage other users to establish similar strong working relationships with our staff. It starts by calling our Customer Assistance Center.

ERDC MSRC Team Member Tutors Underprivileged Students

Mr. Stephen Jones, Chief Technologist for the ERDC MSRC, is one of the busiest and most valued members of the ERDC MSRC Government team. Yet, when he is in town, he persistently sets aside his time two afternoons per week during the school year to tutor underprivileged students at the Good Shepherd Community Center. He primarily tutors junior and senior high students in mathematics, though he occasionally does work with younger students and in other subjects, such as science, reading, and spelling.

The Good Shepherd Community Center, located in a low-income section in the City of Vicksburg, was founded several years ago by a Methodist minister who recognized a great need for the Center and the things it could offer to the poor. The Center is funded by The United Way, local churches, and Government grants and is dependent upon volunteers for most of its staff. It offers a subsidized daycare for children of working parents, after-school tutoring for elementary children, and Family Literacy/General Education Development classes. A free medical clinic for those without medical insurance, a gym program for youth each weeknight, a Saturday enrichment program for youth and children, and a food pantry for persons in emergency situations are also provided by the Center.

We are very proud of Stephen for reaching out into the community in this way to make a difference in the lives of the less fortunate. Stephen has been with the ERDC MSRC from its beginning. He is a graduate of MSU with B.S. and M.S. degrees in civil engineering.

The ERDC MSRC welcomes comments and suggestions regarding *The Resource* and invites article submissions. Please send submissions to our customer assistance center at :

e-mail: ***info-hpc@wes.hpc.mil***
Telephone: ***1-800-500-4722***

ERDC MSRC Participates in . . . Users Group Conference 2000

David Stinson

The ASC MSRC and the HPCMP hosted the tenth annual HPC Users Group Conference at the Hilton Albuquerque, Albuquerque, New Mexico, on June 5-8, 2000. This opportunity allowed HPCMP users to share experiences among themselves and with personnel of the MSRCs, DCs, and the HPC Modernization Office (HPCMO).

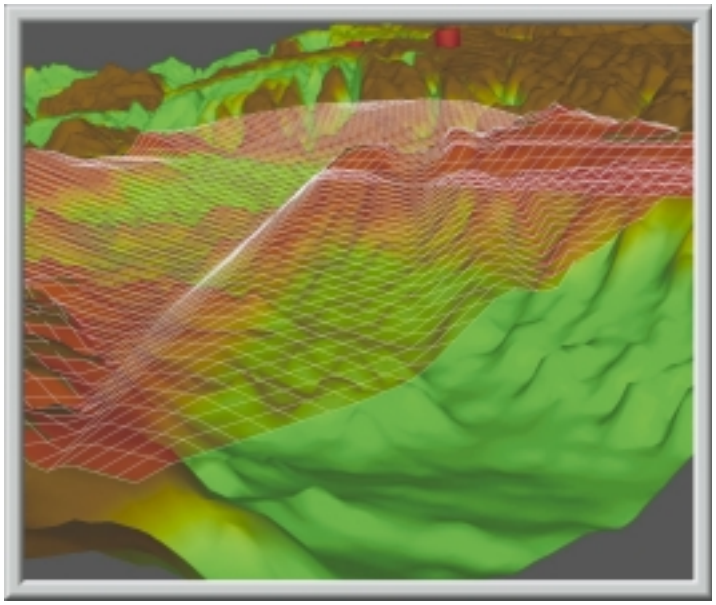
ERDC MSRC team members presented tutorials, papers, and posters, participated in Birds of a Feather (BOF) sessions and Working Group Meetings, and attended many of the conference sessions. The ERDC MSRC also provided a display with handouts available of its latest brochure and newsletter.

Day 1 of the conference was reserved for tutorials. Dr. Clay Breshears assisted in teaching two of the eight tutorials including "Tools and Techniques for OpenMP, MPI, and Mixed OpenMP and MPI Parallel Programming" and "Concurrent Programming with Pthreads."

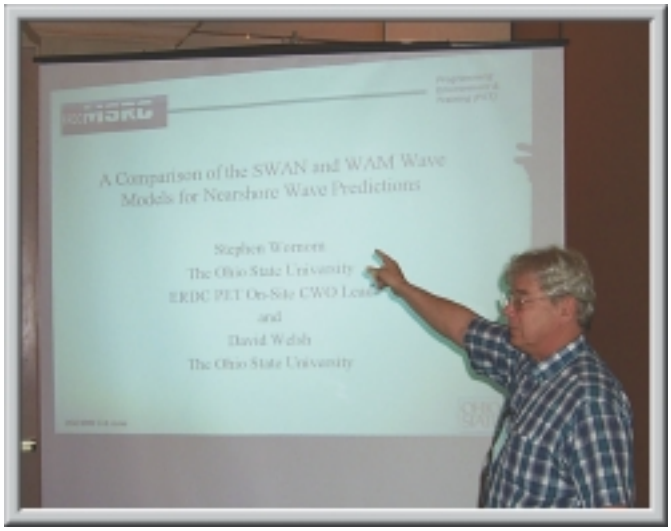
Mr. Steve Scherr, Chair of the Shared Resource Centers Advisory Panel (SRCAP), was the conference moderator. On Tuesday, after kicking off the conference with a welcome, Steve introduced the keynote and invited speakers including Mr. Cray Henry, Director of the HPCMP; Dr. Dan Stewart, Executive Director of the Air Force Materiel Command; Dr. Paul Messina, Associate Director for Advanced Simulation and Computing of the Department of Energy Office of Defense Programs; and Dr. Edwin Rood, Office of Naval Research, who presented his Challenge Project on Time-Domain Computational Ship Hydrodynamics. After a welcome by Dr. Larry Davis on Wednesday, keynote and invited speakers were introduced including Ms. Kay Howell, Director of the National Coordination Office for Computing, Information, and Communications; Dr. Suresh Menon, who presented his Challenge Project entitled Army Research Office Large-Eddy Simulations of Spray Combustions in Full-Scale Gas Turbine Combusters; and Dr. Robert Peterkin, who presented his Challenge work on Virtual Prototyping of Radio Frequency Weapons.

This was followed by a User Feedback Panel chaired by Mr. Steve Finn, Defense Threat Reduction Agency. Representatives from each of the MSRCs sat on the panel and answered user questions about their Centers. Messrs. Brad Comes and Paul Adams represented the ERDC MSRC on the panel.

Dr. Mark R. Fahey, ERDC MSRC Computational Migration Group, presented a poster entitled "Large-Scale Collective Communication and Load-Balancing on Parallel HPC Systems." The poster was designed to show the results of his study on large-scale collective communication calls and load balancing in an MPI to a terrain masking application. The performance results obtained in this work showed that the Cray T3E at the ERDC MSRC performs large-scale (36 million integer elements) broadcasts on 4 to 16 processors approximately three to four times faster than the IBM SP or SGI Origin 2000. However, the IBM SP was observed to compute the same size reduction (max operator) on 4 or more processors in less time than the Cray T3E or SGI Origin 2000. In addition, this work showed the benefits and costs of implementing a load-balanced algorithm.



A terrain map with a portion of its mask shown. The red canopy represents the maximum height under which flying objects cannot be detected by the threats located on the terrain map



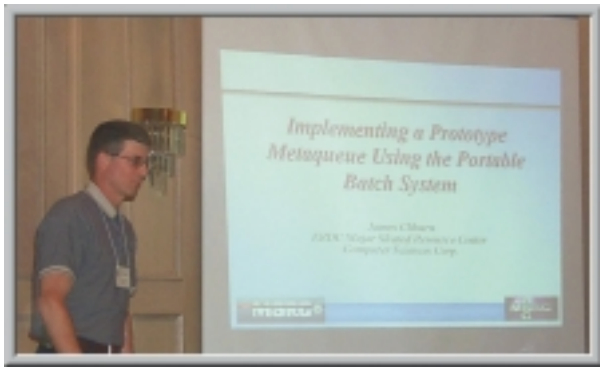
Dr. Stephen Wornom, ERDC PET Onsite CWO Lead, presenting his paper comparing use of SWAN and WAM codes for nearshore wave prediction

Dr. Richard Weed, PET Onsite Computational Structural Mechanics Lead, presented a poster paper entitled "Building Multidisciplinary Applications With MPI," outlining the steps required to implement loosely coupled multidisciplinary applications using MPI and illustrating how to start these applications on different MSRC computing plat-forms. The presentation also described a suite of FORTRAN and C utility routines written by Dr. Weed that simplify the development of multidisciplinary applications.

Dr. Rick Weed, ERDC MSRC PET Onsite Computational Structural Mechanics Lead, presenting his poster entitled "Building Multidisciplinary Applications with MPI"

Dr. Stephen F. Wornom, PET Onsite Climate/Weather/Ocean Modeling and Simulation Lead, presented a paper comparing the use of the SWAN (Simulating WAves Nearshore) and WAM (WAve Model) codes for nearshore wave prediction. The selected test case was a simulation of wave activity during 1995 Hurricane Luis. (Paper presentations discussed in this article can be accessed at ***www.wes.hpc.mil***.)

Mr. James K. (Jay) Cliburn, ERDC Systems Integration and Technology Director, presented a paper on implementing a prototype metaqueue using the Portable Batch System. He discussed the configuration of the ERDC-ASC metaqueue and described the components used, experiences using the metaqueue, lessons learned, and challenges to future metaqueue efforts among DoD HPC sites.



Jay Cliburn (ERDC) presenting a paper on implementing a prototype metaqueue using the Portable Batch System

Dr. Clay P. Breshears, PET Onsite Scalable Parallel Programming Tools Lead, presented a paper on an interface to the part of the POSIX threads (Pthreads) library that is compatible with Fortran 95. He examined the development issues that were faced during the evolution of the interface as well as a test suite and benchmark codes that are included within the package to certify that the package is performing correctly on a target platform. Dr. Breshears also presented a paper co-authored with Dr. Phu Luong, PET Onsite Environmental Quality Modeling and Simulation Lead, on the dual-level parallelization of the Princeton Ocean Model. They demonstrated how threads programming with OpenMP and message passing with MPI can be combined in a multiblock ocean simulation to improve load balance and reduce computation time on the SGI Origin 2000.

ERDC MSRC Participates in . . .
Users Group Conference 2000

In addition to the papers and posters presented, ERDC MSRC personnel including Dean Hampton, Brad Comes, Stephen Jones, David Stinson, John West, Jeanie McDonald, Kelly Lanier, Dr. Art Cullati, and Dr. Wayne Mastin participated in the MSRC Directors BOF, the CHSSI BOF, the Scientific Visualization Working Group Meeting, the HPCMP Training Working Group BOF, the HPCMP Corporate Initiative BOF, the MSF Working Group Meeting, the Metacomputing and PET BOFs, and the Outreach BOF.

The conference provided an excellent opportunity to network with other participants in the HPC Modernization Program. The food was excellent, the facilities were nice, and the Wednesday night social provided a great forum for getting to know fellow HPC users. Hats off to the ASC MSRC, the HPCMO, and the SRCAP for organizing a great conference.

Getting ready for the opening plenary session

John Grosh (left), HPCMP CHSSI/PET Project Manager, and Dr. Bill Ward, ERDC MSRC

(Left to right) Jeanie McDonald, Kelly Lanier, and Dean Hampton, all from the ERDC MSRC

(Left to right) Dr. Joseph Werne, ERDC MSRC Challenge User, Brad Comes, ERDC MSRC Director, and Bob Athow, ERDC Coastal and Hydraulics Laboratory

(Left to right) ERDC MSRC's Drs. William Ward, Daniel Duffy, and Mark Fahey

The SRCs displayed posters and provided newsletter and CD handouts

Paul Adams (first from left) and Brad Comes (fourth from left) represent the ERDC MSRC on the User Feedback Panel

Dave Stinson (left), ERDC MSRC PET Monitor and Outreach Program Manager, and Bill Reidy, HPCMP Shared Resource Centers Deputy Project Manager

Dr. Joe Thompson (left), ERDC MSRC PET Academic Team Lead, and Dr. Wayne Mastin, ERDC MSRC PET Onsite Academic Lead

Dr. Art Cullati (left), ERDC MSRC Systems and Services Director, and Brad Comes (right), ERDC MSRC Director

Concluding the Outreach BOF
Seated left to right: Dean Hampton (ERDC), Jann Ensweiler (HPCMO), Susan Pfeiffer-Vega (HPCMO), and Jeanie McDonald (ERDC)
Standing left to right: Bill Gabor (HPCMO), Chuck Abruzzino (ASC), Mike Moore (ASC), Lisa Powell (HPCMO), Judy Keithley (ARL), Walter Shackleford (NAVO), and Eleanor Schroeder (NAVO)

Interlaboratory Committee on Editing and Publishing (ILCEP)

Attendees of the annual meeting of ILCEP held at the ERDC Headquarters in Vicksburg, MS, visited the HPC center on April 13.

Membership in ILCEP is open to heads of editing and publishing organizations of DoD scientific and technical activities. The purpose of this committee is to improve the scientific and technical publishing programs and practices within the DoD through the interchange of information and the joint study of problems that bear upon these programs and practices.

Dennis Gilman, ERDC MSRC, talks about high performance computing with ILCEP attendees from the DoD

Institute of Electrical and Electronics Engineers (IEEE)

Members of the IEEE Mississippi Section toured the ERDC MSRC on April 20 as part of their monthly meeting. The Mississippi Section has approximately 500 members including student chapters at MSU, the University of Mississippi, and the University of Southern Mississippi.

The IEEE is the world's leading resource for technological innovation and professional networking in the field of electrical engineering, electronics, and computing. IEEE has 300 Sections around the world.

Dr. Kent Eschenberg (pictured at far right), ERDC MSRC, discusses scientific visualization capabilities with members of the Mississippi Section of IEEE

Directors of Information Management/Chiefs of Information Management (DIM/CIM)

"Corporate Information: A New Beginning in 2000" was the theme of the USACE DIM/CIM Conference held April 25-27 at ERDC Headquarters, Vicksburg, MS. This theme was chosen because of the reorganization of USACE, especially at Headquarters, and the emphasis on Corporate Information within the previously identified Information Management (IM) community.

The objectives of the DIM/CIM Conference were to provide a forum to promote and coordinate Information Technology (IT) strategies with the Corps IM and functional communities, discuss outstanding IT issues impacting the IM and functional communities, and identify and understand how to best support the Directors and Chiefs of IM in their various challenges and issues.

Mr. Wilbert Berrios, Chief Information Officer, Corporate Information, USACE, stated that he foresees this conference becoming an annual USACE event.

Dennis Gilman, ERDC MSRC, highlights the tape storage system of the high performance computing center and discusses scientific visualization with the U.S. Army Corps of Engineers DIM/CIM Conference attendees

Training Schedule*

November 13-17

Introduction to the Second-Order Hydrodynamic Automatic Mesh Refinement Code (SHAMRC)

December

Workshop on Future Trends in CFD

*Additional courses are added upon demand. Please check the ERDC MSRC Web page at ***www.wes.hpc.mil***

ASC MSRC PET

Aeronautical Systems Center (ASC) MSRC PET personnel Ms. Charlotte Coleman, Deputy Government PET Director, Mr. Gerard "Zak" Kozak, PET Academic Coordinator, Ohio Supercomputer Center, and Mr. Bill Zilliox, Integrator PET Director, visited the ERDC MSRC on June 21 to exchange information regarding the PET programs at ASC and ERDC.

Dr. Wayne Mastin, ERDC MSRC Acting PET Director, coordinated presentations by Onsite Leads of ongoing work in each of the ERDC MSRC Computational Technology Areas. The ERDC MSRC Interdisciplinary Coordinator, Ms. Dean Hampton, chaired an Administration, Allocation, and Utilization demonstration. A tour of the ERDC MSRC was conducted by Mr. Dennis Gilman, ERDC MSRC Government Contracting Officer's Representative.

Shown after the information exchange are (left to right) Dean Hampton, ERDC, Zak Kozak, ASC, Charlotte Coleman, ASC, Dr. Rick Weed, ERDC, Dr. Clay Breshears, ERDC, Bill Zilliox, ASC, Dr. Wayne Mastin, ERDC, Dr. Stephen Wornom, ERDC, and Dr. Nathan Prewitt, ERDC

HPCMP Shared Resource Centers' Project Manager and Deputy Project Manager

John Baird, HPCMO, Brad Comes, ERDC MSRC Director, and Bill Reidy, HPCMO, (pictured left to right) attend an ERDC MSRC monthly overview meeting

Mr. John Baird and Mr. Bill Reidy, Project Manager and Deputy Project Manager, respectively, Shared Resource Centers, HPCMP, visited the ERDC MSRC on July 21 for an update on the activities here. They began the day by attending the ERDC MSRC monthly overview meeting. Discussions were held with the appropriate personnel regarding metacomputing, projects of the Computational Migration Group, and the mass storage and archival system implementation plan.

HPCMP CHSSI/PET Project Manager

Mr. John Grosh, Project Manager for HPCMP CHSSI/PET, visited the ERDC MSRC on June 22. Several roundtable discussion meetings were held with the following themes: PET Lessons Learned and Strategic Alternative Analysis for the Follow-On to PET. Professor Joe Thompson, PET Academic Team Lead (MSU), and Dr. Wayne Mastin, Acting ERDC MSRC PET Lead, coordinated a roundtable discussion with ERDC MSRC PET Onsite Leads; Dr. Jeff Holland, Environmental Quality Modeling and Simulation Computational Technology Area Lead, and Mr. Bob Athow coordinated a meeting with ERDC Project Leaders; a roundtable discussion with ERDC MSRC Government personnel concluded the visit.

Mr. John Grosh and Mr. Brad Comes at Roundtable with ERDC Project Leaders

Roundtable with ERDC MSRC PET Onsite Leads and Professor Joe Thompson, PET Academic Team Lead

HPCMP User Satisfaction Interviews and Surveys

On May 23-25 personnel from the DoD HPC Modernization Office (HPCMO) and the DoD Joint Interoperability Test Command (JITC) visited the ERDC MSRC for the purpose of evaluation. Participating from the HPCMO were Mr. Bill Reidy, Ms. Valerie Thomas, Mr. Bob Seastrom, and Ms. Sandra Allen. Ms. Jo Ann Caruthers, Mr. Thomas S. Brock, and Mr. Christopher J. Carlson represented the JITC.

Collaborations were held with the ERDC users where they were interviewed and asked to complete User Satisfaction Surveys. The HPCMO Metacomputing Initiative was discussed among HPCMO and ERDC MSRC personnel. An IBM SMP Capability Test was evaluated by both the HPCMO and JITC attendees.

ERDC users are interviewed by personnel from HPCMO and the DoD Joint Interoperability Test Command

HPCMP User Satisfaction Surveys are completed by ERDC users

ERDC MSRC Technical Reports

00-30 "HLA Integration for HPC Applications Applied to CMS," Wojtek Furmanski, David Bernholdt, and Geoffrey Fox.

00-29 "Enforcing Scalability of Parallel Comprehensive Mine Simulator (CMS)," Wojtek Furmanski, David Bernholdt, and Geoffrey Fox.

00-28 "Web Interfaces for Environmental Modeling Systems: A WebFlow Application," Tomasz Haupt.

00-27 "Portals for Web Based Education and Computational Science," Geoffrey C. Fox.

00-26 "Reflections on Three Years of Network-Based Distance Education," David E. Bernholdt, Geoffrey C. Fox, Nancy J. McCracken, Roman Markowski, and Marek Podgorny.

00-25 "Tools for Handheld Supercomputing: An Assessment of the Wireless Application Protocol (WAP)," David E. Bernholdt, Sangyoon Oh, Konrad Olszewski, and Geoffrey C. Fox.

00-24 "Modifications of the External Mode Solver in CH3D-Z," Clint Dawson, Dharhas Potina, and Mary F. Wheeler.

00-23 "Development of Parallel 3D Locally Conservative Projection Codes for Reduction of Local Mass Errors in Hydrodynamic Velocity Field Data," Mary F. Wheeler, Clint Dawson, Victor J. Parr, and Jichun Li.

00-22 "Parallel Software Tools and the Parallel Performance of the CE-QUAL-ICM Water Quality Simulator," Mary F. Wheeler and Victor J. Parr.

00-21 "Contract Year Five Programming and Training (PET) Core Support and Focused Efforts."

00-20 "A Parallel-Processing Coupled Wave/Current/Sediment Transport Model," David J. S. Welsh, Keith W. Bedford, Rong Wang, and Ponnuswamy Sadayappan.

00-19 "HPC Training Courses at ERDC MSRC Provided by the Ohio Supercomputer Center," Troy Baer, David Ennis, and Leslie Southern.

00-18 "A Fortran Interface to POSIX Threads," Richard J. Hanson, Clay P. Breshears, and Henry A. Gabb.

00-17 "Metacomputing: An Evaluation of Emerging Systems," David Cronk, Graham E. Fagg, Brett D. Ellis, and Dorian Arnold.

00-16 "A Comparison of the SWAN and WAM Wave Models for Nearshore Wave Predictions," Stephen Wornom and David J. S. Welsh.

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acronyms

Below is a list of acronyms commonly used among the DoD HPC community. You will find these acronyms throughout the articles in this newsletter.

ASC	Aeronautical Systems Center
ATM	Asynchronous Transfer Mode
BOF	Birds of a Feather
CAC	Customer Assistance Center
CHSSI	Common High Performance Computing Software Support Initiative
CMG	Computational Migration Group
CPU	Central Processing Unit
CSC	Computer Sciences Corporation
DIM/CIM	Directors of Information Management/Chiefs of Information Management
DMF	Data Migration Facility
DNS	Domain Name System
DoD	Department of Defense
DREN	Defense Research and Engineering Network
ERDC	Engineer Research and Development Center
FDDI	Fiber Distributed Data Interface
HAFS	High Availability File Server
HiPPI	High-Performance Parallel Interface
HPC	High Performance Computing
HPCMP	HPC Modernization Program
HPCMO	HPC Modernization Office
IEEE	Institute of Electrical and Electronics Engineers
ILCEP	Interlaboratory Committee on Editing and Publishing
IM	Information Management
IT	Information Technology
JITC	Joint Interoperability Test Command
JSU	Jackson State University
MPI	Message-Passing Interface
MSF	Mass Storage Facility
MSRC	Major Shared Resource Center
MSU	Mississippi State University
NIDS	Network Intrusion Detection System
PET	Programming Environment and Training
PL3	Performance Level 3
R&D	Research and Development
SDP	Service Distribution Point
SMP	Symmetric Multiprocessor
SRC	Shared Resource Center
SRCAP	SRC Advisory Panel
T&E	Test and Evaluation
USACE	U.S. Army Corps of Engineers
WES	Waterways Experiment Station

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