NASA AMES RESEARCH CENTER:
THE ADVANCED SUPERCOMPUTING FACILITY

A Part of NASA's Strategic Capabilities Assets Program

The NASA Advanced Supercomputing (NAS) facility at NASA Ames Research Center provides users with integrated supercomputing support services throughout the entire life cycle of their science and engineering projects. Our high-end computing (HEC) resources are integrated with mass data storage systems and high-speed networks and augmented by customizable support in software performance optimization, advanced scientific visualization, and 24/7 user services.

PRODUCTION SUPERCOMPUTING: Our expert HEC team manages all aspects of the NAS production supercomputing environment to ensure users get secure, reliable resources. The current environment includes three supercomputers, two secure front-end systems requiring two-factor authentication, and two secure unattended proxy systems for remote operations. A new 47,104-core HEC system, Pleiades, was recently installed and became operationally ready in November 2008. Meanwhile, the 14,336-core Columbia supercomputer continues to enable striking advances in addressing NASA's real-world science and engineering challenges.

MASS DATA STORAGE: NASA's HEC customers often require vast amounts of data storage. With about 25 petabytes (PB) of tertiary storage and over 2 PB of disk storage on the floor, NAS's mass storage system allows users to archive and retrieve important results quickly, reliably, and securely. Storage specialists create custom file systems to temporarily store large amounts of data for special user projects in addition to providing individual training to help users efficiently manage and move such massive volumes of data.

NETWORKING TECHNOLOGIES: Since high-speed networking technologies and services are essential to taking advantage of NAS's HEC systems, they are of critical importance to our diverse customers. Using high-capacity network expertise and connections, scientists seamlessly transfer their massive datasets—some exceeding 1 terabyte per hour—between local and remote systems. Our network engineers also customize transfer strategies and protocols to vastly reduce the time-to-solution for users.

PERFORMANCE OPTIMIZATION: The NAS application optimization team specializes in enhancing the performance and scalability of NASA's complex codes so researchers can more effectively utilize the HEC systems, allowing them to do more science and engineering in less time. Optimization services range from answering basic questions to partnering with users for in-depth code performance enhancement. The team also evaluates tools and technologies best suited for the NAS environment and gives feedback to outside tool developers.

SCIENTIFIC VISUALIZATION: Our visualization team develops and applies tools and techniques customized for NASA science and engineering problems. These tools help users view and explore results from their desktops so that they may quickly pinpoint important details. Working closely with users, NAS experts capture, parallelize, and render the enormous amounts of data needed to produce high-resolution, three-dimensional images and videos. NAS's new 245-million-pixel visualization system, known as the hyperwall-2, allows researchers to visualize massive datasets directly from the HEC systems.

USER SERVICES: The user services team works 24/7 to assure users have secure, reliable access to NAS's HEC systems. This team anticipates and prevents problems, as well as quickly solving challenges as they arise. During Space Shuttle missions, the team marshals all HEC components and NAS staff to ensure the essential support is in place for vital analysis tasks. This protocol enables engineers to rapidly provide mission managers with the critical data needed to clear the Shuttle for landing. User services staff monitor all systems, networks, job scheduling, and resource allocations to ensure a stable, seamless computing environment.
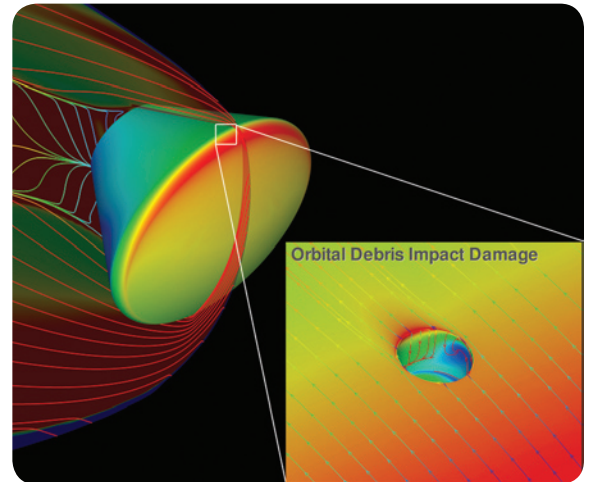
System Name	System Type	# of Cores	Peak Teraflop/s	Total Memory
Pleiades	SGI Altix ICE ES8200EX	47,104	565.2	47.1 TB
Columbia	SGI Altix 3700/3700BX2/4700	14,336	88.9	28.7 TB
RTJones	SGI Altix ICE 8200	4,096	43.5	4.1 TB
Schirra	IBM POWER5+	640	4.8	1.28 TB
hyperwall-2	AMD Opteron Nvidia 8800GTX	1,024 128	74.0	2.0 TB

Orbital Debris Impact Damage

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