A Systems Perspective on the Pleiades Cluster

High-End Computing

The Pleiades supercomputer, operated by the NASA Advanced Supercomputing (NAS) Division at Ames Research Center, has a peak floating point performance of over 1 petaflop, making it one of the fastest general-purpose, open-system compute clusters in the world.

Pleiades' dual-plane InfiniBand fabric interconnects the system's 9,472 nodes (84,992 cores) in a partially populated, 11-D hypercube topology. By node count, this represents the largest InfiniBand fabric ever built, requiring over 45 miles of quad and double data rate InfiniBand cabling.

With an aggregate I/O rate of nearly 40 gigabytes per second, Pleiades provides a good balance of sustained data throughput and I/O transactions-per-second capability. The fully connected hypercube system effectively supports workloads of either multiple applications or single, large applications. InfiniBand is also deployed as the primary local area network (LAN) backbone to merge computing, storage, and visualization systems, and to facilitate cross-system data file access. This enables visualization and data analysis to be performed concurrently as applications run, providing very high temporal resolution for viewing NASA's enormous datasets.

The system is operated under a model of continuous operations, with the goal of no system-wide downtime. This provides continuous computational resources to NASA users by making the upgrading of compute nodes and the addition of additional compute racks transparent.

Bob Ciotti, NASA Ames Research Center
bob.ciotti@nasa.gov



During 2010, a series of expansions were made to the Pleiades cluster, bringing the system to 84,992 cores and achieving a peak performance of over one petaflop.