

# Mellanox's Accelerated Supercomputing at NASA

## Background

Mellanox has maintained a mutually beneficial partnership with NASA Goddard Space Flight Center for more than three years, gradually refreshing and expanding the NASA Center for Climate Simulation (NCCS) Discover supercomputer each year. Mellanox interconnect solutions connect between 500 and 1000 new nodes with each expansion, continually providing NASA with more efficient and scalable compute power.

Having used Mellanox InfiniBand for multiple generations, NCCS relies on Mellanox to provide the fastest and most reliable interconnect available. The most recent upgrade was to Mellanox's leading FDR 56Gb/s InfiniBand interconnect.

## The Solution

Mellanox provided NCCS with an end-to-end FDR solution, offering seamless connectivity and negotiation with the existing InfiniBand core network. Mellanox's full FDR 56Gb/s InfiniBand end-to-end portfolio for data

centers and high-performance computing systems includes the SwitchX® family of FDR InfiniBand switches that offer the highest scalability and future growth, Unified Fabric Management® (UFM) software to simplify network management, and FDR copper and fiber cables. With Mellanox end to end, NASA is assured of the highest interconnect performance and the most efficient network fabric.

Mellanox's solution has enabled NASA to scale its network as needed and has increased the I/O bandwidth to the maximum currently available. This faster bandwidth has significantly reduced the number of required switches, translating to lower cost, less power usage, and a smaller data center footprint.

The unparalleled performance of Mellanox FDR 56 Gb/s InfiniBand provides the backbone for ongoing NASA scientific and engineering projects, such as coupled atmospheric-ocean models, future spacecraft design, large-scale dark matter halos and galaxy evolution, and high-resolution climate simulations.

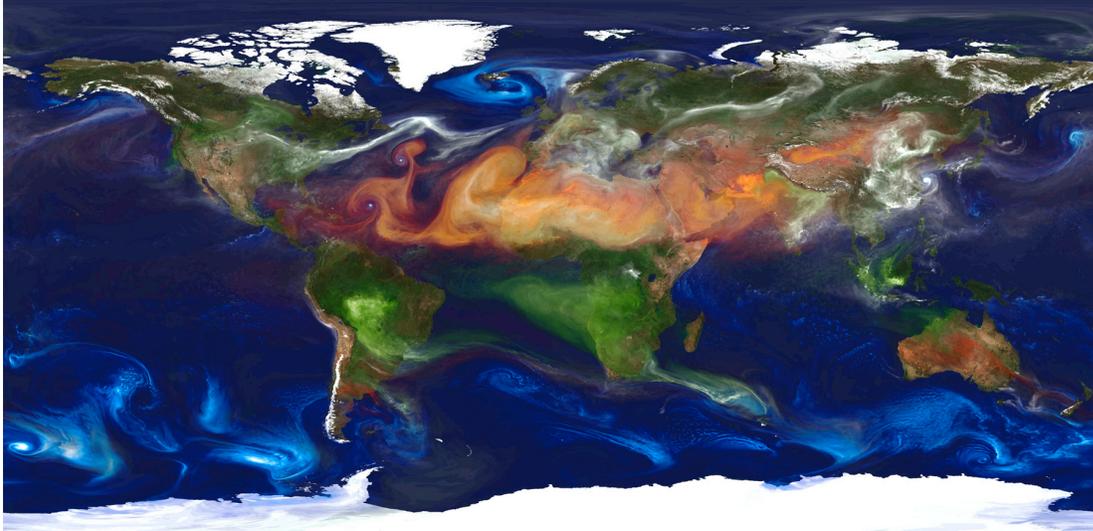


## OVERVIEW

*NASA relies on Mellanox to provide the fastest and most reliable interconnect available as the backbone for its ongoing scientific and engineering research projects.*



**Figure 1.** NASA's Discover supercomputer provides just over 1.1 petaflops of peak performance.



**Figure 2.** A visualization of a 10-kilometer global simulation of aerosols, run at the NASA Center for Climate Simulation. Research and Visualization by William Putman, NASA Goddard Space Flight Center

After the latest upgrade, Mellanox now supports over 3,300 nodes at the Goddard site, running end-to-end FDR 56Gb/s, QDR 40Gb/s, and DDR 20Gb/s solutions to handle NASA's interconnect needs. NASA and Mellanox are now working on implementing a Virtual Protocol Interconnect® (VPI) gateway and an SR-IOV solution to further advance NASA's compute potential within its data centers.

### Conclusion

NASA continues to work closely with Mellanox to build its compute and interconnect capabilities, and ultimately

to achieve the optimal design of its data center. The partners are already working together on new systems to provide additional compute beyond the existing NCCS cluster.

The partnership between NASA and Mellanox has proven beneficial to both parties, as NASA continues to increase its interconnect capabilities and to grow its data centers, while pushing Mellanox to provide even greater possibilities as the worldwide leader in high-speed, high-volume interconnect.



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