NASA SBIR 2006 Phase I Solicitation

S7.02 Long Duration Command and Data Handling for Harsh Environments

Lead Center: GSFC

NASA's space based observatories, fly by spacecraft, orbiters, landers, and robotic and sample return missions, require robust command and data handling system capabilities. Advances in command and data handling technologies are sought to support the NASA's goals for improved investigations of Earth space, the solar system, and the universe.

The subtopic goal is to develop high-performance processors and architectures and reliable electronic systems that can operate effectively for long periods of time in harsh environments. The subtopic objective is to elicit novel architectural concepts and component technologies that are realistic and have credible applications to NASA missions.

A proposal's ideas should reflect (1) that the final end product(s) lead to usable hardware that can be integrated into NASA programs within 5 to 7 years, (2) effective and sustainable hardware and software development environments, (3) sustainability (affordable, reliable and effective), and (4) applicability to deep space missions (i.e., resource efficient and reliable over extreme environments of temperature and radiation), and will significantly advance solutions to the challenges of high performance processing, reconfiguration, and fault tolerant operations.

Technology priorities:

High Performance Processing

- Distributed or multi-core processing, with math co-processor or floating point capability that significantly exceeds the present state of the art;
- FPGA-based processing, targeting performance and fault tolerance, based on voting processors implemented as part of a rad-tolerant FPGA fabric

Onboard Networks

- Rad-hard Ethernet physical layer components, fully compatible with the current ground based 10/100 Ethernet. The board side interface would have the Ethernet MII and RMII interface standards;
- Rad-hard multi gigabit fiber optic transceiver to support high data rate network protocols.

Data System Support Electronics
• Radiation hard oscillators (greater than 150 MHz with equal duty cycles);

• Models for analysis of interplanetary radiation and radiation belts, and technologies that enable in-flight radiation measurements such as total dose and single event effects in computing systems.