NASA SBIR 2004 Phase I Solicitation

E2.02 Command and Data Handling

Lead Center: GSFC

Advancing science with reduced levels of mission funding, shorter mission development schedules and reduced availability of flight electronic components creates new requirements for spacecraft Command and Data Handling (C&DH) systems. There are specific areas for which proposals are being sought.

Onboard Processing

- General purpose data processing: higher levels of spacecraft autonomy require higher levels of general purpose CISC (Complex Instruction Set Computer) and RISC (Reduced Instruction Set Computer) processing with fault tolerance and error correction (system and application).

- Special purpose data processing: higher levels of automated onboard science data processing to complement the data gathering capabilities of future instruments. Reduce the processed data volume to remain within the limits of spacecraft to Earth communications.

- Reconfigurable computing hardware: achieving pure hardware processing capabilities with the flexibility of reprogrammability to allow different science objectives to be met with the same hardware platform. Development of technologies such as radiation hardened Field Programmable Gate Arrays (FPGAs) and similar components for data communications and processing.

- Low-power electronics: in order to provide higher capabilities on smaller and/or less expensive spacecraft. Electronics that consume less power decrease overall thermal load, and decrease battery size and solar panel size.

Command and Data Transfer

- Subsystem data transfer: communications between various spacecraft subsystems in order to realize higher autonomy. Development of technologies and architectures that increase the rate of data transfer above 20 Mbits/s are necessary to achieve the self-diagnosis, autonomous control, and science data transfer requirements.
• Intra-system data transfer: communications within the spacecraft subsystem, between cards within a box to replace the conventional passive backplanes.

Protocols and Architectures

• Internet-based protocol modules and extensions that will support seamless connectivity between terrestrial and aerospace platforms by mitigating variable latencies and bit error rates among distributed air and spacecraft to terrestrial gateways.

• Novel methodologies for performing medium to large-scale simulations of space Internet architectures, protocols, and applications.

• Network security technologies to assure integrity and authentication of data from the public Internet to protected space-based networks.

• Ad hoc and innovative, lightweight networking protocols to support spacecraft constellation, formation flying, satellite clusters, proximity, and sensor based networks.