NASA SBIR 2008 Phase I Solicitation

S6.02 Sensor and Platform Data Processing & Control

Lead Center: ARC

Participating Center(s): GSFC, JPL

This subtopic seeks proposals for software-based advances in data collection quality and/or coverage of scientific instruments that support NASA Science Mission Directorate objectives across any of the Earth, Solar, Lunar, Space, or Planetary sciences.

Algorithmic based approaches expressed in software or reconfigurable hardware can improve measurement quality and coverage of existing scientific instrument technologies. Software or reconfigurable hardware based computing can enable design trades to reduce cost and or mass of instruments by implementing needed sensor or platform capabilities in software. Limited computing resources can require innovative approaches to specific problems or use of FPGA hardware.

Target platforms or instruments can be designed to fly on any of the broadest range of NASA platforms ranging from airborne (e.g., Aircraft, UAVs and SOFIA), small, micro, and nano-satellites that support current and anticipated NASA science mission to NASAâ€™s flagship mission platforms. The Small Spacecraft Build effort highlighted in Topic S4 (Low-cost Small Spacecraft and Technologies) of this solicitation participates in this subtopic. Offerors are encouraged to take this relationship in consideration as a possible flight opportunity when proposing work to this subtopic.

New approaches to software frameworks or APIs are discouraged. Technological advances should leverage or extend existing standards or capabilities within the respective science communities (i.e., Sensor Mark-up Language, Virtual Observatory, Earth Science Federation standards, Planetary data standards). Proposals can develop instrument specific software if demonstrated how the software can improve instrument performance (such as improving sensor calibration and correction of data in a tightly closed loop without human intervention). Other examples would show how on-board data processing enables rapid analysis or data sharing between instruments/platforms (e.g., perform level 0, level 1 or level 2 processing on-board the sensor or platform to support decision making based on data results).

Proposers are encouraged to plan on making contact with existing sensor development or prototype development teams or NASA relevant platform developers to understand the computation services available on the sensor, platform and the information flow expected between the sensor and human controller.

- Novel approaches that can leverage specialized, space qualified computing resources such as FPGAs that return order of magnitude reduction in data volume or screening capabilities are desirable.
- Improvements in measurement quality include system models of specific instruments (developed other SBIR subtopics or elsewhere) that account for more of the underlying instrument physics, improved data calibration and data correction capabilities and instrument â€œintelligenceâ€.

- Improved coverage can be achieved by data compression and/or data prioritization for transmission and closing the collection loop; also by the rapid assessment of data content for re-tasking the platform and sensor as the data are collected.

For data compression, aggressive metrics for compression and data volume have the following requirements:

RADAR Missions	SMAP (RADAR)	DESDynI (RADAR)	SWOT (RADAR)
OBP Input data rate (MHz)	32	400	500
Processor Throughput (GFLOPS)	7	20Â	90
Data Compression RatioÂ Â	80:1	10:1	90:1

Where raw data sample spacing is 0.75 m x 1.5 m (16 bits per sample), and the output data sample spacing is 10 m x 10 m (16 bits per sample).

For Hyper-spectral imaging instruments, here is an exemplar requirement on data compression and on-board feature detection.

Data Rate:	660 gigabits per orbit, 220 megabits per second
Data Compression Ratio:	> 3.0
On-board Detection Capability:	A quick look at the data for presence of cloud cover.

Proposals should show an understanding of one or more relevant science needs, and present a feasible plan to fully develop a technology and infuse it into a NASA program.