The objective of this subtopic is to develop information technologies that enable planetary robots to better support human exploration. Since February 2004, NASA has been actively engaged in a long-term program to explore the Moon, Mars, and other destinations. Several NASA studies have concluded that extensive and pervasive use of intelligent robots can significantly enhance human exploration, particularly for surface missions that are progressively longer, more complex, and must operate with fewer ground control resources.

Robots can do a variety of work to increase the productivity of human explorers on planetary surfaces. Robots can perform tasks that are highly repetitive, long-duration, or tedious. Robots can perform tasks that help prepare for subsequent crew activity. Robots can perform "follow-up" work, completing tasks started by humans. Example tasks include: robotic recon (advance scouting), systematic site surveys, documenting sites or samples, and unskilled labor (initial site prep, site clean-up, etc.).

Proposals are sought which address the following technology needs:

- Advanced user interfaces for remote robotic exploration, which include Web-based collaboration methods, panoramic and time-lapse imagery, support for public outreach/citizen science, social networking and/or visualization of geospatial information. The primary objectives are to enable more efficient interaction with robots, to facilitate situational awareness, and to enable a broad range of users to participate in robotic exploration.

- Ground control data systems for robotic exploration. Proposals should focus on software tools for planning variable-duration and adjustable autonomy command sequences; for event summarization and notification; for interactively monitoring/replaying task execution; for managing; and/or for automating ground control functions.

- Mobile robot navigation (localization, hazard avoidance, etc.) for multi-km traverses in unstructured environments. Novel "infrastructure free" techniques that utilize passive computer vision (real-time dense stereo, optical flow, etc.), active illumination (e.g., line striping), repurposed flight vehicle sensors (low light imager, star trackers, etc.), and/or wide-area simultaneous localization and mapping (SLAM) are of particular interest.
Robot software architecture that radically reduces operator workload for remotely operating planetary rovers. This may include: on-board health management and prognostics, on-board automated data triage (to prioritize information for downlink to ground), and learning algorithms to improve hazard detection and selection of locomotion control modes.