

2005 Abstract Form – Internal-Only Projects (no external funding). Deadline for abstract submission is 8:00 a.m. on July 27th.

ABSTRACT FORM

***NOTE:** Continuing projects should enter the same internal project number **AND** use the same project title from the previous year.*

Project Number:

Project Title:

023 Critical Elements of a Science Instrument Interface
Subsystem for MARS

Project Manager/PI:

Gene Massion

Lead Scientist:

Ken Johnson

Lead Engineer:

Lance McBride

Project Description:

Every use case we have developed for MARS requires elements of the Science Instrument Interface Subsystem (SIIS) defined as part of the NEPTUNE System Engineering process. In fact, the SIIS is proving to be a critical element of the overall OOI that spans all scales of observing systems in much the same way as the OOI DMAS will have to support data from all OOI observatory systems. The NEPTUNE system engineering process has identified the SIIS as a top level subsystem of the RCO and the MARS use cases and the results from many observatory workshops reinforce this decision. In order to efficiently support the science proposed for MARS and meet the goal of providing a test bed for future RCOs, at least a subset of the SIIS needs to be included as part of the MARS infrastructure. Unfortunately, budget and other issues forced the elimination of any SIIS development from the MARS proposal and the recent supplement. This proposal is intended to 1) Identify the requirements and a top level system architecture for the MARS SIIS, 2) identify external funding opportunities that can fund the required elements of the SIIS ensuring they are available when needed on MARS and 3) develop and deliver the bare minimum elements of the SIIS that will be required on MARS in a time frame that cannot be met with external funding sources. Fortunately, MBARI is uniquely suited to address the development of the SIIS because of the work we've accomplished to date on projects like MOOS, SSDS, SIAM, etc. In fact, almost all of the functionality needed for the science instrument interface module (SIIM) element of the NEPTUNE SIIS as it is currently envisioned have been or are currently under development at MBARI.

We are structuring this project as follows. First we will compare the requirements and top level architecture for the SIIS defined by the NEPTUNE SysE process against the results of the existing MARS science use cases, the output of the SENSORS workshop planned for September at MBARI and (hopefully) the responses to the ORION project office prospectus proposing science experiments for the ORION OOI system. A key

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question that will be addressed during this part of our project is how meta-data needs to be handled. We believe the work done at MBARI to date and the planned SENSORS workshop will provide the information necessary to make informed decisions relevant to the community wide OOI system. The deliverable will be a refined set of requirements and a top level architecture for the MARS SIIS.

The second step is to identify external funding opportunities that can fund elements of the SIIS that will be required by science experiments currently identified for MARS. For example, both the borehole project and the seismic observatory have identified functionality that could be provided with the secondary node and extension cable elements of the NEPTUNE SIIS. Ideally, this project would identify the top level requirements and system architecture for a secondary node and extension cables that optimally meet the needs of these and other experiments. We feel it is in everyone's best interests if we do the overall design of these elements correctly considering the needs of a wide variety of users in order to prevent duplication of efforts or designs with unanticipated compromises, e.g. unanticipated noise sources, more complex sparing requirements, multiple ROV interfaces. The actual detailed design, fabrication, test and deployment of a short, high power extension cable and a secondary node could, for example, be funded by the borehole experiment proposal currently being developed by Charlie Paull.

Enough work has been done on use cases and the SIIS that we believe a SIIM will need to be developed on the internal part of this project. Every use case we've looked at requires some level of SIIM functionality. Several external and internal investigators have included SIIM functionality as part of their instrument development. In addition, many users have suggested experiments for MARS using current generation instruments. These uses are straightforward enough that detailed use cases have not been pursued although they may be some of the first MARS users. Examples include Canyon Dynamics experiments that use standard CTDs and current meters, Jim Barry's eddy flux correlation instrument and the deep ESP. The potential for duplication of efforts and confusion is obvious. Our strongest hope is that by pursuing a systematic approach to specifying and designing the SIIS and the SIIM in particular, this process can be done correctly once resulting in a standard SIIM, validated for use on the MARS observatory and configurable for use by a wide variety of observatory instruments. We believe it is reasonable at this point to assume that a SIIM will still be part of the SIIS after the requirements development/subsystem architecture phase is complete. It is the exact functionality of the SIIM that needs to be defined. The effort to develop an appropriate SIIM for MARS should be modest as much of the functionality exists either off the shelf or as part of already funded MBARI efforts. Based on the current understanding of the requirements for the SIIM, it's functionality most likely will include a subset of the following list that also includes where the technology would come from. 1) Voltage level translation – available using off the shelf DC/DC converters, 2) 10/100Base-T to RS-232/422/... - developed for MOOS and also available off the shelf , 3) 10/100Base-T to 10/100Base-F for driving extension cables – available off the shelf 4) extension cable time delay calculation – this has been simulated as part of the MBARI puck functionality and 5) meta-data insertion – at least similar (maybe identical) to the MBARI puck

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although how this is done is a key question that will be addressed at the SENSOR workshop. The deliverable will be a deployable SIIM for use on MARS. Ideally, a SIIM prototype would be available for integration testing Q1 2005 and is critical to the MARS commissioning that starts Q3 2005 when we intend to install a CTD and ADCP as an initial check out test of the system.

Additional deliverables include a Requirements and Concept review for the SIIS. Preliminary and Critical Design Reviews would be held for any elements of the SIIS developed under this internal project. We will assume for the purposes of budgeting and schedule that a SIIM will need to be designed under the internal project. Our project team currently consists of Gene Massion (PM), Lance McBride (LE), Ken Johnson (LS) who we have included as an example of an instrument developing Scientist, Duane Edgington and Dan Davis who have been key players in the development of existing MBARI systems relevant to the SIIS. Wayne Radochonski and John Graybeal have additional expertise we expect to take advantage of.

We have several questions that we would like to discuss with the Management Team as we develop our proposal. These include 1) Should we limit our considerations to a SIIS specifically tuned to MARS or make some efforts to understand the requirements for a SIIS for the RCO, or even for the OOI. 2) How much community involvement should we include? 3) Any recommendations about what aspects of the project should be funded internally and which should be funded externally will be appreciated. For example, the ConDR for the SIIS could be expanded into a community wide effort partially funded by the ORION office. A related question is whether pursuing external funding should be covered on this project or on contingency time.

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Abstract Phase: LABOR Resource Request Form

Project Title: Development of the MARS Testbed Science Instrument Interface Subsystem

Project Manager: Gene Massion

Lead Scientist: Ken Johnson

Lead Engineer: Lance McBride

Please place an “X” to the left of the resources you expect to need for this project, as well as next to “<10” (less than) or “>10” (more than) to indicate estimated need.

Development					
	Development: Electrical Engineer		< 10 days	X	> 10 days
	Development: Software Engineer ¹		< 10 days	X	> 10 days
	Development: Mechanical Engineer		< 10 days	X	> 10 days
	Development: Support Engineering ²		< 10 days		> 10 days
	Development: Machinist		< 10 days	X	> 10 days
ITD					
	ITD: Video Lab/Samples Tech		< 10 days		> 10 days
	ITD: Technical Writer		< 10 days		> 10 days
DMO					
	DMO: Ocean Observatory Tech		< 10 days		> 10 days
	DMO: CTD Instrumentation Tech		< 10 days		> 10 days
	DMO: Diver		< 10 days		> 10 days
COO					
	COO: IS Administrator		< 10 days		> 10 days

¹ Includes John Graybeal, Kevin Gomes, and Andrew Chase, previously in IAG.

² Includes Rich Schramm, Mike McCann, and Brian Schlining, previously in IAG.