

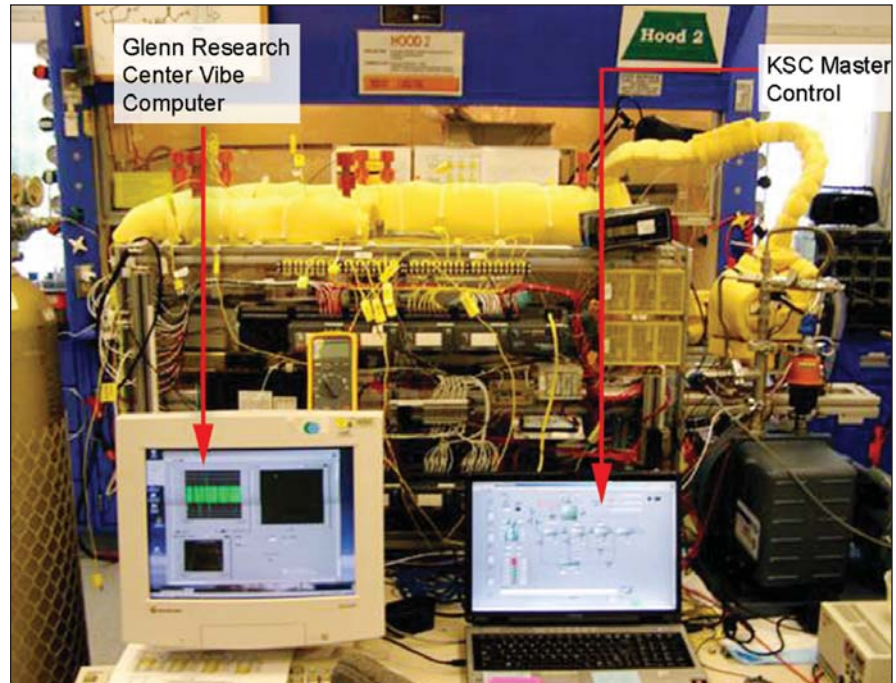
Software Architecture to Support the Evolution of the ISRU RESOLVE Engineering Breadboard Unit 2 (EBU2)

John F. Kennedy Space Center, Florida

The In-Situ Resource Utilization (ISRU) Regolith & Environmental Science and Oxygen & Lunar Volatiles Extraction (RESOLVE) software provides operation of the physical plant from a remote location with a high-level interface that can access and control the data from external software applications of other subsystems. This software allows autonomous control over the entire system with manual computer control of individual system/process components. It gives non-programmer operators the capability to easily modify the high-level autonomous sequencing while the software is in operation, as well as the ability to modify the low-level, file-based sequences prior to the system operation. Local automated control in a distributed system is also enabled where component control is maintained during the loss of network connectivity with the remote workstation. This innovation also minimizes network traffic.

The software architecture commands and controls the latest generation of RESOLVE processes used to obtain, process, and quantify lunar regolith. The system is grouped into six sub-processes: Drill, Crush, Reactor, Lunar Water Resource Demonstration (LWRD), Regolith Volatiles Characterization (RVC) (see example), and Regolith Oxygen Extraction (ROE). Some processes are independent, some are dependent on other processes, and some are independent but run concurrently with other processes.

The first goal is to analyze the volatiles emanating from lunar regolith, such as water, carbon monoxide, carbon diox-



Integrated LWRD/RVC engineering breadboard unit showing computer controls.

ide, ammonia, hydrogen, and others. This is done by heating the soil and analyzing and capturing the volatilized product. The second goal is to produce water by reducing the soil at high temperatures with hydrogen. This is done by raising the reactor temperature in the range of 800 to 900 °C, causing the reaction to progress by adding hydrogen, and then capturing the water product in a desiccant bed.

The software needs to run the entire unit and all sub-processes; however, throughout testing, many variables and

parameters need to be changed as more is learned about the system operation. The Master Events Controller (MEC) is run on a standard laptop PC using Windows XP. This PC runs in parallel to another laptop that monitors the GC, and a third PC that monitors the drilling/crushing operation. These three PCs interface to the process through a CompactRIO, OPC Servers, and modems.

This work was done by Thomas Moss, Mark Nurge, and Stephen Perusich of Kennedy Space Center. Further information is contained in a TSP (see page 1). KSC-13353

Coastal On-line Assessment and Synthesis Tool 2.0

Stennis Space Center, Mississippi

COAST (Coastal On-line Assessment and Synthesis Tool) is a 3D, open-source Earth data browser developed by leveraging and enhancing previous NASA open-source tools. These tools use satellite imagery and elevation data in a way that allows any user to zoom from orbit view down into any place on Earth, and enables the user to experience Earth terrain in a visually rich 3D view. The bene-

fits associated with taking advantage of an open-source geo-browser are that it is free, extensible, and offers a worldwide developer community that is available to provide additional development and improvement potential.

What makes COAST unique is that it simplifies the process of locating and accessing data sources, and allows a user to combine them into a multi-layered

and/or multi-temporal visual analytical look into possible data interrelationships and coefficients for coastal environment phenomenology. COAST provides users with new data visual analytic capabilities. COAST has been upgraded to maximize use of open-source data access, viewing, and data manipulation software tools.

The COAST 2.0 toolset has been developed to increase access to a larger realm