SESP 2010

Session:	Session: EGSE Monitoring and Control (14)
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Date:	Wednesday, September 29, 2010
Time:	14:00 - 15:00
Room:	Einstein
Chair:	
Co-chair:	
Remarks:	

Seq	Time	Title	Abs No
1	14:00	EGSE Health Monitoring as Plug-In for SCOS-2000 Troso, G.; Martucci, V.; Angioli, E.; Izzo, G.P. Vitrociset, ITALY	

A typical EGSE is based on a distributed system architecture that can reach a high degree of complexity. In this context, it becomes of crucial importance for the operator to have at any moment a clear view of the health status of the EGSE used resources and equipments connected.

The basic idea is to endow the EGSE with an integrated monitoring system capable to collect key information from the subsystems, processes them and make available to the operator as a valuable support in the definition and validation the test environment setup and in the execution of test campaign with the Unit Under Test (UUT). The monitoring system shall also provide a benchmark to evaluate and optimize the use of EGSE resource, with a consequent performance improvement.

This paper describes a quite innovative approach adopted to develop such monitoring system as a plug-in for SCOS-2000. This solution is the Health Monitoring System (HM).

The HM module is a "system watcher" in charge of handling and reporting at least the following information:

- Monitoring OS data in EGSE subsystems, like: disk usage, memory and CPU load
- status of processes running in the subsystem;
- point-to-point connection with different hosts
- result of the time synchronization process

The driving factor is to model all the parameters under monitoring as TM parameters in the SCOS-2000 MIB, contained in ad-hoc defined TM packets. The Health Monitoring System is able to inject all this parameters in the SCOS-2000 Telemetry Chain using the provided EXIF interface (a porting to the new SMF module is foreseen).

The definition of the core architecture of the HM subsystem approach is based on enabling the management of EGSE system without a heavy resource investment, providing a scalable management architecture and integrating existing management solutions as well as a good integration with the SCOS-2000 system.

This monitoring system has been conceived as a Central Checkout System component and logically structured in a Client-Server application, potentially extensible in a topological graph on the entire

EGSE system. Client application called HM Agent can be installed on each EGSE's subsystem and is aimed to collect monitoring data to be sent to the to the Server application called HM Manager.
HM Manager application has to be installed on one EGSE machine acting as a central collector of all the information coming from the distributed clients. HM manager takes care to insert all this information into a configurable set of telemetry packets and to inject them regularly inside the SCOS-2000 Telemetry Flow for processing, archiving and displaying. Moreover, in case system information from subsystems are already existing and modeled as SCOE status word, the HM is capable to act as configurable parser to retrieve the information directly from the status word. The mapping of the EGSE status to SCOS-2000 TM Parameters allows their visibility at display and procedure level. Such a feature guarantees the possibility to develop dedicated watchdogs on system variables and react in case of anomalies.
It is important to highlight that the system is fully configurable using well-formed XML files and adding the parameters in the SCOS-2000 MIB. A set of plugins (shell scripts or java code) are used by the agent to retrieve information from the machine. Other plugins can be added as needed.

Due to the previous specifications, the HM architecture takes advantage from the emerging JMX Mbean Technology in Java Programming Language. JMX technology provides the tools for building distributed, modular and dynamic solutions for managing and monitoring devices, applications, and service-driven networks. By design, this standard is suitable for adapting legacy systems, implementing new management and monitoring solutions, and plugging into those of the future.

At the time of writing, the HM is already used and implemented on the EGSE system for VEGA Launcher, providing the health status (cpu usage, disk usage, major connection) of three servers and three clients, plus the connection status and the content of status words coming from various SCOEs.

2 14:30 Right-sizing Test Tools: A Low Cost Alternative to Full-Scall System Checkout Equipment for Instrument & Payload Applications
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In the last few years Terma, in partnership with Satellite Services, has developed a "small" monitoring and control system with equivalent or compatible features to those provided at system level AIT and spacecraft operations. At the start of 2010, this system was completed to the level where all monitoring and control features of SCOS2000 are now implemented.

The system has been used at payload-level in several ESA missions including BepiColombo, Sentinel1, Sentinel2, EarthCare, Galileo FOC and SGEO. Initially there was a clear differentiation in features between the payload level and system level, however this gap is now largely closed.

Why was this kind of "small" system needed? This paper will outline how the needs of instrument-level or payload-level test systems differ from those at system level, and why this means that some of the existing monitoring and control kernels are (at best) cumbersome for payload-level application. The factors include: performance (e.g. to manage data rates more typical of SpaceWire than a limited RF link), speed of installation and deployment, portability to different operating systems, and quick adaptability to mission specific interfaces.

A key benefit of the CMDVS approach is that interfacing to the EGSE front end can be performed directly using function calls from the test language, automatically loaded, and quickly adapted to the exact interface provided by the front ends for a specific mission. This avoids that end users are forced to define an EGSE-specific monitoring and control database.

During the development, compatibility with SCOS2000, or SCOS based CCS was a driving requirement; this ensures that engineers working at instrument level will be familiar with the system used at spacecraft level; it also ensures that test data products created during the lower levels of AIT can be reused to the maximum extent possible at system level.

Finally we consider the future; the technologies used in CMDVS are already included in parts of the system level CCS, in particular for BepiColombo CCS and Galileo FOC CCS. This experience has opened up choices for how to approach the development of future CCS. On the one hand, this mixed approach has addressed and solved many of the concerns about future performance and maintenance of SCOS2000 for EGSE purposes. We can now state that a future development path based on SCOS2000 is possible for many years to come. Alternatively, the original SCOS2000 code base could be removed altogether; providing a SCOS2000-compatible system entirely based on new technology. Terma welcomes input from ESA and the primes as to which is their preferred path.

In any event, the introduction of these new payload-level technologies to the spacecraft level also brings extremely interesting possibilities for future development of the CCS.