GROUND SEGMENT EQUIPMENT SOFTWARE

e·s·c
evolving systems consulting

Mission: SWARM satellite

The SWARM mission objective is to provide the best survey ever of the geomagnetic field and the first global representation of its variations on time scales from an hour to several years. The challenging part is to separate the contributions from the various magnetic field sources. SWARM, a constellation mission (3 identical satellites), will simultaneously obtain a space-time characterization of both the internal field sources in the Earth and the ionospheric-magnetospheric current systems.

Ground systems and operations are key elements of a space system and as such play an essential role in achieving the mission success.

ESC provides Accelerometer (ACC) instrument EGSE SW for the SWARM project.

ACC Instrument EGSE functionality:

- Used during the instrument development, verification / validation testing on the instrument level and during the Spacecraft integration
- Communication front end for generating, handling an receiving TC (telecommand) / TM (telemetry) packets, according appropriate ESA standards (Ground Systems and Operations, Telemetry and Telecommand Packet Utilization ECSS-E-70-41)
  - Load and dump SW
  - Receive and parsing of Housekeeping and Science data
  - Automatic communication logging & a lot more...
- Simulation of OBC (On-board computer) functionality
  - Allows generate all TC packets for the ACC instrument.
  - Open architecture - allows user to write own test scripts including TC packet sequences in widely known PHP scripting language
- Automatic Data parsing
  - EGSE SW functionality provides packet filtering, automatic conversion, generated logs and error logs
  - Packet Analyzer functionality allows autonomous validation of single packets and packet sequences
- Test front end for testing of ACC HW, both digital and analogue part with specific test of HW
  - Control of EGSE HW modules (HW module for two serial RS422 interfaces, digital I/O interface to PPS generator and instrument internal relays control, communication with MCU-controlled instrument electronics checkout unit)
  - Support for autonomous and operator assisted instrument SW and HW tests
- EGSE GUI
  - Provides on-line view (tabular and graphical) of the instrument status and control of instrument operation
  - Allows user-friendly interface for running test scripts and handling communication with ACC
- TC TM FE LAN module
  - Provides communication interface for C&C messages from Core GSE (GSE for the SWARM spacecraft including all on-board instruments) in the integrated configuration
- Technology: Linux/C++/PHP
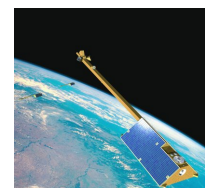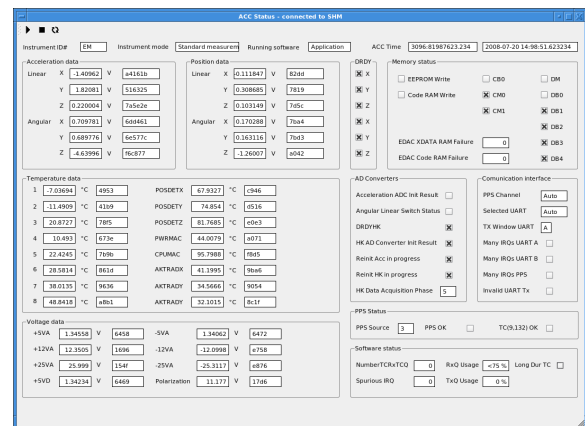
ESC engineers have experiences with GSE SW development from earlier **non-ESA space projects** (**HXRS – Hard X-ray Solar Spectrometer** aboard NASA satellite **MTI**, Czech microsatellite **Mimosa**)