File Management Services interface standardisation

Over the current years, mass memories for space missions are evolving from simple storage areas to being central to the overall spacecraft avionic architecture. Missions are no longer using mass memories only for the storage of science and housekeeping data, but also rely on this storage capability to hold mission-critical items such as telecommand timelines, software images, on-board control procedures or recovery configurations. In parallel, the concept of mission operations is also slowly shifting from the packet paradigm to the file paradigm. With the significant quantity of data that needs to be transferred between space and ground, and the availability of reliable file transfer protocols which can ensure global consistency of the transferred files, the usage of files becomes common on the near-future missions.

In this context, the SAVOIR community has set up a working group dedicated to the establishment of unified functional and interface requirements of the mass memory function: the SAVOIR-MASAIS group. The FMSIS (for File Management Services Interface Standardization) activity has been conducted under the supervision of this working group. In a first phase, a set of user and system requirements, produced by the SAVOIR-MASAIS group, were analyzed alongside a survey of mass memories implemented in missions currently in flight or under development. These user interface requirements were updated, and generic use cases, based on the mass memory survey, were defined. Definition of the use cases was supported by an existing AAML toolset improved in the frame of this study.

In a second phase, a generic technical specification for mass memories was derived from the user requirements. A communication protocol, implementing these requirements, was then defined. This new set of requirements, encompassing both ‘file-aware’ and ‘simple’ mass memories, was then assessed for impact against the SAVOIR Avionics and On-board Software Reference Architectures. In parallel, a demonstrator was designed and implemented according to the specified mass memory requirements, and new PUS-C services relevant to the mass-memories (in particular, services 6 – Memory Management; 15 – On-board Storage; and 23 – File Management) were deployed on top of a mass memory simulation fulfilling the proposed requirements, in order to verify the adequacy of the technical and communication specifications.

After an iteration based on experience gained deploying the mission use cases on this simulator, the specification documents output by the FMSIS study are submitted to the SAVOIS-MASAIS group for future standardization.