

TIME & SPACE PARTITIONING FOR FUTURE SPACE SYSTEMS

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Time and Space Partitioning appears as a growing concern within the system software community, in a context where current implementation platforms allow for new software techniques. Applying (logical) partitioning to Space systems would allow considering different criticality levels or simply separate functionally independent software on a single execution platform. This would have major consequences in terms of cost-efficient software development and validation.

It is worth noting that partitioning is already flying in the European missions! Indeed, the OBCP environments embedded in the state-of-the-art flight software products implement the required control mechanisms. This allowed for changing the way flight software is developed and validated (mission instantiation). However, this solution is very specific to a limited set of functional and performance requirements e.g., bringing flight control procedures onboard.

There are examples of program-level trade offs concluding against applying enhanced partitioning onboard. An important parameter is that partitioning has not been studied yet as generic solution to a system-wide problem, closing the door to the development of applicable solutions for given programs.

What should such system study address?

- Use cases, in terms of data handling & software architecture as well as in terms of software life cycle and organisation of the development. In addition to the benefits that may be found in the application of partitioning to a range of Space missions (with a predictable ROI), can it be considered as an enabler for a certain kind of missions?
- Concepts and algorithms, in terms of the definition of what is a partition, which partition scheduling algorithms are relevant, how partitioning shall be linked to FDIR, which level of flexibility is required with respect to the range of missions targeted, taking account of Space hardware capabilities.
- Standards, which could fit (e.g. POSIX, ARINC653, Ada, Java/JRTS) or which should be elaborated and dedicated to Space systems. Existing standard providing with a partitioning approach must be assessed in the specific context of Space Systems. Do we need a single technical solution, which level of standardisation shall be aimed at ?

A first review of these points will be presented, taking into account state-of-the-art and projected systems, as well as studies in the field of architectures and partitioning.