Framework Concept for Satellite Operations.  
The focusSuite® experience

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The design of new Flight Dynamics systems is driven by the imperative need to reuse legacy software, exhaustively exploited during years of operations which have qualified them as “flight proven”, and the desire to use modern software technologies which dramatically boost system usability, accessibility and stability. In order to fulfill those objectives the “framework” concept appears as the required support for future Flight Dynamics systems development.

Framework concept is thus oriented to minimize programme development schedule, costs and risks, and at the same time to improve the efficiency of operations (minimising operations workload) and reducing the risk of human errors. In order to meet these ambitious goals the framework shall provides a number of ready to use components for data manipulation and visualization as well as event logging, overall framework architecture, communications layers, process management, automation and reporting. Nevertheless, the real power behind the framework lies in its ability to integrate external components. While the integration of disparate software is usually a hard task plagued with difficulties (programs not conceived to act as components, wealth of protocols and formats, unclean interfaces, etc.), the focusSuite® framework makes this issue straightforward. The framework also provides well-designed, high performance, robust, customisable, extensible, flexible and coherent Man Machine Interfaces (MMIs), providing graphical views as much as possible.

Such a framework will allow integration of flight dynamics algorithms with unprecedented ease. Those flight dynamics functions may come from different origins in terms of programming language. Interface between the framework and the flight dynamics algorithms is based on the implementation of an API in order to manage the processing and the data interfaces.

Management of new entities (e.g. satellites) to the system is performed by simply modifying editable configuration files. Those configuration files are interpreted by the framework system in order to create the required database structure, to construct the overall MMI and to generate the flight dynamics functionality including additional (if required) generic functions like plotting or data acquisition and pre-processing. The issue of users and privileges needs also to be managed by the framework, in addition to automation which deserves special attention.

GMV has developed an internal project, called focus, which is aimed to develop a new generation multi-mission and multi-satellite framework. Project focus came through successful requirements definition during the first half of 1999 and the development phase started in August 1999. focus has very ambitious goals in mind, in particular the development of a truly generic operational Flight Dynamics framework for all type of satellite missions (including GEO, LEOP, LEO, satellite formations, constellations, etc.). focus has been conceived as a real framework as it is demonstrated by its major functionalities: a computation and data layer based on the extensive reuse of existing and improved software, a client/server architecture, a database driven system, an advanced MMI (based on desktop applications philosphy: “everything-in-one-working-area” and “all-one-click-away” and using a proprietary toolkit called TkForms that allows a development through configuration files in ASCII format, rather than through code), procedures automation capability through the AutoFocus extension (based on a dedicated language SoL -Spacecraft Operations Language -also developed and integrated by GMV), advanced graphical capabilities, portability (e.g. UNIX/Windows NT), extensibility (any extra functionality following certain I/O rules can be easily integrated within Focus via configuration files) and finally, capability to perform unlimited Undo/Redo operations.