GMV Solution for Satellite Constellation Operations (focusC^n)

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focusCn General Description
General Description

- focusCn is an integrated application that provides full life cycle support of satellite constellations.
- It provides a collection of mission independent and mission dependent functionalities.
- Computational layer is based on the extensive reuse of existing operational flight dynamics systems.
- focusCn inherits GMV’s vast experience with constellations flight dynamics software packages.
- focusCn uses GUI advance widgets and and generic tools from focusSuite.
focusC^n Computational Layer
NAPEOS (NAvigation Package for Earth Observation (or Orbiting) Satellites)

- Requirements on Precise Orbit Determination (POD)
- Functionalities: orbit determination, events generation, manoeuvre planning and calibration,...
- Operational requirements
- NAPEOS targeted to multi-satellite applications (GPS, GLONASS, Galileo)
- ESOC / GMV project since 1995
  - FD version (Envisat operational and POD)
  - Enhanced version (GPS IGS, POD, LEO)
- New modules developed for GSTBV2 and EPS will be reused.
focusC^n inherits from ORION:

- Constellation design Optimisation
- Performance Calculation
- Orbit Control Design
- Replacement strategy
- Orbit determination strategy
- Launch and set-up
- End of Life
focusCn infrastructure
- Multi-satellite, multi-user
- Undo/Redo capabilities
- Portability (UNIX/Linux/Windows)
- Advance MMI
- On-line help
- No licenses of external products are needed
An advanced MMI: The MMI integrates advanced widgets and a design philosophy based on commercial desktop applications for the office: “everything-in-one-working-area” and “all-one-click-away” (tabs). The MMI implementation is based on a proprietary toolkit called TkForms (based on tcl/tk) that allows a development through configuration files rather than through code.
A **client/server architecture**: All data and functionalities reside on a server which is accessed via a client MMI. Communications between client and server are done via TCP/IP. The possibility to work over the Internet with the appropriate degree of security has been foreseen.
Database driven: All important mission data is stored in a database residing on the server side.

In the standard version of Focus the relational database has been implemented as a set of standard ASCII files.

Interface between the database and the Computation Layer is done through a dedicated API, in such a way that the database data can be easily ported to a commercial relational database system (RDBMS) such as ORACLE.
The Computation Layer is the bridge between user and data services. It responds to requests from the user (or other computation processes) in order to execute a process. This protocol insulates the user from direct interaction with the database. Two different types of processes are included in this layer:

- The Process Manager is a single process, receiving requests from the clients and starting and controlling the computation processes.
- The Computation Processes are multiple processes that can run concurrently and perform the computations needed by the system.
The **Data Layer** maintains, accesses, and updates data. It also manages and satisfies requests to manipulate data that are initiated by computation processes.

Separation of data services allows the data structure and access mechanisms to be maintained, modified, or, if necessary, even redesigned without affecting the computation or user layer.

Two different single processes running permanently can be identified in this layer:
- The **Database API Back-end** handles all the requests received from the computation processes.
- The **Relational database** (RDBMS).
Advanced **graphical capabilities**: Dedicated widgets for generic X-Y plots (**focusGrafos**) and Events visualization (**focusEbro**) have been developed.
**Autofocus (Operations Automation)**

- It allows fully automate focusCn for hand-off operations.
- It is fully compatible with today’s operations based on procedures.
- It handles procedures written in **SoL** (Spacecraft operations language). **SoL** is a very high-level language specially targeted towards spacecraft operations which does not require any previous programming experience.
focusServerAdministrator

- It allows to synchronize remote servers (archive and restore data).
- It allows to configure user accounts and scenarios and workspaces.

focusEvelog

- It allows centralized management of events, management of alarms, errors and warnings.
focusSuite Tools (3)

focusRemote
- It provides access to focusCn from the internet.
- Operational feature: two way synchronization between local data and operational data

focusCloseAp
- It allows to control the risk of collision with uncontrolled space objects.
- The orbital elements of the third-party objects are retrieved from the internet in the form of TLE’s.
**Visualfocus**

- It allows to monitor any kind of satellite in any kind of mission.
- It is composed of:
  - 2D Visualization tool
  - 3D Visualization tool
  - Sensor View tool
- It is able to work in two time modes:
  - Real-Time mode
  - Stand-alone playback mode