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Operations Concepts, Methods, Systems, and Automation

CUBIST: Implementation and Evaluation of a Semantic Business Intelligence System for Payload Operations

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The Solar Monitoring Observatory, or in short SOLAR, was among the first Columbus payloads switched on after Columbus installation in February 2008, and continues to perform science until today. The Belgian User Support and Operations Centre (B.USOC, Brussels), responsible for the support of the SOLAR operations, uses, like every mission control centre, heterogeneous sources of information, including structured and unstructured data, for decision making and information tracking. Very large volumes of data are obtained, especially with the SOLAR telemetry data which are generated every second over long periods of time.

Today, during real-time operations, the SOLAR operator constructs a mental model of the current operational status. Unfortunately, no software can provide a bird's view of the operations, nor combine in a unified application the most important operational information. In an anomalous situation, the first actions consist of bringing all the data together, such as experiment telemetry, background information e.g. user and operations manuals, console logs, configuration status, experiment execution planning, etc. Thus, a lot of time and effort is spent on the retrieval of data for real-time and post-analysis information, prior to the actual analysis.

This paper will present the FP7 CUBIST (Combining and Uniting Business Intelligence and Semantic Technologies) project and its prototype for which the SOLAR Operations is one of the three use cases. CUBIST is a research-project, funded by the European Commission, and conducted by seven partners coming from five European Countries (Germany, France, the UK, Belgium, and Bulgaria).

CUBIST envisions combining the two worlds of Business Intelligence and Semantic Technologies.
The objective of CUBIST is to aggregate various information sources available to operators in mission control rooms using technologies based on semantic web standards. Aggregated data, ready for the BI processing, are expected to provide online support - via an online, web based unified interface - for making better decisions, reveal hitherto undiscovered information and provide supportive evidence in debriefing and decision making processes related to the organisation of space control centre operations.

More specifically, CUBIST should provide a system or interface on console which is immediately accessible for the operator on-console, and provides a unified interface to both structured and unstructured data.
It would allow

- automatic notifications, based on the pre-programmed limits (for telemetry) or datasets (archive not being complete, planning changed, ...).
- to provide a system enabling automatic searches for identical or similar events in the past based on a combination of different types of input by the user resulting in easy data mining.
- to support decision making by a rich variety of visual analytics of the housekeeping data, allowing the operator to create a snapshot of a specific event by aggregating all relevant data of that event.

CUBIST has lasted for three years and will be finished by the end of September 2013, providing a first prototype. For the SOLAR use case a user evaluation has been conducted in the light of the final stage of the project.

The paper will conclude with the description of the scenarios that were used for the user evaluation and comparison with the real-time operations.