

INFORMATION-DRIVEN CONTROL OF PRODUCT GENERATION AND RECONCILIATION FOR CASSINI OPERATIONS

The 12-year Cassini mission duration brings severe pressure to reduce operations costs. Expanding the costs are the complex science desires and vast spacecraft and instrument capabilities which must be used to their fullest. Regardless of the complexities, in the end, science data product generation is still telemetry processing, data assessment and file delivery. Because these processes can be information-driven, they are more amenable to automation than other operations processes. The key to cost savings in this area is for software (rather than people) to take advantage of the available information for control of product generation.

A ground data system was designed and implemented which will support both the Imaging Science Subsystem (ISS) and the Visual and Infrared Mapping Spectrometer (VIMS) instruments for the Cassini's Tour phase. For these instruments, the product generation process involves tasks such as:

- scheduling telemetry processing
- accessing and deciphering telemetry
- formatting products
- assessing product quality
- delivery of products and reports to customers
- reconciling received versus expected products
- accounting for missing data

The Cassini challenge was to design a control system for the data production process which:

- is information-driven rather than human-driven
- accesses and utilizes information on predictable events
- replaces traditionally-human control functions by software components
- monitors itself and yet allows human intervention when needed

A design process was conducted which characterized the information needed by processes being controlled. The information required to be exchanged between processes was also defined. The operational rules were codified and a set of database tables was designed for handling the information flow both internally and to/from external sources.

The key to this design's capability is the use of a database to drive the engine of the product generation process. The control functions look to the database for such information as 1) rules established during design, 2) information flowing in from external sources and 3) results of software assessment of task results. This information is organized in a set of related tables used by the controlling processes to prepare, schedule, initiate and monitor the data processing tasks, as well as to pass data between tasks and maintain their status and history.

The paper will describe and illustrate:

- Key driving requirements upon design
- System components
- Database structure of static, dynamic and historical information
- Interaction of components via database tables
- Information which initiates processes
- Information which controls processes
- Automated controlling functions
- Usage of multi-mission services
- External interfaces