

## **CONCEPT**

### **Cross Support Standardization Support re Control of Service Execution**

#### **I. Current State**

- 1.1 CCSDS has produced standards for sending ground station monitor data to a mission operations center as well as tracking data.** MD CSTS and TD CSTS have been developed for transfer of monitor data and tracking data respectively from a ground station to a mission operations center. They are both intended to operate during the execution of a tracking pass providing data to the mission operations center in more or less real time. With regard to the monitor data delivery capability, this required that the functions that a ground station performs be abstracted such that standardized terms can be used to enable any kind of meaningful reporting. In turn this has led to standardized terms for configuring the functional resources, which in turn are captured in a functional resource model (FRM).
- 1.2 CCSDS has produced and is currently developing standards for coordination of service between ground stations and mission operations centers and their spacecraft.** A simple schedule format has been developed for communicating the set of scheduled tracking passes for missions utilizing an agency's ground station tracking network. Currently being developed are standards for requesting specific tracking passes, configuring the space link parameters and expressing the sequences of communication services that are to occur during the requested tracking passes. The configuration of the Spacelink parameters is based on the FRM introduced in paragraph 1.1.
- 1.3 Changes during service execution are not uncommon and require rapid coordination.** It is not uncommon for changes both anticipated and unanticipated to occur during a tracking pass. The anticipated changes can largely be accommodated via the standards that are being developed for coordination between ground station mission operations and their spacecraft. The unanticipated changes can be related to spacecraft issues or ground system issues but regardless of the source require rapid coordination if the particular tracking pass is to be salvaged. The only accommodation for this today is via operations personnel engaging invoice loop communications. There currently is no standard for this kind of coordination during service execution.

#### **II. Proposed to be Developed**

- 2.1 A core Service Control Cross Support Transfer Service (SC-CSTS) based on the CSTS Specification Framework,** that utilizes the functional resource model to assist in parameter selection for configuration items that can be modified during service execution.
- 2.2 Augmentation to the functional resource model for SC CSTS control resources** is needed to introduce the notion of a "station controller" resource. The station controller functional resource defines the monitoring, directive and configuration parameters exposed for SC-CSTS. Configuration of the station controller functional resource includes the event sequence which

is important for deep space missions. The event sequence represents changes to the spacelink services that a mission needs to see and/or have accommodated during tracking pass execution. Examples include configuration changes in telemetry bit rate, initiating and halting ranging service, initiating or halting DOR tones on the return carrier, etc.

**2.3 Harmonization between the functional resource model and the event sequence** supports the definition of the SC CSTS. There are two aspects to this. First it is necessary to have the temporal states indicated in the event sequence relate to the configuration parameters that are exposed to the SC CSTS service instance. For example, entering a communication state where ranging symbols are on the forward carrier corresponds to turning ranging modulation on in terms of the functional resource model. Second, the event sequence is, as noted in paragraph 2.2, one of the key functional parameters of the station controller and is therefore exposed to control by the service control instance.

**2.4 Accommodation for automated execution control** and adjustment of automated control can be achieved using SC-CSTS. In addition to the event sequence as a configuration parameter in the functional resource definition of the station controller, there is also an automation master switch control for requesting that automation with respect to the event sequence is disabled. Adjustments to the tracking pass can include configuring a revised event sequence and then re-enabling the automation. Alternatively, the automation may remain disabled while “manual” control occurs for the remainder of the tracking pass.

**2.5 A proper control model respecting administrative domains** is required and is part of the core SC CSTS functionality. In particular, and in relation to paragraph 2.4 above, any and all changes are at first, by definition, requests. It is ultimately the prerogative of the station controller to either grant or deny any such requests. Furthermore, as part of the station controller functional resource definition there are service agreement parameters that have the capability of being set to categorically deny various configuration changes and/or classes of changes.