**SLS Area comments for**

**CESG-P-2014-06-003 Approval to publish CCSDS 902.0-G-1, Extensible Space Communication Cross Support—Service Management—Concept**

**(Green Book, Issue 1)**

**SLS-01**

Be consistent and replace "(references [3]–[8])." with "(references [3], [4], [5], [6], [7], and [8])." everywhere.

The latter form allows better search.

Response – I have expanded the reference list as identified. I have also confirmed that this was the only case of such an abbreviated list of references.

**SLS-02**

IOAG Service Catalog #1 and IOAG Service Catalog #2 are often mentioned without the related reference. Please include [18] and [19] whenever appropriate.

Response – References have been added to every instance of IOAG Service Catalog #1 and IOAG Service Catalog #2.

**SLS-03**

Note on page 6-5 states: <The SCCS concept of FGs is based on the earlier SLE concept of functional groups as defined in the CSRM (reference [15]). Annex B3 summarizes the differences between the SLE functional group concept and the SCCS concept of FGs.>

As ref. [15] CCSDS 910.4-B-2 is a valid Blue Book in force, what is the consequence of such redefinition of the concept? Should [15] be revised? In case of conflict which concept prevails? As this book is green, the blue book should prevail. The extent and consequences of such redefinition of the concept should be made clearer.

Response – The terms “SCCS Functional Group” and “Functional Group specialization” terminology has been replaced by “Abstract Service Component” (ASC) and “Service Component” (SC), respectively. This eliminates any overloading of the term “Functional Group” and leaves it as a CSRM-only term.

As part of the change to the new terminology, the part of Annex B that compares and contrasts the CSRM (SLE) and SCCS uses of “Functional Group” has been removed.

**SLS-04**

Section B2 states: <b) The SLE FGs mix both space link (e.g., modulation, coding, and space data link protocols) and terrestrial cross-support service (e.g., SLE transfer services, CSTS, and the future IOAG Forward and Return File services) functionality within the same SLE FG. In contrast, the SCCS FG separates the functionality associated with the space link and the functionality associated with terrestrial cross-support services into different FGs.>

It looks as there is some misunderstanding about IOAG Services.

As mentioned e.g. in SC#1 an “IOAG Service span either between the Control Center and the Spacecraft or between the Control Center and the Ground Tracking Asset” and “A given IOAG Service can be built on top of a number of combinations of Space Link Interface standards and Ground Link Interface standards”. Therefore, in the highlighted part, the future “CSTS Forward File Service” and “CSTS Return File Service” should be mentioned. Please amend this references to IOAG services as appropriate.

Response – The specific example cited in the comment no longer exists, as it was part of the discussion of the difference between SLE FGs and SCCS FGs (see response to SLS-04).

The larger problem that the comment identifies is the apparent confusion between the concept of the IOAG Forward File service (which comprises both space link and ground link interface standards) and the “CSTS” Forward File ground link interface standard (the same confusion applies to the IOAG Return File service/”CSTS” Return File ground link interface). I understand the difference, but I was less than precise in my choice of words. With the removal of that section of Annex B, there are no longer any references to the equivalent of the CSTS Forward/Return File ground in the Green Book, so this is no longer an issue for this Green Book. But I will be sure to make the distinction in the other Functional Resource-related documentation as appropriate.

**SLS-05**

On pages 6-7 it is stated that < The set of FGs that correspond to the IOAG data delivery services are the SLS Data Delivery Production FG, the Offline Data Delivery Production FG, the Data Delivery Transfer Services FG, and the Space Internetworking FG.> but as mentioned above an IOAG service is built on top of a number of combinations of Space Link Interface standards and Ground Link Interface standards and confining that correspondence seems restrictive. I suggest rewording this statement to e.g. mention that those FG’s are the most relevant for cross support between ESLT and User nodes or similar. Please amend similar statements elsewhere as appropriate.

Response – A new paragraph has been added before the paragraph cited above to introduce the IOAG Service Catalog concepts of space link interface and ground link interface, and to identify the ASUs that correspond to the space link interface and those that correspond to the ground link interface.

**SLS-06**

Section 6.2.2 SPACE COMMUNICATION CROSS SUPPORT FUNCTIONAL GROUPS mentions the following 3 items

<e) Retrieval space link data stores that capture return space link data.

f) Retrieval radiometric data stores that hold radiometric data that has been extracted from the space link.

g) Forward space link data store that holds forward offline space link data until the space link to the target Space user Node becomes active.>

in a list introduced by the statements <The SLS configurations all involve a layered space link communications model that aligns with the one presented in in various CCSDS Recommended Standards (references [3], [4], [5], [6], [7], and [8]). This layered model has the following abstract components:>

However the layered model from the above references does not consider data storage. Therefore those three items should be removed from that list and mentioned somewhere else as implementation characteristics needed for the correct provision of Space Communication Cross Support services.

Editorial: it looks as the highlighted word “all” should be deleted.

Response – The list has been divided into two, with only the first 4 items being described as corresponding to the referenced space link standards. A following list addresses the remaining data store items.

**SLS-07**

What are the difference between Figure 6-1 and 6-3? If there are no differences, avoid duplicating figures.

Response - There are only one difference between the figures – in the SLS configuration (figure 6-3) there are no connections between the Data Transfer Services ASC and the Offline Data Storage ASC. Although the difference is small graphically, it is significant because in SLS configurations the only data flows that are of concern are those that result in (or result from) data flow across the space link. Connections between the Data Transfer Services ASC and the Offline Data Storage ASC only occur in offline configurations: retrieving data after an SLS or sending it before the SLS in which it is to be transmitted.

Note that figure 6-3 has been changed from showing just the ASCs involved in the SLS configurations to also showing the SCs involve for the IOAG services.

**SLS-08**

On page 6-4 the sentence <Similarly the SLS radiometric configuration adds to the above layered space data link model interface with the ESLT for the purpose of receiving radiometric measurements as they are being extracted from the space link by the ESLT.> seems to imply that radiometric is not part of the layered model described above. However, in that model is clearly mentioned that “the physical channel may also carry non-binary signals, e.g., for the

purpose of range measurements”. Please reword as appropriate. Please consider also adding reference to PN Ranging (two blue books) as needed.

Response – Some text was apparently lost before the file was sent to the Secretariat. The test should have read (and now does read) “Similarly the SLS radiometric configuration adds to the above layered space data link model data processing functionality and radiometric data transfer services that allow Earth User Nodes to interface with the ESLT for the purpose of receiving radiometric measurements as they are being extracted from the space link by the ESLT.” [inserted words are underlined].

References to CCSDS 414 and 415 have been added as appropriate.

**SLS-09**

With reference to Figure 6-1 (and similar ones) it could be good to put the “SLS Radiometric Data Production” box aligned with the physical channel boxes (as 401.0-B defines all those physical signals) and not with the coding boxes.

Response – SLS Radiometric Data Production represents the functions that are needed to “produce” radiometric data, but that are not proper physical channel functions. For example, SLS Radiometric Data Production includes the functions that take the various radiometric data measurements and convert them into formatted and time-tagged records that are subsequently used to create Tracking Data Messages.

The descriptions of the Forward Physical Channel Transmission and Return Physical Channel Reception ASCs and the SLS Radiometric Data Production ASC have been modified to clarify this point.

**SLS-10**

On page 6-4 it is stated <The retrieval data delivery and retrieval radiometric configurations do not require the above space link communications stack, although in some cases the space link stack may be present.>. Actually they do need that stack having been present to store the data. Please consider improving the sentence to better show this concept.

Response – The sentence has been changed to “The retrieval data delivery and retrieval radiometric configurations do not require the above space link communications stack as part of those configurations, because the data being retrieved has been already stored by the prior (or in some cases, concurrent) execution of an SLS configuration (which by definition does include the space link communications stack).”

In addition, the following paragraph has been rewritten as follows “Similarly, the forward offline data delivery configuration does not involve the space link communications stack because its purpose is to deposit data in the ESLT for subsequent transmission during the execution of an SLS configuration. The forward offline data delivery configuration is composed of a forward offline cross-support transfer service and a forward space link data store.”

**SLS-11**

Figure 6-2 shows “Open loop” among the radiometric data, but Open Loop is never mentioned in the document. Please amend appropriately the document.

Response - The purpose of this Green Book is to explain the concept for extensible Space Communication Cross Support Service Management, not to describe all of the services that are expected to be managed by it. The presence of Open Loop Recording, Delta-DOR, etc., are included in the diagrams to illustrate that the concept recognizes the existence of these elements and asserts that the approach is expansive enough to include their management. To include further details on all of the services would make the Green Book much larger without explaining the concept any better.

To help clarify this point in the Green Book, the NOTE has been added after the paragraph that describes Figure 6-1:

“Some (but not all) of the Service Catalog #1 and Service Catalog #2 services represented by the ASCs in the figures in this subsection (6.2) are used to illustrate various aspects of extensibility as they apply to Service Agreements and Configuration Profiles. The complete set of services and the ASCs and SCs that support them are addressed in the *Functional Resources for Cross Support Services Technical Note* (reference [25]).”

Annex E specifically focusses on the Service Components and Functional Resources associated with the two example missions used in section 6 to illustrate how these notions will be applied to Service Agreements and Configuration Profiles. Annex E is included in the Green Book to provide a convenient top-to-bottom illustration of the concept, but it is not intended to address all of the Service Components or their Functional Resources. The NOTE at the beginning of Annex E explains that the complete set of Service Catalog #1 Service Components and Functional Resources are documented in the *Functional Resource for Cross Support Services* Technical Note.

**SLS-12**

Section E11 mentions <a) Time Division Multiplexing (TDM) Segment Generation;>. Should TDM rather correspond to Tracking Data Message as suggested in E13?

Add also TDM acronym to Annex 1.

Response – Yes, this was a typo. It has been corrected in E11 and the acronym has been added to Annex A.

**SLS-13**

“Real-Time Radiometric Data Store” and “Real-Time Radiometric Data” are mentioned (at least) in Figures 6-2 (\*), 6-7, 6-8 but non in their description. Despite some more info are in later in section E11 etc. a few words would be appropriate.

(\*) note that while figures 6-7 and 6-8 are searchable (i.e. text in those figure is detected by a search), figure 6-2 (and some more) are not searchable. It would be good to have all figure searchable.

Response - Regarding “Real-Time Radiometric Data Store” and “Real-Time Radiometric Data”, see the response to SLS-11.

Regarding the searchablity issue, the reason that some diagrams are searchable while others are not is currently unknown, but Tom Gannett will try to fix it.

**SLS-14**

Pre-Validation of Radiometric Data and their store is mentioned in some figures but not in their description. Moreover no related section is present in Annex E.

Please provide clarification text in figure description and add E# section(s) if needed.

Add also RM acronym (= RadioMetric) to Annex 1.

Response - Regarding “Real-Time Radiometric Data Store” and “Real-Time Radiometric Data”, see the response to SLS-11.

Regarding “RM” – all instances have been changed to “Radiomentric”, so no acronym definition in Annex A is necessary.

**SLS-15**

Delta-DOR Data and Delta-DOR Raw Data store are mentioned in some figures but not in their description. Moreover no related section is present in Annex E.

Please provide clarification text in figure description and add E# section(s) if needed.

Response - See the response to SLS-11.

**SLS-16**

With reference to Figure 6-2 there are a number of unclear items as per attached snapshot.

* In SLS Data Delivery Production it would be moving down Unframed Telemetry
* In SLS Data Delivery Production there are 4 arrow exiting at the bottom but they are linked only to 3 input arrows
* Two input arrows seem to go nowehere
* In SLS Data Delivery Production the CFDP presence is unclear and not mentioned in the text.

Response – The graphical conventions for these diagrams were not explained. A new paragraph has been added after the paragraph that introduces figure 6-1, explain iht use of arrow-headed lines and dashed lines.

In figure **Error! Reference source not found.** and subsequent figures that depict the SCs that specialze the ASCs, the placement of the SC icons within the ASC icons is not related to the postion of the arrows entering and leaving the containing parent icons. The figures merely indicate that the SCs belong to their parent ASCs. However, for those ASCs that have both forward and return SCs, the forward SCs are shown in the upper part of the ASC icons, and the return SCs are shown in the lower part of the ASC icons. A NOTE has been added after the paragraph that introduces figure 6-2 to explain this.

The SCs have been re-organized and CFDP is no longer a stand-alone SC. Instead, the CFDP functionality has been distributed to the Forward File SC and Return File SC. See the response to SLS-11 regarding discussion of all SCs and IOAG services.

