Draft Joint SLP- C&S WG TIM

Sept. 30, 2021

Via Webex

Final Version: Issued Oct 1, 2021

Attendees: Ignacio Aguilar Sanchez, Greg Kazz, Matt Cosby, Andrea Modenini, Jon Hamkins, Ken Andrews, Holgar Dreihahn, John Pietrus, Victor Sank, Xavier Enrich, Nicola Maturo, Ricard Abello

Action Items & General Discussion:

1. Action: SLP WG (Kazz/Cosby) – **Reference the correct C&S Blue Book in USLP for direct Space to Ground links.** John Pietrus pointed out USLP BB requires an update, once the C&S WG determines the text necessary within the TM Sync & CC BB to allow for sliced variable length transfer frames. Currently USLP references either TC Sync & CC BB for direct ground to space links and Proximity-1 C&S BB for proximity links. Therefore, coding of variable length transfer frame in the space to ground link direction in not yet covered by USLP. Matt and Greg took the action to update the USLP BB based upon the final resolution of the generic issues of coding *Variable Length Frames (VLFs)* by the C&S WG. This update will be coherent with the publication of the updated TM Sync & CC BB. Due – For discussion at the Fall 2021 CCSDS Meetings
2. Action: SLP WG (Kazz/Cosby) – **Confirm sliced VLFs do not require padding.** John Pietrus asked if padding was necessary for the last BCH or LDPC codeblock, similar to the Telecommand SDLP case. Matt and Greg took the action to investigate. At the meeting it was pointed out that most likely the VLFs will be transmitted contiguously with no fill or idle bits between them and then sliced. Andrea M. brought up the issue that if a codeword does not decode, then an erasure occurs, which will manifest itself in one or more VLFs not being able to be delivered at the protocol sublayer. SLP WG does recognize this issue, since it is similar to the one faced on the proximity-1 link. Due – For discussion at the Fall 2021 CCSDS Meetings
3. General Discussion: **Rationale for VLFs on the Space to Ground Link.** Andrea M. asked the general question of why use VLFs on the Space to Ground link, since their introduction will require agencies to invest more money, also there will be a need to test this capability, etc. There were several motivations given as to why VLFs on the Space to Ground link are attractive. #1) Efficient frame processing at high rate mentioned by Holgar Dreihahn. At Gbit downlink rates, frame processing becomes the bottleneck. There is potential to bypass the packet layer, if VLFs were to be used. Greg Kazz pointed out that currently VLFs are used on both the forward and return Proximity links which utilize slicing of VLFs using LDPC. Jon Hamkins mentioned that optical comm coding standard has the ability to slice on the return link as well. Another point was that by slicing on the Space to Ground link using VLFs, increasing the frame size from 2K to 64K frames would be a great relief to the frame processing function on the ground.
4. Action: C&S WG (Andrea Modenini) – **Make Slicing a generic capability for variable length transfer frames.** Modify the TM Sync & CC standard so that it can generically handle variable-length transfer frames by using slicing. Currently, VLFs are not defined in TM Sync & CC BB. Note that variable length frames are not just limited to the USLP protocol. VLFs are also defined in Proximity-1 and Telecommand (TC). Instead of just limiting VLFs to the LDPC code case, the WG will include slicing for as many codes as possible such as Turbo codes, R-S codes, DVBS-2, and SCCC. Currently slicing is only allowed for fixed length DVBS-2 and SCCC codes. Optical Command Coding & Synchronization already has a book on slicing. C&S WG plans to loosen the restriction in Chapter 8 in the TM Sync & CC BB from only allowing slicing for LDPC codes to opening that option up generically to the other applicable block codes. Due – For discussion at the Fall 2021 CCSDS Meetings

Action: SDLS WG (Gilles Moury/Howie Weiss) & CSTS(Holgar Dreihahn) & SLP WG (Greg Kazz/Matt Cosby) – **What impacts do the SDLS FSR (Frame Status Report) have on the SLE ROCF, CLTU and the emerging Forward Frame Services?**– John Pietrus provided an overview of the SLE ROCF service. Due to bandwidth limitations at a ground station, it may be necessary to provide OCFs back to the Mission Control Center in a timely fashion. In such a scenario, SLE ROCF can return just the OCF instead of the entire transfer frame to save bandwidth. Question for the SDLS WG: Is timely delivery of the FSR required ? Currently the ROCF service does not deliver the OCF. Is that acceptable or not ? If certain flags are set in the FSR, such as a security error has been detected on-board the spacecraft, what behavour should the ground station take? For example, should the FCLTU service interrupt the uplink when such a security error is detected on-board and reported in the FSR ? Which fields in the FSR should the ROCF service examine in order for the FCLTU or Forward Frame Services to take appropriate action ? So there are several open questions that need answers. A possible way forward: Any changes to the SLE services is within the purview of the CSTS WG. SDLS WG can convey that understanding to Holger’s CSTS WG. Answers to these questions and a dialog between CSTS and SDLS WGs will help inform the CSTS WG on what they need to monitor and process from the FSR in order to enable/disable the FCLTU Service.

Due – For Discussion at the Fall CCSDS 2021 Meetings between 3 WGs: SDLS, SLP, and C&S.

1. Action: C&S WG & SLP WG (Victor Sank/Greg Kazz) – **Extend Variable length CCSDS frame sizes to accommodate Slicing to the maximum USLP frame size of 64K octets** – USLP SDLP for example accommodates up to 32 times the current maximum transfer frame size of 2048 octets. For the transfer frame processing reasons mentioned by Holgar and others during the meeting, it makes sense to take advantage of the larger frame size for sliced variable length frames. For fixed length frames, Ken Andrews pointed out that there is at best only a .3 dB gain between the current max sized fixed length frame and an infinitely long frame. Ergo no need to modify the maximum frame lengths for fixed length transfer frames. Due – For discussion at the Fall 2021 CCSDS Meetings
2. Action: SLP WG (Greg Kazz) – **Update the SLP WG PIDs to CSS Area** – Based upon today’s discussion provide comments on the draft SLS PIDs to the SLS AD, who will then finalize the SLS PIDs, and send them to Holgar Dreihahn. Due – Oct 4, 2021