**CMC Draft Minutes**

**Fall 2018 Meetings**

**Berlin, Germany**

**23-24 October 2018**

1. **Call to Order – Welcome/Opening Remarks**

J. Afarin, CCSDS Management Council (CMC) Chair, called the meeting to order at 0830h and welcomed everyone to the fall 2018 CMC meetings hosted by the DLR and DIN. He stated that the joint CESG/CMC meetings would start with updates from the CESG. He thanked O. Peinado and DIN for being excellent hosts, for the excellent lunches that were provided, and reminded everyone about the joint dinner that would be occurring that evening. J. Afarin also expressed thanks to O. Peinado for his efforts as host and for the opportunity to have the meetings here at DIN; everything was fantastic. O. Peinado mentioned that lunch would be at 1300 hours instead of 1230 hours and provided more details on the dinner location and potential methods of transportation to get to the restaurant. He also provided additional administrative and logistics information (coffee, restrooms etc.).

1. **Roll Call of Delegates**

CMC Attendees were:

1. ESA – Michael McKay

2. DLR – Osvaldo Peinado

3. JAXA – Tsutomu Shigeta (Hirokazu Hoshino partially by telecon)

4. NASA - James Afarin

5. INPE – Eduardo Bergamini

6. UKSA – Not Present

7. CNES – Jean-Marc Soula

8. CSA – Not Present

9. ASI – Not Present

10. CNSA – Yonghui Huang, Rusheng Zhang, Yuxia Zhou, Tang WeiWei

11. ROSCOSMOS – Dmitry Barannikov, Vladimir Yanik

12. CESG - Margherita di Giulio, Wallace Tai, Nestor Peccia

12. Secretariat – Calvin Ramos

1. **Agenda Review and Approval** ([October 2018 CMC Agenda](https://cwe.ccsds.org/cmc/_layouts/15/WopiFrame.aspx?sourcedoc=/cmc/Private/CMC%20Meeting%20Minutes%20and%20Presentations/2018%20Fall%20-%20Berlin/October_2018_CMC_Agenda_Draft_2018_10_14-v2.docx&action=default))

The CMC agenda was reviewed and approved with no additional changes to the content. M. di Giulio stated there was no need for the additional 1530 topic (Other CESG Discussion Topics). No additional topics were raised during the CESG meeting.

1. **CESG Chair Report** ([CESG Report to CMC](https://cwe.ccsds.org/cmc/_layouts/15/WopiFrame.aspx?sourcedoc=/cmc/Private/CMC%20Meeting%20Minutes%20and%20Presentations/2018%20Fall%20-%20Berlin/CESG%20Report%20to%20CMC_%20Berlin%20Fall%202018.pptx&action=default))
   1. **CESG Chair Introduction and Overview** [CESG Report to CMC (slides 1-4 and 128-132)]

M. di Giulio provided an overview of the CESG membership and structure of the areas and working groups. She also presented an overview and update on publications; there are currently 154 active publications and at this time 1,111 space missions had adopted and/or used various CCSDS standards since its inception. She also presented several charts that summarized attendance at this year’s technical meeting. Overall, the number of people who attend the fall 2018 Berlin meetings was up and consistent with past meetings; attendance trailed off considerably on the last day. There was some discussion that perhaps future meetings should nominally be kept at 4 days and it was noted that the spring 2019 meetings will occur over a 4-day period. M. di Giulio also shared an attendance chart that summarized the attendance by the sponsoring agencies, attendance by area, and room utilization.

**4.2 Systems Engineering Area (SEA)** [CESG Report to CMC (slides 6-23)]

P. Shames provided an overview of the SEA beginning with the meeting demographics that displayed a cross section of the participating agency representatives and SEA working groups (Systems Architecture, Security, D-DOR, and the SANA Steering Group). P. Shames then proceeded to summarize the Achievements, Working Group Status, Interactions with other WGs and Problems and Issues that each WG is facing.

For the Security WG, the achievements for this meeting cycle included a review of on-going documents in preparation, new work items, and joint meetings that occurred with SLS, SM&C, and SIS. Highlights from the Working Group Status included reviews of the Symmetric Key Management (Magenta Book, MB), Interconnection Guide (Green Book, GB), Mission Planners (GB), Glossary (MB), and Authentication Credentials (Blue Book, BB). Additionally, the Network Layer Security Adaptation Profile, Cloud Testing was published and lastly, there were exploratory discussions of adapting blockchain technology for secure key management. J. Afarin asked about the relevance of blockchain technology for space communications and P. Shames stated this was a research topic that is of great interest and shared a high-level definition of blockchain technology (used for security of digital currency among other uses) that has potential extensibility for space communications. With regards to interaction with other Working Groups, the Security WG coordinated with SDLS on Space Data Link Security standards; with SM&C to consider the Security WG recommended authentication and Key Management (KM) approach (and others); and with the DTN WG regarding the Bundle Security approach and potential to adopt a similar SA mechanism as SDLS (no KM yet).

Noted Concern: P. Shames expressed a concern that security is almost completely missing from the IOAG Catalog and that the Security WG has a task to review the catalog and provide feedback to the IOAG.

P. Shames provided an executive summary of the SEA Systems Architecture Working Group. The major achievements for this group were the updated Application and Support Architecture Green Book, reviewed new “Implementation” viewpoint to showcase desirable features of MOIMS & SOIS for translating abstract specifications into implementations. Problems and Issues: Resources are constrained (as always), key staff were absent or unavailable for significant periods (Roger Thompson/ESA and P. Shames/NASA), but good progress was still made; Need to divert resources to help resolve dispute over value of MOIMS inputs to SOIS YB; Agreement that the Green Book will contain as complete an architecture as is practical, based on current published and in work materials. The “moving target” nature of the book makes this challenging. A request was made that all MOIMS & SOIS WG inform the SAWG of any major changes in document plans.

P. Shames provided an update on the status of the DDOR Working Group. This WG has all new participants and the new WG Chair was unable to attend, but his replacement did admirably. In DDOR, three projects are in progress (red, blue, and green books); a White Book on Terrestrial Generic File Transfer was discussed and further study is needed to determine if the proposed standard will handle large DDOR files (10’s of GB) in an efficient manner. Additionally, there is joint NASA/ESA work on a Ka-band quasar catalog that has resulted in improvements to the reference frame published in the new IAU standard 3rd generation International Celestial Reference Frame (ICRF3). P. Shames mentioned that offline discussions with RF&M would continue at the next meeting and a new project for higher resolution D-DOR PN signal will be proposed (with output in RF&Mod BB). Problems and Issues that were raised included delays that were introduced by changes in DDOR WG personnel and that while the new ESA member was present (as well as a CNSA representative), key NASA & JAXA reps were unable to attend.

P. Shames provided an Executive Summary for what occurred at the SEA Time Birds of Feather (BoF) in which there was a noon time meeting that included eight people and two agencies. The BoF also reviewed the existing draft charter and any changes to proposed work scope and content. The BoF concluded that there was still a need for the three major proposed work items: time exchange, time correlation (challenging, especially at higher levels of accuracy), and time synchronization (may be workable at millisecond accuracies, but not higher). Other items discussed were use cases (seven quickly identified); related issues having to do with differences in required precision, need to handle relativistic effects, time exchange and overall approaches that are quite common across agencies, but differ in implementation; no agreement yet on whether the result should be a BB or MB; and the assertion that SIS / DTN does not need much from Time (minutes to seconds), but that it would be a useful service to offer DTN users. In this BoF SLS, SIS, CSS, and SEA were all represented, but not MOIMS or SOIS. There is interest in (re-)starting this work, and the charter is pretty sound, but resources continue to be scant. The BoF agreed to revise the Charter and hold one or more telecons in the coming months to see if sufficient progress can be made to process the work.

The SANA Steering Group reviewed the SANA Operations report, QSCID implementation, user acceptance, and discussed issues regarding the CCSDS website integration into SANA. Updates from this Working Group includes:

New QSCID registries have been in use, making allocations within frequency bands. Web interface refinement has been done; Issues from importing the CCSDS website Missions into SCID registry identified, 430 new missions identified, <200 are new, but some may be overlaps with aliased names. Request to be made to each agency AR to review.

Problems and Issues: Access to the SSA registry is open to anyone with CCSDS login, but SANA does not have a list of users with CWE credentials (see above); CCSDS Glossary – all WG must review their documents and verify terms, these documents are now all marked “Provisional” and not “Approved”; CCSDS Glossary – Secretariat (Chief Technical Editor) will update Glossary with new terms as part of publication process; Need to resolve issues with CMC and registries. The SSG strongly recommends use of the SANA registries and changing the CCSDS web pages to dynamically fetch the user and organization data from the SANA registries; Recommend SANA provide web pages to allow AR to directly request updates of information under their control.

Additional Charts: ‘Spacecraftid’ Assignments; SANA QSCID Assignment view; SEA SANA Steering Group Resolutions; Systems Engineering Area Upcoming New Work Items; Systems Engineering Area Planned Resolution Summary.

**4.3 Cross Support Services Area (CSS)** (CESG Report to CMC [slides 24-35])

E. Barkley provided an overview of the CSS Area beginning with the Meeting Demographics that displayed a cross section of the participating agency representatives and CSS working groups (CSSM/Cross Support Service Management and CSTS/Cross Support Transfer Services). It was pointed out by Eric that EUMETSAT had two representatives attend the meeting – EUMETSAT is the EU equivalent of NOAA in the US.

The goals for the CSS CSTS WG this meeting cycle included: resolving CESG poll conditions for *Forward Frame* CSTS (BB track) -- goal met; completing prototyping of *Tracking Data Service* (BB) - goal was partially met (schedule to complete has yet to be determined, ~60% done); submit *Guidelines* (MB) to AD for review - goal was met; advance the *Concept* (GB) to AD for review - goal was met. E. Barkley also summarized the status of this WG that included a concern regarding resources availability (personnel are leaving, but still two new projects being considered and maintenance work – looks like only NASA and ESA participants starting fall 2019). J. Afarin commented that if resources are an issue, why are new projects being considered; we should be finishing what is in the current schedule/plan. The major problems/issues raised in the WG was that the functional resource model is a key underpinning for the CSS Area, however, the completion/development of the functional resource model is taking a low priority in favor of book production. Consequently, the WG requests consideration for more dedicated resources and/or consideration for a different type of project (not a book project). Lastly, the following CSTS WG Resolutions were agreed upon at this meeting: Resolution 1, CSTS Concept: CESG Poll/publication and Resolution 2, CSTS Guidelines: CESG/CMC Poll/publication.

Goals for the CSS CSSM WGincluded:

* Planning Information Format (BB): Set schedule for Red-1 Agency Review; goal met;
* Terrestrial Generic File Transfer (BB): Set schedule for Red-1 Agency Review; goal met;
* Service Package Data Format (BB): Produce first draft; WG review; goal met;
* Service Management Utilization Request Format (BB): Set schedule for Red-1 Agency Review; goal met
* Abstract Event Definition (MB): Set schedule for Red-1 Agency Review; goal met;
* Common Data Entities (MB): Set schedule for Red-1 Agency Review; goal met.

With regard to the status of the CSSM Working Group, E. Barkley stated that the TGFT Prototyping is running behind plan and that ambiguities in the test plan being sorted out. CSSM resolutions agreed upon for Agency Review for this meeting included Abstract Event Definition, CSSM Common Data Entities, Service Management Utilization, Planning Information Format, Service Package Data Format, and Generic File Transfer. E. Barkley also summarized the projects that are currently in Planning (only approved Projects) and the status of Approved CSSM Projects. Additionally, E. Barkley provided a summary of CSSM Planned Resolutions which include Agency Reviews for the following: Abstract Event Definition, CSSM Common Data Entities, Service Management Utilization, Planning Information Format, Service Package Data Format, and Terrestrial Generic File Transfer.

CSS AreaIssues for CESG/CMC - CSS Area standards development would benefit from a Configuration Management system such as Github or a Git server for proper management of schema; Can CWE host a git server or something similar? This also points to a somewhat more general concern in that CCSDS projects are about books; this is about maintenance of information assets. E. Barkley stated that CM can be done by the WG, but it would be more beneficial if there were a CM capability that could support all of the CESG and CCSDS (he also later mentioned that the Nav WG has a schema for CM). M. di Giulio stated that a CM schema would need to be a cross cutting IT capability; J. Wilmot also stated that SOIS has a CM tool/capability but this is provided by NASA.

CSS AreaNew Work Items include: Functional Resource Model (specifies functions needed to provide telemetry, command, and radiometric services in the abstract, independent of implementation); Service Control (CSTS); and Concept Book Update for CSSM.

E. Barkly also provided feedback on the CSS Area meetings. His working groups shared that the physical facilities were excellent, the coffee and lunch was very good and much appreciated, the Wi-Fi was very good, and the projectors were excellent. The CSS Area expressed their thanks to DIN and DLR for excellent hosting services.

**4.4 Space Internetworking Services Area (SIS)** [[CESG Report to CMC](https://cwe.ccsds.org/cmc/Private/CMC%20Meeting%20Minutes%20and%20Presentations/2017%20Fall%20-%20Darmstadt/d03-CESG-Report-to-CMC%20Fall%202017.pptx) (slides 36-54)]

S. Burleigh provided an overview of the SIS Area beginning with the meeting demographics that displayed a cross section of the participating agency representatives and SIS working groups and activities (Motion Imagery and Applications WG, and Delay Tolerant Networking WG, Delay Tolerant Networking - Interoperability Testing, and CCSDS CFDP Revisions Working Group).

S. Burleigh stated that the major achievement for the SIS-CFDPv1 Task was the development of a plan for interoperability testing of CFDP Revisions. The WG will be testing the interoperability of implementations developed by KARI (S. Korea) and BITTT (China). J. Afarin inquired why NASA was supporting the development of the test plan if China and Korea were doing their implementations and S. Burleigh stated that NASA would be providing consulting expertise. The on-line (cloud) pre-tests are planned for January 8-11 and if necessary, on-site supplementary testing will occur March 4-8 (location TBD). S. Burleigh also reported that the Yellow Book (test plan and report) was managed and submitted by NASA.

S. Burleigh reported that the SIS-Voice WG did not meet this cycle and that the Green Book (706.2-G-0) finished CESG polling with conditional approval from three areas and unconditional approval from all others. Resolutions were reached informally within the WG and discussion with the three area directors are pending. Completion is estimated for end of calendar year 2018. J. Afarin inquired if this group would be closing down since they didn’t meet during the spring 2018 Meeting and S. Burleigh responded that there is still work to do and progress is being made with the RTP standard in collaboration with the Motion Imagery WG (to be discussed at the spring Meeting 2019) – there is just not a large workload for the Voice WG. Afarin responded that if there is not that much work in this WG, maybe the WG should close after the Green Book is completed.

S. Burleigh also provided an update of activities and progress with the SIS-MIA WG. Major achievements for MIA included development of a plan for prototype testing, editing of the RTP White Book (draft 2), and discussion of the need to update the Digital Motion Imagery Blue Book 766.1-B-2 prior to the 5-year requirement (Pink Sheets). J. Afarin inquired about the purpose of an RTP protocol to function over DTN and J. Wilmot replied that RTP/DTN is of value for video streaming and is needed to assist the reassembly of video packets since packets may not arrive in the correct order. S. Burleigh also provided an update on the Working Group Status to include: the Green Book, Concepts and Rationale for Streaming over Bundle Protocol, was published Sept. 2018; the second draft of White Book for Real-time Protocol Over Delay-Tolerant Networking for Video Applications will be available for WG review by Nov. 2018. The hope is to conduct interoperability testing between two prototypes by late spring 2019; and lastly, there is a potential new project to update the Digital Motion Imagery Blue Book 766.1-B-2.

S. Burleigh reported the SIS-DTN WGwas busy with three major products related to the DTN protocol suite. J. Afarin added that this work is urgent since there is a deadline for this protocol suite to be infused into future operational networks. S. Burleigh stated that the DTN project is on schedule and could be completed faster if more resources were available. S. Burleigh continued to provide an update on key achievements that include: work on the Schedule-Aware Bundle Routing (SABR) Blue Book, whereby JAXA presented their current progress on their Schedule-Aware Bundle Routing (SABR) implementation and a framework for interoperability testing. The WG discussed moving some SABR capabilities into an informative annex and adding some informative use cases to the document (DLR/ESA/JAXA may be able to provide use cases). Another achievement was related to the Streamlined Bundle Security Protocol (SBSP) Blue Book. The SBSP document was discussed with SEA-SEC and it was determined that the SIS-DTN working group will work more closely with SEA-SEC in order to address issues in the draft Blue Book and furthermore, request resources to work together with SEA-SEC to produce an SBSP Green Book. Finally, the DTN WG went through the Network Management for BP (Green Book) and the MO Services Blue Book.

S. Burleigh also reported that the Schedule-Aware Bundle Routing and Streamlined Bundle Security Protocols were on track for publication by the end of CY 2019; and that an initial draft of Network Management Green Book was circulated to the WG before the meetings and reviewed during the meeting. The WG will need to address coordination / copyright issues with the IETF and would also work more closely with SEA-SEC to complete the SBSP book. The DTN WG also met w/ MOIMS SM&C to present the BP services to SM&C as a possible bearer service for SM&C messages.

Problems and Issues: No resources identified for First-Hop / Last-Hop service (listed as ‘[CCSDS Delivery Agent](https://cwe.ccsds.org/fm/_layouts/15/listform.aspx?PageType=4&ListId=%7bBC2D6E0F-3242-46E3-A13D-3D907343AF44%7d&ID=289&ContentTypeID=0x0100B63160D64FE81342BE42A874DE7E703D)’ in ICPA). It was also mentioned that there was a Technical Interagency Coordination (TIC) meeting between NASA/JPL and ESA on the current DTN WG Program of Work regarding this service. If this service were available now, it could be deployed into existing ground stations thereby providing a pathway for DTN to eventually be infused on spacecraft.

S. Burleigh quickly covered the remaining charts on DTN Upcoming New Work Items, SIS Approved Project Status, SIS Resource Issues for Approved Projects, SIS Resource Issues for Approved Projects, SIS Upcoming New Work Items, and SIS Planned Resolution Summary.

* 1. **Space Link Services Area (SLS)** [[CESG Report to CMC](https://cwe.ccsds.org/cmc/Private/CMC%20Meeting%20Minutes%20and%20Presentations/2017%20Fall%20-%20Darmstadt/d03-CESG-Report-to-CMC%20Fall%202017.pptx) (slides 55-87)]

G.P. Calzolari provided an overview of the SLS Area beginning with the meeting demographics that displayed a cross section of the participating agency representatives and SLS Working Groups (RF and Modulation, Space Link Coding and Synchronization, Multispectral and Hyperspectral Data Compression, Space Link Protocols, Space Data Link Layer Security, and Optical Communications Working Groups).

G. P. Calzolari provided an update on the Radio Frequency and Modulation WG achievements that included the following: approved editorial revisions of 401.0-B Recommendations (2.4.18) and (2.4.23); agreed on new recommendation (2.1.9) on uplink multicarrier transmissions for MSPA, which will be submitted for agency review at the next meeting along with Rec. (2.6.13); and completed RID dispositions for recommendation (2.4.17A), (2.4.22A/B), (2.4.24), and (3.1.7) Pink Sheets. The RFM WG also made good progress on discussing revisions to draft recommendation (2.6.13) on flexible turn-around ratios in support of MSPA policy recommendation (3.1.7, expected to be ready for agency review at the spring 2019 meeting); discussed updates to draft recommendation (2.3.7) on earth station reference frequency stability (expected to be ready for agency review by spring 2019 meeting); and discussed the new draft recommendation 2.6.14 on 22/26 GHz turnaround ratios. The RFM WG also had a joint meeting with the C&S WG to discuss DVB-S2X, SCCC-X, VCM BB, and longer length pseudo-randomizer for high data rate applications. Resolutions agreed upon this meeting included resolutions for:

* publication of editorial revisions to 401.0-B Recommendations (2.4.18) and (2.4.23);
* publication of revised Recommendation (2.4.17A) on modulations for 8 GHz SRS band;
* publication of new Recommendation (2.4.24) on telemetry ranging;
* publication of revised Recommendations (2.4.22A) and (2.4.22B) on GMSK+PN ranging;
* publication of new 401.0-B Recommendation (3.1.7) on MSPA.

G. P. Calzolari provided an update on major achievements in the SLS Coding and Synchronization WG. Achievements for this meeting cycle included: 130.11-G (SCCC) Green Book completed and queued for publication and 431.1 (VCM protocol) Blue Book queued to start Agency Review (both occurring before the meeting); agreed to final WG edits to 211.2-B (Prox-1 C&S) Blue Book, and interoperability test results (resolution to start Agency Review); agreed way forward for “AOS Uplink” (concept paper will follow for “Coding profiles for fixed-length frames Uplink” and harmonization edits for the 3 Coding books (TM [to be renamed], SCCC, DVB); planned concept paper to update 130.1-G (TM C&S) Green Book to add parallel encoders for (O)QPSK modulation; planned concept paper to add longer randomizer for high data-rate telemetry to 131.0-B (TM C&S) Blue Book; presented progress for DVB-S2x Orange Book, which adds high-order modulations to the current 131.3-B (DVB-S2); presented progress on SCCC-X, which adds higher-order modulations to the current 131.2-B (SCCC) Blue Book; and planned concept paper to develop an Orange Book.

In regards to C&S resolutions, Initiate Agency Review of Prox-1 coding Pink Book/Sheets resolution was agreed upon at this meeting and following are further resolutions anticipated in the next 6 months:

* Initiate project to update of the 130.1-G (TM Coding) to add parallel encoders for (O)QPSK;
* Initiate project to update 131.0-B (TM Coding) to add longer randomizer;
* Initiate project to write SCCC-X Orange Book;
* Initiate project to write “Coding profiles for fixed-length frames uplink” Blue Book;
* Initiate three projects to update and harmonize the 3 Coding books regarding fixed length frames uplink:
  + 131.0-B TM coding (to be renamed) [possibly together with longer randomizer];
  + 131.2-B SCCC;
  + 131.3-B DVB.

G. P. Calzolari provided a summary of achievements from the SLS Space Link Protocols WG for this meeting cycle that included: publishing of the USLP Blue Book; achievement of consensus to craft a Resolution for Publication of CCSDS 700.1-G USLP Green Book Issue 1 once final cross-check with Blue book is completed; further refinement of Space Packet Protocol (SPP) within the SPP Revisions Project; and update of Overview of Space Communication Protocols GB with latest refinements of SPP. Overall good progress was made in in advancing USLP GB to Issue 1 and a new project involving the removal of the Space Packet from Encapsulation Service was identified. With regard to interaction with other WGs, pink sheets were generated to add USLP frame into Prox-1 C&S blue book and were discussed with the C&S WG resulting in a SLS-C&S Resolution to start an Agency Review; and coordination occurred with SDLS for adding Frame Security Report in TM and AOS Operation Control Field. Further Resolutions anticipated in the next 6 months include publication of Issue 1 of CCSDS 700.1-G, USLP Green Book and a new project for the removal of the Space Packet from Encapsulation Service.

G. P. Calzolari provided a summary of achievements from the SLS Space Data Link Layer Security WG. Major achievements for this meeting cycle included: before the meeting, publication of the SDLS Core protocol green book (350.5) - published in June 2018; SDLS Extended Procedures (355.1-B) document finalized and submitted to Agency Review #1 (August 2018); and SDLS Extended Procedures Green Book (350.11) with inputs from contributing agencies. Additionally, good progress was made in the working group regarding the SDLS Extended Procedures red-1 (355.1) whereby, all RIDs generated in Agency Review #1 were dispositioned resulting in no significant technical changes. The draft blue book will be prepared while the final round of interoperability testing is performed and the resolution to publish blue book is expected around January 2019. G. P. Calzolari also shared that all contributions to SDLS Extended procedures green book (350.11) were reviewed and the document is 85% complete.

G. P. Calzolari provided a summary of achievements from the Multispectral Hyperspectral Data Compression Working Group (SLS-MHDC). Achievements for this meeting cycle included progress on the CCSDS-123.0-B-2 “Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression” book in which all RIDs were resolved and a marked up Pink Book and RID resolutions were delivered. Additionally, the WG delivered a cross-verification Yellow Book (May, 2018), in which the RID resolution includes a very minor change in the encoding of image metadata in the header. Cross-verification of test cases exercising this change is to be run in the next 2 weeks. G. P. Calzolari updated the progress on CCSDS-121.0-B Lossless Data Compression (reconfirmation review) which will need a new issue due to revisions to address an identified shortcoming that falls outside the scope of a Corrigendum – the working group reviewed draft text for Issue 3 to solve the problems. The WG expects this will be sent to Agency Review before spring 2019 meeting.

G. P. Calzolari shared that progress was made during this meeting cycle: CCSDS-123.0-B-2 - expect publication request in a few weeks; CCSDS-120.2-G (GB for CCSDS-123.0-B-2) - revised draft was reviewed substantially and writing assignments were made to produce the next draft; CCSDS-124.0-B telemetry housekeeping compression – the first draft was reviewed and significant revisions were proposed and real-time edits made; CCSDS-120.0-G-3 (GB for CCSDS-121.0-B-3 - reconfirmation review of Issue 2 was addressed and the WG agreed on list of items to be addressed in this revision (a New Issue is needed). G. P. Calzolari expressed that the United States Air Force is vested in this protocol and J. Afarin inquired who was producing the prototype, to which Gilles Moury responded that ESA and CNES are producing the prototypes and the specification is in first stages of development so prototyping can start.

SLS-MDFC resolutions agreed upon this meeting included a start for a new project for Issue 3 of CCSDS-121.0-B “Lossless Data Compression” Blue Book and a start for a new project for Issue 4 of CCSDS-120.0-G “Lossless Data Compression” Green Book. Further Resolutions anticipated in the next 6 months include: Publication of Issue 2 of CCSDS-123.0-B “Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression” and Agency Review of CCSDS-121.0-B-3 “Lossless Data Compression”.

Major achievements in this meeting cycle provided by G. P. Calzolari from the Optical Communications Working Group (SLS-OPT) include: the HPE “Coding and Synchronization Layer” Red Book – Agency Review RIDs were resolved and the book was updated (Two draft Blue Books ready for publication waiting on prototypes); the working group resolved to start the Optical Communications Physical Layer Issue 2 which will add optical on-off keying (O3K); the draft O3K Physical Layer input was reviewed; discussion began on O3K Coding and Synchronization; the draft MB “Atmospheric Characterization and Forecasting for Optical Link Operations was reviewed”; the High Data Rate 1064 nm Orange Book completed and queued for publication polls (before meeting); and the draft High Data Rate 1550 nm Orange Book was reviewed. G. P. Calzolari stated that good progress was made in this working group and other accomplishments included: agreeing that NASA will provide two independent prototypes (JPL & MIT) for HPE (ESA still to confirm starting a 3rd); there was consensus to focus on HPE for Issue 1 of the Optical Communications Green Book; and lastly, the WG reviewed recent developments in optical communications across the various space agencies.

* 1. **Mission Operations and Information Management Services (MOIMS)** [CESG Report to CMC (slides **88 - 115)**]

M. Merri provided an overview of the MOIMS Area beginning with the meeting demographics that displayed a cross section of the participating agency representatives and MOIMS Working Groups (Data Archive Ingestion, Navigation, Spacecraft Monitor & Control, and Mission Planning and Scheduling).

M. Merri provided a summary of major achievements from the Data Archive Ingestion (DAI) WG in this meeting cycle that included: the first Archive Auditing Body accredited (PTAB) and first Archive (IG-NCAA) was certified by ISO in accordance with OAIS (1st ISO compliance certification to CCSDS); the WG almost finished resolving all RIDs for the OAIS update (over 200 were received - ISO & CCSDS parallel review expected to start Dec18); started addressing RIDs for Audit and Certification Blue Book; good progress made on Archive Architecture (OAIS-Interoperability Framework). M. Merri also stated that with regards to the Working Group Status, good momentum was made and the majority of projects were on schedule. Additionally, he welcomed new DLR and ESA working group members. M. Merri also shared a concern also acknowledged by other Area Directors regarding cancellation of webex services by ISO; subsequently, an action was assigned to the Secretariat.

**CMC-A-2018-10-05** Secretariat was requested to coordinate with J. Afarin to obtain Zoom accounts for CESG Chair/Deputy Chair and Area Directors.

*Due Date:* November 7, 2018

M. Merri also provided a summary of resolutions agreed upon this meeting cycle. DAI-01 was a resolution to re-confirm the multiple documents that are at 5-year review date (May 2018) as they are currently used and which there is no requirement for changes. M. Merri emphasized that based on CESG discussion, before submitting the resolution, the WG shall produce a short justification for each of the required changes documenting why it is proposed to re-confirm and to spell out changes that have been identified (including compliance to latest CCSDS template, e.g. PICS Proformat, Security/SANA sections …). M. Merri also listed several resolutions anticipated in the next 6 months and further emphasized that for the Control Authority documents, the CESG requested to revise them and align them with the SANA RMP (Registry Management Policy, CCSDS 313.1-Y-1).

M. Merri provided a summary of the major achievements of the Mission Planning and Scheduling Working Group for this meeting cycle. M. Merri reported that the focus for all four days was on discussion at the technical level on the Mission Planning Information Model and Services; that the Information Model core is more stable and nearly completed**;** and that work on services has started and is progressing nominally. Regarding the Working Group Status, M. Merri reported: “High Momentum” with very active and high participation; participation included three people from CNES, two from DLR, six from ESA (plus three from CGI), four from NASA, one from CNSA, and two from EUMETSAT; the WG determined if the Information Model of the WG is compatible with selected ESA and DLR missions; NASA JPL is considering performing a similar test for their selected missions; and that work on a prototype based on the ESA MPSF (Mission Package Support Facility) has started.

Problems and Issues raise by M. Merri include: lack of a Deputy Chair and that a request was submitted to the AD to initiate a resolution for a new deputy chair; the MP&S WG considers essential to meet 4 days during spring Meetings 2019 (Room allocation has been requested); and that if confirmed that the MP&S WG would be located in isolation from other WGs, this limits the interactions with other WGs.

M. Merri provided a summary of major achievements for the MOIMS Navigation Working Group at this meeting cycle that included the following: completed internal review of 5-y revisions of Orbit Data Messages, Attitude Data Messages, Navigation Data Definitions & Conventions, Navigation Data Messages XML Specification, Navigation Data Messages Overview; continued discussion of Navigation Events Message in preparation for first WB; completed RID disposition and continued discussion of Prototyping Plans for the Re-Entry Data Message and Tracking Data Message V2; initiated project approval for Conjunction Data Message 5-y revision and Tracking Data Message V3; and initiated discussion of potential alternative format for standards besides KVN, XML. M. Merri also relayed that there was a joint meeting with the SANA Operator regarding plans to migrate material from document annexes to SANA [Ref Frames (various types), Covariance Matrix Elements, Attitude, References]. Resolutions that were agreed at this meeting included: NAV-1, request to create new project for revision of CCSDS 508.0 Conjunction Data Message; and NAV-2, request to create new project for revision of CCSDS 503.0 Tracking Data Message V3.

M. Merri provided a summary of the achievements for the Spacecraft Monitor & Control Working Group at this meeting cycle which included the following: presented the status of the LOP-G (nothing developed), OMG, and IOAG (push towards development of an interface gateway between Agencies); analysed all documents due for 5 year review; presentations of CNES’s ISIS control system and the ESA/JPL “Shadow” project; worked on MO Service Concept Green Book update and on first draft of File Management Services; and held both an open WG discussion on the OMG C2MS/MO overlap. M. Merri communicated that LOP-G is moving ahead with draft standards but there were not any MOIMS based standards that were included in that framework – in addition, a white paper was generated and provided to the LOP-G project but(?) they did not receive a response from JSC (Sharada). M. Merri stated that it was important to coordinate a meeting with the right person and J. Afarin stated he would be able to coordinate a meeting with the appropriate contact at NASA HQ – B. Knopf, from NASA HQ was mentioned as a possible person of interest. M. Merri stated that it would be of value if Dan Smith were also available to attend this meeting. M. Merri also covered SM&C related resolutions that were agreed upon and further resolutions anticipated in the next 6 months (pending analysis and availability of resources).

M. Merri led a discussion on the topic and issue of CCSDS-MO and OMG-C2MS (Satellite Command & Control Message Specification (C2MS) overlap. He provided a short summary of the topic and issues, stating that C2MS data was received late and that there was non-consensus when this issue was raised in the spring 2018 Meeting; hence M. Merri was requested to produce a Technical Note (completed by DLR) and gave a heads up to the OMG that the TN was occurring. When the TN was ready, it had to be reviewed by the CESG and WG which was too late for it to be considered by the OMG. J. Afarin noted that it is the function of the CESG, working in concert with M. Merri, functioning as the OMG Liaison to have resolved this issue instead of bringing it forward to the CMC for resolution.

M. Merri shared that the SM&C WG requested the MOIMS Area Director to raise the SM&C items of non-concurrence regarding the CCSDS-MO and OMG-C2MS overlap discussions to the CESG as appropriate and provide actions back to the WG should additional information be needed. M. Merri relayed that the SM&C WG made two high-level recommendations to the Area Director for consideration and discussion with the CESG and/or CMC regarding overlap between these two groups. The first was to revisit the liaison rules, responsibilities and reporting channels; this entails reporting out at plenary meetings to raise awareness to the entire CCSDS organization, communication of potential standards development efforts as early as practical, provision for a forum to encourage open dialog and potential collaboration across standards organizations, and addressing the issue of the convoluted process to submit comments external to CCSDS. The second was to review any existing MoUs between CCSDS and OMG. Merri also shared several areas of non-consensus within the working group: 1) there was no consensus on the degree of overlap; and 2) there was no consensus on the level of conflict and impact of such an overlap – it was noted however that NASA feels the two standards represent very different approaches that can complement each other and ESA, DLR and CNES are concerned that C2MS is a competing standard and therefore will reduce the support for the MO service usage; and lastly 3) due to ESA, DLR, and CNES’s view that the standards are competing, they have a strong concern about the conflict of interest with the SM&C WG Chair being lead of both activities.

M. di Giulio stated that the SMC Working Group, led by Dan Smith should perform an analysis of the overlap between the two standards. M. Merri also made the point in his presentation that D. Smith should document how the two standards were complementary and secondly, for D. Smith to participate in promoting MO services with LOP-G. J. Afarin remarked that if there was overlap between the two standards, that CCSDS would incorporate any overlap into the CCSDS standard profile. Concern was also expressed by M. Merri and M. di Giulio that D. Smith’s participation in the development of both standards was perceived to be a conflict of interest that somehow needs to be deconflicted. M. Merri also mentioned that a number of Agencies have invested significantly in MOIMS standards and it is beneficial for missions such as LOP-G to adopt them for operational use – he would also be advocating their use to ESA. M. Merri also stated it would be beneficial if the NASA WG Chair were to promote the MOIMS SMC solution, but was again concerned with the perceived conflict of interest. It was finally agreed that 1) D. Smith would document the complementarity of the two standards and, 2) that D. Smith and the WG would promote MO Services with LOP-G (FOD/MCC-21, Steve Beisert).

* 1. **Spacecraft Onboard Interface Services (SOIS) Area Report (CESG Report to CMC Slides 116 - 127)**

J. Wilmot provided an overview of the SOIS Area beginning with the meeting demographics that displayed a cross section of the participating agency representatives and SOIS Working Groups (Subnetwork Services, Application Support Services and Onboard Wireless Working Groups).

J. Wilmot provided a summary of major achievements for the SOIS Application Services Working Group (SOIS APP WG) for this meeting cycle that included the following: dispositioned final agency review RIDs for CCSDS 876.0-R-3, Spacecraft Onboard Interface Services—XML Specification for Electronic Data Sheets; completed CCSDS 876.0-R-3 interoperability tests and content for test yellow book (completed 10/26/2018); held discussion of ESA SOIS EDS study project (Funded: April 2018 – fall 2019); held discussion of Lunar Orbital Platform-Gateway software use cases (from iHAB Multilateral TIM); held discussion of China Academy of Space Technology (CAST) software architecture use cases; and conducted joint meetings with the SEA-SA and MOIMS Working Groups. J. Afarin inquired how interoperability testing was completed during the Technical Meeting and Wilmot responded that it was completed online.

J. Wilmot also share that good progress was made in this Working Group that included: minor updates of use case sections of Electronic Data Sheets and Common Dictionary of Terms occurred (Overview and Rationale); the SAVOIR EDS study project is in progress with estimated completion in the fall FY2019; there is active development of SEDS import/export functions in NASA JSC CCDD tool (CCDD tool is used for Lunar Orbital Platform/Gateway prototype projects); the WG started a White Paper on SLS-SLP Space Packet Protocol name space extension use cases; the was participation in the Lunar Orbital Platform-Gateway avionics and software technical meetings; and the WG is coordinating with SEA-SA WG to resolve comments on MAL and SOIS EDS yellow book. An issue raised by J. Wilmot addressed the APP WG’s need for resources to resolve RIDS from review of Report on Analysis of CCSDS MAL and SOIS EDS Relationships Yellow Book; the APP WG will work with SEA-SA and include some information in SEA-SA books. J. Wilmot also share a number of resolutions anticipated in the next 6 months that include a resolution for publication of 876.0 XML Specification for Electronic Data Sheets for Onboard Devices and Software Components; a resolution for the XML EDS Prototyping Test Plan and Report Yellow Book Test Report (876.1-Y-1) to be submitted to CESG for review; a resolution for publication of 876.1 Specification for Dictionary of Terms for Electronic Data Sheets for Onboard Components; and a resolution for agency review of Electronic Data Sheets and Common Dictionary of Terms - Overview and Rationale (870.1).

J. Wilmot provided a summary of major achievements for the SOIS Onboard Wireless Working Groups (SOIS WIR WG) for this meeting cycle that included the following: discussed additional SOIS-WIR projects with a focus on non-NASA led projects; and evolved NASA-led Orange Book on Proximity Wireless Network Communications in support of the LOP-G (specific ICSIS inputs were delivered). J. Wilmot also stated that good progress was made in the Working Group that included evolving a draft of the Orange Book (identified Test Plan strategic objectives and worked on composing Test Plan objectives); identified a potential new wireless communications activity (DLR, JAXA, ESA/ESTEC, Roscosmos) in support of satellites, launchers, EGSE, and AIT. In regards to interaction with other WGs, there was consensus to compose a SOIS-WIR mapping to SOIS-Subnetwork Services for Wireless Orange book; a meeting took place with Berlin-based PTScientists to discuss LTE communications for the Mission-to-the-Moon activity; and there were meetings and discussions held with SIS-MIA as a lead user of the Orange Book high-speed wireless proximity network communications. J. Wilmot brought up a couple of issues: the SOIS WIR WG was unable to come to consensus for any new Blue Book project - participation is needed from non-NASA agencies and there is a need for CSA support (Stephen Braham, SFU).

J. Wilmot provided a summary of major achievements for the SOIS Subnetwork Services Working Groups (SOIS SUBNET WG) for this meeting cycle that included the following: discussed and dispositioned early Packet Service RIDs received from Roscosmos; presentation from Roscosmos on SpaceWire (SpW) STP-ISS transport protocol (Roscosmos will request SpW protocol ID and make openly available); discussion of network topology, timing, and terms for SEDS and DoT (potentially need additional syntax in schema); and a CAST presentation on the Subnetwork Service Access Point interface.

J. Wilmot also reported that there was good progress in the Working Group - the Packet Service book is in secretariat queue for agency review and Memory Access Service was beginning a 5-year review. With regards to interaction with other WGs, there was a joint meeting with SOIS APP (5 days) and a joint meeting with SEA-SA on SOIS MOIMS architectures and relationship. J. Wilmot reported that Resolutions anticipated in the next 6 months include a resolution for publication of 851.0 SOIS Subnetwork Packet Service and a resolution for Agency review of 852.0 SOIS Subnetwork Memory Access Service.

J. Wilmot also highlighted several upcoming new work items to include: a white paper on deterministic subnetworks and data sheet descriptions for TTE, SpaceWire-D, CAN, ARINC-653, and others; and development of a schema for Subnetwork Management Information Base (MIB) that may require new blue book or appendix to an existing blue book. J. Wilmot also reported that the SUBNET WG has discussions on LOP-G needs that led to the revival of the silvered SOIS File store service book to include Subnetwork interfaces and the silvered SOIS packet store service book to include Subnetwork interfaces.

1. **Additional CESG Items Reported to the CMC** [[CESG: Extra Items to Report to CMC](https://cwe.ccsds.org/cmc/_layouts/15/WopiFrame.aspx?sourcedoc=/cmc/Private/CMC%20Meeting%20Minutes%20and%20Presentations/2018%20Fall%20-%20Berlin/CESG%20Report%20_to%20CMC_Extra%20Items_%20Berlin%20Fall%202018.pptx&action=default); slides 1-14)]

M. di Giulio relayed that discussions at the CESG meeting focused on a number of topics to include technical issues, practices, concept papers, etc. There were also two important topics that were addressed – these were AOS Uplink protocol and the path forward regarding CCSDS and OMG overlap. M. di Giulio also covered multiple charts that provided an update on CMC/CESG polling statistics since the spring 2018 Meeting. Additionally, she provided summaries of publications in CMC polls, books that are currently in Agency Review, books that were reconfirmed, and CMC Polls with conditions.

M. di Giulio also provided an updated matrix on resources deployed across the different areas and working groups by Member Agency. Overview charts and demographics of the WG Chair/Deputy Chairs and Area Directors/Deputy ADs was provided. These charts provided demographics on the percentage of WG Chairs / Dep and AD/DADs that are currently being filled by the different member agencies. An analysis of the number of Blue Books being worked on by member agency and the corresponding level of effort/resources allocated to these books was also shared by M. di Giulio. She also presented a table that listed Books with Due Dates for Revision. It was communicated by di Giulio that the table is outdated and a further assessment is needed to bring this table up to date. The final two charts shared by M. di Giulio was information related to CCSDS-IOAG activities and a listing of IOAC-CCSDS Project Agreements.

M. di Giulio also facilitated a short discussion on the Plenary that occurs at the beginning of the Technical Meeting and shared that some attendees felt the kickoff plenary was too long, however it was acknowledged that some attendees appreciated the details that were provided.

1. **SANA Resolution Discussion**

J. Afarin introduced the SANA topic and stated that after having more discussion in a follow-on meeting with W. Tai, he understood the value of keeping the organization and contact data in the SANA registry. There is still concern however with the accuracy of the data and the challenge would be to determine the process for updating the information in SANA. J. Afarin outlined the two options, keep SANA dedicated to maintaining only technical and mission-oriented data or move all relevant organization and contact data in the SANA registry that could be done in two steps: 1) update the CCSDS website data and export the data to SANA and 2) establishing the process (including roles and responsibilities) for keeping the information accurate. With regards to roles and responsibilities, the Agency Representatives or Heads of Delegation would be responsible for keeping their member agency information accurate and the Secretariat would also have responsibility for accessing the contact and organization registries to execute updates. Once this transition is complete, SANA would become the trusted source for this information. There was CMC consensus in proceeding with the second option – to have SANA as the trusted source of this information and an action was given to P. Shames to define and document the transition process.

**CMC-A-2018-10-01** Peter Shames was requested to work with the Secretariat to create a process description for transitioning the existing CCSDS website information (contacts and organization) into SANA. The process should also describe specific role and responsibilities of the appropriate stakeholders (process-owners) who will be responsible for updating and maintaining accuracy of the information.

*Due Date:* November 7, 2018

1. **Agency Reports on Other Activities** 
   1. **JAXA (**[**JAXA Agency Report**](https://cwe.ccsds.org/cmc/Private/CMC%20Meeting%20Minutes%20and%20Presentations/2018%20Spring%20-%20Beijing/JAXA%20input%20to%20Beijing%20CMC%20May%202018.pdf)**)**

T. Shigeta provided the JAXA agency report to the CMC and presented two topics, the Status of Hayabusa2 and an update on the JAXA-CCSDS Website. Shigeta-san reported that the small asteroid lander, MASCOT, developed in Germany and France was successfully separated from the *Hayabusa2* spacecraft on October 3 and delivered safely to the surface of *Ryugu*. After landing, *MASCOT* acquired scientific data on the asteroid surface, which was transmitted to the *MASCOT* team via the *Hayabusa2*. Scientific analysis of this data is expected to be performed by the *MASCOT* team from now onwards.

T. Shigeta provided an update on progress on the JAXA-CCSDS Public Website. On the website, summaries of all the 153 publishedBlue/Magenta/Green Books in the Japanese language have been posted to the JAXA-CCSDS Public Website. Additionally, JAXA has categorized all published/approved/not approved CCSDS books according to their respective services to visualize their relations. As a result, the entire structure and relations of the books are clearly displayed which is helpful in grasping the status of the standards book development. JAXA is planning to make the outcome open to public in the hope that it will encourage non-agency entities to employ CCSDS and to participate in developing CCSDS standards. T. Shigeta also shared several charts that explained JAXA’s process and activities for making the CCSDS-related information open to the public, the organization and grouping of the books, and several detailed examples of how books in multiple technical domains were organized and visually structured to explain value added relationships. After going through the presentation, Shigeta inquired if it would be alright to make the organization of CCSDS books in the JAXA website open to the public? W. Tai had no issues and others to include E. Barkley, M. Merri and J. Wilmot explained corresponding frameworks for the relation of books/standards in their respective working groups and areas. The CMC as a group did not have any issues with JAXA’s framework or intention to share it to the public.

1. **Meeting Planning**
   1. **Spring 2019 Tech Plenary & CMC (USA/CSA)**

J. Afarin provided an update on the spring 2019 CCSDS Technical and CESG Meetings that will be held at the NASA Ames Conference Center (NACC) in Mountain View, California in the United States. He stated that two airports are available to those flying into the US in the San Francisco area. The NACC is located just outside the gates of NASA Ames Research Center. J. Afarin also stated that the spring 2019 CCSDS Technical Meetings will be held 6-9 May 2019, Monday through Thursday and the CESG will meet on Friday, 10 May 2019. The meetings will be held in Buildings 3 and 152 and there is a 650m walk from one building to the other. C. Ramos relayed to the CMC that the CMC spring meeting will be held at CSA HQ in St-Hubert, QC, per correspondence from S. Tafazoli (CSA).

* 1. **Fall 2019 Tech Plenary & CMC (ESA-ESOC)**

M. McKay shared that the fall 2019 Technical Plenary and CCSDS Technical and CMC Meetings will be held in Darmstadt, DE on the 21st through 30th of October 2019. M. McKay also stated that with his retiring at the end of May 2019, he will be replaced by Nicholas Bobrinsky. J. Afarin took this opportunity to thank M. Mckay for his support and service to the CCSDS organization.

**8.3 Spring 2020 Tech Plenary & CMC (USA/JAXA)**

J. Afarin had a preliminary discussion with Kevin Gifford and there is a possibility of the spring 2020 meeting to be held at the University of Colorado, located in the city of Boulder, Colorado. If this option does not materialize, he is also looking at the meeting location of Huntsville, Alabama adjacent to NASA’s Marshall Space Flight Center. T. Shigeta stated that the spring 2020 CMC meeting will be hosted by JAXA in the city of Tokyo, Japan.

**8.4 Fall 2020 Tech Plenary & CMC (CNES)**

J. M. Soula shared that the location for the fall 2020 meeting has not been determined. He is currently looking at the meeting to be located in Paris, France and could possibly be hosted by the DIN equivalent in France, AFNOR (Association Française de Normalisation).

1. **Schedule for Next CMC Mid-Term Telecon**

J. Afarin led a short discussion to determine the next CMC mid-term telecon. The CMC agreed to schedule this telecon for Wednesday, 14 February 2019 (0800 US Eastern Time Zone).

1. **Secretariat Report**
   1. **Document Status Report**

T. Gannett provided an overview and update of the CCSDS Document Status as of October 23, 2018. T. Gannet reported that eight CMC documents have been completed and that six documents are actively being worked and will go to polling soon. T. Gannett also provided an overview of the Document Editor Queue.

* 1. **Action Item Status (only open issues)**

C. Ramos led a discussion of all current open Action Items and the closure of completed action items.

* CMC-A-2014-11-01; The CMC requests Peter Shames draft a formal memorandum from CCSDS to ISO/TC 20/SC14 (Space Systems and Operations) to describe the coordination needed on RASDS. Ensure that SC13 is referenced in the draft memorandum.  
  Status: Closed; memorandum was sent and waiting to hear from SC14
* CMC-A-2017-06-07; The CMC instructs the Secretariat to provide updated Yellow Book text to the CESG.  
  Status: Open - some proposed changes still need to be consolidated
* CMC-A-2018-02-02; The CMC directs the Secretariat to address how additional information can be requested when users request to be added to mailing lists.  
  Status: Open – Secretariat requested to clarify current practice for providing additional information and circle back with CESG Chair
* CMC-A-2018-05-03; The CMC requests that the CCSDS Secretariat conduct a review of the contact information for the list of Observers, Liaisons, and Associates on the CWE.  
  Status: Open – C. Ramos updated CMC on current progress and follow-up that is still required
* CMC-A-2018-08-01; The CMC directs CCSDS Tech Support to address the proposed RID template with the CESG Chair and resolve the issue.  
  Status: Open – During the meeting M. di Giulio communicated that she spoke with the Secretariat (M. Blackwood and C. Ramos) to look into the possibility of using Bugzilla, open source database software instead of an excel RID report. During the meeting, the concept of using a GIT server to support CM/Configuration Management was also discussed as a potential tool to support RIDs. It was also brought up that the DAI was using Bugzilla. P. Shames is following up with the CESG and Secretariat to further understand the requirements to determine what tool is the best suited solution.
* CMC-A-2018-08-02; The CMC directs the Secretariat to add an agenda item to the fall 2018 CMC meeting for J. Afarin to provide a report for the IOP presentation. The agenda item will be for one half hour.  
  Status: Closed – IOP agenda item added and report presented by J. Afarin at Berlin CMC Meeting.
* CMC-A-2018-08-03; The CMC directs the Secretariat to issue a poll to CMC members to determine the best date for a supplementary meeting on the subject of SANA. The meeting should be scheduled for the second half of the month of September.  
  Status: Closed
* CMC-A-2018-08-04; The CMC directs the Secretariat to add an agenda item to the fall 2018 CMC meeting for further discussion of SANA.  
  Status: Closed
* CMC-A-2018-08-05: The CMC directs the Secretariat to add the dates of the fall 2019 meetings to the public website.  
  Status: Closed

1. **Hellenic Space Agency Observer Request Discussion**

The CMC reviewed the Hellenic Space Agency’s request for Observer Agency/Organization status. The request was submitted by Dr Vassilis Tsaoussidis, Professor, Democritus University on behalf of the Ministry of Infrastructure and Transport (Kalithea Athens, Greece). The Hellenic Space Agency was founded on 19 March 2018 and Dr. Tsaoussidis has been involved in CCSDS activities already through his involvement with the SIS-DTN working group. The CMC agreed to accept the HSA as an Observer Agency.

1. **Head of Delegate Only Discussion**

This session was called at the request of the CMC Chair and convened after a short break.

1. **Call to Order – Welcome/Opening Remarks for the 2nd day**

J. Afarin, CCSDS Management Council (CMC) Chair, called the meeting to order at 0830h and welcomed everyone to the fall 2018 CMC meetings hosted by the DLR. The following CMC members and other CCSDS representatives were in attendance.

1. ESA – Michael McKay
2. DLR – Osvaldo Peinado
3. JAXA – Tsutomu Shigeta
4. NASA - Dr. James Afarin
5. INPE – Eduardo Bergamini
6. CNES – Jean-Marc Soula
7. CNSA – Yonghui Huang, Rusheng Zhang, Yuxia Zhou, Tang WeiWei
8. ROSCOSMOS – Dmitry Barannikov, Vladimir Yanik
9. CESG - Margherita di Giulio, Wallace Tai, Nestor Peccia
10. Secretariat – Calvin Ramos
11. **Agenda Review and Approval**

Based on additional feedback J. Afarin received from several CMC members, the agenda was modified to include an additional item to continue discussion on the CCSDS Website and process to update the SANA registry with accurate contact and organizations data. This agenda item was to be discussed after the ISO/TC 20 SC13 time slot.

1. **Continued SANA Discussion**

J. Afarin stated there were still a number of questions and concerns that were not addressed during the previous SANA discussion time slot and wanted to make sure this topic was fully vetted before the CMC adjourned. P. Shames provided a high-level view of the SANA Registry Categories that are outlined in the Registry Management Policy (RMP). The Enterprise Registries included the Organization, Contact, Spacecraft and Service Site & Aperture Registries. The other two major registry categories were Global and Local/WG Registries that were mission and technical oriented and primarily updated by the Working Groups, Area Directors and CESG. This information is all contained in the RMP and per an inquiry from J. Afarin, on roles and responsibilities, P. Shames affirmed that the CMC has final decision authority on approval of registries.

Other questions and discussion on the SANA registries addressed the multiple registries on organization and contact roles (O. Peinado) and the difference between the ‘Service Site and Apertures’ registry and the ‘Site Service Information’ registry (J.M. Soula). P. Shames and M. di Giulio explained that while on the surface, some of the registries appear to overlap, each of the registries were defined uniquely or were subordinate to another registry; however, each registry had its own unique OID that provided value as defined in the relational database that is of value to CCSDS and the Working Groups. While there was agreement on the value of a relational database for tracking data, there was also discussion on maintenance of the data (as some of the data is old or obsolete) and if SANA was to be the authoritative and trusted source for the contacts and organizational data, how would this data be kept updated (J. Afarin, N. Peccia, J. M. Soula, M. di Giulio, O. Peinado, M. Merri) – essentially a configuration management and governance challenge. The value of using a relational database over maintaining the data in a flat file on multiple servers was acknowledged and the CMC affirmed the action assigned previously for P. Shames to come up with the process for transitioning current contacts/organizational data and assuring for the upkeep and maintenance of that data. It was also acknowledged that Agency Representatives have a primary role in assuring that contact and organizational data is updated on a regular basis.

1. **IOP Topics [J. Afarin presentation – not publicly available]**

J. Afarin walked through a draft Report on CCSDS Standards that was prepared for presentation at the InterOperability Plenary #4 (IOP-4). The presentation provided an overview of the Member and Observer Agencies that are currently active in supporting the development of international standards, the organizational structure and technical domains that CCSDS covers, and an overview of the end to end architecture from which CCSDS is currently developing 80 data standards and technology development projects to foster interoperability. J. Afarin also shared charts that illustrated future mission drivers and the number of space missions that have adopted and used various CCSDS standards (1,111) and the number of currently active publications (154) that are downloadable from the CCSDS website. He stated since IOP-3, CCSDS standards have played a key role in facilitating on-going international collaborations for future missions (e.g. Mars and lunar exploration) and there are a number of new standards that will advance space communications into a new era, benefitting the space missions at an unprecedented scale. Among them are optical communication standards for extreme high-rate links, Disruption Tolerant Network (DTN) standards for space internetworking, and Unified Space Link Protocol (USLP) for advanced data communications. Detailed charts were also shared that illustrated the development of CCSDS standards for cross support core services, navigation and mission operations standards for spacecraft control, high-performance coding for high-rate links, and a defined framework for the systems architecture for standards development. J. Afarin also shared graphical charts of three planetary network architectures that CCSDS standards will underpin: the Earth Planetary Network Architecture; the Lunar Communications Architecture; and the Mars Planetary Network Architecture – all three enabling a Space-based Internet.

1. **CCSDS Standards for NASA’s Future Lunar Exploration Missions**

W. Tai walked through a draft presentation that described CCSDS Communication Standards for NASA’s Future Lunar Missions. In his presentation Tai identified potential lunar missions to be launched during the 2018-2028 decade that also included international and private sector endeavors. He also discussed the current vision of the Lunar Communications Architecture – A Space Internet; consisting of a Lunar Relay Network, a Lunar Surface Network, and the Earth Network). Tai also shared that it’s been recognized that the set of CCSDS standards are key to the design of NASA’s Lunar space communications architecture and will be key to supporting the Lunar Orbital Platform – Gateway (LOP-G) and Lunar surface science missions. Tai stated that, given the rich repertoire of the standards produced by the CCSDS, it is imperative for us to pick and choose suitable standards as the solutions to the problems. He discussed primary factors that need to be accounted for in the selection of CCSDS Standards, which included: interoperability between the lunar vehicles (orbiters, landers, rovers) and their supporting network assets (owned by IOAG member agencies and commercial providers); interoperability between a lunar relay orbiter and its user vehicles; cost of implementation; and constraints due to spectral limitation (i.e., ITU, SFCG and NTIA imposed). Tai also listed applicable CCSDS standards applicable specifically to the Lunar Gateway and technical areas that need convergence, specifically: frequency bands, modulation schemes, ranging capabilities, space data link protocols and space internetworking (network layer protocol). Tai also shared an informative table that provide a high-level description of relay orbiters to be launched in the next decade.

1. **Other Open Topics**

No topics were brought up for discussion.

1. **CMC Review of Resolutions and Action Items**

**RESOLUTIONS**

**CMC-R-2018-10-01 Appointment of CESG Chair:** The CMC resolves that Margherita di Giulio will assume the permanent role and responsibility as the CCSDS CESG Chair.

**CMC-R-2018-10-02 Host Appreciation** **Letters:** Resolution from the CMC for Secretariat to draft appreciation letters to DIN and DLR for the excellent support provided in hosting the CCSDS Fall Technical Meetings and CMC Meetings. Osvaldo Peinado will provide Secretariat with the appropriate contact information.

*Due Date:* 7 November, 2018

**CMC-R-2018-10-03 Approval of New Projects:** The CMC resolves to approve the following projects as requested by the CESG:

* NAV-1: Request to create new project for revision of CCSDS 508.0 Conjunction Data Message
* NAV-2: Request to create new project for development of 503.0 Tracking Data Message V3
* SM&C-3: Approve new project for 5-y revision of MO Reference Model MB
* SM&C-4: Approve new project for 5-y revision of XTCE GB
* SM&C-5: Approve new project for 5-y revision of XTCE Element Description GB
* SM&C-6: Approve new project for MO File Management Service BB

**CMC-R-2018-10-04 Approval of New Work Items:** The CMC resolves to approve the following New Work Items as requested by the CESG:

* SLS-MHDC 121.0 Lossless Data Compression (Issue 3) Blue Book
* SLS-MHDC 120.0 Lossless Data Compression (Issue 4) Green Book

Resolutions *CMC-R-2018-10-03 Approval of New Projects*and **“***CMC-R-2018-10-04 Approval of New Work Items*”were unanimously approved by the following CMC Board Members in attendance at this meeting:

CNES – Jean-Marc Soula INPE – Eduardo Bergamini

CNSA - Rusheng Zhang JAXA - Tsutomu Shigeta

DLR – Osvaldo Peinado NASA – James Afarin

ESA – Michael McKay ROSCOSMOS - Kirill Borisov

**ACTIONS**

**CMC-A-2018-10-01** Peter Shames was requested to work with the Secretariat to create a process description for transitioning the existing CCSDS website information (contacts and organization) into SANA. The process should also describe specific role and responsibilities of the appropriate stakeholders (process-owners) who will be responsible for updating and maintaining accuracy of the information.

*Due Date:* November 7, 2018

**CMC-A-2018-10-02** Margherita D. Giulio was requested to provide an update at the next CMC Midterm Telecon on outstanding books that are delayed.

*Due Date:* Feb 14, 2018

**CMC-A-2018-10-03** Secretariat was requested to identify source of problem preventing published books from getting downloaded (user was requested to obtain CWE login)

*Due Date:* November 7, 2018

**CMC-A-2018-10-04** Secretariat was requested to update organizations and contacts contained in current flat file structure in CCSDS.

*Due Date:* November 7, 2018

**CMC-A-2018-10-05** Secretariat was requested to coordinate with J. Afarin to obtain Zoom accounts for CESG Chair/Deputy Chair and Area Directors.

*Due Date:* November 7, 2018

1. **Any Other Business**

No additional business was raised and the meeting was concluded.