CMC Draft Minutes
Fall 2017 Meetings
Darmstadt, Germany
13-14 November 2017

1. Call to Order – Welcome/Opening Remarks

James Afarin, CCSDS Management Council (CMC) Chair, called the meeting to order at 0845h and welcomed everyone to the fall 2017 CMC meetings hosted by the European Space Agency (ESA)/European Space Operations Center (ESOC) in Darmstadt, Germany. J. Afarin then yielded the floor to J. Miro for opening remarks. J. Miro provided opening remarks for the CMC meeting, welcoming all of the delegates to ESOC. He noted that it was an especially interesting time to be meeting at ESOC, as the operations center is celebrating their 50th anniversary, is currently operating eighteen (18) space missions, and is preparing for missions to Jupiter, Mercury, and elsewhere throughout the solar system. J. Miro then passed the floor back over to J. Afarin for the roll call of delegates.

2. Roll Call of Delegates

Introductions followed. CMC Attendees were:

1. ESA – Juan Miro, Nestor Peccia, Tomaso de Cola, Gian Paolo Calzolari, Margherita di Giulio
2. DLR – Osvaldo Peinado, Martin Pilgram
3. JAXA – Tsutomu Shigeta
4. NASA - Wallace Tai, Dr. James Afarin
5. INPE - Eduardo Bergamini
6. UKSA – Christopher Perry
7. CNES – Jean-Marc Soula
8. CSA – Not Present
9. ASI – Not Present
10. CNSA – Yonghui Huang
11. ROSCOSMOS – Dmitry Barannikov, Vladimir Yanik
12. Secretariat - David Ross

3. Agenda Review and Approval (November 2017 CMC Agenda)

The CMC agenda was reviewed and approved with one addition to address the Mission Planning and Scheduling blue book.

4. CESG Chair Report (CESG Report to CMC)

4.1 CESG Chair Introduction and Overview (CESG Report to CMC (slides 2-5))

N. Peccia provided an overview of the updated organizational charts and an overview of the number of missions utilizing CCSDS standards. Following the introduction, N. Peccia went directly to the Systems Engineering Area (SEA) presentation.

4.2 Systems Engineering Area Overview (SEA) (CESG Report to CMC (slides 6-26))

P. Shames provided an overview of the SEA WG meeting statistics and reviewed the executive summary of the SEA working groups during the spring 2017 technical meetings. P. Shames noted that the Security Working Group (WG) is making good progress on their plan to provide a schedule of publications during the next publication cycle. P. Shames noted that the WG is losing key resources, and is revising their work plan as a result of this. P. Shames continued with an overview of the Delta Differential One Way Ranging (D-DOR) WG. P. Shames noted that the D-DOR WG has come up with a set of new projects and currently has two documents in queue to be published. Regarding the Systems Architecture Working Group (SAWG), the WG is working on a presentation reviewing the MOIMS and SOIS reference architectures. P. Shames discussed the SANA Steering Group (SSG), and announced that the SANA contractor has completed their implementation of the revised SANA registries. He continued by noting that the SANA

operator is currently working with CCSDS Secretariat IT Support to synchronize contacts between the SANA registries and the CCSDS Collaborative Work Environment (CWE). P. Shames also discussed working with the Data Archive Ingestion (DAI) WG, and added that he believes that this WG would benefit from some assistance by systems architecture experts. After reviewing the planned resolutions from the SEA, P. Shames reminded the agency heads of delegation to update their agency resources and service site aperture information on the SANA registries. P. Shames then provided an overview of the area's issues, noting that he would like to coordinate with the IOAG to understand any security concerns about access to service sites and apertures on the SANA registries.

Questions for SEA

J. Afarin asked if there should be an issue for the IOAG service catalogue given that there is no mention of security. P. Shames responded that this should absolutely be brought up as an issue.

J. Afarin asked, "You previously mentioned resource issues with SOIS, can you explain this in more detail?" P. Shames, added that the issue is resource contention between the Systems Architecture WG and the SOIS area.

J. Afarin asked whether we had any previous issues with the dual assignment of SCID's. P. Shames responded that past issues with SCIDs being assigned twice have been resolved, and the new QSCID format prevents this by adding the frequency bin to each spacecraft ID.

J. Miro noted that P. Shames mentioned that the changes in the SOIS area structure are affecting the work in the SEA, asking, "How should that be understood?" P. Shames responded, that there are two things to consider, one of them is that SOIS used to have a message service and a file service identified. However, they have made the services documents into silver books (retired), and in doing so, they have removed them from the SOIS literature. The consequence of this is that the MO services expected to have available some sort of message layer and some sort of file service. Therefore, the natural connection point between MOIMS onboard and SOIS onboard. Some of the things that SOIS had described as abstract services have gone away and the focus has shifted to the Electronic Data Sheets (EDS) and Definition of Terms (DOT). These are very powerful capabilities and may provide a nice connection between the description of spacecraft and spacecraft component connectivity that can be ingested into MOIMS. This new work that can be ingested by MOIMS and was newly discussed during the CCSDS Technical Meetings. Therefore, the confusion is to understand what it is that is being developed and what is proposed to be developed and it needs to be understood that how these things are going to fit together. The path that we are on right now is to address MOIMS and SOIS separately, as two separate areas, then to address where and how they intersect and a set of transition strategies to connect these two items more directly.

J. Miro added that he did not detect any changes/updates to the overall strategic plan of the SEA; he noted that other areas, such as XML standards and Time Standards were not mentioned. He asked if the work was finished in these areas. P. Shames asked the CMC if they have any resources to participate in time synchronization/correlation, and if so, to please send their names to the Area Director. P. Shames noted that the timeline data exchange identified features that are valuable and not represented elsewhere, but that will be kept to remind people that these topics should be addressed. P. Shames added that he would take an action to clean up the strategic plan for SEA.

M. Pilgram asked about the future work of security, and was wondering if there are any new issues that should be picked up by the WG beyond the current publications. P. Shames responded by adding that there are some new topics in the works right now, adding that the WG is looking into a couple of different network layer security documents, as well as physical layer security.

4.3   Cross Support Services Area (CSS) (CESG Report to CMC (slides 27-36))

M. di Giulio provided an overview of the CSS WG meeting statistics and reviewed the executive summary of the CSS working groups during the fall 2017 technical meetings. M. di Giulio reviewed the executive summary, and reviewed the executive summary for CSS. M. di Giulio noted that the Cross Support Transfer Services (CSTS) WG is working on the Forward Frame CSTS project and that NASA has committed to provide resources for the second prototype, allowing this project to move forward. M. di Giulio also noted that with the completion of a guideline book for developing a new set of services (currently with the CMC), all tasks of the original charter are almost completed at this time. Upcoming work items remaining include only Forward Frame CSTS, and a new project, Terrestrial File Transfer Services, which will begin next year with prototypes by CNES and CNSA. M. di Giulio also brought up the CSS Control Architecture, noting that the service control concept is not mentioned in any IOAG catalogue or any

other forum, but that it is in a way a condition for providing other services. Therefore, the CSS area would like to bring this to the attention of the IOAG and CCSDS. M. di Giulio continued by noting that the CSTS WG has nominated Holger Dreihan as the next WG chair. M. di Giulio also noted that there were issues with regards to the forward frame CSTS, encoding and RF modulation options for AOS uplink, the WG is currently addressing the impact of those issues, and will address them when the magenta book becomes available. Further elaborating upon the issue, M. di Giulio noted that while AOS services are well defined for return capabilities, there are no ideas developed for the AOS uplink (forward). So at the spring meetings, this issue was raised, and the fall meetings the discussion of the issue continued. The problem for the WG is to identify which modulation services are used, and this is being discussed with the Space Link Services area where there is a proposal to come up with a magenta book to describe which coding and modulations services will be used. For the Forward Frame CSTS book to be advanced/completed, this must be finalized. M. di Giulio completed her review of the CSTS area by noting three resolutions coming up for a concept book, tracking data, and forward frame project creation. Additionally, the transfer data book has been completed and all RIDs dispositioned, but the WG is still awaiting the prototype to ensure that there are no unanticipated changes. M. di Giulio then continued by reviewing the work of the Cross Support Service Management (CSSM) WG. She noted that the WG is currently working on a new publication on Planning and Information Format (PIF), Terrestrial Generic File Transfer (TGFT), and the SMURF publication, all of which are blue books. M. di Giulio noted that resolutions would be coming shortly for Simple Schedule Format for publication, and a poll for a new project for the Service Package Data Format publication. Area issues, as noted by M. di Giulio included, the need to identify a service for delivering files between two ground entities, which is why they have established the TGTF project, but once they have the file transfer services, what goes in the meta data will be the specific information on any service that wants to use it? It is not clear who will use the services. Will it be up to the experts on the radiometric services, or will CSS provide guidelines for whomever wants to develop the service for the experts of the service or shall there be a joint effort between CSS and an Area where the services are needed? In a way, we have established the file transfer services, but all aspects of utilizing this is not under our area. So the open question is, what kind of document do we want for this? Will they all be blue books? Moreover, if so, what should be contained in these publications? Alternatively, should these be standing annexes for each publication? Such as handling everything via an XML service that will be handled by SANA.

Questions for CSS

J. Afarin asked about IOAG priority 1 projects that do not have resources, do we have an explanation why we are doing other projects but not the IOAG priority 1 projects? N. Peccia responded that this needs to be discussed with the IOAG and how they setup the priorities. The infusion table has some issues, and it needs to be discussed how this is derived. N. Peccia noted that he would come to the IOAG joint meeting and address this, because there are some things that need to be explained, for example, CFDP file delivery, there is only one agency that is asked for it. N. Peccia noted that from his perspective, CCSDS is not so bad with the priorities, and noted that there are some delays in the need dates, but with the need dates, there is an issue, as they are being chosen as the earliest time when there are numerous moving dates. J. Miro responded, how do we respond to the question about us being in draft status for items identified by the IOAG? M. di Giulio noted that these are not critical publications, and the projects can begin next year. Upon further discussion, the CMC agreed to discuss the topic later on in the day during the IOAG ICPA discussion.

4.4 Space Internetworking Services Area (SIS) ([CESG Report to CMC](#) (slides 37-53))

T. de Cola provided an overview of the SIS area demographics and reviewed the executive summary of the WG accomplishments from the fall 2017 meetings. T. de Cola reviewed the SIS executive summary, and noted that during this meeting, the Voice WG did not meet. For CFDP, T. de Cola noted that the CFDP revisions WG could still not publish their document due to a lack of resources to close interoperability testing. T. de Cola noted that DTN does not have any resources identified for its first-hop/last-hop services publication. The MIA WG is collaborating with the DTN WG on the development of a Real-Time Protocol (RTP) standard. During the meeting, there was a proposal for a specification on how to use the RTP standard on top of DTN. This fruitful discussion produced a path forward, and the group discussed prototyping efforts and is currently working a plan for a path forward. The Collaborative Work Environment (CWE) will be updated according to this plan. Further, regarding DTN, T. de Cola noted that JAXA presented their current progress on their Schedule Aware Bundle Routing (SABR) implementation, and discussed resolutions to edit the DTN green book, as necessary, for refreshing the SCPS-TP blue book. In general, the overall status of the DTN WG is good, the WG has many ongoing activities in Security, Schedule Aware Routing, and is reviewing future work for network management and working to identify resources for this specification. Currently, the biggest issue with the DTN WG is that there are no resources identified for First-Hop/Last-Hop services, aka

CCSDS Delivery Agent in the ICPA. A white paper is being prepared by Marshall Space Flight Center for the spring 2018 meetings though to discuss this item. After reviewing the summary of publications and their status within the SIS area, T. de Cola reviewed the approved project statuses and the planned resolutions. T. de Cola noted a number of planned resolutions, including a refresh of the SCPS blue book (with no change), an update to the DTN green book, and a new specification on Bundled Protocol Network Management. Further resolutions in the next six months also include a CESG poll to release the bundled protocol security specification to agency review, as well as the schedule aware bundle routing specification.

Questions for SIS

J. Afarin, asked why do we need a white paper for the First Hop Last Hop services if we do not have the resources? T. de Cola and M. di Giulio responded that the white paper is going to be used to facilitate the discussions and define what needs to be done and what the future project will look like, including the resources that will be required, to write this book.

J. Afarin asked when the Area believes that DTN will be completed. N. Peccia responded, if you go to the schedule, it would be completed by the end of 2021, if all resources were deployed. J. Afarin followed up with the question, from an operational standpoint, are these four books all that are needed for DTN to become operational? T. de Cola confirmed that from an operational standpoint, yes, with these books you could deploy DTN.

J. Miro asked if the SIS real time protocols project was an approved blue book project. N. Peccia responded that yes, this specification was approved one month ago.

4.5 Space Link Services Area (SLS) ([CESG Report to CMC](#) (slides 54-81))

Gian Paolo Calzolari provided an overview of the SLS area demographics and reviewed the executive summary of the WG accomplishments from the fall 2017 meetings.

G. Calzolari reviewed the Radio Frequency and Modulation WG accomplishments, noting that the WG had a busy week and worked with a number of working groups as well, including the Space Data Link Security (SDLS) WG, the Coding and Synchronization (C&S) WG, and the SEA D-DOR WG. The WG revised recommendations 2.1.4A&B, and is also working on the publication of new recommendation 2.6.11A – turnaround ratios for EESS 7/8 GHz. G Calzolari also noted that the WG agreed to start agency review of revised Recommendations 401.0-B (2.4.22A), (2.4.22B), new Recommendations (3.1.7) and (2.4.24), and agreed to update their charter for a new DDOR Wide-Band PN signal. The D-DOR work will be conducted in coordination with the D-DOR WG.

G. Calzolari reviewed the coding and synchronization (C&S) WG, adding that the WG has reached an agreement to have an orange book for DVB-S2 and DVB-S2X. The WG has also identified a new work item to identify coding options out of the telemetry coding book to be used for the AOS uplink (as mentioned previously by the CSS Area). The color of the book is being discussed by the WG, and the WG will define what can be updated in the SLS blue book for what can be used to support AOS uplink. G. Calzolari finished reviewing the C&S WG slides by reviewing their executive summary, and noting that two blue books have been published, Next Generation Uplink Coding and the Update to the TM Channel Coding (with LDPC slicing). Regarding issues in the C&S WG, G. Calzolari noted that as far as RFM and C&S are concerned, there is no need for additional recommendations on top of the Variable Coding and Modulation specification. As such, any additional tasks to be considered for Adaptive Coding and Modulation will be agency specific, such as SNR at the ground station, and determination of other station/receiver specific information. Retrieval of this information between agencies is another consideration that must be taken into account, and considered by the agencies whom may grant this information to the other agency; it cannot be addressed by the RFM and C&S WGs.

G. Calzolari continued by providing an overview of the Space Link Protocols WG, noting that they reconfirmed their IP over CCSDS blue book, and resolved all RIDS against the Universal Space Link Protocol red-3 specification. There were no problems or issues with the SLP WG, whose upcoming work item is on the space packet protocol and does not require any additional prototypes/resources at this time.

G. Calzolari added that the Space Data Link Security (SDLS) WG finalized its green book on extended procedures and that a draft outline was agreed upon. The WG is also currently investigating physical layer security by analyzing the security services best provided at the physical layer. The interoperability of cloud testing was finalized and

published through the Systems Engineering Area. The WG has no issues, and its forthcoming plans are to submit its extended procedures specification to agency review.

The Multispectral Hyperspectral Data Compression WG has finalized most of the details on the low complexity near lossless multispectral and hyperspectral image compression. The WG would like this to be issue 2 of the lossless multispectral and hyperspectral image compression specification, but with the new title to reflect the addition of near-lossless capabilities. The WG will complete CCSDS-120.3-G and CCSDS 123.0-B in early 2018. Upcoming work in the WG includes a request for two new projects, one to develop a blue book for compression of spacecraft telemetry housekeeping data, and one to develop a lossless multispectral and hyperspectral image compression green book.

Lastly, G. Calzolari, reviewed the Optical Communications WG. He noted that the WG reached consensus to rename the low complexity recommendation to the Optical On Off Keying (O3K) specification. G. Calzolari also noted a number of other projects that are making progress in the WG, including: Atmospheric Characterization and Forecasting for Optical Link Operations (Magenta Book), the Optical Communications Coding and Synchronization blue book, the Optical Communications Physical Layer blue book (HPE), and two draft orange books on optical high data rate communications (1550 nm and 1064 nm).

G. Calzolari closed the SLS presentation by noting that they checked their documents with respect to the ICPA and noted that there is one document which is late, and that is the SDLS extended procedures publication, but that it is only about six (6) months late compared to the IOAG request date.

Questions for SLS

M. Pilgram asked if there were resources available for the VCM publication to turn from Magenta to Blue. G. Calzolari responded that yes, resources and prototypes will be provided by JPL and GSFC as independent prototypes from NASA.

4.6 Mission Operations and Information Management Services Area (MOIMS) (CESG Report to CMC (slides 82-105))

Mario Merri provided an overview of the MOIMS area demographics and reviewed the executive summary of the WG accomplishments from the fall 2017 meetings. M Merri added that the telerobotics WG has not met due to its dormant state, but added that there is still some possible interest from DLR, Canada, and possibly from ESTEC. M. Merri added that there are globally many forthcoming telerobotic missions, and that he believes this area should not remain dormant.

M. Merri reviewed the Data Archive Ingestion (DAI) WG accomplishments, noting that a large portion of the DAI WG attendees were from academia. M. Merri added that the WG is making good progress and that all of its projects are currently on schedule. The AD/DAD reviewed the IPELTU specification (for long term preservation) and noted that it lacked concreteness, annexes with checklists for space emissions will be added for OPS and EO data. In the near future, the WG will be requesting an update to its current charter.

M. Merri discussed the status of the Mission Planning and Scheduling (MP&S) WG, noting that it is very active and held excellent technical discussions during the fall meetings. The MP&S Green book is currently with the CCSDS Chief Technical Editor (CTE), and has been with him since July 2017. The group has high momentum and active participation, but noted as a part of its issues resource contention due to the meeting schedules.

M. Merri then reviewed the Navigation WG, noting that the WG will be demoting the Navigation Hardware Message to a draft project. In the next six months, the WG plans to have three resolutions, to advance the Tracking Data Message, request to create a new project for the Navigation Data Messages overview (NEM, RDM, NHM, SMM), and to move the Pointing Request Message from in progress to published. M. Merri noted no additional issues or concern noting that the group has high momentum and good participation.

The Area Director continued his review by providing an overview of the Spacecraft Monitor and Control WG. M. Merri noted that the WG is very active with seven (7) documents currently in the review/production cycle and one (1) document under development. The WG formulated its work plan for the future and prioritized its schedule during these meetings, and M. Merri added that the WG has made good progress on the MO Services green book. The WG also identified the need for an interoperability book to focus on the narrowed scope that could be implemented to

support key data exchanges and interactions between agencies. M Merri noted that if the WG would like to be involved in any discussions on relay operations if this becomes an active CCSDS activity.

Questions for MOIMS

J. Miro asked if there were any conclusions on the MO services issues. J. Miro noted that J. Afarin had mentioned that he supports MO services, but added that there is no standing mechanism to force missions to utilize the standards. It is up to the missions to utilize the standards. M. Merri noted that within the WG, they have been working to update their "PR" material, and that it is up to the agencies to then use this material to propose the missions the use of different standards. M. Merri noted, however, it is difficult to propose the use of standards without an actual service, so now is the time to use the MO services.

4.7 Spacecraft Onboard Interface Services Area (SOIS) (CESG Report to CMC (slides 105-115))

Jonathan Wilmot provided an overview of the SOIS area demographics and reviewed the executive summary of the WG accomplishments from the fall 2017 meetings. J. Wilmot noted that the SOIS Wireless WG met alone back in the United States. The Application Support (APP) and Subnetworking (SUBNET) WGs met jointly for the entire week of the fall meetings in The Hague.

J. Wilmot noted that the App WG developed consensus on the new SOIS service diagram view, and revised the SOIS layering diagram with consensus from the WG. The WG has also developed an interoperability test plan outline. The SUBNET WG reviewed the first draft of the SUBET packet service magenta book, and reviewed a presentation from ROSCOSMOS re-enforcing the interest/requirement to extend the Electronic Data Sheets to include subnetwork topology and timing.

J. Wilmot noted that ESA and NASA will be having presentations at the flight software workshop, and that the SAVOIR EDS studies will kick off December 2017, and will be completed in the Spring of FY 2019. The WG's expect to have two resolutions forthcoming, one to release the yellow book on the MOIMS and CCSDS MAL and SOIS EDS relationships, and another to publish the interoperability test plan. J. Wilmot noted that the SOIS APP blue book specification is currently on track, but budgets for FY 18 are still a concern. Overall issue noted by the Area Director is resource contention (on the NASA side) to get individuals time outside of the meetings.

Questions for SOIS

J. Miro asked if the EDS is the last book for SOIS, due to be completed in 2018. J. Wilmot responded that that is not correct, and that there is a presentation later on in the SOIS future section that provides an overview of the additional projects that will be occurring in the SOIS area.

J. Miro asked if the future work is in SUBNET and the Wireless domain, or if it is in the App WG? J. Wilmot responded that there is work in all three areas.

J. Miro asked to the CMC and to J. Wilmot, "What other agencies are providing resources to the SUBNET WG beyond NASA?" J. Wilmot responded that NASA – JSC is providing the largest percentage of the resources.

4.8 CESG Fall 2017 Poll Statistics (CESG Report to CMC (slides 116-121))

N. Peccia provided an overview of the CESG poll statistics since May 2017. N. Peccia, as CESG chair also brought it to the CMC's attention that not all Area Directors attended the FY 17 CESG/CMC joint meeting at ESA/ESOC and noted that he thought that this was a problem. J. Afarin asked if this was not okay because of the shorter meeting. N. Peccia replied that during the prior meeting it was not decided this way, and that everyone should have attended, and that participation should be considered compulsory. N. Peccia requested reconfirmation of the following specifications which was approved by the following CMC Resolution.

Resolution 2017-11-01:

The CMC resolves to reconfirm the following CCSDS publications:

> **CCSDS 702.1-B-1, IP over CCSDS Space Links (Blue Book, Issue 1, September 2012)**

CCSDS 351.0-M-1, Security Architecture for Space Data Systems (Magenta Book, Issue 1, November 2012)

CCSDS 352.0-B-1, CCSDS Cryptographic Algorithms (Blue Book, Issue 1, November 2012)

Resolution 2017-11-02:
The CMC resolves to demote the MOIMS Navigation Hardware Message (NHM) from approved to draft project.

4.9 Summary Meeting Statistics (CESG Report to CMC (slides 122-126))

N. Peccia provided a discussion of the CCSDS Technical Plenary meeting summary statistics. N. Peccia noted that the meeting statistics were nominal for a non-US held meeting. N. Peccia added that in a shortened meeting week (4-days), still some of the WGs finished earlier, as such, there is evidence that the WGs could adopt to smaller rooms and smaller meetings, and that four (4) day meetings are likely okay for execution of the technical meetings from a resource perspective.

5   SIS/SOIS Future (CESG Report to CMC Extra Items (slides 1-12))

J. Wilmot reviewed the program of work and the activities of the SOIS area. J. Wilmot noted that SOIS in general is supporting real mission needs, and is getting most of their funding from NASA's Advanced Exploration Services along with ESA, CAST, and ROSCOSMOS. Multiple agencies are producing work in the SOIS area that is being used in real missions, and SOIS has identified a need to extend the EDS technology to include network topology and timing. J. Wilmot also noted that there is industry interest in having information that is electronically exchanged, rather than having to exchange information manually using paper ICD's. The area would like to integrate SOIS wireless with SOIS SUBNET service access points as well, which would require a new Magenta book update (in addition to the other publications identified in the slides). EDS will be used for the JUICE mission, to provide science instrument information to ESA, and EDS will be used to validate specifications against prototype hardware. ESA can then take the EDS and can auto generate an ECSS PUS or CCSDS MOIMS interface to the instrument, which can then be used to generate the XTCE ground system database, and can then be used to generate simulations or models to send back to NASA to confirm instrument operations. The overall result is reduced risks associated with late phase instrument integration, through the validation of instruments against the electronic data sheets. This work will need to be executed through 2022. J. Wilmot noted that the strategic plan needs to be updated to include this future work.

J. Miro asked, noted that there is strong interest in EDS by NASA, ESA, and others, and in Wireless for the Deep Space Gateway, but what about the SUBNET WG, which agencies support this. J. Wilmot responded by noting that SOIS SUBNET will define the management information base schema element so that systems that are interoperating. Defining how systems are connected between one another, what their timing is, and what their latency is etc... Right now, there is no way to coordinate all of that electronically. This is all currently executed with a paper ICD. As such, this will be a type of EDS, but in a different layer, at the subnet level, done at the tooling level.

AI-CMC-A-2017-11-01: The CMC asks that Jonathan Wilmot update the Strategic Plan, Charters, and the projects as presented in the Spacecraft Onboard Interface Services Area Strategic Plan by the spring 2018 Meetings.

Due by 9 April 2018.

T de Cola presented the SIS roadmap and walked through each of the SIS working groups' publications that are currently or planned to be worked on in the future. T. de Cola noted a number of new specifications, such as the real-time protocol in MIA, and the five-year update of the asynchronous message service. He also added that DTN must initiate a five-year revision of the DTN green book, as well as complete the bundle security protocol, Schedule Aware Bundle Routing, Erasure Coding, and simplifications in thee licklider transmission protocol blue book. The WG is also working to develop the first-hop/last-hop applications for DTN and Bundle Streaming support for 2025. Solar System Internet support and administration green book for 2019, network management green book and blue book (by 2021) are also planned. T. de Cola noted that operations at the network layer of the canonical protocol stack are central to the success of modern communications. The standardization of these operations requires specialized expertise and experience available in the SIS area WG. Voice and MIA application layer protocol standards initiatives will be completed in the near future. A wide range of other application-layer protocols will require standardization to ensure the continued growth and effectiveness of flight comm. The SIS strategic plan will be revised accordingly. T. de Cola

added that the DTN WG work is serialized due largely in part to resource constraints. J. Afarin asked if more resources could alleviate this serialization. O. Peinado responded that the problem is not resources in terms of funding, but is that the number of knowledgeable resources that can work on the protocol development are already working on these protocol developments for CCSDS. Meaning, there are physically no more human resources whom can work this until more resources can be trained to do so.

J. Miro asked if this information should be updated in the strategic plan. T. de Cola responded that the plan must be updated to reflect the current vision of the SIS area.

Prompted by a question from J. Miro if there was any action to be taken at this time, the CMC discussed and concluded that no decision will be made on SIS/SOIS re-organization at this time, as there is sufficient work in both areas for them to continue.

AI-CMC-A-2017-11-02: The CMC asks that S. Burleigh and Tomaso de Cola update their respective projects and the online strategic plan by the spring 2018 Meetings.

Due by 9 April 2018.

AI-CMC-A-2017-11-03: The CMC asks that Peter Shames remove any items from the Systems Engineering Area Strategic Plan that are no longer being worked. Additionally, P. Shames is asked to update the projects and online Strategic Plan. This action is to be completed by the spring 2018 Meetings.

Due by 9 April 2018.

6   Projects with Disproportionate Delays (CESG Report to CMC Extra Items (slides 19-20))

N. Peccia provided the overview of projects with disproportionate delays. N. Peccia noted that many of these projects are in the CWE due to a period of time when books were allowed to be added as projects without having had started yet. No questions were asked.

7   Resources Topics (CESG Report to CMC Extra Items (slides 21-30))

7.1   CESG Report on Resources Status (CESG Report to CMC Extra Items (slides 21-25))

N. Peccia provided an overview of overall resource allocations for each of the Areas and projects. N. Peccia noted that NASA's resources are primarily going to magenta and not to blue books. No questions were asked.

7.2   **CESG Report on New Work Items** (CESG Report to CMC Extra Items (slides 26-30))

N. Peccia discussed the CESG New Work Items to be introduced within the next six (6) months. J. Afarin asked, if we do not update the books listed for updates, is it possible that we giving erroneous standards to the missions. Alternatively, if they are not being updated and not used, then do you need it? N. Peccia responded that the groups have analyzed this and have said that they need to update this when they have the chance/resources available to do so.

The CMC held an extended discussion about whether or not the agencies needed to update the identified publications. M. di Giulio indicated they reviewed the books and came up with the decision to update the books identified. O. Peinado clarified that J. Afarin was asking if you are designing a satellite would you require an update to fly it. M. di Giulio – responded, that for some books, yes, they were reviewed and they need some updates to reconfirm them. N. Peccia noted that some of these books are not normative, and they do not require updates because they are not implementations.

8   IOAG/ICPA Update (CESG Report to CMC Extra Items (slides 31-35))

N. Peccia opened by noting that the CMC Poll for replacing the IOAG liaison incorrectly states that there is not currently an IOAG liaison identified. N. Peccia then continued by reviewing the service catalogue #1 priorities and

identified services with no corresponding CCSDS draft projects. N. Peccia noted that there is a request to the IOAG to change the end dates for the radiometric and D-DOR services. In response to J. Afarin's question about the need dates, W. Tai responded that the IOAG agencies were asked "what is your need date" and so the IOAG agencies put down their need dates without taking into account whether or not the CCSDS can create the publications by that date. The CMC then held a discussion amongst its members about whether or not it is useful for the IOAG to create standards/priorities of CCSDS, or whether CCSDS should be influenced by IOAG. J.M. Soula discussed that there should be dialogue between IOAG and CCSDS to provide feedback to and from the IOAG and CCSDS regarding the individual mission needs and requirements. J. Afarin asked about how high priorities in CCSDS are not also high priorities in IOAG. N. Peccia responded by noting that in the IOAG if one agency indicates that an item is a high priority and for six (6) others it is not a high priority, then it is not a high priority for the IOAG. This is how they function in that group. The CMC then discussed the holistic picture of how the IOAG vs. how the CCSDS works, noting the CCSDS works generally from the engineering perspective for missions, while the IOAG tends to work from the top down. The CMC discussed that this does breed some disconnects between the IOAG and CCSDS. J.M. Soula added that the role of IOAG is to build a common vision of what will be the ground and common systems of the future. These are the service catalogues. We try to work on these collectively and to say that "this is what the messages are" and these are used to trigger certain things, but it is not the case all the time that these will be deployed all at the same time. For example SLE. The strength of the IOAG is that it is supposed to be the collective approach. Because we need to convince them (the agencies and their missions) to go and use it. One argument is we have a collective agent (the IOAG) and we have to use that collective agent to push the message for what will be done in the future. This is taken in a different way than if it is taken from the Project. The CMC continued to discuss the implementation of IOAG core vs. standard services by CCSDS. J. Afarin noted generally CCSDS is implementing what the IOAG requests be implemented, and project-by-project the CCSDS is getting closer to implementing all of the requested services. N. Peccia agreed, but noted that he believes that the CCSDS should also have a discussion with the IOAG on the infusions of standards as well. N. Peccia concluded the discussion by finishing a review of the Service Catalogue 2, and noting that P. Shames will be reviving the timing BoF for this work.

9   CESG poll conditions & AD responsibilities/technical quality of documents (CESG Report to CMC Extra Items (slides 36-37))

N. Peccia analyzed the technical quality of CCSDS documents and CESG poll conditions. He noted that the quality of books has been improved in the last years, and that in discussions with the CTE, he revealed that some WGs are not using copies checked by him for their updates, and that also he is not always aware of whom the WG's technical editor is. N. Peccia added that the CESG also discussed Poll Item Discrepancies (PIDs), and noted that PIDs shall be raised for major issues/showstoppers only, while editorial/minor issues may be delivered in a pdf and be dealt with during agency reviews.

N. Peccia added that the CESG also discussed mappings of the mailing lists to CWE login accounts, and noted the large disparity between the two lists. The CMC then discussed the issue and N. Peccia noted that the WG's use the mailing lists for a variety of different reasons and have both internal and external uses for their lists.

AI-CMC-A-2017-11-04:
The CMC asks that the Secretariat and General Secretary, James Afarin, formally address the decision to declare that all working files must be placed in the private area of the CWE. The proposed rule is to be delivered to the CMC for consideration prior to 15 January 2017 and will be discussed at the coming CMC Mid-Term Teleconference.

Due by 15 January 2018.

10   CCSDS Strategic Plan Update (CCSDS Strategy Updates CMC Meeting 171113)

J. Miro provided an overview of the CCSDS strategic plan, noting that he went into the strategic plan and tried to represent the situation in terms of draft projects and ongoing projects per each objective. However, he realized after the SIS/SOIS discussions, and the SEA presentations, that the strategic plan is quite off track in terms of what is written compared to what is actually occurring within the working groups. J. Miro provided his overview of the CCSDS strategic plan, but concluded by noting that the WG chairs must update their areas so that the strategic plan will be up to date, he also requested that the Secretariat make the strategic plan document visible to users (currently an ongoing action item, CMC-A-2017-06-09.

13 Commercial Industry Participation

The CMC began a discussion of commercial industry participation. N. Peccia provided an overview of the work of Eurospace working with the European prime contractors, and indicated that they will be the prime point of contact for CCSDS Industry contacts in Europe. The role of Eurospace will be to distribute CCSDS documents under international review and to coordinate their reviews on behalf of ECSS. J. Afarin added that we want to be careful with how many people are introduced from commercial industry to the CCSDS, as the organization should not be overrun by standards developers whose focus is profit oriented.

J. Afarin continued by adding that NASA recently held an industry webinar to invite new commercial participants to join the CCSDS as associates. The plan is for NASA to continue to have these types of presentations to industry approximately once per year. In response to this, N. Peccia added that, from what he has seen, there is a strong campaign from the OMG Space Domain Taskforce for infusion of their standards into the EGS (the enterprise ground system for the USAF) and the CCSDS does not have a similar Program for infusion. N. Peccia continued by adding that the USAF is not using SLE for cross support between their ground stations, but that there are some attempts to implement a common interface for all the USAF. Another challenge, noted by N. Peccia is that Universities working on the development of CubeSats are using whatever protocols that they can get, and most of those protocols are not CCSDS and do not promote CCSDS.

O. Peinado added that, as a caution that they have run into a situation with a commercial partner whom has been working in contrary to the views of DLR. Therefore, due to problems with this company, they have been told that they cannot participate in CCSDS, because they have indicated that they are not willing to coordinate with their sponsoring agency (DLR).

T. Shigeta added that, as he has previously presented, he has approached ISO TC 20 SC 13 and SC 14 members and inquired with them about whether they expect JAXA to encourage more industry participation. Their response, he noted, was that it depends on the subject of the working group if they will participate or not. For example, in the optical communications area, there are some Japanese industries interested in participating in the WG. T. Shigeta added that it depends on the WG if they are interested in participating or not. T. Shigeta added that he asked JAXA if they will be trying to gather more participation from Japanese industries in their activities and their response was not clear at this time.

CNSA added that their agency is not currently doing anything involving industry.

D. Barannikov, ROSCOSMOS representative, added that they have one organization that is responsible for commercial participation and that organization is ROSCOSMOS. D. Barannikov added that ROSCOSMOS directs the necessary organizations of their industry participants. The participants from industry in Russia are those individuals in the working groups at each meeting. To facilitate this participation, ROSCOSMOS uses a special document that is approved in ROSCOSMOS before every meeting. So that is why ROSCOSMOS sends the usual team (based on their expertise), all associated with commercial industries in Russia. D. Barannikov concluded by adding that everything ultimately comes from ROSCOSMOS' direction.

J. Afarin continued by adding that NASA is planning to have more outreach as we move forward. The goal of NASA to involve more commercial participants is to get them involved in CCSDS as associate members.

J.M. Soula noted that CNES has the same process as NASA, and their goals are to have their industry involved as industry associates.

In response to a previous comment about commercial industry not using CCSDS Standards, O. Peinado asked why is it that other organizations (especially commercial satellite industries) use other protocols, not CCSDS protocols? N. Peccia and W. Tai, both agreed that they do this because it is cheaper.

T. Shigeta added that, in JAXA's experience, commercial industry only uses CCSDS requirements when interoperability is required within their equipment. If the industry only requires that they interoperate with their own equipment, then they choose the cheapest solution. O. Peinado asked if this is because our protocol is too expensive. K. Suzuki responded that yes, this is the case, adding that commercial participants are more likely to use for example TCP/IP instead of SLE to their MOC's.

T. Shigeta asked what is the point of the discussion on commercial industry participation. Is it to encourage using CCSDS within industry? If so, why? Is it because we are concerned with divergence between space agencies and non-space agencies? J. Afarin, responded that he thinks that the reason that we started the discussions on commercial participation is because we recognize that the space industry is getting stronger and stronger, and he does not think we are going to have a lot of taxpayer industries left supporting space data systems in the next 20-30 years (that it may be all commercially driven in low Earth). As such, it would be desirable to get them involved in standards to ensure that their future operations take interoperable support into account. E. Bergamini indicated that there would still be a need for coordination from the government, he thinks. N. Peccia, added, if the commercial industry needs us, then they come to us, but when ESA reaches out to them, they are frequently unresponsive if the participant does not require or want support. J.M. Soula, added that what we do might survive based for some need for cross support, but for many new activities, there will be cheaper systems and more competitive solutions.

O. Peinado noted that it would be cheaper in the long run for industries to utilize the assets of one another, as they do not then have to pay the infrastructure costs for maintaining and standing up their own global networks, they can leverage the use of other networks. This creates a more price competitive area, and can only be driven by standardization.

T. Shigeta made the point that there should be a discussion about the threat in the future for these 'loose' institutions (universities) to monitor what all their satellites are using for space communications protocols. N. Peccia added that if we allow proliferation to continue without following standards, then cross support will be reduced and the agencies/public will have a problem. T. Shigeta asked if this issue should be brought up in the IOP. J. Afarin agreed that this should be a point made in the IOP to discuss that industry is up and coming and taking over for many services that agencies used to provide themselves. He concluded by adding that it would be good to get the thoughts of the IOAG on bringing this topic to the IOP.

14   RID Template Discussion

The CMC discussed the RID template and changing the RID template to an excel format. N. Peccia noted that this would be better because this would provide others the opportunity to better filter and review RIDs submitted by section. The RID template will be submitted to the CESG for comments and feedback and then will be discussed further.

15   CESG Chair Discussion

J. Afarin opened the discussion about the CESG Chair and thanked O. Peinado for nominating himself (previously) to be CESG Chair, and added that he thought that O. Peinado would have made an excellent CESG chair, but understands that he has withdrawn his name from consideration to avoid any conflict of interest. J. Afarin then provided a brief overview of the qualifications of current Deputy CESG Chair Mr. Wallace Tai, the NASA candidate for CESG Chair. Following J. Afarin's overview of Mr. Wallace Tai's qualifications, J. Miro provided a brief overview of the qualifications of M. di Giulio the ESA candidate for CESG Chair. E. Bergamini asked how much time would be required for the position (full time equivalent). J. Afarin and J. Miro both responded that per discussions with the current CESG chair, the position requires about 25% of their time. The CMC then discussed amongst the group the needs to balance the technical merits of each individual along with the needs to maintain agency diversity amongst CCSDS leadership. After a long discussion of technical merits and the need to balance agency diversity, ROSCOSMOS' D. Barannikov noted that while they understand that per the regular course of events, the positions should go from the Deputy CESG chair up to the CESG Chair, they understand that NASA current holds a large majority of the management positions, and asked what the plan would be if Wallace were not to assume the role of CESG Chair. The group discussed and agreed that W. Tai would remain the deputy CESG chair. D. Barannikov then discussed that in Russian practice, when a new person comes, that person is usually in an acting role through a probationary period, and proposed that the nomination of M. di Giulio might be considered provided a probationary period of one year, at which point in time the CMC will evaluate the role during the next Fall CMC and determine if she should remain in this role. The CMC discussed the idea of a one-year period and M. di Giulio's candidacy with this in mind. After more discussion, the CMC agreed that M. di Giulio should be nominated to be the CESG chair, with a one-year review to be held during the fall 2018 CMC to determine if she will retain the CESG Chair position based upon performance. The CMC made it clear that this is a special case for the nomination period, and not to be considered a rule that all CESG candidates will be required to perform a one-year probationary period. The probationary period is considered a special case due to the fact that the CMC was provided two exceptional candidates, but one with significant CESG Deputy Chair experience, and one without CESG experience, and opted to choose the

candidate with lesser experience in the position to preserve agency diversity in the management functions of the CCSDS.

Resolution 2017-11-03:
The CMC resolves to nominate Margherita di Giulio to be the CESG Chair and will confirm this decision in one year's time.

The CMC also agrees that Wallace Tai will remain the Deputy CESG chair.

16 IOAG Liaison Discussion

J. Afarin opened the discussion by noting that he spoke with several IOAG members regarding the need for a management member from CCSDS to participate as the IOAG liaison. He noted that the IOAG liaison was brought up during the mid-term teleconference and that during this teleconference, J. Miro requested more information about the tasks that needed to be performed by the IOAG liaison. During the mid-term teleconference, it was agreed that after more information was provided about the role of the liaison, that a CMC poll would be released to nominate the IOAG liaison and this poll was issued by the CCSDS Secretariat. The poll was subsequently extended by the request of the ESA representative J. Miro, and the CMC agreed to hold a discussion about whether or not the CMC General Secretary, the original nominee for IOAG Liaison, should continue to be considered in the role given the information provided about the role that is to be performed by the IOAG liaison. At the heart of the discussion, was information provided by the current IOAG liaison and members of the CESG regarding technical information/advice that is requested from the IOAG liaison. J. Miro added that while he believes that there needs to be an interface from CCSDS at the management level, he believes that some of the activities performed are really more at the technical level. As such, J. Miro recommended an option put on the table by the CESG, which was to have both a technical liaison and a management liaison with the IOAG. This bifurcation of responsibilities will allow the CCSDS to service both the management discussions that occur at the IOAG and the day-to-day activities and the technical discussions such as the ICPA updates. J. Miro then provided a brief presentation on proposed roles and responsibilities between the IOAG Liaison and the CESG Chair (whom would provide the technical support to the IOAG). The CMC then held extensive discussions on the needs and the role of the IOAG liaison in terms of leading technical discussions and also working on technical discussions and management of routine tasks such as the ICPA. The CMC then reviewed the roles and responsibilities of the IOAG liaison and ultimately agreed upon the following roles and responsibilities of the IOAG liaison, whom will be supported by the CESG Chair, at the request of the IOAG liaison, in the following capacity:

The CCSDS liaison with IOAG is the CMC Chair and covers the following main responsibilities:

- Agree on standards to be developed and relevant priorities;
- Clarify resources needed to perform the tasks and ensure their availability;
- Clarify scope of WGs to be established;
- Communicate IOAG inputs to CMC and CESG Chair;
- Support IOAG in preparing IOP meetings as required.

The CESG Chair role in support to the CCSDS Liaison, the CMC Chair, is to:

- Participate in meetings and telecons at the request of the CCSDS liaison;
- Provide technical reports periodically and as required by the CCSDS Liaison;
- Support the CCSDS Liaison in technical discussions and queries during meetings / telecons;
- Maintain ICPA (IOAG CCSDS Product Agreement);
- Communicate the IOAG requirements and suggestions to the relevant CCSDS WGs.

Resolution 2017-11-03:
The CMC resolves to nominate J. Afarin to be the IOAG Liaison.

17 Next CMC mid-term telecom and Agenda

The CMC discussed dates for the next CMC mid-term teleconference, and agreed to add to the agenda a discussion of the RID template. The CMC discussed and agreed to meet on 7 February 2018, 0800 eastern time. The CMC also

agreed to add an agenda item to discuss new projects from the IOAG joint meeting and to hold a follow-up discussion of the outcomes of the IOAG meeting.

18   Upcoming Meetings (2018 only) (Information Sheet – Berlin)

Y. Huang provided a brief overview of the logistics for the spring 2018 CMC meeting to be held in Beijing, China. Y. Huang indicated that he would be working with the CCSDS Secretariat to obtain information for travel visas for participation by CMC members in the spring 2018 meetings.

O. Peinado provided an overview of the fall technical meetings to be held at DLR, and a brief overview of the facility map where the CCSDS technical meetings will be held. The CMC discussed possible interference with SpaceOps and determined that the meeting schedule must remain as all logistics have already been finalized for the meeting in Berlin.

19   Secretariat Report

19.1   Action Item Status (only open items)
D. Ross led a discussion of all current open Action Items and the closure of completed action items. The following completed action items were agreed to be closed by the CMC.

- CMC-A-2013-04-03;
- CMC-A-2016-10-12;
- CMC-A-2017-06-01;
- CMC-A-2017-06-02;
- CMC-A-2017-06-03;
- CMC-A-2017-06-04;
- CMC-A-2017-06-05;
- CMC-A-2017-06-06;
- CMC-A-2017-06-08;
- CMC-A-2017-06-10;
- CMC-A-2017-06-11;
- CMC-A-2017-06-12;
- CMC-A-2017-06-14;
- CMC-A-2017-06-15.

19.2   Document Status Report/Poll Overview: (Summary of CMC Polls)
D. Ross displayed the CCSDS Chief Technical Editor's queue and CMC Polls document. No questions were asked.

19.3   IT Status Update (IT Update)
D. Ross provided the IT status report. M. Pilgram asked approximately how long each action item takes. D. Ross responded that over the average of all action items, it takes approximately one hour to complete an action item.

20   Action Items and Resolutions Review

D. Ross provided an overview of the Action Items and Resolutions from the two-day CMC meetings.

21   Space Assigned Numbering Authority (SANA) overview (SANA Overview)

A Schiltknecht provided a presentation on the SANA SCID assignments. O. Peinado requested that SANA provide a full overview of all of the activities of SANA during the February mid-term teleconference.