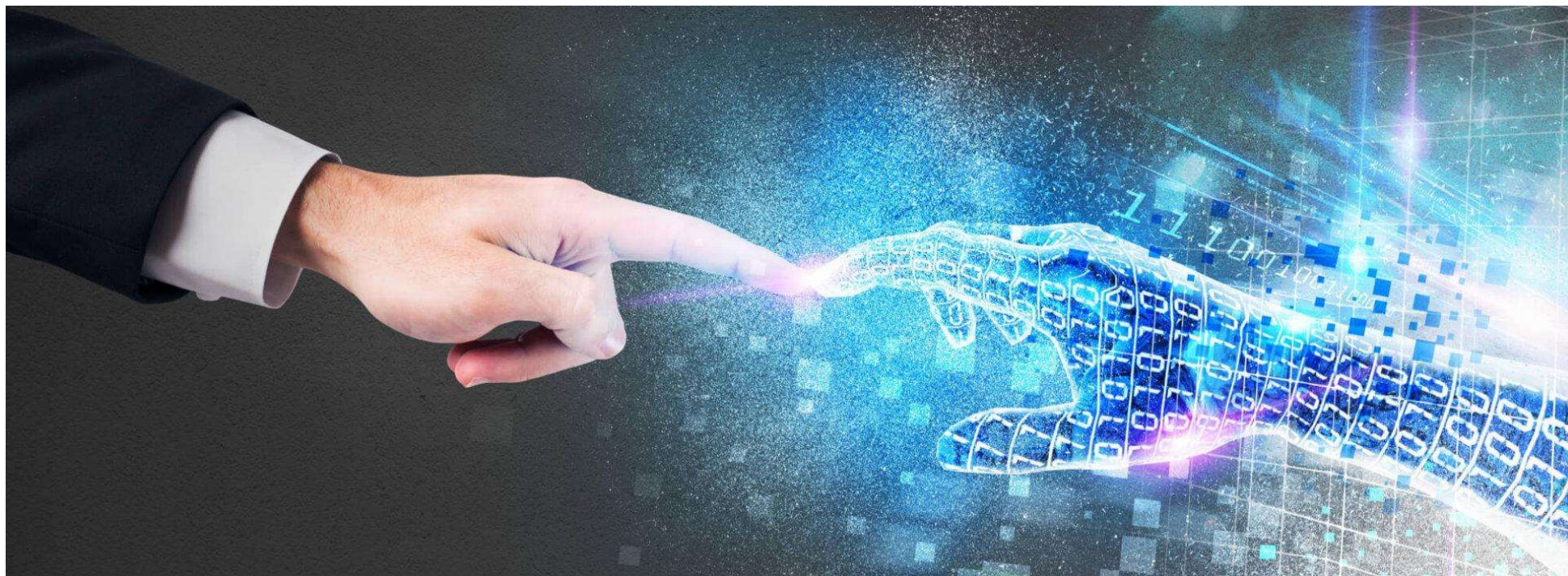


CCSDS FALL 2023 MEETING



06 Nov 2023
09:00 CDT

Time (UTC)	Duration	Topic	Presenter
900	10 minutes	Welcome – ESA	Ignacio Aguilar Sanchez, ESA Representative
910	10 minutes	Introduction	Klaus-Juergen Schulz – CESG Chair
920	10 minutes	Role of the CESG LunaNet Overview	Peter Shames – SEA Area Director
930	10 minutes	MOIMS Workplan	Daniel Fisher – MOIMS Area Director
940	10 minutes	SIS Workplan	Tomaso de Cola – SIS Area Director
950	10 minutes	SLS Workplan	Ignacio Aguilar Sanchez – SLS Area Director
1000	10 minutes	SOIS Workplan	Jonathan Wilmot – SOIS Area Director
1010	10 minutes	CSS Workplan	Erik Barkley – CSS Area Director
1020	10 minutes	SEA Workplan	Peter Shames – SEA Area Director
1030	10 minutes	Additional Topics/ Adjournment	Klaus-Juergen Schulz – CESG Chair

CCSDS Fall 2023 Meetings – Welcome!



Our Technical Heart



The *European Space Research and Technology Centre* known as **ESTEC** is the largest ESA site and our technical and scientific heart — the incubator of the European space effort — where most ESA projects are born, developed and scientifically exploited no matter whether in the domain of Science, Human and Robotic Exploration, Earth Observation, Telecommunications or Navigation.



ESA Standardisation Activities



ESA-only Standards and Handbooks



European Cooperation for Space Standardization



European Space Components Coordination



Consultative Committee for Space Data Systems



European Committee for Standardization



Other Standardisation bodies: ISO, etc.

Development

- ESA **contributes** to the development of standardisation documents:
 - as “ESA-only” document
 - as part of standardisation bodies where ESA is member or contributor (ECSS, CCSDS, ESCC, CEN, ISO)
- **internal structure** (various standardisation boards) governs these development activities

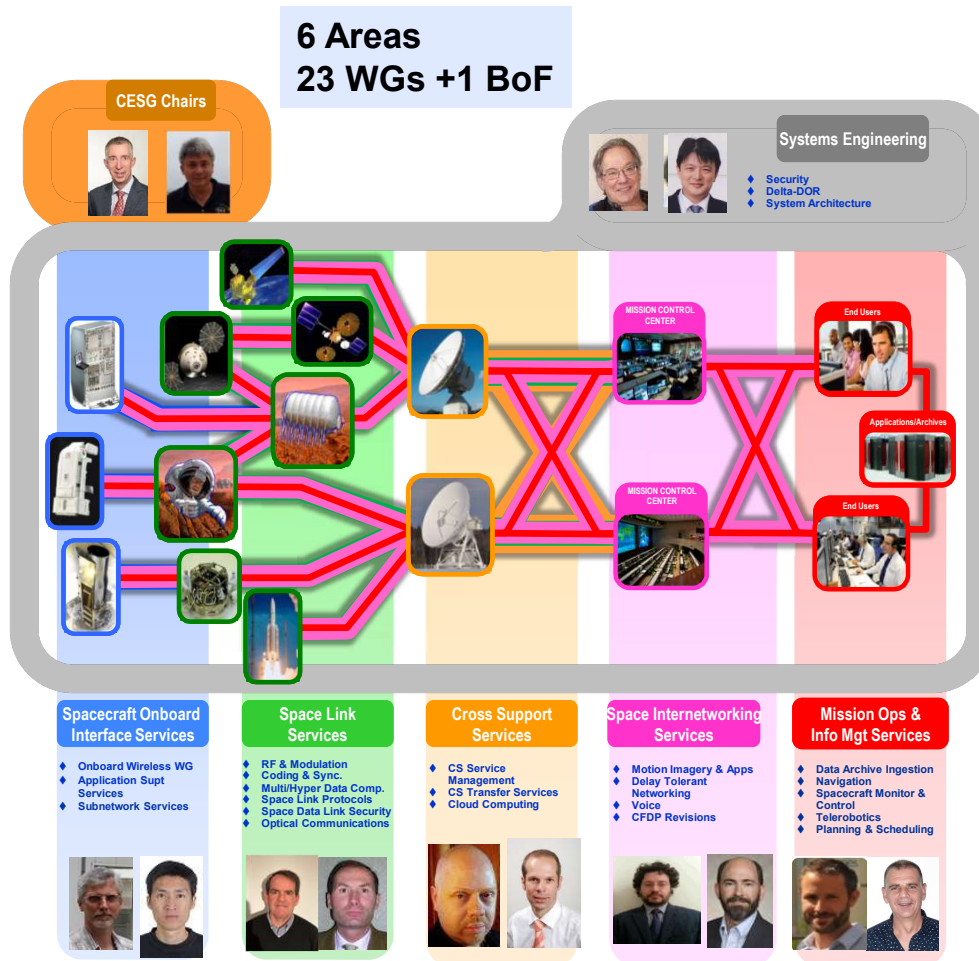
Use in ESA projects

- The **LEAS, List of ESA Applicable Standards**, contains all standards to be used by ESA projects:
 - ESA-only standards
 - ECSS standards
 - ESCC spec
 - most CCSDS standards and recommended practices
 - a few others (eg 1 US MIL)
- exceptions shall be justified



Time (UTC)	Duration	Topic	Presenter
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1030	10 minutes	Additional Topics/ Adjournment	Klaus-Juergen Schulz – CESG Chair

Members of the CESG



CESG Chair
Deputy

Klaus-Juergen Schulz
Timothy Pham

SEA Area Director
Deputy

Peter M. Shames
Hiroshi Takeuchi

MOIMS Area Director
Deputy

Daniel Fischer
Marc Duhaze

CSS Area Director
Deputy

Erik Barkley
Holger Dreihahn

SLS Area Director
Deputy

Ignacio Aguilar Sanchez
Gilles Moury

SIS Area Director
Deputy

Tomaso de Cola
Rodney Grubbs

SOIS Area Director
Deputy

Jonathan Wilmot
Xiongwen He

CCSDS Publications since CCSDS SPRING Mtg 2023

Blue Books – Recommended Standards

- CCSDS 232.0-B-4 Cor.1 : Technical Corrigendum to CCSDS 232.0-B-4, Issued October 2021 (Oct 2023)
- CCSDS 509.0-B-1 Cor.2 : Technical Corrigendum 2 to CCSDS 509.0-B-1, Issued February 2018 (Oct 2023)
- CCSDS 702.1-B-1 Cor.2 : Technical Corrigendum 2 to CCSDS 702.1-B-1, issued September 2012 (Oct 2023)
- CCSDS 131.0-B-5 : TM Synchronization and Channel Coding (Sep 2023)
- CCSDS 911.1-B-5 : Space Link Extension-Return All Frames Service Specification (July 2023)
- CCSDS 911.2-B-4 : Space Link Extension-Return Channel Frames Service Specification (July 2023)
- CCSDS 911.5-B-4 : Space Link Extension-Return Operational Control Fields Service Specification (July 2023)
- CCSDS 912.1-B-5 : Space Link Extension-Forward CLTU Service Specification (July 2023)

Magenta Books – Recommended Practices

-

Orange Books

- CCSDS 142.10-O-1 : Reed-Solomon Product Code for Optical Communication (Oct 2023)
- CCSDS 922.27-O-1 : Cross Support Transfer Service-Return CFDP PDU Service (May 2023)

Green Books – Informational Reports

- CCSDS 130.12-G-2 : CCSDS Protocols over DVB-S2-Summary of Definition, Implementation, and Performance (July 2023)
- CCSDS 350.9-G-2 : CCSDS Cryptographic Algorithms (June 2023)
- CCSDS 130.11-G-2 : SCCC-Summary of Definition and Performance (May 2023)

Yellow Books

• -

CMC Poll Statistics since CCSDS SPRING Mtg 2023

Approval to publish:

- CCSDS 509.0-B-1 Cor. 2, Technical Corrigendum 2 to CCSDS 509.0-B-1, Issued February 2018 (Blue Book, Issue 1)
- CCSDS 702.1-B-1 Cor. 2, Technical Corrigendum 2 to CCSDS 702.1-B-1, issued September 2012 (Blue Book, Issue 1)
- CCSDS 131.0-B-5, TM Synchronization and Channel Coding (Blue Book, Issue 5)
- CCSDS 911.1-B-5, Space Link Extension—Return All Frames Service Specification (Blue Book, Issue 5)
- CCSDS 911.2-B-4, Space Link Extension—Return Channel Frames Service Specification (Blue Book, Issue 4)
- CCSDS 911.5-B-4, Space Link Extension—Return Operational Control Fields Service Specification (Blue Book, Issue 4)
- CCSDS 912.1-B-5, Space Link Extension—Forward CLTU Service Specification (Blue Book, Issue 5)
- CCSDS 350.9-G-2, CCSDS Cryptographic Algorithms (Green Book, Issue 2)
- CCSDS 232.0-B-4 Cor. 1, Technical Corrigendum to CCSDS 232.0-B-4, Issued October 2021 (Blue Book, Issue 4)
- CCSDS 876.1-M-1, Spacecraft Onboard Interface Services—Specification for Dictionary of Terms for Electronic Data Sheets (Magenta Book, Issue 1)
- CCSDS 734.1-B-1 Cor. 1, Technical Corrigendum to CCSDS 734.1-B-1, Issued May 2015
- CCSDS 142.10-O-1, Reed-Solomon Product Code for Optical Communication (Orange Book, Issue 1)
- CCSDS 130.12-G-2, CCSDS Protocols over DVB-S2—Summary of Definition, Implementation, and Performance (Green Book, Issue 2)
- CCSDS 734.1-B-1, Licklider Transmission Protocol (LTP) for CCSDS (Blue Book, Issue 1, May 2015)

Agency Reviews:

- CCSDS 732.0-P-4.1, AOS Space Data Link Protocol (Pink Sheets, Issue 4.1) for CCSDS Agency review
- CCSDS 732.1-P-2.1, Unified Space Data Link Protocol (Pink Sheets, Issue 2.1) for CCSDS Agency review
- CCSDS 142.0-P-1.1, Non-Coherent Optical Communications Coding and Synchronization (Pink Sheets, Issue 1.1) for CCSDS Agency review
- CCSDS 529.1-R-1, Mission Operations—Mission Planning and Scheduling Services (Red Book, Issue 1)
- CCSDS 506.2-R-1, Delta-DOR Architectural Guidelines (Red Book, Issue 1)

Approval of new Projects

New Projects of the SEA Area

- CMC-P-2023-06-003 New 1.02 Security Working Group Project – Magenta Book

New Projects of the MOIMS Area

- CMC-P-2023-07-001 New 2.01 Data Archive Interoperability Working Group Projects – Blue Book
- CMC-P-2023-05-004 New 2.04 Spacecraft Monitoring and Control Working Group Projects – Blue Book
- CMC-P-2023-05-003 New 2.02 Navigation Working Group Project – Blue Book

New Projects of the CSS Area

- CMC-P-2023-08-003 New 3.03 Cross Support Service Management Working Group Project – Blue Book
- CMC-P-2023-07-002 New 3.06 Cross Support Transfer Services Working Group Projects – Blue Book

New Projects of the SLS Area

- CMC-P-2023-09-006 New 5.02 Space Link Coding and Synchronization Working Group Projects – Blue Book
- CMC-P-2023-06-002 New 5.03 Data Compression Working Group Project – Blue Book
- CMC-P-2023-07-003 New 5.04 Space Link Protocols Working Group Projects – Blue Book
- CMC-P-2023-06-001 New 5.04 Space Link Protocols Working Group Projects – 2 Blue Books, 1 Green Book
- CMC-P-2023-09-007 New 5.10 Optical Communications Working Group Project – Blue Book

New Projects of the SIS Area

- CMC-P-2023-07-012 New 6.09 Delay Tolerant Networking Working Group Project – Orange

Slide 10

KS4 Update Maria
Klaus-Juergen Schulz, 10/10/2022

MB7 ??? can't remember where the data came from
Maria Beickler, 10/12/2022

CMC Poll Statistics since CCSDS SPRING Mtg 2023

New Appointments

- **MOIMS Area Director : Daniel Fischer**
- **SIS CFDP WG Chair: Felix Flentge**
- **SEA Time Management WG Chair : Sinda Mejri**
- **SEA Security WG Deputy Chair : Marcus Wallum (poll ongoing)**
- **MOIMS SM&C WG Deputy Chair : Costin Radulescu (poll ongoing)**
- **SLS Optical WG Chair : Jon Hamkins (poll ongoing)**
- **SEA-D-DOR WG Chair : Javier de Vicente**
- **SIS-MIA WG Deputy Chair : Falk Schiffner**

Request for Nominations

- **SIS Deputy Area Director**
- **MOIMS Deputy Area Director**
- **MOIMS MPS WG Deputy Chair**
- **SEA Time Management WG Deputy Chair**

CESG Topics since SPRING Mtg 2023

1. LunaNet Developer's Forum (The Hague, 14 Nov 2023)

- Preparations had started
 - **CCSDS announcement on CCSDS web page after CMC**
 - **Agenda formulated: Programmatic context, CCSDS context, Communication System Developer's Presentations**
 - **ESA "Conference" Announcement sent out to European industry (TTC Conference distribution), not via Procurement, 14 interests expressed, Moonlight tender action extended**
 - **CESG Coordination about presentations of Area Directors**
 - **LunaNet Interoperability Specification (LNIS) draft 5 issued 31 Aug 2023, Coordinated Review by IOAG ongoing**
 - **NASA could not go ahead due to ongoing tender actions**
- **→ Decision to postpone to Spring 2024**

Slide 12

KS10 Klaus-Juergen Schulz, 10/10/2022

KS11 Done
Klaus-Juergen Schulz, 10/12/2022

CCSDS Resources

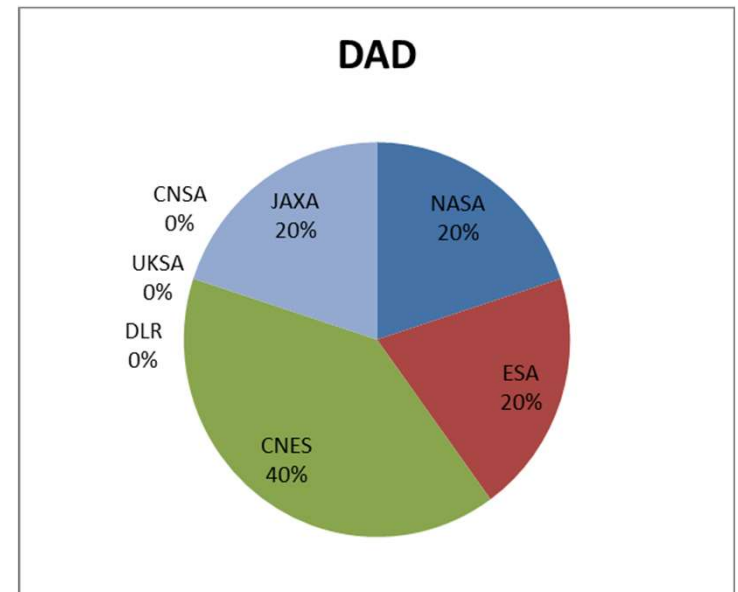
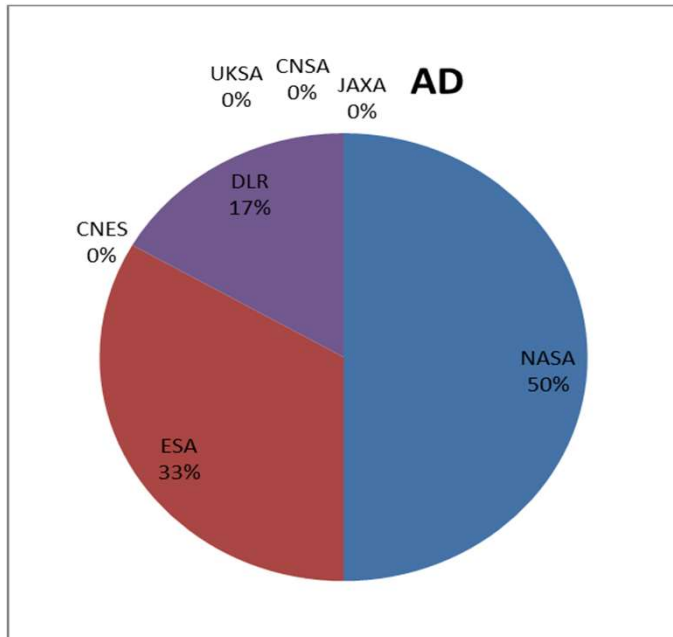
Area	WG	C	Co	NASA						ESA						CNES						DLR						OTHER																											
				BB	P1	P2	GB	MB	OB	BB	P1	P2	GB	MB	OB	BB	P1	P2	GB	MB	OB	BB	P1	P2	GB	MB	OB	BB	P1	P2	GB	MB	OB																						
SEA	SA	NASA						2																																															
SEA	Security	NASA	ESA		1								1	2																																									
SEA	Time	NASA	ESA				1																																																
SEA	D-DOR	ESA	NASA			1		2		1	1																										P3=JAXA																		
MOIMS	DAI	UKSA	NASA		1			2				1										1				1		1	2							MBS, GB & BB=UKSA																			
MOIMS	NAV	NASA	ESA	3	4							4				2	2								1		1									BB=UKSA																			
MOIMS	SM&C	ESA	NASA			1	1			4	4	1	1			1	1	2						1		1																													
MOIMS	MP&S	ESA	CNES							1	1													1																															
CSS	SM	NASA	ESA	1		1				1	1	1		1								1	2	1												P3=ESA																			
CSS	CSTS	ESA		3	1				1		1																																												
SOIS	APP	NASA	UKSA						1																		1	1								MB=AFRL (USA), OBs=NASA, GB=UKSA																			
SOIS	WIR	NASA	FSA	1	1					1												1						2								OB=NASA, P2=CSA (1) and JAXA (1), P1=DLR																			
SOIS	SNW	NASA	ESA					5																																															
SLS	RFM	ESA	NASA			1				1	1																																												
SLS	C&S	ESA	NASA	1	1	2				2	2	1																																											
SLS	MHDC	NASA	ESA	1	1	2				1	1		1																								P3=CNES																		
SLS	SLP	NASA	UKSA	4	2		2	1				1																1									P2=ESA, UKSA																		
SLS	SDLS	CNES	NASA				1						1																																										
SLS	OPT	NASA	ESA	1	1							3	1									2				1											BB=DLR, OB=JAXA																		
SIS	MIA	NASA	DLR	1		1	2															1															P1=DLR																		
SIS	DTN	NASA	JAXA	4	2	1	2		1		1	1				1							1				1										P1=JAXA, P2=DLR																		
SIS	VOICE	DLR	FSA																																																				
SIS	CFDP	ESA	UKSA							1				1																																									
				20	15	10	9	15	3	13	12	14	5	4	1	3	3	3	0	1	1	6	4	0	1	3	1	4	2	3	1												157												
				72						49						10						12						14																											
				%						45.86						31.21						6.37						7.64						8.92																					
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																																						157																	

Slide 13

KS6 Update Maria
Klaus-Juergen Schulz, 10/10/2022

MB10 Updated 12/10/2022
Maria Beickler, 10/12/2022

Area Directors / Area Directors Overview



	AD	DAD
NASA	3	1
ESA	2	1
CNES		2
DLR	1	
UKSA		
CNSA		
JAXA		1
CAST		1
Total	6	6

Slide 14

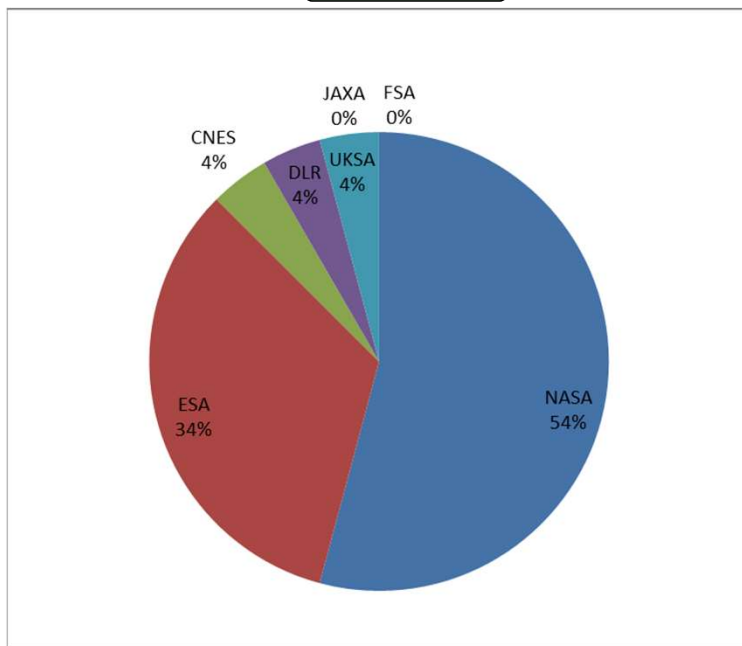
- KS7** Update Maria
Klaus-Juergen Schulz, 10/10/2022
- MB9** Updated 12/10/2022
Maria Beickler, 10/12/2022

WG Chair / Deputy Chair Overview

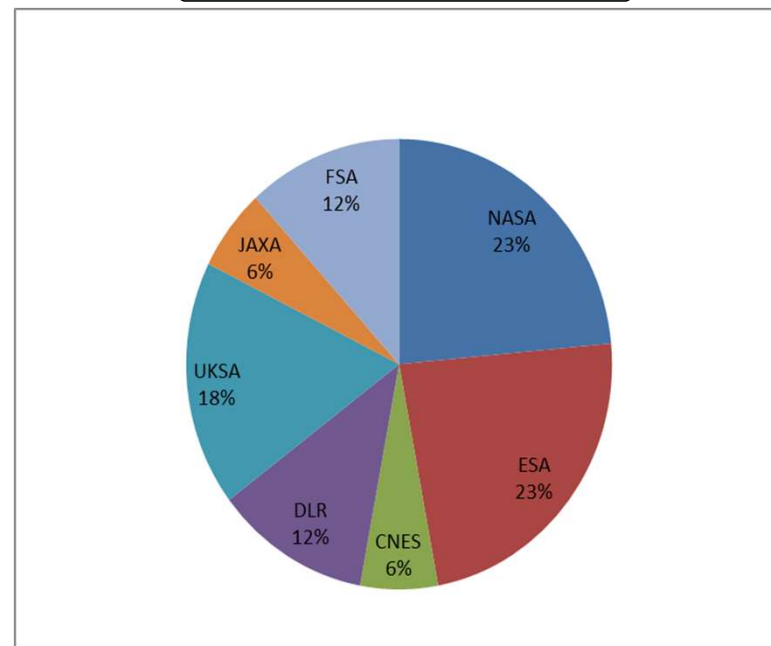
Area	WG	C	Co
SEA	SA	NASA	0
SEA	Security	NASA	0
SEA	Time	ESA	0
SEA	D-DOR	ESA	NASA
MOIMS	DAI	UKSA	NASA
MOIMS	NAV	NASA	ESA
MOIMS	SM&C	ESA	0
MOIMS	MP&S	ESA	CNES
CSS	SM	NASA	DLR
CSS	CSTS	ESA	0
CSS	Cloud	NASA	0
SOIS	APP	NASA	UKSA
SOIS	WIR	NASA	FSA
SOIS	SNW	NASA	ESA
SLS	RFM	NASA	ESA
SLS	C&S	ESA	NASA
SLS	MHDC	NASA	ESA
SLS	SLP	NASA	UKSA
SLS	SDLS	CNES	NASA
SLS	OPT	ESA	0
SIS	MIA	NASA	DLR
SIS	DTN	NASA	JAXA
SIS	VOICE	DLR	FSA
SIS	CFDP	ESA	UKSA

	WG Chair	WG Deputy Chair
NASA	13	4
ESA	8	4
CNES	1	1
DLR	1	2
UKSA	1	3
JAXA	0	1
FSA	0	2
Total	24	17

WG CHAIR



WG DEPUTY CHAIR



Slide 15

KS8 Update Maria
Klaus-Juergen Schulz, 10/10/2022

MB8 Updated 12/10/2022
Maria Beickler, 10/12/2022

CCSDS Plenary

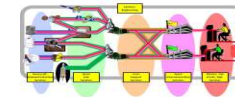
Role of the CESG

**Peter Shames, SEA AD
ESA, The Hague, Netherlands**

Nov 2023



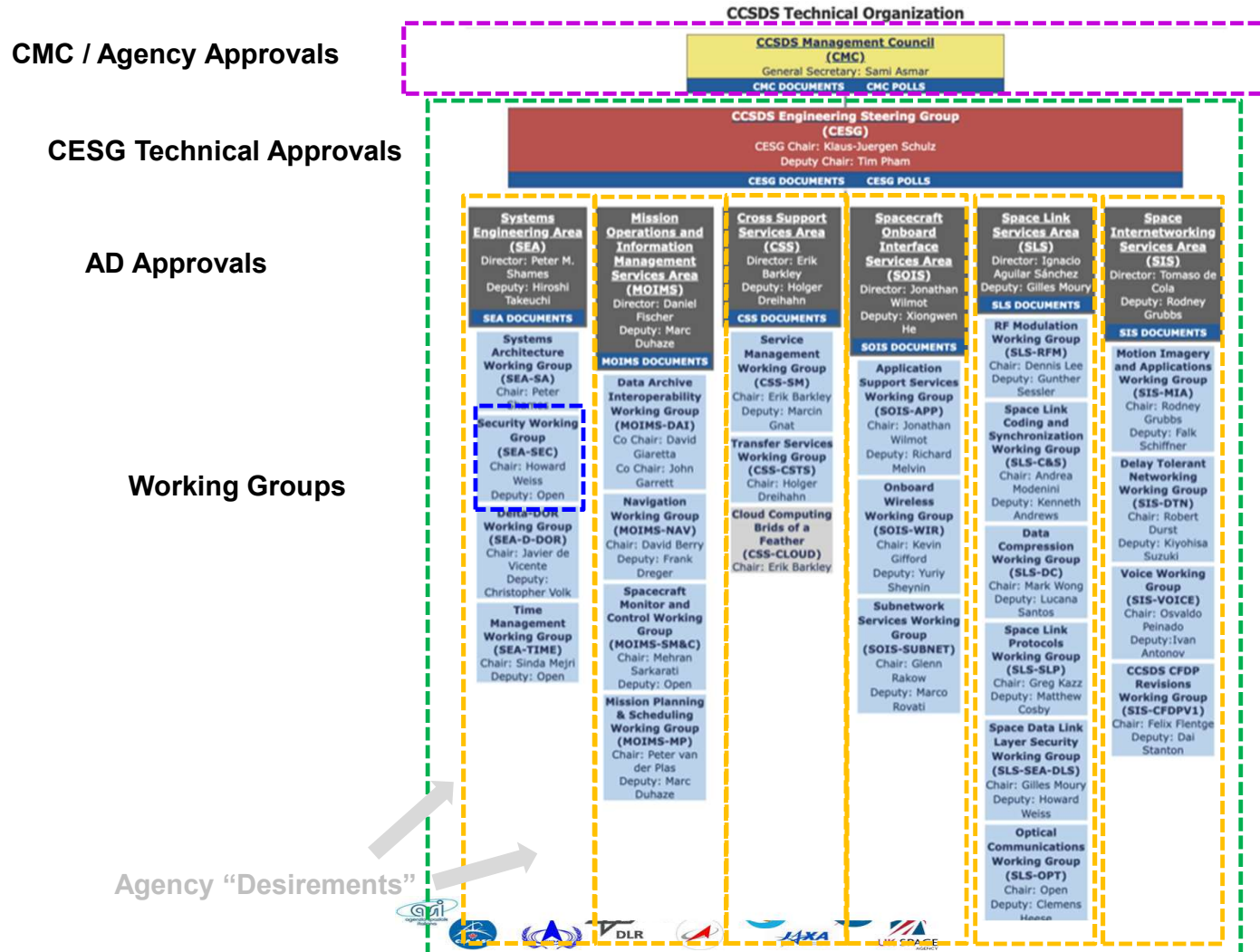
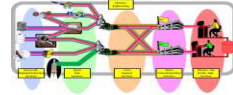
Agenda



- An intro to CESH and AD guidelines and norms
- Extracted from “the Bible”, *Organization and Processes for the Consultative Committee for Space Data Systems*. Yellow Book. Issue 4, Jan 2016.
 - Text in **this font, in blue**, is quoted directly from that document
- Just what role is the CESH intended to play?
 - Explore expectations on CESH, ADs, and their WGs
- Current definitions of guidelines, principles, and responsibilities
- Consensus Process
- Architectural Principles

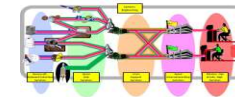


CCSDS Org Chart – Nov 23 (top down view)



CCSDS Organizational Responsibilities

Top Down



• CMC

CMC Agency Approvals

- Represent Member Agencies, approve observer agencies and associates from their countries
- Provide CCSDS resources
- Final approval to publish for most CCSDS documents

• CESG

CESG Cross-Area Technical Approvals

- Senior technical architecture body across all CCSDS standards
- Ensure consistency, integrity, functionality, and alignment of all CCSDS standards
- Responsible for coordination across all Areas

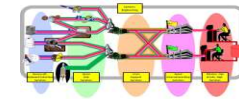
• Area Directors

Area & WG Approvals

- Senior technical leader for a related body of work
- Ensure consistency, integrity, functionality and alignment of all standards in their Area
- Responsible for coordination across all WGs in their Area



CESG Responsibilities (1 of 2)

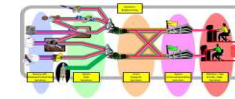


The CESG is specifically responsible for the following:

- a) maintaining and upholding the overall technical quality and consistency of the evolving set of CCSDS Recommended Standards and Practices;
- b) providing the CCSDS-wide forum where the work programs of the Areas may be coordinated and synchronized in the context of an overall architecture for space- mission cross support and the needs of individual customers;
- c) reviewing the proposed composition and program of work of all new WGs in each Area to ensure that they are technically consistent, contribute to a cohesive set of CCSDS architectural concepts, properly respect the need for smooth evolution of the large installed base of CCSDS-compatible systems, and are not otherwise disruptive to the needs of customers;
- d) making recommendations to the CMC concerning which new WGs should be approved;
- e) ensuring that the resource requirements of all WGs are addressed, identified, and approved by the CMC prior to initiating new work;
- f) hearing appeals from any BOF whose proposal to form a WG was rejected by an AD;
- g) deciding and recommending to the CMC the appropriate “track” assignment for a particular work item, and monitoring the work item’s progression through various stages of maturity;



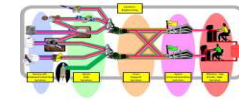
CESG Responsibilities (2 of 2)



- h) reviewing requests from ADs to advance specifications in their Areas along the various document tracks, and making consensus recommendations to the CMC when it feels that documents and related materials are ready for publication as CCSDS products, in their various interim and final stages of maturity;
 - i) periodically reviewing the technical work of each Area to ensure that it is progressing toward common goals, that the process of consensus is being observed and that the needs of CCSDS stakeholders (2.2) are being satisfied in a timely manner (the ADs shall be responsible for reporting on all work items within their Area);
 - j) identifying “red flag” items where technical work in a proposed CCSDS document is not of the required quality or nature, where technical work is not progressing satisfactorily, where resources are inadequate, or where significant issues exist, and raising these to the attention of the CMC for corrective action;
 - k) maintaining records of the status of all CCSDS work items, including completed WG deliverables that have been deployed into operational use;
 - l) making recommendations to the CMC concerning when to reconvene a WG to refresh a standard that has been finalized and deployed into operational use;
 - m) making recommendations to the CMC concerning when to retire a standard based on its obsolescence;
 - n) approving WG Chairs and Deputy Chairs;
- NOTE – BOF and SIG chairs are not subject to CESG approval.
- o) monitoring the need for and triggering periodic maintenance of published CCSDS documents.



Consensus Process (Annex G)



- The entire CCSDS technical organization is run by a process of consensus, and it is the CESG that decides if the standardization process has come up with a result that reflects a real consensus. Consensus does not necessarily mean that unanimous agreement has been reached, but that the result incorporates the best set of compromises that all parties can agree to. The principle of consensus applies to the decisions made at the CMC, CESG, and WG levels.
- Coming to consensus is a matter of understanding, considering, eliminating disagreements, and arriving at the best set of compromises. Consensus is achieved when all significant issues are addressed, but not necessarily accommodated.

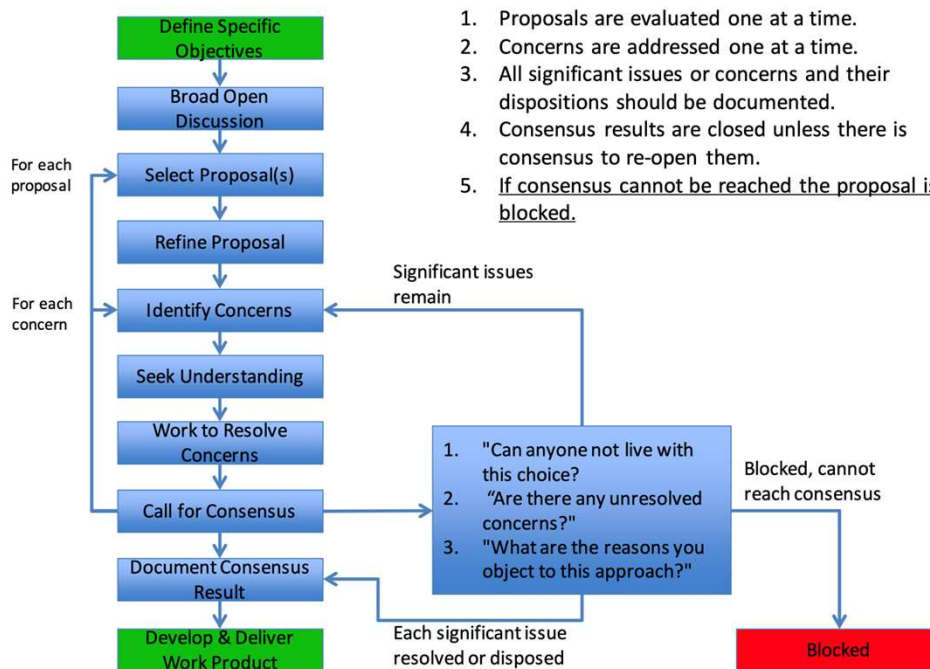
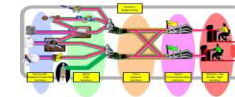


Figure G-1: CCSDS Consensus Process Flow Chart

Architectural Principles (Annex A)



CESG Chair Responsibility, Sec 2.3.4.3.2

d) ensuring that all CCSDS work follows the **agreed set of architectural principles** and is properly synchronized with the smooth evolution of the large installed base of CCSDS-compatible mission support infrastructure;

A2 DEVELOP LEADING STANDARDS

Statement: Develop Leading Standards to Meet Aggregate Future Multi-Mission Requirements

A3 PROVIDE CROSS SUPPORT

Statement: Provide Cross Support Capabilities Among Different Organizations

A4 MINIMIZE DISRUPTIONS

Statement: Minimize Disruptions to Existing Standards and Installed Systems

A5 ADOPT, ADAPT, DEVELOP

Statement: Adopt, Adapt, Develop (i.e., only develop new standards when necessary)

A6 USE FREELY AVAILABLE TECHNOLOGY

Statement: Define Standards Using Unpatented or Royalty Free, Internationally Available, Free Technology Independent of Specific Agency or Vendor

A7 ADOPT NATURAL, MODULAR BOUNDARIES

Statement: Define Interfaces at Natural Boundaries, Adopt Modularity and Loose Coupling, Reduce Integration Complexity

A8 INTEROPERABILITY IS ESSENTIAL

Statement: Interoperability is Essential and Must Be Demonstrated, Use Testing for Early Standards Validation and Defect Elimination

A9 SEEK SCALABILITY AND EXTENSIBILITY

Statement: Seek Scalability and Extensibility Across Different Deployments (single mission / interdependent missions, near Earth / in Situ, Deep Space, low cost / flagship, robotic / manned)

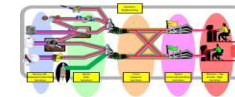
A10 STRIVE FOR SIMPLICITY AND CLARITY

Statement: Strive for Simplicity and Clarity in Design and Documentation

A11 USE COMMON VOCABULARY AND DEFINITIONS

Statement: Develop and Utilize Common Vocabulary and Data Definitions





References

- ***Organization and Processes for the Consultative Committee for Space Data Systems.*** CCSDS A02.1-Y-4, Yellow Book. Issue 4, Corrigendum 2. Jan 2016.
- ***CCSDS Publications Manual.*** CCSDS A20.0-Y-4, Yellow Book. Issue 4, Corrigendum 1. Feb 2015.
- ***CCSDS Implementation Conformance Statements,*** CCSDS A20.1-Y-1, Yellow Book, Issue 1, April 2014.
- ***Space Assigned Numbers Authority (SANA)—Role, Responsibilities, Policies, and Procedures,*** CCSDS 313.0-Y-3, Issue 3, Oct 2020.
- ***CCSDS Registry Management Policy,*** CCSDS 313.1-Y-2, Issue 2, Oct 2020.
- ***Procedures for SANA Registry Specification,*** CCSDS 313.2-Y-2, Issue 2, Oct 2020.



National Aeronautics and
Space Administration



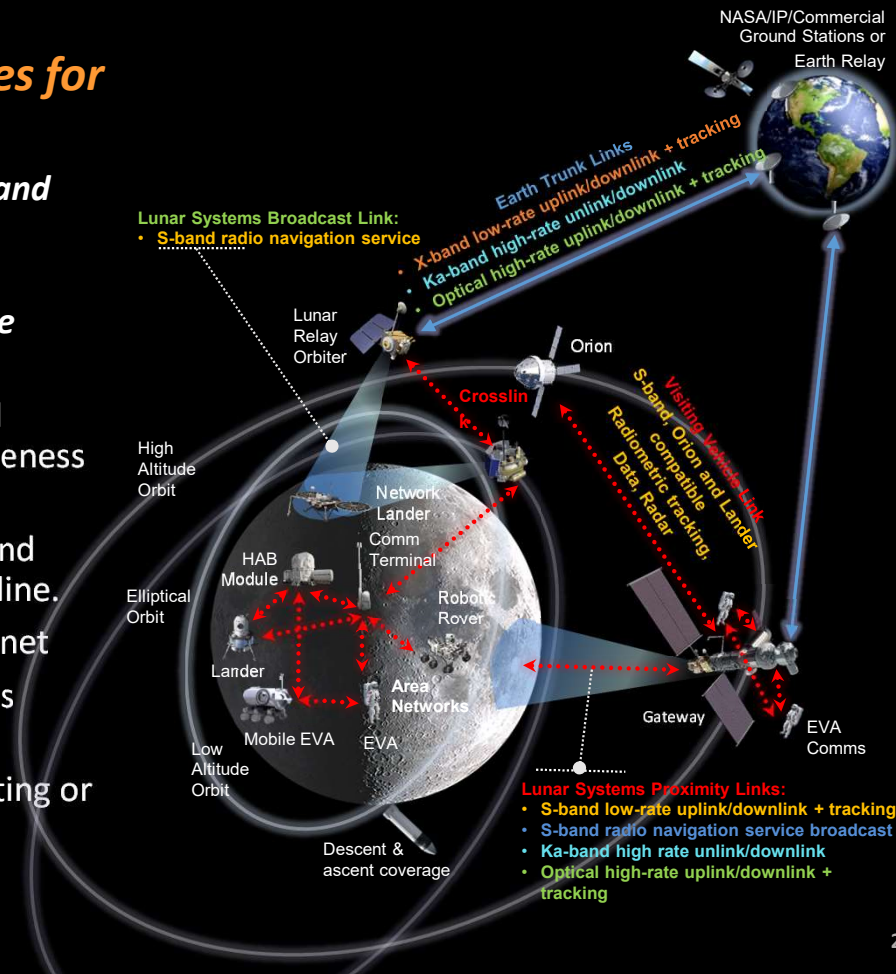
LunaNet: The Lunar Internet for Space Communications, Position, Navigation, & Timing (CPNT)

Jim Schier, Chief Architect, Space Communications and Navigation Program
1 June 2023

(Abbreviated version for CCSDS, Nov 23, Peter Shames)

LunaNet, the Lunar Internet

- **LunaNet is a set of cooperating networks providing interoperable communications and navigation services for users on and around the Moon.**
- **Based on a framework of mutually agreed-upon standards, protocols, and interface requirements that enable interoperability.**
- **Allows many lunar mission users to engage the services of diverse commercial and government service providers in an open and evolvable architecture.**
 - **Service-Oriented:** LunaNet services can include data transmission and distribution of position, navigation, timing (PNT), and situational awareness information.
 - **Scalable:** LunaNet can be introduced as part of the earliest missions and accommodate expansion as new users and service providers come online.
 - **Open:** LunaNet is based on open international standards like the Internet
 - **Resilient:** As LunaNet grows into many networks and users, it becomes steadily more resilient to individual failures and outages
 - **Secure:** LunaNet protects sensitive and proprietary data while preventing or rapidly recovering from cyber threats
 - **Extensible:** The LunaNet concept is applicable to any planetary body.



Planetary Network Services

Networked Communication Services

- Critical data transmitted in real time.
- Data aggregated and transmitted in store-and-forward mode from orbiting and surface relays
- Data exchanged among lunar users with no need for transfer to and from Earth
- Data sent on demand by user or scheduled to better manage Earth stations loading & spectrum use

PNT Services

- Precise position, velocity & time for autonomous nav & collision avoidance
- Fusion of multiple data types including radiometrics, optometrics, celestial nav, optical nav, terrain relative nav, & GNSS
- Broadcast service supplies time transfer and metric tracking to synchronize users



Detection & Information Services

- Alerts for events such as space weather, collision avoidance, & surface impact predictions sent to all LunaNet subscribers
- Mission sensors for space weather and other measurements distribute information services to other users via LunaNet information services
- Search and Rescue (SAR) services

Science Services

- Use RF & optical assets as (part of) scientific instruments
- Supports Radio & Radar Sciences, Radio Astronomy / Very Long Baseline Interferometry (VLBI) & other space sciences

CCSDS Questions

- **Would CCSDS “adopt” LunaNet, or provide a home for it?**
- **What would that look like?**
 - **Would LunaNet specs just “become” CCSDS specs?**
 - **Would they be reformatted?**
 - **Would they adhere to all CCSDS policies?**
- **Would the LNIS project orgs provide resources for this new work?**
- **Which WGs might be involved?**
 - **SLS: RFM, C&S, SLP, SDLS**
 - **SIS; DTN, Voice, Video**
 - **MOIMS: Nav**
 - **SOIS: Wireless (WiFi, 3GPP)**
 - **SEA: Security, Time Management, Architecture**

Mission Operations and Information Management Services Area (MOIMS)

CCSDS Plenary Fall 2023

Daniel Fischer (ESA)

6 November 2023

CCSDS/MOIMS Status



- **MOIMS General Issue: Marc Duhaze stepped back? as deputy AD**

- **Data Archive Interoperability WG (DAI)**

- CCSDS → ISO process is starting up, several documents that completed AR are now under ISO review
- **Issues: None, Good progress**
- **MB: 650.0 Open Archival Information System (OAIS): 5y revision** Undergoing ISO review
- **MB: 652.0 Audit and Certification of Trustworthy Digital Repositories: 5y revision** Undergoing ISO review
- **MB: 653.0 Information Preparation to Enable Long Term Use (IPELTU)** Undergoing ISO review
- **MB: 652.1 Requirements for Bodies Providing Audit and Certification of Trustworthy Digital Repository: 5y revision** Completed AR. Undergoing ISO review
- **MB: 671.0 Open Archive Information Systems Interoperability Framework (OAIS-IF) Architecture Description** On-going, good progress, prototype development starting soon
- **BB: OAIS-IF Core Specification** Drafting, API development ongoing
- **GB: OAIS-IF Rationale, Scenarios and Requirements** Drafting, currently addressing possible

- **Mission Planning & Scheduling WG (MP&S)**

- **Issues: No deputy chair!, Good progress**
- **BB: 529.1 Mission Planning and Scheduling (ESA, DLR)** Draft ready for AR (currently in poll), prototyping ongoing

CCSDS/MOIMS Status



• Navigation WG (NAV)

- **Issues: None, Good progress**
- **Specific discussions: Potential LunaNet standardisation support (Lunar PnT)**
- **BB: 503.0 Tracking Data Message (TDM - NASA, ESA): 5y revision** In progress (P-2.0.2 in preparation)
- **BB: 504.0 Attitude Data Message (ADM - CNES, ESA): 5y revision** Waiting for Approval to publish Poll
- **BB: 505.0 Navigation Data Message XML Specs (NDM - no prototype): 5y revision** In progress (Draft P-3.0.1 in preparation)
- **BB: 507.0 Navigation Events Message (NEM – CNES, ESA)** Drafting
- **BB: 508.0 Conjunction Data Message (CDM): 5y revision** In progress (Draft P-1.0.6 in int. review)
- **BB: 509.0 Pointing Request Message (PRM)** Corrigendum published. Planned reconfirm.
- **BB: TBD Launch Data Message**

• Spacecraft Monitor & Control WG (SM&C)

- **New deputy chair appointment under CESG poll: Costin Radulescu (NASA)**
- **BB: 521.0 Mission Operations - Message Abstraction Layer (MAL) (ESA, CNES)** AR & testing completed, CESG Publ. Poll open
- **GB: 520.0 MO Services Concept (ESA): 5y revision** On hold waiting for MAL
- **MB: 520.1 Mission Operations Reference Model (DLR): 5y revision** On hold waiting for MAL
- **BB: 522.2 Mission Product Data Distribution Services (ESA, CNES)** On hold waiting for MAL
- **BB: 522.x File Management Services (ESA, ?)** Drafting

SIS Area Fall 2023 Status + Meeting Objectives (1/2)



Consultative Committee for Space Data Systems

Voice WG

Dormant, not meeting

CFDP Revision WG

CFDP 727.0-B-5 Pink Sheets

Preparation of the content for a new B-6 version based on the discussion had so far and further new inputs

CCSDS 722.1-M-1 (CFDP over Encap)

Extension to include CFDP over BP, LTP, UDP, and TCP

MIA WG

766.3-B-1 (RTP over DTN)

Discussion on the way forward (keep blue or orange) on the basis of agency experience about streaming over DTN

Video Quality Assessment for Space Applications

Review of the draft and progress in editing

SIS Area Fall 2023 Status + Meeting Objectives (2/2)



Consultative Committee for Space Data Systems

DTN WG

BPv7

BPv7 Extensions

DTN Multipoint Delivery (orange book)

DTN Network Management
(Blue and Green Books)

Compressed Bundle Status Reporting
(Orange book)

LTP reaffirmation

HPRP book
(Orange book)

Joint DTN/SEA-SEC

Finalisation plan

QoS/Priority assignment (joint DTN-MIA meeting)
DTN System Bootstrapping/Auto Configuration
Bundle in Bundle Encapsulation

Discussion of the content based on the already
available material

Discussion and consolidation of the
content

Review of the current content and next steps

Discussion about SANA-related issues

Discussion about the draft and its consolidation

DTN/BPv7 role in mission security architecture

SLS Meeting Objectives: 1/2



- **RF & Modulation WG (D. Lee & G. Sessler)**
 - **415.0-B 2 GHz CDMA Links for Data Relay Satellites**
 - Pink sheets to add on-regenerative PN ranging and lunar relayAchieve consensus on updates
 - **401.0-B Pink Sheets**
 - Possible reorganization of 401.0 Part 2 with data relay recommendationsDiscussion
 - **413.1-G**
 - Add annex on GMSK+PN tracking performance under high Doppler conditionsFinalization of updates
 - **211.1-B Proximity-1 Physical Layer**
 - Revisions for S-band frequencies and lunar Prox-1Discussion (Joint RFM/SLP/C&S Meeting)

- **Space Link Code/Sync WG (A. Modenini & K. Andrews) – meeting already held**
 - **Slicing**
 - Update of 131.0-B for TF slicing
 - Update of 131.0-B for Turbo interleaverAchieve consensus on updates
Achieve consensus on updates
 - **Joint topics**
 - VCM Green Book (C&S, RFM)
 - Proximity-1 (SLP, C&S, RFM)
 - Status of Slicing for potential use of Variable Length Frames (SLP, C&S, OPT)Introduction of a proposed new project
Discussion
Status check

- **Space Link Protocols WG (G. Kazz & M. Cosby)**
 - **133.0-B-2 Space Packet Protocol**
 - Technical corrigendum on optional idle packetsDiscussion, achieve consensus
 - **732.1-B Unified Space Link Protocol**
 - Agency Review RIDsDiscussion, achieve consensus on updates
 - **211.0-B Proximity-1 SDLP – New Normative Annexes**
 - Directive set for Lunar operations
 - Default session access control parametersDiscussion, achieve consensus on updates
Discussion, achieve consensus on updates
 - **211.0-B split into 3 components**
 -Discussion
 - **5-year Due Diligence**
 -Status check
 - **Joint topics**
 - Proximity-1 (SLP, C&S, RFM)Discussion

SLS Meeting Objectives: 2/2



- **Space Data Link Security (SDLS) WG (G. Moury & H. Weiss)**
 - **350.11-G SDLS Extended Procedures**
 - Review of final version
 - **New protocol employing post quantum crypto to complement SDLS**
 - **Security services for LunaNet communications service providers**

- **Data Compression (DC) WG (M. Wong & L. Santos)**
 - **124.0-G Robust Compression of Fixed-length Housekeeping Data**
 - **123.0-B3 Low-Complexity Lossless and Near-Lossless Multispectral and Hyperspectral Image Compression**
 - **125.0- B Raw SAR Compression**

- **Optical Communications WG (B. Edwards & C. Heese)**
 - **Coherent Blue Book**
 - Fading Mitigation Approaches
 - Proposals from ESA, CNES and JAXA
 - **O3K Recommendations, Prototypes and Yellow Books**
 - Comparison of O3K LDPC and the LDPC being used by the Space Development Agency
 - O3K Ranging Prototype
 - **Atmospheric Monitoring and Prediction Update**
 - **Agency Presentations on Topics of Interest**
 - ESA Specification for Terabit/sec for Optical Links (part of the HyDRON program)
 - ESA presentation on Quantum Key Distribution

Review and Finalization of the document

Presentation

Discussion

Review and achieve consensus for Agency Review

Review draft and submit version 3 BB for review

Review and resolve technical issues within WG

Review

Review

Discussion

Discussion

Discussion

Discussion

Discussion

SOIS Area Fall 2023 Status + Meeting Objectives (1/2)



Application Support WG

- Ongoing discussions with Artemis mission engineers on use of EDS for operational interface definitions
- Completion of interoperability tests and documentation for 876.0-P-1.1 XML Specification for Electronic Data Sheets (Pink sheets)
- Disposition of open items from recent interoperability tests on Git repository
- Submitted 876.1 Specification for Dictionary of Terms for publication. Addressing one RID from SEA and SANA registry
- Submitted request for Publication of CCSDS 870.0-G-1, Electronic Data Sheets and Dictionary of Terms for Onboard Devices and Components (Green Book, Issue 1).
- Discussion of new project SEDS container magenta book
- Support meetings with SEA, DTN
- Discuss and update SOIS project schedules in CWE based on resource availability

Subnet WG Joint meeting with Subnet WG

- Discussion of Subnet 5-year review updates
- SOIS Sub-network Synchronization Service 5 Year Book Review
 - Discussion on integration of other standards (like Precision Time Protocol (PTP))
- SOIS Sub-network Device Discovery Service 5 Year Book Review
 - Updates to SOIS device discovery/enumeration with focus on use cases for crewed systems (in orbit and surface)

SOIS Area Fall 2023 Status + Meeting Objectives (2/2)



Wireless WG

- All meetings virtual
- Resolved RIDs on CCSDS 883.0-P-1.1 following Agency review
 - Finalizing SANA issues with SEA AD, then submit resolution for publication
- Establishing interoperability test capability at NASA-JSC
- Discuss updates on relevant agency wireless activities
 - NASA
 - CSA
 - DLR:
 - Roscosmos
 - CNES
- Discuss new Projects
 - CCSDS-883 BBv3 (additional material on 5G)

CSS Area Spring 2023 Status + Meeting Objectives (1/2)



Cross Support Transfer Services WG

Latest SLE Books (RAF, RCF, ROCF, FCLTU)	All published
Return CFDP PDU (Experimental Standard)	Published
CSTS Concept Book	Published
Functional Resource Model (MB)	Working on resolving CESG Publication Poll conditions
Functional Resource Model (SANA+)	Completed Tier 2 resource definitions; CCSDS review pending; Tier 3 resource definitions in progress
Service Control – SC-CSTS	Review progress/latest version, discuss prototyping plans
Cross Support Reference Model	Resolution for retirement issued

Cross Support Service Management WG

Abstract Event Definition (MB)	Resolution for Technical Corrigendum issued
Service Management Concept (GB)	Survey for refresh
Simple Schedule Format (SSF)	Survey for refresh
Common Data Entities (MB-2)	Review for publication
Service Management Utilization Request Format (BB)	Review prototype plan to enable publication
Service Package Data Format (BB)	Review prototype plan to enable publication
Configuration Profile, Service Agreement (BB)	Project created; review draft so far
Event Sequence (BB)	Review draft material developed; discuss project creation
Management Service	Review draft book outline; discuss, develop

CSS Area Fall 2022 Status + Meeting Objectives (2/2)



Cross Computing BOF (Concluded)

Concept Paper/Report

Done

Would you like to be a participant in producing data delivery standards applicable in a cloud computing environment?

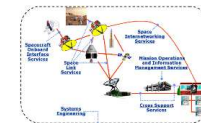
CSS (Area Level)

Plenary

Discuss, coordinate regarding FRM classification metadata;

Use of GitHub – CSSM and CSTS repositories are now available on GitHub;

Discuss ways to make CSS Area standards development faster, better known and/or more appealing for “NewSpace” ventures



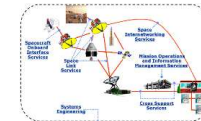
Systems Engineering Area (SEA) Opening Plenary

Fall 2023 Meetings

Peter Shames (Area Director)
Hiroshi Takeuchi (Deputy Area Director)

Nov 2023

Systems Engineering Area Status



Security Working Group:

- Plans
 - On-going work on Key Management GB, DTN/BPsec, and Intergov Cloud Certificate Authority (IGCA). Progress on new work items for Secure SW Engineering and new Space ATT&CK framework. New Deputy WG Chair.
 - Problems / Issues: Design of security architecture for DTN multi-mission space deployments needs attention for SSI Stage 2(a/b).

Systems Architecture Working Group:

- Plans
 - Complete draft of RASDS++ with integrated TC20/SC14 revisions, new ontology & representation views created. External review with Systems Architecture experts is planned.
 - SCCS-ARD revisions nearly complete, both ABA and SSI now quite well in hand. New, more compact, tabular format by Nodes types. New standards, including optical comm, USLP, SM, and many other documents included.
- Problems / Issues: We have a coherent group but very limited resources. NASA is the only agency supporting this CCSDS-wide Architecture work.

Delta-DOR Working Group:

- Plans
 - MB on Architecture is at Tech Writer, BB & Operations MB update in process. New PN DOR tones will be included in next RFM update. Considering changes for new Quasar flux database, fluxes for multiple baseline, and same beam interferometry.
- Problems / Issues: Small, but effective, working group with all three agencies participating in this meeting.

Time Management WG:

- Plans
 - Working group has produced Green Book, at Tech Writer. Active participation by five agencies. Plan for a single Time Management Blue Book is formulated. New WG Chair, Deputy position is open.
- Problems / Issues
 - The LunaNet CPNT work, and other IOAG network requirements, are more extensive than this BB, it may not be ready in time to be effective.

SANA and SANA Steering Group (SSG):

- Plans
 - BETA website incorporating ISO TC20/SC14 terms has been updated, being evaluated by SC14. Many new process and feature improvements, increased ease of use.
- Problems / Issues
 - AOS SCIDs are now all used. No more S & X band identical SCIDs are available. Agency HOD must assign Agency Representation (AR) to update their agency data in "Enterprise" registries. Service Site and Aperture (SS&A) registry access supports direct AR updates to apertures.

Spring 2024 Meetings

NIST
**National Institute of
Standards and Technology**
U.S. Department of Commerce



- **Hosted by the National Institute of Standards and Technology (NIST).**
- **Venue will be at the Department of Commerce (Herbert C. Hoover Building), in Washington, DC.**
- **Spring Technical Plenary to scheduled for 29 April-3 May, with CESG meetings occurring 6-7 May.**
- **Group hotel accommodation rates and other details to be announced.**
- **Closest airport is DCA-Regan Ronald Reagan Washington National Airport located less than 2km from venue.**