**European Space Agency**

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**Strategic Plan of the Consultative Committee for Space Data Systems**

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# Strategic Plan of the Consultative Committee for Space Data Systems

## Introduction to CCSDS

The Consultative Committee for Space Data Systems (CCSDS) was formed in 1982 by letter of agreement, signed by responsible officials of the participating national and international space agencies

Since its formation, the CCSDS has developed and published many documents (“Recommendations for Space Data System Standards”, herein usually referred to as “CCSDS Standards”), the majority of which have become full international standards. Over 100 CCSDS documents are currently active and applicable in widespread use across the international space community. Note that CCSDS Recommended Standards may be adopted as the basis for international agreements, or they may be incorporated into local standards that form the controlling documentation for such agreements.

In 1990, Technical Committee 20 (TC 20) of the International Organization for Standardization (ISO) formed Subcommittee 13 (SC 13), Space Data and Information Transfer Systems. Recognizing CCSDS as a leading international authority in developing standards for space-related information technologies, ISO agreed that CCSDS has the primary responsibility for technical development of standards that are approved by ISO TC 20/SC 13.

The purposes of the CCSDS are contained in the Charter (above). Broadly, they are to provide an international forum in which the CCSDS agencies can discuss common space data communications and service-based needs and arrive through consensus at standard solutions to those needs, thereby increasing efficiency and interoperability among agencies, and decreasing costs

This Strategic Plan has been approved by the CCSDS Member Agencies. It is intended that the Strategic Plan should be updated whenever necessitated by changing events (or at least every 5 years) to redefine the organization’s current objectives, domains for standardization, and strategic goals. The Strategic Plan also serves to reaffirm the cooperative agreements entered into by the founding and continuing members of the CCSDS

CCSDS’ online Collaborative Work Environment (CWE) supports this Strategic Plan by providing organizational details, charters of each working group, project definitions and resource matrices, online polling, and a host of other collaborative tools designed to assist in document development and lead to better understanding of the CCSDS. The CWE is maintained by the CCSDS Engineering Steering Group, and is updated in real time as charters are approved.

## CCSDS Operating Concept

The CCSDS executes its business in accordance with document CCSDS A02.1-Y-4 Organization and Processes for the Consultative Committee for Space Data Systems. Within the terms of that document, the CCSDS provides the environment and infrastructure whereby:

1. The international space community—the member and observer space agencies and their commercial partners—can openly discuss common problems associated with implementing space mission information and communication systems so as to identify where standard solutions will be beneficial.
2. Technical experts within the community can develop the necessary standards and practices. The resources needed for these activities are provided primarily by the participating agencies at levels commensurate with their individual requirements. Where mutual interests exist, the CCSDS will develop technical alliances with other organizations as appropriate.
3. The community can formally review and comment on those standards and practices as their development progresses.
4. The CCSDS Member Agencies can approve the publication of standards and practices when their review is complete and consensus is achieved.
5. The approved standards and practices are made available for adoption and use across the community.

In the process of developing CCSDS standards, the community will, as a first priority, adopt existing standards and approaches rather than developing something new. If an existing standard or innovative technical approach cannot be adopted as is, the second priority is to adapt it to fit the needs of the space community. As a final resort, when nothing exists that can be adopted or adapted, the community will develop new technical approaches to meet the needs of the spaceflight community. This is the basis of the CCSDS mantra to “adopt/adapt/develop”, in that order.

Additionally, in providing these functions, the CCSDS is committed to:

* allowing the CCSDS participating agencies (at their individual discretion) to open the standardization process, on a voluntary basis, to all interested parties across their government, private sector, and academic space communities;
* using experimentation, prototyping, and demonstration as integral components of standards development;
* encouraging partnerships between space agencies and the commercial sector to produce commercial off-the-shelf (COTS) hardware and software so that the standards can be used to build space mission communication and information systems that are scalable, quick to integrate, low in cost, and interoperable among different users.

While the primary objective of CCSDS will always be to encourage cooperative spaceflight missions through interoperability of data and communications systems, there is a secondary objective of encouraging commercial development of standardized components to lower risk, improve efficiency and reduce cost. As a result, the scope of CCSDS occasionally may include “intra-operability” between components of an agency’s spaceflight systems, as well as interoperability between agencies. This could be to support (in rare cases) application migration between agencies (by development of application programming interfaces) as well as commercialization of plug-in components with standardized system interfaces. While these are allowable CCSDS objectives for some projects, they will always be secondary in priority to the goal of interoperability to enable multinational spaceflight missions.

## CCSDS Target Missions and “CCSDS Conformance”

Standardization is widely recognized as a vehicle for interoperability and to stimulate the development of world markets. To help develop space as an international marketplace, CCSDS standards aim to support the data information, communications, and service needs of a wide, but not totally inclusive, set of space missions. Primary CCSDS target missions include civilian spacecraft and landed vehicles operating in Earth orbit, within the Earth-Moon system, in deep space, and on and around other Solar System bodies.

While no kind of mission—civil, military, commercial, robotic, piloted—is specifically excluded from the interests of CCSDS, it is recognized that some spacecraft provide specialized data-handling services that are well supported by their own user communities or by other standardization bodies. For example, commercial voice, data, and video broadcasting satellites may use their own transponder data communications protocols, and commercial Earth-observing satellites may use their own private data distribution protocols, yet they both may use CCSDS standards to support other parts of their mission infrastructure—such as Tracking, Telemetry, and Command (TTC) functions. As a natural consequence, CCSDS is constantly motivated to consider the establishment of formal and technical liaisons with other organizations as a means for expanding space data systems standardization on a worldwide basis.

CCSDS therefore aims to perform the necessary outreach to seek the widest possible set of target missions. There are multiple interfaces at which “CCSDS conformance” may be achieved by following defined CCSDS interface standards, protocol/information proformas and profile requirements lists. However, conformance with a single particular standard will not necessarily result in interoperability unless both parties to the data exchange also agree to use the same “stack” of underlying standards.

## CCSDS Objective

The objective of the CCSDS is to harmonize and lead the worldwide standardization of space mission information and communication systems, thus promoting international cooperation and enabling these space systems to be effectively integrated with their terrestrial data communications and information systems counterparts.

## Rationale

CCSDS provides the means whereby space agencies can reach voluntary consensus on standardized solutions to common problems associated with the design of compatible space mission information and communication systems. The fruits of that consensus are made available across the space community in the form of new international standards, along with hardware and software (e.g., a future CCSDS Open Source Library) that facilitate their adoption. Theses standards enable space agencies to utilize space and ground assets of other agencies to execute their missions and therefore reduce their cost and operation risk. Standardization (through standardized products and COTS products) enhances the international exploration and exploitation of space by increasing the use and value of the information gathered, while simultaneously realizing significant savings in cost and development time for all participants.

## CCSDS Management, External Relations, and Outreach Strategic Goals

In order to maximize the benefits of standardization, CCSDS has as an objective to disseminate the results of its standardization activities and promote their worldwide adoption. This includes promotion of CCSDS standards within the member organizations’ programs and outreach towards other space communities. Tracking and reporting the infusion of the standards in space programs within member organizations also serves this purpose

CCSDS shall promote:

* the use of CCSDS standards within projects and technical support sections of the CCSDS Member Agencies;
* that CCSDS standards are adopted by—either in whole or in part—the missions of a large majority of all civil, military, and commercial spacecraft that are launched.

CCSDS facilitates adoption of its standards and support to its users by providing:

* online capabilities that give an expanded capability to support CCSDS users
* software implementations and tutorial information;
* information on benefits which would be gained as a result of adopting each CCSDS standard.

In order to increase the productivity and impact of the standardization activities, it is important to increase the number of agencies that actively contribute to the development of new standards in CCSDS by leveraging the agencies’ resources and expertise.

CCSDS will continue its strong relationships and ties with ISO to further the stature and pre-eminence of CCSDS standards in the international community

CCSDS has achieved greater international visibility by responding to requests for support to other governing and coordinating bodies on the topic of spaceflight. An example of this is the report that CCSDS provided to the United Nations Committee on the Peaceful Uses of Outer Space; the Working Group on the Long-term Sustainability of Outer Space Activities. CCSDS shall continue to provide responses to such requests, and will further seek out additional opportunities for similar outreach

In order to extend the CCSDS body of standards with sufficient lead time to keep pace with the new requirements of space missions to be flown in the coming decades, CCSDS shall conduct continuing outreach that will build liaisons with CCSDS stakeholders (space missions and space mission support organizations) as well as with other standardization organizations and with other space communities. The new requirements include:

* constellations of spacecraft in the vicinity of the Earth and the Moon;
* constellations of spacecraft in deep space;
* orbiting and in-situ landed vehicles deployed around and on other Solar System bodies;
* commercial and military missions;
* space- and ground-based cross support among an increasingly interdependent set of international users.

## CCSDS Standardization Concept

CCSDS exists to develop the necessary agreements that allow standardized space communication between participating organizations. When a standard service is offered by one organization and is used by another, an instance of CCSDS cross support has occurred. When information flows across the interface that is created in accordance with standard data exchanges or protocols under well-defined interoperable profiles, an instance of CCSDS interoperability has occurred.

It is a CCSDS core requirement that recommended standards and practices must be developed to facilitate interoperability and cross support.

In order to satisfy this requirement, CCSDS establishes technical areas for standardization. Although they are intended to be relatively stable entities, areas may be added or deleted in response to changes in space mission environment.

As shown in Figure 1, six technical areas form the current working structure of CCSDS. Each area contains narrowly chartered working groups (not shown here) that concentrate on the production of specific recommended standards and practices within the theme of that parent area.



Figure 1: CCSDS Technical Areas of Standardization

As shown in Figure 1, six technical Areas form the current working structure of CCSDS. Each Area contains narrowly chartered Working Groups that concentrate on the production of specific recommended standards and practices within the theme of that parent Area.

1. The Spacecraft On-board Interfaces Services area shall define the on-board data-handling interface between payloads or subsystems and their carrier spacecraft.
2. The Space Link Services area shall define the data-handling interfaces between multiple free-flying spacecraft/landed elements, and between free-flying spacecraft/landed elements and their ground support networks.
3. The Cross Support Services area shall define the data-handling interfaces between ground support networks and ground user facilities.
4. The Mission Operations and Information Management Services area shall define the mission control application protocols and services that traverse the logical (end-to-end) interface between user facilities and payloads/subsystems in space, and between multiple ground-user facilities.
5. The Space Internetworking Services area supports the Mission Operations and Information Management Services area and shall define the end-to-end data communications protocols and services that traverse interface between user facilities and payloads or subsystems in space.

The Systems Engineering Area supports each of the other five areas and shall define the common or cross-cutting conventions and interfaces that support the end-to-end architecture.

# CCSDS High-Level Goals

**Preface**

The overall goal as expressed in the [CCSDS Charter](http://public.ccsds.org/about/charter.aspx) is the enabling of interoperable spaceflight missions by producing standards in the communications and data systems area. The strategic goals that follow are intended to be unique approaches to better enable that charter

**Overall Strategic Goals**

The CCSDS Mission Statement is “Advancing interoperability among international space agencies by developing internationally agreed interoperable space communication standards”

In order to enable the next generation of spaceflight missions, CCSDS is aiming at technology evolution and innovation through the process of developing, validating, maintaining and promoting a body of unique space data systems standards, focusing on interoperability of space systems and cross-support between space organizations.

CCSDS shall keep pace with the new requirements of space missions to be flown in the coming decades for scientific, exploration, commercial, and defense purposes, as reflected in relevant roadmaps of participating agencies and inputs and recommendations of other organizations and bodies, like the Interagency Operations Advisory Group (IOAG), International Space Exploration Coordination Group (ISECG) and others.

CCSDS shall keep pace with technology advancements in the industry. While we respect and learn from requirements of current missions, future missions are the primary target of CCSDS standards. CCSDS strives to develop new interoperability capabilities, which will enable a new set of missions, some of which are not even yet envisioned.

**Technical Strategic Goals**

The strategic technical objectives and goals below are not intended to be all-inclusive of ongoing CCSDS work, nor are they grouped by organization or teams within CCSDS; rather, they are intended to be the more strategic and high-level initiatives guiding the current and future direction of the CCSDS as a whole. Grouping of the goals naturally reflects the direction of the CCSDS organization and the common-sense breakdown of technical disciplines.

## TECHNICAL GOAL 1

To define innovative, secure, widely applicable communication standards and related architectures that facilitate interoperability and cross support and meet the challenges and anticipated needs of the future projects, including:

* the use of higher frequency bands (radio frequency and optical);
* the achievement of higher data rates and volumes with simultaneously greater spectral efficiency through more capable protocols, modulation, coding, and compression techniques;
* the achievement of higher accuracy distance and velocity measurements of near-Earth and deep-space missions;
* the use of secure communication protocols and links to protect associated systems and information flows

## TECHNICAL GOAL 2

To define a complete suite of interoperable, cross support planning, data delivery, and control service interfaces, implementing an efficient management of the cross support services, providing end-to-end solutions, and meeting mission challenges, including:

* integrated mission planning for combined interagency operations taking into account resource needs;
* simplification and improved efficiency of cross support service request, delivery, and governance;
* call-up of international cross support during spacecraft emergencies;
* a complete suite of cross support interfaces supporting forward- and return-data transfers, radiometric data, monitor data, and service control;
* cross support file transfer operations such as: radiometric, Delta Differential One-way Ranging (Delta-DOR), off-line data, and space file transfer.

## TECHNICAL GOAL 3

To define the full suite of mission operations standard functions and services to enable ground and on-board interoperability at the Application Layer level in support of complex joint collaborative missions and of the standardization of the corresponding ground data systems interfaces, in order to meet the needs of future projects, including:

* implementation of multi-mission spacecraft and instrument mission operations services;
* exchange of mission plans between cooperating agencies;
* conjunction assessment, navigation, tracking, and trajectory prediction;
* interoperability of robotic systems for cross-agency support

## TECHNICAL GOAL 4

To define an integrated set of space internetworking standard services in support of end-to-end communications between applications for the full scope of future joint collaborative missions, covering the entire Solar System, and meeting future project needs, including:

* jointly conducted human and robotic operations;
* management of space-to-space and direct-to-Earth links as part of the network;
* sensor web and other innovative technologies for low Earth orbit (LEO) operations;
* application to the space domain of well-established internetworking technologies;
* fully automated routing across networks end-to-end;
* end-to-end file and message transfer operations.

## TECHNICAL GOAL 5

To define reference on-board communications architectures and services supporting efficient data-handling applications and future system evolution, including:

* standardized avionics architectures;
* advanced technologies, such as wireless communications and software-defined radios;
* innovative approaches such as plug-and-play approaches and electronic data sheets;
* on-board autonomy capabilities.

## TECHNICAL GOAL 6

To define cross-cutting functions and end-to-end system architectures, in support of interoperability and cross support, overarching and underpinning the above goals, and facilitating addressing global challenges, including:

* cyber security;
* reference system architectures;
* information models and architectures;
* systems-of-systems interoperability;
* CCSDS support services and capabilities

# CCSDS Area Objectives and Goals

## SYSTEMS ENGINEERING AREA

The objective of the Systems Engineering Area (SEA) is to address system-wide architectural and engineering topics that are so pervasive that they span over all, or several, other CCSDS areas. This work includes development of specific standards and guidelines, development of system architectures and models, coordination/collaboration with other areas, and otherwise supporting CCSDS and CMC engineering and operational goals.

The SEA system architecture tasks include end-to-end reference architecture, architecture analysis and description methods, and related cross cutting terminology topics. The SEA security architecture and standards are to be used by other CCSDS areas requiring security guidance and services. The Delta-DOR services touch upon the Cross Support Services (CSS) and Space Link Services (SLS) areas, and Mission Operations and Information Management Services (MOIMS) may be involved in planning for use of these services. The information architecture and registry services also cross cut MOIMS, CSS, Space Internetworking (SIS), and other Services. Extensible Markup Language (XML) standards and guidelines and other special cross-cutting topics that are guided by SEA affect all of the other areas. As system or information architecture standards are developed, SEA will coordinate with the other CCSDS areas and working groups to develop approaches that align with CCSDS goals for interoperability and cross support. The strategic goals of the SEA are listed below.

### SEA GOAL 1

Complete a security architecture and the framework, infrastructure mechanisms, and techniques to protect system elements, communication links, networks, and information as it flows through the end-to-end space mission system.

### Related CCSDS Technical Strategic Goals:

1, 6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 350.0-G-2 The Application of CCSDS Protocols to Secure Systems. | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.1-G-1 Security Threats against Space Missions | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x1g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.2-G-1 Encryption Algorithm Trade Survey | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x2g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.3-G-1 Authentication/Integrity Algorithm Issues Survey | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x3g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.4-G-1 CCSDS Guide for Secure System Interconnection | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x4g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.6-G-1 Space Missions Key Management Concept | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x6g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.7-G-1 Security Guide for Mission Planners  | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x7g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.8-G-1 Information Security Glossary of Terms | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x8g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 350.9-G-1 Cryptographic Algorithms | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x9g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 311.0-M-1 Reference Architecture for Space Data Systems  | [Click Here for More Information](http://public.ccsds.org/publications/archive/311x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 351.0-M-1 Security Architecture for Space Data Systems | [Click Here for More Information](http://public.ccsds.org/publications/archive/351x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 352.0-B-1 Cryptographic Algorithms | [Click Here for More Information](http://public.ccsds.org/publications/archive/352x0b1.pdf%E2%80%8E%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 350.1-G Security Threats against Space Missions (Issue 2) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=351" \t "_blank) |
| CWE Doc. 353.1-G-1 Cryptographic Algorithms | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=350" \t "_blank) |
| CWE Doc. TBD Symmetric Key Management Rationale (Green Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=369" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD Symmetric Key Management Recommendations (Magenta Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=84" \t "_blank) |
| CWE Doc. TBD Network Layer Security Adaptation Profile (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=352" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD CCSDS Authentication Credentials (Blue Book) |  |
| CWE Doc. TBD Network layer Security over Space Packets (Blue Book) |  |
| CWE Doc. TBD Secure Software Engineering for Space Missions (Green Book) |  |
| Five year confirmation Review process for published recommended standards and practices |  |

### SEA GOAL 2

Define the mechanisms for performing Delta-DOR spacecraft ranging operations and the exchange and processing of observational data. Ensure that operational planning (service management and DOR tones) and ancillary tasks (Quasar reference sources) are well specified.

### Related CCSDS Technical Strategic Goals:

2, 3, 6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 500.1-G-1 Delta-DOR—Technical Characteristics and Performance | [Click Here for More Information](http://public.ccsds.org/publications/archive/500x1g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 506.0-M-1 Delta-Differential One Way Ranging (Delta-DOR) Operations  | [Click Here for More Information](http://public.ccsds.org/publications/archive/506x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 506.1-B-1 Delta-DOR Raw Data Exchange Format | [Click Here for More Information](http://public.ccsds.org/publications/archive/506x1b1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 500.1-G Delta-DOR Technical Characteristics and Performance (Issue 2) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=380" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CCSDS 506.1-B-2 Delta-DOR Raw Data Exchange Format (Blue Book, Issue 2) |  |
| CWE Doc. 506.0-M Delta-Differential One Way Ranging (Delta-DOR) Operations (Magenta Book) (Issue 2) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=378" \t "_blank) |
| CWE Doc. TBD Delta-DOR Architectural Guidelines (Magenta Book) |  |
| CWE Doc. TBD Delta-DOR Quasar Catalogue (Magenta Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=379" \t "_blank) |
| **Future Work** |
| Five year confirmation Review process for published recommended standards and practices |  |

### SEA GOAL 3

Complete a reference information architecture, information infrastructure services including service-oriented architecture (SOA) and interfaces, and frameworks for handling operational data flows and supporting multi-agency federated data systems.

### Related CCSDS Technical Strategic Goals:

1,2,3,6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 312.0-G-1 Reference Architecture for Space Information Management | [Click Here for More Information](http://public.ccsds.org/publications/archive/312x0g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 311.0-M-1 Reference Architecture for Space Data Systems  | [Click Here for More Information](http://public.ccsds.org/publications/archive/311x0m1.pdf%22%20%5Ct%20%22_blank) |
| **Future Work** |
| CWE Doc. TBD Reference Information Architecture, Infrastructure Services and Interfaces (Magenta Book)  |  |
| Five year confirmation Review process for published recommended standards and practices |  |

### SEA GOAL 4

Define the XML standards and guidelines to be used across all CCSDS areas.

### Related CCSDS Technical Strategic Goals:

1,2,4,5,6

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| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD CCSDS XML Namespace RFC (Internet Draft) |  |
| CWE Doc. TBD XML Namespace Policy (Yellow Book) |  |
| **Future Work** |
| CWE Doc. TBD XML Standards and Guidelines (Yellow Book) |  |
| Five year confirmation Review process for published recommended standards and practices |  |

### SEA GOAL 5

Define an extensible timeline data standard for exchange of linear and activity timelines to be used across all CCSDS areas.

### Related CCSDS Technical Strategic Goals:

1,2,3,4,5,6

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| **Future Work** |
| CWE Doc. TBD Timeline Data Standard (Blue Book) |  |

### SEA GOAL 6

Define an overall time services architecture for time correlation, synchronization, and distribution, for end-to-end mission operations and cross support throughout the mission lifecycle.

### Related CCSDS Technical Strategic Goals:

1,2,3,4,5,6

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| **Existing Recommended Standards / Practices** |
| CCSDS 301.0-B-4 Time Code Formats | [Click Here for More Information](http://public.ccsds.org/publications/archive/301x0b4e1.pdf%22%20%5Ct%20%22_blank) |
| **Future Work** |
| CWE Doc. TBD Time Service Architecture (Magenta Book) |  |
| Five year confirmation Review process for published recommended standards and practices |  |

### SEA GOAL 7

Produce a consistent set of CCSDS architectures, information models, and policies. Produce a CCSDS Application Layer Architecture showing the relationships among all of the application layer standards and services and their relationships to supporting standards for space communication and cross support. This is a companion document to the Space Communication Cross Support architecture (SCCS-ADD) that documents SLS, SIS, CSS, and SEA standards relationships. Work with MOIMS and SOIS to document the relationships between the standards in these two areas and with those already documented in the SCCS-ADD. Revise the CCSDS Reference Architecture for Space Data Systems (RASDS) to accomplish its 5-year review and, in a second phase, augment the existing document with methods using Model-Based System Engineering (MBSE) and SysML. Working with the other areas, update the CCSDS Glossary to provide a self consistent and unambiguous set of terms. Create a Registry Management Policy and related procedures and information models for managing the sets of registry information created by the other CCSDS areas.

### Related CCSDS Technical Strategic Goals:

1,2,3,4,5,6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 350.9-G-1 Cryptographic Algorithms | [Click Here for More Information](http://public.ccsds.org/publications/archive/350x9g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 901.0-G-1 Space Communication Cross Support Architecture – Architecture Description Document | [Click Here for More Information](http://public.ccsds.org/publications/archive/901x0g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 311.0-M-1 Reference Architecture for Space Data Systems  | [Click Here for More Information](http://public.ccsds.org/publications/archive/311x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 313.0-Y-1 Space Assigned Numbers Authority (SANA)-Role, Responsibilities, Policies and Procedures (Issue 2) | [Click Here for More Information](http://public.ccsds.org/publications/archive/313x0y1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 320.0-B-6 CCSDS Global Spacecraft Identifier Field: Code Assignment Control Procedures (issue 7) | [Click Here for More Information](http://public.ccsds.org/publications/archive/320x0b6c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 901.1-M-1 Space Communication Cross Support Architecture – Architecture Requirements Document | [Click Here for More Information](http://public.ccsds.org/publications/archive/901x1m1.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD Symmetric Key Management Recommendations (Magenta Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=84" \t "_blank) |
| **Future Work** |
| CCSDS 311.0-M Reference Architecture for Space Data Systems (Issue 3, MBSE and other extensions) |  |
| CCSDS 311.0-M Reference Architecture for Space Data Systems (Magenta Book, Issue 2) |  |
| CWE Doc. Registry Management Policy (including policy, procedures, and information models) |  |
| CWE Doc. TBD CCSDS Application Layer Architecture (Magenta Book) |  |
| CWE Doc. TBD CCSDS Glossary updates (SANA) |  |
| Five year confirmation Review process for published recommended standards and practices |  |

## MISSION OPERATIONS AND INFORMATION MANAGEMENT SERVICES AREA

The objective of the MOIMS area is to address all application-level standards and their associated information management that are required to operate spacecraft and robots, and their ground system in response to mission requirements and any data handling and archival systems making use of the information gathered by the mission. The focus of this area is primarily on the Mission Operations (MO) data and services that are required for preparing and conducting space mission operations and the archival systems maintaining the information obtained. These application-level standards will facilitate the availability of plug-in components exposing standard service interfaces, which will allow a simplified and economical assembly of both space and ground segments and enable interoperability and operations automation. Consistency at data and service level within MOIMS shall be achieved by adherence of new standards to the MO Service Framework and the Reference Model for Open Archival Information Systems (OAIS).

The MOIMS area needs to coordinate with:

* the CSS area that is responsible for the interfaces between the mission control systems and the ground network/stations, including for ground station planning and scheduling;
* the SEA area on matter regarding the CCSDS System Architecture, Security and XML guidelines;
* the SOIS area on matter related with potential MO services on-board;
* all areas, including within MOIMS, for the provision of consultancy and support on the potential use of the MO Service Framework;
* the SANA on matter regarding practices for registries and repositories.

The strategic goals of the MOIMS area are listed below.

### MOIMS GOAL 1

Establish the content and format for tracking, attitude, trajectory, pointing, and maneuver data to enable the exchange of navigation information (e.g., position, velocity, and attitude).​.​

### Related CCSDS Technical Strategic Goals:

2,3,6

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| --- |
| **Existing Recommended Standards / Practices** |
| CCSDS 502.0-B-2 Orbit Data Messages | [Click Here for More Information](http://public.ccsds.org/publications/archive/502x0b2c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 503.0-B-1 Tracking Data Message | [Click Here for More Information](http://public.ccsds.org/publications/archive/503x0b1c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 504.0-B-1 Attitude Data Messages | [Click Here for More Information](http://public.ccsds.org/publications/archive/504x0b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 505.0-B-1 XML Specification for Navigation Data Messages | [Click Here for More Information](http://public.ccsds.org/publications/archive/505x0b1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 500.0-G Navigation Data Message Overview | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=170" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 502.0 Orbit Data Message (ODM) 5 Year Review Revision  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=505" \t "_blank) |
| CWE Doc. 503.0 Tracking Data Message (TDM) 5 Year Review Revision  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=385" \t "_blank) |
| CWE Doc. 504.0 Attitude Data Message (ADM) 5 Year Review Revision | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=411" \t "_blank) |
| CWE Doc. 510.0 Navigation Hardware Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=190" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD Events Message (Predicted Orbital Events) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=554" \t "_blank) |
| CWE Doc. TBD Spacecraft Perturbation Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=553" \t "_blank) |
| CWE Doc. TBD Spacecraft Re-Entry Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=552" \t "_blank) |

### MOIMS GOAL 2

Enable the exchange of space situational awareness information between navigation data originators and satellite owner/operators and other authorized parties via Orbit Data Messages (ODMs) (for prediction), Tracking Data Message/Navigation Hardware Message (TDM/NHM) (for tracking data used in orbit determination), Spacecraft Maneuver Message (SMM) (for disseminating information regarding maneuvers), and the Conjunction Data Message (CDM) (for communicating a predicted conjunction collision).

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 500.0-G-3 Navigation Data—Definitions and Conventions | [Click Here for More Information](http://public.ccsds.org/publications/archive/500x0g3.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 502.0-B-2 Orbit Data Messages | [Click Here for More Information](http://public.ccsds.org/publications/archive/502x0b2c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 503.0-B-1 Tracking Data Message | [Click Here for More Information](http://public.ccsds.org/publications/archive/503x0b1c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 505.0-B-1 XML Specification for Navigation Data Messages | [Click Here for More Information](http://public.ccsds.org/publications/archive/505x0b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 508.0-B-1 Conjunction Data Message | [Click Here for More Information](http://public.ccsds.org/publications/archive/508x0b1e1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 551.1-O-1 Correlated Data Generation | [Click Here for More Information](http://public.ccsds.org/publications/archive/551x1o1e1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 500.0-G Navigation Data Message Overview | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=170" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 502.0 Orbit Data Message (ODM) 5 Year Review Revision  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=505" \t "_blank) |
| CWE Doc. 503.0 Tracking Data Message (TDM) 5 Year Review Revision  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=385" \t "_blank) |
| CWE Doc. 504.0 Attitude Data Message (ADM) 5 Year Review Revision | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=411" \t "_blank) |
| CWE Doc. 509.0 Pointing Requests Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=189" \t "_blank) |
| CWE Doc. 510.0 Navigation Hardware Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=190" \t "_blank) |
| CWE Doc. 511.0 Spacecraft Maneuver Message (SMM)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=267" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD Events Message (Predicted Orbital Events) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=554" \t "_blank) |
| CWE Doc. TBD Spacecraft Perturbation Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=553" \t "_blank) |
| CWE Doc. TBD Spacecraft Re-Entry Message | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=552" \t "_blank) |

### MOIMS GOAL 3

Specify an extensible framework for describing and packaging data and metadata, to share non-ambiguous data descriptions usable by software to enable the exchange and dissemination of data accompanied by the information required to use it.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 610.0-G-5 Space Data Systems Operations with Standard Formatted Data Units: System and Implementation Aspects | [Click Here for More Information](http://public.ccsds.org/publications/archive/610x0g5.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 621.0-G-1 Standard Formatted Data Units—A Tutorial  | [Click Here for More Information](http://public.ccsds.org/publications/archive/621x0g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 631.0-G-2 Standard Formatted Data Units—Control Authority Procedures Tutorial | [Click Here for More Information](http://public.ccsds.org/publications/archive/631x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 641.0-G-2 Parameter Value Language—A Tutorial | [Click Here for More Information](http://public.ccsds.org/publications/archive/641x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 645.0-G-1 The Data Description Language EAST—A Tutorial | [Click Here for More Information](http://public.ccsds.org/publications/archive/645x0g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 646.0-G-1 The Data Description Language EAST—List of Conventions | [Click Here for More Information](http://public.ccsds.org/publications/archive/646x0g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 620.0-B-2 Standard Formatted Data Units—Structure and Construction Rules  | [Click Here for More Information](http://public.ccsds.org/publications/archive/620x0b2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 622.0-B-1 Standard Formatted Data Units—Referencing Environment | [Click Here for More Information](http://public.ccsds.org/publications/archive/622x0b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 630.0-B-1 Standard Formatted Data Units—Control Authority Procedures | [Click Here for More Information](http://public.ccsds.org/publications/archive/630x0b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 632.0-B-1 Standard Formatted Data Units—Control Authority Data Structures  | [Click Here for More Information](http://public.ccsds.org/publications/archive/632x0b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 641.0-B-2 Parameter Value Language Specification (CCSD0006 and CCSD0008)  | [Click Here for More Information](http://public.ccsds.org/publications/archive/641x0b2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 643.0-B-1 ASCII Encoded English (CCSD0002) | [Click Here for More Information](http://public.ccsds.org/publications/archive/643x0b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 644.0-B-3 The Data Description Language EAST Specification (CCSD0010) | [Click Here for More Information](http://public.ccsds.org/publications/archive/644x0b3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 647.1-B-1 Data Entity Dictionary Specification Language (DEDSL)—Abstract Syntax (CCSD0011)  | [Click Here for More Information](http://public.ccsds.org/publications/archive/647x1b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 647.2-B-1 Data Entity Dictionary Specification Language (DEDSL)—PVL Syntax (CCSD0012)  | [Click Here for More Information](http://public.ccsds.org/publications/archive/647x2b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 647.3-B-1 Data Entity Dictionary Specification Language (DEDSL)— XML/DTD Syntax (CCSD0013)  | [Click Here for More Information](http://public.ccsds.org/publications/archive/647x3b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 661.0-B-1 XML Formatted Data Unit (XFDU) Structure and Construction Rules  | [Click Here for More Information](http://public.ccsds.org/publications/archive/661x0b1.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD Data Entity Dictionary Specificaton Language (DEDSL) - XML Schema | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=115" \t "_blank) |

### MOIMS GOAL 4

Specify widely applicable generic CCSDS requirements for data archival and retrieval, either during the mission life (preservation preparation), or on the long term. It includes acquiring, ingesting, managing, and disseminating data and metadata to, within, and from archives, and the data lifecycle management.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Existing Recommended Standards / Practices** |
| CCSDS 650.0-M-2 Reference Model for an Open Archival Information System (OAIS) | [Click Here for More Information](http://public.ccsds.org/publications/archive/650x0m2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 651.0-M-1 Producer-Archive Interface Methodology Abstract Standard | [Click Here for More Information](http://public.ccsds.org/publications/archive/651x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 651.1-B-1 Producer-Archive Interface Specification (PAIS) | [Click Here for More Information](http://public.ccsds.org/publications/archive/651x1b1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. TBD Producer Archive Interface Specification Tutorial | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=91" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD Information Curation Process | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=368" \t "_blank) |

### MOIMS GOAL 5

Establish the criteria that a repository must meet to be designated an “ISO Trusted Digital Repository”.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Existing Recommended Standards / Practices** |
| CCSDS 652.0-M-1 Audit and Certification of Trustworthy Digital Repositories | [Click Here for More Information](http://public.ccsds.org/publications/archive/652x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 652.1-M-2 Requirements for Bodies Providing Audit and Certification of Candidate Trustworthy Digital Repositories | [Click Here for More Information](http://public.ccsds.org/publications/archive/652x1m2.pdf%22%20%5Ct%20%22_blank) |

### MOIMS GOAL 6

Establish the CCSDS MO Service Framework to be used to specify MO Services in a technology and location independent manner for any application-level services between mission control systems and all other mission operations ground assets (except ground stations) and for end-to-end space-ground MO services via encapsulation/SLE tunneling, including mission planning and scheduling. Also, promote and support the use of MO Service Framework in other CCSDS WGs.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| Existing Informational Reports and Experimental Specifications |
| CCSDS 520.0-G-3 Mission Operations Services Concept | [Click Here for More Information](http://public.ccsds.org/publications/archive/520x0g3.pdf%22%20%5Ct%20%22_blank) |
| Existing Recommended Standards / Practices |
| CCSDS 520.1-M-1 Mission Operations Reference Model | [Click Here for More Information](http://public.ccsds.org/publications/archive/520x1m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 521.0-B-2 Mission Operations Message Abstraction Layer | [Click Here for More Information](http://public.ccsds.org/publications/archive/521x0b2e1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 521.1-B-1 Mission Operations Common Object Model | [Click Here for More Information](http://public.ccsds.org/publications/archive/521x1b1.pdf%22%20%5Ct%20%22_blank) |

### MOIMS GOAL 7

Specify an expandable suite of MO Services that shall be used for the interfaces between the mission control systems and all other mission operations ground assets (except ground stations) and for end-to-end space-ground. The preliminary list of MO Services includes: monitor & control; mission planning, scheduling and automation; mission data product distribution; navigation; time; software management; file management; data product management control.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 660.0-G-1 XML Telemetric and Command Exchange (XTCE) | [Click Here for More Information](http://public.ccsds.org/publications/archive/660x0g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 660.1-G-1 XML Telemetric and Command Exchange (XTCE)—Element Description | [Click Here for More Information](http://public.ccsds.org/publications/archive/660x1g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 660.0-B-1 XML Telemetric and Command Exchange (XTCE) | [Click Here for More Information](http://public.ccsds.org/publications/archive/660x0b1.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 522.0 Mission Operations - Common Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=147" \t "_blank) |
| CWE Doc. 522.1 Mission Operations - Monitor & Control Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=148" \t "_blank) |
| CWE Doc. TBD Mission Operations - Mission Data Product Distribution Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=153" \t "_blank) |
| CWE Doc. TBD XML Telemetric and Command Exchange (XTCE) 1.2 | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=159" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD Mission Operations Automation Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=152" \t "_blank) |
| CWE Doc. TBD Mission Operations File Management Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=156" \t "_blank) |
| CWE Doc. TBD Mission Operations Navigation Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=154" \t "_blank) |
| CWE Doc. TBD Mission Operations Planning Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=150" \t "_blank) |
| CWE Doc. TBD Mission Operations Remote Buffer Management Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=157" \t "_blank) |
| CWE Doc. TBD Mission Operations Scheduling Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=151" \t "_blank) |
| CWE Doc. TBD Mission Operations Software Management Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=158" \t "_blank) |
| CWE Doc. TBD Mission Operations Time Services | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=155" \t "_blank) |

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### MOIMS GOAL 8

Specify an expandable suite of software language Application Programming Interfaces and technology bindings/encodings that allow the deployment of MO Services over different technologies. This allows for the selection of the best technology for any MO Service deployment.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Existing Recommended Standards / Practices** |
| CCSDS 523.1-M-1 Mission Operations Message Abstraction Layer—JAVA API  | [Click Here for More Information](http://public.ccsds.org/publications/archive/523x1m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 524.1-B-1 Mission Operations - MAL Space Packet Transport Binding and Binary Encoding | [Click Here for More Information](http://public.ccsds.org/publications/archive/524x1b1.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD Mission Operations - HTTP Transport and XML Encoding | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=513" \t "_blank) |
| CWE Doc. TBD Mission Operations - TCP/IP Transport and Split Binary Encoding | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=516" \t "_blank) |
| CWE Doc. TBD Mission Operations - ZeroMQ Transport and CNES Binary Encoding | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=500" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD Mission Operations C++ API | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=501" \t "_blank) |
| Decision delegated to IOAG. Inputs are expected during 2015.  |  |

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### MOIMS GOAL 9

Specify an expandable suite of MO services for Telerobotic operations that will permit operators and robotic agents to freely exchange information, enabling the operators to communicate with heterogeneous robots in a uniform fashion.

### Related CCSDS Technical Strategic Goals:

2,3,6

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| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. TBD Telerobotics Standard Roadmap | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=345" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. TBD Telerobotic Standard | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=346" \t "_blank) |

## CROSS SUPPORT SERVICES AREA

​The CSS area addresses how the services of an agency’s TTC network are made available to another agency’s mission spacecraft. This includes addressing data transfer services and their management. The data transfer services involve both space link (to/from TTC network ground station to mission spacecraft) and terrestrial link (to/from TTC network ground station to the mission ground data system). The space link data transfer encoding/protocol schemes are subject to the SLS area and are not defined by the CSS area. The terrestrial data transfer services, with regard to transfer mission data and observations such as ground station tracking data, are addressed by the CSS area. The management of both the space link and data transfer services is also addressed by the CSS area. Proper definitions of the services and management of these services depends on a reference architecture definition and also agreed, internationally recognized terms for the functional components of this architecture. The terrestrial data transfer services and management data format definitions may be incorporated into mission operations end-to-end recommendations of the MOIMS area. The strategic goals of the CSS area are presented below.​

### CSS GOAL 1—CROSS SUPPORT ARCHITECTURE DEFINITION

​Define and maintain a reference architecture such that it is clear how the various (there are many) cross support standards are best organized, and that it provides guidance as to the requirements for putting these various standards together for achieving interagency cross support. Such an architecture needs to consider, for example, that a service such as telemetry is in fact composed of three major sub-services: space link data transfer, terrestrial data transfer, and off-line data maintenance. This architecture therefore addresses how the various standards involved are connected and further addresses the managements of these types of services (e.g., telemetry, telecommand, ranging, etc.) for inter-agency cross support. This needs to be addressed both in a traditional “single-hop” environment and a space internetworking environment.​

### Related CCSDS Technical Strategic Goals:

1,2

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 901.0 G-1 Space Communications Cross Support—Architecture Description Document | [Click Here for More Information](http://public.ccsds.org/publications/archive/901x0g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 901.1 M-1 Space Communications Cross Support—Architecture Requirements Document  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=144" \t "_blank) |
| **Future Work** |
| Five-year confirmation review process for published recommended standards and practices |  |

### CSS GOAL 2—EXTENSIBLE TERRESTRIAL DATA TRANSFER SERVICES

Establish the normative recommendation for a framework for terrestrial Cross Support Transfer Services (CSTS) and normative recommendations for the application of the framework to inter-agency terrestrial data transfer services. A key characteristic of this goal is that it shall be extensible and that it shall be clear for subsequent efforts as to how the extensibility is to be performed.​

### Related CCSDS Technical Strategic Goals:

1,2

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 901.0 G-1 Space Communications Cross Support—Architecture Description Document | [Click Here for More Information](http://public.ccsds.org/publications/archive/901x0g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 910.0-G-2 Space Link Extension Services—Executive Summary | [Click Here for More Information](http://public.ccsds.org/publications/archive/910x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 910.2-G-1 Standard Terminology, Conventions and Methodology (TCM) for Defining Data Services | [Click Here for More Information](http://public.ccsds.org/publications/archive/910x2g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 910.3-G-3 Cross Support Concept—Part 1: Space Link Extension | [Click Here for More Information](http://public.ccsds.org/publications/archive/910x3g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 912.11-O-1 Space Link Extension--Enhanced Forward CLTU Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/912x11o1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 914.1-G-1 Space Link Extension—Application Program Interface for Transfer Services—Summary of Concept and Rationale | [Click Here for More Information](http://public.ccsds.org/publications/archive/914x1g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 914.2-G-2 Space Link Extension—Application Program Interface for Transfer Services—Application Programmer's Guide | [Click Here for More Information](http://public.ccsds.org/publications/archive/914x2g2.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 910.4-B-2 Cross Support Reference Model—Part 1: Space Link Extension Services | [Click Here for More Information](http://public.ccsds.org/publications/archive/910x4b2e1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 911.1-B-3 Space Link Extension—Return All Frames Service Specification | [Click Here for More Information](http://public.ccsds.org/publications/archive/911x1b3ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 911.2-B-2 Space Link Extension—Return Channel Frames Service Specification  | [Click Here for More Information](http://public.ccsds.org/publications/archive/911x2b2ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 911.5-B-2 Space Link Extension—Return Operational Control Fields Service Specification | [Click Here for More Information](http://public.ccsds.org/publications/archive/911x5b2ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 912.11-O-1 SLE - Enhanced Forward CLTU Service  | [Click Here for More Information](http://public.ccsds.org/publications/archive/912x11o1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 912.1-B-3 Space Link Extension—Forward CLTU Service Specification | [Click Here for More Information](http://public.ccsds.org/publications/archive/912x1b3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 912.3-B-2 Space Link Extension—Forward Space Packet Service Specification | [Click Here for More Information](http://public.ccsds.org/publications/archive/912x3b2ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 913.1-B-1 Space Link Extension—Internet Protocol for Transfer Services | [Click Here for More Information](http://public.ccsds.org/publications/archive/913x1b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 914.0-M-1 Space Link Extension—Application Program Interface for Transfer Services—Core Specification  | [Click Here for More Information](http://public.ccsds.org/publications/archive/914x0m1ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 915.1-M-1 Space Link Extension—Application Program Interface for Return All Frames Service  | [Click Here for More Information](http://public.ccsds.org/publications/archive/915x1m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 915.2-M-1 Space Link Extension—Application Program Interface for Return Channel Frames Service  | [Click Here for More Information](http://public.ccsds.org/publications/archive/915x2m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 915.5-M-1 Space Link Extension—Application Program Interface for Return Operational Control Fields Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/915x5m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 916.1-M-1 Space Link Extension—Application Program Interface for the Forward CLTU Service  | [Click Here for More Information](http://public.ccsds.org/publications/archive/916x1m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 916.3-M-1 Space Link Extension—Application Program Interface for the Forward Space Packet Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/916x3m1.pdf%22%20%5Ct%20%22_blank) |
| Informational Reports in Production and Experimental Specifications |
| CCSDS Doc 920.0-G Cross Support Transfer Services - Specification Framework Concept | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=98" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 902.1-B Cross Support Service Management: Simple Schedule Format Specification (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=342" \t "_blank) |
| CWE Doc. 921.1-B Cross Support Transfer Service—Specification Framework (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=96" \t "_blank) |
| CWE Doc. 921.2-M Guidelines for Specification of Cross Support Transfer Services (Magenta Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=97" \t "_blank) |
| CWE Doc. 922.1-B Monitored Data—Cross Support Transfer Service (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=99" \t "_blank) |
| CWE Doc. 922.2-B Tracking Data Cross Support Transfer Service (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=100" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD Forward Frame Cross Support Transfer Service |  |
| CWE Doc. TBD Service Control Cross Support Transfer Service  |  |
| Five-year confirmation review process for published recommended standards and practices |  |

### CSS GOAL 3—EXTENSIBLE SERVICE MANAGEMENT

Establish the normative recommendations for data format definitions for exchanges of information between a mission operations ground system and an agency TTC network. A key characteristic of this goal is that the recommendations developed shall be extensible to incorporate management of future services as they become standardized. It shall be clear as to how the extensibility is to be performed.

### Related CCSDS Technical Strategic Goals:

1,2

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| **Existing Informational Reports and Experimental Specifications** |
| 902.0-G-1 Extensible Space Communication Cross Support - Service Management—Concept Issue 1 | [Click Here for More Information](http://public.ccsds.org/publications/archive/902x0g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 910.14-G-1 Space Communications Cross Support—Service Management— Operations Concept | [Click Here for More Information](http://public.ccsds.org/publications/archive/910x14g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 910.11-B-1 Space Communication Cross Support—Service Management—Service Specification  | [Click Here for More Information](http://public.ccsds.org/publications/archive/910x11b1ec2.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc 902.2-B Cross Support Service Management: Planning Data Formats (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=359" \t "_blank) |
| CWE Doc. 902.1-B Cross Support Service Management: Simple Schedule Format Specification (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=342" \t "_blank) |
| CWE Doc. 902.3-B Cross Support Service Management: Trajectory Prediction Data Format (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=387" \t "_blank) |
| **Future Work** |
| CWE Doc. TBD Cross Support Service Management: Best Practices (Magenta Book) |  |
| CWE Doc. TBD Cross Support Service Management: Event Sequence Data Format (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=365" \t "_blank) |
| CWE Doc. TBD Cross Support Service Management: Management Services (Automation) (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=388" \t "_blank) |
| CWE Doc. TBD Cross Support Service Management: Service Accounting Data Format (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=367" \t "_blank) |
| CWE Doc. TBD Cross Support Service Management: Service Agreement and Service Configuration Profile Data Formats (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=364" \t "_blank) |
| CWE Doc. TBD Cross Support Service Management: Service Catalog Data Format (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=366" \t "_blank) |
| CWE Doc. TBD Cross Support Service Management: Service Request and Service Package Data Formats (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=363" \t "_blank) |
| Five-year confirmation review process for published recommended standards and practices |  |

### CSS GOAL 4— TERRESTRIAL GENERIC FILE TRANSFER

Develop a normative adaptation profile recommendation to address bulk data transfers for inter-agency cross support, providing basic metadata definitions for normative identification and basic management of files typically transferred between agencies.

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| **Informational Reports in Production and Experimental Specifications** |
| None; however, a concept paper has been produced by the Generic File Transfer (GFT) Birds of a Feather |  |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 927.1-B Cross Support - Terrestrial Generic File Transfer |  |

## SPACECRAFT ONBOARD INTERFACE SERVICES AREA

The objective of the Spacecraft Onboard Interface Services (SOIS) area is to address the services and protocols used by communication networks within a spacecraft and within close proximity of the spacecraft. These are applicable to the core spacecraft platform as well as to the interfaces with both internal and external payloads and extra-vehicular activities. SOIS also covers the use of wireless technology for ground, space and planetary surface communication within the spacecraft and within close proximity to the spacecraft.

The long-term goal of the SOIS area is to encourage the standardization of interfaces such that spacecraft building blocks, which may range from individual sensors and actuators to complete units, may be developed and utilized with minimum or no change.

As part of this objective, the way in which spacecraft device and interface information is presented is being analyzed and standards are being proposed for specifying such information in electronic, machine-readable format. This aspect is intended to reduce the effort required for spacecraft development and testing by automating the process of code generation and database import. The area will also evaluate other opportunities which may benefit from international standards.

The SOIS area needs to coordinate the following:

* the seamless extension of CCSDS SLS and SIS into the spacecraft by developing and deploying standardized onboard data communication services;
* the use of terrestrial wireless technology
* the seamless coupling of SOIS with the ground services defined by the MOIMS area;
* the definition of an architecture interface standardization (SEA), following also in particular the European initiatives European Coordination for Space Standardization (ECSS) and SAVOIR (Space Avionics Open Interface Architecture) and the U.S. SUMO (Space Universal MOdular Architecture) group.
* the adoption of SEA security recommended standards and practices;
* the SANA recommended practices for registries and repositories.

The strategic goals of the SOIS area are presented below.

## SOIS GOAL 1

Encourage the standardization of onboard interfaces to enable unit and device reuse across missions.

### Related CCSDS Technical Strategic Goals:

2,3,5

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 850.0-G-2 Spacecraft Onboard Interface Services | [Click Here for More Information](http://public.ccsds.org/publications/archive/850x0g2.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 851.0-M-1 Spacecraft Onboard Interface Services—Subnetwork Packet Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/851x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 852.0-M-1 Spacecraft Onboard Interface Services—Subnetwork Memory Access Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/852x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 853.0-M-1 Spacecraft Onboard Interface Services—Subnetwork Synchronisation Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/853x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 854.0-M-1 Spacecraft Onboard Interface Services—Subnetwork Device Discovery Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/854x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 855.0-M-1 Spacecraft Onboard Interface Services—Subnetwork Test Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/855x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 871.0-M-1 Spacecraft Onboard Interface Services—Device Access Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/871x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 871.1-M-1 Spacecraft Onboard Interface Services—Device Data Pooling Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/871x1m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 871.2-M-1 Spacecraft Onboard Interface Services—Device Virtualization Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/871x2m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 872.0-M-1 Spacecraft Onboard Interface Services—Time Access Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/872x0m1ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 873.0-M-1 Spacecraft Onboard Interface Services—File and Packet Store Services | [Click Here for More Information](http://public.ccsds.org/publications/archive/873x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 875.0-M-1 Spacecraft Onboard Interface Services—Message Transfer Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/875x0m1.pdf%22%20%5Ct%20%22_blank) |
| CWE Doc. 871.3-M-1 Spacecraft Onboard Interface Services—Device Enumeration Service | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=113" \t "_blank) |
| To review and update the SOIS architecure and services following industrial implementation and feedback |  |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 876.1-B-1 Common Dictionary of Terms for Onboard Devices and Software Components | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=270" \t "_blank) |
| **Future Work** |
| Edit SAVOIR as a CCSDS Onboard Reference Architecture  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=547" \t "_blank) |
| Five-year confirmation review process for published recommended standards and practices |  |
| NASA core Flight System (cFS) as a CCSDS Onboard Reference Architecture  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=546" \t "_blank) |
| SOIS Subnetwork Services - Mapping on Existing Data Link Protocols | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=535" \t "_blank) |
| SOIS Subnetwork Services - Subnetwork Deterministic Service | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=536" \t "_blank) |
| Spacecraft Onboard Interfaces Services User’s Guide | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=545" \t "_blank) |

### SOIS GOAL 2

Define recommended practices for onboard wireless communications for low, medium and high-rate applications.

### Related CCSDS Technical Strategic Goals:

2,3,5

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 880.0-G-1 Wireless Network Communications Overview for Space Mission Operations | [Click Here for More Information](http://public.ccsds.org/publications/archive/880x0g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 881.0-M-1 Spacecraft Onboard Interface Services—RFID-Based Inventory Management Systems | [Click Here for More Information](http://public.ccsds.org/publications/archive/881x0m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 882.0-M-1 Spacecraft Onboard Interface Systems—Low-Data-Rate Wireless Communications for Spacecraft Monitoring and Control | [Click Here for More Information](http://public.ccsds.org/publications/archive/882x0m1.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 881.1-R-0 RFID Tag Encoding Standard for Space Applications (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=391" \t "_blank) |
| **Future Work** |
| Five-year confirmation review process for published recommended standards and practices |  |
| Spacecraft Onboard Interface Services - RFID Sensing Recommended Standard | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=533" \t "_blank) |
| Spacecraft Onboard Interface Services - RFID-Based Inventory Management Systems | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=534" \t "_blank) |

### SOIS GOAL 3

Define Electronic Data Sheets (EDS) recommended practices for onboard devices including XML schemas and common dictionary of terms. Promote their use as a means to specify onboard units and transducers.

### SOIS Goal 4

To exploit the use of wireless technology wherever applicable

### Related CCSDS Technical Strategic Goals:

2,3,5

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| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. TBD Electronic Data Sheets | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=466" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 876.0-B-1 XML Specification for Electronic Data Sheets for Onboard Devices and Software Components (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=269" \t "_blank) |
| CWE Doc. 876.1-B-1 Common Dictionary of Terms for Onboard Devices and Software Components | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=270" \t "_blank) |
| **Future Work** |
| Five-year confirmation review process for published recommended standards and practices |  |

## SPACE LINK SERVICES AREA

The objective of the SLS area is to address all of the point-to-point communications links and protocols that interconnect a spacecraft with its ground-support system, or with another spacecraft, by developing standards for efficient and reliable space link communications systems addressing nominal as well as emergency scenarios. Specific attention is given by SLS to needs for higher data rates and better link performances, a standard security mechanism, and lower cost, mass, and power.

SLS area objectives focus on Layers 1 & 2 (of the Open Systems Interconnection [OSI] protocol stack)—i.e., the Physical Layer and the Data Link Layer. This means that SLS concentrates in particular on radio-frequency and optical systems, modulation, synchronization and channel coding, and data link protocols, for both long-haul (e.g., spacecraft-to-ground) and proximity links (e.g., orbiter-to-lander). Moreover SLS concentrates also on two additional functions essential on the space link: data compression for end-to-end data transfer optimization, and ranging for accurate orbit determination.

The SLS area needs to coordinate:

* with CSS for the identification of relevant parameters for service management;
* with CSS for the inner behavior (i.e., the implementation aspects and not the terrestrial interface characteristics) of the CSTS to be made available to other agencies;
* with MOIMS and CSS if the need of standardized exchange of meteorological and orbital data will be required for optical communications;
* with SEA for Delta-DOR issues;
* with SEA for development, adoption and integration of security-related recommended standards and practices;
* the SANA-recommended practices for registries and repositories.

The strategic goals of the SLS area are presented below.

### SLS GOAL 1

Enable efficient bi-directional transmission for near-Earth spacecraft (including missions to—and/or orbiting around—the Moon and at Lagrange points) and deep-space spacecraft (especially Mars missions) by developing appropriate modulation schemes for telecommand, telemetry, and ranging signals in the applicable frequency bands while providing narrower bandwidth and higher data returns.

### Related CCSDS Technical Strategic Goals:

1,2,3,5

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 413.0-G-2 Bandwidth-Efficient Modulations: Summary of Definition, Implementation, and Performance | [Click Here for More Information](http://public.ccsds.org/publications/archive/413x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 414.0-G-2 Pseudo-Noise (PN) Ranging Systems | [Click Here for More Information](http://public.ccsds.org/publications/archive/414x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 415.0-G-1 Data Transmission and PN Ranging for 2 GHz CDMA Link via Data Relay Satellite | [Click Here for More Information](http://public.ccsds.org/publications/archive/415x0g1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 211.1-B-4 Proximity-1 Space Link Protocol—Physical Layer | [Click Here for More Information](http://public.ccsds.org/publications/archive/211x1b4.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 401.0-B-23 Radio Frequency and Modulation Systems--Part 1: Earth Stations and Spacecraft | [Click Here for More Information](http://public.ccsds.org/publications/archive/401x0b25.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 414.1-B-2 Pseudo-Noise (PN) Ranging Systems | [Click Here for More Information](http://public.ccsds.org/publications/archive/414x1b2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 415.1-B-1 Data Transmission and PN Ranging for 2 GHz CDMA Link via Data Relay Satellite | [Click Here for More Information](http://public.ccsds.org/publications/archive/415x1b1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 413.1-G Simultaneous Transmission of GMSK Telemetry and PN Ranging | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=400" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 231.0-B TC Synchronization and Channel Coding: Development of new schemes to be used with the TC Space Data Link Protocol over ground-to-space communications links to improve performance in terms of distance and data rate  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=397" \t "_blank) |
| CWE Doc. 401.0-B Radio Frequency and Modulation Systems--Part 1: Earth Stations and Spacecraft (Blue Book) (Issue XX) (including a set of modulation schemes for 26 GHz)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=126" \t "_blank) |
| CWE Doc. 401.0-B Radio Frequency and Modulation Systems--Part 1: Earth Stations and Spacecraft (Blue Book) (Issue XX) (including recommendations of higher-order modulations for deep space applications) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=126" \t "_blank) |
| CWE Doc. 401.0-B Radio Frequency and Modulation Systems--Part 1: Earth Stations and Spacecraft (Blue Book) (Issue XX) (including standards on Multiple Spacecraft Per Aperture [MSPA] techniques, on 22 GHz modulations, and on emergency communications)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=126" \t "_blank) |
| CWE Doc. 431.1 Variable Code and Modulation Systems for CCSDS (Magenta Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=398" \t "_blank) |
| **Future Work** |
| CWE Doc. 440.0-G Planetary Communications Systems  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=377" \t "_blank) |
| Development of Recommended Practice for Adaptive Coded Modulation (ACM) for combinations of modulation and coding for channel-dependent effects. | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=542" \t "_blank) |
| Five-year confirmation review process for published recommended standards and practices |  |

### SLS GOAL 2

Produce efficient standards for coding schemes and synchronization, providing new generations of space missions with telecommand and telemetry capabilities beyond current technologies, such that spacecraft interconnection with its ground support system, or with another spacecraft, can accommodate higher data rates and better link performances, together with lower cost, mass, and power.

### Related CCSDS Technical Strategic Goals:

1,2,3,5

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 130.0-G-3 Overview of Space Communications Protocols | [Click Here for More Information](http://public.ccsds.org/publications/archive/130x0g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 130.1-G-2 TM Synchronization and Channel Coding—Summary of Concept and Rationale | [Click Here for More Information](http://public.ccsds.org/publications/archive/130x1g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 131.5-O-1 Erasure Correcting Codes for Use in Near-Earth and Deep-Space Communications | [Click Here for More Information](http://public.ccsds.org/publications/archive/131x5o1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 210.0-G-2 Proximity-1 Space Link Protocol—Rationale, Architecture, and Scenarios | [Click Here for More Information](http://public.ccsds.org/publications/archive/210x0g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 230.1-G-2 TC Synchronization and Channel Coding—Summary of Concept and Rationale | [Click Here for More Information](http://public.ccsds.org/publications/archive/230x1g2e1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 230.2-G-1 Next Generation Uplink Application Profiles Milestone ID: MIL-SLS-201 Completion Date: 2014 | [Click Here for More Information](http://public.ccsds.org/publications/archive/230x2g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 231.1-O-1 Short Block Length LDPC Codes for TC Synchronization and Channel Coding | [Click Here for More Information](http://public.ccsds.org/publications/archive/231x1o1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 131.0-B-2 TM Synchronization and Channel Coding | [Click Here for More Information](http://public.ccsds.org/publications/archive/131x0b2ec1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 131.2-B-1 Flexible Advanced Coding and Modulation Scheme for High Rate Telemetry Applications | [Click Here for More Information](http://public.ccsds.org/publications/archive/131x2b1e1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 131.3-B-1 CCSDS Space Link Protocols over ETSI DVB-S2 Standard | [Click Here for More Information](http://public.ccsds.org/publications/archive/131x3b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 131.4-M-1 TM Channel Coding Profiles | [Click Here for More Information](http://public.ccsds.org/publications/archive/131x4m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 211.2-B-2 Proximity-1 Space Link Protocol—Coding and Synchronization Sublayer | [Click Here for More Information](http://public.ccsds.org/publications/archive/211x2b2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 231.0-B-2 TC Synchronization and Channel Coding | [Click Here for More Information](http://public.ccsds.org/publications/archive/231x0b2c1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 130.11-G TM Channel Coding for SCCC  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=349" \t "_blank) |
| CWE Doc. 130.12-G TM Channel Coding for DVB-S2  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=360" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc, 131.0-B Update TM channel coding Blue Book with LDPC slicing | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=399" \t "_blank) |
| CWE Doc. 231.0-B TC Synchronization and Channel Coding: Development of new schemes to be used with the TC Space Data Link Protocol over ground-to-space communications links to improve performance in terms of distance and data rate  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=397" \t "_blank) |
| CWE Doc. 431.1 Variable Code and Modulation Systems for CCSDS (Magenta Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=398" \t "_blank) |
| **Future Work** |
| Development of Recommended Practice for Adaptive Coded Modulation (ACM) for combinations of modulation and coding for channel-dependent effects. | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=542" \t "_blank) |
| Development of standards for Erasure Correcting Codes for Near Earth and Deep Space communications to provide efficient countermeasures for guaranteeing reliable communications even at low signal-to-noise ratio regimes when conventional coding may fail | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=543" \t "_blank) |
| Five-year confirmation review process for published recommended standards and practices |  |

### SLS GOAL 3

To provide efficient and operable space data link protocols capable of satisfying the needs of current and future missions; i.e., to produce or maintain standards to support emerging capabilities (e.g. enabling higher data rates, greater throughput, higher reliability) with seamless interface to both user applications and communication technologies over radio frequency (RF) and/or optical links.

### Related CCSDS Technical Strategic Goals:

1,2,3,5

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 130.0-G-3 Overview of Space Communications Protocols | [Click Here for More Information](http://public.ccsds.org/publications/archive/130x0g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 130.2-G-2 Space Data Link Protocols—Summary of Concept and Rationale | [Click Here for More Information](http://public.ccsds.org/publications/archive/130x2g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 200.0-G-6 Telecommand Summary of Concept and Rationale | [Click Here for More Information](http://public.ccsds.org/publications/archive/200x0g6.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 210.0-G-2 Proximity-1 Space Link Protocol—Rationale, Architecture, and Scenarios | [Click Here for More Information](http://public.ccsds.org/publications/archive/210x0g2.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 132.0-B-1 TM Space Data Link Protocol | [Click Here for More Information](http://public.ccsds.org/publications/archive/132x0b1c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 133.0-B-1 Space Packet Protocol | [Click Here for More Information](http://public.ccsds.org/publications/archive/133x0b1c2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 133.1-B-2 Encapsulation Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/133x1b2c2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 211.0-B-5 Proximity-1 Space Link Protocol—Data Link Layer | [Click Here for More Information](http://public.ccsds.org/publications/archive/211x0b5.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 232.0-B-2 TC Space Data Link Protocol | [Click Here for More Information](http://public.ccsds.org/publications/archive/232x0b2c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 232.1-B-2 Communications Operation Procedure-1 | [Click Here for More Information](http://public.ccsds.org/publications/archive/232x1b2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 732.0-B-2 AOS Space Data Link Protocol | [Click Here for More Information](http://public.ccsds.org/publications/archive/732x0b2c1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 130.2-G Space Data Link Protocols Green Book (Issue 3) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=485" \t "_blank) |
| CWE Doc. 700.1-G Next Generation Space Data Link Protocol (Green Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=384" \t "_blank) |
| CWE Doc. TBD-G Next Generation Space Data Link Protocol Green Book | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=384" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 132.0-B TM Space Data Link Protocol (Blue Book) (Issue 2) (including the integration of the Space Data Link Security Protocol) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=275" \t "_blank) |
| CWE Doc. 232.0-B TC Space Data Link Protocol (Blue Book) (Issue 3) (including the integration of the Space Data Link Security Protocol) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=353" \t "_blank) |
| CWE Doc. 732.0-B AOS Space Data Link Protocol (Blue Book) (Issue 3) (including the integration of the Space Data Link Security Protocol)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=274" \t "_blank) |
| CWE Doc. 732.1-B Next Generation Space Data Link Protocol (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=390" \t "_blank) |
| **Future Work** |
| Five-year confirmation review process for published recommended standards and practices |  |

### SLS GOAL 4

​Develop data compression standards enabling efficient data rates and data volume reduction to optimize the usage of available space links bandwidth and onboard storage capacity. These internationally agreed data compression standards will foster interoperability and multi-mission development of compression functions.​

### Related CCSDS Technical Strategic Goals:

1,2,3,5

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 120.0-G-3 Lossless Data Compression | [Click Here for More Information](http://public.ccsds.org/publications/archive/120x0g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 120.1-G-2 Image Data Compression | [Click Here for More Information](http://public.ccsds.org/publications/archive/120x1g2.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 121.0-B-2 Lossless Data Compression | [Click Here for More Information](http://public.ccsds.org/publications/archive/121x0b2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 122.0-B-1 Image Data Compression | [Click Here for More Information](http://public.ccsds.org/publications/archive/122x0b1c3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 123.0-B-1 Lossless Multispectral & Hyperspectral Image Compression | [Click Here for More Information](http://public.ccsds.org/publications/archive/123x0b1ec1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 120.2-G Lossless Multispectral & Hyperspectral Image Compression | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=138" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 122.0-B Image Data Compression (Blue Book) (Issue 2) (including changes necessary to accommodate a pre-processing function enabling efficient compression of 3D [multispectral and hyperspectral] images using CCSDS-122.1-B) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=273" \t "_blank) |
| CWE Doc. 122.1-B Spectral Pre-Processing Transform for Multispectral & Hyperspectral Image Compression | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=386" \t "_blank) |
| CWE Doc. 123.1-B Low-Complexity Near-Lossless Multispectral & Hyperspectral Image Compression | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=517" \t "_blank) |
| **Future Work** |
| Five-year confirmation review process for published recommended standards and practices |  |
| Green Book for CCSDS-122.1-B, which defines a multispectral & hyperspectral image compressor as an extension to the 122.0 Blue Book by defining a one-dimensional pre-processing spectral decorrelating transform and associated output data structures. This a | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=562" \t "_blank) |
| Green Book for CCSDS-123.1-B, which extends the CCSDS-123.0-B-1 (Lossless Multispectral & Hyperspectral Image Compression) to provide near-lossless compression. This compression approach targets applications requiring very high-fidelity reconstructed imag | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=561" \t "_blank) |

### SLS GOAL 5

Provide security functions operating at Layers 1 & 2 (of the OSI protocol stack) of CCSDS space links. The targeted security services include authentication, integrity check, anti-replay, and confidentiality both for uplink and downlink. The corresponding security protocols/functions shall be compatible with CCSDS TM, TC, and AOS data link protocols and be independent from any specific cryptographic algorithm. Develop associated management functions for monitoring and control, key and security association management. Security at Physical Layer level should also be considered.

### Related CCSDS Technical Strategic Goals:

1,2,3,5,6

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| **Informational Reports in Production and Experimental Specifications** |
| CWE Doc. 350.5-B Space Data Link Security Concept of Operation, Issue 2 | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=218" \t "_blank) |
| CWE Doc. 350.5-G Space Data Link Security Concept of Operation | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=104" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 355.0 Space Data Link Security Protocol (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=103" \t "_blank) |
| CWE Doc. 355.1 Space Data Link Security (SDLS) Protocol: Extended Procedures (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=217" \t "_blank) |
| **Future Work** |
| CWE Doc. 350.5 Space Data Link Security Concept of Operation, Issue 2 | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=218&Source=http://cwe.ccsds.org/fm/Lists/Projects/AllOpenChartersWithDraftProjects.aspx" \t "_blank) |
| Five-year confirmation review process for published recommended standards and practices |  |
| Security at Physical Layer | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=541" \t "_blank) |

### SLS GOAL 6

Establish a common framework of standardized services for space optical communications for interoperability and cross support by creating new standards for optical links (ISO Layers 1 & 2), taking into account the uniqueness of these types of links, such as very high data rates, geographic station diversity, and atmosphere (“weather”) influences. Consider also the services to be offered/required to/by space data link protocols and relevant procedures. Finally, identify the needed coordination with other CCSDS areas.

### Related CCSDS Technical Strategic Goals:

1,2,3,5,6

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| **Informational Reports in Production and Experimental Specifications** |
| CCSDS 140.0-G Optical Communications Concepts and Terminologies | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=395" \t "_blank) |
| CCSDS 140.1-G Real-Time Weather and Atmospheric Characterization Data | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=396" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 141.0-B Optical Communications Physical Layer (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=393" \t "_blank) |
| CWE Doc. 142.0-B Optical Communications Coding & Synchronization (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=394" \t "_blank) |
| **Future Work** |
| Definition and recommendations for optical communications profiles. | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=550" \t "_blank) |
| Green Book for optical communications physical layer and coding and synchronization sublayer | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=551" \t "_blank) |
| Standardized method(s) for using real-time weather and atmospheric characterization data; | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=548" \t "_blank) |
| Standards for modulation and coding for forward optical links; | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispFormDraft.aspx?ID=549" \t "_blank) |

## SPACE INTERNETWORKING SERVICES AREA

The objective of the SIS area is to address the communications services and protocols supporting end-to-end communications among applications, particularly where those communications may span multiple heterogeneous physical and data link technologies. Areas addressed by SIS include the networking infrastructure to support application-to-application communication onboard a single spacecraft, communications among multiple spacecraft, and communications between space-based applications and their counterparts on Earth and/or other planetary bodies.

The SIS area deals with communication services and protocols that are independent of specific link technology (as a lower layer bound) and independent of application-specific semantics (as an upper bound). Thus the SIS area covers essentially the Network through Transport Layers of the OSI reference model. The SIS area also develops application support protocols where the services provided are intended to operate over an internetworked infrastructure. An example of such an application support protocol is the Asynchronous Messaging System (AMS), which is intended to be invoked by applications to effect message exchange.

SIS protocols use the underlying communication and infrastructure services provided by the SLS and SOIS areas and any other onboard networks, and provide the networked connectivity needed by applications developed in other CCSDS areas such as MOIMS and SOIS. The SIS services provide hardware-independent mechanisms for identifying end systems and provide communications services that allow users to operate the same way whether communication is over a single data link layer or over multiple hops. The suite of capabilities developed by the SIS area accommodates all ranges of delay, interactivity, and directionality, although not all protocols are appropriate for all environments.

The SIS area needs to coordinate the following:

* SIS security mechanisms need to be consistent with other security mechanisms at other layers in the stack, such as those deployed at the link layer.
* The MOIMS area is developing Mission Operations data and services that might, depending on mission design choices, need to be deployed over SIS infrastructure. SIS needs to coordinate with MOIMS to ensure that such missions can efficiently use MOIMS data and services over SIS internetworks.
* The internetworking technologies developed by SIS need to be managed during operations. Since the deployed internetworks will typically span agency boundaries, the management mechanisms need to be coordinated with CSS for ground station interfaces and with MOIMS for application-level services required for operations, in particular for network management.
* The SOIS area is advocating for the use of wireless technologies for both onboard and inter-spacecraft communication. SIS needs to coordinate with SOIS and provide protocols that support internetworked communication over a mix of wireless technologies and/or heterogeneous wireless/wired scenarios.
* SOIS also develops a set of onboard services that SIS can leverage (e.g. file and packet storage services). SIS needs to coordinate with SOIS to ensure that SIS requirements are reflected in the SOIS designs.

### SIS GOAL 1

Promote the use of Internet standards for data transport, routing, and auxiliary functions in environments where end-to-end paths exist and are relatively stable. This includes the use of Transmission Control Protocol (TCP) (including options defined by CCSDS and/or the Internet Engineering Task Force [IETF]) when round trip times are low (~<2s), and possible use of User Datagram Protocol (UDP) for unidirectional paths and/or high delay paths.

### Related CCSDS Technical Strategic Goals:

1,4

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| **Existing Recommended Standards / Practices** |
| CCSDS 702.1-B-1 IP over CCSDS Space Links | [Click Here for More Information](http://public.ccsds.org/publications/archive/702x1b1c1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 714.0-B-2 Space Communications Protocol Specification (SCPS)—Transport Protocol (SCPS-TP) | [Click Here for More Information](http://public.ccsds.org/publications/archive/714x0b2.pdf%22%20%5Ct%20%22_blank) |
| **Future Work** |
| Review existing standards for applicability and maintain or retire as appropriate. |  |

### SIS GOAL 2

Develop a Solar System Internet (SSI) suite of protocols and procedures to enable, under policy control of the asset (e.g., spacecraft) managers, cross-supported internetworked data communications. The SSI protocols can be used as a replacement for Internet technologies where delays are low with minimal impact, and also function in environments with long delays (days or weeks) and scheduled or unscheduled intermittent end-to-end connectivity.

### Related CCSDS Technical Strategic Goals:

1,2,4,6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 730.1-G-1 Solar System Internetwork (SSI) Architecture Milestone ID: MIL-SIS-203 Completion Date: 2014 | [Click Here for More Information](http://public.ccsds.org/publications/archive/730x1g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 734.0-G-1 Rationale, Scenarios, and Requirements for DTN in Space | [Click Here for More Information](http://public.ccsds.org/publications/archive/734x0g1e1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 734.1-B-1 Licklider Protocol (LTP) for CCSDS | [Click Here for More Information](http://public.ccsds.org/publications/archive/734x1b1.pdf%22%20%5Ct%20%22_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 734.2-B Bundle Protocol for CCSDS (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=78" \t "_blank) |
| CWE Doc. TBD Bundle Security Protocol (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=371" \t "_blank) |
| CWE Doc. TBD Contact Graph Routing (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=370" \t "_blank) |
| **Future Work** |
| CWE Doc. 734.n Bundle Protocol Network Management (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=202" \t "_blank) |
| CWE Doc. 734.n Framework for SSI Cross-Support and Administration (Green Book describing SSI coordinating function) |  |
| CWE Doc. TBD Erasure Coding for LTP (Blue Book) |  |
| CWE Doc. TBD SSI Streaming Service (Blue Book) |  |
| Five-year confirmation review process for published recommended standards and practices |  |

### SIS GOAL 3

Develop application support protocols that facilitate internetworked mission operations that are capable of running over internetworked (e.g. IP suite, BP suite) or single-hop mechanisms such as the Encapsulation Service and the Licklider Transmission Service.​ ​

### Related CCSDS Technical Strategic Goals:

1,4

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 700.0-G-3 Advanced Orbiting Systems, Networks and Data Links: Summary of Concept, Rationale and Performance | [Click Here for More Information](http://public.ccsds.org/publications/archive/700x0g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 706.1-G-2 Motion Imagery and Applications | [Click Here for More Information](http://public.ccsds.org/publications/archive/706x1g2.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 706.2-G-1 Voice Communications | [Click Here for More Information](http://public.ccsds.org/publications/archive/706x2g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 720.1-G-3 CCSDS File Delivery Protocol (CFDP)—Part 1: Introduction and Overview | [Click Here for More Information](http://public.ccsds.org/publications/archive/720x1g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 720.2-G-3 CCSDS File Delivery Protocol (CFDP)—Part 2: Implementer's Guide | [Click Here for More Information](http://public.ccsds.org/publications/archive/720x2g3.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 720.3-G-1 CCSDS File Delivery Protocol (CFDP)—Part 3: Interoperability Testing Final Report | [Click Here for More Information](http://public.ccsds.org/publications/archive/720x3g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 735.0-G-1 Asynchronous Message Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/735x0g1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 740.0-G-1 Mars Mission Protocol Profiles—Purpose and Rationale | [Click Here for More Information](http://public.ccsds.org/publications/archive/740x0g1e1.pdf%22%20%5Ct%20%22_blank) |
| **Existing Recommended Standards / Practices** |
| CCSDS 722.1-M-1 Operation of CFDP over Encapsulation Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/722x1m1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 727.0-B-4 CCSDS File Delivery Protocol (CFDP) | [Click Here for More Information](http://public.ccsds.org/publications/archive/727x0b4.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 735.1-B-1 Asynchronous Message Service | [Click Here for More Information](http://public.ccsds.org/publications/archive/735x1b1.pdf%22%20%5Ct%20%22_blank) |
| CCSDS 766.1-B-1 Digital Motion Imagery | [Click Here for More Information](http://public.ccsds.org/publications/archive/766x1b1.pdf%22%20%5Ct%20%22_blank) |
| **Informational Reports in Production and Experimental Specifications** |
| Update of 720.1-G-3 CFDP Introduction and Overview (Green Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=372" \t "_blank) |
| Update of 720.2-G-3 CFDP Implementation Guide (Green Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=373" \t "_blank) |
| Update of 720.3-G-1 CFDP Interoperability Test Plan (Green Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=374" \t "_blank) |
| **Recommended Standards / Practices Currently in Production** |
| CWE Doc. 766.2 Voice and Audio Communications (Blue Book) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=183" \t "_blank) |
| Update of 727.0-B-4 CCSDS File Delivery Protocol (CFDP) | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=376" \t "_blank) |
| Update of 766.1-B-1 Digital Motion Imagery Applications (Blue Book)  | [Click Here for More Information](http://cwe.ccsds.org/fm/Lists/Projects/DispForm.aspx?ID=168" \t "_blank) |

## CCSDS MANAGEMENT COUNCIL

The objective of the CCSDS Management Council (CMC) is to provide the executive management oversight of the organization. The CMC is responsible for staying technically and politically informed about important long-term issues in the field of international space mission cross support and for keeping an eye on the “big picture” of the CCSDS program of work. The CMC provides oversight for the whole CCSDS technical organization and of support organizations like the SANA. The technical work of the SANA is specifically guided by the SANA Steering Group (SSG).

### CMC GOAL 1

Promote an atmosphere of cooperation in developing standards for a maximum interoperability among international space agencies.

### CMC GOAL 2

Enhance the existing SANA to act not only as a centralized reference point and distributed federated elements owned by participating agencies, but also to foster the measurability of CCSDS standards utilization. The evolution of the SANA is guided by the SSG.

### Related CCSDS Technical Strategic Goals:

1, 2, 3, 4, 5, 6

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| **Existing Informational Reports and Experimental Specifications** |
| CCSDS 313.0-Y-1 Space Assigned Numbers Authority (SANA)—Role, Responsibilities, Policies, and Procedures | [Click Here for More Information](http://public.ccsds.org/publications/archive/313x0y1.pdf%22%20%5Ct%20%22_blank) |
| **Future Work** |
| CWE Doc. TBD CCSDS Standards Utilization (Yellow Book)  |  |
| Five-year confirmation review process for published recommended standards and practices |  |