CCSDS End-to-End Data System

The physical entities that make up an end-to-end space data system are shown in the figure below. Each entity performs a set of functions that, when taken together, allow the data to flow from the sensor located in space to a remote data archive. The data is stored in the archive indefinitely and may be accessed many years later for some new purpose or investigation.

The same system is depicted functionally in the figure to the right. In the functional model, the functions have been separated into “function groups” (boxes) that, when concatenated with appropriate protocols, preserve system integrity. The boxes are connected by arrows that indicate needed data/metadata flows at the interfaces between the function groups. The CCSDS has developed or is developing Recommendations for each of the interface points.

This high-level functional model seeks to serve potential users in several ways:

– it places each “standard” within the context of the total data system;

– it allows potential users of the standards to identify quickly, for a given domain of interest, those standards that obtain at an appropriate system interface;

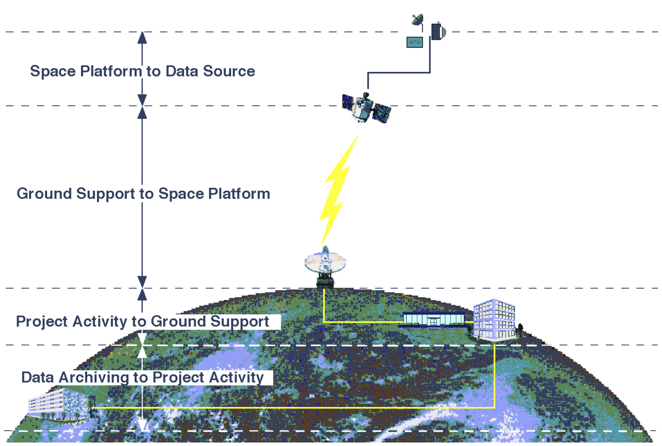
– it promotes industry’s interest in developing standard products through which the acceptance of standards can be furthered and the benefits of standards can be realized.

A point-and-click version of the model is on the Web at:

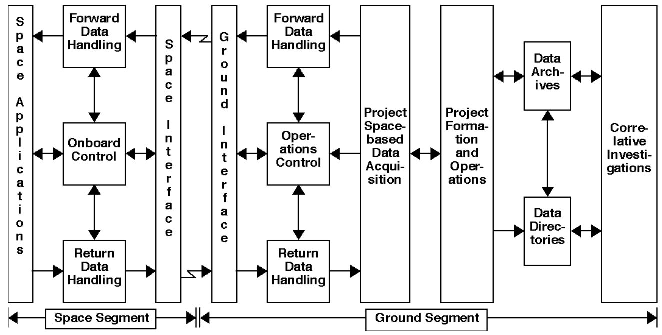
http://www.ccsds.org/ccsds/functional_model/

Clicking on any interface shown in the on-line model causes a list of the CCSDS Recommendations that obtain at that interface to be displayed; clicking on a function box causes a list of functions within the function group to be displayed.

Space Data System Physical Interfaces



Space Data System Functional Model



CCSDS Recommendations

Telemetry Channel Coding
Packet Telemetry
Packet Telemetry Services
Lossless Data Compression
Telecommand Part 1 — Channel Service
Telecommand Part 2 — Data Routing Service
Telecommand Part 2.1 — Command Operation Procedures
Telecommand Part 3 — Data Management Service
Time Code Formats
CCSDS Global Spacecraft Identification Field Code Assignment Control Procedures
Radio Frequency and Modulation Systems—Part 1: Earth Stations and Spacecraft
Radio Metric and Orbit Data
Standard Formatted Data Units — Structure and Construction Rules
Standard Formatted Data Units — Control Authority Procedures
Standard Formatted Data Units — Control Authority Data Structures
Standard Formatted Data Units — Referencing Environment
Parameter Value Language Specification
ASCII Encoded English
The Data Description Language EAST Specification
Data Entity Dictionary Specification Language (DEDSL) (draft)
Advanced Orbiting Systems, Networks and Data Links: Architectural Specification
Advanced Orbiting Systems, Networks and Data Links: Audio, Video and Still-Image Communications Services
Space Communication Protocol Specification (SCPS) (drafts) for Network Protocol (SCPS-NP), Security Protocol (SCPS-SP), Transport Protocol (SCPS-TP), and File Protocol (SCPS-FP)
Cross Support Reference Model Part 1: Space Link Extension Services

NOTE – Companion Reports (CCSDS Green Books) containing concept, rationale, and tutorial material exist for most CCSDS Recommendations.

A complete listing of CCSDS and CCSDS/ISO documents can be found on the Web at:

http://www.ccsds.org/ccsds/ccsds_document_access.html

Hard copies of published CCSDS documents can be ordered from the CCSDS Secretariat (address on back of leaflet).

About CCSDS

The Consultative Committee for Space Data Systems (CCSDS) was formed in 1982 by the major space agencies of the world to provide a forum for discussion of common problems in the development and operation of space data systems. It is currently composed of ten member agencies, twenty-three observer agencies, and over 100 industrial associates. Since its establishment, it has been actively developing Recommendations for data- and information-systems standards to a) reduce the cost to the various agencies of performing common data functions by eliminating unjustified project-unique design and development, and b) promote interoperability and cross support among cooperating space agencies to reduce operations costs by sharing facilities.

CCSDS ORGANIZATION

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BNSC/UK
CNES/France
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DLR/Germany
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CSIR/South Africa
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FSST&CA/Belgium
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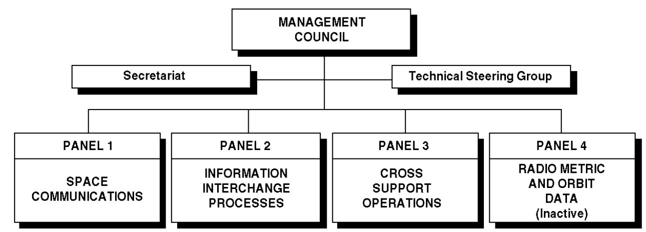
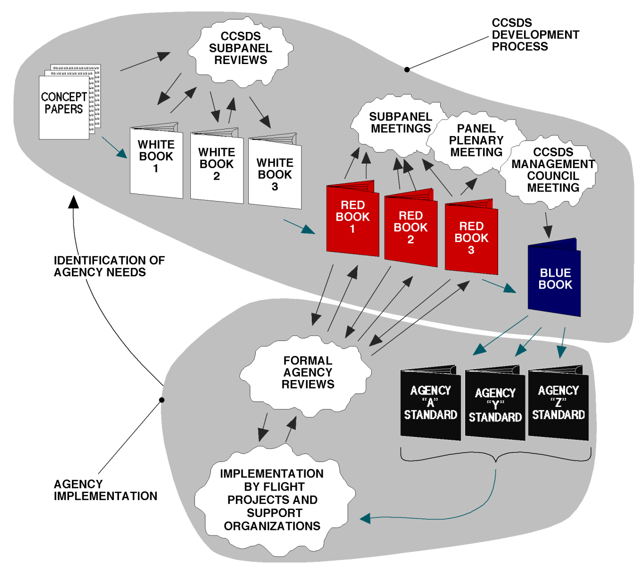
KARI/Korea
KFKI/Hungary
MOC/Isreal
NOAA/USA
NSPO/Taipei
SSC/Sweden
TsNIIMash/Russia
USGS/USA



CCSDS products are data- and information-system Recommendations (Blue Books). These Recommendations serve as baseline documents for the applicable standards of the participating agencies. The process by which CCSDS Recommendations are developed is shown in the figure below. It is an iterative process (depicted by multiple Red Books), first among technical-panel experts and then among the CCSDS agencies. Final approval is by consensus of the voting members. CCSDS Recommendations are also being converted into ISO International Standards.



Goal of CCSDS

ESTABLISH A WORLD-WIDE, OPEN, CCSDS-COMPATIBLE VIRTUAL SPACE DATA SYSTEM FOR INTERNATIONAL CROSS SUPPORT, INTEROPERABILITY, AND SCIENCE INFORMATION INTERCHANGE

Benefits of CCSDS

PROMOTES UNDERSTANDING OF EXCHANGED DATA

REDUCES NONRECURRING COSTS

- fewer project-unique developments
- shorter system test periods
- less training/retraining of personnel

REDUCES RECURRING COSTS

- more commercial-off-the-shelf hardware
- fewer facilities because of load leveling
- only selected system redundancy
- more automation

REDUCES MISSION RISK

ENABLES INGEST/ACCESS TO LONG-TERM DATA ARCHIVES

CCSDS and ISO

CCSDS Recommendations are routinely submitted to the International Standards Organization (ISO) through ISO Technical Committee 20 (TC 20 Aircraft and space vehicles)/Subcommittee 13 (SC 13 Space data and information transfer systems). Many CCSDS Recommendations have already been adopted as international standards, and many others are currently in the review process leading to adoption by ISO.

Information published by the CCSDS is available on the World Wide Web at:

http://www.ccsds.org/ccsds/

Inquiries concerning the CCSDS, and requests for CCSDS publications, should be directed to

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CCSDS A10.1-Y-3.1, August 1998

AN INTRODUCTION TO

Consultative Committee for Space Data Systems

AN INTERNATIONAL ORGANIZATION OF SPACE AGENCIES COOPERATING IN THE DEVELOPMENT OF DATA STANDARDS TO PROMOTE INTERCHANGE OF SPACE-RELATED INFORMATION