
**Space data and information transfer
systems — Cross support reference
model — Space link extension services**

*Systèmes de transfert des informations et données spatiales — Modèle de
référence pour le support croisé — Services S.L.E.*



Avant-propos

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La Norme internationale ISO 15396 a été élaborée par le comité technique ISO/TC 20, *Aéronautique et espace*, sous-comité SC 13, *Systèmes de transfert des informations et données spatiales*.

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Space data and information transfer systems — Cross support reference model — Space link extension services

1 Scope

This International Standard specifies the requirements for space link extension services for a cross support reference model for space data and information transfer systems.

2 Requirements

Requirements are the technical recommendations made in the following publication (reproduced on the following pages), which is adopted as an International Standard:

CCSDS 910.4-B-1, May 1996, *Recommendation for space data system standards — Cross support reference model — Part 1: Space link extension services*.

For the purposes of international standardization, the modifications outlined below shall apply to the following pages of publication CCSDS 910.4-B-1.

Pages i to v

This part contains information which is relevant to the CCSDS publication only.

Pages 1-9 and 1-10

Add the following information to the references indicated:

[2] Document CCSDS 102.0-B-4, May 1996, is equivalent to ISO 13419:1977.

[3] Document CCSDS 101.0-B-3, May 1992, is equivalent to ISO 11754:1994.

[4] Document CCSDS 701.0-B-2, November 1992, is equivalent to ISO 13420:1997.

[5] Document CCSDS 201.0-B-2, May 1996, is equivalent to ISO 12171:—¹⁾.

[6] Document CCSDS 202.0-B-2, November 1992, is equivalent to ISO 12172:—¹⁾.

[7] Document CCSDS 203.0-B-1, January 1987, is equivalent to ISO 12174:—¹⁾.

1) To be published.

Page 1-10

ISO 8824:1990 has been replaced. Reference [13] should read as follows:

- [13] ISO/IEC 8824-1:1995, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*, and its Amendment 1:1996.

ISO/IEC 8824-2:1995, *Information technology — Abstract Syntax Notation One (ASN.1): Information object specification*, and its Amendment 1:1996.

ISO/IEC 8824-3:1995, *Information technology — Abstract Syntax Notation One (ASN.1): Constraint specification*.

ISO/IEC 8824-4: 1995, *Information technology — Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications*.

3 Revision of publication CCSDS 910.4-B-1

It has been agreed with the Consultative Committee for Space Data Systems that Subcommittee ISO/TC 20/SC 13 will be consulted in the event of any revision or amendment of publication CCSDS 910.4-B-1. To this end, NASA will act as a liaison body between CCSDS and ISO.

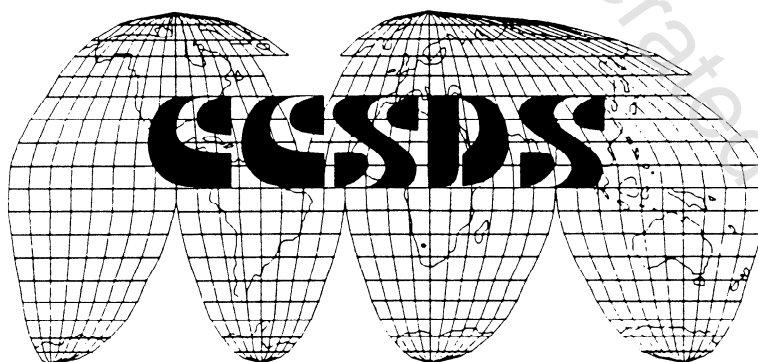
Consultative Committee for Space Data Systems

RECOMMENDATION FOR SPACE
DATA SYSTEM STANDARDS

CROSS SUPPORT REFERENCE MODEL PART 1 SPACE LINK EXTENSION SERVICES

CCSDS 910.4-B-1
BLUE BOOK

May 1996



RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

AUTHORITY

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This document has been approved for publication by the Management Council of the Consultative Committee for Space Data Systems (CCSDS) and represents the consensus technical agreement of the participating CCSDS Member Agencies. The procedure for review and authorization of CCSDS Recommendations is detailed in reference [1], and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

This Recommendation is published and maintained by:

CCSDS Secretariat
Program Integration Division (Code OI)
National Aeronautics and Space Administration
Washington, DC 20546, USA

RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

STATEMENT OF INTENT

The Consultative Committee for Space Data Systems (CCSDS) is an organization officially established by the management of member space Agencies. The Committee meets periodically to address data systems problems that are common to all participants, and to formulate sound technical solutions to these problems. Inasmuch as participation in the CCSDS is completely voluntary, the results of Committee actions are termed **Recommendations** and are not considered binding on any Agency.

This **Recommendation** is issued by, and represents the consensus of, the CCSDS Plenary body. Agency endorsement of this **Recommendation** is entirely voluntary. Endorsement, however, indicates the following understandings:

- o Whenever an Agency establishes a CCSDS-related **standard**, this **standard** will be in accord with the relevant **Recommendation**. Establishing such a **standard** does not preclude other provisions which an Agency may develop.
- o Whenever an Agency establishes a CCSDS-related **standard**, the Agency will provide other CCSDS member Agencies with the following information:
 - The **standard** itself.
 - The anticipated date of initial operational capability.
 - The anticipated duration of operational service.
- o Specific service arrangements shall be made via memoranda of agreement. Neither this **Recommendation** nor any ensuing **standard** is a substitute for a memorandum of agreement.

No later than five years from its date of issuance, this **Recommendation** will be reviewed by the CCSDS to determine whether it should: (1) remain in effect without change; (2) be changed to reflect the impact of new technologies, new requirements, or new directions; or, (3) be retired or canceled.

In those instances when a new version of a **Recommendation** is issued, existing CCSDS-related Agency standards and implementations are not negated or deemed to be non-CCSDS compatible. It is the responsibility of each Agency to determine when such standards or implementations are to be modified. Each Agency is, however, strongly encouraged to direct planning for its new standards and implementations towards the later version of the Recommendation.

RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

FOREWORD

This document is a technical **Recommendation** for use in developing ground systems for space missions and has been prepared by the **Consultative Committee for Space Data Systems** (CCSDS). The Cross Support reference model described herein is intended for missions that are cross-supported between Agencies of the CCSDS.

This **Recommendation** establishes a common framework and provides a common basis for the specification of data services that extend the space to ground communication services previously defined by CCSDS. It allows implementing organizations within each Agency to proceed coherently with the development of compatible derived Standards for the ground systems that are within their cognizance. Derived Agency Standards may implement only a subset of the optional features allowed by the **Recommendation** and may incorporate features not addressed by the **Recommendation**.

Through the process of normal evolution, it is expected that expansion, deletion or modification to this document may occur. This **Recommendation** is therefore subject to CCSDS document management and change control procedures, as defined in reference [1].

RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

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- European Telecommunications Satellite Organization (EUTELSAT)/Europe.
- Hellenic National Space Committee (HNSC)/Greece.
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- Swedish Space Corporation (SSC)/Sweden.
- United States Geological Survey (USGS)/USA.

RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

DOCUMENT CONTROL

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CCSDS 910.4-B-1	Cross Support Reference Model—Part 1: Space Link Extension Services	May 1996	Original Issue

RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

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RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

1 INTRODUCTION

1.1 PURPOSE OF THIS RECOMMENDATION

1.1.1 BASELINE AND REFERENCE FOR SLE SERVICE SPECIFICATIONS

This Recommendation defines a Cross Support reference model which provides a common basis for coordinating the development of CCSDS Recommendations for Space Link Extension (SLE) service specifications and serves as a reference to maintain the consistency of these Recommendations.

1.1.2 RELATIONSHIP TO SPACE LINK RECOMMENDATIONS

1.1.2.1 CCSDS Space Link Recommendations (Advanced Orbiting System (AOS), Packet Telemetry, and Telecommand, references [2]–[7]) define formats and protocols for the transfer of data from/to data sources/sinks on board a space vehicle to/from data sinks/sources on the ground as shown on figure 1-1. These Space Link protocols are designed to work efficiently in the noisy, high-delay environment of space/ground radio links; thus they do not carry information needed to configure and operate the ground systems that link numerous ground stations with the ground sinks and sources of data.



Figure 1-1: CCSDS Space Mission Data System

1.1.2.2 The SLE Recommendations complement the CCSDS Space Link Recommendations with a range of services that are required to configure, operate, and supervise the ground data systems.

1.1.2.3 The SLE Recommendations apply to data systems that are able 1) to receive CCSDS Space Link data structures from a spacecraft via a Space Link, or 2) to send CCSDS Space Link data structures to a spacecraft via a Space Link, or 3) to transfer such CCSDS Space Link data structures between ground-based entities.

1.1.3 SLE SERVICES

SLE services comprise:

- a) SLE transfer services, which are concerned with the ground part of the data transfer described in 1.1.2. This transfer is either within the ground data system or between the ground data system and the ground data sources/sinks.
- b) SLE management services, which control the scheduling and provision of SLE transfer services by ground systems.

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1.1.4 SLE SYSTEMS

Ground systems that provide services that comply with the CCSDS Recommendations for SLE service specifications are called SLE systems.

1.1.5 FRAMEWORK FOR SLE SERVICES

This Recommendation provides the framework for definition of SLE service specifications to be used in support of space missions. This framework comprises:

- a) the identification of an SLE system and of its environment;
- b) an architectural model of an SLE system including:
 - 1) a functional view;
 - 2) a management view;
- c) the common characteristics of SLE services and the template for SLE service specifications:
 - 1) each individual SLE service specification expresses its requirement on supporting telecommunication services in a respective quality-of-service clause;
 - 2) it is assumed that the provider and user of a given SLE service ensure that appropriate telecommunication facilities are in place;
- d) the identification of the SLE transfer services;

NOTE – In d), SLE transfer services are identified; however, the complete service specification will be provided in a separate Recommendation.

1.2 SCOPE

1.2.1 The scope of this Recommendation is the definition of all concepts and terms that establish a common basis for coordinating the development of CCSDS Recommendations for SLE services specifications. In defining these concepts and terms the following assumptions are made:

- a) the context is that of a single space mission;
- b) within this space mission a single spacecraft is considered;
- c) this spacecraft's telemetry and telecommand are compliant with CCSDS Space Link Recommendations;
- d) all ground end-users (i.e., data sinks or sources) are affiliated with a single mission management entity.

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1.2.2 The following points are not covered by this Recommendation:

1.2.2.1 Although sharing ground systems between multiple space missions or between multiple spacecraft of the same space mission is not explicitly modeled, this Recommendation does not in any way preclude sharing ground systems.

1.2.2.2 Ground systems and/or services that are not directly concerned with the transport of data compliant to CCSDS Space Link Recommendations are not described. Processing data held within the data fields of Source Packet Protocol Data Units (PDUs) described in CCSDS Packet Telemetry, Telecommand, and AOS Recommendations (references [2]–[7]) is outside the scope of this Recommendation.

1.2.2.3 This reference model assumes that ground communications services are used in conjunction with the SLE services to support a space mission, but does not explicitly model these communications services.

1.3 APPLICABILITY

1.3.1 APPLICABILITY OF THIS RECOMMENDATION

This Recommendation serves as a guideline for the development of compatible Agency standards for SLE systems. Systems embraced by this Recommendation include manned and unmanned free-flying spacecraft and space transportation systems. This Recommendation is particularly relevant to the SLE systems that are involved in cross support.

1.3.2 LIMIT OF APPLICABILITY

This Recommendation is neither a specification of, nor a design for, real SLE systems that may be implemented for the control and monitoring of existing or future missions.

1.4 RATIONALE

The primary goal of CCSDS is to increase the level of interoperability among Agencies. This Recommendation furthers that goal by establishing the basis for a set of SLE services to be used in the area where most cross-support activity occurs: between the tracking stations or ground data handling systems of various Agencies and the mission specific components of a mission ground system. Reference [11], *Cross Support Concept — Part 1: Space Link Extension Services*, provides further discussion of the rationale for this Recommendation.

RECOMMENDATION FOR CROSS SUPPORT REFERENCE MODEL—PART 1: SLE SERVICES

1.5 DOCUMENT STRUCTURE

This Recommendation is organized as follows:

- a) Section 1 provides purpose, scope, applicability and rationale of this Recommendation and lists the definitions, conventions, and references used throughout the Recommendation.
- b) Section 2 provides the context of cross support, presents the cross-support documentation structure, and shows how this Recommendation fits into that framework. It expands on the scope of this Recommendation to provide an overview of the document.
- c) Section 3 defines the SLE system environment, data handled by an SLE system, and introduces SLE services.
- d) Section 4 defines an architectural model for the SLE system. This architectural model comprises two views:
 - 1) A functional view which defines the system concepts, including functions and data, from which the SLE services are derived. In this functional view, the SLE system is decomposed into SLE Functional Groups (SLE-FGs), which implement and augment the ground side of the Space Link protocols described in CCSDS Packet Telemetry, Telecommand, and AOS Recommendations (references [2]-[7]).
 - 2) A cross-support management view, which defines the management interactions between the entities involved in the provision of SLE services and provides the baseline for the SLE Service Management Specification. In this management view, the SLE system is decomposed into SLE Complexes and the notion of SLE Service Package is introduced.
- e) Section 5 defines the common characteristics of SLE services, provides the template for SLE transfer services specifications, and provides an initial description of each SLE service including operations and parameters at the corresponding ports.
- f) Annex A expands upon the description, in Section 3, of the data handled in SLE systems.

1.6 DEFINITIONS**1.6.1 DEFINITIONS FROM REFERENCES**

This Recommendation uses the Abstract Service Definition Conventions (ASDC) methodology, which provides the means to create a model of a system composed of objects that provide services to one another. This Architecture Model is composed of abstract-objects which have abstract ports, through which they provide abstract-services to other abstract-objects. The definitions below are from reference [10].