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**Space link extension — Cross  
support transfer service —  
Monitored data service**

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This document was prepared by the ISO/TC 20, *Space vehicles*, Subcommittee SC 13, *Space data and information transfer systems* and adopted under the "fast-track procedure".

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## 1 INTRODUCTION

### 1.1 PURPOSE OF THIS RECOMMENDED STANDARD

This Recommended Standard defines the Monitored Data Cross Support Transfer Service (CSTS), in conformance with the Cross Support Transfer Services Specification Framework Recommended Standard (reference [1]). The Monitored Data CSTS (MD-CSTS) is a service that allows a spaceflight mission to receive cyclic reports on, and to query the current values of, the parameters that are pertinent to Cross Support Services being provided by a Cross Support Complex. The Monitored Data service also allows a spaceflight mission to receive notifications of the occurrence of events of interest associated with the services that are being provided by a Cross Support Complex.

NOTE – The term ‘Cross Support Complex’, as used throughout this document, corresponds to the Earth Space Link Terminal (ESLT) defined in the Space Communications Cross Support Architecture Description Document (reference [G9]).

### 1.2 SCOPE

This Recommended Standard defines the Monitored Data service in terms of:

- a) the CSTS procedures that constitute the service;
- b) the extensions and refinements of the behavior of those CSTS procedures necessary to provide the transfer service;
- c) the extensions and refinements of standard CSTS operations associated with each of the procedures;
- d) the relationships among the procedures that constitute the service.

It does not specify:

- a) individual implementations or products;
- b) the implementation of entities or interfaces within real systems;
- c) the methods or technologies required to measure the values of monitored parameters and to detect the occurrence of events of interest;
- d) the methods or technologies required for communication;
- e) the management activities necessary to schedule, configure, and control the MD-CSTS;
- f) the specific parameters that are to be reported and events that are to be notified by the MD-CSTS.



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**1.3 APPLICABILITY****1.3.1 GENERAL**

The applicability and limits of applicability of Cross Support Transfer Services in general, as described in reference [1], pertain to the Monitored Data service, with the addition of the conditions described in 1.3.2, below.

**1.3.2 APPLICABILITY OF THIS RECOMMENDED STANDARD**

This Recommended Standard is applicable to the implementation of real systems that monitor provision and production of space communication Cross Support Services for the purposes of generating cyclic status reports, generating notifications of changes in status in real time, and responding to queries of current values of operational parameters.

**1.4 RATIONALE**

The goal of this Recommended Standard is to create a standard for interoperability for the exchange of cross support service-related status information between the cross support elements of various space Agencies and the users of the Cross Support Services that they provide.

**1.5 DOCUMENT ORGANIZATION**

Section 2 describes the Monitored Data Cross Support Transfer Service in terms of:

- the role of Service Management with respect to the MD-CSTS;
- the allocation of production and provision of the MD-CSTS to Functional Resources;
- the cross support view of the MD-CSTS;
- the functional description of the production and provision of the service; and
- an operational scenario that illustrates some of the more significant aspects of the service.

Section 3 specifies the composition of the MD-CSTS. The service type identifier is declared, the procedures that constitute the service are identified, and the CSTS state machine that applies to the MD-CSTS is specified. Because the MD-CSTS is composed of procedures that are directly adopted from the CSTS Framework without extension, no further specification of the MD-CSTS is required.

Section 4 specifies the On-Change-Option Cyclic Report procedure, which is an extension and refinement of the Framework Cyclic Report Procedure.

Section 5 specifies the refinements of the Information Query procedure.

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Section 6 specifies the refinements of the Notification procedure.

Section 7 specifies how the procedure configuration parameters are to be set for the MD-CSTS.

Section 8 specifies the Monitored Data Service-specific versions of the service-generic parameter and events that are defined in *Cross Support Transfer Service—Specification Framework* (reference [1]).

Section 9 specifies the refinements of the definitions of Framework parameters, events, and directives for the purposes of making them applicable to the MD-CSTS.

Annex A is the Implementation Conformance Statement Proforma for the MD-CSTS.

Annex B provides the formal specification of the ASN.1 Object Identifiers module for the Monitored Data transfer service.

Annex C provides the formal specification of the ASN.1 Protocol Data Unit module for the On-Change-Option Cyclic Report procedure of the Monitored Data transfer service.

Annex D defines the monitored data production process. In particular, it specifies how monitored data values are to be labeled so that, when transferred by MD-CSTS instances, the sources of the measurements are unambiguous.

Annex E addresses the security, Space Assigned Numbers Authority (SANA), and patent considerations associated with the MD-CSTS.

Annex F describes an example set of monitored parameters, notifiable events, and their associated Functional Resource Types. These examples are modeled on the contents of the SANA Functional Resource Registry (reference [3]).

NOTE – The SANA Functional Resource Registry is the normative repository of all such definitions. The example entries in annex F are included to illustrate the concepts of the use of Functional Resources by the MD service. Any real implementation of the MD service must use the Functional Resource specifications found in the SANA Functional Resource Registry.

Annex G provides the list of informative references.

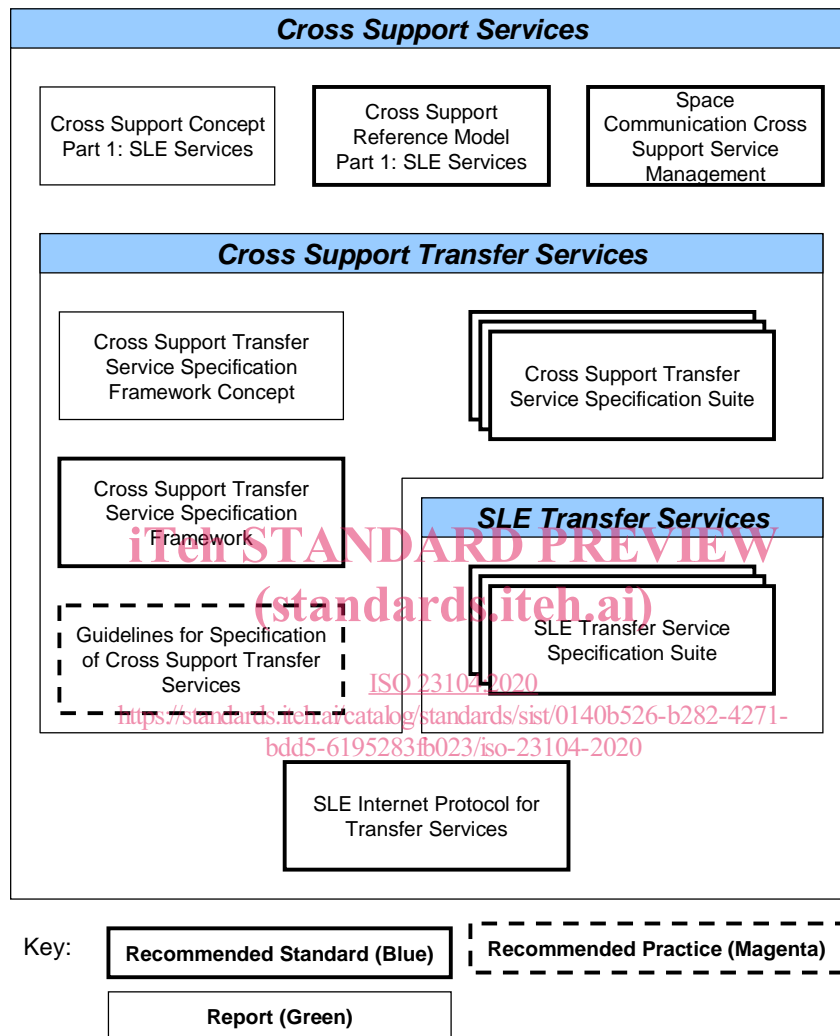
Annex H lists the acronyms used in this document.

Annex I identifies the specific reference-[1] sections that are cross referenced by the MD-CSTS Recommended Standard, and the sections of the MD-CSTS Recommended Standard that reference each of those sections or subsections in reference [1]. This annex is included for maintainability of this Recommended Standard through future changes in reference [1].

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## 1.6 CROSS SUPPORT TRANSFER SERVICES DOCUMENTATION

The basic organization of the Cross Support Services documentation and the relationship to the CSTS documentation is shown in figure 1-1.



**Figure 1-1: Cross Support Services Documentation**

The CSTS Documentation is:

- Cross Support Concept—Part 1: Space Link Extension Services* (reference [G1]): a Report introducing the concepts of cross support and the Space Link Extension (SLE) services. Many of the concepts for the SLE transfer services have been adopted for the CSTSes (see h) below);
- Cross Support Reference Model—Part 1: Space Link Extension Services* (reference [2]): a Recommended Standard that defines the framework and

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terminology for the specification of SLE services. Much of the framework and terminology of this reference model has been adopted or adapted for CSTSes (see 1.7.2 and 2.2).

- c) *Space Communication Cross Support Service Management* suite (informative references [G6], [G7], and [G8]): Recommended Standards that specify the Service Management Information Entities that are used to configure and schedule CSTSes;
- d) The *SLE Transfer Services* suite: The SLE Transfer Services comprise a set of Cross Support Transfer Services that are used to transfer specific telecommand and telemetry protocol data units. The SLE Transfer Services are closely related to the CSTS suite in that they collectively define the set of operations that are the basis for the CSTS Specification Framework. However, because of history (the SLE Transfer Services were already specified and implemented prior to development of the CSTS Framework) the SLE Transfer Services are separated from CSTSes;
- e) *Space Link Extension - Internet Protocol for Transfer Services* (reference [G2]): a Recommended Standard that defines a protocol for transfer of Protocol Data Units (PDUs) defined in the Cross Support Transfer Services. This Recommended Standard was originally developed to support SLE transfer services (hence the title), but it is also applicable to (and specified for) use by Cross Support Transfer Services.

The documents specific to Cross Support Transfer Services are:

- f) *Cross Support Transfer Services Specification Framework* (reference [1]): a Recommended Standard that defines basic building blocks for the specification of Cross Support Transfer Service procedures;
- g) *Guideline for Specification of Cross-Support Transfer Services*: a Recommended Practice that, when published, will define the guidelines for construction of a Cross Support Transfer Service based on the CSTS Specification Framework;

NOTE – As of the publication of this Recommended Standard, the Guidelines Magenta Book is in-progress. It is not required to understand this Recommended Standard.

- h) *Cross Support Transfer Services Specification Framework Concepts* (reference [G3]): A Report that provides tutorial material on the objectives and concepts of the CSTS Specification Framework;
- i) *Cross Support Transfer Services Suite*: The set of specifications for actual CSTSes built from the procedures in the CSTS Specification Framework and in accordance with the CSTS Guidelines.

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**1.7 DEFINITIONS****1.7.1 TERMS DEFINED IN THE CROSS SUPPORT TRANSFER SERVICES SPECIFICATION FRAMEWORK RECOMMENDED STANDARD (REFERENCE [1])**

- a) Association Control procedure;
- b) Buffered Data Delivery procedure;
- c) complete data delivery mode;
- d) Cross Support Complex;
- e) Cross Support Service production;
- f) Cross Support Transfer Service;
- g) Event Identifier;
- h) Event Label;
- i) Event Name;
- j) Functional Resource instance;
- k) Functional Resource Instance Number;
- l) Functional Resource Name;
- m) Functional Resource Type;
- n) Label List;
- o) Label List Set;
- p) non-blocking (operation);
- q) Parameter Identifier;
- r) Parameter Label;
- s) Parameter Name;
- t) prime procedure instance;
- u) procedure configuration parameter;
- v) procedure type;
- w) procedure instance identifier;
- x) Published Identifier;
- y) qualified parameter;

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- z) secondary procedure instance;
- aa) service management parameter;
- bb) service-user-responding-timer;
- cc) subscription.

**1.7.2 TERMS DEFINED IN THE CROSS SUPPORT REFERENCE MODEL (REFERENCE [2])**

- a) Complex Management (CM) (called *SLE Complex Management* in reference [2]);
- b) Mission User Entity (MUE);
- c) service agreement (called *SLE Service Agreement* in reference [2]);
- d) service package (called *SLE Service Package* in reference [2]);
- e) space link session;
- f) transfer service production;
- g) transfer service provision;
- h) Utilization Management (UM);
- i) utilization phase (called *SLE Service Package Utilization phase* in reference [2]).

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**1.8 NOMENCLATURE**

**1.8.1 NORMATIVE TEXT**

The following conventions apply for the normative specifications in this Recommended Standard:

- a) the words ‘shall’ and ‘must’ imply a binding and verifiable specification;
- b) the word ‘should’ implies an optional, but desirable, specification;
- c) the word ‘may’ implies an optional specification;
- d) the words ‘is’, ‘are’, and ‘will’ imply statements of fact.

NOTE – These conventions do not imply constraints on diction in text that is clearly informative in nature.

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**1.8.2 INFORMATIVE TEXT**

In the normative sections of this document, informative text is set off from the normative specifications either in notes or under one of the following subsection headings:

- Overview;
- Background;
- Rationale;
- Discussion.

**1.9 CONVENTIONS****1.9.1 OVERVIEW**

The conventions defined in the CSTS Specification Framework Recommended Standard (reference [1]) are applicable to this Monitored Data service specification, with the exception of the representation of Object Identifiers. The conventions for the representation of Object Identifiers in this Recommended Standard are described in 1.9.2.

**1.9.2 OBJECT IDENTIFIER REPRESENTATION****1.9.2.1 General**

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The MD service involves extensive use of Functional Resource Types, procedure types, Functional Resource Names, procedure instance identifiers, Parameter Names, Parameter Identifiers, Event Names, and Event Labels. As specified in reference [1], all of these names are based on Published Identifiers, which are International Organization for Standardization (ISO) Object Identifiers (OIDs). OIDs have the syntax of strings of integers. For purposes of readability, rather than using actual OIDs in the descriptions and examples in this Recommended Standard, the OIDs in these names and identifiers are represented using the following textual notation to represent the OIDs.

**1.9.2.2 Functional Resource Type**

As specified in reference [1], a Functional Resource Type is a Published Identifier (i.e., an ISO OID). In the descriptions and examples in this Recommended Standard, a Functional Resource Type is represented using the notation *{published identifier descriptor}*, which is a textual description of the Published Identifier. Thus {Antenna} represents the Published Identifier for the Antenna Functional Resource Type.