Consultative Committee for Space Data Systems

REPORT CONCERNING SPACE DATA SYSTEM STANDARDS

CONSULTATIVE COMMITTEE FOR SPACE DATA SYSTEMS GLOSSARY

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FOREWORD

This document is a technical report which consolidates glossaries provided by the active technical panels of the Consultative Committee for Space Data Systems (CCSDS).

Through the process of normal evolution and the progress in the build-up of implementations, it is expected that modifications and expansions of this report will occur. This Report is therefore subject to CCSDS document management and change control procedures which are defined in reference [46]. The most recent issues of CCSDS documents can be found on the World Wide Web at http://www.ccsds.org/ccsds.

At time of publication, the active Member and Observer Agencies of the CCSDS were

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- Agenzia Spaziale Italiana (ASI)/Italy.
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- Canadian Space Agency (CSA)/Canada.
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- National Space Development Agency of Japan (NASDA)/Japan.
- Russian Space Agency (RSA)/Russian Federation.

Observer Agencies

- Austrian Space Agency (ASA)/Austria.
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- Ministry of Communications (MOC)/Israel.
- National Oceanic & Atmospheric Administration (NOAA)/USA.
- National Space Program Office (NPSO)/Taipei.
- Swedish Space Corporation (SSC)/Sweden.
- United States Geological Survey (USGS)/USA.

DOCUMENT CONTROL

Document	Title	Date	Status/Remarks
CCSDS A30.0-G-1	Consultative Committee for Space Data Systems Glossary	November 1995	Original Issue
CCSDS A30.0-G-2	Consultative Committee for Space Data Systems Glossary	February 1997	Add terms for Lossless Data Compression CCSDS 121.0-B-1
CCSDS A30.0-G-3	Consultative Committee for Space Data Systems Glossary	July 1997	Added terms for o Lossless Data Compression CCSDS 121.0-G-1, o SFDU Referencing Environment CCSDS 622.0-B-1 o EAST Specification CCSDS 644.0-B-1 o EAST Tutorial CCSDS 645.0-G-1 o EAST List of Conventions CCSDS 646.0-G.1

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1 INTRODUCTION

This document consolidates glossaries provided by the active technical panels of the Consultative Committee for Space Data Systems (CCSDS). It has been compiled for two purposes:

- to provide an authoritative reference work for CCSDS document users who are unfamiliar with CCSDS terminology;

- to provide CCSDS document developers with a resource that may help them avoid redefining terms already in use as well as reinventing terms already defined.

The terms in the Definitions section (Section 3) are organized alphabetically in a single list. Where the same term has been defined differently by the different technical panels, that term is given only once, and the different definitions are grouped under it. In some cases, a term defined by one or more CCSDS panels has also been defined by an external standards organization. For such terms, the CCSDS panel definitions are given first, and definitions from external standards organizations follow. Definitions from external standards organizations are identified by the organization's acronym in italics followed by a period (e.g., *ANSI*.) at the beginning of the definition.

In most cases, terms and definitions are derived from the glossaries of CCSDS Blue and Green books. CCSDS documents in which a term is used are referenced where appropriate at the end of a definition. Document references are indicated by a number in square brackets corresponding to a number in the References section (Section 2). In the case of multiple definitions for a single term, different documents may be referenced for different definitions.

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3 DEFINITIONS

abstract-association
The relationship that exists between two abstract-ports that are bound to each other [43].

abstract binding
When two abstract ports of the same type have an association established between them such that an abstract service can be provided, the two ports are said to be bound. The act of establishing such an association is called abstract binding [45].

abstract-bind-operation
A task whose successful performance binds one or more pairs of abstract-ports [43].

abstract-error
A predefined condition that, upon occurrence during an attempted invocation of an abstract-operation, causes that abstract-operation to fail [43].

abstract-model
The macroscopic level of ASDC, composed of abstract-objects, abstract-ports, and abstract-services [43].

abstract-object
A functional entity (e.g., a system) that interacts with one or more other abstract-objects to provide abstract-services to, and/or use the abstract-services of, those abstract-objects [43][45].

abstract-operation
A task whose performance provides all or part of an abstract-service. An abstract-operation is invoked by an abstract-object and performed by another abstract-object via the abstract-association that exists between them [43].

abstract-port
A point at which an abstract-object interacts with another abstract-object, via an abstract-port of the same type on the other abstract-object [43].

abstract-port-type
The common identifier for a collection of abstract-ports that perform the same set of abstract-operations. There are two varieties of abstract-port-types, symmetric and asymmetric [43].

abstract-refinement
The process of modeling a system as one or a few high-level abstract-objects and successively decomposing each of those abstract-objects into lower-level component-abstract-objects [43].

abstract-service
A set of capabilities that one abstract-object offers to another by means of one or more of its abstract-ports [43][45].

abstract-service-provider
An abstract-object that offers an abstract-service to another abstract-object [43].

abstract-service-user
An abstract-object that uses an abstract-service of another abstract-object [43].

abstract syntax
The specification of Application Layer data or application-protocol-control-information by using notation rules which are independent of the encoding techniques used to represent them [43].

abstract transfer syntax
Telecommand. A formal logical notation used within the **application process layer** to express a **user** command request [11].

abstract-unbind-operation
A task whose performance unbinds two abstract-objects [43].

acceptance
Telecommand. Within the **transfer layer**, recognition by the **receiving end** that a TC frame has passed the validation and acceptance test criteria as programmed into the **frame acceptance and reporting mechanism** [7][9].

acceptor
In a particular instance of OSI-service-procedure, an OSI-service-user that receives a deliver primitive and as a result may issue one or more submit primitives [43].

acquisition sequence
Telecommand. A specific high transition density bit pattern transmitted to permit the **receiving end** to acquire **symbol** synchronization [8].

adaptive entropy coder
An Entropy Coder codes the source samples with uniquely decodable codewords that, upon decoding, reconstruct the source samples. With an adaptive entropy coder, the average codeword length also follows closely the information content of the source [5].

ADI
Obsolete. Authority and Data Descriptive Record Identifier [18].

ADID
See **Authority and Description Identifier**.

ADU

Application Data Unit [19][20].

advanced orbiting systems (AOS)

Those systems, located in space and on ground, that support earth orbiting missions involving manned space stations, manned and unmanned platforms, and space transportation systems [32][33][34][35][36][37][38][39][40].

AE-invocation

A specific utilization of part or all of the capabilities of a given application-entity in support of the communications requirements of an application-process-invocation [44].

NOTE – This is a specific use of the ASO-invocation concept.

agency

A national or international space organization that is a Member or Observer of the Consultative Committee for Space Data Systems.

aggregation block

A named collection of assignment statements and/or other aggregation blocks [25][26].

agreement phase

Phase during which the agencies agree on the objectives of the service managerial interfaces, legal and financial responsibilities, etc. This phase is not anticipated to be automated via a distributed application; rather, this phase will be implemented through human interactions [44].

alphanumeric character set

The set of characters comprising the digits 0 through 9 and the letters a-z or A-Z [25][26]. *ANSI*. A character set that contains both letters and digits, special characters and the space character [X3.1772].

American Standard Code for Information Interchange (ASCII)

A 7-bit code also known as USA Standard Code for Information Interchange (USASCII) [22][27][28]; ASCII is commonly embedded in an eight-bit field in which the highest order bit (written as the left-most) is either used as a parity bit or set equal to zero; the 7-bit code consists of two character sets: a Control (C) set and a Graphics (G) set. The control set, occupying positions 0/0 (0 hex) through 1/15 (lF hex), is described in ANSI 3.4-1986 and in ISO 646:1983. The graphics set, occupying positions 2/0 (20 hex) through 7/14 (7E hex), is described in ANSI 3.4-1986; and as the G0 set of ISO 88591:1987 plus space. The graphics set is also the same as the IRV version of ISO 646, with the exception of positions 2/4 (24 hex) and 7/14 (7E hex), which contain dollar ($) and tilde (~), respectively, in the ASCII set, and currency and overscore in ISO 646. *ANSI*. The standard code, using a coded character set consisting of 7-bit coded characters (8-bits including parity check), that is used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters [X3.172].

annotation

The extension of the Space Link services requires that information be added to the SL data units. The process of adding information to the Space Link data is called annotation [44].

ANSI

American National Standards Institute [18][19][20].

AOS

Advanced Orbiting System.

aperiodic

Not occurring at a constant rate (see **constant rate: periodic**) [4].

APID

Application Process Identifier.

APID qualifier

AOS. A **path service** mechanism for supplementing the **application process ID** in the **header** of a version-1 **CCSDS packet** so that it may be locally discriminated from other **CCSDS packets** bearing the same APID [33].

application-association, association

A cooperative relationship between two ASO-invocations which governs their bilateral use of the Presentation Service for communication of information and coordination of their joint operation [44].

NOTE – This is a specific use of the ASO-association concept.

application-entity

An application element, within an application process, embodying a set of capabilities which is pertinent to OSI and which is defined for the Application Layer, that corresponds to a specific application-entity-type (without any extra capabilities being used) [43].

application process

AOS, Telecommand, Telemetry. A process that provides the facilities and interfaces whereby a **user** directs a **receiving element** in space. Application processes exist at both ends of the **telecommand system**. At the **sending end**, application processes formulate **command directives** in response to requests for **command** submitted by a **user**. Other application processes integrate, aggregate, assemble, validate and "name" sets of **command directives** for delivery to the spacecraft in order to execute desired mission sequences. Application processes also direct and monitor the end-to-end process of delivering and executing the **commands**, including the selection of recovery strategies in case of abnormal performance by lower **layers** of the system. At the **receiving end**, application processes execute and confirm the spacecraft actions specified by the **command directives** [3][11]. An element within a real open system which performs the information processing for a particular application [43].

application process identifier

Telecommand, Telemetry and AOS. A bit pattern in the appropriate **header** which identifies the **application process** [3][11][33].

application-process-invocation

A specific utilization of part or all of the capabilities of a given application process in support of a specific occasion of information processing [43].

application process layer

Telecommand and Telemetry. The upper **layer** of the TC/TLM system. It contains the **application processes** that support spacecraft commanding/telemetering at the sending and **receiving ends**, and includes the data formats and **protocols** that are used to exchange information. The **layer** translates **user** requests into **command/telemetry** directives/data [7][11].

application-service-element

A set of application-functions that provides a capability for the interworking of application entity-invocations for a specific purpose; application-service-elements are a component of application-service-objects [43].

NOTE – This definition refines the original definition of application-service-elements in ITU-T Rec. X.200 | ISO 7498-1.

application-service-object
An active element within (or equivalent to the whole of) the application entity embodying a set of capabilities defined for the Application Layer that corresponds to a specific ASO-type (without any extra capabilities being used) [43].

NOTE – This is a specific use of the (N)-entity concept defined in ITU-T Rec. X.200 | ISO 7498-1.

application services
The upper-**layer** communication **services** provided to interactive space mission applications such as file transfers, electronic messages, data base queries, etc.

archive
A place in which data are preserved. Typically, an archive will provide services for storing and cataloging collected data, and for retrieving selected data upon request. Data delivered to and received from space-related data archives should be in the form of SFDUs, although the data may be stored internally in some other form [18].

array type
An array type is a composite type whose components are al l of the same type. Components are selected by indexing [29][30].

ASCII
See **American Standard Code for Information Interchange**.

ASDC
Abstract Service Definition Conventions.

ASN.1
Abstract syntax notation one [19][25][26].

ASO-association
A cooperative relationship among two or more ASO-invocations for the purpose of communication of information and the coordination of their joint operation [43].

NOTE – This is a specific use of the (N)-association concept.

ASO-invocation
A specific utilization of part or all of the capabilities of a given ASO (without extra capabilities being used) [43].

NOTE – This is a specific use of the (N)-entity-invocation concept defined in ITU-T Rec. X.200 | ISO 7498-1.

ASO-type

A description of a class of ASOs in terms of a set of capabilities defined for the Application Layer [43].

NOTE – This is a specific use of the (N)-entity-type concepts defined in ITU-T Rec. X.200 | ISO 7498-1.

association

A cooperative relationship among entities in the same layer [4].

association control service element

An ASE that provides the exclusive means for establishing and terminating all application-associations [44].

NOTE – The functionality of this ASE is defined in CCITT Rec. X.217 | ISO/IEC 8649.

asymmetric

A variety of abstract-port-type that indicates that the two abstract-ports of the port pair invoke and perform different and complementary sets of abstract-operations. One asymmetric abstract-port is designated the consumer, and the other, the supplier. The consumer performs the set of operations invoked by the supplier, and the supplier performs the operations invoked by the consumer [43].

asymmetrical service

An OSI-service for which the definitions of all OSI-local views are not all the same (i.e. there are several types of OSI-local view) [43].

asynchronous

Not synchronous (see **synchronous**) [4]. Transmitted in a manner that does not preserve precise time or structural relationships. *ANSI*. (asynchronous operation) An operation that occurs without a regular or predictable time relationship to a specified event; for example, the calling of an error diagnostic routine that may receive control at any time during the execution of a computer program [X3.172].

audio

A data stream containing digitized samples of human voice signals.

authority and description identifier (ADID)

The concatenation of the Control Authority Identifier (CAID) and the Data Description Identifier (DDID)[21][22][23][24][28].

In the context of EAST, an ADID is an identifier of the EAST recommendation within the CCSDS organization [29]

autotrack

A system that causes an earth station's antenna to automatically follow (track) a moving spacecraft [14].

based literal

A based literal is a numeric literal expressed in a form that specifies the base explicitly [29][30].

binary symmetric channel (BSC)

A channel through which it is possible to send one binary digit per unit of time and for which there is a probability p ($0 < p < 1/2$) that the output is different from the input. This probability does not depend on whether the input is a zero or a one. Successive input digits are affected by the channel independently [2].

bit numbering convention

The convention according to which bit numbering is being performed; e.g., in **packet telemetry** the first bit in a field has the number zero.

bitstream

A string of bits, each having apparently equal weight, which has no known structure to a **service** provider.

bitstream protocol data unit

The **protocol data unit** of the bitstream **protocol data unit** construction function of the **space link subnet**, having the format of a **header** followed by a fixed-length block of data that contains a string of **user** bits (possibly terminated with **fill data**), the boundary between **user** and **fill data** being indicated by a pointer in the **header** [33].

bitstream service

A **service** within the **space link subnet** which allows **bitstream** data to be transferred on a dedicated **virtual channel** [32][33].

bit stream

A bit string is a sequence of bits, each having the value 0 or 1 [30].

bit transition generator

A generator that produces a specific random sequence of 255 bits to be “OR” -ed with the TC data bits to increase the frequency of bit transitions (between “1” and “0”). No additional bits are added by this process [8].

block encoding

A one-to-one transformation of sequence of length k of elements of a source alphabet to sequences of length n of elements of a code alphabet, $n>k$ [1][2].

blocking
A **protocol** function that maps multiple **service data unit**s into one **protocol data unit** [4].

block name
The name used to identify an aggregation block [25][26].

bound
The state that exists between two abstract-ports as a result of a successful bind-operation [43].

CA
See **control authority**.

CADS
Control authority data structure [24].

CAID
See **control authority identifier**.

calendar segmented time code
One of three CCSDS-recommended **segmented time codes** [12].

CAO
Control Authority Office [20].

carrier modulation mode
The data type being used to modulate the RF carrier or subcarrier [8].

Category A missions
Those missions whose altitude above the earth is less than, or equal to, $2*10^6$ km [14].

Category B missions
Those missions whose altitude above the earth is greater than $2*10^6$ km [14].

CCITT
International Telegraph and Telephone Consultative Committee [18].

CCSDS
Consultative Committee for Space Data Systems.

CCSDS ADID
The combination of the CAID = "CCSD" and a four-character RA string which makes the identifier unique within the CCSDS domain [22][23].

CCSDS packet
A variable length, delimited data unit whose structure and **header** information is specified by the CCSDS. Also may be referred to a Version 1 packet [3][11][33].

CCSDS Principal Network (CPN)
The CPN serves as, or is embedded within, the **project** data handling networks that provide end-to-end data flow in support of space mission **users** [32][33][36].

CCSDS Version 1 Packet
See CCSDS Packet.

CCSDS Version 2 Packet
Obsolete.

CD-ROM
Compact Disk - Read Only Memory [26].

channel access data unit
The **protocol data unit** of the channel access **sublayer** within the **space link subnetwork** [33].

channel symbol
The unit of output of the innermost **encoder** which is a serial representation of bits, or binary digits which have been encoded to protect against transmission-induced errors [1][2].

character literal
A character literal is formed by enclosing a graphic character between two apostrophe characters [29][30].

character type
a character type is an enumeration type that represents a character set [29][30].

CLCW
See **command link control word**.

clean
Data that are declared to be error free within the error detection and (optional) error correction capabilities of the TC **coding layer** [7][9].

clean data bits
Telecommand. **TC data** bits that have been decoded and are output from the **coding layer**.

CLNP
Connectionless Network Protocol.

closed data system
A data system that employs standards that are applicable at a service access port and are expected to be known only to agents within the enterprise [18].

closed system interchange
An information interchange between systems using private agreements on data representation; includes reliance on common environments [27]. *ANSI*. A system whose characteristics comply with proprietary standards and that therefore cannot be readily connected with other systems [X3.172].

CLTU
See **command link transmission unit**.

code
A correspondence between a symbol or character of a written language and a number of digits of a number system. *ANSI*. A set of rules that maps the elements of one set, the coded set, onto the elements of another set, the coded element set. Synonymous with coding scheme [X3.172].

code rate
The average ratio of the number of binary digits at the input of an **encoder** to the number binary digits at its output [2].

codeblock
A fixed-length data entity containing information and check bits that have been structured by an encoding algorithm. A codeblock of an (n,k) block code is a sequence of n **channel symbols** that were produced as a unit by encoding a sequence of k information **symbols**, and will be decoded as a unit [1][2][7].

coded virtual channel data unit (CVCDU)
A **virtual channel data unit** to which a block of error-correcting Reed-Solomon check **symbols** has been appended [33].

coding layer
That **layer** of the **TC channel service** that uses a prescribed coding technique to reliably transfer information bits through the potentially noisy **physical layer**. It is the upper **layer** of the **TC channel service** [7][8].

command
An instruction from a **user** to a **receiving element** (spacecraft **application process**) to perform a specific control action [7][10][11]. *ANSI*. An order for an action to take place [X3.172].

command directive

A high-level language representation of a desired control action, which has been formulated by an **application process** in an **abstract transfer syntax** in response to a request for **command** activity submitted by a **user**. A command directive contains three abstract components: (1) an identifier by which the **user** may trace the **command**(s) during transit; (2) the requested **command**(s); and (3) the instructions for delivering and executing the **command**(s) (time windows, required system state at **execution** time, contingency **procedures**, etc.) [7][11].

command link control word

A four-**octet** word, which is conveyed in the **operational control field** of a CCSDS **telemetry transfer frame** or **virtual channel data unit**. It provides the mechanism by which the **frame acceptance and reporting mechanism (FARM)** reports the status of frame **acceptance** to the **frame operation procedure (FOP)** at the **sending end** of the **transfer layer** [1][3][7][9][10].

command link transmission unit (CLTU)

Within the **Coding** Layer , the protocol data unit which carries buffers of error-protected symbols (correspnding to one or more encoded **Telecommand Transfer Frames**) during transfer through the data channel to the spacecraft [7]. A **coding layer protocol** data entity that is used to synchronize and delimit the beginning of a continuum of bits consisting of a **start sequence** followed by an integral number of **codeblocks** [8].

command operation procedure (COP)

Telecommand. A sequence of procedural activities designed to assure the **reliable**, error-controlled delivery of a **TC transfer frame** across the **transfer layer**. The COP comprises a **frame operation procedure (FOP)** operating within the **sending end** of the **layer** and a **frame acceptance and reporting mechanism (FARM)** operating within the **receiving end** of the **layer**. Currently, one COP is defined in detail, COP-1, which supports sequential **acceptance** and retransmission with frame sequence numbering [7][9][10].

command session

A continuous period of time during which the signal path is established for the communications channel [8].

command threshold

Telecommand. The **telecommand** channel operating point at which a deletion rate of 1 frame per 1000 frames is obtained.

comment

A delimited string of characters, which is treated as white space syntactically. Comments are intended to provide explanatory information [25]. *ANSI*. In programming languages, a language construct that allows text to be inserted into a program and does not have any effect on the execution of the program [X3.172].

comment delimiter symbols
The symbols used to delimit a comment string [26].

comment delimiters
The character pairs (/* and */) used to delimit a comment [25].

comment string
A delimited string of character information that provides explanatory information. This string is treated as white space syntactically [26].

component-abstract-object
A lower-level abstract-object that results for the refinement of a higher-level abstract-object [43].

composite type
A composite type is a collection of components of the same or different types [29][30].

concatenation
The use of two or more codes to process data sequentially with the output of one **encoder** used as the input of the next [1][2].

conceptual structure
The organization of a data object/unit used for analytical or deductive reasoning about the information it carries. A conceptual data structure may have several formats, e.g., on different media [18].

concrete syntax
A language for describing the physical representation of data structures [18].

concrete transfer syntax
The actual **telecommand** data that are transported to the spacecraft as the contents of **TC packets**, consisting of binary-encoded representations of the abstract **command** [11].

confirm (primitive); acceptor.submit (primitive)
A deliver primitive received by a requestor [43].

congruent environments
Processing environments that are consistent with each other in the processing and representation of data [27].

connectionless
A communications **protocol** that operates in a unidirectional fashion. Without handshaking from the **receiving end**, using a data path that may dynamically vary.

connection-oriented

A communications **protocol** that operates in a closed-loop fashion by receiving handshaking acknowledgements from the **receiving end** using a preestablished data path.

connection vector

In convolutional coding, a device used to specify one of the parity checks to be performed on the shift register in the **encoder**. For a binary **constraint length** k convolution code, a connection vector is a k-bit binary number. A "one" in position i (counted from the left) indicates that the output of the ith stage of the shift register is to be used in computing that parity check [2].

constant

A constant is a keyword that indicates that the identifier it qualifies has a unique and specified value [29][30].

constant rate: periodic

A sequence of events in which each event occurs at a fixed time interval (within specified tolerance) after the previous event in the sequence [4].

constrained array

A constrained array is an array with a constant numer of elements [29][30].

constraint length

In convolutional coding, the number of consecutive input bits that are needed to determine the value of the output **symbols** at any time [1][2].

consumer

The designation of one of the two port subtypes of an asymmetric abstract-port-type; the complement to the supplier subtype [43].

control authority (CA)

An organization under the auspices of CCSDS which supports the transfer and usage of SFDUs by providing operational services of registration, archiving, and dissemination of data descriptions. It comprises the CCSDS Secretariat supported by the CA Agent and Member Agency Control Authority Offices (MACAOs) [18][19][20][21][22][23][24].

control authority agent (CA agent)

An organizational entity that has agreed to perform the CA responsibilities of the CCSDS Secretariat. The WDC-A-R&S has agreed to act as this agent. Overall CA responsibility rests with the CCSDS Secretariat [22][23].

control authority identifier (CAID)

A four-character restricted-domain ASCII string, which identifies an individual CA office or the CCSDS Secretariat[21] [22][23][24].

control command
A special **telecommand** frame that carries **control instructions** in its data field to set up the internal operating parameters of the **FARM** [7][9].

control function
The component of an ASO that controls the interaction among the ASEs and/or ASOs within the containing ASO [43].

control instructions
Information required to set up a TC system **layer** to support the handling of **telecommands** [7][9][11].

convolutional code
A code in which a number of output **symbols** are produced for each input information bit. Each output **symbol** is a linear combination of the current input bit as well as some or all of the previous k –1 bits where k is the **constraint length** of the code [1][2].

COP
Command Operation Procedure.

CPN
See **CCSDS Principal Network**.

cross support
One agency's use of part of another agency's data-system resources to complement its own system [16][19][20][42]. The activity of one CCSDS agency to bi-directionally transfer data from another CCSDS agency between space and ground systems, using its own transmission and reception resources. The term cross support is applied when one agency uses part of another agency’s data-system resources to complement its own system [44].

CVCDU
Coded VCDU.

data
Representation forms of information dealt with by information systems and their users [27]. *ANSI*. A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means [X3.172].

data description identifier (DDID)
A four-character restricted-ASCII string, assigned by a MACAO or the CCSDS, to distinguish among descriptions with the same CAID[21] [22][23][24].

data description language (DDL)
A formal notation for specifying the conceptual representation of data objects [18]. A language for describing the logical representation of data [20][27]. *ANSI*. (Data Definition Language - DDL) A programming language used to define the logical and physical structure of a data base; that is, the language used for defining the database schema [X3.172].

data description package (DDP)
The combination of a data description, its ADID, and identification information, originating from MACAOs and supplied to users to facilitate understanding of data [22][23][24].

data description record (DDR)
A set of DDL statements that convey the information necessary to parse the VALUE field of a specific TLV Object [18]. (Also referred to as Data Description Record Object) A syntactic description for data entities [19][20].

data descriptive language (DDL)
Obsolete. See **data description language (DDL)**.

data descriptive record (DDR)
Obsolete. See **data description record (DDR)**.

data dictionary (DD)
A system that contains the definitions and supplementary information that describe DDRs or data elements/objects [18]. *ANSI*. A database used for data that refers to the use and structure of other data; that is, a database for the storage of metadata [X3.172].

data element
The smallest named item or items of data for a given application [18][19][20][26]; a named unit of data that, in some contexts, is considered indivisible and in other contexts may consist of data items.

data entity
A named collection of data elements [19][20][26].

data entity dictionary (DED)
A collection of semantic definitions for data entities [19][20][26].

data interchange language (DIL)
A language used for specifying the physical (bit pattern) representation of data [27].

data management service

In the space data systems **layer**ed **telecommand** architecture, the top **service** of the **telecommand system**. It includes the primary facilities for interfacing the **user** with the systems used to communicate **telecommands**. Its bottom **layer** provides a **protocol data unit** known as a **telecommand packet**, which provides data formatting **services** so that command data may be transported between **user application processes** [7][11].

data object

A collection of data elements that are packaged for or by a specific application [19][20][18]. *ANSI*. In programming languages, an element of data structure such as a file, an array, or an operand, that is needed for the execution of programs and that is named or otherwise specified by the allowable character set of the language of the program [X3.172].

data product

A collection of one or more data objects [19][20].

data routing service

In the space data systems **layer**ed **telecommand** architecture, the middle **service** of the **telecommand system**. It provides a fundamental **service** within the TC system by guaranteeing the delivery of **TC data** from the sending to the **receiving ends** of the ground-to-space data link [7][9].

data start

A signal from the **layer** below which becomes "true" to notify the **transfer layer** that valid decoded data **octets** are being transferred [9].

data stop

A signal from the **layer** below corresponding to **data start** becoming "false", which notifies the **transfer layer** that no more valid data **octets** are being transferred by the **layer** below [9].

data system

A system of an enterprise with the goal to provide services that satisfy the information needs of the enterprise. Major operating facilities of the data system are: physical storage, data management, data retrieval, and data manipulation facilities [18].

data unit

An aggregation of data objects that forms a single data interchange entity [18].

data unit zone

That portion of a **virtual channel data unit** into which complete higher **layer** data units may be placed for **asynchronous** or **isochronous** transmission [33].

day segmented time code
One of three CCSDS-recommended **segmented time codes**, where day, milliseconds of day and microseconds of milliseconds are the time units [12].

DBMS
Data base management system [18][27].

DDID
See **data description identifier**.

DDL
See **data description language**.

DDP
See **data description package**.

DDR
See **data description record**.

DDU
Description data unit [19][20][24].

debrief phase
During the Debrief phase, accounting and performance information about the Execution phase is delivered to the Service Manager and/or to the service user [44].

decoder (hard decision)
A **coding layer** algorithmic process that utilizes the check bits contained in a **codeblock** for detecting or correcting errors in the information bits. The check bits are then removed before the information bits are output.

decoder (soft decision)
A **coding layer** algorithmic process that uses quantization of the detector output into n levels for each received bit to decide upon the most likely **codeblock** and to estimate the reliability of that decision. The check bits are then removed before the best estimate information bits and any reliability information are output. *ANSI*. (decoder) A functional unit that has a number of input lines such that any number may carry signals and a number of output lines such that no more than one at a time may carry a signal; the combination of input signals serves as a code to indicate which output line carries the signal [X3.172].

decoding procedure
A **procedure** for decoding encoded data [3][9].

deferred

The storage and delayed transfer of data from a space end application process to a ground end application process (return data), or vice versa (forward data) [44].

delimitation

The method of specifying the end of a block of data [19][20]. *ANSI*. (Delimiter) A character used to indicate the beginning or the end of a character string [X3.172].

deliver (primitive)

An OSI-service primitive initiated by an OSI-service-provider [41].

delivery conditions

Control instructions, generated by the **application process layer**, that specify the parameters and conditions that are required to exist within lower **layers** in order to perform the delivery of **telecommands** from the sending to the **receiving end** of the TC system [7][11].

discrete type

A discrete type is either an integer type or an enumeration type. Discrete types may be used, for example, in case statements and as array indexes [29][30].

discriminant

A discriminant is a component of a record type whose value influences the structure of this record [29].

A discriminant type is either an integer type or an enumeration type. Discrete types may be used, for example, in case statements and as array indexes[30].

dibit

A group of two bits in 4-phase modulation. Each possible dibit is encoded in the form of one of four unique phase shifts of the RF carrier [14].

DIL

See **data interchange language**.

elementary type

An elementary type does not have components [29][30].

encapsulation protocol data unit

The **protocol data unit** of the **encapsulation sublayer** of the **space link subnetwork**, having the format of a **CCSDS packet** [33].

encapsulation service

A **service** within the **space link subnet** that wraps incoming delimited data units (that are not in **CCSDS packet** format) into **CCSDS packets**, during their transfer through the subnet [32][33].

encapsulation sublayer

The upper **sublayer** of the **space link subnet**, which temporarily wraps incoming delimited data units that are not in **CCSDS packet** format into **CCSDS packets**, for transfer through the subnet [33].

encoded TC data

The **TC data** contained in a **codeblock** [8].

encoder

A **coding layer** algorithmic process that adds check bits to a series of information bits to create a **codeblock** [2]. *ANSI*. A functional unit that has a number of input lines such that not more than one at a time may carry a signal, and a number of output lines such that any number may carry signals. The combination of output signals serves as the code that indicates which input line carries the signal [X3.172].

encoding procedure

A **procedure** for encoding data [3][9].

end point, end system

AOS. The location on the **CCSDS Principal Network (CPN)** of a **user** application, at which the CPN **services** are terminated.

end statement

An optional statement that terminates the PVL Module prior to the end of the provided octet space [25].

entropy

Entropy is a quantitative measure of the average amount of information per source sample, expressed in bits/sample. [5].

enumeration representation clause

An enumeration representation clause specifies the bit pattern for each literal of the corresponding enumeration type [29][30].

enumeration type

An enumeration type is defined by the list of ts values, called enumeration literals, which may be identifiers or character literals. All values for a given enumeration type are different[29].

An enumeration type is defined by an enumeration of its values, which may be identifiers or character literals. All values for a given enumerated type are different [30].

EOL

End of line [26].

epoch

The starting time from which the time is counted in **segmented and unsegmented time codes** [12].

error-information

Information supplied by the responder as the consequence of an unsuccessful abstract-bind-operation or abstract-unbind-operation [43].

ESA

European Space Agency [18].

event

An action that causes the **TC channel service** to change states [8]. *ANSI*. An occurrence or happening that is significant to the performance of a function, operation or task [X3.172].

execution

Telecommand. The act of effecting a commanded change within a spacecraft **application process**, in response to a **telecommand** that has been delivered to that process. *ANSI*. The process of carrying out an instruction or the instructions of a computer program by a computer [X3.172].

execution phase

Phase during which various interactions may take place between the Agencies. Interactions may concern the exchange of space data or with the delivery of event, alarm, and status reports [44].

FAF

Forward All Frames.

FARM

Telecommand. See **frame acceptance and reporting mechanism**.

FG

Functional Group.

field

An abstract component of a data unit that is assigned a length and a representation. The instance of a field is the field value. Fields may be divided into sub-fields that may be used as fields [18]. *ANSI*. On a data medium or in storage, a specified area used for a particular class of data; for example, a group of character positions used to enter or display wage rates on a screen [X3.172].

fill data

Extra trailing **octets** of meaningless data sent to the **transfer layer** by the **layer** below as a result of the mechanization of that lower **layer**. Fill must be removed by the **transfer layer** [9].

first header pointer

The first header pointer field is part of the **transfer frame primary header**. The first header pointer contains information on the position of the first **source packet** or the first **segment** within the **transfer frame data field** [3].

FITS

Flexible image transport system [26].

FOP

Telecommand. See **frame operation procedure**.

format

The assignment of each of the data elements of a data object to a field or sub-field and to a specific location or address in a given physical medium or in a device [18]. *ANSI*. The arrangement or layout of data in or on a data medium [X3.172].

forward data

Data generated by an end application process on the ground for consumption by one or more data sinks in space. Forward data is all data that is sent from the ground element to the space element (e.g., telecommand) [44].

Forward Space Link Data Unit

A Forward SL-DU is a data structure defined by the CCSDS Telecommand or AOS Recommendations [8][9][11][33]. The types of Forward SL-DUs are provided in tables A-2 and A-3 of annex A [45].

NOTE – Examples of Forward SL-DUs are: a Telecommand Packet; a Telecommand Frame, as defined in the above references.

frame acceptance and reporting mechanism (FARM)

The **procedures** executed by the **receiving end** of the **transfer layer** to decide whether to accept a **TC transfer frame** and how to report operation and status back to the **FOP** via **command link control words** [9][10].

frame acceptance check

A further set of sequence tests to which Type-A frames are subjected when they pass the **frame validation check**. Frames that fail the acceptance check are rejected [9].

frame error control field

An optional field, located at the end of the **transfer frame format**, that provides a capability for detecting errors that may have been introduced into the frame during the transmission and the data handling process (see [3], Section 5.5 and also relation to AOS VCDU Error Control Field [33].

frame operation procedure (FOP)

The **procedure** executed by the **sending end** of the **transfer layer** to transmit a **TC transfer frame**. The **FOP** conducts a transfer sequence using the communication **services** of the underlying **TC channel service**. Actions of the **FOP** are dictated by the rules of the **COP** and the **FARM** status information passed back to it via the telemetered **command link control word (CLCW)** [9][10].

frame validation

A process performed at the **receiving end** of the **transfer layer** to check the integrity of a **TC transfer frame** [9].

frame validation check

A set of common integrity and quality tests to which all frames are first subjected when they are processed by the **receiving end** of the **transfer layer** [9]**.**

FSH

Frame Secondary Header.

FTP

File transfer protocol [18].

Functional Group

The Functional Group (FG) is the fundamental building block of an SLE service; it is not decomposed further. FGs are derived from the layered functionality specified in the Space Link protocols [44].

functional unit

A subset of the functionality of the functional group, associated with a single CCSDS service [44].

fundamental sequence

The variable-length Fundamental Sequence (FS) code represents the non-negative integer m with a binary codeword of m zeros followed by a 1. Application of the FS code to a block of J samples produces a sequence of J concatenated codewords called the Fundamental Sequence [5].

Fwd

Forward.

gateway
The connecting point between two dissimilar **subnetworks**.

GE
Ground Element.

GF(n)
The Galois Field consisting of exactly "n" elements [2].

global
Pertaining to the CCSDS sphere of influence [18]. *ANSI*. Pertaining to that which is defined in one subdivision of a computer program and used in at least one other subdivision of that computer program [X3.172].

Grade-1 service
A **service** in which **space link subnetwork (SLS)** data units are delivered through the SLS complete, with their sequence preserved, and with a very high probability of containing no errors induced by the SLS [32][33].

Grade-2 service
A **service** in which **space link subnetwork (SLS)** data units are delivered through the SLS possibly incomplete, but with their sequence preserved and with a very high probability of containing no errors induced by the SLS [32][33].

Grade-3 service
A **service** in which **space link subnetwork (SLS)** data units are delivered through the SLS possibly incomplete and with a moderate probability that they contain errors induced by the SLS, but with their sequence preserved [32][33].

grade of service
A selectable method of data transmission **service** within the **space link subnetwork** [32][33].

ground application
A source or sink application process on the ground [44].

ground element
The collection of systems and organizations based on the ground that provide SLE services used by a specified mission [44]. The ground element of a Space Mission Data System includes a Mission Data Operation System (MDOS) and an SLE system. It may also contain other components, but these are not within the scope of this Recommendation [45].

ground network
The ground data distribution part of the **CCSDS Principal Network** [33].

group of source packets
A set of **source packets** that are designated by the originator of the **packets** to indicate that belong to the same group. This indication is achieved by use of the **grouping flags** [3].

grouping flags
Part of the **packet primary header.** The flags are used to indicate that the **source packet** belongs to a **group of source packets** and to signal whether it is the first, a continuing, or the last **packet** of this group [3].

GSFC
Goddard Space Flight Center [18].

GVCID
Global VCID.

header
A standard label that identifies a standard data communications structure [3][8][33].

IBM
International Business Machines [18].

ICD
Interface Control Document [17].

ID
Identifier.

idle
A mechanism for maintaining synchronous data transmission, in the event that no **user data** are available, by inserting **fill data**.

idle data
Telemetry. Data in a **source packet data field** that are neither observational nor ancillary application data; data in a **transfer frame data field** that are neither **source packets**, nor **segments** nor **privately defined data**. Their contents is not defined.

idle packet
A **source packet** that carries **idle data** in its **packet data field** [3]**.**

idle sequence
A specific high transition density bit pattern transmitted during a **command session** in the absence of a **CLTU** to maintain **symbol** synchronization in the channel [8].

implementation phase
The time allowed for the **service complex** to acquire, develop, and configure the resources necessary to satisfy the support contract. This phase includes any testing necessary to ensure conformance of the implementation with the appropriate CCSDS standards and compatibility between peer processes [44].

implicit DIL
Use of system utilities or custom software in place of an explicit DIL in the interchange data between heterogeneous environments [27].

indication (primitive); acceptor.deliver (primitive)
A deliver primitive received by an acceptor [43].

information
Any kind of knowledge that is exchangeable between users [27]. *ANSI*. The meaning that is currently assigned to data by means of the conventions applied to that data [X3.172].

initiator
The abstract-object that issues the request to bind (abstract-bind-operation) or unbind (abstract-bind-operation) [43].

inner code
In a concatenated coding system, the last encoding algorithm that is applied to the data stream. The data stream here consists of the codewords generated by the outer **decoder** [1][2].

input data
A discrete collection of data bits provided at the input to the **coding layer** from the **data routing service** [8]. *ANSI*. Data being received or to be received by a device or a computer program [X3.172].

insert service
A **service** or function within the **space link subnet** that allows **isochronous user data** to share a **virtual channel** with other types of data [32][33].

insert service data unit
The data unit that is placed within the **insert zone** of the insert **protocol data unit** during transfer through the **space link subnet** [33].

insert zone
That portion of a **virtual channel data unit** into which small samples of higher **layer** data units (**insert service data units**) may be placed for **isochronous** transmission [33].

instance

A specific occurrence of values of a data entity [19][20]. A data object, or a set of data objects, that exhibits the distinguishing characteristics of its class; an instance of an SFDU is one of a set of values for the data unit which is presented in a specified format. The term "instance" is used where an individual data unit must be distinguished from its format [18]. *ANSI*. In a conceptual schema language, an individual entity, for which a particular type of proposition holds; that is, an entity that belongs to a particular class of entities [X3.172].

instance-dependent metadata

Metadata that is applicable to only one data instance; for example, catalogue data [20].

instance-independent metadata

Metadata that is applicable to many data instances; for example, a format description that is applicable to many data instances [20].

internet service

The CCSDS **service** that supports **protocol**-driven data flow from end to end through multiple, heterogeneous **subnetworks** [32][33].

interoperability

The capability for one CCSDS agency to interface with and operate through space/ground **transmission resources** owned by another CCSDS agency (see also **cross support**). *ANSI*. The capability of a functional unit to operate normally in different data processing environments in a way that requires users to have little or no knowledge of the unique characteristics of those units [X3.172].

interpret

To explain or present in understandable terms. SFDU interpretation is the process of recognizing the format of a data entity, identifying its component parts, and extracting and presenting the information it carries. *ANSI*. To translate and to execute each source language statement of a computer program before translating and executing the next statement [X3.172].

invoker

The abstract-object that issues the request to perform an abstract-operation [43].

ISO

International Organisation for Standardisation [19][18][25]; International Standards Organization [25].

isochronous

Preserving the timing relationships of the transmitted signal. *ANSI*. (isochronous transmission) A data transmission process in which there is always an integral number of unit intervals between any two significant instants [X3.172].

JPL

Jet Propulsion Laboratory [18].

label field

The LABEL field of a LV Object contains an identifier of the format and meanings of all the other LABEL sub-fields, an identifier of the description of the format and meaning of the data in the VALUE field, an indication of the type of data in the VALUE field and the necessary information required to delimit the VALUE FIELD [19].

language

A definition comprised of a grammar and associated semantics [27]. *ANSI*. A set of characters, conventions, and rules that is used for conveying information [X3.172].

layer

A functional organization whereby a complex distributed system may be broken into relatively simple modules of **service**.

length clause

A length clause specifies the amount of storage in bits associated with a type [29][30].

lifetime control

A method of data transmission whereby data units are discarded if the number of times that they pass through intermediate nodes (such as routers and **gateways**) exceeds a pre-established value.

link and weather not combined

With a Link Design Control Table, calculations are made assuming clear and dry weather conditions. Thereafter, the values obtained under such ideal conditions are adjusted using a correction factor representing the loss due to weather effects [14].

link design control table

A set of tables used to display the operating parameters of a telecommunications link and to calculate the expected performance of that link [14].

link identifier

The name of the physical channel access **protocol data unit** and the addressing mechanism for the **insert service** [33].

literal

A literal is a value represented by its value itself instead of an identifier. A literal can be specialized as a numeric literal, an enumeration literal, a character literal, or a string literal [29][30].

lockout

A condition whereby the **FARM** has detected a TC frame that violates certain **frame acceptance checks** [9]. *ANSI*. (protection) An arrangement for restricting access to or use of all, or part, of a computer system [X3.172].

logical data path

A pre-configured route between two application endpoints, through which data may flow without the need for large communications **headers**. A logical data path associates the source, the destination, and the route between them [33].

logical representation

The assignment of data type and data structure attributes to the entities specified to a machine (computer) for a given application. Examples of data type attributes are real, integer, double precision, complex, logical (Boolean), and character. Examples of structural attributes are scalar, array, fields, and logical records [18].

loop bandwidth

The resultant phase locked bandwidth when the signal-to-noise ratio in the phase locked loop is 10 dB [14].

loop threshold

That signal level producing a signal-to-noise ratio of 10 dB in the phase locked loop's bandwidth [14].

LSB

Least significant bit.

LSEGMENT

The length of the **segment data field** of all **segments** of a **source packet** except the last one, which may be shorter. LSEGMENT remains the same for a **virtual channel** throughout a **mission phase** [3].

LVO

LABEL-VALUE Object The LVO is the basic building block of the SFDU concept. It consists of a LABEL field and a VALUE field. The LABEL field contains information pertaining to the VALUE field. The VALUE field may contain any form of data that can be described by a user-defined data description or it may contain other SFDUs [19][20][21][24].

MACAO

See **member agency control authority office**.

macro

A facility in ASN.1 to add semantic information to a collection of ASN.1 data types [43].

managed object
A parameter associated with a **CCSDS Principal Network service** which is exposed to network **management** for the purpose of network monitoring and control [33]. The OSI management view of a resource within the OSI environment that may be managed through the use of OSI management protocols [43].

management (of the CPN)
Processes that operate in the background of the **CCSDS Principal Network** to control its configuration and operational integrity [33].

management information base (MIB)
The conceptual repository of management information within an open system [43].

MAP
See **multiplexer access point**.

marker
A marker is a constant value provided by a data description. This value will be found in the data as an end-delimiter of a repetition [29][30].

master channel
A channel that is constituted by the transmission of **transfer frames** with the same **transfer frame version number** and the same **spacecraft identifier** on the same **physical channel** [3].

master channel frame count
Part of the **transfer frame primary header** (see [3], Fig. 5-1). It contains a sequential count of each **transfer frame** transmitted within a specific **master channel** [3].

master channel frame count field
See **master channel frame count**.

match
The condition that allows two abstract-ports to bind to each other. Symmetric abstract-ports match if they are of the same abstract-port-type. Asymmetric abstract-ports match if they are of the same abstract-port-type and one is a consumer and the other is a supplier [44].

MC
Master Channel [3]. Management Council [46].

MDOS
Mission Data Operation System.

member agency control authority office (MACAO)
An individual CCSDS-participating Agency organization that has accepted the operational responsibilities and constraints specified within CCSDS Recommendations on CA operations[21] [22][23][24].

metadata
Data about other data [19][20]. *ANSI*. In database management systems, information about an organization's information and data activities [X3.172].

mission
An undertaking to explore/utilize fields of interest by use of one or more spacecraft [44].

mission data
Mission data comprises of spacecraft, instrument, and other data for a specific mission. It includes spacecraft forward and return data in raw and processed form [44].

Mission Data Operation System
The Mission Data Operation System (MDOS) acts as a source of forward data and as a sink of return data. For a given SLE system, the MDOS selects SLE services and specifies respective service detail as necessary [45].

mission management
Within the mission ground segment, the function that is responsible for the management of the mission. It identifies and defines the detailed objectives of a mission considering the conflicting requirements of payload users, the spacecraft, and the resources available to the mission [44].

mission phase
The phase of a mission during which certain parameters of **telemetry** and **telecommand** data structures remain the same. Examples are early orbit phase, cruise phase, encounter phase, etc. [3].

Mission User Entities (MUEs)
Within the MDOS, the MUEs are sources of forward data or sinks of return data. The SLE system provides the forward and return data in the form of transfer services to these MUEs. Several transfer service instances may be provided to a single MUE [45].

a) Service selection and specification are based on the requirements of the MUEs that are affiliated with the MDOS.

b) In order to cover all requirements, a given MDOS may cooperate with several SLE systems; it is the responsibility of the MDOS to harmonize its cooperation with several SLE systems. (See figure 3-3.) The MDOS contains one SLE Utilization Management and one or more MUEs.

NOTES

1 The MDOS may not be the ultimate source of forward data or sink of return data on the ground element, but from the perspective of this Recommendation it functions as the source or sink.

2 The MDOS negotiates and manages the services provided by the SLE system for a space mission.

3 This model of an MDOS is not intended to represent physical aspects of a space mission. For example, the MUEs may be distributed geographically or belong to several Agencies.

modulating waveform
A way of representing data bits ("1" and "0") by a particular waveform [1][2].

modulo-2 addition
An operation on a pair of bits such that like bits result in a 0 and unlike bits result in 1 (also called an "exclusive OR").

most significant bit
The first bit of an **n-bit field**.

MSB
See **most significant bit**.

MSO
Most significant octet [19].

MUE
Mission User Entity.

multiplexer access point (MAP)
A mechanism provided within the **segmentation layer** to allow different **user data** structures to be multiplexed together for transmission on one **virtual channel** provided by the transfer layer. Multiplexing allows user data structures with different delivery priorities to share the same **virtual channel** and thus provides flow control of the **layer** below [7][9].

multiplexing protocol data unit
The **protocol data unit** of the multiplexing function of the **space link subnet**, having the format of a **header** followed by a fixed-length block of data that contains a piece of a contiguous string of concatenated **CCSDS packets** [33].

multiplexing service
Within the **space link subnet**, a **service** that packs **CCSDS packets** together so that they may efficiently occupy the fixed-length data field of a **coded virtual channel data unit** [32][33].

multiplexing sublayer
An intermediate **sublayer** of the **space link subnet** which packs **CCSDS packets** together so that they may efficiently occupy the data field of a constant-length **virtual channel data unit** [33].

N/A
Not applicable.

named set
A collection of **user command directives** that must be delivered as a complete entity. The set of interrelated directives is given a "name" by the **user** to facilitate control and traceability of the collection during the delivery process [11].

(N)-association
A cooperative relationship among (N)-entity-invocations [44].

n-bit field
A field containing n bits.

negotiated system interchange
Interchange between systems using different physical representations, where transformation utilities or custom software is used in place of an explicit DIL [27].

negotiation phase
During the Negotiation phase, the cross-support agencies develop the SLE Service Contract for the mission. This phase is not anticipated to be automated via a distributed application; rather, this phase will probably be implemented through human interactions [44].

(N)-entity
An active element within an (N)-subsystem embodying a set of capabilities defined for the (N)-layer that corresponds to a specific (N)-entity-type (without any extra capabilities being used) [44].

(N)-entity-invocation
A specific utilization of part or all of the capabilities of a given (N)-entity (without any extra capabilities being used) [44].

(N)-entity-type
A description of a class of (N)-entities in terms of a set of capabilities defined for the (N)-layer [44].

next expected frame sequence number N(R)
The observed current value of **V(R)** that is telemetered from the **FARM** to the **FOP** via each **CLCW** [9].

(N)-function
A part of the activity of (N)-entities [44].

(N)-layer
A subdivision of the OSI architecture, constituted by subsystems of the same rank (N) [44].

(N)-layer management
Functions related to the management of the (N)-layer partly performed in the (N)-layer itself according to the (N)-protocol of the layer (activities such as activation and error control) and partly performed as a subset of systems management [44].

(N)-layer operation
The monitoring and control of a single instance of communication [44].

(N)-protocol
A set of rules and formats (semantic and syntactic) which determines the communication behavior of (N)-entities in the performance of (N)-functions [43].

(N)-protocol-control-information
Information exchanged between (N)-entities, using an (N-1)-connection, to coordinate their joint operation [43].

(N)-protocol-data-unit
A unit of data specified in an (N)-protocol and consisting of (N)-protocol-control-information and possibly (N)-user data [43].

(N)-service
A capability of the (N)-layer and the layers beneath it, which is provided to (N+1)-entities at the boundary between the (N)-layer and the (N+1)-layer [43].

(N)-service-access-point
The point at which (N)-services are provided by an (N)-entity to an (N+2)-entity [43].

(N)-service-data-unit
An amount of information whose identity is preserved when transferred between peer-(N+1)-entities and which is not interpreted by the supporting (N)-entities [43].

(N)-service-user
The user of the service provided by the (N)-service-provider [44].

(N)-subsystem
An element in hierarchical division of an open system which interacts directly only with elements in the next higher division or the next lower division of that open system [43].

(N)-user-data
The data transferred between (N)-entities on behalf on the (N+1) entities for whom the (N)-entities are providing services [43].

N(R)
See **next expected frame sequence number N(R)**.

NRZ-L
A **modulating waveform** in which a data "one" is represented by one of two levels, and a data "zero" is represented by the other level [1][2].

NRZ-M
A **modulating waveform** in which a data "one" is represented by a change in level and a data "zero" is represented by no change in level [1][2]. *ANSI*. Synonym for non-return-to-zero change-on-ones recording [X3.172].

NSSDC
National Space Science Data Center [18].

numeric
A sequence of unrestricted characters that conform to encoding rules that permit its interpretation as a number [25]; a special case of unquoted string that conforms to formation rules for numeric values [26].

numeric literal
A numeric literal is the value of a number, expressed by means of characters [29].

object
An object is either a constant or a variable. An object contains a value [29][30].

occupied bandwidth
(ITU/RR/147) "The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage b/2 of the total mean power of a given emission. (Unless otherwise specified by the CCIR for the appropriate class of emission, the value of b/2 should be taken as 0.5%.)" [14].

OCF
Operation Control Field.

octet

A contiguous string of 8 bits; an 8-bit word (or field). A sequence of eight bits [25]; a data object consisting of eight bits [18]. *ANSI*. A byte composed of eight binary elements. Synonymous with eight-bit bytes [X3.172].

octet string service

A **service** option within the **path service**, whereby the **CCSDS Principal Network** creates the **CCSDS packets** that support the path control [33].

ODL

Object description language [26].

offline

Of or pertaining to the transfer of SLE service data through all or part of the SLE System at a time other than that during which the associated space link session is active [44].

onboard application

A source or sink application process onboard the spacecraft [44].

onboard element

The collection of systems and organizations bases onboard the spacecraft that provide SLE services used by a specified mission [44].

onboard network

The onboard data distribution part of the **CCSDS Principal Network** [33].

one-way-communication

Data communication in one pre-assigned direction [4].

online

Of or pertaining to the transfer of SLE service data through all or part of the SLE System during the time that the associated space link session is active [44].

open

A **control command** that authorizes use of a **virtual channel** and programs certain operational windows and numbers into the **FARM**. Within an open **virtual channel** the **FARM** transmits **CLCWs** to the **FOP** via **telemetry** [9].

open data system

A data system that offers its service to customers outside the enterprise. These outside customers need to know how to operate a service access port. Thus they must be able to: (a) communicate with the system, (b) request data services, (c) accept data products, and (d) elaborate the structure of these products according to standard protocols and structuring rules defined in the public domain [18]. *ANSI*. A system whose characteristics comply with readily available standards and that therefore can be connected to other systems that comply with these standards [X3.172].

open system

The representation within the Reference Model of those aspects of a real open system that are pertinent to OSI [43].

open system data interchange

The process of transferring data from one open system to another. An open system is one that uses publicly available formats and protocols, so that anyone can communicate with the open system by following the open system standards. It should be noted that open system does not imply an uncontrolled or unrestricted access to the data [19][20][21][22][23][24].

open system interchange

Obsolete. See **open system data interchange**.

operation

An operation is a procedure that one object (the invoker) can request of another (the performer) through a port pair bound within the terms of an agreement [45].

operational control field

The part of the **transfer frame** that follows the **transfer frame data field** (see [3], Fig. 5-1). It is optional. It contains either the **command link control word** or any other operational data to be defined by mission **management** [3].

operational control field flag

The part of the **transfer frame primary header**. This flag signals the presence or absence of an **operational control field**. It remains the same either within a specific **master channel** or specific **virtual channels** throughout a **mission phase** [3].

operations phase

Phase in which the user defines support requests that are sent to the provider agency who in turn responds by establishing the support in the form of a schedule for his organization. If the support cannot be scheduled, then this is communicated to the user who can in turn formulate new support requests [44].

originator

That individual or organization that submits a **registration package** or a **revision registration package** to a MACAO and accepts responsibility for its contents [23][24].

OSI

Open Systems Interconnection [18].

OSI-local view

The shared behavior on an OSI-service-user and an OSI-service-provider in terms of their interactions at a service boundary [43].

OSI-service

The capability of an OSI-service-provider to OSI-service-users at the boundary between the OSI-service-provider and the OSI-service-users [44].

NOTE – The OSI-service defines the external behavior of the OSI-service-provider independent of the mechanisms used to provide that behavior. (N)-layers, (N)-entities, application-service-elements, etc. are components of an OSI-service-provider.

OSI-service primitive; primitive

An abstract, atomic, implementation-independent representation of an interaction between an OSI-service-user and its OSI-service-provider [44].

NOTE – The term “primitive” is used in some documents in place of the preferred form “OSI-service primitive”.

OSI-service-procedure

Either a submit primitive together with the locally-resulting deliver primitive of primitives, if any, or a deliver primitive together with the locally-resulting submit primitive or primitives, if any, seen at an OSI-local view [43].

OSI-service-provider

An abstract representation of the totality of those entities which provide an OSI-service to OSI-service-users [43].

OSI-service-user

An entity in a single open system that makes use of an OSI-service [44].

NOTE – The OSI-service-user makes use of the OSI-service through a collection of OSI-service primitives defined for the OSI-service.

outer code

In a concatenated coding system, the first encoding algorithm that is applied to the data stream [1][2].

packet

A variable-length, delimited data structure consisting of a set of higher layer **user data** that are encapsulated within standard **header** information. See also **source packet** (telemetry) and **telecommand packet** [3][7][11][33]**.** *ANSI*. In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. The data, control signals, and possibly error control information, are arranged in a specific format [X3.172].

packet channel

A mechanism used by the multiplexing function within the **space link subnet** to allow multiple **users** to share one **virtual channel** [33].

packet channel identifier

The identifier for the **packet channel**, mechanized using the contents of the application identifier field of the **CCSDS packet** [33].

packet data field

A part of the **source packet** containing either the **packet secondary header** or the **source data field** or both [3].

packet data length

The two **octets** in the **source packet primary header** that contain the length of the **packet data field** [3].

packet data length field

See **packet data length**.

packet identification

A group of three fields in the **packet primary header** that verifies the type of **packet**, indicates whether the **packet** carries a **packet secondary header** or not, and provides information on the source of the data, i.e., the **application process** [3].

packet identification field

Telemetry. See **packet identification**.

packet order flag

A part of the **transfer frame primary header** (not currently used by the CCSDS) [3].

packet primary header

The primary **header** of the **source packet** [3].

packet secondary header

An optional part of the **packet data field** carrying time and other information as chosen by the **user** [3].

packet secondary header data field
See **packet secondary header**.

packet secondary header flag
A flag within the **packet primary header** (see [3], Fig. 3-1) indicating whether a **packet secondary header** is present or not [3].

packet secondary header time code field
A field located in the **packet secondary header** containing a CCSDS **segmented or unsegmented time code** [3].

packet sequence control
A part of the **packet primary header** consisting of two sub-fields, the **grouping flags** and the **source sequence count** [3]. *ANSI*. (packet sequencing) A process of ensuring that packets are delivered to the receiving data terminal equipment in the same sequence as they were transmitted by the sending data terminal equipment [X3.172].

packet sequence control field
See **packet sequence control**.

packet service
A **service** option within the **path service**, whereby **users** create the **CCSDS packets** that support the path **protocol** [33].

packet telemetry
A concept that facilitates the transmission of space-acquired data from source to **user** in a standardized highly automated manner [3].

packet telemetry concept
See **packet telemetry**.

packet telemetry data system
See **packet telemetry**.

packetization layer
The layer immediately below the **system management layer** that (1) formats the **telecommand** application data into end-to-end transportable data units called **telecommand packets**, (2) possibly arranges the **packets** into interdependent batches called **telecommand files**, (3) moves the **packets** to the **receiving end**, and (4) confirms their correct receipt [11].

parameter
An information object associated with an abstract-error [43].

parameter name
The name used to associate a data value with a parameter [26]; the name used to reference the value assigned in the assignment statement [25]. *ANSI*. (Parameter) A variable that is given a constant value for a specified application [X3.172].

participating agency
A Member or Observer Agency of the CCSDS [22][23].

path identifier
An identifier for a **logical data path** [33].

path service
The **CCSDS Principal Network service** that, using **logical data paths**, allows large rates and volumes of space mission data to flow between relatively static endpoints without requiring large communication **headers**, thus conserving **space channel** bandwidth [32][33][37][38].

payload
The Payload is the equipment, carried on board the spacecraft, that directly relates to the purpose of the flight [44]. A facility of the spacecraft which directly performs the mission-unique science functions.

PDDL
Pilot data description language [27].

PDU
Protocol Data Unit.

peer-(N)-entitles
Entities within the same (N)-layer [43].

performer
The abstract-object that performs an abstract-operation [43].

permitted reviser
An individual or organization that has been specified, in a **registration package** or **revision registration package**, as having the authority to submit a revision of the data description [22][23][24].

P-field
The first field, the **preamble field**, of the **time code** describing the options, parameters and encoding structure of the **time specification field** [12].

physical channel
The space/space or space/ground transmission medium. A physical channel is the capability to transfer a single stream of bits, in a single direction (space to ground or ground to space) [45].

physical layer
The bottom **layer** of the **space link subnetwork**.

physical layer operations procedure (PLOP)
A specific **procedure** of the **physical layer** designed to activate and deactivate the physical **telecommand** channel by invoking RF carrier and modulation techniques [7][8].

physical representation
The assignment of coded addresses to the data structures placed on storage media or sent through the communications networks and the logical representation of the elements that comprise these structures. In communications, the address specifies the datum's temporal position. The codification may vary from device to device and medium to medium [18]. *ANSI*. (Physical) Pertaining to actual implementation or location as opposed to conceptual content or meaning [X3.172].

playback
The replaying of return data that has been stored onboard a spacecraft [44].

PLOP
See **physical layer operations procedure**.

Port Types
Ports that are involved in providing different services are said to be of different types [45].

preamble field
See **P-field**.

predefined type
A predefined type is a type provided by EAST, that is, a type that can be used in any EAST decription without being previously declared [29][30].

preparation phase
Phase in which parameter values are selected for all parameters within the bounds of service specified during the negotiation phase and any schedule information applicable to a particular execution subphase [44].

primary MACAO
The entity in the Control Authority organization that has overall responsibility for ensuring Control Authority services for its Agency and any of its Descendant MACAOs are provided [22][23].

primitive
An abstract model of the logical exchange of **user data** and control information between network **layers** or **sublayers**.

primitive, service primitive
An abstract, atomic, implementation-independent representation of an interaction between a **service-user** and its **service-provider** [4].

privately defined data
Data that are not suitable for being structured into **source packets**. These could also be, for example, play-back data [3].

procedure
A set of functional processes that are used to implement a **service**. *ANSI*. In programming languages, a block that can be executed within a predetermined period of time [X3.172].

production data processing
A value-added **service**, performed at a **CCSDS Principal Network** endpoint, which prepares **user data** for delivery (also referred to as "level zero processing") [33].

project
An organization that has the technical and funding cognizance to execute a particular space mission. *ANSI*. An undertaking with prescribed objectives, magnitude and duration [X3.172].

protocol
A set of rules and formats (semantic and syntactic) that determine the communication behavior of layer entities in the performance of communication functions [4]. A set of standard rules and **procedures**, plus their accompanying format conventions, that define the orderly exchange of information between peer entities within a given **layer** of the **TC** system [7]. *ANSI*. A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication [X3.172].

protocol data unit
A data structure that operates across a **layer** within a distributed system in order to implement the **service** offered by that **layer** [33]. A unit of data specified in a **protocol** and consisting of protocol control information and possibly user data [4].

pseudo-randomization
Pseudo-randomization, herein called Randomization, is a bandwidth-efficient technique of algorithmically translating the data bits to insure frequent bit transitions in the communications channel [8].

PVL
Parameter Value Language [19][20][24][25][26].

PVL module
The externally defined octet space that may optionally be terminated by a PVL end statement, within which PVL statements are written [25].

quoted string
Zero or more PVL characters enclosed between matching quote string delimiters [25]; a delimited sequence of PVL characters [26].

quote string delimiters
The symbols (apostrophe or quotation mark) used to delimit quoted strings [26][25].

RA
See **restricted ASCII** [19][20][22].

radiocommunication service
(ITU/RR/RR1-3.1) "A Service . . . involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes" [14][15].

RAF
Return All Frames.

ranging measurement
A process for establishing, usually by a time delay measurement, the one-way distance between an earth station and a spacecraft [14].

real open system
A real system which complies with the requirements of OSI standards in its communication with their real systems [43].

real system
A set of one or more computers, the associated software, peripherals, terminals, human operators, physical processes, information transfer means, etc., that forms an autonomous whole capable of performing information processing and/or information transfer [43].

real time
The immediate transfer of data between a space end application process and the ground termination of the space link, or vice versa [44].

receiver frame sequence number V(R)
The value of the frame sequence number, N(S), which the **FARM** expects to see in the next Type-A frame in order to preserve upcounting sequence [9].

receiving element
That part of the space system that executes a **command** to produce a desired control action [11].

receiving end
Those parts of the **telecommand system** that are in the vicinity of the **receiving element** [11].

recommendation
A document produced by CCSDS which contains recommendations for agency **standards**.

record representation clause
A record representation clause specifies the storage representation of the record type on the medium, that is, the order, position and size of record components (including discriminants, if any) [29][30].

record type
A record type is a composite type consisting of zero or more named components, possibly of different types [29][30].

Reed-Solomon code block
The set of data on which **Reed-Solomon Coding** is applied [2][3].

Reed-Solomon coding
A high performance block-oriented outer coding technique that provides powerful error-correction capability (named after its inventors, Reed and Solomon).

reference environment
An environment in which the value of a REFERENCE statement is understood to give one or more locations at which external data objects begin [19][20].

registration date
The date a MACAO assigns an ADID or increments a revision number of a data description [22][23][24].

registration package (RP)
A particular data description, with its accompanying identification information, intended for registration by a MACAO [22][23][24].

reliable

Meeting the quality, quantity, continuity, and completeness criteria that are specified by the **telecommand system** [7][8]. *ANSI*. (reliability) The ability of a functional unit to perform a required function under stated conditions for a stated period of time [X3.172].

Remote Operations

(1) A concept and notation supporting the specification of interactive communication between application-entities. This includes the Remote Operation Service Element and the mapping of the notation onto the service primitives of used application-service-elements. (2) The set of bind-operations, unbind-operations and operations [43].

Remote Operation Service Element

The application-service-element defined in ISO/IEC 9072 [43].

representation clause

Representation clauses specify the mapping between types of the language and their physical representation [29][30].

request (primitive); requestor.submit (primitive)

A submit primitive issued by a requestor [43].

requestor

In a particular instance of OSI-service-procedure, an OSI-service-user that issues a submit primitive and as a result may receive one or more deliver primitives [43].

reserved characters

The set of PVL characters that are reserved for special uses. These characters may not occur in parameter names, unquoted strings, or block names [26][25].

residual packet length

Part of the **segment header** providing a measure for the part of the **source packet data field** still to be transmitted [3].

residual packet length field

See **residual packet length**.

responder

The abstract-object that performs an abstract-bind-operation or an abstract-unbind-operation [43].

response (primitive); acceptor.submit (primitive)

A submit primitive issued by an acceptor [43].

restricted ASCII (RA) character

A character from the ASCII character set consisting of the numeric characters, 0-9, and the upper case letters, A-Z, of the Roman alphabet [24][22][23].

result

An optional information object provided by the performer of a successful abstract-operation [43].

resume

A **control command** that unfreezes a suspended **virtual channel** in its prior configuration, and restores normal **CLCW** reporting priority [9].

retransmit

A flag indication from the **FARM**, contained in a **CLCW**, that at least one Type-A frame has been rejected and that retransmission is required from the **FOP** [9]**.**

return data

Return data is all data that is sent from the space element to the ground element (e.g., telemetry) [44].

Return Space Link Data Unit

A return SL-DU is a data structure defined by the CCSDS Packet Telemetry and AOS Recommendations . The types of return SL-DUs are provided in tables A-1 and A-3 of annex A [45].

NOTE – Examples of return SL-DUs are: a Space Packet; a telemetry Transfer Frame, as defined in the above references.

revision registration package (RRP)

A revision of a particular data description, with its accompanying identification information, intended for registration by a MACAO [22][23][24].

RF

Radio Frequency.

Rice's adaptive coding

The basic Rice adaptive coding algorithm chooses the best of several code options to use on a block of data. These options are targeted to be efficient over different ranges of data activity. The options are implemented using a combination of FS coding and the splitting of preprocessed samples into their most-significant and least-significant bit parts [5].

RP

See **registration package**.

RP originator
Obsolete. See **originator**.

RRP
See **revision registration package**.

sample splitting
Sample splitting is a procedure for separating the binary representation of a sample into two groups of adjacent bits, one for lower-order bits, the other for higher-order bits [5].

SAP
See **service access point**.

scalar type
Scalar types are discrete types and real types [29][30].

schedule
A chronological list or timeline of spacecraft activities and allocated resources constituting the daily operations plan for mission support [44].

scheduling
The task of placing activities onto a timeline and allocating resources [44].

SCID
Spacecraft Identifier.

SDIS
Standard data interchange structures [18].

SDU
Service Data Unit.

SE
Space Element.

segment
The data unit into which **source packets** can be segmented [3]. The **protocol data unit** of the TC **segmentation layer** that facilitates breaking long **user data** units into shorter, communications-oriented pieces and multiplexing them together for flow control purposes [7][9]. *ANSI.* A portion of a program that may be executed without the entire program being maintained in main storage [X3.172].

segment data field
Obsolete. The part of the **segment** containing the **segment** data.

segment header
Obsolete. The **header** of the **segment**.

segment identification
Obsolete. A group of three fields in the **segment header** , the contents of which is identical to that of the **packet identification field**.

segment length identifier
Obsolete. A part of the **transfer frame primary header** indicating which of the three possible values for **LSEGMENT** (256, 512 or 1024 **octets**) has been chosen.

segment sequence control
Obsolete. A group of three fields in the **segment header** providing information necessary to reconstruct the original **source packet** from its constituent **segments**.

segment sequence control field
Obsolete. See **segment sequence control**.

segmentation
A **protocol** function that maps one **service data unit** into multiple **protocol data unit**s [4].

segmentation flags
obsolete - Bits within the **segment sequence control field** in the **segment header** indicating whether a **segment** contains a first, continuing, or last block of a **packet data field**.

segmentation layer
The upper **layer** of the TC **data routing service** [9].

segmented time code
The count of time units and fractional time units accumulated in two or more cascaded counters which count modulo of various bases beginning from a starting time called **epoch** [12].

semantic information
Information associated with data that defines the meaning of the data [19][20]. *ANSI*. (semantics) The relationship of characters or groups of characters to their meanings independent of the manner of their interpretation and use [X3.172].

sending end
Those parts of the **telecommand system** that are in the vicinity of the **user** [11].

sequence
A delimited collection of values in which the order of the enclosed values is significant [25][26]. *ANSI*. A series of items that have been sequenced [X3.172].

service

A capability of a layer, and the layers beneath it (a **service-provider**), that is provided to **service-user**s at the boundary between the **service-provider** and the **service-user**s [4]. [NOTE - The service defines the external behavior of the **service-provider**, independent of the mechanisms used to provide that behavior. Layers, layer entities, application-service-elements, etc., are components of a **service-provider**.] A standard capability that is offered by the **CCSDS Principal Network** to its **users** [33]. *SFDU*. Work performed for the benefit of others. Numerous services are involved in the operation of open data systems, including: data collection, conversion, and storage; communication services; archive services such as catalog queries and data distribution; and control authority services such as registration and distribution of DDRs [18]. *ANSI*. In network architecture, the capabilities that a layer and the layers closer to the physical media provide to the layers closer to the end user [X3.172].

service access point (SAP)

A logical interface where **services** are exposed to **users** of the **CCSDS Principal Network** (see [33], Item 2.2.a). The point at which services are provided by an entity in a layer to an entity in the layer above [4].

service complex

A grouping of systems performing SLE service. The functions that perform SLE services can be distributed across multiple systems. This distribution is aligned with the layering of the Space Link services. The systems performing individual functions of a service may belong to different organizations and have varying size and structure. The systems performing SLE service are grouped into service complexes by the organizations that implement them. Each service complex has two components, a service provision component and a management component [44].

service complex manager

The component of a Service Complex that manages Space Data Transfer [44].

service data unit

A data unit which is provided as an input to a **service**, or which is output by that **service**. An amount of information whose identity is preserved when transferred between peer entities in a given layer and which is not interpreted by the supporting entities in that layer [4].

service-provider

An abstract representation of the totality of those entities which provide a service to service-users; i.e., a layer, and the layers beneath it [4].

service-user

An entity in a single system that makes use of a service [4].

NOTE – The service-user makes use of the service through a collection of **service primitive**s defined for the service.

Service User/Provider
An object that offers a service to another by means of one or more of its ports is called a service provider (provider). The other object is called a service user (user). An object may be a provider of some services and a user of others [45].

NOTE – "Provide" is used in the sense of "make available to be used" and does not necessarily imply that the service is being used.

set
A delimited collection of values in which the order of the enclosed values is not significant [25][26]. *Telecommand*. A Type-B **control command** that sets **V(R)**, i.e., the value of the frame sequence number in the **telecommand** frame expected to be seen by **FARM** in the next Type AD frame on the **virtual channel** (see [9], Section 4.2.1.2.2). *ANSI*. A finite or infinite number of objects, entities, or concepts, that have a given property or properties in common [X3.172].

setup phase
Phase during which all necessary actions are taken to ensure that the service selected during the preparation phase can actually be provided during the execution phase [44].

SFDU
See **standard formatted data unit**.

signalling
The technique whereby background network **management** systems exchange control information.

sink
An entity that receives **service data unit**s from a service provider [4].

sink process
The ultimate destination of **telemetry** on ground. **Source packets** with a given **application process identifier** are delivered to one or more sink processes [3].

SL
Space Link.

SLE
Space Link Extension.

SLE Complex

An SLE Complex is a set of SLE-FGs under a single management authority. At the time of cross support, an SLE complex has a single established relationship between the SLE system and the MDOS [44]. The systems performing SLE service are grouped into SLE Complexes by the organizations that implement them. Each SLE Complex has two components, a Service Provision component and a management component [44].

SLE Complex abstract-object type

An SLE Complex comprises one or more instances of SLE-FGs, of one or more SLE-FG types. An SLE Complex also contains a management entity, called the SLE Complex Management, which coordinates the activities of the SLE-FGs pertaining to the SLE Complex on behalf of the SLE Utilization Management [45].

SLE Complex Management abstract-object type

An SLE Complex Management negotiates the provision of SLE Service Packages with the SLE Utilization Management and controls and monitors the production and provision of SLE transfer service instances by the SLE-FGs belonging to the SLE Complex. An SLE Complex Management exchanges, with the SLE Utilization Management, set-up and configuration parameters required for the provision of the SLE transfer service instances. An SLE Complex Management distributes these parameters to the SLE-FGs and coordinates their activities for the provision of the SLE transfer service instances. An SLE Complex Management collects from the SLE-FGs reporting information, consolidates it, and forwards it to the SLE Utilization Management [45].

NOTE – The interactions between the SLE Complex Management and the SLE Utilization Management are discussed in the SLE Service Management specification.

SLE Complex Manager

The SLE Complex Manager is the component of an SLE Complex which manages space data transfer [44].

SLE component

The global collection of systems and organizations that provide SLE services [44].

SLE service (service)

Service that supplies or consumes one or more channels of the same **space data channel** type (e.g., master channel, virtual channel), derived from the space link channel [45].

SLE service bundle (service bundle)

The set of service packages associated with a single **space link** session. In general, an SLE service bundle is provided by multiple service complexes, each of which holds one of the **SLE service packages** [45].

SLE service category
An SLE service category is one of the following: return SLE services, forward AOS SLE services, or forward telecommand SLE services [44].

SLE service contract
The Service Contract is the agreement between the agencies that are engaged in cross support. The SLE Service Contract defines the set of Service Packages that are to be supported over the lifetime of the SLE Service Contract. The resources that will be accessible and the privileges that will be extended are identified [44].

SLE service instance
One occurrence of a service package being provided by a single service complex to a user [44]. A period of time during which a particular **SLE service** is available from the provider of that service to the authorized user of that service. The user does not necessarily have to be using the service instance for the service instance to exist [45].

SLE service instance lineage (service instance lineage)
The specific subset of branches through a **channel tree/subtree** that supports a **service instance** [45].

SLE service instance string
The set of complexes that support an **SLE service instance** and its **SLE service instance lineage** [45].

SLE service package (service package)
A group of **SLE service instances** that are derived from a common channel subtree and provided by a single **service complex** [45]. A group of service instances provided by a single service complex [44].

SLE service profile
The time sequence of **SLE service** instance strings associated with a specific **SLE service**. The profile may be described over varying periods of time, e.g., "the profile for August" [45].

SLE service provider (service provider)
The SLE **service complex** that contains the **service-provider** port for the **SLE service** [45].

SLE service session
The connection between an SLE **service user** and an SLE **service provider** over which an **SLE service** is utilized [44][45].

SLE service stack (service stack)
Stack that identifies the **space data channel** types that must be present to produce a service of the type of interest. There is no mapping to specific space data channels or service complexes [45].

SLE service type
The type of an SLE service; e.g., All Frames, MC Frames, VC Frames, etc. [44][45].

SLE support contract
Definition of the set of service packages that are to be supported over the lifetime of the support contract. The resources that will be accessible and the privileges that will be extended are identified [44].

SLE System
An SLE System comprises the global collection of systems and organizations that provide SLE services [44].

SLE System object
An object of the SLE system that performs the ground part of the data transfer between the space element and the MDOS [45]. This data transfer is an extension of the Space Link data transfer, which is specified in Recommendations: [2][3][8][9][11][33].

SLE Transfer Service Instance
An SLE transfer service instance is the provision by an SLE Complex of the capability to transfer one or more SLE data channels of a given type, all of which are related to the same Space Link Session [45].

SLE Transfer Service Production
In order to provide an SLE transfer service, an SLE system must perform the necessary transformations between the RF carrier channel and the SLE data channels(s) to be transferred to/from the user of the SLE transfer service. Performance of these transformations is called *production* of the SLE transfer service.

SLE Transfer Service Provision
An SLE system is said to *provide* an SLE transfer service when it exposes the operations necessary to obtain the service. Provision of an SLE transfer service implies making available to the service user the capability to obtain the service. Provision involves the interface between the service user and the service provider, and is characterized by what SLE data channels are transferred, when they are transferred, and the quality of service with which they are transferred (e.g., completely, reliably) [45].

SLE Utilization Management
Within the MDOS, the SLE Utilization Management negotiates with the SLE system the provision of transfer services and controls and monitors the provision of these services [45].

NOTES

1 The SLE Utilization Management (SLE-UM) is responsible only for the management of the MDOS related to the SLE system (and is not responsible for the management of the complete MDOS) or the space element.

2 The SLE-UM coordinates, internally to the MDOS, the provision of the transfer services of forward and return data transfer to the MUEs.

3 The management of the SLE system by the SLE-UM is the subject of a separate management service specification.

SLE-FG object
An SLE-FG performs the functions that transform SLE-SDUs from an SLE data channel of a given type to produce and provide a related group of SLE transfer services [45].

SLS
See **Space Link Subnet(work)**.

SL session
The connection between a mission spacecraft and an SLE service complex over which a physical channel access protocol unit is transmitted with fixed characteristics. A change in one or more of these characteristics results in a new space link session [44][45].

SNA
System network architecture [18].

source
An entity that sends **service data unit**s, using a **service provider** [4].

source data
The data produced by the **application process** and inserted into the **packet data field** of the **source packet** [3].

source data field
See **source data**.

source packet
An encapsulated block of observational and ancillary application data that is to be transmitted from an **application process** in space to one or more **sink processes** on the ground [3].

source packet data field
See **packet data field**.

source packet format
The format of the **source packet** [3].

source packet primary header
See **packet primary header**.

source packet secondary header
See **packet secondary header**.

source packet segment
See **segment**.

source packet segment format
The format of the **source packet segment** [3].

source packet segmentation
obsolete - A process through which very long **source packets**, generated by **application processes**, are subdivided by the on-board data system into smaller, fixed-length **source packet segments.**

source sequence count
The sequential binary count of each **source packet** generated by an **application process** identified by a unique **application process identifier** [3].

spacecraft identifier
A number providing the identification of the spacecraft that created the frame of **telemetry** data [3][33]. A number providing the identification of the spacecraft that shall receive the frame of command data [9].

space channel
A space/space or space/ground data transmission path.

space data channel
A virtual stream of space link data units of the same type, with a single unique identification; e.g., a single master channel, as uniquely identified by frame version number and SCID. Note that the complete unique identification of the data units does not have to be completely contained in the data unit itself. For example, a space packet channel is partially identified by the master channel ID of the master channel that carries the space packets [45]. A virtual stream of space link data units of the same type, with a single unique identification [44].

space data channel tree (channel tree)
A hierarchically-related set of **space data channels,** derived from a single "root" space data channel [45].

space element

The space element comprises the collection of systems and organizations, based on board the spacecraft, that provide SLE services used by a specified mission.

Space Link

The exchange of forward and return data is performed over a Space Link. A Space Link (SL) consists of one or both of a forward RF carrier channel and/or a return RF carrier channel, each of which may provide one or more physical channels. The simultaneous coexistence of several forward and several return links with a given spacecraft is possible [45].

space link ARQ procedure

A function within the **space link subnet** that performs retransmission control to ensure delivered completeness of higher-**layer** data [32][33].

Space Link Data Channel

A Space Link data channel is a uniquely identifiable stream of SL-DUs of the same type received from, or sent to, a space element. Annex A explains the relationship between SL-DUs and the Space Link protocols [45].

NOTE – Examples of Space Link data channels are: a Return Space Packet channel with a specific application identifier; a Return VC Frame channel with a specific virtual channel identifier.

Space Link Data Unit

The SLE system exchanges with the space element streams of Space Link Data Units (SL-DUs). SL-DUs are either Return SL-DUs or Forward SL-DUs [45].

Space Link Extension Data Channel

An SLE data channel is a uniquely identifiable stream of SLE-SDUs of the same type derived from a Space Link data channel. The types and identification are the same as for space data channels. SLE data channels are the streams of data processed and transferred by an SLE System. The types of Space Link Extension Data Channels are listed in tables A-4 and A-5 of Annex A [45].

NOTE – Formally speaking, an SLE data channel cannot be transferred by an SLE System. It is the SLE-SDUs belonging to an SLE data channel that are transferred by an SLE System.

Space Link Extension service

Space Link Extension (SLE) service is the set of services that extend one of the CCSDS SLS services, providing access to the ground termination of that service from a remote ground-based system. An SLE service supplies or consumes one or more channels of the same Space Data Channel type [44].

Space Link Extension Service Data Unit

An SLE Service Data Unit (SLE-SDU) contains an annotated SL-DU and/or control information related to the processing and transfer of SL-DUs by the SLE System [45].

Space Link Extension System

The Space Link Extension (SLE) System extends the transfer and delivery of forward and return data between a Space Link ground termination point and the MDOS. For a given mission, an SLE system provides its services according to specifications that have been prepared and issued by the respective MDOS [45].

NOTE – Transfer and delivery involve implementing the ground processing of the protocol described in CCSDS Packet Telemetry, Telecommand, and AOS Recommendations: [2][3][8][9][11][33].

space link layer

The top **layer** of the **space link subnet**, composed of the **virtual channel** link control and **virtual channel** access sublayers [33].

space link service

The service provided over the **space link subnet** to the user during a contact with the spacecraft [44].

Space Link Session

A Space Link Session is a continuous period during which an SLE system provides the capability to use one or more physical channels on a space link [45].

split bits

Split bits are the lower-order bits separated by sample splitting from the binary representation of a sample [5].

standard

A document that commits CCSDS agency resources to a particular **project**-independent data handling technique.

standard data interchange structure

A CCSDS-defined standard method for passing data between **application processes** [11].

standard formatted data unit (SFDU)

Data units that conform to a specific set of CCSDS recommendations for structure, construction rules, and field specification definition [18][21][22][23][24][25][26].

start sequence
A specific bit pattern at the beginning of a **CLTU** having a high autocorrelation function following an **idle** or **acquisition sequence** and which: a) synchronizes start of a **CLTU**; b) delimits start of first **codeblock**; and c) resolves the sense of a "1" and "0" in the **CLTU**, if necessary [8].

string literal
A string literal is formed by a sequence of graphic characters (possibly none) enclosed between two quotation marks used as string bracktets [29][30].

sublayer
An internal partitioning of a **layer** in a layered architecture.

submission date
The date the RP or RRP is submitted to a MACAO, as determined by its Originator [22][23][24].

submit (primitive)
An OSI-service primitive initiated by an OSI-service-user [43].

subnetwork
A component of a network that provides local communications **services** corresponding to OSI **layers** 1 and 2.

subtypes
A subtype is a type together with a constraint, which constrains the values of the type to satisfy a certain condition. The values of a subtype are a subset of the values of its type [29][30].

supplier
The designation of one of the two subtypes of an asymmetric abstract-port-type; the complement to the consumer subtype [43].

symbol
The encoded representation of space mission information as it flows through **space channels**. *ANSI*. A conventional representation of a concept or a representation of a concept upon which agreement has been reached [X3.172].

symbol rate
The baseband bit rate following error correction coding but excluding any spectrum modification encoding [14].

symmetric
A characteristic of an abstract-port-type that indicates that either one of the two abstract-ports of the port pair may invoke any of the abstract-operations associated with that port pair [43].

Symmetric/Asymmetric Ports

Two ports (of two objects) involved in the provision of a service may be either symmetric ports or asymmetric ports. The ports are symmetric if each offers all of the operations associated with the service. The ports are asymmetric if each offers different operations; in this case, one port is called a consumer, and the other is called a supplier [45].

symmetrical service

An OSI-service for which definitions of all OSI-local views are the same (i.e. there is only one type of OSI-local view) [43].

symmetric service

In a symmetric service, the local views at the service interfaces in two systems are the same [4].

synchronization flag

A bit that signals the type of data that is inserted into the **transfer frame data field**. It is "0" if **octet**-synchronized and forward-ordered **source packets** or **segments** or **idle data** are inserted; it is "1" if **privately defined data** is inserted [3].

synchronization marker

A pattern used to delimit the boundaries of fixed-length data blocks as they are transmitted through a **space channel**.

synchronous

A sequence of events occurring in a fixed time relationship (within specified tolerance) to another sequence of events. Note that 'synchronous' does not necessarily imply 'constant rate' [4].

syntactic information

Information associated with data that defines the format of the data [19][20]. *ANSI*. (syntax) The relationships among characters or groups of characters, independent of their meanings or the manner of their interpretation and use [X3.172].

systematic code

A code in which the input information sequence appears in unaltered form as part of the output codeword [1][2].

system management layer

The layer immediately below the **application process layer** providing the transformation between high-level **user command directives** and the detailed information and instructions used within lower **layers** to deliver sets of **commands**. In particular, the **layer** translates between the **abstract transfer syntax** used by the **application processes** and the **concrete transfer syntax** used by the packetization and lower **layers** [11].

systems management
Functions in the Application layer related to the management of various OSI resources and their status across all layers of the OSI architecture [43].

systems management application entity (SMAE)
An application-entity for the purposes of systems management communications [43].

T-field
The **time specification field**, i.e., that part of the **time code format** that contains the time information [12].

tail sequence
A specific data pattern that delimits the end of a **CLTU** [8].

TC
Abbreviation for **telecommand**.

TC channel service
In the space data systems **layer**ed **service** architecture, the bottom **service** of the **telecommand system**. Among its **services** it delivers the encoded bits of a buffer of **transfer frames** across the physical communications link under error-controlled condition [8].

TC data
The data content (after decoding) of the **CLTU** which is output to the **data routing service** (**layer** above) and which may include fill [8].

TCM
Terminology, Conventions, and Methodology.

TC packet
See **telecommand packet**.

TC transfer frame
The **protocol data unit** of the **transfer layer** [9].

TC user data unit
A finite-length **user data** structure carried within the frame data field of a **TC transfer frame**. If the **layers** above the **transfer layer** conform to the CCSDS **telecommand** architecture, the TC **user data** unit will correspond to a **TC packet** or a TC **segment**. If the **layers** above the **transfer layer** do not conform to the CCSDS **telecommand** architecture, the TC **user data** unit may be any other higher-**layer user data** structure [9].

telecommand (TC)
A generic term used to describe **commands** during the time that they are being telecommunicated to the spacecraft.

telecommand channel service
A **telecommand service** that provides error controlled communications across the space link [8].

telecommand data routing service
A **telecommand service** that provides error controlled message communications between remote entities [9].

telecommand delivery
The end-to-end process of transferring **telecommands** from an **application process** at the **sending end** to an **application process** at the **receiving end**. An intermediate step within the delivery process is **telecommand** transport.

telecommand file
A **named set** of interrelated and ordered **TC packets** which together control an independent unit of activity on board the receiving spacecraft, and which must be transported intact and complete (but not necessarily in sequence) prior to being released for delivery and **execution**. The TC file contains all the **telecommands** to perform one complete, well-defined sequence of activities for a specific segment of a mission, e.g., a trajectory maneuver, a scientific data-taking exercise, or an emergency routine, and therefore often contains commands addressed to multiple destinations. The activities directed by a file are theoretically independent of those directed by other files [11].

telecommanding
A generic term used to describe the process of telecommunicating **commands** to the spacecraft.

telecommand packet
A **protocol data unit** consisting of two elements: (1) a **header** conveying identification information, and (2) a data field containing **user command** application data destined for delivery to a specific **application process** onboard a desired receiving spacecraft. Conceptually, the length of a **TC packet** is unconstrained: however, the present concrete implementation of the **TC packet** has a finite maximum length [11].

telecommand segment
The **protocol data unit** of the TC **segmentation layer**. **TC segments** consist of a **segment header** and **segment data field** [9].

telecommand session

The period of time when **application processes** at the sending and **receiving ends** of the TC system are physically and/or logically interconnected for the purpose of delivering **telecommand** data. A TC session is established to transport all of the **telecommands** required to execute a specific set of actions that implement a particular phase of the overall mission profile [11].

telecommand system

The end-to-end system of **layer**ed space mission telecommunication **services** that exist to enable a **user** to send **commands**, in a **reliable** and **transparent** error-controlled environment, to **receiving elements** in space [7].

telecommand transfer frame

The **protocol data unit** of the **transfer layer**. **TC transfer frames** contain a frame **header**, a frame data field, and an optional **frame error control field**. The data field carries either a **TC user data unit** (e.g., **TC segments** or **TC packets**), or **control commands** that establish the internal operations of the **transfer layer** [9].

telecommand transport

The process of moving a set of TC **user data** from the **sending end** to the **receiving end** of the **packetization layer**, using **services** provided by the lower **layers**. When correct receipt of the set is confirmed at the **receiving end**, the **commands** are passed to the **system management layer** for delivery.

telemetry

A term used to characterize the generation of more or less continuous and predictable sets of space mission measurement data at rates and volumes which may be extremely high, and which have a large interaction with overall communications resources.

telemetry data flow

This flow is shown in [3], Fig. 2-2.

telemetry source packet

See **source packet**.

time code fields

The **preamble field (P-Field**) and the **time specification field** (**T-Field**) of which a **time code** may consist. The **T-field** is mandatory [12].

time code formats

Formats to be used in the interchanging of **time codes** between CCSDS agencies [12].

time codes
Digital representations of time information. There are four CCSDS-recommended time codes. These use the International Standard Second as the fundamental unit of time. Among the four time codes there is one **unsegmented time code** and three **segmented time codes** [12].

time specification field
See **T-field**.

timetag
The digital representation of time information, used to annotate a space **service data unit** with respect to its time of generation relative to other mission events.

TLV
Obsolete. See **LENGTH-VALUE Object**.

TLV Object
Obsolete. See **LENGTH-VALUE Object**.

TLVO
Obsolete. See **LENGTH-VALUE Object**.

TM
Telemetry.

transaction
A term used to characterize interactive space mission operations such as file transfers, electronic messages, data base queries, etc., which tend to be periodic, unpredictable and typically have a low interaction with overall communications resources. *ANSI*. A command, message, or input record that explicitly or implicitly, calls for a processing action, such as updating a file [X3.172].

transfer frame
The data structure that provides the envelope for transmitting packetized or **privately defined data** over the space-to-ground channel [1][3][7].

transfer frame data
The data carried in the **transfer frame data field** [3].

transfer frame data field
The part of the **transfer frame** carrying the **transfer frame data** [3].

transfer frame data field status
A field with five sub-fields in the **transfer frame primary header.** This field indicates whether a secondary header is present. Further, it provides information on the type of data contained in the frame and provides, together with the **virtual channel frame count**, the control information necessary to enable **source packets** and **segments** to be extracted from the **transfer frame data field** [3].

transfer frame data field status field
See **transfer frame data field status**.

transfer frame format
The format of the **transfer frame** [3].

transfer frame identification
A field with three sub-fields in the **transfer frame primary header**. This field identifies the generator of the **transfer frame**, it specifies the **Virtual Channel** to which it belongs, and it provides information on the format of the **transfer frame** [3].

transfer frame identification field
See **transfer frame identification**.

transfer frame primary header
The primary **header** of the **transfer frame** [3].

transfer frame secondary header
Te*lemetry*. An optional part of the **transfer frame** consisting of a **header** and a data field. It may carry any type of **telemetry** data to be determined by mission design and operations **management**. If this secondary header is associated with a **master channel** it allows the transfer of data frame-synchronously with respect to this **master channel** [3].

transfer frame secondary header data field
The data field of the **transfer frame secondary header** [3].

transfer frame secondary header flag
A part of the **transfer frame data field status** in the **transfer frame primary header** that signals whether a secondary header is present in this frame or not. It shall remain the same within a specific **master channel** throughout a **mission phase** [3].

transfer frame secondary header identification field
A part of the **transfer frame secondary header** providing the **version number** of the secondary header and its length [3].

transfer frame secondary header length
The length of the **transfer frame secondary header** given in the **transfer frame secondary header identification field** [3].

transfer frame secondary header length field
See **transfer frame secondary header length**.

transfer frame secondary header version number
Part of the **transfer frame secondary header identification field**. There may be different versions of the **transfer frame secondary header**. The current document recognizes one version only [3].

transfer frame secondary header version number field
See **transfer frame secondary header version number**.

transfer frame version number
The first two bits of the **transfer frame primary header** which are set to "00" if the **transfer frame** contains "conventional" **packet telemetry**. The "**transfer frame**" defined in the **advanced orbiting system** [33] is called **virtual channel data unit** and is identified by the **version number** "01" [3].

transfer layer
The bottom **layer** of the **data routing service**, which performs the transfer of **user data** structures to the receiving spacecraft [7][9].

transmission resources
The resources available for transmitting data. Most space communication systems are capacity limited. Multiple **users** have to share access to the downlink data channel which requires appropriate management of the data flow. In **telemetry** two methods are used for this purpose: **virtual channelization** and **source packet segmentation** [3].

transparent
As viewed by the **user**, the invisible and seemingly direct (virtual) transfer of data from the originating point to the receiving point [1][7].

transparent code
A code that has the property that when complementing the input of the **encoder** or **decoder** results in complementing the output [1][2].

TSDN
Transfer syntax data notation [27].

type
A type is a named set of characteristics. This name can be used to define sets of values [29].
A type has an associated set of values [30].

type-1-report
A report inserted into the optional **operational control field** of the **transfer frame**. It contains the **command link control word** [3].

type-2-report
A report inserted into the optional **operational control field** of the **transfer frame**. Its use/contents has not yet been specified by CCSDS [3].

type-A TC (acceptance mode) frame
A **TC transfer frame** that has a flag set indicating that it is to be tested against the **frame acceptance check** [9].

type-AD TC frame
A **TC transfer frame** that carries **TC data** (e.g., **packets** or **segments**), subject to **acceptance** check under control of the **FARM**. These frames use the sequence-controlled (or AD) **service** of the **COP** [9].

type-B TC (bypass mode) frame
A **TC transfer frame** that has a flag set indicating that it is not to be tested against the **frame acceptance check**, but may be delivered as soon as it passes the **frame validation check** [9].

type-BC TC frame
A **TC transfer frame** that carries **FARM control commands**, with all **frame acceptance checks** bypassed under control of the **FARM**. These frames control the sequence-controlled **service** of the **COP** [9].

type-BD TC frame
A **TC transfer frame** that carries **TC data** (e.g., **packets** or **segments**), with all **frame acceptance checks** bypassed under control of the **FARM**. These frames use the expedited (or BD) **service** of the **COP** [9].

type flag
Part of the optional **operational control field** in the **telemetry transfer frame.** This flag occupies the first bit of the **operational control field** and signals whether this field contains a **type-1-report**, i.e., a **command link control word**, or a **type-2-report** [3].

type indicator
Part of the **packet identification** in the **packet primary header** of the **telemetry source packet** and the **telecommand packet**. It is set to "0" to indicate that the data structure is a **telemetry source packet** as opposed to a **telecommand packet** where it is set to "1" [3][11].

TYPE-LENGTH-VALUE Object (TLV Object) (TLVO)
Obsolete. The fundamental structural data object that is used to build SFDUs. This object consists of a TYPE field, followed by a LENGTH field, and this is followed by a VALUE field. The flexibility of the VALUE field permits it, under certain conditions, to contain complete TLV Objects and/or complete SFDUs as part of its structure.

UM
Utilization Manager.

unconfirmed service
Service in which the sending end does not receive confirmation that data it sends has reached the receiving end [4].

unconstrained array
An unconstrained array is an array with a variable number of elements [29][30].

units expression
A string enclosed within angle brackets which may follow a simple value, set, or sequence [26].

unlock
A Type-B **control command** that resets a **FARM lockout** condition [9].

unquoted string
A value consisting of a sequence of unrestricted characters [25][26].

unrestricted characters
The set of PVL characters that may be used to form parameter names, unquoted strings or block names [25][26].

unsegmented time code
A pure binary count of time units and fractional time units beginning from a starting time called **epoch** [12].

user
An entity receiving services [44]. A human or machine-intelligent process that directs the progress of a space mission by sending **commands** to a space system [7][11].
ANSI. Any person, organization, or functional unit that uses the services of an information processing system [X3.172].

user data
Telecommand information bits that are to be delivered without alteration to a **user application process** [11].

user file name

Name given to a user file. Naming of the file is performed by an **application process**. The user file name (e.g., "Orbit 426") provides the capability for the **user** to track the status of the file as it progresses through the delivery process, so that it may be activated, suspended, **resumed** or aborted at any point prior to **execution**. The **system management layer** translates the high-level user file name into an appropriate **concrete transfer syntax** for use by the **packetization layer**, and creates the corresponding TC session **control instructions** that request **services** from lower **layers** of the TC system in order to deliver the file [11].

user-optional

Of or pertaining to a capability that the entity using a service may choose to use or not to use. The **service provider** is presumed to provide the capability if requested, but also to be able to provide service that does not include the user-optional capability [4].

utilization manager (management)

The component of mission management responsible for **SLE service**s. Service management is accomplished through the management of the functions performed by the individual service complexes that provide the SLE services [44].

variable

A variable is an identifier that represents a data item occurrence [29][30].

variant part

A variant part of a record specifies alternative record components, dependent on the discriminant of the record. Each value of the discriminant establishes a particular alternative of the variant part [29][30].

VC

Virtual Channel.

VCA

Virtual Channel Access.

VCDU

Virtual Channel Data Unit.

VCID

Virtual Channel Identification.

version number (segment)

The contents of the first three bits of the **segment header**. It has to be set to "100" [3].

version number (source packet)

The contents of the first three bits of the **source packet primary header**. It has to be set to "000" [3].

version number (transfer frame and virtual channel data unit)
An identifier, contained within the **header** of the **transfer frame/virtual channel data unit** which defines the version of the unit in use [3][9][33].

video
A stream of data containing digitized samples of television signals [34][35].

virtual channel
The sub-channel of a **master channel** which is created by assigning the same **virtual channel identifier** to a group of **transfer frames** and another **virtual channel identifier** to another group of **transfer frames**, etc. Up to eight virtual channels may be specified for a **master channel** in "conventional" **packet telemetry**. Up to 64 virtual channels may be specified in AOS **telemetry** (using the **virtual channel data unit** instead of the **transfer frame**) [3][33]. Virtual channels are provided by the **transfer layer**, which interfaces with the single **physical channel** in the **layers** below and presents the **service** of apparently separating this single channel into multiple "virtual" paths to the **layer** above (e.g., the **segmentation layer**) [9].

virtual channel access service
A **space link subnet service** that exposes the **data unit zone** of a **virtual channel** to **users** [32][33][37].

virtual channel access sublayer
A **layer** of the **space link subnet** that transmits higher-**layer** data through the **physical channel** using constant-length data blocks [33][40].

virtual channel data unit identifier
An identifier, consisting of a **spacecraft identifier** concatenated with a **virtual channel identifier**, which (when qualified by the **version number** "01") uniquely identifies a particular AOS **virtual channel** [33].

virtual channel data unit service
A **service** within the **space link subnet** that allows independently created **virtual channel data units** and **coded virtual channel data units** to be transmitted on a **physical channel** [33].

virtual channel data unit (VCDU)
The central **protocol data unit** of the **space link subnet**. A constant-length data structure, **standard**ized by CCSDS, which is used bi-directionally on **space channels** within **advanced orbiting systems** to implement an OSI **layer** 2 **protocol** [33].

virtual channel frame count
Part of the **transfer frame primary header** (see [3], Fig. 5-1) providing the individual count for each of the maximum eight (for "conventional" **packet telemetry**) **virtual channels** [3].

virtual channel frame count field
See **virtual channel frame count**.

virtual channel identifier
Part of the **transfer frame identification field** in the **transfer frame primary header** providing the identification of the **virtual channel** to which the frame belongs [3].

virtual channelization
See **virtual channel**.

virtual channel link control (VCLC)
The service that provides transfer of bitstream data or octet-aligned packetized data across a **virtual channel** [39].

virtual channel link control sublayer
A **layer** of the **space link subnet** which allows **user data** to be placed on individual **virtual channel**s [33].

virtual discriminant
A virtual discriminant is a discriminan that is not included in the composite type that it discriminates [29].

virtual fill
Added bits that are not transmitted. In a systematic block code, a codeword can be divided into an information part and a parity (check) part. Suppose that the information part is N symbols long (a symbol is defined here to be an element of the code's alphabet) and that the parity part is M symbols long. A "shortened" code is created by taking one S (S<N) information symbols as input, appending a fixed string of length N-S and then encoding in the normal way. This fixed string is called "fill". Since the fill is a predetermined sequence of symbols, it need not be transmitted over the channel. Instead, the **decoder** appends the same fill sequence before decoding. In this case, the fill is called virtual fill [1][2]. *Telecommand*. Added bits that are not transmitted, but their presumption in the encoding process must be known for the decoding process (i.e., the **decoder** must know the **codeblock** length) [8].

V(R)
See **next expected frame sequence number V(R)**.

wait
An indication from the **FARM**, contained in a **CLCW**, that the **receiving end** of the **transfer layer** has encountered congestion in passing data to the **layer** above, and cannot accept any more Type-A frames [9].

WDC-A-R&S
World Data Center A for Rockets and Satellites [13][18][22][23].

white space

One or more space or format effecter characters. Used to promote readability between syntactic elements or within the contents of comment or text strings [25][26].

World Data Center A for Rockets and Satellites (WDC-A-R&S)

An organization under the World Data Center that is collocated with NASA's National Space Science Data Center. It responds to world-wide requests for information about rockets and satellites and performs related services [22][23].

YACC

Yet another compiler-compiler [26].