

Space data and information transfer systems — Data entity dictionary specification language (DEDSL) — PVL syntax

ICS 49.140

National foreword

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The UK participation in its preparation was entrusted by Technical Committee ACE/68, Space systems and operations, to Subcommittee ACE/86/-/7, Space data and information transfer systems, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Summary of pages

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Space data and information transfer systems — Data entity dictionary specification language (DEDSL) — PVL syntax

*Systèmes de transfert des informations et données spatiales —
Langage de spécification pour le dictionnaire d'entités de données —
Syntaxe PVL*



Foreword

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International Standard ISO 21962 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 647.2-B-1, June 2001) and was adopted (without modifications except those stated in Clause 2 of this International Standard) by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 13, *Space data and information transfer systems*.

Space data and information transfer systems — Data entity dictionary specification languages (DEDSL) — PVL syntax

1 Scope

This International Standard specifies the requirements for establishing a parameter value language (PVL) to be used in the creation of a data entity dictionary (DED).

The scope and field of application are furthermore detailed in subclauses 1.1 and 1.2 of the enclosed CCSDS publication.

2 Requirements

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

CCSDS 647.2-B-1, June 2001, *Data entity dictionary specification language (DEDSL) — PVL syntax (CCSD0012)*.

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 647.2-B-1.

Pages i to v

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

Page 1-7

Update and add the following information to the references indicated in 1.6:

- [1] Document CCSDS 647.1-B-1, June 2001, is equivalent to ISO 21961:2003.
- [2] Document CCSDS 641.0-B-2, is equivalent to ISO 14961:2002.
- [3] Document CCSDS 620.0-B-2, May 1992, is equivalent to ISO 12175:1994.
- [4] Document CCSDS 643.0-B-1, November 1992, is equivalent to ISO 14962:1997.
- [5] Document CCSDS 630.0-B-1, June 1993, is equivalent to ISO 13764:1996.

Update the following reference:

- [6] ISO/IEC 8859-1:1998, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

Page C-1

Update and add the following information to the reference indicated in annex C:

[C6] Document CCSDS 301.0-B-3, January 2002, is equivalent to ISO 11104:—¹⁾.

3 Revision of publication CCSDS 647.2-B-1

It has been agreed with the Consultative Committee for Space Data Systems that Subcommittee ISO/TC 20/SC 13 will be consulted in the event of any revision or amendment of publication CCSDS 647.2-B-1. To this end, NASA will act as a liaison body between CCSDS and ISO.

1) To be published. (Revision of ISO 11104:1991)

Consultative Committee for Space Data Systems

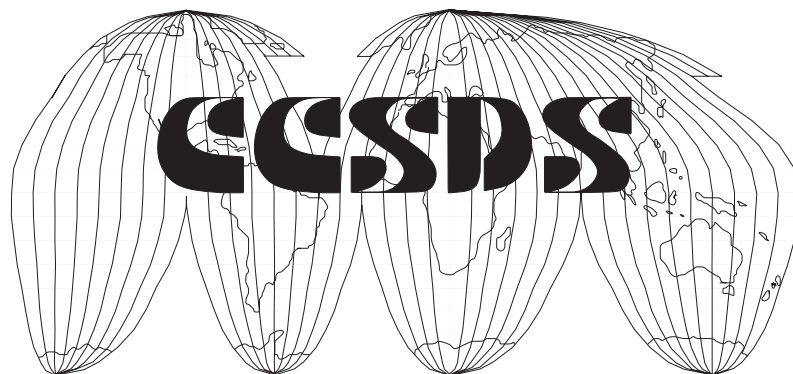
RECOMMENDATION FOR SPACE
DATA SYSTEM STANDARDS

DATA ENTITY DICTIONARY
SPECIFICATION LANGUAGE (DEDSL)—
PVL SYNTAX
(CCSD0012)

647.2-B-1

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June 2001



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CCSDS RECOMMENDATION FOR DEDSL—PVL SYNTAX

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This document has been approved for publication by the Management Council of the Consultative Committee for Space Data Systems (CCSDS) and represents the consensus technical agreement of the participating CCSDS Member Agencies. The procedure for review and authorization of CCSDS Recommendations is detailed in [C1], and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

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STATEMENT OF INTENT

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

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

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- o Whenever an Agency establishes a CCSDS-related **standard**, the Agency will provide other CCSDS member Agencies with the following information:
 - The **standard** itself.
 - The anticipated date of initial operational capability.
 - The anticipated duration of operational service.
- o Specific service arrangements shall be made via memoranda of agreement. Neither this **Recommendation** nor any ensuing **standard** is a substitute for a memorandum of agreement.

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

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

CCSDS RECOMMENDATION FOR DEDSL—PVL SYNTAX

FOREWORD

This Recommendation is a technical Recommendation providing the PVL implementation for the Abstract Syntax defined in the *DEDSL—Abstract Syntax* Recommendation (reference [1]) in order to provide a computer processable standardisation of the expression of the semantic information which is to be carried with data.

Through the process of normal evolution, it is expected that expansion, deletion or modification to this document may occur. This Recommendation is therefore subject to CCSDS document management and change control procedures defined in reference [C1]. Current versions of CCSDS documents are maintained at the CCSDS Web site:

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Questions relative to the contents or status of this document should be addressed to the CCSDS Secretariat at the address indicated on page i.

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Recommendation is to provide a standard method to represent the attributes and their values, as has been defined by the Abstract Syntax of the Data Entity Dictionary Specification Language (DEDSL) (reference [1]), using the Parameter Value Language (PVL) (references [2] and [C3]) for the construction and interchange of data entity dictionaries.

This Recommendation is registered under the CCSDS Authority and Description Identifier (ADID): CCSD0012.

This Recommendation does not exclude other implementation Recommendations of the *DEDSL—Abstract Syntax* Recommendation.

1.2 APPLICABILITY

This Recommendation is intended to be used by implementers of Data Entity Dictionaries, and for example:

- by data producers to construct dictionaries that describe, in a more formal manner, data entities within their data products;
- by data users to understand data received from data producers who have used this Recommendation to construct their dictionaries;
- by an organisation that mandates the attributes used to define each entity description in dictionaries used within that organisation;
- by a particular community, such as Earth observation, space physics, archives, etc., to establish a degree of standardisation for the contents of any data dictionary associated with a data product (this would be done by using this Recommendation to define a community-wide data dictionary);
- by organisations and communities to exchange the contents of a data dictionary in a standardised manner, i.e., to facilitate interoperability.

1.3 RATIONALE

A given data entity may take on a range of values that are represented differently within different formats or in native formats. However there is information about that data entity, such as its definition and other semantic attributes, which are independent of the values and their representation in any given format. These include:

- the exchange of data entity dictionaries among disciplines and organizations which typically use differing standard formats;

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- the exchange of data entity dictionary information with registration authorities such as the CCSDS/ISO Control Authority (references [5] and [C4]), and
- the exchange of data entity dictionary information using general data packaging techniques such as the CCSDS/ISO Standard Formatted Data Unit (SFDU) (see references [3] and [C2]).

1.4 DOCUMENT STRUCTURE

This document presents the PVL implementation of the DEDSL Abstract Syntax in a layered manner. The reader should be familiar with both the DEDSL Abstract Syntax (see reference [1]) and the PVL Recommendation (see reference [2]) in order to fully understand this document.

In summary, the document is structured as follows:

- Section 2 introduces the use of PVL as implementation language of the DEDSL.
- Section 3 specifies the exact PVL syntax for each DEDSL dictionary attribute and the way of defining a data entity dictionary in PVL.
- Section 4 specifies the exact PVL syntax for each DEDSL data entity attribute and the way of defining a data entity in PVL.
- Section 5 specifies the exact PVL syntax for each DEDSL descriptor and the way of defining a user-defined attribute in PVL.
- Section 6 discusses the levels of conformance to the DEDSL Recommendation, in relation to the abstract specification and the PVL implementation, and the CCSDS Control Authority registration of this Recommendation.
- Section 7 lists the reserved keywords associated with the PVL implementation.
- Annex A provides examples of data entity definitions.
- Annex B provides an example of a complete data entity dictionary.
- Annex C provides a list of references that may be valuable to the user of this Recommendation as background material or as implementation guidelines for using this Recommendation.

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1.5 DEFINITIONS**1.5.1 ACRONYMS AND ABBREVIATIONS**

This subsection defines the acronyms and abbreviations that are used throughout this Recommendation:

ADID	Authority and Description Identifier
ASCII	American Standard Code for Information Interchange
CCSDS	Consultative Committee for Space Data Systems
DED	Data Entity Dictionary
DEDSL	Data Entity Dictionary Specification Language
ID	IDentifier
ISO	International Organization for Standardization
LVO	Label Value Object
MACAO	Member Agency Control Authority Office
PVL	Parameter Value Language
SFDU	Standard Formatted Data Unit

1.5.2 GLOSSARY OF TERMS

For the purpose of this document the following definitions apply:

Attribute	A piece of information that describes a Data Entity or Dictionary Entity. This information characterizes or enhances the understanding of the data that is described. Attributes are used to define the semantics of data entities.
Attribute Descriptor	A piece of information that describes an attribute. This document specifies a set of descriptors for attribute description.
Attribute Value	A value associated with an attribute instance.
Composite Data Entity	A data entity which consists of a combination of various other elementary and composite entities.
Constant	A named constant value that is used within a dictionary but is not part of the data themselves. Use of constants enables data entity dictionaries to specify values which will be used by several projects or within a domain (astronomy constants, image size, etc.).

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Data Entity	A concept that can, or does, take on one or more values. The concept, and optionally constraints on the representation of its value, are defined by attributes and their values.
Data Entity Dictionary	A collection of semantic definitions of various data entities, together with a few mandatory and optional attributes about the collection as a whole. Data entity dictionaries may be just for a single product, i.e., all the data entities within a single product are described in a corresponding single dictionary, or the data entity dictionary may be a discipline-oriented dictionary that holds a number of previously defined data entity definitions which may be used by data designers and users as references. Some parts of a dictionary are optional. In practical terms the dictionary could be a file or a Standard Formatted Data Unit (SFDU) Label-Value Object (LVO) value field (see references [3] and [C2]). Within this Recommendation, the expression ‘data entity dictionary’ can refer either to the notion of data entity dictionaries or to a data entity dictionary instance. A data entity dictionary is also an entity, called Dictionary Entity.
Data Product	A collection of one or more data items that are packaged for or by a specific application.
Defaulted	Indication of an attribute or descriptor value that is understood when the attribute or descriptor is not explicitly included in the containing definition.
Descriptor Name	An Identifier that is the name of the descriptor.
Descriptor Type	The characterization of the descriptor value; e.g., text, identifier, integer.
Elementary Data Entity	A data entity whose data type is elementary, that is Integer, Real, Text or Enumerated.
Enumerated	A set containing a restricted number of discrete values, where each discrete value is named and unique within the set.
Identifier	A PVL unquoted string that designates something.
Integer	The set of integer values. It can optionally be defined more precisely by specifying a range (minimum and maximum bounds).
Model	A data entity described independently from any instance in a data product and corresponding to a re-usable data entity definition from which other data entities may inherit the attributes and apply some specialization rules.
Real	The set of real values. It can optionally be defined more precisely by specifying a range (minimum and maximum bounds).
Semantics	Information that defines the meaning rather than the physical representation of data. Semantics potentially cover a very large domain, from the simple domain, such as the units of one data entity, to a more complex one, such as the relationship between a data entity and another.

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Standard Attribute	One of the attributes defined within the DEDSL Abstract Syntax Recommendation (reference [1]).
Syntax	Information defining the physical representation of data. It includes the structural arrangement of the fields within the data on the exchanged media.
Text	A PVL quoted string. The set of allowed characters is defined in the Data Entity Dictionary.
User Defined Attribute	An attribute that is defined by a particular user or project and after definition is then used in the same manner as a Standard Attribute within that data entity dictionary.
White Space	Consists of the equivalent of the ASCII characters line feed (0A _{hex}), carriage return (0D _{hex}), horizontal tab (09 _{hex}), vertical tab (0B _{hex}), form feed (0C _{hex}) and space (20 _{hex}) (see reference [4]).

1.5.3 NOMENCLATURE

The following conventions apply throughout this Recommendation:

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

1.5.4 CONVENTIONS

Convention 1: Conventions for the syntax of the DEDSL PVL constructs

The syntax of the DEDSL PVL constructs is described using the following conventions:

- a) the item named on the left of the ::= symbol is the statement being defined;
- b) the corresponding definition is on the right of the ::= symbol and is made up of a series of items;
- c) the statement which is being defined is delimited by the two delimiters, ‘<’ and ‘>’;
- d) items denoting reserved keywords defined by the DEDSL PVL implementation are represented as unquoted strings in bold characters;
- e) optional items are enclosed by parentheses;
- f) an item on the right of the ::= symbol can be a statement which is defined elsewhere;
- g) repeatable items are marked by an asterisk ‘*’;

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- h) items are separated by space characters;
- i) when a statement is no further detailed, its definition may appear within a note, which is delimited by the two delimiters, '[' and ']'.

The following example presents the definition of the item Statement. Statement is defined:

- first as 3 keywords ('BEGIN_GROUP', '=', 'SEMANTIC_GROUP') optionally followed by a semicolon;
- followed by a repeatable item Inner_Statement;
- followed by an optional item Optional_Statement, which is further detailed as a note;
- then ended by 3 keywords ('END_GROUP', '=', 'SEMANTIC_GROUP') optionally followed by a semicolon.

```

<Statement> ::=
    BEGIN_GROUP = SEMANTIC_GROUP (;
    < Inner_Statement >*
    ( < Optional_Statement >)
    END_GROUP = SEMANTIC_GROUP (;
  
```

```

< Optional_Statement > ::= [Sequence of PVL statements whose syntax and semantics
    are defined in section xxx]
  
```

Figure 1-1: Example of the Conventions for DEDSL PVL Constructs Convention

The Rules appearing throughout this Recommendation are numbered consecutively.