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Space data and information transfer systems — Producer–archive interface — Methodology abstract standard

*Systèmes de transfert des informations et données spatiales —
Interface entre producteur et archives — Norme pour la méthodologie
concernant les abstraits*



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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 20652 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 13, *Space data and information transfer systems*.

ISO 20652 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 651.0-B-1, May 2004) 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*.

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Space data and information transfer systems — Producer–archive interface — Methodology abstract standard

1 Scope

This International Standard identifies, defines and provides structure to the relationships and interactions between an information producer and an archive. This International Standard defines the methodology for the structure of actions that are required from the initial time of contact between the producer and the archive until the objects of information are received and validated by the archive. These actions cover the first stage of the ingest process as defined in the open archival information system (OAIS) reference model (see ISO 14721). This International Standard describes parts of the functional entities administration ('negotiate submission agreement') and ingest ('receive submission' and 'quality assurance').

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 651.0-B-1, May 2004, *Producer–archive interface — Methodology abstract standard*.

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 651.0-B-1.

Pages i to v

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

Pages 1-7 to 1-8

Add the following information to the reference indicated:

- [1] Document CCSDS 650.0-B-1, January 2002, is equivalent to ISO 14721:2003.
- [2] Document CCSDS 647.1-B-1, June 2001, is equivalent to ISO 21961:2003.
- [5] Document CCSDS 620.0-B-2, May 1992, is equivalent to ISO 12175:1994.

Page B-1

Add the following information to the reference indicated:

- [B2] Document CCSDS 647.3-B-1, January 2002, is equivalent to ISO 22643:2003.
- [B3] Document CCSDS 647.2-B-1, June 2001, is equivalent to ISO 21962:2003.
- [B4] Document CCSDS 644.0-B-2, November 2000, is equivalent to ISO 15889:2003.

ISO 20652:2006(E)

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 651.0-B-1. To this end, NASA will act as a liaison body between CCSDS and ISO.

Consultative Committee for Space Data Systems

RECOMMENDATION FOR SPACE
DATA SYSTEM STANDARDS

Producer-Archive Interface Methodology Abstract Standard

CCSDS 651.0-B-1

BLUE BOOK

May 2004



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RECOMMENDATION FOR A PRODUCER-ARCHIVE
INTERFACE METHODOLOGY ABSTRACT STANDARD

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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 reflects the consensus of technical panel experts from CCSDS Member Agencies. The procedure for review and authorization of CCSDS Reports is detailed in the *Procedures Manual for the Consultative Committee for Space Data Systems*.

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RECOMMENDATION FOR A PRODUCER-ARCHIVE
INTERFACE METHODOLOGY ABSTRACT STANDARD

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:

- Whenever an Agency establishes a CCSDS-related **standard**, this **standard** will be in accord with the relevant **Recommendation**. Establishing such a **standard** does not preclude other provisions which an Agency may develop.
- 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.
- Specific service arrangements are made via memoranda of agreement. Neither this Recommendation nor any ensuing standard is a substitute for a memorandum of agreement.

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

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

RECOMMENDATION FOR A PRODUCER-ARCHIVE
INTERFACE METHODOLOGY ABSTRACT STANDARD**FOREWORD**

The purpose of this Recommendation is to identify, define and provide structure to the relationships and interactions between an information Producer and an Archive.

Through the process of normal evolution, it is expected that expansion, deletion, or modification to this Report may occur. This Report is therefore subject to CCSDS document management and change control procedures which are defined in the *Procedures Manual for the Consultative Committee for Space Data Systems*. Current versions of CCSDS documents are maintained at the CCSDS Web site:

<http://www.ccsds.org/>

Questions relating to the contents or status of this report should be addressed to the CCSDS Secretariat at the address on page i.

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

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 - Swedish Space Corporation (SSC)/Sweden.
 - United States Geological Survey (USGS)/USA.

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CCSDS 651.0-B-1	Producer-Archive Interface Methodology Abstract Standard	May 2004	Original Issue

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Recommendation is to identify, define and provide structure to the relationships and interactions between an information Producer and an Archive. This Recommendation defines the methodology for the structure of actions that are required from the initial time of contact between the Producer and the Archive until the objects of information are received and validated by the Archive. These actions cover the first stage of the Ingest Process as defined in the Open Archival Information System (OAIS) Reference Model (reference [1]). This Recommendation describes parts of the functional entities Administration ('Negotiate Submission Agreement') and Ingest ('Receive Submission' and 'Quality Assurance').

This Recommendation accomplishes the following:

- identifies the different phases in the process of transferring information between a Producer and an Archive;
- defines the objective of each of these phases, the actions that must be carried out during these phases, and the expected results (e.g., administrative, technical, contractual) at the end of a phase;
- forms a general methodological framework, which should be able to be applied and reused in those processes that relate to the Producer-OAIS Archive interface (this general framework should also provide sufficient flexibility for each particular case);
- forms a basis for the identification and/or development of standards and implementation guides in the community in question;
- forms a basis for identification and/or development of a set of software tools that will assist the development, operation and checking of the different stages in the process of information transfer between the Producer and the Archive.

NOTE – The term 'Archive' refers to an Archive that is in compliance with the OAIS Reference Model. This Recommendation uses terminology as defined in the OAIS Reference Model (reference [1]).

1.2 APPLICABILITY

The methodology defined in this Recommendation applies both to the information Producer and to the Archives to which this information must be transmitted, where such Archives are conformant to the Reference Model.

This methodology could also be of interest and be fully or partially applied to Archives that are not conformant to the Reference Model.

This methodology is of relevance to Archives containing physical, as well as digital, objects.

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1.3 RATIONALE

Relationships between Archives and the Producers are rarely simple and easy. There are serious difficulties with the management of the Producer-Archive Interface in all the contexts which have been analyzed in preparation of this Recommendation (e.g., traditional Archives, libraries, Scientific Data Centers, business Archives).

These difficulties generally lead to an increased workload and may have negative consequences on the quality of the archived information. They can also have a negative effect on the relationship between the Archive and the Producer.

Potential problems include the following:

- the digital objects received do not conform to what the Archive expects;
- what the Producer delivers has not been clearly defined;
- the ingest schedule is not fulfilled by the Producer;
- errors in transfers are detected late by the Archive, or are not detected prior to use.

Within this context, the development of a standard methodology in this domain should aid in reducing these problems.

1.4 CONFORMANCE

This standard provides an abstract general methodology framework applicable to the interface between the Archive and the Producer. The aim is to first create a 'Submission Agreement', then transfer Submission Information Packages (SIPs) to the Archive, and finally to check these SIPs. In order for this standard to be easily applicable to a particular community, a specific standard or 'community standard' could be created in order to take into account all of the specific features of the community in question.

This community standard will be considered to conform to this abstract standard if:

- all of the actions have been considered and tailored as appropriate within the context of that community;
- the methodology for creating the community standard has addressed the various work phases defined in section 4, 'Creating a Producer-Archive Interface Methodology Community Standard from the Producer-Archive Interface Methodology Abstract Standard'.

In the case that this abstract standard is directly used by a Producer and an Archive within the framework of a certain Producer-Archive Project, the methodology applied will be deemed as conforming to the abstract standard if all of the actions have been considered and implemented as appropriate within the context of that project.

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1.5 DOCUMENT STRUCTURE

1.5.1 HOW TO READ THIS DOCUMENT

All readers should study subsections 1.1 (Purpose and Scope), 1.2 (Applicability) and 1.4 (Conformance) in order to understand the objectives and applicability of this Recommendation.

Readers seeking an overview of the methodology should also read section 2, 'An Overview of the Producer-Archive Interface Methodology'.

Those who will use the methodology should read the entire document.

NOTE – Working knowledge of the concepts and vocabulary defined in the OAIS Reference Model (reference [1]) is required in order to understand this Recommendation. Annex A contains a targeted overview of the OAIS Reference Model dedicated to the Methodology Abstract Standard.

1.5.2 ORGANIZATION BY SECTION

Section 1 defines the purpose, scope, applicability, rationale and definitions for terminology used in this Recommendation. It also specifies what is required for conformance to this standard.

Section 2 contains a general overview of the methodology, the players involved, their relationships and the activity phases that should be organized to manage the submission of information to an Archive for preservation and access.

Section 3 analyzes in detail each of the four phases defined in the methodology for all submissions. The phases are as follows:

- preliminary;
- formal definition;
- transfer;
- validation.

Section 4 describes the work stages that enable a methodological community standard to be created in conformance with this abstract standard.

The annexes listed here are not part of the this Recommendation and are provided for the convenience of the reader:

- Annex A contains a targeted overview of the OAIS Reference Model (reference [1]) dedicated to the Methodology Abstract Standard.
- Annex B contains the informative references.

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- Annex C provides a table showing the correspondence between the preliminary phase and the formal definition phase.

1.6 DEFINITIONS

1.6.1 ACRONYMS AND ABBREVIATIONS

AIP	Archival Information Package
ASCII	American Standard Code for Information Interchange
CCSDS	Consultative Committee for Space Data Systems
DED	Data Entity Dictionary
DEDSL	Data Entity Dictionary Specification Language (reference [2])
DIF	Directory Interchange Format
DTD	Document Type Definition
EAD	Encoded Archival Description
EAST	Enhanced Ada SubseT
FGDC	Federal Geographic Data Committee
IEEE	Institute of Electrical and Electronic Engineers
ICA	International Council on Archives
ISO	International Organization for Standardization
MARC	MAchine-Readable Cataloging
OAIS	Open Archival Information System
PDI	Preservation Description Information
PDF	Portable Document Format
PVL	Parameter Value Language
RM	Reference Model
SGML	Standard Generalized Markup Language

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SIP	Submission Information Package
TEI	Text Encoding Initiative
UML	Unified Modeling Language
XML	eXtensible Markup Language

1.6.2 TERMINOLOGY

Following is a short glossary of the OAIS terminology indispensable for this document. The terminology used is fully defined in reference [1], except the definitions printed in italics. Only brief definitions are provided here. This terminology does not seek to replace existing terminology in the various domains related to archiving. Each domain should be able to apply this methodology while retaining their specific terminology.

When first used in the text, the terms defined in the terminology are shown in bold.

Access: The OAIS entity that contains the services and functions which make the archival information holdings and related services visible to Consumers.

Archival Information Package (AIP): An Information Package, consisting of the Content Information and the associated Preservation Description Information (PDI), which is preserved within an OAIS.

Archive: An organization that intends to preserve information for access and use by a Designated Community.

Consumer: The role played by those persons, or client systems, who interact with OAIS services to find preserved information of interest and to access that information in detail. This can include other OAISs, as well as internal OAIS persons or systems.

Content Data Object: The Data Object, that together with associated Representation Information, is the original target of preservation.

Content Information: The set of information that is the primary target for preservation. It is an Information Object comprised of its Content Data Object and its Representation Information. An example of Content Information could be a single table of numbers representing, and understandable as, temperatures, but excluding the documentation that would explain its history and origin, how it relates to other observations, etc.

Data Dictionary: A formal repository of terms used to describe data.

Data Entity Dictionary (DED): *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 pertain to 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*

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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.

Data Object: Either a Physical Object or a Digital Object.

Data Submission Session: A delivered set of media or a single telecommunications session that provides data to an OAIS. The Data Submission Session format/contents is based on a data model negotiated between the OAIS and the Producer in the Submission Agreement. This data model identifies the logical constructs used by the Producer and how these are represented on each media delivery or in the telecommunication session.

EAST: *The EAST language is a CCSDS and ISO norm. EAST offers means to describe the syntax of a data file, including:*

- the fields in which it can be decomposed;*
- structure (simple or composite);*
- type (integer, real, enumerated, array, record, list);*
- range (min value, max value);*
- coding (ASCII, binary);*
- location (rank, length);*
- optionality (mandatory or not and, if not, presence condition);*
- eventually, variable dimension (for arrays).*

Fixity Information: The information which documents the authentication mechanisms and provides authentication keys to ensure that the Content Information Object has not been altered in an undocumented manner.

Information: Any type of knowledge that can be exchanged. In an exchange, it is represented by data. An example is a string of bits (the data) accompanied by a description of how to interpret a string of bits as numbers representing temperature observations measured in degrees Celsius (the Representation Information).

Information Object: A Data Object together with its Representation Information.

Ingest: The OAIS entity that contains the services and functions that accept Submission Information Packages from Producers, prepares Archival Information Packages for storage, and ensures that Archival Information Packages and their supporting Descriptive Information become established within the OAIS.

Meta-data: *Data about the content, the quality, condition and other characteristics of the data (from the FGDC Standards Reference Model, reference [3]).*

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Packaging Information: The information that is used to bind and identify the components of an Information Package. For example, it may be the ISO 9660 volume and directory information used on a CD-ROM to provide the content of several files containing Content Information and Preservation Description Information.

Preservation Description Information (PDI): The information which is necessary for adequate preservation of the Content Information and which can be categorized as Provenance, Reference, Fixity, and Context Information.

Producer: The role played by those persons or client systems who provide the information to be preserved. This can include other OAISs or internal OAIS persons or systems.

Producer-Archive Project: *A Producer-Archive Project is a set of activities and the means used by the information Producer as well as the Archive to ingest a given set of information into the Archive.*

Representation Information: The information that maps a Data Object into more meaningful concepts. An example is the ASCII definition that describes how a sequence of bits (i.e., a Data Object) is mapped into a symbol.

Submission Agreement: The agreement reached between an OAIS and the Producer that specifies a data model for the Data Submission Session. This data model identifies format/contents and the logical constructs used by the Producer and how they are represented on each media delivery or in a telecommunication session.

In the framework of this abstract methodology, the Submission Agreement will also deal with other aspects such as validation, change management and schedule.

Submission Information Package (SIP): An Information Package that is delivered by the Producer to the OAIS for use in the construction of one or more AIPs.

Transfer: *The act involved in a change of physical custody of SIPs.* This definition is derived from the International Council on Archives [ICA] Dictionary on Archival Terminology (reference [4]).

The terms '**class**', '**association**', and '**aggregation**' refer to UML terminology.

1.7 APPLICABLE REFERENCES

- [1] *Reference Model for an Open Archival Information System (OAIS)*. Recommendation for Space Data System Standards, CCSDS 650.0-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, January 2002. [Equivalent to ISO 14721:2003.]
- [2] *Data Entity Dictionary Specification Language (DEDSL)—Abstract Syntax (CCSD0011)*. Recommendation for Space Data System Standards, CCSDS 647.1-B-1. Blue Book. Issue 1. Washington, D.C.: CCSDS, June 2001. [Equivalent to ISO 21961:2002.]

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- [3] *FGDC Standards Reference Model*. Washington, DC: Federal Geographic Data Committee, March 1996. <http://www.fgdc.gov/standards/refmod97.pdf>
- [4] *Dictionary of Archival Terminology: English and French with Equivalents in Dutch, German, Italian, Russian, and Spanish*. International Council on Archives, Handbook No. 7. 2nd ed., 1988.
- [5] *Space Data and Information Transfer Systems—Standard Formatted Data Units—Structure and Construction Rules*, Recommendation for Space Data System Standards, CCSDS 620.0-B-2. Blue Book. Issue 2. Washington, D.C.: CCSDS, May 1992. [Equivalent to ISO 12175:1994.] (Note: You should ensure that this standard has the Technical Corrigendum - CCSDS 620.0-B-2 Cor. 1, November 1996 - applied.)

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2 AN OVERVIEW OF THE PRODUCER-ARCHIVE INTERFACE METHODOLOGY

2.1 THOSE INVOLVED AND THEIR RELATIONSHIPS

2.1.1 THE PRODUCER

In conformance with the definition given in the Reference Model, the term '**Producer**' designates the persons and systems which supply the **Archive** with **Information** to be preserved.

The term 'Producer' thus covers a wide variety of situations: the Producer can be an editor, a scientific team, a laboratory, a company department, a Ministry, an administrative body, a private individual, etc.

The Producer's activities can be multiple and varied and they may require the involvement of a whole group of people with different skills and professions.

For the purpose of this methodology, it is assumed that the Producer is represented by a single person who has the responsibility for all the activities related to a phase, and for each of the phases identified in this methodology.

The Producer has his own management. This management defines the objectives and responsibilities of the Producer's activity, and provides him with the necessary resources. This management may be different from or the same as the Producer. In this Recommendation, the Producer and the Producer's management are differentiated and considered to be two different functions even if they are assumed by the same person.

2.1.2 THE ARCHIVE

The Archive is an OAIS Archive. The main responsibility of an Archive is to preserve a set of information and to make this available in an intelligible and useable form to a defined Designated Community.

In that context, the term 'Information' is used as defined in subsection 1.6.2 of this document, as well as in subsection 2.2.1 of the OAIS Reference Model (reference [1]). The OAIS framework is summarized in annex A.

The responsibilities of the Archive (e.g., which information to archive and which Designated Community) are defined by the OAIS Management.

2.1.3 GENERAL FRAMEWORK OF PRODUCER-ARCHIVE RELATIONSHIPS

There are a wide range of relationships and context situations that can exist between a Producer and an OAIS Archive, and they include the following:

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- They can have the same management. This is the situation in a company, in which one department is entrusted to archive the information produced by the other departments.
- They can have different management, the **transfer** of data to be archived is, nonetheless, of an obligatory nature. This is the case for government Archives and Legal Deposit Libraries, whose tasks are defined by regulations or law.
- They can have a voluntary relationship when there is no obligation for the Producer to co-operate with the Archive. These Archives are called collecting Archives. Collecting Archives often specialize in one type of record such as labor union records, business records, commercial broadcasting records, or immigration records.
- They can have a contractual relationship. This is the case for ‘commercial Archives’, i.e., companies specializing in archiving and who ensure the preservation of information for other companies.

In some cases there is no relationship established between the Archive and the Producer, e.g., this is the case when an institutional library is entrusted to archive all electronic publications (CD-ROM) and, due to the great number of editors or to their non co-operation, there is no relationship—and thus no negotiation—between the Producer and the Archive. In this case, the library could decide to create a department, within its own structure, to collect electronic publications to be archived and prepare the SIPs. This department plays the role of a Producer with respect to the Archive department.

2.1.4 NEGOTIATION FOR AN AGREEMENT

The conditions under which negotiation takes place between the Producer and the Archive depend on the nature of the relationship between the Producer and the Archive and whether the archiving is mandatory or not.

This negotiation can be of an iterative nature. Negotiations should result in a ‘**Submission Agreement**’. This agreement precisely and thoroughly defines the different **Data Objects** which are to be transmitted to the Archive, the means used to transfer this data, the transfer schedule, etc.

In the absence of a relationship between the Producer and the Archive, as discussed previously, there is no negotiation with the actual Producer. For example, the Archive may collect information from various Web sites. In essence the Archive establishes a virtual Submission Agreement with the actual Producer without any negotiation beyond that involved in conformance to Web protocols. Virtual Submission Agreement is understood in the sense defined in subsection 2.3.2 reference [1].

Whatever the Archive/Producer relationships may be, experience shows that negotiations are easier when they are initiated very early on in the information creation process. It is always easier to agree on a data format before, rather than after, data are produced.