INTERNATIONAL STANDARD

ISO 20107

First edition
2015-08-15

Space data and information transfer systems — Spacecraft onboard interface services — Device virtualization service

Systèmes de transfert des informations et données spatiales — Services d'interfaces à bord des véhicules spatiaux — Service de virtualisation des périphériques

Reference number
ISO 20107:2015(E)

© ISO 2015



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 20107 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 871.2-M-1, March 2014) 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*.

© ISO 2015 – All rights reserved

The Consultative Committee for Space Data Systems

Recommendation for Space Data System Practices

SPACECRAFT ONBOARD INTERFACE SERVICES—DEVICE VIRTUALIZATION SERVICE

RECOMMENDED PRACTICE

CCSDS 871.2-M-1

MAGENTA BOOK

March 2014

AUTHORITY

Issue:	Magenta Book, Issue 1
Date:	March 2014
Location:	Washington, DC, USA

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 documents is detailed in *Organization and Processes for the Consultative Committee for Space Data Systems*, and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

This document is published and maintained by:

CCSDS Secretariat
Space Communications and Navigation Office, 7L70
Space Operations Mission Directorate
NASA Headquarters
Washington, DC 20546-0001, USA

© ISO 2015 – All rights reserved

STATEMENT OF INTENT

The Consultative Committee for Space Data Systems (CCSDS) is an organization officially established by the management of its members. 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 in themselves considered binding on any Agency.

CCSDS Recommendations take two forms: **Recommended Standards** that are prescriptive and are the formal vehicles by which CCSDS Agencies create the standards that specify how elements of their space mission support infrastructure shall operate and interoperate with others; and **Recommended Practices** that are more descriptive in nature and are intended to provide general guidance about how to approach a particular problem associated with space mission support. This **Recommended Practice** is issued by, and represents the consensus of, the CCSDS members. Endorsement of this **Recommended Practice** is entirely voluntary and does not imply a commitment by any Agency or organization to implement its recommendations in a prescriptive sense.

No later than three years from its date of issuance, this **Recommended Practice** 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 **Recommended Practice** is issued, existing CCSDS-related member Practices and implementations are not negated or deemed to be non-CCSDS compatible. It is the responsibility of each member to determine when such Practices or implementations are to be modified. Each member is, however, strongly encouraged to direct planning for its new Practices and implementations towards the later version of the Recommended Practice.

© ISO 2015 – All rights reserved

FOREWORD

This document is a technical Recommended Practice for use in developing flight and ground systems for space missions and has been prepared by the Consultative Committee for Space Data Systems (CCSDS). The Device Virtualisation Service described herein is intended for missions that are cross-supported between Agencies of the CCSDS, in the framework of the Spacecraft Onboard Interface Services (SOIS) CCSDS area.

This Recommended Practice specifies a set of related services to be used by space missions to access and manage files and packets within a spacecraft subnetwork. The Device Virtualisation Service provides a common service interface regardless of the particular type of data link or protocol being used for communication.

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Practice is therefore subject to CCSDS document management and change control procedures, which are defined in the *Organization and Processes for the Consultative Committee for Space Data Systems* (CCSDS A02.1-Y-3). 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 document should be addressed to the CCSDS Secretariat at the address indicated on page i.

© ISO 2015 – All rights reserved

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

Member Agencies

- Agenzia Spaziale Italiana (ASI)/Italy.
- Canadian Space Agency (CSA)/Canada.
- Centre National d'Etudes Spatiales (CNES)/France.
- China National Space Administration (CNSA)/People's Republic of China.
- Deutsches Zentrum für Luft- und Raumfahrt (DLR)/Germany.
- European Space Agency (ESA)/Europe.
- Federal Space Agency (FSA)/Russian Federation.
- Instituto Nacional de Pesquisas Espaciais (INPE)/Brazil.
- Japan Aerospace Exploration Agency (JAXA)/Japan.
- National Aeronautics and Space Administration (NASA)/USA.
- UK Space Agency/United Kingdom.

Observer Agencies

- Austrian Space Agency (ASA)/Austria.
- Belgian Federal Science Policy Office (BFSPO)/Belgium.
- Central Research Institute of Machine Building (TsNIIMash)/Russian Federation.
- China Satellite Launch and Tracking Control General, Beijing Institute of Tracking and Telecommunications Technology (CLTC/BITTT)/China.
- Chinese Academy of Sciences (CAS)/China.
- Chinese Academy of Space Technology (CAST)/China.
- Commonwealth Scientific and Industrial Research Organization (CSIRO)/Australia.
- Danish National Space Center (DNSC)/Denmark.
- Departamento de Ciência e Tecnologia Aeroespacial (DCTA)/Brazil.
- European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)/Europe.
- European Telecommunications Satellite Organization (EUTELSAT)/Europe.
- Geo-Informatics and Space Technology Development Agency (GISTDA)/Thailand.
- Hellenic National Space Committee (HNSC)/Greece.
- Indian Space Research Organization (ISRO)/India.
- Institute of Space Research (IKI)/Russian Federation.
- KFKI Research Institute for Particle & Nuclear Physics (KFKI)/Hungary.
- Korea Aerospace Research Institute (KARI)/Korea.
- Ministry of Communications (MOC)/Israel.
- National Institute of Information and Communications Technology (NICT)/Japan.
- National Oceanic and Atmospheric Administration (NOAA)/USA.
- National Space Agency of the Republic of Kazakhstan (NSARK)/Kazakhstan.
- National Space Organization (NSPO)/Chinese Taipei.
- Naval Center for Space Technology (NCST)/USA.
- Scientific and Technological Research Council of Turkey (TUBITAK)/Turkey.
- South African National Space Agency (SANSA)/Republic of South Africa.
- Space and Upper Atmosphere Research Commission (SUPARCO)/Pakistan.
- Swedish Space Corporation (SSC)/Sweden.
- Swiss Space Office (SSO)/Switzerland.
- United States Geological Survey (USGS)/USA.

© ISO 2015 – All rights reserved

DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 871.2-M-1	Spacecraft Onboard Interface Services—Device Virtualization Service, Recommended Practice, Issue 1	March 2014	Original issue

© ISO 2015 – All rights reserved

CONTENTS

Section Page

1 INTRODUCTION 1-1

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT 1-1
1.2 APPLICABILITY 1-1
1.3 RATIONALE 1-1
1.4 DOCUMENT STRUCTURE 1-1
1.5 CONVENTIONS AND DEFINITIONS 1-2
1.6 NOMENCLATURE 1-3
1.7 REFERENCES 1-3

2 OVERVIEW 2-1

2.1 CONTEXT 2-1
2.2 DEVICE TYPES AND FUNCTIONAL INTERFACES 2-2
2.3 PURPOSE AND OPERATION OF THE DEVICE VIRTUALISATION SERVICE 2-4

3 SERVICE DEFINITION 3-1

3.1 PROVIDED SERVICE 3-1
3.2 EXPECTED SERVICES FROM UNDERLYING LAYERS 3-1
3.3 SERVICE PARAMETERS 3-2
3.4 DEVICE VIRTUALISATION SERVICE PRIMITIVES 3-3

4 MANAGEMENT INFORMATION BASE 4-1

4.1 OVERVIEW 4-1
4.2 SPECIFICATIONS 4-1
4.3 MIB GUIDANCE 4-1
4.4 DEVICE AND VALUE IDENTIFIER RESOLUTION TABLE 4-1

ANNEX A DEVICE VIRTUALIZATION SERVICE PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT PROFORMA (NORMATIVE) A-1
ANNEX B SECURITY CONSIDERATIONS (INFORMATIVE) B-1
ANNEX C ACRONYMS (INFORMATIVE) C-1
ANNEX D INFORMATIVE REFERENCES (INFORMATIVE) D-1

Figure

2-1 Command and Data Acquisition Services Context 2-1
2-2 Relationship between Command and Data Acquisition Services 2-2

© ISO 2015 – All rights reserved

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document is one of a family of documents specifying the Spacecraft Onboard Interface Services (SOIS)-compliant service to be provided in support of applications.

This document defines the SOIS Device Virtualisation Service (DVS). The definition encompasses specification of the service interface exposed to onboard software (user applications and libraries) as well as the conceptual mapping of the DVS primitives to the protocols implementing such services.

The SOIS DVS is for use by onboard software to provide a standard interface between onboard software applications and flight hardware such as sensors and actuators.

1.2 APPLICABILITY

This document applies to any mission or equipment claiming to provide a CCSDS SOIS-compatible DVS.

1.3 RATIONALE

SOIS provide service interface specifications in order to promote commonality of functionality amongst systems implementing well-defined services. These interfaces do not dictate implementation of interfaces or protocols supporting the services.

1.4 DOCUMENT STRUCTURE

This document has four major sections:

- this section, containing administrative information, definitions, and references;
- section 2, containing general concepts and assumptions;
- section 3, containing the Device Virtualisation Service, in terms of the service provided, services expected from underlying layers, and the service interface;
- section 4, containing the Management Information Base (MIB) for this service.

In addition, one normative and three informative annexes are provided:

- annex A, comprising a Protocol Implementation Conformance Statement Proforma;
- annex B, discussing security considerations relating to the specifications of this document;
- annex C, containing a list of acronyms;
- annex D, containing a list of informative references.

© ISO 2015 – All rights reserved

1.5 CONVENTIONS AND DEFINITIONS

1.5.1 DEFINITIONS

1.5.1.1 General

For the purpose of this document the following definitions apply.

1.5.1.2 Definitions from the Open Systems Interconnection (OSI) Basic Reference Model

This document is defined using the style established by the Open Systems Interconnection (OSI) Basic Reference Model (reference [D2]). This model provides a common framework for the development of standards in the field of systems interconnection.

The following terms used in this Recommended Practice are adapted from definitions given in reference [D2]:

layer: Subdivision of the architecture, constituted by subsystems of the same rank.

service: Capability of a layer, and the layers beneath it (service providers), provided to the service users at the boundary between the service providers and the service users.

1.5.2 TERMS DEFINED IN THIS RECOMMENDED PRACTICE

For the purposes of this Recommended Practice, the following definitions also apply.

application: Any component of the onboard software that makes use of the Device Virtualisation Service. This includes flight software applications and higher-layer services.

NOTE – Such components include flight software applications and higher-layer services.

device: Real hardware component of the spacecraft or a single register within such a component.

NOTE – Examples of such components are sensors and actuators.

timestamp: Time associated with a value.

NOTES

1 The format of a timestamp is implementation-specific.

2 The timestamp may indicate the time the value was generated by the device, emitted by the device or acquired by the service. This is implementation-specific.

value: Formatted atomic unit of data that is acquired from or used as a command to a device.

© ISO 2015 – All rights reserved