INTERNATIONAL STANDARD

**ISO 20105**

First edition
2015-08-15

# Space data and information transfer systems — Operation of CFDP over encapsulation service

*Systèmes de transfert des informations et données spatiales — Exploitation du CFDP lors des services d'encapsulation*

Reference number
ISO 20105:2015(E)

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The Consultative Committee for Space Data Systems

**Recommendation for Space Data System Practices**

# OPERATION OF CFDP OVER ENCAPSULATION SERVICE

**RECOMMENDED PRACTICE**

**CCSDS 722.1-M-1**

**MAGENTA BOOK**

**March 2014**

# AUTHORITY

| | |
|---|---|
| Issue: | Recommended Practice, 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* (CCSDS A02.1-Y-3), 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


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# 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 **Recommended Practice** described herein is intended for missions that are cross-supported between Agencies of the CCSDS.

This **Recommended Practice** specifies methods for operating the CCSDS File Delivery Protocol (CFDP) over the CCSDS Encapsulation Service.

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:

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# DOCUMENT CONTROL

| Document | Title | Date | Status |
|---|---|---|---|
| CCSDS 722.1-M-1 | Operation of CFDP over Encapsulation Service, Recommended Practice, Issue 1 | March 2014 | Original issue |


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# 1 INTRODUCTION

## 1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

The CCSDS File Delivery Protocol (CFDP—reference [1]) has been designed to support the transfer of files in a variety of mission scenarios. CFDP offers different qualities of service ranging from best effort to fully reliable and has been specifically optimized for long delay, noisy, and disjoint links. CFDP requires a simple minimum service from the underlying protocols, operating over any link providing a packet communication service.

The purpose of this document is to specify how to operate CFDP over the CCSDS Encapsulation Service (reference [2]) as provided for Earth-to-spacecraft, spacecraft-to-Earth, and spacecraft-to-spacecraft communications. It sets out the communications architecture for CFDP operating over the Encapsulation Service. It describes the service expected by CFDP of the underlying layers and reconciles this with the service provided by the Encapsulation Service.

## 1.2 APPLICABILITY

This document applies to any mission or equipment claiming to provide a CCSDS-compliant CFDP capability between two endpoints operating over a single CCSDS space link.

## 1.3 RATIONALE

This document is needed to clarify how CFDP should be used with the CCSDS Encapsulation Service.

## 1.4 DOCUMENT STRUCTURE

The document has three major sections and four annexes:

- this section, containing administrative information, definitions, and references;
- section 2, describing the communications architecture of CFDP operating over an underlying transport protocol;
- section 3, reconciling the service required of the underlying layer by CFDP with the service provided by the underlying Encapsulation Service;
- annex A, listing informative references;
- annex B, discussing the operation of CFDP over long-haul and planetary CCSDS space links;
- annex C, discussing options for deployment into ground station networks;
- annex D, expanding abbreviations used in the document.


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## 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 [A1]). 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 [A1]**:**

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

**protocol data unit**: Unit of data specified in a protocol and consisting of protocol-control information and possibly user data.

**protocol ID**: Identifier that specifies the layer-(*N+1*) protocol (type of service data unit) encapsulated within a protocol data unit at layer *N*.

**service**: Capability of a layer (service provider) together with the layers beneath it, provided to the service users.

**service data unit, SDU**: Set of data that is sent by a user of the services of a given layer and is transmitted to a peer service user semantically unchanged.

#### 1.5.1.3 Definitions of Terms as Used in this Recommended Practice

**packet**: Delimited, octet-aligned data unit.

## 1.6 NOMENCLATURE

### 1.6.1 NORMATIVE TEXT

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

a) the words ‘shall’ and ‘must’ imply a binding and verifiable specification;

b) the word ‘should’ implies an optional, but desirable, specification;

c) the word ‘may’ implies an optional specification;


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