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Space data and information transfer systems — CCSDS cryptographic algorithms

Systèmes de transfert des informations et données spatiales — Algorithmes cryptographiques CCSDS

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Foreword

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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 20215 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 352.0-B-1, November 2012) 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*.

The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

CCSDS CRYPTOGRAPHIC ALGORITHMS

RECOMMENDED STANDARD

CCSDS 352.0-B-1

BLUE BOOK

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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 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:

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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 **Recommended Standards** and are not considered binding on any Agency.

This **Recommended Standard** is issued by, and represents the consensus of, the CCSDS members. Endorsement of this **Recommendation** is entirely voluntary. Endorsement, however, indicates the following understandings:

- Whenever a member establishes a CCSDS-related **standard**, this **standard** will be in accord with the relevant **Recommended Standard**. Establishing such a **standard** does not preclude other provisions which a member may develop.
- Whenever a member establishes a CCSDS-related **standard**, that member will provide other CCSDS members with the following information:
  - -- The **standard** itself.
  - -- The anticipated date of initial operational capability.
  - -- The anticipated duration of operational service.
- Specific service arrangements shall be made via memoranda of agreement. Neither this **Recommended Standard** nor any ensuing **standard** is a substitute for a memorandum of agreement.

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

FOREWORD

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

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Standard is therefore subject to CCSDS document management and change control procedures, which are defined in *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.

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

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- Canadian Space Agency (CSA)/Canada.
- Centre National d'Etudes Spatiales (CNES)/France.
- China National Space Administration (CNSA)/People's Republic of China.
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- Austrian Space Agency (ASA)/Austria.
- Belgian Federal Science Policy Office (BFSPO)/Belgium.
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DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 352.0-B-1	CCSDS Cryptographic Algorithms, Recommended Standard, Issue 1	November 2012	Original issue

CONTENTS

1 INTRODUCTION

1.1 PURPOSE OF THIS RECOMMENDED STANDARD

This Recommended Standard provides the recommendation for standard CCSDS security algorithms.

A single, symmetric encryption algorithm is recommended for use by all CCSDS missions. In addition, a specific mode of operation for the algorithm is also recommended.

This Recommended Standard provides several alternative authentication/integrity algorithms which may be chosen for use by individual missions depending on their specific mission environments.

This Recommended Standard does not specify how, when, or where these algorithms should be implemented or used. Those specifics are left to the individual mission planners based on the mission security requirements and the results of the mission risk analysis. Suggestions for the use of these algorithms may be found in *The Application of CCSDS Protocols to Secure Systems* (reference [B1]), *Security Architecture for Space Data Systems* (reference [B17]), and *Space Data Link Security Protocol* (reference [B23]).

By using standardized, well-known algorithms, the use of high-quality cryptography and authentication is ensured, the potential rewards of economies of scale through the ability to buy off-the-shelf products is enabled, and the potential for interoperability among missions choosing the same algorithm is assured.

The implementer shall take into account that the use of this Recommended Standard alone does not mitigate all security risks related to confidentiality, integrity, and authentication. An information security risk assessment is necessary to identify additional security risks.

1.2 SCOPE

The algorithms contained in this document are recommended for use on space missions with a requirement for information (e.g., data, voice, and video) confidentiality, authentication, or authenticated confidentiality. The algorithms may be employed on any or all mission communications links such as the forward space link (e.g., telecommand), the return space link (e.g., telemetry, science data), as well as across the ground data network. They could as well be used to ensure confidentiality and authenticity of stored data.

A symmetric algorithm assumes that all communicating entities possess a shared secret (i.e., a ‘key’) which enables them to encrypt, decrypt, and authenticate information shared among them. The manner in which the shared secret is distributed and managed (key management) is not within the scope of this document. Further information on key management can be found in *Space Missions Key Management Concept* (reference [B22]).