INTERNATIONAL STANDARD

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Information technology — ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)

Technologies de l'information — Règles de codage ASN.1: Spécification des règles de codage de base (BER), des règles de codage canoniques (CER) et des règles de codage distinctives (DER)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national 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 and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 8825-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*, in collaboration with ITU-T. The identical text is published as Rec. ITU-T X.690 (11/2008).

This fourth edition cancels and replaces the third edition (ISO/IEC 8825-1:2002), which has been technically revised. It also incorporates the Amendments ISO/IEC 8825-1:2002/Amd.1:2004 and ISO/IEC 8825-1:2002/Amd.2:2007, and the Technical Corrigendum ISO/IEC 8825-1:2002/Cor.1:2007.

ISO/IEC 8825 consists of the following parts, under the general title *Information technology — ASN.1 encoding rules*:

— *Part 1: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

— *Part 2: Specification of Packed Encoding Rules (PER)*

— *Part 3: Specification of Encoding Control Notation (ECN)*

— *Part 4: XML Encoding Rules (XER)*

— *Part 5: Mapping W3C XML schema definitions into ASN.1*

— *Part 6: Registration and application of PER encoding instructions*

Introduction

ITU-T Rec. X.680 | ISO/IEC 8824-1, ITU-T Rec. X.681 | ISO/IEC 8824-2, ITU-T Rec. X.682 | ISO/IEC 8824-3, ITU-T Rec. X.683 | ISO/IEC 8824-4 (Abstract Syntax Notation One or ASN.1) together specify a notation for the definition of abstract syntaxes, enabling application standards to define the types of information they need to transfer. It also specifies a notation for the specification of values of a defined type.

This Recommendation | International Standard defines encoding rules that may be applied to values of types defined using the ASN.1 notation. Application of these encoding rules produces a transfer syntax for such values. It is implicit in the specification of these encoding rules that they are also to be used for decoding.

There may be more than one set of encoding rules that can be applied to values of types that are defined using the ASN.1 notation. This Recommendation | International Standard defines three sets of encoding rules, called *basic encoding rules*, *canonical encoding rules* and *distinguished encoding rules*. Whereas the basic encoding rules give the sender of an encoding various choices as to how data values may be encoded, the canonical and distinguished encoding rules select just one encoding from those allowed by the basic encoding rules, eliminating all of the sender's options. The canonical and distinguished encoding rules differ from each other in the set of restrictions that they place on the basic encoding rules.

The distinguished encoding rules is more suitable than the canonical encoding rules if the encoded value is small enough to fit into the available memory and there is a need to rapidly skip over some nested values. The canonical encoding rules is more suitable than the distinguished encoding rules if there is a need to encode values that are so large that they cannot readily fit into the available memory or it is necessary to encode and transmit a part of a value before the entire value is available. The basic encoding rules is more suitable than the canonical or distinguished encoding rules if the encoding contains a set value or set-of value and there is no need for the restrictions that the canonical and distinguished encoding rules impose. This is due to the memory and CPU overhead that the latter encoding rules exact in order to guarantee that set values and set-of values have just one possible encoding.

Annex A gives an example of the application of the basic encoding rules. It does not form an integral part of this Recommendation | International Standard.

Annex B summarizes the assignment of object identifier and OID internationalized resource identifier values made in this Recommendation | International Standard. It does not form an integral part of this Recommendation | International Standard.

Annex C gives examples of applying the basic encoding rules for encoding reals. It does not form an integral part of this Recommendation | International Standard.

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ITU-T RECOMMENDATION

Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)

1 Scope

This Recommendation | International Standard specifies a set of basic encoding rules that may be used to derive the specification of a transfer syntax for values of types defined using the notation specified in ITU-T Rec. X.680 | ISO/IEC 8824-1, ITU-T Rec. X.681 | ISO/IEC 8824-2, ITU-T Rec. X.682 | ISO/IEC 8824-3, and ITU-T Rec. X.683 | ISO/IEC 8824-4, collectively referred to as Abstract Syntax Notation One or ASN.1. These basic encoding rules are also to be applied for decoding such a transfer syntax in order to identify the data values being transferred. It also specifies a set of canonical and distinguished encoding rules that restrict the encoding of values to just one of the alternatives provided by the basic encoding rules.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

– ITU-T Recommendation X.680 (2008) | ISO/IEC 8824-1:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

– ITU-T Recommendation X.681 (2008) | ISO/IEC 8824-2:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*

– ITU-T Recommendation X.682 (2008) | ISO/IEC 8824-3:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification.*

– ITU-T Recommendation X.683 (2008) | ISO/IEC 8824-4:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.*

2.2 Additional references

– ISO *International Register of Coded Character Sets to be used with Escape Sequences.*

– ISO/IEC 2022:1994, *Information technology – Character code structure and extension techniques.*

– ISO/IEC 2375:2003, *Information technology – Procedure for registration of escape sequences and coded character sets.*

– ISO 6093:1985, *Information processing – Representation of numerical values in character strings for information interchange.*

– ISO/IEC 6429:1992, *Information technology – Control functions for coded character sets.*

– ISO/IEC 10646:2003, *Information technology – Universal Multiple-Octet Coded Character Set (UCS).*