Information technology — ASN.1 encoding rules: XML Encoding Rules (XER)

Technologies de l'information — Règles de codage ASN.1: Règles de codage en XML (XER)
## CONTENTS

1. Scope .............................................................................................................................................................. 1
2. Normative references ....................................................................................................................................... 1
   2.1 Identical Recommendations | International Standards ................................................................. 1
   2.2 Additional references ............................................................................................................................ 1
3. Definitions .......................................................................................................................................................... 2
   3.1 Basic Encoding Rules .......................................................................................................................... 2
   3.2 Additional definitions ............................................................................................................................ 2
4. Abbreviations ................................................................................................................................................... 2
5. Notation ............................................................................................................................................................ 3
6. Encodings specified by this Recommendation | International Standard ..................................................... 3
7. Conformance .................................................................................................................................................... 3
8. Basic XML encoding rules ............................................................................................................................. 3
   8.1 Production of a complete XER encoding ............................................................................................ 3
   8.2 The XML prolog ................................................................................................................................... 4
   8.3 The XML document element .............................................................................................................. 4
   8.4 Encoding of the EXTERNAL type ..................................................................................................... 4
9. Canonical XML encoding rules ...................................................................................................................... 4
   9.1 General rules for canonical XML encodings ....................................................................................... 5
   9.2 Real values ........................................................................................................................................... 5
   9.3 Bitstring value ...................................................................................................................................... 5
   9.4 Octetstring value ................................................................................................................................. 5
   9.5 Sequence value ................................................................................................................................... 5
   9.6 Set value .............................................................................................................................................. 5
   9.7 Set-of value ......................................................................................................................................... 6
   9.8 Object identifier value ......................................................................................................................... 6
   9.9 Relative object identifier value .......................................................................................................... 6
   9.10 GeneralizedTime ............................................................................................................................. 6
   9.11 UTCTime ............................................................................................................................................ 6
10. Object identifier values referencing the encoding rules ............................................................................. 7
Annex A – Example of encodings .................................................................................................................... 8
    A.1 – ASN.1 description of the record structure ...................................................................................... 8
    A.2 – ASN.1 description of a record value .................................................................................................. 8
    A.3 – Basic XML representation of this record value ............................................................................. 8
    A.4 – Canonical XML representation of this record value ..................................................................... 9
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 8825-4 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 ITU-T Rec. X.693.

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
Introduction


This Recommendation | International Standard defines encoding rules that may be applied to values of ASN.1 types defined using the notation specified in ITU-T Rec. X.680 | ISO/IEC 8824-1 and ITU-T Rec. X.681 | ISO/IEC 8824-2. 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 is more than one set of encoding rules that can be applied to values of ASN.1 types. This Recommendation | International Standard defines two sets of encoding rules that use the Extensible Markup Language (XML). These are called the XML Encoding Rules (XER) for ASN.1, and both produce an XML document compliant to W3C XML 1.0. The first set is called the Basic XML Encoding Rules. The second set is called the Canonical XML Encoding Rules because there is only one way of encoding an ASN.1 value using these encoding rules. (Canonical encoding rules are generally used for applications using security-related features such as digital signatures.)
1 Scope

This Recommendation | International Standard specifies a set of Basic XML Encoding Rules (XER) that may be used to derive a transfer syntax for values of types defined in ITU-T Rec. X.680 | ISO/IEC 8824-1 and ITU-T Rec. X.681 | ISO/IEC 8824-2. This Recommendation | International Standard also specifies a set of Canonical XML Encoding Rules which provide constraints on the Basic XML Encoding Rules and produce a unique encoding for any given ASN.1 value. It is implicit in the specification of these encoding rules that they are also used for decoding.

The encoding rules specified in this Recommendation | International Standard:
- are used at the time of communication;
- are intended for use in circumstances where displaying of values and/or processing them using commonly available XML tools (such as browsers) is the major concern in the choice of encoding rules;
- allow the extension of an abstract syntax by addition of extra values for all forms of extensibility described in ITU-T Rec. X.680 | ISO/IEC 8824-1.

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

2.2 Additional references
Definitions

For the purposes of this Recommendation | International Standard, the following definitions apply.

3.1 Basic Encoding Rules

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.690 | ISO/IEC 8825-1:

a) data value;
b) dynamic conformance;
c) encoding (of a data value);
d) receiver;
e) sender;
f) static conformance.

3.2 Additional definitions

For the purposes of this Recommendation | International Standard, the following definitions apply.

3.2.1 ASN.1 schema

The definition of the content and structure of data using an ASN.1 type definition.

NOTE – This enables encoding rules to produce binary encodings of the values of an ASN.1 type, or encodings using XML.

3.2.2 canonical encoding

A complete encoding of an abstract value obtained by the application of encoding rules that have no implementation-dependent options. Such rules result in the definition of a 1-1 mapping between unambiguous and unique encodings and values in the abstract syntax.

3.2.3 valid XML document (for an ASN.1 schema)

An XML document which is well-formed (see W3C XML 1.0) and whose content conforms to the XER specification for the encoding of the ASN.1 type specified by an ASN.1 schema.

3.2.4 XML document

A sequence of characters which conforms to W3C XML 1.0 definition of document.

4 Abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

- ASN.1 Abstract Syntax Notation One
- PDU Protocol Data Unit
- UCS Universal Multiple-Octet Coded Character Set
- UTC Coordinated Universal Time
- UTF-8 UCS Transformation Format, 8-bit form
- XML Extensible Markup Language
- XER XML Encoding Rules

NOTE – The reference to a document within this Recommendation | International Standard does not give it, as a stand-alone document, the status of a Recommendation or International Standard.