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

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

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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.

This third edition cancels and replaces the second edition of ISO/IEC 8825-4:2008 which has been technically revised. It also incorporates ISO/IEC 8825-4:2008/Cor.1:2012 and ISO/IEC 8825-4:2008/Cor.2:2014.

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International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
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SERIES X: DATA NETWORKS, OPEN SYSTEM COMMUNICATIONS AND SECURITY

OSI networking and system aspects – Abstract Syntax Notation One (ASN.1)

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

Recommendation ITU-T X.693

International Telecommunication Union

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INTERNATIONAL STANDARD ISO/IEC 8825-4
RECOMMENDATION ITU-T X.693

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

Summary

Recommendation ITU-T X.693 | ISO/IEC 8825-4 specifies rules for encoding values of ASN.1 types using the Extensible Markup Language (XML).

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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1.2	ITU-T X.693 (2001) Amd. 2	2006-06-13	17	11.1002/1000/8841
1.3	ITU-T X.693 (2001) Amd. 3	2007-05-29	17	11.1002/1000/9110
2.0	ITU-T X.693	2008-11-13	17	11.1002/1000/9611
2.1	ITU-T X.693 (2008) Cor. 1	2011-10-14	17	11.1002/1000/11381
2.2	ITU-T X.693 (2008) Cor. 2	2014-03-01	17	11.1002/1000/12148
3.0	ITU-T X.693	2015-08-13	17	11.1002/1000/12489

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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1 Introduction

Rec. ITU-T X.680 | ISO/IEC 8824-1, Rec. ITU-T X.681 | ISO/IEC 8824-2, Rec. ITU-T X.682 | ISO/IEC 8824-3, Rec. ITU-T X.683 | ISO/IEC 8824-4 together describe Abstract Syntax Notation One (ASN.1), a notation for the definition of messages to be exchanged between peer applications.

This Recommendation | International Standard defines encoding rules that may be applied to values of ASN.1 types defined using the notation specified in Rec. ITU-T X.680 | ISO/IEC 8824-1 and Rec. ITU-T 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 three sets of encoding rules that use the Extensible Markup Language (XML). These encoding rules all produce an XML document compliant to W3C XML 1.0. The first set is called the Basic XML Encoding Rules (BASIC-XER). The second set is called the Canonical XML Encoding Rules (CANONICAL-XER, or CXER) 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.) The third set is called the extended XML Encoding Rules (EXTENDED-XER). The extended XML Encoding Rules allow additional encoders options, and take account of encoding instructions that specify variations of the BASIC-XER encodings in order to support specific styles of XML documents (see below). The extended XML Encoding Rules are not canonical, and there is no canonical form for these rules defined in this Recommendation | International Standard.

There are many aspects of an XML representation of data (such as the use of XML attributes instead of child elements, or the use of white-space delimited lists) whose use is a matter of style and XML designer choice. If a type defined in an ASN.1 specification is encoded by BASIC-XER or by CXER, then there is a single fixed style used for the XML representation, with no user control of stylistic features. This Recommendation | International Standard specifies the syntax and semantics of XER encoding instructions which specify the stylistic features of the XML in an EXTENDED-XER encoding. XER encoding instructions can also be used to determine the possible insertion of XML processing instructions in an EXTENDED-XER encoding. XER encoding instructions are ignored by BASIC-XER and by CXER, but are used by EXTENDED-XER.

NOTE – "Stylistic features", such as use of attributes or white-space delimited lists, can also affect the size of an encoding and the ease with which it can be processed, so use of such features is not just a matter of style. Where such issues are important, EXTENDED-XER with encoding instructions may be preferred over BASIC-XER or CXER.

Clause 8 specifies the BASIC-XER encoding of ASN.1 types.

Clause 9 specifies the CXER encoding of ASN.1 types.

Clause 10 specifies the EXTENDED-XER encoding of ASN.1 types, referencing later clauses which define the XER encoding instructions.

Clauses 11 to 14 list and categorize the XER encoding instructions and specify the syntax for their assignment to an ASN.1 type or component using either an XER type prefix (see Rec. ITU-T X.680 | ISO/IEC 8824-1, 31.3) or an XER encoding control section (see Rec. ITU-T X.680 | ISO/IEC 8824-1, clause 54).

Clause 15 defines the order of precedence if XER encoding instructions are present in both an XER type prefix and in an XER encoding control section.

Clause 16 specifies the XER encoding instruction support for XML namespaces when using EXTENDED-XER.

Clause 17 specifies EXTENDED-XER encodings.

Clauses 18 to 39 specify:

a) the syntax of each XER encoding instruction used in a type prefix or an XER encoding control section;

b) restrictions on the XER encoding instructions that can be associated with a particular ASN.1 type (resulting from inheritance and multiple assignments);

c) modifications to the XER encoding rules that are required in an EXTENDED-XER encoding when an XER encoding instruction is applied.

Annex A is informative and contains examples of BASIC-XER and CXER encodings.

Annex B is informative and contains a description of the partial XML content that is produced when constructions such as sequence and sequence-of have their surrounding tags removed, together with restrictions on EXTENDED-XER specifications that enable easy determination of the ASN.1 component that an XML element is associated with.

Annex C is informative and contains examples of XER encoding instructions and of the corresponding EXTENDED-XER encodings.