INTERNATIONAL STANDARD

ISO/IEC 8824-3

Information technology — Abstract Syntax Notation One (ASN.1): Constraint specification

Technologies de l'information — Notation de syntaxe abstraite numéro un (ASN.1): Spécification des contraintes

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 fifth edition cancels and replaces the fourth edition of ISO/IEC 8824-3:2008 which has been technically revised. It also incorporates ISO/IEC 8824-3:2008/Cor.1:2014.

ISO/IEC 8824-3 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 X.682 (08/2015).

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

X.682
(08/2015)

SERIES X: DATA NETWORKS, OPEN SYSTEM COMMUNICATIONS AND SECURITY

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

Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification

Recommendation ITU-T X.682

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For further details, please refer to the list of ITU-T Recommendations.

INTERNATIONAL STANDARD ISO/IEC 8824-3
RECOMMENDATION ITU-T X.682

Information technology – Abstract Syntax Notation One (ASN.1):
Constraint specification

Summary

Recommendation ITU-T X.682 | ISO/IEC 8824-3 provides the ASN.1 notation for the general case of constraint and exception specification by which the data values of a structured data type can be limited. The notation also provides for signalling if and when a constraint is violated.

History

Edition	Recommendation	Approval	Study Group	Unique ID[*]
1.0	ITU-T X.682	1994-07-01	7	11.1002/1000/3044
2.0	ITU-T X.682	1997-12-12	7	11.1002/1000/4445
2.1	ITU-T X.682 (1997) Technical Cor. 1	2000-03-31	7	11.1002/1000/5047
2.2	ITU-T X.682 (1997) Technical Cor. 2	2001-02-02	7	11.1002/1000/5334
2.3	ITU-T X.682 (1997) Technical Cor. 3	2001-03-15	7	11.1002/1000/5434
3.0	ITU-T X.682	2002-07-14	17	11.1002/1000/6087
4.0	ITU-T X.682	2008-11-13	17	11.1002/1000/9606
4.1	ITU-T X.682 (2008) Cor. 1	2014-03-01	17	11.1002/1000/12145
5.0	ITU-T X.682	2015-08-13	17	11.1002/1000/12481

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[*] 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.

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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/.

CONTENTS

Introduction

Application designers require a notation to define a structured data type to convey their semantics. This is provided in Rec. ITU-T X.680 | ISO/IEC 8824-1 and Rec. ITU-T X.681 | ISO/IEC 8824-2. A notation is also required to further constrain the values that can appear. Examples of such constraints are restricting the range of some component(s), or using a specified information object set to constrain an "ObjectClassFieldType" component, or using the "AtNotation" to specify a relation between components.

This Recommendation | International Standard provides the notation for the general case of constraint specification.

> NOTE 1 – For historical reasons the special case of a "subtype constraint" is specified in Rec. ITU-T X.680 | ISO/IEC 8824-1.

Constraint notation can appear (in round brackets) after any use of the syntactic construct "Type", and the purpose of this Recommendation | International Standard is to specify the general case of what goes in the round brackets.

> NOTE 2 – Multiple constraints (each inside its own round brackets) can be applied to the same "Type", as the result of constraining a "Type" is itself formally a "Type" construct.

When a constraint is applied to the textually outermost use of a "Type" construct, it results in the creation of a new type which is a subtype of the original (parent) type.

A subtype of a parent type can itself be used in defining other subtypes of the same parent type in other uses of the constraint notation. Thus the subset of values constituting a subtype can be defined either by limiting the range of the parent type, or by specifying the subtype as a union of sets of values.

> NOTE 3 – The "ValueSet" notation specified in Rec. ITU-T X.680 | ISO/IEC 8824-1, 16.7, provides a further means of specifying a subtype.

Constraints may also be used to produce a subtype of a parent type (as described above) when the notation is embedded within another type. However, some "component relation" constraints are textually included following a "Type" (within a set or sequence type definition), but are not used to restrict the set of possible values of the "Type" which they follow (the referencing component). Rather, they specify a relation between the value of the referencing component and the value of one or more other "Type"s in the same set or sequence type (called the referenced components).

Component relation constraints can be seen as subtyping the sequence type within which they are embedded, but not necessarily the referencing type.

A constraint on an "ObjectClassFieldType" component can be applied by restricting the type or values in the component by using an information object set. Such constraints are called table constraints, since they are specified in terms of the "associated table" of the object set. The component relation constraints defined in this Recommendation | International Standard are a special case of table constraints.

Finally, a "Type" may be subtyped by specifying the set of values in the subtype by human-readable text. Such a constraint is called a user-defined constraint. For example, a user-defined constraint can be specified to constrain a **BIT STRING** to the set of values produced by the encryption of a value of a specified ASN.1 type.

It is the purpose of this Recommendation | International Standard to provide the notation to be used for specifying table constraints (including component relation constraints), and user-defined constraints.

> NOTE 4 – In general, full support for the specification of constraints in a flexible way (particularly component relation constraints, subtyping constraints, and user-defined constraints with a formally defined body) would require notation with a power comparable to that of programming languages. Such power can only be sensibly provided by the establishment of links from the ASN.1 notation into some other defined computer language. This version of this Recommendation | International Standard does not provide such links, and hence supports only a small number of constraining mechanisms.

While the embedding of notation defining constraints (subtypes and relationships) will frequently be the most convenient form of specification (particularly for the simple subtyping of primitive components of structures), separate (external) specification will sometimes be preferred, particularly where the constraints are being imposed by a separate group from that which defined the basic protocol.

> NOTE 5 – The parameterization defined in Rec. ITU-T X.683 | ISO/IEC 8824-4 is specifically designed to enable a piece of ASN.1 specification (and in particular, a constraint) to be parameterized, allowing the actual constraint to be imposed by some other group that provides actual parameters for the parameterized construct.

The notations for constraint specification supported here are:

–   user-defined constraints (see clause 9);

–   table constraints, including component relation constraints between two components which are carrying values related to an information object, defined using the notation of Rec. ITU-T X.681 | ISO/IEC 8824-2 (see clause 10);

–   contents constraints (see clause 11).

The application of table constraints to the "InstanceOfType" construct of Rec. ITU-T X.681 | ISO/IEC 8824-2, Annex C, is specified in Annex A.

INTERNATIONAL STANDARD
ITU-T RECOMMENDATION

Information technology –
Abstract Syntax Notation One (ASN.1):
Constraint specification

1　Scope

This Recommendation | International Standard is part of Abstract Syntax Notation One (ASN.1) and provides notation for specifying user-defined constraints, table constraints, and contents constraints.

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

–　Recommendation ITU-T X.680 (2015) | ISO/IEC 8824-1:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

–　Recommendation ITU-T X.681 (2015) | ISO/IEC 8824-2:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*

–　Recommendation ITU-T X.683 (2015) | ISO/IEC 8824-4:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.*

3　Definitions

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

3.1　Specification of basic notation

This Recommendation | International Standard uses the terms defined in Rec. ITU-T X.680 | ISO/IEC 8824-1.

3.2　Information object specification

This Recommendation | International Standard uses the terms defined in Rec. ITU-T X.681 | ISO/IEC 8824-2.

3.3　Parameterization of ASN.1 specification

This Recommendation | International Standard uses the following term defined in Rec. ITU-T X.683 | ISO/IEC 8824-4:

–　parameterized type.

3.4　Additional definitions

3.4.1　component relation constraint: A constraint on the values of a set type or sequence type which is textually associated with one of the component types (the referencing component) of the set type or sequence type, and which specifies the relationship between the value of that component and the values of one or more other components (the referenced components).