INTERNATIONAL
STANDARD

ISO/IEC
8824-2

Fifth edition
2015-11-15

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

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

ISO/IEC 8824-2:2015(E)

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 8824-2:2008 which has been technically revised. It also incorporates ISO/IEC 8824-2:2008/Cor.1:2012.

ISO/IEC 8824-2 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.681 (08/2015).

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

X.681
(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): Information object specification

Recommendation ITU-T X.681

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

INTERNATIONAL STANDARD ISO/IEC 8824-2
RECOMMENDATION ITU-T X.681

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

Summary

Recommendation ITU-T X.681 | ISO/IEC 8824-2 provides the ASN.1 notation which allows information object classes as well as individual information objects and sets thereof to be defined and given reference names. An information object class defines the form of a conceptual table (an information object set) with one column for each field in the information object class, and with each complete row defining an information object.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T X.681	1994-07-01	7	11.1002/1000/3042
1.1	ITU-T X.681 (1994) Amd. 1	1995-04-10	7	11.1002/1000/3043
2.0	ITU-T X.681	1997-12-12	7	11.1002/1000/4444
2.1	ITU-T X.681 (1997) Technical Cor. 1	1999-06-18	7	11.1002/1000/4702
2.2	ITU-T X.681 (1997) Amd. 1	1999-06-18	7	11.1002/1000/4701
2.3	ITU-T X.681 (1997) Amd. 2	2001-10-29	7	11.1002/1000/5564
3.0	ITU-T X.681	2002-07-14	17	11.1002/1000/6086
3.1	ITU-T X.681 (2002) Amd. 1	2003-10-29	17	11.1002/1000/7020
3.2	ITU-T X.681 (2002) Technical Cor. 1	2006-06-13	17	11.1002/1000/8837
3.3	ITU-T X.681 (2002) Technical Cor. 2	2007-05-29	17	11.1002/1000/9106
4.0	ITU-T X.681	2008-11-13	17	11.1002/1000/9605
4.1	ITU-T X.681 (2008) Cor. 1	2011-10-14	17	11.1002/1000/11377
5.0	ITU-T X.681	2015-08-13	17	11.1002/1000/12480

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

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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

An application designer frequently needs to design a protocol which will work with any of a number of instances of some class of information objects, where instances of the class may be defined by a variety of other bodies, and may be added to over time. Examples of such information object classes are the "operations" of Remote Operations Service (ROS) and the "attributes" of the OSI Directory.

This Recommendation | International Standard provides notation which allows information object classes as well as individual information objects and information object sets thereof to be defined and given reference names.

An information object class is characterized by the kinds of fields possessed by its instances. A field may contain:

– an arbitrary type (a type field); or

– a single value of a specified type (a fixed-type value field); or

– a single value of a type specified in a (named) type field (a variable-type value field);

– a non-empty set of values of a specified type (a fixed-type value set field); or

– a non-empty set of values of a type specified in a (named) type field (a variable-type value set field); or

– a single information object from a specified information object class (an object field);

– an information object set from a specified information object class (an object set field).

A fixed-type value field of an information object class may be selected to provide unique identification of information objects in that class. This is called the identifier field for that class. Values of the identifier field, if supplied, are required to be unique within any information object set that is defined for that class. They may, but need not, serve to unambiguously identify information objects of that class within some broader scope, particularly by the use of object identifier as the type of the identifier field.

An information object class is defined by specifying:

– the names of the fields;

– for each field, the form of that field (type, fixed-type value, variable-type value, fixed-type value set, variable-type value set, object, or object set);

– optionality and default settings of fields;

– which field, if any, is the identifier field.

An individual information object in the class is defined by providing the necessary information for each field.

The notation defined herein permits an ASN.1 type to be specified by reference to a field of some information object class – the object class field type. In Rec. ITU-T X.682 | ISO/IEC 8824-3, notation is provided to enable this type to be restricted by reference to some specific information object set.

It can be useful to consider the definition of an information object class as defining the form of an underlying conceptual table (the associated table) with one column for each field, and with a completed row defining an information object. The form of the table (determined by the information object class specification) determines the sort of information to be collected and used to complete some protocol specification. The underlying conceptual table provides the link between those specifying information objects of that class and the protocol which needs that information to complete its specification. Typically, the actual information object set used to complete a particular protocol specification will be a parameter of that protocol (see Rec. ITU-T X.683 | ISO/IEC 8824-4).

The "InformationFromObjects" notation referencing a specific object or object set (probably a parameter) can be used to extract information from cells of conceptual tables.

This Recommendation | International Standard:

– Specifies a notation for defining an information object class, and for identifying it with a reference name (see clause 9).

– Specifies a notation by which the definer of an information object class can provide a defined syntax for the definition of information objects of that class; a default notation is provided for classes for which no defined syntax has been defined (see clause 10).

– Specifies a notation for defining an information object, and for assigning it to a reference name (see clause 11), and provides analogous notation for an object set (see clause 12).

– Defines the "associated table" for an object or object set of a class (see clause 13).

– Specifies notation for the object class field type and its values (see clause 14).

> NOTE – These constructs enable an ASN.1 type to be specified using a named field of a named information object class. Constraints on that type to restrict it to values related to a specific information object set appear in Rec. ITU-T X.682 | ISO/IEC 8824-3.

– Specifies notation for extracting information from objects (see clause 15).

The set of information objects used in defining an object set may be partially or entirely unknown at the time of definition of an ASN.1 specification. Such cases occur, for example, in network management where the set of managed objects varies while the network manager is executing. This Recommendation | International Standard specifies the rules for inclusion of an *extension marker* in the definition of object sets to signal to implementers the intention of the designer that the contents of the object set is not fully defined in the ASN.1 specification. When an object set is defined with an extension marker, the implementer must provide means, possibly outside the scope of ASN.1, for dynamically adding objects to the object set and removing previously added objects from the object set.

Annex A, which is an integral part of this Recommendation | International Standard, specifies the information object class whose object class reference is `TYPE-IDENTIFIER`. This is the simplest useful class, with just two fields, an identifier field of type object identifier, and a single type field which defines the ASN.1 type for carrying all information concerning any particular object in the class. It is defined herein because of the widespread use of information objects of this form.
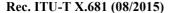
Annex B, which is an integral part of this Recommendation | International Standard, specifies the notation for defining an abstract syntax (composed of the set of values of a single ASN.1 type) by the definition of an appropriate information object.

Annex C, which is an integral part of this Recommendation | International Standard, specifies the notation for the instance-of type (the `INSTANCE OF` notation).

Annex D, which is not an integral part of this Recommendation | International Standard, provides examples on how to use the notation described in this Recommendation | International Standard.

Annex E, which is not an integral part of this Recommendation | International Standard, provides a summary of the ASN.1 model of object set extension.

Annex F, which is not an integral part of this Recommendation | International Standard, provides a summary of the notation defined herein.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

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

1   Scope

This Recommendation | International Standard is part of Abstract Syntax Notation One (ASN.1) and provides notation for specifying information object classes, information objects and information object sets.

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.682 (2015) | ISO/IEC 8824-3:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint 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.*