INTERNATIONAL STANDARD

ISO 20022-4

Financial services — Universal financial industry message scheme —

Part 4:
XML Schema generation

Services financiers — Schéma universel de messages pour l'industrie financière —

Partie 4: Génération de schéma XML

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

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

ISO 20022-4 was prepared by Technical Committee ISO/TC 68, *Financial services*.

This first edition cancels and replaces ISO/TS 20022-4:2004.

ISO 20022 consists of the following parts, under the general title *Financial services — Universal financial industry message scheme*:

— *Part 1: Metamodel*

— *Part 2: UML profile*

— *Part 3: Modelling*

— *Part 4: XML Schema generation*

— *Part 5: Reverse engineering*

— *Part 6: Message transport characteristics*

— *Part 7: Registration*

— *Part 8: ASN.1 generation*

ISO 20022-1:2013, ISO 20022-2:2013, ISO 20022-3:2013, ISO 20022-4:2013, ISO 20022-5:2013, ISO 20022-6:2013, ISO 20022-7:2013 and ISO 20022-8:2013 will be implemented by the Registration Authority by no later than the end of May 2013, at which time support for the concepts set out within them will be effective. Users and potential users of the ISO 20022 series are encouraged to familiarize themselves with the 2013 editions as soon as possible, in order to understand their impact and take advantage of their content as soon as they are implemented by the Registration Authority. For further guidance, please contact the Registration Authority.

For the purposes of research on financial industry message standards, users are encouraged to share their views on ISO 20022:2013 and their priorities for changes to future editions of the document. Click on the link below to take part in the online survey:

http://www.surveymonkey.com/s/20022_2013

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Introduction

This International Standard defines a scalable, methodical process to ensure consistent descriptions of messages throughout the financial services industry.

The purpose of this International Standard is to describe precisely and completely the externally observable aspects of financial services messaging in a way that can be verified independently against operational messaging.

The trigger for the creation of this International Standard was the rapid growth in the scale and sophistication of messaging within financial services during the 1990s using ISO 15022. The financial services industry (from here on referred to as "the industry") created the first version of this International Standard as the successor to ISO 15022 in response to that trigger. Since ISO 15022, the industry has broadened the scope from securities to the entire industry for this International Standard.

This International Standard is based on open technology standards, which historically have evolved more rapidly than the industry itself. Consequently, this International Standard adopted a model-driven approach where the model of the industry's messaging can evolve separately from the evolution of the messaging technology standards. The period during which this International Standard has emerged followed the widespread adoption of the World Wide Web (the Web) for business. XML (eXtensible Mark-up Language) emerged as the *de facto* standard for document representation on the Web and it became the first syntax for ISO 20022.

The modelling process is further refined into three levels which, in addition to the messaging technology standard, is why this International Standard is based on four levels: the Scope level, the Conceptual level, the Logical level and the Physical level.

This four-level approach is based on the first four levels of the Zachman Framework. The remaining two levels of the Zachman Framework are equivalent to the implementations and the operational levels, respectively.

In ISO 20022-1, the first, second and third levels are described in UML (Unified Modelling Language) because it is widely supported and supports multiple levels of abstraction. The models created in accordance with this International Standard are technology independent in that they do not require any particular physical expression or implementation. Such models aim to describe all parts of the message exchange. The models form the definition of the protocol between participants exchanging messages. This International Standard defines a method that describes a process by which these models can be created and maintained by the modellers.

The models and the Physical level artefacts are stored in a central repository, serviced by a Registration Authority. This International Standard's repository is available on the World Wide Web and offers public access for browsing.

The Repository is organized into two areas:

— A DataDictionary containing the industry model elements likely to have further or repeated use.

— A BusinessProcessCatalogue that contains models describing specific message definitions and business processes, and physical syntax implementations.

This International Standard is organized into the following parts.

— ISO 20022-1 describes in MOF (Meta-Object Facility) the metamodel of all the models and the Repository.

— ISO 20022-2 covers the UML profile, a grounding of general UML into a specific subset defined for this International Standard (to be used when UML is selected to define the models).

— ISO 20022-3 describes a modelling method to produce models for this International Standard.

— This part of ISO 20022 covers XML schema generation rules to transform a Logical level model into a Physical level description in the syntaxes.

— ISO 20022-5 covers logical model alignment and reverse engineering of existing message syntaxes.

— ISO 20022-6 covers message transport characteristics that define the quality of service required by the business process definitions so that they can operate successfully.

— ISO 20022-7 describes the process of managing the registration of models and physical syntax implementations.

— ISO 20022-8 gives ASN.1 syntax generation rules to transform a Logical level model into a Physical level description in ASN.1.

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Financial services — Universal financial industry message scheme —

Part 4:
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1 Scope

This part of ISO 20022 was prepared to complement the ISO 20022 Metamodel, as specified in ISO 20022-1, with the XML syntax transformation rules to be applied by the ISO 20022 Registration Authority in order to translate an ISO 20022 compliant MessageDefinition into an XML Schema for the description and validation of XML Messages.

It specifies the transformation rules from level 3 to level 4. It is a deterministic transformation, meaning that the resulting XML Schema is completely predictable for a given MessageDefinition. There is neither manual input to the transformation itself nor manual adjustment to the result of the transformation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20022-1, *Financial services — Universal financial industry message scheme — Part 1: Metamodel*

RFC 5141, Available at http://www.rfc-archive.org/getrfc.php?rfc=5141

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20022-1 apply.

4 Background

XML is a standard defined by W3C (the World Wide Web Consortium) that is used for the representation (i.e. the syntax) of standardized ISO 20022 MessageDefinitions. XML leaves a lot of freedom for the exact way it is used in a particular application. Therefore, merely stating that XML is used is not sufficient to guarantee predictability; it is also necessary to explain how it will be used.

This part of ISO 20022 contains a set of XML design rules. These design rules define how a MessageDefinition is transformed into an ISO 20022 XML Schema.

A valid XML document (referred to hereafter as 'XML Instance' or 'Instance') is any XML document that has an associated description and that complies with the constraints expressed in that description. The associated description in this case is derived from the MessageDefinition.

This part of ISO 20022 also describes how a MessageSet can be converted into XML Schemas by specifying how a MessageDefinition is transformed into an XML Schema. This XML Schema will then make it possible to use a validating XML Schema parser to automatically verify that a given XML Instance complies with the constraints (or a subset of constraints) described in the MessageDefinition.

This part of ISO 20022 is limited to explaining how a given MessageDefinition will be mapped into XML; it does not explain how to create a MessageDefinition. This information can be found in ISO 20022-3.

5   ISO 20022 transformation rules for MessageSet

5.1   Preconditions

The MessageSet used as input for the transformation is a valid instance of the MessageSet meta-class.

5.2   Transformation constraints

An ISO 20022 XML Schema contains an XML comment at the top, which contains the following metadata:

— the ISO 20022 RA issued release number;

EXAMPLE   R6.1.0.2

— the generation date;

— documentation text (optional).

Apart from the RA administered XML comment line, an ISO 20022 XML Schema contains only information relevant for the validation of XML Instances by an XML Schema parser. For example, it does not contain documentation (definitions, etc.) or implementation information (relationships between similar Components, etc).

An ISO 20022 XML Schema is an implementation of the MessageDefinition. The MessageDefinition is always the definitive source.

XML Schema Definition (XSD) Elements are local within their complexType, except for rootElement ComplexTypes, which are global. This approach is commonly called the 'Venetian blind' approach.

All aspects of dictionary management, e.g. reuse and pointers, are managed at the level of the MessageDefinition. These aspects, among others, are covered in ISO 20022-3.

All complexType and simpleType elements in the XML Schema appear after the root element, in alphabetical order, using the type "name" attribute as sort key.

5.3   Namespaces

There are several namespace declarations used in the XML Schema.

1)   The targetNamespace, which is the namespace to which all XSD Elements and Types belong. The URN, which shall be in accordance with RFC 5141, consists of:

— a fixed part consisting of the URN of the namespace for ISO documents, urn:iso:std:iso:20022:tech;

— a part unique to each schema, xsd: *MessageDefinitionIdentifier*; the structure and meaning of *MessageDefinitionIdentifier* are explained in ISO 20022-3.

2) The XML Schema namespace.

3) The default namespace, which is the same as the TargetNamespace.

EXAMPLE   Namespace declarations in an ISO 20022 XML Schema:
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns="urn:iso:std:iso:20022:tech:xsd:camt.007.002.01" elementFormDefault="qualified"
targetNamespace="urn:iso:std:iso:20022:tech:xsd:camt.007.002.01">

EXAMPLE   Namespace declarations in an ISO 20022 XML Instance:
<Doc:Document xmlns:Doc="urn:iso:std:iso:20022:tech:xsd:camt.007.002.01">
or, in case the Sender decides to use the default namespace,
<Document xmlns="urn:iso:std:iso:20022:tech:xsd:camt.007.002.01">

5.4   Granularity of schemas

There is one well-formed and valid XML Schema per MessageDefinition.

5.5   XML MessageInstances

5.5.1   Encoding

The encoding shall be UTF-8, and shall be identified as UTF-8 in the XML prolog of the document.

EXAMPLE   <?xml version="1.0" encoding="UTF-8"?>

5.5.2   Default namespace

The document may declare any namespace as default.

5.5.3   DOCTYPE

The document shall not include a DOCTYPE declaration.

5.5.4   SchemaLocation

The document may declare any schemaLocation. However, the schema shall be resolved from the namespace alone and not from the schemaLocation.

5.5.5   XML name abbreviation algorithm

Names of XML Elements and XML Attributes appearing in XML Instances are derived from their MessageDefinition names according to the algorithm posted on the ISO 20022 website, whereby the algorithm is part of this International Standard.

5.6   Completeness

The list of transformation rules described in this subclause is complete. Therefore, no other transformation rules are applicable and no other information may be added to the XML Schema outside of what is allowed by the transformation rules given below.

The XML Schema is a representation of the MessageDefinition.

5.7   Method

5.7.1   General

A MessageDefinition is composed of a limited number of distinct modelling patterns. For a depiction of the Message Metamodel, see ISO 20022-1, Figure 7.

By defining the transformation rules from those patterns to ISO 20022 XML Schema, any MessageDefinition can be transformed into its corresponding ISO 20022 XML Schema.

5.7.2   Relationship between metamodel concepts and XML Schema artefacts

5.7.2.1   MessageSet

Each MessageSet is transformed into an artefact of MIME type application/zip, containing all MessageDefinition XML Schemas belonging to that MessageSet. It may also contain images of the sequence diagrams relevant to this MessageSet.

5.7.2.2   MessageDefinition

A MessageDefinition is transformed into an XML Schema Document using the MessageDefinitionIdentifier as the filename suffixed with ".xsd".

EXAMPLE   camt.001.001.01.xsd

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The XML Schema Document consists of the following elements.

a)   The XML prolog containing XML attribute "version" with value "1.0" and XML attribute "encoding" with value "UTF-8" (see also 5.5.1).

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b)   The RA administered XML comment line defined in 5.2.

c)   The XML Element "xs:schema" containing

— XML Attributes declaring the namespaces defined in 5.3,

— an XML Attribute with name "elementFormDefault" and value "qualified".

d)   An XML Element "xs:element" containing

— XML attribute with name "name" and value the MessageDefinition rootElement's Name,

— XML attribute with name "type" and value the MessageDefinition rootElement's Name.

e)   An XML Element "xs:complexType" whereby the MessageDefinition rootElement's Name is the value of the XML Attribute "name". The XML Element "xs:complexType" contains

— an XML Element "xs:sequence". Within that XML Element "xs:sequence" the value of MessageDefinition is used to create (following the abbreviation algorithm in 5.5.5) the value of the XML Attribute "name" of the XML Element "xs:element" and is also copied into the XML Attribute "type".

NOTE   The version number (indicated as "Vxx" where "xx" is numerical) is not part of that name. This means that in the mapping table used by the transformation algorithm, all versions (shown as "Vxx") are mapped to an empty value.

f)   An XML Element "xs:complexType" whereby the MessageDefinition's value is the value of the XML Attribute "name". The XML Element "xs:complexType" contains