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Financial services — Universal financial industry message scheme —

Part 2: UML profile

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

Partie 2: Profil UML

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Contents

Page

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 20022-2 was prepared by Technical Committee ISO/TC 68, *Financial services*.

This third edition cancels and replaces the second edition (ISO 20022-2:2007) which has been technically revised.

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

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.

— This part of ISO 20022 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.

— ISO 20022-4 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.

Financial services — Universal financial industry message scheme —

Part 2: UML profile

1 Scope

This part of ISO 20022 defines the UML Profile for this International Standard. In essence, it defines how to use UML to create models that conform to the ISO 20022 Metamodel, which is defined in ISO 20022-1. In so doing, it defines a UML-based concrete syntax for the Metamodel. It does not preclude the specification of additional concrete syntaxes for the Metamodel, such as a textual concrete syntax.

The Profile defines how to represent in UML each of the Metamodel's Scope Level Elements (Level 1), Business Level Elements (Level 2) and Message Level Elements (Level 3), as well as Metamodel Elements that are scoped across the levels.

Therefore, the Profile covers all of the Metamodel's Packages, except for the following:

- ISO20022::Metamodel::ConceptualLevel::MessageTransport
- ISO20022::Metamodel::LogicalLevel::Reversing
- ISO20022::Metamodel::LogicalToPhysicalTransformation
- ISO20022::Metamodel::PhysicalLevel

The Profile also covers the ISO20022::TypeLibrary Package, upon which the Metamodel has some dependencies.

This part of ISO 20022 is only applicable when UML is used.

2 Normative references

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

3 Terms and definitions

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

3.1
Metamodel[1)]
the ISO 20022 metamodel

1) The reason that the defined term is "the metamodel" rather than "metamodel" is that sometimes the term "UML Metamodel" is used, and it would be incorrect in such cases to substitute "ISO 20022 metamodel" for "metamodel," since the result of the substitution would be "UML ISO 20022 metamodel."

3.2
Profile
the UML profile for ISO 20022

3.3
UML metamodel
OMG's metamodel of UML

4 How the Profile is specified

4.1 General

This clause explains the technique used to specify the Profile.

4.2 Package structure of the Profile

The internal Package structure of the Profile is similar to the internal Package structure of the Metamodel. Whereas the Metamodel's top-level Package is ISO20022::Metamodel, the Profile's top-level Package is ISO20022::Profile. The following are the top-level Packages within the ISO20022::Profile Package:

1) ISO20022::Profile::ScopeLevel;

2) ISO20022::Profile::DataTypes;

3) ISO20022::Profile::ConceptualLevel;

4) ISO20022::Profile::LogicalLevel;

5) ISO20022::Profile::ConceptualToLogicalTransformation.

The ISO20022::Profile::Conceptual Package contains two Packages:

ISO20022::Profile::Conceptual::Dynamic;

ISO20022::Profile::Conceptual::Static.

The ISO20022::Profile Package imports two Packages:

ISO20022::TypeLibrary::Enumerations;

ISO20022::TypeLibrary::XMLSchema.

NOTE The ISO20022::Profile Package contains no Package that corresponds to the ISO20022::Metamodel::ScopeToConceptual Package, because it is not necessary for the Profile to define any Stereotypes in order to implement that Metamodel Package.

4.3 Basic organization of the Profile specification

Clause 5 systematically outlines the Metamodel, Package by Package, defining how each Metamodel element maps to UML (it does not include the Packages of the Metamodel that the Profile does not cover, which are listed in the Scope). Within each Metamodel Package, the Metaclasses are treated in alphabetical order, and

then any DataTypes contained in the Package are treated in alphabetical order[2]. For each Metaclass and DataType, the Corresponding UML Element is specified.

After outlining the ISO20022::Metamodel Package and its sub-Packages, Clause 5 covers the ISO20022::TypeLibrary Package and its sub-Packages, defining how each element maps to UML.

In many cases, the definition of how an element maps to UML refers to Stereotypes and Tag Definitions that are normatively defined in Annex A.

4.4 Properties of the Metamodel and UML — Tag Definitions

In outlining the Metamodel, Metaclass by Metaclass, this part of ISO 20022 lists each of the Properties of the Metaclass along with the defined approach for modelling that Property in UML. In some cases, the definition states that the Property in question maps to a Tag Definition defined in Annex A.

4.5 Properties of the Metamodel that correspond to existing UML Properties

In many cases, a Property of a Metaclass from the Metamodel corresponds to a UML Property already defined in the OMG's UML specification. This part of ISO 20022 explicitly defines these correspondences. In such a case, there is no need to define a Tag Definition to realize the Property in UML.

In a number of these cases, the Profile defines that the corresponding UML Property is the non-navigable memberEnd of an Association in the UML specification, meaning that the Property cannot be captured in an ISO 20022-compliant UML model. In essence, this means that the Metamodel supports the back-pointer while UML does not, and there is no compelling reason to define a Tag Definition to fill the gap. The burden of tracking and setting the back-pointer via a Tagged Value would fall entirely on the modeller, unless additional code with specific knowledge of this back-pointer had been added to the UML tool.

4.6 AssociationEnds

UML 1.x has a Metaclass named AssociationEnd. UML 2.x does not have a Metaclass of that name; the Metaclass has been replaced by the "memberEnd" Property of Association. Consequently, this part of ISO 20022 refers frequently to a "memberEnd" of an Association, whereas UML 1.x discourse would refer to an "AssociationEnd." For readability, the quotation marks have been omitted when referring to this Property, even though all other Property names are in quotation marks when they appear in narrative text.

4.7 Constraints

Profile Constraints are expressed in OCL. The Constraints are motivated by the fact that the Profile is an implementation of the ISO 20022 Metamodel, and they restrict the freedom of the UML modeller. UML models that do not adhere to the Constraints are not ISO 20022-compliant.

4.8 Figures

The definitions in Annex A of the Profile Stereotypes and Tagged Definitions include figures that use UML Profile notation to graphically depict the Stereotypes and Tag Definitions. The figures also depict the UML Metaclasses that the Stereotypes extend, and the Stereotypes' superclasses where applicable. As is typical in specifications of MOF Metamodels and UML Profiles, the diagrams duplicate some of the information contained in the narrative text. The narrative text is normative and the diagrams are non-normative.

4.9 How modellers choose which UML Diagrams to create

A complete overview of when to use which UML diagram can be found in ISO 20022-3.

2) The DataTypes that lie within the Metamodel Package and its contained Packages are DataTypes used to specify the Metamodel. On the other hand, the DataTypes that lie within the ISO20022::TypeLibrary Package and its contained Packages are DataTypes used by modellers to specify ISO 20022–compliant financial models.

5 Mapping the Metamodel's elements to UML

5.1 General

This clause defines how each element of the Metamodel is realized in UML.

5.2 UML realization of ISO20022::Metamodel

5.2.1 General

This subclause defines how the elements of the ISO20022::Metamodel Package map to UML.

5.2.2 Metaclass: BusinessProcessCatalogue

— Corresponding UML Element: A <<BusinessProcessCatalogue>>-stereotyped Package.

— Mappings of the Metaclass's Properties:

repository: not implemented in the Profile[3)];

topLevelCatalogueEntry: corresponds to UML Package's "packagedElement" Property, which points to <<TopLevelCatalogueEntry>>-stereotyped UML Elements contained by the <<BusinessProcessCatalogue>>-stereotyped Package.

5.2.3 Metaclass: CodeSet

— Corresponding UML Element: A <<CodeSet>>-stereotyped Enumeration.

— Mappings of the Metaclass's Properties:

identificationScheme: captured via <<CodeSet>>'s "identificationScheme" Tag Definition;

code: corresponds to UML Enumeration's "ownedLiteral" Property, which points to <<Code>>-stereotyped EnumerationLiterals;

derivation: corresponds to the "supplierDependency" memberEnd of the Association between UML's NamedElement and Dependency Metaclasses (the other memberEnd of the Association is named "supplier"). The <<CodeSet>>-stereotyped Enumeration is the NamedElement playing the "supplier" role and a <<Trace>>-stereotyped Dependency plays the "supplierDependency" role (another <<CodeSet>>-stereotyped Enumeration is the client end of the Dependency);

trace: corresponds to the "clientDependency" memberEnd of the Association between UML's NamedElement and Dependency Metaclasses (the other memberEnd of the Association is named "client"). The <<CodeSet>>-stereotyped Enumeration is the NamedElement playing the "client" role and a <<Trace>>-stereotyped Dependency plays the "clientDependency" role (another <<CodeSet>>-stereotyped Enumeration is the supplier end of the Dependency);

length (inherited from Text): captured via <<CodeSet>>'s length Tag Definition;

minLength (inherited from Text): captured via <<CodeSet>>'s minLength Tag Definition;

maxLength (inherited from Text): captured via <<CodeSet>>'s maxLength Tag Definition.

3) It is not realized in the Profile because there is no explicit element in the Profile that corresponds to the Metamodel's Repository Metaclass (see 5.2.8).

5.2.4 Metaclass: Code

— Corresponding UML Element: a <<Code>>-stereotyped EnumerationLiteral.

— Mappings of the Metaclass's Properties:

Code value: corresponds to the "body" Property of the OpaqueExpression that plays the "specification" role for the UML EnumerationLiteral.

5.2.5 Metaclass: Constraint

— Corresponding UML Element: a <<Constraint>>-stereotyped Constraint.

— Mappings of the Metaclass's Properties:

— expression: corresponds to the "body" Property of the OpaqueExpression that plays the "specification" role for the UML Constraint;

— expressionLanguage: corresponds to the "language" Property of the OpaqueExpression that plays the "specification" role for the UML Constraint.

5.2.6 Metaclass: DataDictionary

— Corresponding UML Element: a <<DataDictionary>>-stereotyped Package.

— Mappings of the Metaclass's Properties:

— repository: not implemented in the Profile[4];

— topLevelDictionaryEntry: corresponds to UML Package's "packagedElement" Property, which points to <<TopLevelDictionaryEntry>>-stereotyped UML Elements contained by the <<DataDictionary>>-stereotyped Package.

5.2.7 Metaclass: IdentifierSet

— Stereotype: an <<IdentifierSet>>-stereotyped Class.

— Mappings of the Metaclass's Properties:

identificationScheme: captured via <<IdentifierSet>>'s "identificationScheme" Tag Definition;

length (inherited from Text): captured via <<IdentifierSet>>'s length Tag Definition;

minLength (inherited from Text): captured via <<IdentifierSet>>'s minLength Tag Definition;

maxLength (inherited from Text): captured via <<IdentifierSet>>'s maxLength Tag Definition.

5.2.8 Metaclass: Repository

— Corresponding UML Element: there is no corresponding UML element. ISO 20022-compliant models do not contain an explicit element corresponding to the Metamodel's Repository Metaclass. The overall ISO 20022 Repository implicitly realizes this Metaclass.

— Mappings of the Metaclass's Properties: N/A

4) It is not realized in the Profile because there is no explicit element in the Profile that corresponds to the Metamodel's Repository Metaclass (see 5.2.8).

5.2.9 Metaclass: RepositoryConcept

— Corresponding UML Element: a NamedElement, stereotyped by one of the concrete descendants of the <<RepositoryConcept>> Stereotype.

— Mappings of the Metaclass's Properties:

name: corresponds to NamedElement's "name" Property;

definition: corresponds to the "ownedComment" Property of UML Element. NamedElement is a descendant of Element and thus inherits the "ownedComment" Property. "ownedComment" is of type Comment, and the "definition" populates the "body" Property of Comment;

example: captured via <<RepositoryConcept>>'s "example" Tag Definition;

registrationStatus: captured via <<RepositoryConcept>>'s "registrationStatus" Tag Definition;

removalDate: captured via <<RepositoryConcept>>'s "removalDate" Tag Definition;

semanticMarkup: captured via <<RepositoryConcept>>'s "semanticMarkup" Tag Definition;

constraint: corresponds to <<Constraint>>-stereotyped UML Constraints. For each such UML Constraint, the value of the "constrainedElement" Property points to the RepositoryConcept that owns the Constraint.

5.2.10 Metaclass: TopLevelCatalogueEntry

— Corresponding UML Element: a NamedElement, stereotyped by one of the concrete descendants of the <<TopLevelCatalogueEntry>> Stereotype.

— Mappings of the Metaclass's Properties:

  — businessProcessCatalogue: corresponds to the "owner" Property, which UML NamedElements inherit from Element, and which points to a <<BusinessProcessCatalogue>>-stereotyped Package.

5.2.11 Metaclass: TopLevelDictionaryEntry

— Corresponding UML Element: a NamedElement, stereotyped by one of the concrete descendants of the <<TopLevelDictionaryEntry>> Stereotype.

— Mappings of the Metaclass's Properties:

  — dataDictionary: corresponds to the "owner" Property, which UML NamedElements inherit from Element, and which points to a <<DataDictionary>>-stereotyped Package.

5.2.12 Metaclass: Trace

— Corresponding UML Element: a <<Trace>>-stereotyped Dependency.

— Mappings of the Metaclass's Properties: Trace has no Properties of its own.

5.2.13 DataType: Cardinality

— Corresponding UML Element: MultiplicityElement.

— Mappings of the Metaclass's Properties:

  - isOrdered: corresponds to the “isOrdered” Property of MultiplicityElement;
  - isUnique: corresponds to the “isUnique” Property of MultiplicityElement;
  - maximumOccurrence: corresponds to the “upperValue” Property of MultiplicityElement. If maximumOccurence contains 'UNBOUNDED' then the "upperValue" is literal UnlimitedNatural with value "infinity";
  - minimumOccurrence: corresponds to the “lowerValue” Property of MultiplicityElement.

5.3 UML realization of ISO20022::Metamodel::ScopeLevel

5.3.1 General

This subclause defines how the elements of the ISO20022::Metamodel::ScopeLevel Package map to UML.

5.3.2 Metaclass: BusinessProcess

- Corresponding UML Element: a <<BusinessProcess>>-stereotyped UseCase.
- Mappings of the Metaclass’s Properties:
  - businessRole: corresponds to the Actor memberEnd of an Association between a <<BusinessRole>>-stereotyped Actor and a <<BusinessProcess>>-stereotyped UseCase;
  - included: corresponds to the “includingCase” Property of the UML Include Metaclass, which is accessed via UseCase’s “include” Property;
  - includer: corresponds to the non-navigable memberEnd of the Association between UML’s Include and UseCase Metaclasses, where the navigable memberEnd is “includingCase”;
  - extender: corresponds to the non-navigable memberEnd of the Association between UML’s Extend and UseCase Metaclasses, where the navigable memberEnd is “extendedCase”;
  - extended: corresponds to the “extendedCase” Property of the UML Extend Metaclass, which is accessed via UseCase’s “extend” Property;
  - businessProcessTrace: corresponds to the “ownedBehavior” Property that UseCase inherits from BehavioredClassifier, pointing to the <<BusinessTransaction>>-stereotyped Interactions that the <<BusinessProcess>>-stereotyped UseCase owns.[5)]

5.3.3 Metaclass: BusinessRole

- Corresponding UML Element: a <<BusinessRole>>-stereotyped Actor.
- Mappings of the Metaclass’s Properties:
  - businessProcess: corresponds to the UseCase memberEnd of an Association between a <<BusinessRole>>-stereotyped Actor and a <<BusinessProcess>>-stereotyped UseCase;
  - businessRoleTrace: corresponds to the use of an instance of a <<BusinessRole>>-stereotyped Actor to represent a Lifeline[6)] in a <<BusinessTransaction>>-stereotyped Interaction.[7)]

5) In the Metamodel, this relationship is captured via the BusinessProcessTrace Metaclass, which relates BusinessProcesses to BusinessTransactions.