



BSI Standards Publication

Information technology — Metamodel framework for interoperability (MFI)

Part 16: Metamodel for document model registration

National foreword

This British Standard is the UK implementation of ISO/IEC 19763-16:2021+A1:2023. It supersedes BS ISO/IEC 19763-16:2021

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO/IEC text carry the number of the ISO/IEC amendment. For example, text altered by ISO/IEC amendment 1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee IST/40, Data management and interchange.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 23078 9

ICS 35.040.50

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2021.

Amendments/corrigenda issued since publication

Date	Text affected
31 January 2024	Implementation of ISO/IEC amendment 1:2023

INTERNATIONAL
STANDARD

ISO/IEC
19763-16

First edition
2021-09

**Information technology — Metamodel
framework for interoperability
(MFI) —**

**Part 16:
Metamodel for document model
registration**



Reference number
ISO/IEC 19763-16:2021(E)

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Published in Switzerland

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

A list of all parts in the ISO/IEC 19763 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

There is an increasing demand for systems to interoperate by exchanging information and data. These exchanges are sometimes performed using 'documents' such as XML documents and JSON documents. The business information requirements conveyed by these documents are often specified in supporting document models, for example, in XML schemas for XML documents and in JSON schemas for JSON documents.

The information contained in these models – the metadata – can be registered using the facilities specified by this document. Most of the metaclasses specified in this document are subclasses of the metaclasses specified in ISO/IEC 19763-10:2014, 7.1, 7.2 and 7.3.

Where there is an overlap of the universe of discourse of the business information requirements specified in the registered models, the mappings between registered models can then be registered using the facilities specified in ISO/IEC 19763-10:2014, Clause 8, thus enabling further interoperation.

A model registry, as specified using any of the metamodels described in ISO/IEC 19763, uses the common facilities specified in [A1](#) ISO/IEC 11179-3:2023 [A1](#). A model registry is, therefore, a part of a metadata registry.

Information technology — Metamodel framework for interoperability (MFI) —

Part 16: Metamodel for document model registration

1 Scope

The primary purpose of the ISO/IEC 19763 series is to specify a metamodel framework for interoperability. This document specifies a metamodel for registering document models (or schemata). Examples of such document models include:

- specifications for XML documents (using XML schema^[3]);
- specifications for JSON documents (using JSON schema^[2]).

This metamodel was developed taking into account the requirements for both XML schema and JSON schema, but is applicable to all current specifications for document models.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

[A1] ISO/IEC 19763-10:2023, *Information technology — Metamodel framework for interoperability (MFI) — Part 10: Core model and basic mapping*

ISO/IEC 11179-3:2023, *Information technology — Metadata registries (MDR) — Part 3: Metamodel for registry common facilities* **[A1]**

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

document

unit of data that is well-formed according to some agreed specification

Note 1 to entry: In this document, examples of a unit of data that is referred to as a document include, but are not restricted to, XML documents and JSON documents.

[SOURCE: ISO/IEC TR 24716:2007, 4.4, modified — Note 1 has been added.]

3.1.2

document schema

formal specification of the structure of a *document* ([3.1.1](#))

Note 1 to entry: The same schema can be used for multiple documents.

3.1.3

document schema language

language used to specify document schemata

3.1.4

namespace

set of character strings available for naming entities of specific classes within a specific scope

3.1.5

node

elements, comments, processing instructions, and text in a document

[SOURCE: ISO 24531:2013, 4.35 modified — The definition in the source document specifically referred to XML documents but is applicable to all documents; the references to XML and Note 1 have been removed.]

3.1.6

node enumeration

list of named values used as the range of a particular *node* ([3.1.5](#))

3.2 Abbreviated terms

Abbreviated terms	Definition
JSON	JavaScript Object Notation
MFI Core and mapping	Metamodel Framework for Interoperability Core and mapping
MFI Document model registration ^a	Metamodel Framework for Interoperability document model registration
MDR Metamodel	 Metadata registries metamodel for registry common facilities 
URL	Uniform Resource Locator
XML	eXtensible Markup Language
^a Whenever this abbreviation is used, this document is referring to itself.	

4 Conformance

4.1 General

Any claim of conformance to this document shall support the metamodel specified in [Clause 5](#), depending on a degree of conformance as described below.

4.2 Degree of conformance

4.2.1 General

The distinction between “strictly conforming” and “conforming” implementations is necessary to address the simultaneous needs for interoperability and extensions. This document describes specifications that promote interoperability. Extensions are motivated by needs of users, vendors, institutions and industries, but are not specified by this document.

A strictly conforming implementation may be limited in usefulness but is maximally interoperable with respect to this document. A conforming implementation may be more useful but may be less interoperable with respect to this document.

4.2.2 Strictly conforming implementation

A strictly conforming implementation:

- a) shall support the metamodel specified in [Clause 5](#);
- b) shall not use, test, access, or probe for any extension features nor extensions to the metamodel specified in [Clause 5](#).

4.2.3 Conforming implementation

A conforming implementation:

- a) shall support the metamodel specified in [Clause 5](#);
- b) as permitted by the implementation, may use, test, access, or probe for any extension features or extensions to the metamodel specified in [Clause 5](#).

NOTE 1 All strictly conforming implementations are also conforming implementations.

NOTE 2 The use of extensions to the metamodel can cause undefined behaviour.

4.3 Implementation conformance statement (ICS)

Any claim of conformance to this document shall include an implementation conformance statement stating:

- a) whether it is a strictly conforming implementation ([4.2.2](#)) or a conforming implementation ([4.2.3](#));
- b) what extensions, if any, are supported or used if it is a conforming implementation.

5 Structure of MFI Document model registration

5.1 Overview of MFI Document model registration

[Figure 1](#) shows the metamodel for the registration of document models such as XML schemas and JSON schemas.

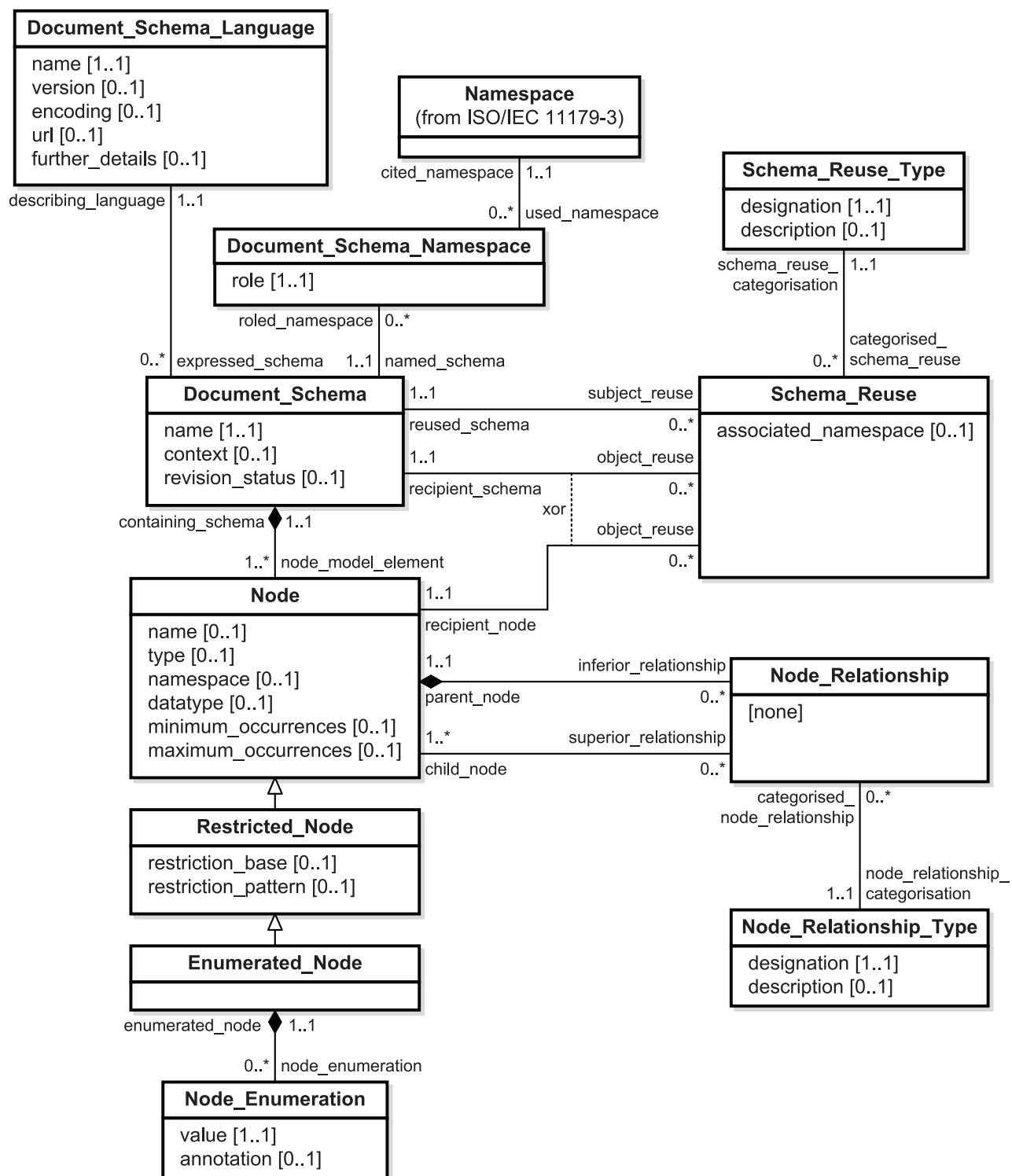


Figure 1 — Metamodel of MFI Document model registration

The metamodel for document model registration comprises the following metaclasses:

- **Document_Schema**
- **Document_Schema_Language**
- **Document_Schema_Namespace**
- **Enumerated_Node**, a subclass of **Restricted_Node**

- **Namespace** (which shall be in accordance with ^[A1] ISO/IEC 11179-3:2023, 7.3.3 ^[A1])
- **Node**
- **Node_Enumeration**
- **Node_Relationship**
- **Node_Relationship_Type**
- **Restricted_Node**, a subclass of **Node**
- **Schema_Reuse**
- **Schema_Reuse_Type**

The metamodel is described in detail in [Annex A](#). Detailed specifications of the metaclasses are provided in [5.3](#).

Examples of the registration of document models using this metamodel are provided in ^[A1] [Annex B](#). ^[A1]

5.2 Association between MFI Document model registration and MFI Core and mapping

The associations between the metaclasses specified in this document and the metaclasses in MFI Core and mapping (^[A1] ISO/IEC 19763-10:2023, 6.1, 6.2 and 6.3 ^[A1]) are shown in [Figure 2](#).

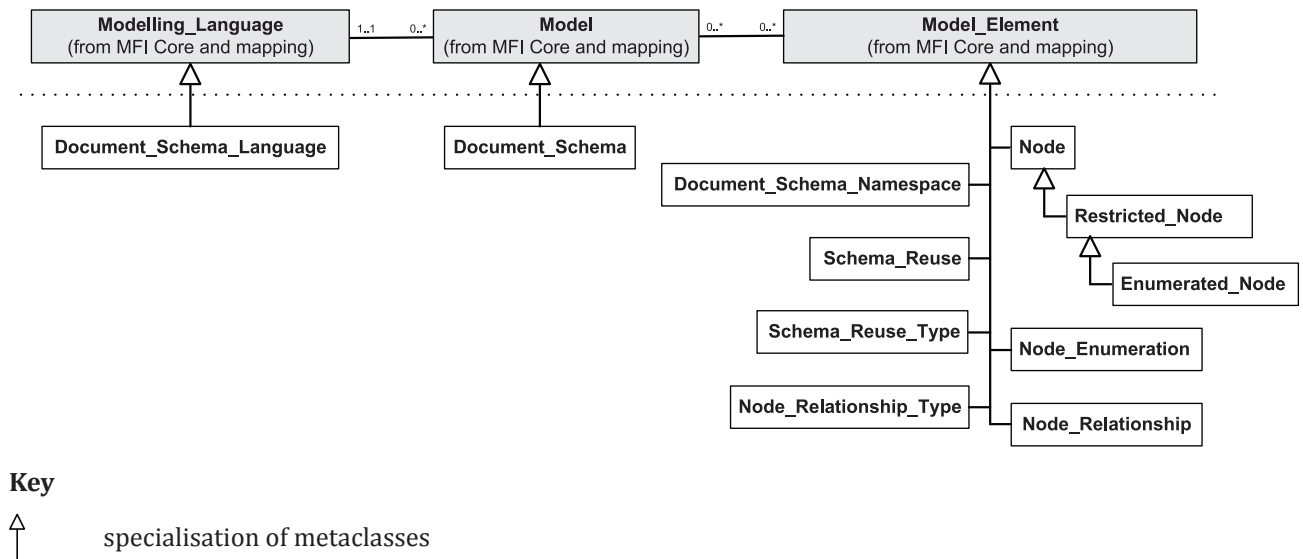


Figure 2 — Associations between MFI Document model registration and MFI Core and mapping

Document_Schema_Language in this document is a specialisation of (or subclass of) Modelling_Language (in accordance with ^[A1] ISO/IEC 19763-10:2023, 6.1 ^[A1]).

Document_Schema in this document is a specialisation of Model (in accordance with ^[A1] ISO/IEC 19763-10:2023, 6.2 ^[A1]).

All the remaining metaclasses are specialisations of Model_Element (in accordance with ^[A1] ISO/IEC 19763-10:2023, 6.3 ^[A1]).

The association between Document_Schema and Document_Schema_Language in this document is a specialisation of the association between Model (in accordance with ^[A1] ISO/IEC 19763-10:2023, 6.1 ^[A1]) and Modelling_Language (in accordance with ^[A1] ISO/IEC 19763-10:2023, 6.2 ^[A1]).

The association between Document_Schema and the remaining metaclasses specified in this document are specializations of the association between Model (in accordance with [A1](#)) ISO/IEC 19763-10:2023, 6.2 [A1](#)) and Model_Element (in accordance with [A1](#)) ISO/IEC 19763-10:2023, 6.3 [A1](#)).

[A1](#)) MFI Core and mapping (ISO/IEC 19763-10:2023, Clause 8) explains how instances of the metaclasses specified in 5.3 can be identified, registered, administered, named, defined and classified. [A1](#)

5.3 Metaclasses in MFI Document model registration

5.3.1 Document_Schema

Document_Schema is a metaclass each instance of which represents a representation of a particular document schema.

Superclass

Model (which shall be in accordance with [A1](#)) ISO/IEC 19763-10:2023, 6.2 [A1](#))

Attribute	DataType	Multiplicity	Description		
name	String	1..1	A statement specifying the name by which this document schema is known.		
context	String	0..1	A statement describing the universe of discourse covered by this document schema.		
revision_status	String	0..1	A statement describing revision or version status of this document schema.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
describing_language	Document_Schema_Language	1..1	The document schema language in which this schema is expressed.	expressed_schema	No
roled_namespace	Document_Schema_Namespace	0..*	The set of namespaces that are cited in this schema.	named_schema	Yes
node_model_element	Node	1..*	The set of nodes contained within this document schema.	containing_schema	Yes
subject_reuse	Schema_Reuse	0..*	The set of schema reuses that record that this schema is reused within another schema (the recipient schema) or as a node in another schema (the recipient node).	reused_schema	Yes
object_reuse	Schema_Reuse	0..*	The set of schema reuses that record that this schema reuses another schema (the reused schema).	recipient_schema	Yes

Constraints

[None]

5.3.2 Document_Schema_Language

Document_Schema_Language is a metaclass each instance of which represents a representation of a particular document schema language.

Superclass

Modelling_Language (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.1 [A1](#))

Attribute	DataType	Multiplicity	Description		
name	String	1..1	A statement specifying the name by which this document schema language is known.		
version	String	0..1	A statement specifying the version of this particular document schema language.		
encoding	String	0..1	A statement specifying the encoding that is used within this particular document schema language.		
url	String	0..1	A statement specifying the URL that may be used to access the specification of this particular document schema language.		
further_details	String	0..1	A statement providing any necessary further details necessary to unambiguously specify this particular document schema language.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
expressed_schema	Document_Schema	0..*	The set of document schemas that are expressed in this language.	describing_language	Yes

Constraints

[None]

5.3.3 Document_Schema_Namespace

Document_Schema_Namespace is a metaclass each instance of which represents a representation of a particular namespace that is cited within a schema.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description		
role	String	1..1	A statement specifying the role that this particular namespace is playing within the related document schema. Examples are “Target”, “Prefix” and “Default”.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
cited_namespace	Namespace	1..1	The namespace cited for use with this role in the related document schema.	used_namespace	No
named_schema	Document_Schema	1..1	The document schema for which this namespace is specified with this role.	roled_namespace	No

Constraints

[None]

5.3.4 Enumerated_Node

Enumerated_Node is a metaclass each instance of which represents a representation of a particular type of node within a schema, a restricted node for which there is a set of permitted values specified for the restricted node.

Superclass

Restricted_Node

Attribute	DataType	Multiplicity	Description
-----------	----------	--------------	-------------

[None]

Reference	Class	Multiplicity	Description	Inverse	Precedence
node_enumeration	Node_Enumeration	2..*	The set of valid values for this node.	enumerated_node	Yes

Constraints

[None]

5.3.5 Namespace

Namespace is a metaclass defined in [A1](#) ISO/IEC 11179-3:2023, 7.3.3 [A1](#). It is shown here to indicate the additional reference required for this document.

Superclass

[None]

Attribute	DataType	Multiplicity	Description
-----------	----------	--------------	-------------

[None]

Reference	Class	Multiplicity	Description	Inverse	Precedence
used_namespace	Document_Schema_Namespace	0..*	The set of document schema namespace within which this namespace is the cited namespace.	cited_namespace	Yes

Constraints

[None]

5.3.6 Node

Node is a metaclass each instance of which represents a representation of a particular node within a schema. Node has one subclass; Enumerated_Node.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description
name	String	0..1	A statement specifying the name for this node.
type	String	0..1	A statement specifying the type of this node. Examples are "simple", "complex", "group", "sequence", "choice", "element" and "attribute".

namespace	String	0..1	A statement specifying the namespace to be used for this node. This shall only exist if the namespace for the node differs from the namespace specified as the default namespace for the document schema of which this node is a component part or if there is no default specified for the document schema.		
datatype	String	0..1	A statement specifying the datatype for this node.		
minimum_ occurrences	String	0..1	A statement of the minimum number of occurrences of values of this node. In most circumstances this will be “0” (indicating that the note is optional) or “1” (indicating that the node is mandatory).		
maximum_ occurrences	String	0..1	A statement of the maximum number of occurrences of values of this node. In most circumstances this will be “1” or “unbounded”.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
containing_ schema	Document_ Schema	1..1	The schema that contains this node.	node_model_ element	No
object_reuse	Schema_ Reuse	0..*	The set of schema reuses that record that this node reuses a schema (the reused schema).	recipient_ node	Yes
inferior_ relationship	Node_ Relationship	0..*	The set of node relationships through which this node is the parent of other nodes.	parent_node	Yes
superior_ relationship	Node_ Relationship	0..*	The set of node relationships through which this node is the child of other nodes.	child_node	Yes

Constraints

[None]

5.3.7 Node_Enumeration

Node_Enumeration is a metaclass each instance of which represents a representation of a particular permitted value for an enumerated node.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description		
value	String	1..1	A specification of the actual permitted value.		
annotation	String	0..1	A statement describing the meaning of the value.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
enumerated_node	Enumerated_Node	1..1	The enumerated node for which this value is a permitted value.	node_enumeration	No

Constraints

[None]

5.3.8 Node_Relationship

Node_Relationship is a metaclass each instance of which represents a representation of a particular relationship between two nodes.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description	Inverse	Precedence
[None]					
Reference	Class	Multiplicity	Description	Inverse	Precedence
node_relationship_categorisation	Node_Relationship_Type	1..1	The categorisation of this node relationship.	categorised_node_relationship	No
parent_node	Node	1..1	The referenced node that is the parent node in this node relationship.	inferior_relationship	No
child_node	Node	1..*	The set of referenced nodes, each element of which is a child node in this node relationship.	superior_relationship	No

Constraints

[None]

5.3.9 Node_Relationship_Type

Node_Relationship_Type is a metaclass each instance of which represents a representation of a particular categorisation of a set of node relationships.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description	Inverse	Precedence
designation	String	1..1	A statement specifying the category of the associated node relationships.		
description	String	0..1	A statement explaining the meaning of the designation statement for this node relationship type.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
categorised_node_relationship	Node_Relationship	0..*	The set of node relationships that are categorised by this node relationship type.	node_relationship_categorisation	Yes

Constraints

[None]

5.3.10 Restricted_Node

Restricted_Node is a metaclass each instance of which represents a representation of a particular type of node within a schema, a node for which there is a restriction, such as a pattern, placed upon the values of the node.

Superclass

Node

Attribute	DataType	Multiplicity	Description
restriction_base	String	0..1	A statement specifying the datatype within which each of the values of the node is to be specified.
restriction_pattern	String	0..1	A statement specifying any pattern that is to be applied to the values specified for the node.

Reference	Class	Multiplicity	Description	Inverse	Precedence
[None]					

Constraints

[None]

5.3.11 Schema_Reuse

Schema_Reuse is a metaclass each instance of which represents a representation of a particular schema reuse within another schema or of a particular schema reuse as a node within a schema.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description		
associated_namespace	String	0..1	A statement of any namespace associated with the reused schema.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
schema_reuse_categorisation	Schema_Reuse_Type	1..1	The categorisation of this schema reuse.	categorised_schema_reuse	No
reused_schema	Document_Schema	1..1	The schema that is reused through this schema reuse.	subject_reuse	No
recipient_schema	Document_Schema	1..1	The schema that reuses the schema designated as the reused schema cited in this schema reuse.	object_reuse	No
recipient_node	Node	1..1	The node that reuses the schema designated as the reused schema cited in this schema reuse.	object_reuse	No

Constraints

One, but not both, of recipient_schema or recipient_node shall exist.

5.3.12 Schema_Reuse_Type

Schema_Reuse_Type is a metaclass each instance of which represents a representation of a particular categorisation of a set of schema reuses.

Superclass

Model_Element (which shall be in accordance with [A1](#) ISO/IEC 19763-10:2023, 6.3 [A1](#))

Attribute	DataType	Multiplicity	Description		
designation	String	1..1	A statement specifying the category of the associated schema reuses.		
description	String	0..1	A statement explaining the meaning of the designation statement for this schema reuse type.		
Reference	Class	Multiplicity	Description	Inverse	Precedence
categorised_schema_reuse	Schema_Reuse	0..*	The set of node relationships that are categorised by this node relationship type.	schema_reuse_categorisation	Yes

Constraints

[None]

Annex A (informative)

Description of the metamodel

[Figure A.1](#) repeats the metamodel for the registration of document models, which is then informally described in detail.

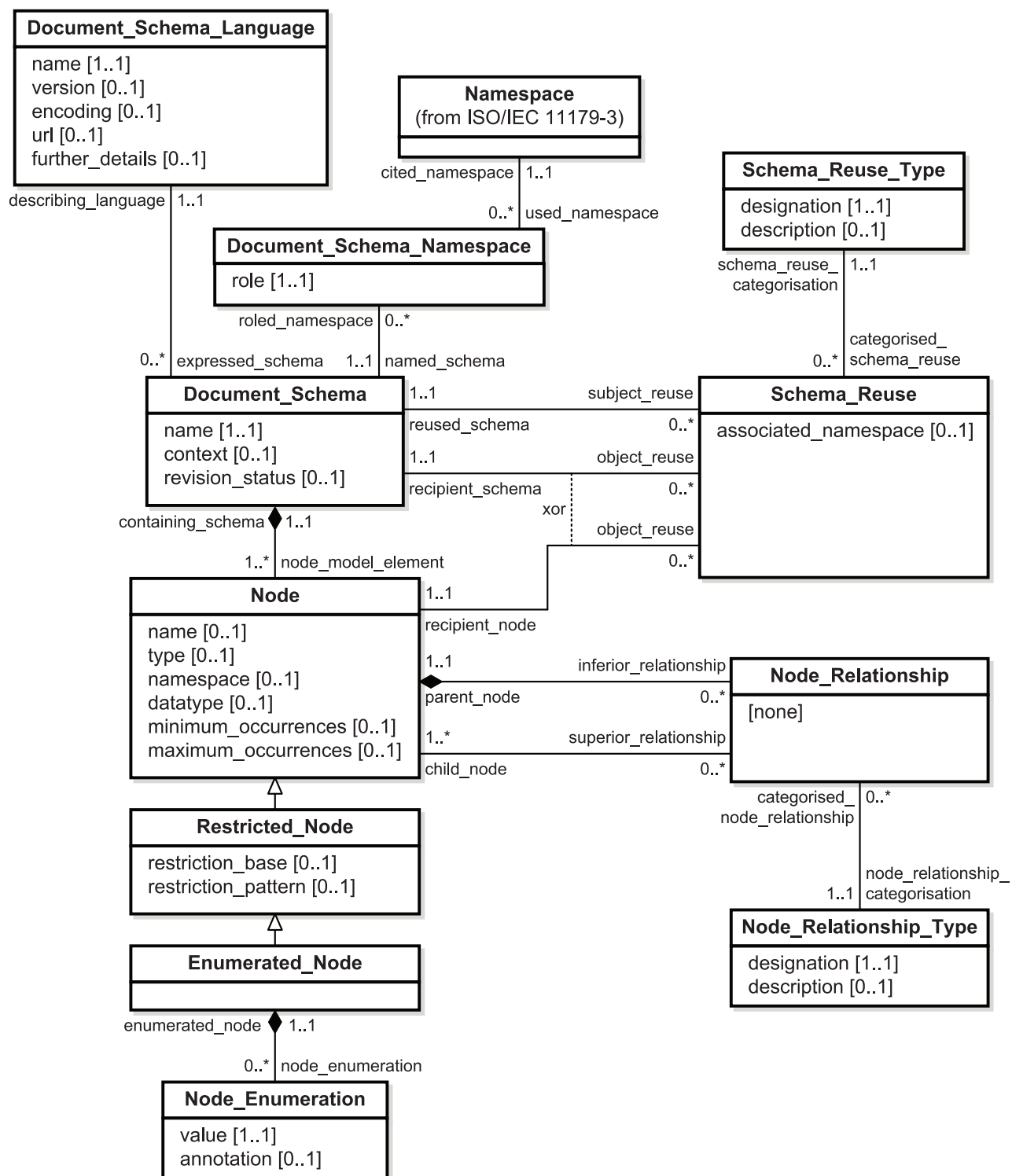


Figure A.1 — Metamodel of MFI Document model registration (repeated)

Each document schema language is a language or notation that is used to model information requirements in a document schema. In addition, each document schema language:

- may be the language used to express zero, one or more document schemas (each of which are an expressed schema); not every document schema language has to be used to express a document schema;
- shall have a name, which is a unique name by which this document schema language is known;

- may have a version, which is a statement specifying the version of this particular document schema language; not every document schema language has to have a version;
- may have an encoding, which is a statement specifying the encoding that is used within this particular document schema language; not every document schema language has to have an encoding;
- may have a URL, which is a statement specifying the URL that may be used to access the specification of this particular document schema language; not every document schema language has to have a URL;
- may have a further_details, which is a statement providing any necessary further details necessary to unambiguously specify this particular document schema language; not every document schema language has to have a further_details.

Each document schema is a textual representation of the information to be included in documents that conform to this document schema. In addition, each document schema:

- shall be expressed in one and only one document schema language (the describing language);
- shall be comprised of one or more nodes (each of which are node model elements);
- may be specified with zero, one or more document schema namespaces (each of which are a roled namespace); not every document schema has to be specified with a document schema namespace;
- may be reused within zero, one or more schema reuses (each of which are a subject reuse); not every document schema has to be specified with a subject schema reuse;
- may be reuser of subject schema cited in zero, one or more schema reuses (each of which are an object reuse); not every document schema has to be specified with an object schema reuse;
- shall have a name, which is a unique name by which this document schema is known;
- may have a context, which is a description of the universe of discourse covered by the document schema; not every document schema has to have a context;
- may have a revision_status, which is a statement describing revision or version status of this document schema; not every document schema has to have a revision_status.

Each document schema namespace is a representation of a particular namespace that is cited within a document schema. In addition, each document schema namespace:

- shall be specified with one and only one namespace (the cited namespace);
- shall be specified for one and only one document schema (the named schema);
- shall have a role, which is a specification of the role that the specified namespace is playing within the related document schema; examples are “Target”, “Prefix” and “Default”.

Each namespace is a set of designations or scoped identifiers for a particular need. In addition to the attributes and relationships defined in the MDR Metamodel, each namespace shall be specified with one and only one document schema namespace (the used namespace).

Each node is a representation of a particular node within a document schema. In addition, each node:

- may be specialised as a restricted node; not every node has to be specialised as a restricted node;
- shall be within one and only one document schema (the containing schema);
- may be reuser of subject schema cited in zero, one or more schema reuse (each of which is an object reuse); not every node has to be specified with an object schema reuse;
- may be specified as superior node within zero, one or more node relationships (each of which is a superior relationship); not every node has to be specified as superior node within a node relationship;