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**Information technology — MPEG systems  
technologies —**

**Part 2:  
Fragment request units**

*Technologies de l'information — Technologies des systèmes MPEG —*

*Partie 2: Unités de demande de fragment*  
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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. 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.

ISO/IEC 23001-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 23001 consists of the following parts, under the general title *Information technology — MPEG systems technologies*:

- *Part 1: Binary MPEG format for XML* [ISO/IEC 23001-2:2008](https://standards.iteh.ai/catalog/standards/sist/969402c8-d500-44d2-8481-96615e3c6410/iso-iec-23001-2-2008)
- *Part 2: Fragment request units*
- *Part 3: XML IPMP messages*
- *Part 5: Bitstream Syntax Description Language (BSDL)*

## Introduction

Today the use of Extensible Markup Language (XML) for many applications is widespread. This includes ISO International Standards such as ISO/IEC 15938 and ISO/IEC 21000. In addition there is increasing growth of applications being developed for resource constrained environments such as mobile platforms and set top boxes. Information utilized by such applications is often expressed in XML. When the size of such XML documents can be large, it is desirable to be able to request only those fragments of the XML required at a given time by the application. The technology in this International Standard is intended to address this.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of a patent.

The ISO and IEC take no position concerning the evidence, validity and scope of this patent right.

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# Information technology — MPEG systems technologies —

## Part 2: Fragment request units

### 1 Scope

This part of ISO/IEC 23001 specifies the fragment request unit technology. It comprises a syntax and semantics for expressing a request for fragments of XML. It also specifies how such requests can be used in XML based systems such as ISO/IEC 15938-1 and ISO/IEC 23001-1. The technology can be used in resource constrained environments so that only the fragments of XML of interest at a given time need be transmitted to a requesting peer from a responding peer. It can also be used for node-by-node navigation of a remote XML document.

### 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/IEC 15938-1, *Information technology — Multimedia content description interface — Part 1: Systems*

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, IETF Request For Comments, January 2005

W3C XML, *Extensible Markup Language (XML) 1.0 (Fourth Edition)*, W3C Recommendation, 29 September 2006

W3C XML NAMES, *Namespaces in XML 1.0 (Second Edition)*, W3C Recommendation, 16 August 2006

W3C XML SCHEMA, *XML Schema Part 1: Structures Second Edition* and *XML Schema Part 2: Datatypes Second Edition*, W3C Recommendations, 28 October 2004

W3C XPATH 1, *XML Path Language (XPath) Version 1.0*, W3C Recommendation, 16 November 1999

### 3 Terms and definitions

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

#### 3.1

##### **context processor**

part of a system that maintains information on the current Navigation or Query context resulting from processing FRUs

#### 3.2

##### **fragment**

##### **XML document fragment**

portion of an XML document that need not be a well-formed XML document on its own but shall conform to the *content* production of W3C XML

NOTE In the Document Object Model (DOM) [2] this corresponds to a DocumentFragment

**3.3**

**FRU processor**

part of a system that composes an FRU based on Query or Navigation information from the application layer (and possibly context information) and places it in an FRU Request for transport via the delivery layer and that receives FRU Requests and makes the FRU available for processing

NOTE This part of ISO/IEC 23001 defines syntax and semantics of the FRUs, it does not normatively define the interface between the application layer and the systems layer. This will be dependent on the system in which the FRUs are being processed. See also Clause 6.

**3.4**

**FRU Request**

system defined container that contains an FRU that can be transported over the delivery layer used by the system

NOTE This part of ISO/IEC 23001 defines syntax and semantics of the FRUs, it does not normatively define the composition of the FRU Requests. This will be dependent on the system in which the FRUs are being processed. See also Clause 6.

**3.5**

**FRU Response**

system defined container that contains an XML document fragment(s) resulting from processing of an FRU that can be transported over the delivery layer used by the system

NOTE This part of ISO/IEC 23001 defines syntax and semantics of the FRUs, it does not normatively define the composition of the FRU Responses. This will be dependent on the system in which the FRUs are being processed. See also Clause 6.

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**3.6**

**FRU response processor**

part of a system that composes FRU Responses containing the XML document fragments resulting from processing of an FRU for transport via the delivery layer and that receives FRU Responses for forwarding of the delivered XML document fragments to the application layer

**3.7**

**Navigation**

traversing the structure of an XML document either on a node-by-node basis or a level-by-level basis

**3.8**

**null FRU Response**

FRU Response that contains no XML document fragment

NOTE While a null FRU Response contains no XML document fragment, it might contain additional system defined information dependent on the system in which the FRUs are being used. See also Clause 6.

**3.9**

**requesting peer**

system that composes FRU Requests, transmits them to the responding peer, and receives the FRU Responses

NOTE While typically the requesting peer and responding peer will be different physical systems they could also be on the same physical system. In terms of software systems they could also be the same software system, for example for purposes of simulation.

**3.10**

**responding peer**

system that receives FRU Requests, processes them to extract the XML document fragments from the source document, composes the FRU Responses and transmits them to the requesting peer



**3.11****source document****XML source document**

the XML document subject to Navigation and/or Query and from which fragments are being requested

**3.12****Query**

search or interrogate an XML document through the use of a query language

**4 Abbreviated terms**

For the purposes of this document, the following abbreviations apply.

<b>AU:</b>	Access Unit, as defined in ISO/IEC 15938-1
<b>BiM:</b>	Binary MPEG format for XML, as defined in ISO/IEC 23001-1
<b>DOM:</b>	Document Object Model [2]
<b>FRU:</b>	Fragment Request Unit
<b>FUU:</b>	Fragment Update Unit, as defined in ISO/IEC 15938-1
<b>HTTP:</b>	Hypertext Transfer Protocol [1]
<b>MPEG:</b>	Moving Picture Experts Group
<b>MPEG-21:</b>	ISO/IEC 21000
<b>MPEG-7:</b>	ISO/IEC 15938-7
<b>MPEG-B:</b>	ISO/IEC 23001
<b>SOAP:</b>	SOAP Version 1.2 [3]
<b>TeM:</b>	Textual format for Multimedia description schemes, as defined in ISO/IEC 15938-1
<b>URI:</b>	Uniform Resource Identifier, as defined in IETF RFC 3986
<b>W3C:</b>	World Wide Web Consortium
<b>XML:</b>	Extensible Markup Language, as defined in W3C XML

**5 Overview**

Fragment request units (FRUs) provide a standard syntax and semantics to request fragments of an XML document. This allows requesting only fragments of an XML document that are of immediate interest be transmitted without the need to transmit the entire XML document. This significantly reduces processing and storage requirements for the requesting peer and can enable applications on constrained devices that would not otherwise be possible. FRUs enable the requesting application to maintain control over how and what parts of the XML document are delivered.

**NOTE** A typical scenario for the use of FRUs in the context of ISO/IEC 15938-1 is as follows: The application requests a fragment of an XML document. The ISO/IEC 15938-1 Systems layer composes this request into an FRU (optionally binarised using BiM), which is provided to the delivery layer. The remote device responds with one or more ISO/IEC 15938-1 Fragment Update Units (optionally binarised using BiM), which are received by the delivery layer and processed by the ISO/IEC 15938-1 Systems Layer before being passed to the application. The application may request

further fragments based on the FUU's received or on other information. This scenario provides a description of how FRUs can be used in the context of ISO/IEC 15938-1 (see also Annex B), however the use of ISO/IEC 15938-1 for handling FRUs (and vice versa, that is use of FRUs in ISO/IEC 15938-1) is not normative.

Fragments of an XML document can be requested for the purpose of Navigation through, or Querying of the remote XML document.

Navigation involves stepping through the XML structure either on a node-by-node basis (i.e. one selected element at a time) or a level-by-level basis (i.e. immediate child nodes of a selected element), retrieving only the nodes relevant to the node or level.

Querying allows queries to be performed on the remote XML document (i.e. sending an FRU with an XPath expression) to request fragments based on the result of the XPath expression.

## 6 Systems model

This International Standard specifies the standard syntax and semantics for FRUs to allow requesting of XML document fragments using this standard syntax and semantics. Thus FRUs provide a standard syntax and semantics for expressing a request for XML document fragments.

However, FRUs do not operate in isolation, and instead are incorporated in to systems that require the functionality enabled by FRUs. Within such a system an FRU is composed from information supplied by the application, placed in to an FRU Request appropriate for the system, and the FRU Request is transported to another system. The responding system extracts the FRU from the FRU Request, processes the FRU, places the XML document fragments in to an FRU Response appropriate for the system, and the FRU Response is transported to the requesting system.

FRUs can be utilized in any system that provides this basic model of operation for FRUs. This International Standard does not normatively specify any such system or parts of such a system. However this clause provides a descriptive model of how FRUs could operate within a system. Only those parts of the system dealing with FRUs are described. Other parts of the system will be dependent on the system in which the FRUs are being processed.

EXAMPLE 1 Transport of FRU requests and their responses could use well known and standardized protocols such as SOAP or HTTP.

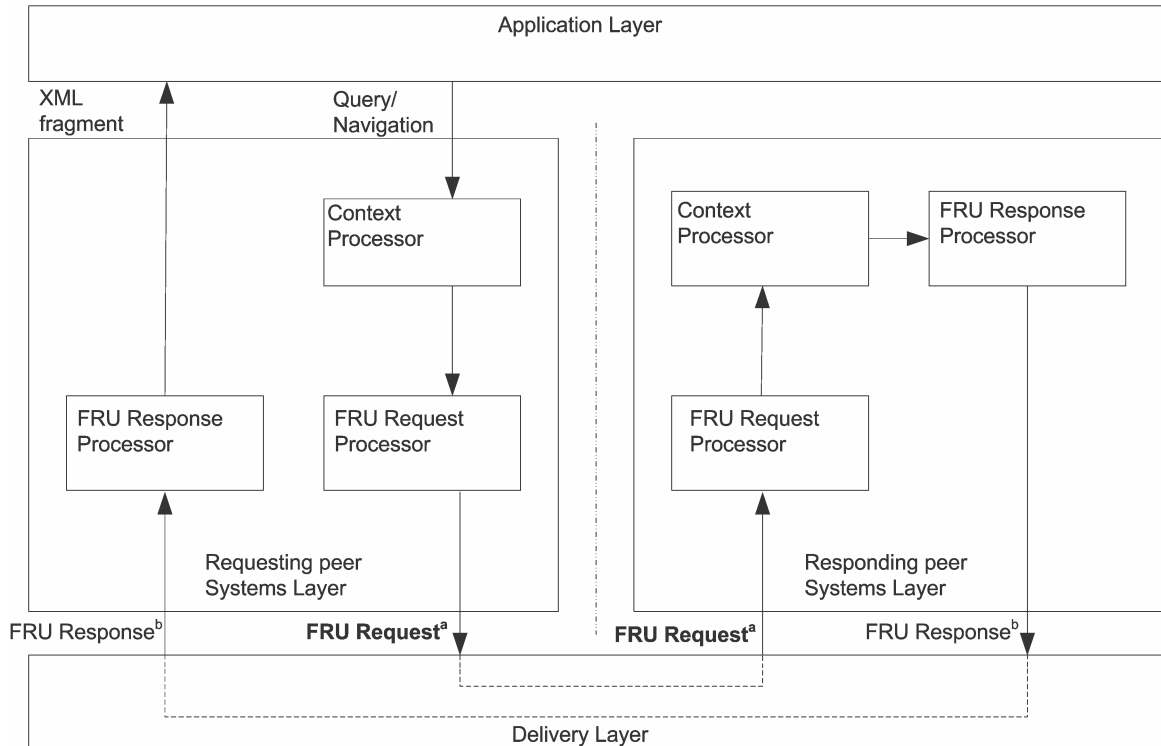
EXAMPLE 2 Prior to transport, a system could also encode FRUs, for example using BiM.

A requesting peer issues Navigation or Query requests from the application layer to the systems layer. This request is processed to determine if path context is to be retained (required for XMLPull operations and XPaths utilizing the ./ notation). The FRU shall be composed according to the syntax defined in clause 7 and an FRU Request assembled as appropriate for the system in use. The FRU Request is delivered to the responding peer via the delivery layer.

A responding peer receives an FRU Request, extracts and processes the FRU and determines its context. The appropriate operations shall be executed according to the semantics defined in clause 7. The operations are executed against the XML source document identified by a previous SRC operation. The result of the operations will be the appropriate XML document fragment(s). An FRU Response containing the XML document fragment(s) is assembled as appropriate for the system in use and delivered back to the requesting peer.

The XML document fragments are extracted from the FRU Response and delivered to the application layer.

NOTE 1 In some systems the XML document fragments might not be delivered directly to the application layer. For example in the context of ISO/IEC 15938-1 the fragments are received directly as FUU's in to the ISO/IEC 15938 systems layer and instead of being delivered to the application directly, are applied to update the current document tree as per ISO/IEC 15938-1.



<sup>a</sup> This International Standard normatively defines the syntax and semantics for the Fragment Request Units (FRUs).

<sup>b</sup> ISO/IEC 15938-1 defines the syntax and semantics for Fragment Update Units (FUUs) that are contained in the FRU Response.

**Figure 1 — FRU systems model**

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The number of FRU Responses sent in response to an FRU Request is dependent on the system. In the simplest case there might be a single FRU Response for each FRU Request. In this case the FRU Response should allow for responding to multiple operations in a single FRU and for an operation that results in multiple XML document fragments. For FRUs containing multiple operations, the resulting XML document fragments should be forwarded to the application in the same order as the corresponding operations as they appear in document order in the FRU.

NOTE 2 A system could allow out of order responses if, for example, it also included in the FRU Request and FRU Response some sequencing information.

In other cases a system might use one or more FRU Responses per FRU Request.

NOTE 3 In such a system the FRU Response processor might collect the XML document fragments delivered in the FRU Responses until all the XML document fragments resulting from a given FRU are received, then forward these to the application layer.

If processing an FRU fails on the responding peer, a null FRU Response should be delivered back to the requesting peer. The responding system may also respond with an error response appropriate for the system in use.