INTERNATIONAL STANDARD

ISO/IEC 15938-12

First edition
2008-12-15

Information technology — Multimedia content description interface —

Part 12: Query format

Technologies de l'information — Interface de description du contenu multimédia —

Partie 12: Format de requête

Reference number
ISO/IEC 15938-12:2008(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 15938-12 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 15938 consists of the following parts, under the general title *Information technology — Multimedia content description interface*:

— *Part 1: Systems*

— *Part 2: Description definition language*

— *Part 3: Visual*

— *Part 4: Audio*

— *Part 5: Multimedia description schemes*

— *Part 6: Reference software*

— *Part 7:* Conformance testing

— *Part 8: Extraction and use of MPEG-7 descriptions*

— *Part 9: Profiles and levels*

— *Part 10: Schema definition*

— *Part 11: MPEG-7 Profile schemas*

— *Part 12: Query format*

Introduction

The MPEG-7 standard, also known as the "Multimedia Content Description Interface", aims at providing standardized core technologies allowing the description of audiovisual data content in multimedia environments. This is a challenging task given the broad spectrum of requirements and targeted multimedia applications, and the broad number of audiovisual features of importance in such a context. In order to achieve this broad goal, MPEG-7 standardizes:

- Datatypes that are description elements not specific to the audiovisual domain that corresponds to reusable basic types or structures employed by multiple Descriptors and Description Schemes.

- Descriptors (D) to represent Features. Descriptors define the syntax and the semantics of each feature representation. A Feature is a distinctive characteristic of the data, which signifies something to somebody. It is possible to have several descriptors representing a single feature, i.e. to address different relevant requirements. A Descriptor does not participate in many-to-one relationships with other description elements.

- Description Schemes (DS) to specify the structure and semantics of the relationships between their components, which may be both Ds and DSs. A Description Scheme shall have descriptive information and may participate in many-to-one relationships with other description elements.

- A Description Definition Language (DDL) to allow the creation of new DSs and, possibly, Ds and to allow the extension and modification of existing DSs.

- Systems tools to support multiplexing of descriptions or description and data, synchronization issues, transmission mechanisms, file format, etc.

The standard is subdivided into twelve parts:

1. Systems: Architecture of the standard, tools that are needed to prepare MPEG-7 Descriptions for efficient transport and storage, and to allow synchronization between content and descriptions. Also tools related to managing and protecting intellectual property.

2. Description Definition Language: Language for defining new DSs and eventually also new Ds, binary representation of DDL expressions.

3. Visual: Visual description tools (Ds and DSs).

4. Audio: Audio description tools (Ds and DSs).

5. Multimedia Description Schemes: Description tools (Ds and DSs) that are generic, i.e. neither purely visual nor purely audio.

6. Reference Software: Software implementation of relevant parts of the MPEG-7 Standard.

7. Conformance: Guidelines and procedures for testing conformance of MPEG-7 implementations.

8. Extraction and use of MPEG-7 descriptions.

9. Profiles and Levels.

10. Schema Definition.

11. MPEG-7 Profile Schemas.

12. Query Format.

This part of ISO/IEC 15938 contains the tools of the MPEG Query Format (MPQF). It addresses the normative aspects of the MPQF and also illustrates some non-normative examples. The syntax of the Query Format is defined using the guidelines of DDL ISO/IEC 15938-2.

Information technology — Multimedia content description interface —

Part 12: **Query format**

1 Scope

1.1 Organization of the document

This part of ISO/IEC 15938 describes the query format tools which may be used independently or in combination with other parts of ISO/IEC 15938. Each query format tool is described in two normative sections:

- Syntax: Normative specification of the query and management format.
- Semantic: Normative definition of the semantics of all the components of the corresponding query format specification.

In some instances the query format level tool is also described using either one or two informative sections:

- Examples: Optionally an informative section dealing with examples is appended.
- Definitions: Optionally an informative section dealing with definitions is appended.

1.2 Overview of the Query Format

The query format provides a standardized interface for multimedia content information retrieval systems (e.g. MPEG-7 databases) in three aspects which are input query format, output query format, and query managements. The input query format specifies the interface through which the users can describe their search criteria with a set of precise input parameters in addition to a set of preferred output parameters to depict the return result sets. The output query format specifies the interface format for the result set. The query management provides means for selecting services (e.g. MPEG-7 database) or aggregated services (e.g. service provider that administers a set of different services) based on service properties (e.g. supported query format).

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.

XQuery 1.0 and XPath 2.0 Data Model (XDM). W3C Recommendation, 23 January 2007. http://www.w3.org/TR/xpath-datamodel/

XML Path Language (XPath) 2.0. W3C Recommendation, 23 January 2007. http://www.w3.org/TR/xpath20/

3 Terms, definitions, abbreviated terms and conventions

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

3.1 Terms and definitions

3.1.1
content
data and the associated **metadata**

3.1.2
evaluation item
EI
unit, against which the query condition is tested

NOTE By default, an EI is a **multimedia content** of the multimedia repository, but other types of EI are also possible. An EI can be:

1) A **multimedia content**;

2) A **segment** of a **multimedia resource**;

3) An **XPath-item** related to the **multimedia content's metadata** XML tree.

3.1.3
input query format
interface format going from a requester to one or more responders with two functionalities

— functionality provides a combination of syntax and semantics of the interface, through which the requester assigns search criteria and associated data;

— functionality provides syntax and semantics of the interface, through which the requester specifies the format of the result data.

NOTE The second functionality of the input query format provides tools by which the requester can express desired output format that should be conformant to the specification of **output query format**.

3.1.4
metadata
data expressed as a schema valid XML instance to carry additional information describing a **multimedia resource**, where the schema defines the information model of the data

3.1.5
multimedia content
coded representation of the information contained in or related to a **multimedia resource** in a formalized manner suitable for interpretation by human means

3.1.6
multimedia resource
URI identifiable portion of raw data of a video, an image, an audio or text in any format, that is associated with a MIME Content-Type

3.1.7
output query format
interface format going from the responder to the requester as a response to the request specified by the **input query format**

NOTE Output query format defines all possible structures of return from responder to the requester. The structure of an actual return shall be decided by OutputDescription element in **input query format**.

3.1.8
query management tools
tools to support the functionality required to manage the query transaction between the requesters and the responders

NOTE The query management tools do not include tools that are supported by network protocols. The query management tools intend to be network agnostic and media agnostic.

3.1.9
segment
spatial, temporal, or spatio-temporal unit of multimedia, for example, a temporal segment of video, or a spatial segment of an image

3.1.10
XPath-item
either a node from the **multimedia content's metadata** XML tree or an atomic value

NOTE Details about the different types of nodes and atomic values can be found in the W3C Recommendation on XQuery 1.0 and XPath 2.0 Data Model. An XPath-item of a **multimedia content's metadata** may or may not be related to a **multimedia content's segment**. Also, a **multimedia content** or a **multimedia content's segment** may or may not be related to XML **metadata**. Within MPQF queries, XPath can be used to select a sequence of **multimedia content's segments** and/or **metadata** XPath-items. According to the W3C Recommendation on XQuery 1.0 and XPath 2.0 Data Model, a sequence is an ordered collection of zero or more XPath-items.

3.2 Abbreviated terms

MPEG: Moving Picture Experts Group

MPEG-7: ISO/IEC 15938

MPQF: MPEG Query Format, ISO/IEC 15938-12

URI: Uniform Resource Identifier (IETF Standard is RFC 2396)

URL: Uniform Resource Locator (IETF Standard is RFC 2396)

XML: Extensible Markup Language (W3C, http://www.w3.org/XML/)

3.3 Conventions

3.3.1 Query and query management tools

This part of ISO/IEC 15938 specifies the format for query and query management tools using XML-Schema.

- Query – A set of tools supporting the definition of the query request as well as the query response defined for the MPEG query format. The structure defined for the `Query` element provides a container for input query format or output query format.
  - Input query format – `Input` and `FetchResult` elements are defined for the query. The input query format structure provides a container for a query request. Such a request should contain a set of conditions and/or the output description which specifies the structure and content of the output query format and/or a set of declarations.
  - Output query format – The `Output` element is defined for the query. It provides a container for all the responses from a responder to a requester. It may contain not only query results but also any messages such as error and exceptions.
- Management tools – A set of tools for the query management defined for the MPEG query format including service discovery, querying service capability, and service capability description. The structure

defined for the management tools provides a container for input management tools or the output management tools.

- Input management tools – An `Input` element is defined for the management tools intended to be sent from a requester to one or more responders.
- Output management tools – An `Output` element is defined for the management tools intended to be sent from a responder to one or more requesters.

3.3.2 Naming convention

In order to specify tools for the query format, this part of ISO/IEC 15938 uses constructs provided by the language specified in ISO/IEC 15938-2 [1], such as "element", "attribute", "simpleType" and "complexType". The names associated to these constructs are created on the basis of the following conventions:

- If the name is composed of various words, the first letter of each word is capitalized. The rule for the capitalization of the first word depends on the type of construct and is described below.
- Element naming: the first letter of the first word is capitalized (e.g. TimePoint element of TimeType).
- Attribute naming: the first letter of the first word is not capitalized (e.g. timeUnit attribute of IncrDurationType).
- complexType naming: the first letter of the first word is capitalized, the suffix "Type" is used at the end of the name, except the concrete types inherited from abstract types.
- simpleType naming: the first letter of the first word is not capitalized, the suffix "Type" may be used at the end of the name (e.g. timePointType).

NOTE The full name of the complexType or simpleType is used when referencing a complexType or simpleType in the definition of the query format.

3.3.3 Documentation convention

The syntax of each datatype, descriptor and description scheme is specified using the constructs provided by ISO/IEC 15938-2 [1], and is shown in this part of ISO/IEC 15938 using a specific font and background:

```
<complexType name="ExampleType">
   <sequence>
      <element name="Element1" type="string" minOccurs="1" maxOccurs="1"/>
   </sequence>
   <attribute name="attribute1" type="string" use="default" value="attrvalue1"/>
</complexType>
```

The semantics of each datatype, descriptor and description scheme is specified using a table format, where each row contains the name and a definition of a type, element or attribute:

Name	*Definition*
ExampleType	Specifies an ...
element1	Describes the …
attribute1	Describes the …

Non-normative examples are included in separate sections, and are shown in this part of ISO/IEC 15938 using a separate font and background:

```
<Example attribute1="example attribute value">
   <Element1>example element content</Element1>
</Example>
```

Moreover, the schema defined in this part of ISO/IEC 15938 follows a type-centric approach. As a result, almost no elements (in the XML schema sense) are defined. Most of the description tools are specified only by defining a complexType or a simpleType. In order to create a description, it has to be assumed that an element of a given type (complexType or simpleType) has been declared somewhere in the schema, for example as a member of another complexType or simpleType.

The examples in the informative sections assume that the following declaration has been made:

```
<element name="Example" type="mpqf:MyToolType">
```

Therefore, the example shown above is a valid description.

3.3.4 Wrapper convention of the schema

The Syntax defined in this part of ISO/IEC 15938 assumes the following schema wrapper.

```
<schema xmlns:mpqf="urn:mpeg:mpqf:schema:2008"
xmlns="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:mpeg:mpqf:schema:2008" elementFormDefault="qualified"
attributeFormDefault="unqualified">
```


4 Structure and Data Model

4.1 Structure

The Query Format defines the interface between a requester and a responder. The requester may be any requester and the according responder might be the service provider, which can in turn additionally be a requester to a number of other databases. Additionally, one or more service providers can utilize the Query Format acting as responder from the requester side and as requester, when forwarding the messages to a number of databases. Furthermore, the service provider may have the capability to aggregate the results from different databases and to reply a combined result to the requester. Figure 1 depicts a possible setup for the use of the MPEG Query Format.

The part of the query format related to the messages from the requester to the responder, describing their search criteria, is called Input Query Format; the part of the query format related to the messages in return is called Output Query Format. Additionally, the format for the management messages provides means for selecting services (e.g., MPEG-7 database) or aggregated services (e.g., service provider that administers a set of different services) based on service properties (e.g., supported query format, etc.).

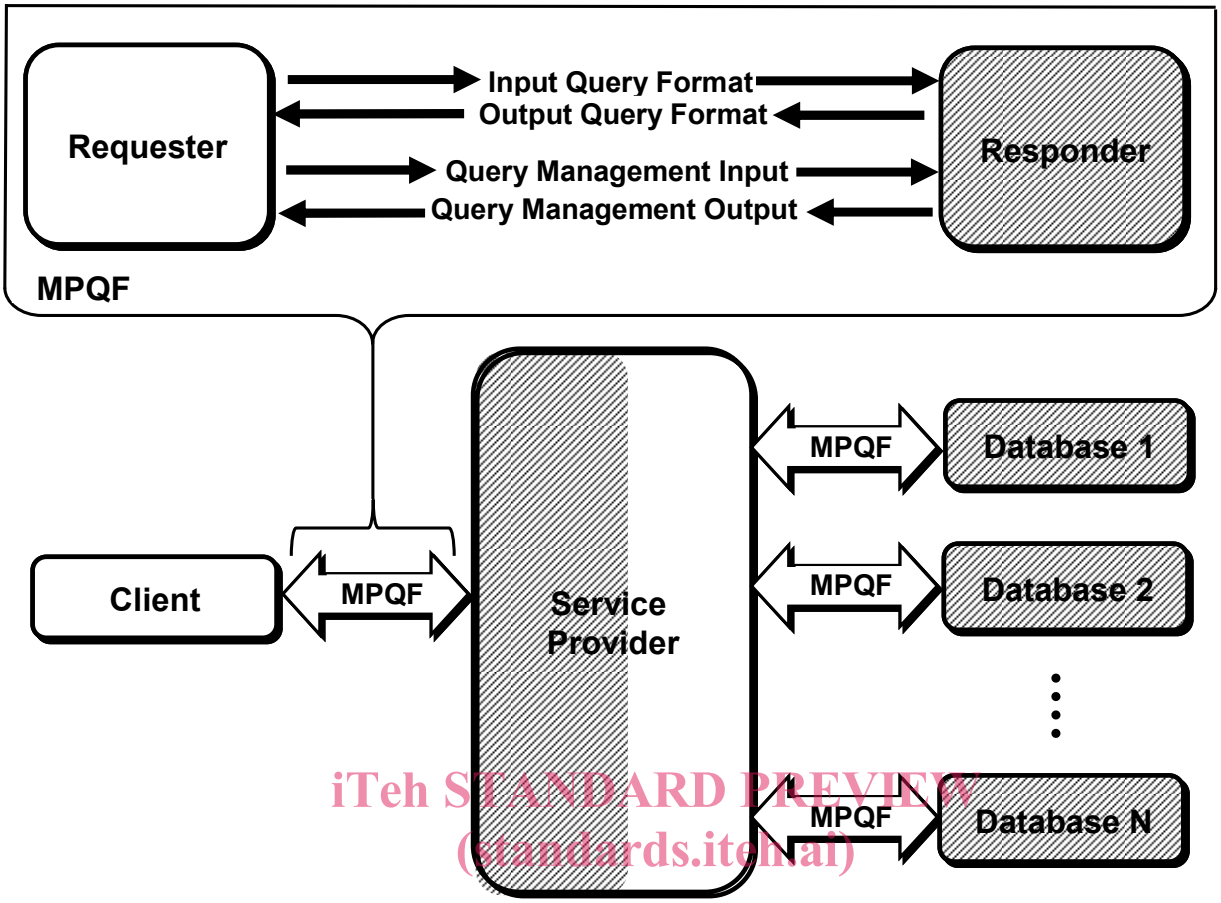

Figure 1 — Possible scenario for the use of the MPEG Query Format

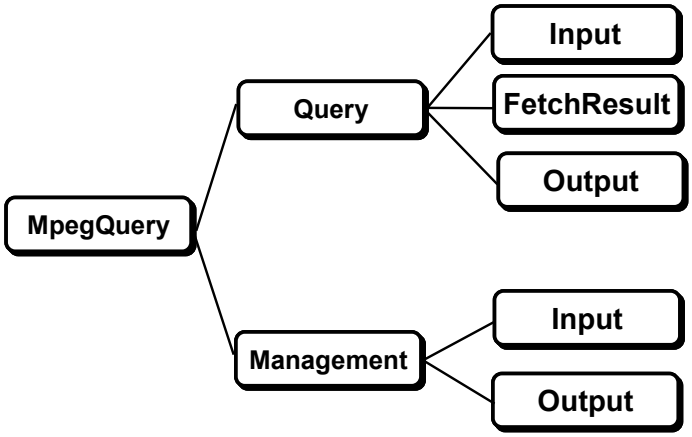

Figure 2 — Schema overview of the uppermost elements of the MPEG Query Format

The root element of the MPEG Query Format is named “MpegQuery” and it contains a sequence of `Query` and `Management` elements. Table 1 explains both elements in more detail:

Table 1 — Query and Management elements

`Query`	A set of tools are defined for the query and response for the MPEG Query Format. The structure defined for the `Query` element provides a container for Input Query Format or Output Query Format.
`Management`	A set of tools for the query management defined for the MPEG Query Format including service discovery, querying service capability, and service capability description. The structure defined for the `Management` element provides a container for Management Input Tools or the Management Output Tools.

The `Query` element of the MPEG Query Format defines a set of tools for the query and its response. Table 2 depicts the containing elements in more detail. Note that the `Input` and the `FetchResult` elements belong to the Input Query Format, which provides a container for describing a query request (e.g., the query condition and/or the output description which specifies the structure and content of the output query format).

Table 2 — Elements in Query Tools

`Input`	The `Input` element is part of the Input Query Format. Its structure provides a container for describing a query request. Such a request can consist of a query condition and/or the output description which specifies the structure and content of the output query format and/or some declaration parts.
`FetchResult`	The `FetchResult` element is also part of the Input Query Format. It allows the user to request the results of a previous query issued using e.g., the asynchronous mode.
`Output`	The `Output` element describes the Output Query Format. It provides a container for all the responses from a responder to a requester. It may contain not only query results but also any messages such as errors, exceptions or comments.

The `Management` element of the MPEG Query Format represents the Query Management Tools of the Query Format. It describes a set of tools for the query management including service discovery, querying service capability, and service capability description. Similar to the query tools (Input Query Format and Output Query Format), the management part distinguishes the tools for the request (Input Management Type) and the response (Output Management Type). Table 3 depicts the containing elements in more detail.

Table 3 — Elements in Query Management Tools

`Input`	The `Input` element, which is defined for the management tools, is intended to be sent from a requester to one or more responders.
`Output`	The `Output` element, which is defined for the management tools, is intended to be sent from a responder to one requester.