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Information technology — Multimedia framework (MPEG-21) —

Part 15:
Event Reporting

Technologies de l'information — Cadre multimédia (MPEG-21) —

Partie 15: Rapport d'événement

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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 21000-15 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 21000 consists of the following parts, under the general title *Information technology — Multimedia framework (MPEG-21)*:

— *Part 1: Vision, Technologies and Strategy* [Technical Report]

— *Part 2: Digital Item Declaration*

— *Part 3: Digital Item Identification*

— *Part 4: Intellectual Property Management and Protection Components*

— *Part 5: Rights Expression Language*

— *Part 6: Rights Data Dictionary*

— *Part 7: Digital Item Adaptation*

— *Part 8: Reference Software*

— *Part 9: File Format*

— *Part 10: Digital Item Processing*

— *Part 11: Evaluation Tools for Persistent Association Technologies* [Technical Report]

— *Part 12: Test Bed for MPEG-21 Resource Delivery* [Technical Report]

— *Part 14: Conformance Testing*

— *Part 15: Event Reporting*

— *Part 16: Binary Format*

⎯ *Part 17: Fragment Identification of MPEG Resources*

⎯ *Part 18: Digital Item Streaming*

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Introduction

Today, many elements exist to build an infrastructure for the delivery and consumption of multimedia content. There is, however, no 'big picture' to describe how these elements, either in existence or under development, relate to each other. The aim for ISO/IEC 21000 is to describe how these various elements fit together. Where gaps exist, ISO/IEC 21000 will recommend which new standards are required. ISO/IEC JTC 1/SC 29/WG 11 (MPEG) will then develop new standards as appropriate while other relevant standards may be developed by other bodies. These specifications will be integrated into the multimedia framework through collaboration between MPEG and these bodies.

The result is an open framework for multimedia delivery and consumption, with both the content creator and content consumer as focal points. This open framework provides content creators and service providers with equal opportunities in the ISO/IEC 21000 enabled open market. This will also be to the benefit of the content consumer providing them access to a large variety of content in an interoperable manner.

The vision for ISO/IEC 21000 is to define a multimedia framework to enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities.

This part of MPEG-21 (ISO/IEC 21000-15) specifies Event Report Requests and Event Reports and how to use these in an ISO/IEC 21000 environment.

Information technology — Multimedia framework (MPEG-21) —

Part 15:
Event Reporting

1 Scope

1.1 General

This part of ISO/IEC 21000 specifies

- how to express Event Report Requests (ER-R) that contain information about which Events to report, what information is to be reported and to whom;

- how to express Event Reports (ER) which are created by an MPEG-21 Peer in response to an Event Report Request when the conditions specified by an ER-R are met.

Event Reports Requests are used for specifying a set of conditions upon which a Peer will generate an Event Report and send it to a Recipient. Event Report Requests also specify what information is to be included in the resulting Event Report. The scope of Event Reporting is limited to reporting of Events between Peers, and does not include internal reporting of Events within a Peer.

1.2 Organisation of the Document

This part of ISO/IEC 21000 comprises nine clauses. This first clause provides scope and the organisation of the specification. Clauses 2 to 5.3 contain a set of references, terms and definitions and abbreviations.

Clause 6 introduces a high level architecture for Event Reporting, while clauses 7 and 8 specify the syntax and semantics of Event Report Requests, and Event Reports. Clause 9 then specifies the data types that are frequently used throughout this part of ISO/IEC 21000.

Finally, Annex A contains the XML Schema definition for the descriptors defined in clauses 7 and 8 and Annex B and Annex C provide examples of Event Report Requests and Event Reports.

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 21000 (all parts), *Information technology — Multimedia framework (MPEG-21)*

IETF RFC 3986, *Uniform resource identifier (URI): Generic syntax*, 2005

W3C, *XML Schema — Part 1: Structures*, Second edition, 2004

W3C, *XML Schema — Part 2: Datatypes*, Second edition, 2004

W3C, REC-xml-names-19990114, *Namespaces in XML*, 14 January 1999

3 Terms and Definitions

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

3.1
Digital Item
structured digital object, including a standard representation, identification and meta-data within the MPEG-21 framework

NOTE   This entity is the fundamental unit of distribution and transaction within the multimedia framework as a whole.

[ISO/IEC TR 21000-1:2004, definition 2.3]

3.2
Digital Item Declaration
declaration of the resources, metadata and their interrelationships of a Digital Item

NOTE   See ISO/IEC TR 21000-2:2005.

3.3
Event
occurrence of a reportable activity

3.4
Event Report
representation of an Event(s) as specified by the related Event Report Request

3.5
Event Reporting
ISO/IEC 21000-15, which provides a means to exchange information about Events, between Peers

3.6
Event Report Request
request to report an Event(s)

3.7
Peer
device or application that compliantly processes a Digital Item

NOTE   The term "Terminal" has been deliberately avoided because of its connotation as being the end point in a chain of communication. However, the term Peer explicitly also includes devices or applications that create or alter Digital Items.

[ISO/IEC TR 21000-1:2004, definition 2.7]

3.8
User
entity that interacts in the MPEG-21 environment or makes use of Digital Items

NOTE   This includes all members of the value chain (e.g., creator, rights holders, distributors and consumers of Digital Items).

[ISO/IEC TR 21000-1:2004, definition 2.9]

4 Symbols and Abbreviated Terms

DI
Digital Item

DID
Digital Item Declaration

DII
Digital Item Identification

ER
Event Report

ERL
Event Reporting Language

ER-R
Event Report Request

RDD
Rights Data Dictionary

REL
Rights Expression Language

URI
Uniform Resource Identifier [IETF RFC 3986]

URL
Uniform Resource Locator [IETF RFC 3986]

URN
Uniform Resource Name [IETF RFC 3986]

5 Namespace and Conventions

5.1 Namespace

The Event Reporting namespace shall be `urn:mpeg:mpeg21:2005:01-ERL-NS`.

5.2 Schema Wrapper

XML Schema declarations and definitions provided as XML fragments are to be understood as fragments of a complete schema and contained within an XML Schema schema element as follows:

```
<?xml version="1.0"?>
<!— Event Reporting ISO/IEC 21000-15 -->
<schema
 targetNamespace="urn:mpeg:mpeg21:2005:01-ERL-NS"
 xmlns="http://www.w3.org/2001/XMLSchema"
 xmlns:dip="urn:mpeg:mpeg21:2005:01-ERL-NS"
 elementFormDefault="qualified" attributeFormDefault="unqualified">
</schema>
```

5.3 Use of namespace prefixes

Throughout this part of ISO/IEC 21000, Qualified Names are written with a namespace prefix followed by a colon followed by the local part of the Qualified Name as shown in the following example:

EXAMPLE   `erl:EventReport`

For clarity, throughout this part of ISO/IEC 21000, consistent namespace prefixes are used. Table 1 gives these prefixes and the corresponding namespace.

Table 1 — Mapping of prefixes to namepsaces in examples and text

Prefix	Namespace
`dia`	`urn:mpeg:mpeg21:2003:01-DIA-NS`
`didl`	`urn:mpeg:mpeg21:2002:02-DIDL-NS`
`dii`	`urn:mpeg:mpeg21:2002:01-DII-NS`
`dip`	`urn:mpeg:mpeg21:2005:01-DIP-NS`
`mx`	`urn:mpeg:mpeg21:2003:01-REL-MX-NS`
`r`	`urn:mpeg:mpeg21:2003:01-REL-R-NS`
`sx`	`urn:mpeg:mpeg21:2003:01-REL-SX-NS`
`mpeg7`	`urn:mpeg:mpeg7:schema:2004`
`xsd`	`http://www.w3.org/2001/XMLSchema`
`xsi`	`http://www.w3.org/2001/XMLSchema-instance`
NOTE The prefixes `xml` and `xmlns` are normatively defined by *Namespaces in XML (see W3C REC-xml-names-19990114)*. All other prefixes are informative and are used by convention for consistency in this part of ISO/IEC 21000.	

For informative examples provided as XML fragments without namespace declarations, the default namespace by convention in this part of ISO/IEC 21000 is defined as `urn:mpeg:mpeg21:2002:02-DIDL-NS` and the different prefixes are bound to the namespaces as listed above. It is to be understood that the appropriate namespace declarations would appear elsewhere in a complete XML document in which the example fragments are contained.

6   Reference Architecture

6.1   Background to Event Reporting

Event Reporting is required within the ISO/IEC 21000 Multimedia Framework in order to provide a standardised means for sharing information about Events amongst Peers and Users. Such Events relate to Digital Items and/or Peers that interact with them.

One example relates to the monitoring of the usage of copyrighted material. The provider offering Digital Items for download would specify in an Event Report Request that, whenever a Resource within a Digital Item is rendered (e.g. played), he would receive an Event Report enabling him to manage his royalties. Upon rendering, the Peer will generate an ISO/IEC 21000 Event Report which will be delivered to the rights holder specified, in an Event Report Request, containing information about the Digital Item, the Resource, and the conditions under which it has been rendered.

In another example, Event Reports are necessary for network nodes to know the exact connectivity condition between two Peers when trying to deliver Digital Items. While a network Peer may receive Digital Items from some Peers and forward them to other Peers in its network, the network Peer will monitor its load. When a

critical threshold is reached, an Event Report may be created and sent to neighbouring network Peers who will in turn re-route their Digital Items to avoid the congested network Peer.

Fundamentally, Event Reporting in ISO/IEC 21000 will benefit Users by:

— Standardising metrics and interfaces for performance of all reportable events in MPEG -21;

— Providing a means of capturing and containing these metrics and interfaces that refers to identified Digital Items, Peers, and Users.
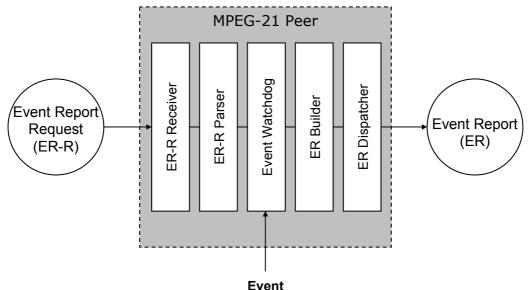
This part of ISO/IEC 21000 will facilitate Interoperability between Event consumers and creators, thereby enabling multimedia usage information to be both requested and represented in a normalized way. Examples where Event Reports may be requested include:

— Usage reports:

— Copyright reports:

  — Monitoring of Copies;

  — Monitoring of Performances;

  — Marketing information;

— Technical reports:

  — Bandwidth usage/availability;

  — Network congestion;

  — Load balancing;

— Financial reports:

  — Proof of purchase;

  — License purchase and delivery.

An Event Report Request (ER-R) is used to define the conditions (predicates) under which an Event is deemed to have occurred. Events defined by ER-Rs trigger the creation of an associated Event Report (ER), which contains information describing the Event, as specified in the associated ER-R.

Figure 1 depicts the general reference architecture for Event Reporting within ISO/IEC 21000. The architecture distinguishes five elements within a Peer that act upon receipt of an Event Report Request. These elements are:

— Event Report Request Receiver (responsible for receiving an Event Report Request from another Peer);

— Event Report Request Parser (responsible for interpreting an Event Report Request);

— Event Watchdog (responsible for monitoring Events and detecting when Event Report Request conditions have been fulfilled);

— Event Report Builder (responsible for assembling reportable Event data and creating an Event Report); and

— Event Report Dispatcher (responsible for taking an Event Report and sending it to the designated recipient Peers).

Event

1. DI-related User operations

2. Peer-related internal processes

Figure 1 — Conceptual Diagram of Event Reporting

Event Reporting is used to report on the occurrence of Events which may be either directly or indirectly related either to a DI or a Peer. Note that it is not normative that an ER is only created as the result of ER-R processing. This means that applications may create Event Reports which are normative on their own initiative.

This part of ISO/IEC 21000 specifies the syntax and semantics of Event Report Requests and Event Reports and how they can be integrated with other parts of ISO/IEC 21000. Note that the functional blocks shown in Figure 1 of the general reference architecture are not normative.

6.2 Creating and Processing Event Reports

Within ISO/IEC 21000 Event Reporting there are two major classes of "reportable" Events:

a) Events which are generated as a result of User-related-operations on a specific instance of a Digital Item; and

b) Events which are generated within a Peer that are related to internal Peer processes.

The Events of type (a) only concern the usage of Digital Items. For example, when a Digital Item is played, this is considered to be a reportable Event as it deals exclusively with operations on a specific Digital Item instance.

In contrast, Events of type (b) are associated with a Peer, rather than a specific Digital Item instance. These Events concern Peer actions and do not need to be related to interaction with Digital Item instances. They can be the result of any internal Peer process. For example, when a Peer detects that it has lost network connectivity, falls into this category.

The handling of Peer-related Events is not currently specified in this part of MPEG-21.

An Event Report Request is defined by a User. It comprises of at least:

— A description of the Event;

— The syntax/format of the Event Report;

⎯ The recipient(s) of the Event Report;

⎯ Parameters related to delivery of the Event Report (e.g. recipients or time of delivery mechanisms).

Upon the Event occurring, an Event Report may be generated and delivered to the specified recipient(s). The Event Report Request may specify that the generation and delivery of an Event Report is mandatory; this would be implemented using, for example, the Event Report Request as an "obligation" of a Rights Expression.

Event Reports, being Digital Items, will inherit their characteristics allowing identification, description and interaction with other parts of ISO/IEC 21000.

6.3   Relationship of Event Reporting with other Parts of ISO/IEC 21000

While it is possible to store and exchange Event Report Requests and Event Reports outside an ISO/IEC 21000 Digital Item this specification defines how Event Report Requests and Event Reports are contained within Digital Items, more specifically a Digital Item Declaration as defined in ISO/IEC 21000-2.

Both ER and ER-R's may be represented within Digital Items, and therefore can natively inherit all of the properties of Digital Items.

When Event Reports Requests and Event Reports are packaged inside a Digital Item, they are encapsulated in *descriptor* elements.

A Digital Item may contain any number of Event Report Requests or Event Reports.

Event Report Request descriptors may be the only *descriptor* in a DI or may be provided alongside other resources.

The conditions associated with an ER-R, and the data items that can be reported within an ER may be retrieved from DIA Tools such as DIA's Usage Environment Description Tool as defined in ISO/IEC 21000-7. Details on how this may be achieved is beyond the scope of this specification.

```
<!-- Example of an Event Report that is embedded inside a Digital Item -->

<didl:DIDL>
  <didl:Container>
    <didl:Item>
      <didl:Descriptor id="dii:ERRID">
       <didl:Statement mimeType="text/xml">
        <erl:ER id="ID000000">
         <erl:ERDescriptor/>
         <erl:ERData/>
        </erl:ER>
       </didl:Statement>
      </didl:Descriptor>
    </didl:Item>
  </didl:Container>
</didl:DIDL>
```

Figure 2 — Example of an Event Report embedded within a Digital Item

Where appropriate, Event Reporting will utilise other parts of ISO/IEC 21000. The syntax for referencing other parts of ISO/IEC 21000 is provided whenever necessary throughout the document.

In the referenced Digital Item, DIDL <Statement> elements may be referenced through the use of XPath. For example, a Statement element can be located via a sequence of location steps, based on the element tag names, e.g. `/DIDL/Item[2]/Descriptor[1]/Statement`.

6.3.1 Identification of Event Report Requests and Event Reports

Event Report Requests and Event Reports may be embedded within Digital Items. When this is the case, it is possible to make use of ISO/IEC 21000-3 (Digital Item Identification) to identify both Event Report Requests and their related Event Reports using standard Digital Item Identification (DII) mechanisms. For example, if an Event Report Request (ER-R) is included inside a Digital Item's Item, then DII can be used to identify that ER-R. The same applies for Event Reports.

6.3.2 Access Control in Event Reporting

This optional clause specifies access rights which will apply to all ER-Rs, and all Event Reports that are generated as a result of processing an ER-R. This clause uses the REL language as defined by ISO/IEC 21000-5. The REL expression, if present, will be inserted at the top level of the Digital Item containing the Event Report Request or the Event Report.

```
<r:licenseGroup xmlns="urn:mpeg:mpeg21:2003:01-REL-R-NS"
  xsi:type="LicenseGroup">
  <mx:License>
    <mx:Grant>
      <mx:principal>Joe User</mx:principal>
      <mx:action>READ</mx:action>
      <mx:resource>
      <SelectionViaXPath>
          /Item/Descriptor/Title[Title='Hey Jude']
      </SelectionViaXPath>
      </mx:resource>
    </mx:Grant>
  </mx:License>
</r:licenseGroup>
```

EXAMPLE   In this example, Joe User is granted the right to read a given element of the Event Report which is specified using XPath.

7 Event Report Requests

7.1 Introduction

As indicated in clause 6, the basic model of Event Reporting indicates that Events that need to be reported may be specified by interested parties through the use of an Event Report Request. The ER-R's purpose is to:

- describe the Event which is to be reported,

- indicate which Peers the Event should be reported to, and

- the data items that are to be included in such an Event Report(s).

The following subclauses provide details on the syntax and semantics of ER-Rs.

7.2 High-level Structure

Event Report Requests are composed of three main sections, where each main section comprises of several parts which are specified in the following subclauses.

If an Event Report Request is packaged within a Digital Item, there are two elements that need to be inserted at the top level of the *item* which contains such an Event Report Request. This is before the Event Report Request Descriptor itself. These 2 elements are:

-Event Report Request identifier (as specified in subclause 6.3.1),
-Event Report Request access control information (as specified in subclause 6.3.2).

If an ER-R does not explicitly specify the items and/or resources that it concerns, its default scope then applies only to the item in which it has been declared. For example, if an ER-R is nested within a DI Item, its scope of validity is limited to the child elements of that Item.

7.2.1 Syntax

```
<!-- ###################################### -->
<!--        Definition of ER-R              -->
<!-- ###################################### -->

<xsd:element name="ERR">

<xsd:complexType>
  <xsd:sequence>
   <xsd:element ref="erl:ERRDescriptor"/>
   <xsd:element ref="erl:ERSpecification"/>
   <xsd:element ref="erl:EventConditionDescriptor"/>
  </xsd:sequence>
</xsd:complexType>
```

7.2.2 Semantics

Name	Definition
ERR	Serves as the root element for describing an entire Event Report Request.
ERRDescriptor	Provides a description of the ER-R including aspects such as the Lifetime, Modifications and Priority level of the ER-R. See subclause 7.3 for a more detailed explanation.
ERSpecification	Provides a specification of the ER(s) which result from the processing of this ER-R. It contains aspects such as the Data items which are to be reported, the format in which they should be reported, details of any (optional) embedded ER-R, etc. See subclause 7.4 for a more detailed explanation.
EventConditionDescriptor	Provides a description of the conditions under which the ER-R is deemed to have occurred. This may relate to DI-Operation-based conditions or Peer-based conditions. See subclause 7.5 for a more detailed explanation.

7.2.3 Example

A complete example of an Event Report Request is provided in Annex B.

7.3 Event Report Request Descriptor

An Event Report Request Descriptor's purpose is to provide a mechanism to allow description of general ER-R parameters. It is in some ways analogous to a "header", often used in communications protocols, since it provides general parameters of the ER-R.

For example, each ER-R includes a lifetime specification, which is used to indicate a validity period for the specific ER-R. Such a parameter is general in nature and can be utilised by all ER-Rs.