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Information technology — Multimedia framework (MPEG-21) —

Part 7: Digital Item Adaptation

Technologies de l'information — Cadre multimédia (MPEG-21) — Partie 7: Adaptation d'article numérique

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Foreword

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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.

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 patents.

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ISO/IEC 21000-7 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*

— *Part 2: Digital Item Declaration*

— *Part 3: Digital Item Identification*

— *Part 5: Rights Expression Language*

— *Part 6: Rights Data Dictionary*

— *Part 7: Digital Item Adaptation*

The following parts are under preparation:

— *Part 8: Reference Software*

— *Part 9: File Format*

— *Part 10: Digital Item Processing*

— *Part 11: Evaluation Methods for Persistent Association Technologies*

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Introduction

The multimedia industry is increasing at a rapid pace. For this industry, the term content is widely used across different segments and applied in many different ways. For this reason the term is deliberately avoided within the context of ISO/IEC 21000 specifications, where it has been replaced by the defined terms Digital Item, media resource and resource. Of equal importance for the specifications of the multimedia framework is the notion of the User. A User of a system includes all members of the value chain (e.g., creator, rights holders, distributors and consumers of Digital Items).

Access devices, with a large set of differing terminal and network capabilities, are making their way into peoples' lives. Additionally, these access devices are used in different locations and environments: anywhere and at anytime. The Users, however, are currently not given tools to deal efficiently with all the intricacies of this new multimedia usage context.

Solutions with advanced multimedia functionality are becoming increasingly important as individuals are producing more and more digital media, not only for professional use but also for their personal use. All these “resource providers” have many of the same concerns: management, re-purposing based on consumer and device capabilities, protection of rights, protection from unauthorised access/modification, protection of privacy of providers and consumers, etc. For example, it is becoming increasingly difficult to identify and understand the different intellectual property rights that are associated with the elements of multimedia resources. The boundaries between the delivery of audio (music and spoken word), accompanying artwork (graphics), text (lyrics), video (visual) and synthetic spaces will become increasingly blurred. New solutions are required to manage the access and delivery process of these different resource types in an integrated and harmonized way, entirely transparent to the many different Users of multimedia services.

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The need of these solutions motivates the initiatives of the ISO/IEC 21000 Multimedia Framework, which aims to enable transparent and augmented use of multimedia resources across a wide range of networks and devices.

This seventh part of ISO/IEC 21000 specifies tools for the adaptation of Digital Items (as specified in ISO/IEC 21000-2).

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Information technology — Multimedia framework (MPEG-21) —

Part 7:
Digital Item Adaptation

1 Scope

1.1 General

This part of ISO/IEC 21000 specifies the syntax and semantics of tools that may be used to assist the adaptation of Digital Items, i.e., the Digital Item Declaration and resources referenced by the declaration. The tools could be used to satisfy transmission, storage and consumption constraints, as well as Quality of Service management by the various Users. It is important to emphasize that the adaptation engines themselves are non-normative tools of this part of ISO/IEC 21000.

1.2 Organization of the document

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This document describes the various Digital Item Adaptation tools specified in part 7 of the ISO/IEC 21000 standard. In the remainder of this part of ISO/IEC 21000, each tool is described by the following subclauses:

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— Syntax: Normative specification of the syntax of the tool using XML Schema.

— Semantic: Normative specification of the semantics of the tool and its components.

— Informative examples: Optionally, informative examples illustrating use of the tool.

1.3 Overview of Digital Item Adaptation

The goal of the Terminals and Networks element described in ISO/IEC 21000-1 is to achieve interoperable transparent access to (distributed) advanced multimedia content by shielding Users from network and terminal installation, management and implementation issues. To achieve this goal, the adaptation of Digital Items is required. This concept is illustrated in Figure 1. As shown in this conceptual architecture, a Digital Item is subject to a resource adaptation engine, as well as a description adaptation engine, which together produce the adapted Digital Item.

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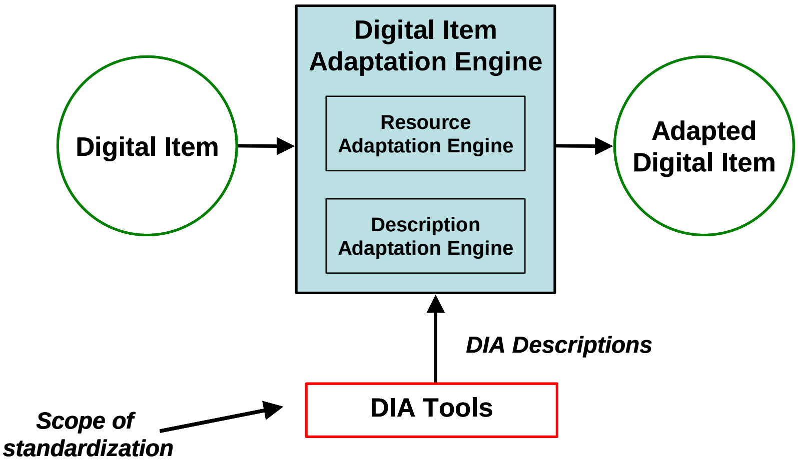

Figure 1 — Illustration of Digital Item Adaptation

It is important to emphasise that the adaptation engines themselves are non-normative tools of Digital Item Adaptation. However, descriptions and format-independent mechanisms that provide support for Digital Item Adaptation in terms of resource adaptation, description adaptation, and/or Quality of Service management are within the scope of the standardization, and are collectively referred to in Figure 1 as DIA Tools.

1.4 Overview of Digital Item Adaptation tools

The Digital Item Adaptation tools in this part of ISO 21000 are clustered into eight major categories as illustrated in Figure 2.

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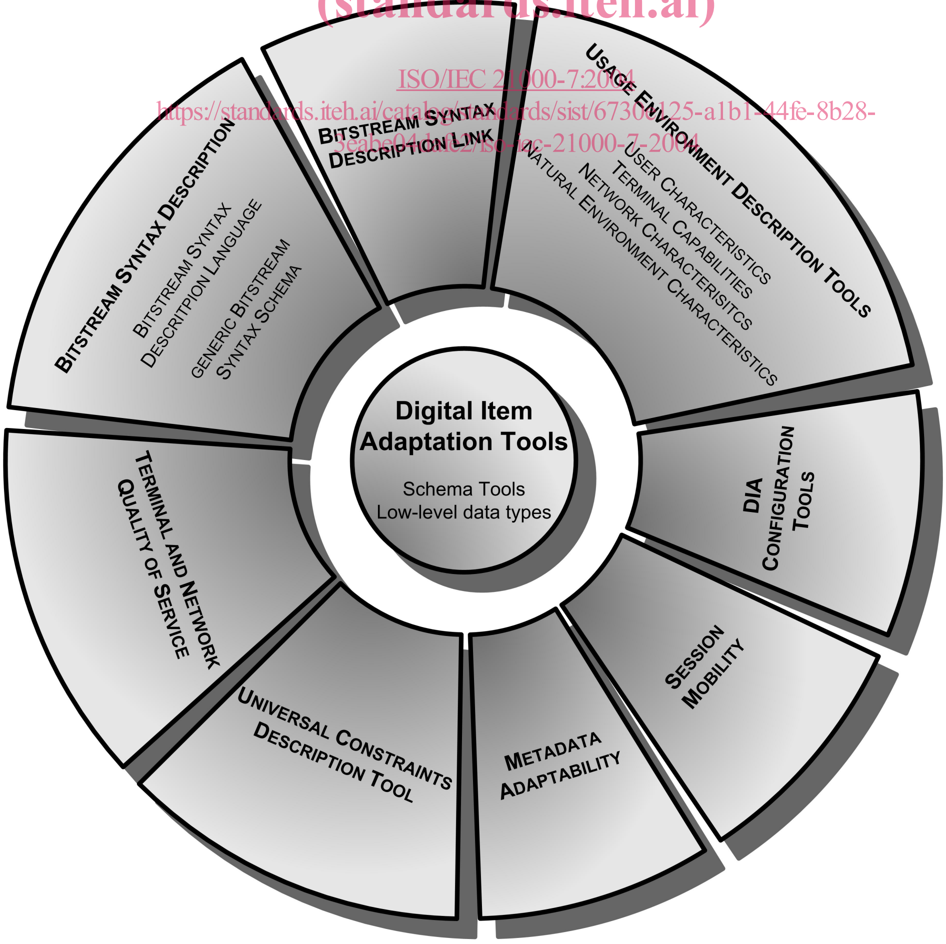

Figure 2 — Overview and organization of Digital Item Adaptation tools

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— The categories are clustered according to their functionality and use for Digital Item Adaptation around the *Schema Tools* and *Low-Level Data Types*. The schema tools provide uniform root elements for all DIA descriptions as well as some low-level and basic datatypes which can be used by several DIA tools independently. The syntax and semantics of the schema tools and low-level datatypes are specified in clause 4 and 5, respectively.

— The first major category is the *Usage Environment Description Tools*, which include User characteristics, terminal capabilities, network characteristics and natural environment characteristics. These tools provide descriptive information about the various properties of the usage environment, which originate from Users, to accommodate, for example, the adaptation of Digital Items for transmission, storage and consumption. The syntax and semantics of these tools are specified in clause 6.

— The second category is referred to as *BSDLink* which provides the facilities to create a rich variety of adaptation architectures based on tools specified within this part of ISO/IEC 21000, ISO/IEC 21000-2, and ISO/IEC 15398 among others. The syntax and semantics of this tool is specified in clause 7.

— *Bitstream Syntax Description* tools comprise the third major category of Digital Item Adaptation tools. A BSD describes the syntax – in most cases, the high level structure – of a binary media resource. Using such a description, a Digital Item resource adaptation engine can transform the bitstream and the corresponding description using editing-style operations such as data truncation and simple modifications. These tools are specified in clause 8.

— The fourth category of tools is referred to as *Terminal and Network Quality of Service*. The tools specified in this category describe the relationship between QoS constraints (e.g., on network bandwidth or a terminal's computational capabilities), feasible adaptation operations satisfying these constraints and associated media resource qualities that result from adaptation. This set of tools therefore provides the means to trade-off these parameters with respect to quality so that an adaptation strategy can be formulated and optimal adaptation decisions can be made in constrained environments. The syntax and semantics of these tools are specified in clause 9.

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— The *Universal Constraints Description Tools* form the fifth category of tools which enables the possibility to describe limitation and optimisation constraints on adaptations. The syntax and semantics of these tools are specified in clause 10.

— The sixth category is referred to as *Metadata Adaptability*. This tool specifies hint information that can be used to reduce the complexity of adapting the metadata contained in a Digital Item. On the one hand, they are used for filtering and scaling, and on the other hand, for integrating XML instances. The syntax and semantics of this tool are specified in clause 11.

— For *Session Mobility*, the seventh category of tools, the configuration state information that pertains to the consumption of a Digital Item on one device is transferred to a second device. This enables the Digital Item to be consumed on the second device in an adapted way. The syntax and semantics of these tools are specified in clause 12.

— Finally, the eighth category of tools is referred to as *DIA Configuration Tools*, which provides information required for the configuration of a Digital Item Adaptation Engine. The syntax and semantics of these description tools are specified in clause 13.

1.5 Relation between Digital Item Adaptation and other parts of ISO/IEC 21000

The Digital Item is the fundamental unit of distribution and transaction in the Multimedia Framework. While the different parts of ISO/IEC 21000 deal with the components and different aspects of Digital Items, together they form a complete integrated interoperable framework. This subclause describes the relationship of this part of ISO/IEC 21000 with the other parts of ISO/IEC 21000 in addressing the specific function of adapting Digital Items.

ISO/IEC 21000-2 enables the declaration of Digital Items. A Digital Item is a packaging of resources, descriptions and rights expression. A Digital Item may contain elements that conform to ISO/IEC 21000-3,

ISO/IEC 21000-4, ISO/IEC 21000-5, ISO/IEC 21000-6, and tools that are defined in this part of ISO/IEC 21000.

A Digital Item may be input to a Digital Item Adaptation Engine. The Adaptation Engine can modify the input Digital Item by adapting the resources or metadata within the Digital Item or the declaration of the Digital Item to the usage environment. Additionally, the identifiers and rights expressions pertaining to the adapted Digital Item need not be the same as those pertaining to the input Digital Item. This specification deals with adaptation but specifically does not address the relationship of rights and permissions to adaptations. The relationship of rights and permissions is to be addressed in an amendment to this part of ISO/IEC 21000. It is expected that users of this part of ISO/IEC 21000 will register terms describing their specific adaptations with the Registration Authority described in ISO/IEC 21000-6 in order to provide interoperability.

1.6 Relation between Digital Item Adaptation and ISO/IEC 15938

ISO/IEC 15938 is a standard for multimedia content description. For the most part, the description of multimedia content is used to satisfy a User's request for the resources contained in a particular Digital Item. This search would be carried out by a search engine. However, given the Digital Item of interest, ISO/IEC 15938 descriptions could also be used in the adaptation process. For example, ISO/IEC 15938 offers tools for the summarization of media resources, tools that provide transcoding hints about the media resources, and tools that indicate the available variations of a given media resource. See ISO/IEC 15938 for further information on the syntax and semantics of these tools.

Besides serving as an input to the Digital Item Adaptation Engine, several ISO/IEC 15938 tools are also referenced by the DIA specification. For example, tools that indicate a User's preference have been adopted as part of the DIA usage environment description tools, along with tools that indicate location and time associated with a User. The multimedia description schemes specified by ISO/IEC 15938 can also be used to specify the decoding and encoding formats as part of the terminal capabilities description tool. In this particular case, there exists symmetry between tools that are used to describe media resources and tools that are used to describe the capabilities of a terminal. In this way, the media resources can easily be matched or adapted to satisfy the terminal capabilities.

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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.

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ISO/IEC 14496-2, *Information technology – Coding of audio-visual objects – Part 2: Visual*

ISO/IEC 15938-3, *Information technology – Multimedia content description interface – Part 3: Visual*

ISO/IEC 15938-5, *Information technology – Multimedia Multimedia content description interface – Part 5: Multimedia description schemes*

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IEEE 754-1985, IEEE Standard for Binary Floating-Point Arithmetic

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3 Terms, definitions, symbols, and abbreviated terms

3.1 Terms and definitions

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For the purposes of this document, the terms and definitions given in the following apply:

It should be noted that the term content is widely used across different industries and applied in many different ways. For this reason the term is deliberately avoided within the context of ISO/IEC 21000 specifications, where it has been replaced by the terms Digital Item, media resource and resource, as defined below.

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3.1.1 General terms and definitions

3.1.1.1
Description
An instantiation of one or more **tool**s.

3.1.1.2
Digital Item
A structured digital object conforming to ISO/IEC 21000-2 that is the fundamental unit of transaction and distribution in the multimedia framework.

3.1.1.3
Media resource
A **resource** corresponding to audio-visual or multimedia data.

3.1.1.4
Receiver
The side of a multimedia transaction that receives a **resource**.

3.1.1.5
Resource
A component of a **Digital Item** corresponding to a digital asset or other form of intellectual content.

3.1.1.6
Sender
The side of a multimedia transaction that sends a **resource**.

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