An overview of MPEG 21 and its Applications

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Abstract: MPEG-21 is an open standards-based framework for multimedia delivery and consumption. It aims to enable the use of multimedia resources across a wide range of networks and devices. Multimedia standards are MPEG-1 (1993), MPEG-2 (1996), MPEG-4 (1999), and MPEG-7 (2001). In this paper MPEG-21's parts, achievements, ongoing activities, and opportunities for new technologies and an overview of the video compression standards related to the MPEG family are discussed. MPEG-21 is mainly used for DRM. (Digital Rights Managements).

Keywords: Multimedia Framework, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21.

INTRODUCTION

1.1 MPEG-21

The MPEG-21 standard, from the Moving Picture Experts Group, defines an open framework for multimedia delivery and consumption. MPEG-21 is ratified in the standards ISO/IEC 21000 - Multimedia framework (MPEG-21). The Moving Picture Experts Group (MPEG) is widely known and highly regarded for its pioneering work in creating the MPEG-1, 2, 4, and 7 standards. These standards define an extensive set of tools for audio-visual compression and transport as well as metadata for multimedia content description. MPEG-21, formally referred to as ISO/IEC 21000 Multimedia Framework, aims to address the above problem by standardizing interfaces and tools to facilitate the exchange of multimedia resources across heterogeneous devices, networks and users. More specifically, MPEG-21 standardizes requisite elements for packaging, identifying, adapting and processing these resources as well as managing their usage rights.

1.2   MPEG 21 BENEFITS

One of the standards produced by the MPEG is MPEG-21. Its aim is to offer interoperability in multimedia consumption and commerce. It can be used to combine video, audio, text and graphics. MPEG-21 provides normative methods for content identification and description, rights management and protection, adaptation of content, processing on and for the various elements of the content, evaluation methods for determining the possible persistent association of information. Enable access to any multimedia content from any type of terminal to achieve transparent and interoperable access to multimedia content.[2]

MPEG-21 is based on two essential concepts and that are definition of a Digital Item (a fundamental unit of distribution and transaction) and users interacting with Digital Items.

Digital Items can be considered the kernel of the Multimedia Framework and the users can be considered as who interacts with them inside the Multimedia Framework. At its most basic level, MPEG-21 provides a framework in which one user interacts with another one, and the object of that interaction is a Digital Item.

MPEG-21 is the newest of a series of standards being produced by the Moving Picture Experts Group more formally known as ISO/IEC JTC 1/SC29/WG11. MPEG has a long history of producing multimedia standards: MPEG-1 (1993), MPEG-2(1996), MPEG-4 (1999), and MPEG-7 (2001). MPEG-1 and MPEG-2 resulted in many successful commercial products and services, such as video-CD, DVD, digital television, digital audio broadcasting (DAB), and MP3 (MPEG-1/-2 audio layer 3).Together, the MPEG-1, -2, -4, and -7 standards provide a complete, powerful, and successful set of tools for multimedia representation.

1.3 MPEG-21 OBJECTIVES

A key assumption of MPEG-21 is that every human is potentially an element of a network involving billions of content providers, value adders, packagers, service providers, consumers, and resellers. Thus, besides client-server-based

applications, peer-to-peer networking and the resulting flexibility of user roles has been an underlying part of MPEG-21 thinking since the early days of the standardization process. The main objective of the MPEG-21 is to define the technology needed to support users to exchange, access, consume, trade or manipulate digital Items in an efficient and transparent way.

1.4 PARTS OF MPEG-21

MPEG-21 is organized into several independent parts primarily to allow various slices of the technology to be useful as stand-alone. This maximizes their usage and lets users implement them outside MPEG-21 as a whole in conjunction with proprietary technologies. For example, we use MPEG-2 video together with MPEG-2 systems but not with MPEG-2 audio in the context of the US digital TV system.[3]

The MPEG-21 parts already developed or currently under development are

1.   Vision, technologies, and strategy.

It describes the architectural elements with the functional requirements and the multimedia framework for their specification. This contains the most current information on all parts of MPEG-21. The MPEG-21 vision for a multimedia framework is to enable transparent and extended use of multimedia resources. A method to facilitate the integration of components and standards in order to harmonise technologies for the creation, management, manipulation, transport, distribution and consumption of content; A strategy for achieving a multimedia framework by the development of specifications and standards based on well defined functional requirement through collaboration with other bodies.

2.   Digital Item Declaration (DID)

It provides a uniform and flexible abstraction and interoperable schema for declaring Digital Items. The DID, along with referenced resources defines a Digital Item(DI).The DI is the basic unit of "transaction". A framework extendable by all other parts of MPEG-21 for the inclusion of part specific declarations and descriptions.

3.   Digital Item Identification (DII):

It defines the framework for identifying any entity regardless of its nature, type, or granularity. No single identification scheme specified and specific identification schemes to be registered with a registration authority (RA). Some DI descriptions may be specified by MPEG-21 although the use of other descriptions will be supported as well.

   4. Intellectual property management and protection (IPMP)

It provides the means to manage and protect content across networks and devices. Provide specifications supporting the declaration of IPMP and processing is required for given components of a given DI. It support secure Peer-to-Peer and intra-Peer communications and enable development of trust management architecture or framework.

   5. Rights Expression Language (REL)

It specifies a machine-readable language that can declare rights and permissions using the terms as defined in the Rights Data Dictionary. It declares rights to users to act upon digital items, components, fragments and containers. Specifies a set of actions that can be taken on a give DI and highly extensible. Also support a number of common business models in the content distribution and consumption value chain

   6. Rights Data Dictionary (RDD).

It specifies a dictionary of key terms required to describe users right. Also it contains a set of clear, consistent, structured, integrated and uniquely identified terms. It specifies a structure and core for any rights data dictionary to be defined and different RDDs to be registered with a register authority.

   7. Digital Item Adaptation (DIA).

This seventh part of MPEG-21 (ISO/IEC 21000-7) specifies tools for the adaptation of Digital Items. It defines description tools for usage environment and content format features that might influence the transparent access to the multimedia content notably terminals, networks, users, and the natural environment where users and terminals are located.

   8. Reference software.

It includes software that implements the tools specified in the other MPEG-21 parts.

   9. File format.

It defines a file format for storing and distributing Digital Items.

10. Digital Item Processing (DIP).

It defines mechanisms for standardized and interoperable processing of the information in Digital Items DIP includes normative methods to declare possible actions on a given DI.

11. Evaluation methods for persistent association technologies.

Documents best practices in evaluating persistent association technologies using a common methodology.

12. Test bed for MPEG-21 resource delivery.

This provides a software-based test bed for delivering scalable media and testing or evaluating this scalable media delivery in streaming environments.

1.5 MPEG-21 ACHIEVEMENTS

Enabling access to any multimedia content from any type of terminal or network is very much in line with the MPEG-21 standardization committee's vision, which is to achieve interoperable and transparent access to multimedia content. Supports the creation, distribution and consumption of content that provides a richer user experience than previously possible except on a proprietary basis, MPEG-21 supports creation at all points in the distribution and consumption chain, Improves interoperability across applications, Opens the way for more user interaction with content,[8] In the case of the REL and RDD, provide tools missing from MPEG2/4 IPMP. An overview on currently available MPEG-21 technologies include

Vision, technologies, and strategy

The MPEG-21 technical report describes the multimedia framework and its architectural elements with the functional requirements for their specification.

The Digital Item Declaration part is the second part of MPEG-21 (ISO/IEC 21000-2)and it specifies a uniform and flexible abstraction and interoperable scheme for declaring the structure and makeup of Digital Items. Digital Item Identification which is the third part of MPEG-21 (ISO/IEC 21000-3) specifies how to uniquely identify Digital Items, intellectual property related to the Digital Items and description schemes.

1.6 APPLICATIONS

Used in Digital Audio Broadcasting**,** Digital TV Broadcasting**,** Music download service**,** streaming music service and Internet radio. MPEG-21 supports the creation, distribution and consumption of content that provides a richer user experience than previously possible except on a proprietary basis. MPEG-21 supports creation at all points in the distribution and consumption chain, improves interoperability across applications. Opens the way for more user interaction with content. In the case of the REL and RDD, provide tools missing from MPEG2/4 IPMP.

CONCLUSION

The MPEG family of standards has proven to be one of the most successful standards. MPEG-21 is mainly developed to adopt for the distributed environment and improves interoperability across applications. MPEG-21 offers exciting solutions to support interoperable exchanging, accessing, consuming, trading, and otherwise manipulating DIs between Users in an efficient, transparent, and interoperable way. MPEG-21 provides DI Adaptation to enable UMA scenarios.

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