# ACHIEVEMENT OF MPEG - 7 AND MPEG - 21 AS STANDAERS FOR ACCESS, DISTRIBUTION AND MANAGEMENT WITH INFORMATION

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## ABSTRACT

Today, the Internet allows the spread and distribution of not only textual but also audio - visual data. The rapid development and increasing demand of these data, has led institutions that standardize this data and they create new technologies. However, the concept of enriching multimedia data and the increasing diversity of devices using multimedia networks has also led to some difficulties in managing these communications. As a result of such a growing demand of users, of the institutions and everyday needs of a modern man, MPEG - 7 and MPEG 21 standards have been developed. These standards provide more information on the content of multimedia data and consist of autonomous factors who have an expandable architecture. Multimedia systems provide information to users in different locations, a different form of data that can be accessed in different ways. This paper presents the areas in which MPEG - 7 and MPEG 21 standards are applied.


**Keywords:** Multimedia access, Content analysis, MPEG - 7 and MPEG 21 standards.


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## 1. INTRODUCTION

Today, a modern man is more open, has various hobbies, spends more time on research and uses modern technologies. In modern communication technologies, the multimedia data provides an advantage in the transmission of information. With the permanent development of the Internet and Internet applications, there is appears the need for developing of new technologies. Therefore, apart from the standard for video data compression, have been developed new flexible standards for multimedia data search. The development of such new applications makes it possible to apply these standards in different areas. In this way, new areas and applications for the implementation of these standards are being constructed on a daily basis. In this way the constructed standards allow for great flexibility to the multimedia technologi users. The growing trend of Internet popularity, has led to an increase in the experience and knowledge of audio-visual applications. Today, it is very important for the people to get a necessary information and knowledge to get in the possible faster and easier way. Due to the scale of the information we have a continuous development of a new multimedia database. The importance of this information and datas is right proportional to the possibilities of how easy we can get them, how easy we can manage them and how we can easily filter them. The development of multimedia databases provides the possibility except text, we search a applications with more semantic content.

The development and distribution of portable multimedia devices, their multidimensional application, led to the emergence of the concept of a universal multimedia approach. The basis of this concept lies in the content of multimedia data, automatic adjustment, selection and unhindered access to information in multimedia devices. The selection process is a process that takes place between data with different content or process between data with exactly defined content. The adaptations reduce the rate of the process, are easier to adjust, reduces summation, personalization and rearrangement of the multimedia data. The main goal here is to respond to the customer demand using multimedia devices and network specification through the process of adaptation to data access and optimal conditions for achieving the highest customer satisfaction. It is important for provide easier access and easier management with information to the users. Information that can be easily filtered and received are very important for the user. When performing these goals, several parameters need to be considered. It is also important to emphasize that these parameters change from users to users. Some of these parameters, are the capacity and properties of the device, the permeable range of data, possible user choices.

The second goal of a universal multimedia approach is to provide access to multimedia devices that have limited processing and data storing. In order to achieve this goal, a series of customizing data operations are performed (Vetro, 2004: 84). Due to the different types of devices and various sources of data, it is very difficult to develop a universal system that will comply with these conditions. Almost in all video data the common aspect is personalizing of content and their quick availability for needs of the users.

The first step in the acces to the multimedia data from different servers and internet networks is to direct in one particular part of this data. This process involves downloading audio data from the Internet to selecting a multicasting TV channel (Tseng, 2004:42). The number and type of media data grows day by day, so it is important to ensure faster and more efficient data transport. Keeping records of user preferences and has many advantages. Users need the multimedia data they can get with the help of software agents. Through personal taste and need, they can automate access to data and can easily search for the required multimedia data. In order to respond to all these needs of the user, the Moving Pictures Experts Group - MPEG has been developed by ISO / IEC (International Organization for Standardization / International Electronics Commission) standards.

From MPEG the following standards have been developed to date (Burnet, 2006: 462)

- ISO/IEC 11172 (MPEG-1), Coding of Moving Pictures and Associated Audio at up to about 1.5Mbps ")
- ISO/IEC 13818 (MPEG-2), Generic Coding of Moving Pictures and Associated Audio
- ISO/IEC 14496 (MPEG-4), Coding of Audio-Visual Objects
- ISO/IEC 15938 (MPEG-7), Multimedia Content Description Interface
- ISO/IEC 21000 (MPEG-21), Multimedia Framework

MPEG7 and MPEG 21 are defined such that the setting of the multimedia datas are accepted by all. With these standards, the procedure for searching, accessing and manipulating multimedia data is facilitated and accelerated.

## 2. CONCEPTUALLY AND METHODOLOGICALLY DETERMINATION

The research methodology consists of three parts: Conceptual basics of search and distribution of multimedia data, definition of MPEG - 7 and MPEG 21 standards and achievements of MPEG - 7 and MPEG 21 as the latest search standards.

### 2.1 Definition of Multimedia Content Interface in MPEG-7

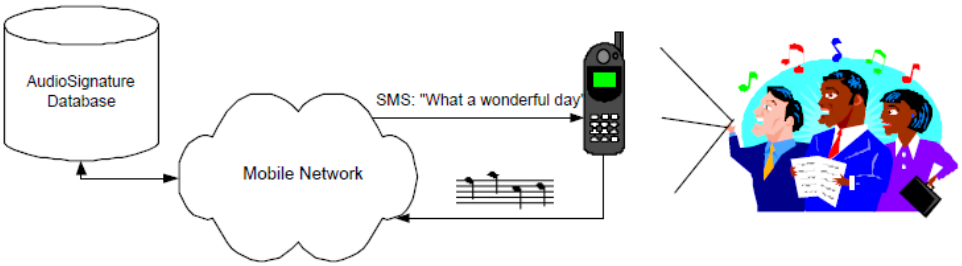
In 2001, MPEG-7 became a standard that enables fast, efficient search, filtering and identification of multimedia content. From the previously developed MPEG standards MPEG - 7 differs in the format of displaying audio - visual data and does not deal with the compression of these data but creates metadata that describes the characteristics of a source in digital form (Burnet, 2006 : 462).

This is the main point that separates MPEG - 7 from previously developed MPEG standards. MPEG - 7 contains a new way of defining multimedia content. This method consists in analysis of content and in a different approach to data processing. The objective of MPEG-7 standards is not only a single data analysis but also supporting a wide range of applications in accessing the requested information as much as possible. This is one of the key differences between MPEG - 7 and previously developed standards (Martinez, 2002: 78).

With the MPEG - 7, is defined the format and mode of code. The main goal is to un-complicate and non-reduce data, but work with metadata. This approach gives more freedom in the application of these applications. In MPEG - 7 is determined the structure and relationship between descriptor (D) and descriptive scheme (DS). Descriptors represent data characteristics, while descriptive schemes determine the structure and connection between the data components and can be easily understood by the users. The descriptive language DDL (Description Definition Language) is used to define the connection between the descriptors. Metadata standards propose descriptive schemes for multimedia data and in this way help users in finding multimedia data by content. MPEG-7 standards allow users using the mobile phone to find the title of a song if they only know a few words or a several notes of that song. To determine the title of an unknown

song, we need to record only a few seconds of this song and with the Music Scout application we get quick identification of the content via SMS. The method of indication is given in Figure 1. Fraunhofer Institute has proposed Audio Signature Technology integrated into Music Scout that automatically recognizes audio content (www.net-m.de).

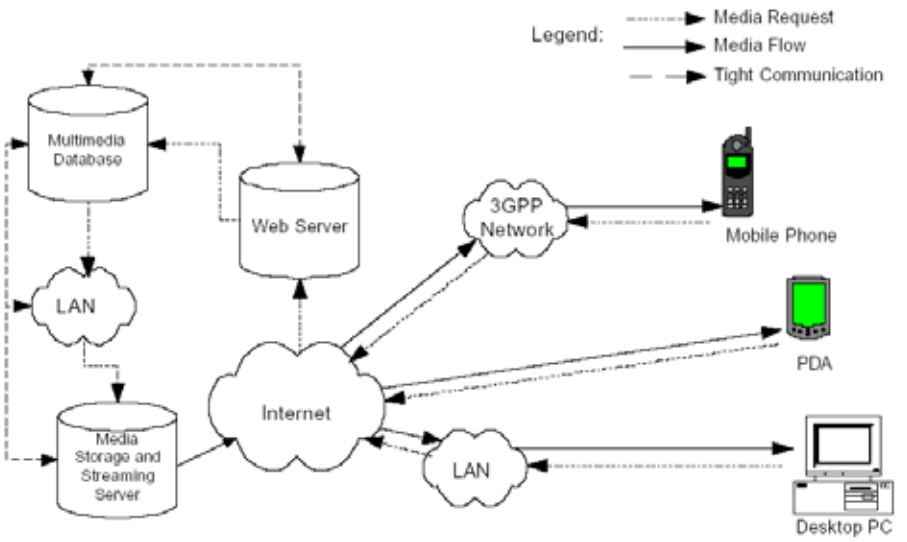
**Figure 1.** The way to search for a song title




Efficient use of metadata in the distributed multimedia system requires a multimedia database for managing, storing, searching and delivering metadata. For creation of metadata database, we need to know about the location of storing these data in the media, and the location must match the requirements of media resources. In Figure 2, one possible distributed architectures and main players in a multimedia database system are often referred to as N architecture in literature. This system includes a web server that represents the input for user requests (Özsu, 2011: 41).

The web server is interested in managing authenticity issues that can be entrusted to another check in another server. The web server is also the front end of the multimedia database. The multimedia database is the "master" of metadata, while Multimedia Storage and Streaming Server are the "master" of media data. Both data are strongly linked and their communication protocol is placed between their components. There are strict protocols for communication. The communication between the server elements is generally two-way. For example, if a user uploads video to Media Storage Server, the database must be updated with metadata. If the database prepends a video that is out of date, it must notify Media Storage Server to delete it.

**Figure 2.** Components and information flow in a typical distributed multimedia system and database




Using metadata in a distributed multimedia system provides many benefits and enables the search of multimedia data by content. Before can be searched, the multimedia data must be indexed, which means that metadata information must be extracted automatically or manually from the video. Another use of metadata is what they serve to describe the characteristics of the environment in which the data are located (networks and terminal constraints). This information is used to customize the search for data by content. Metadata is used to describe Intellectual Properties of multimedia data. Such characteristics enable fair use of data for commercial purposes. Metadata are also used in a distributed multimedia system to describe the possibilities that exist for the adaptation of data resources. They are preparing a course for unforeseen situations, on the road to delivering information to clients

## 2.2 MPEG 21: The multimedia frame.

The creators of multimedia content provide consumers with great opportunities in to multimedia data access and distribution. Also today, companies, business people, scientists for getting the certain information, continuously use the multimedia devices, and for to have access to multimedia

services, they are daily investing money in new multimedia applications. However, there is still no way to communicate between two different user communities. Although there is a variety of multimedia technologies today, lacking interoperable solutions is the reason of the slow progress in the packaging and distribution of multimedia applications (Bormans, 2003: 53). Previously defined MPEG standards, although they provided powerful tools in encoding and transferring multimedia data, have had difficulty in practical application. Applications of this type are multimedia applications that have been built as disparate collections of standard format and are not interconnected. Example for this is a telecommunications connection. In response to all these needs, a vision about the MPEG 21 standard is being developed. With MPEG21, MPEG creates a complete frame that will be a "big picture" of existing multimedia and standards. MPEG 21 enables transparent and extended use of multimedia sources over a wide range of networks and devices. The firms believed that the vision of creating fully functional standards can be achieved and that in this way the results and experience of multimedia service users will be improved temporarily. But with the appearance of the concept of "big picture", the following questions also appeared:

- Will the existing multimedia standards be a compatible with each other?
- If they are compatible, how can they be connected and used together?
- If a user wants to sell / use multimedia content, how can do that?
- If no system is compatible, what should be done in this situation?
- Which systems can be standardized?
- Who will be responsible for the "link" between the parts of the system?

MPEG 21 has an approach of defining one framework in which operations will be interconnected and highly automated. Therefore, "Digital Rights Management" (DRM) has been formed, which aims to use heterogeneous networks and terminals for accessing and distributing multimedia data (Burnet, 2006: 462). Individual terminals and a large part of the network capacities of multimedia devices have found the way to enter people's lives. These devices can be used in different locations and in various environments and at any time when needed. More users of multimedia devices are not able to cope with the complexity of these content each time. Multimedia space is gaining better functionality, and increasing the growth of

permanent personal use. All content providers also think about managing content, data protection, unauthorized access, changing of content and protecting consumer privacy. Based on these findings, MPEG 21 defined a "open framework" for multimedia distribution and use that will be applied by all users. This open box provides the same chances to all creators of multimedia content and service providers in the marketplace where MPEG 21 standards are applied.

So, the vision for MPEG 21 can be defined as follows: defining a multimedia framework, a license to use large networks from different communities, allowing transparent and extended use of multimedia devices. Also, MPEG 21 as a multimedia data delivery chain identifies the relationship between elements and mechanisms for support and defining network operations. MPEG 21 is based on two basic concepts: defining the Digital Item (DI), distribution and functioning as the first concept and interaction of users with the help of DI as the second concept (Kosch, 2004:280). MPEG 21 is organized by several independent parts that primarily allow the technology to be divided into different parts that can be used as stand - alone. This maximizes the use of these technologies and allows users to implement MPEG 21 as a whole. However, although is possible to use different parts independently, they are developed to give optimal results when used together. Parts of MPEG 21 that are developed are (Burnet, 2003: 60) :

- Vision, technology and strategy: describes the multimedia framework and its elements in architecture with functional requirements for their specification.
- Digital Item Declaration (DID): provides uniform, flexible abstraction and interoperability scheme for the digital item declaration.
- Digital Item Identification (DII): : defines the framework for identifying any entity, regardless of its nature, type or granularity.
- Intellectual property management and protection (IPMP): Provides resources for reliable management and protection of content in networks and devices.
- Rights Expression Language (REL): specifies a machine-readable language that can declare rights and permissions using the terms defined in the Rights Data Dictionary.

- Rights Data Dictionary (RDD): Defines the dictionary of key terms needed to describe Rights of users.
- Digital Item Adaptation (DIA): defines tools for describing the use of environment and content of the format functions that can affect the transparent access to multimedia content, especially terminals, networks, users, and the natural environment in which users and terminals are located.
- Reference Software: includes software that is implementing the tools specified in another part of MPEG-21.
- File format: defines the file format for storing and distributing digital products.
- Digital Item Processing (DIP): defines mechanisms for standardized and interoperable processing of information in digital items.
- Evaluation methods for persistent association technologies: documents best practices in evaluating persistent connectivity technologies using a common methodology (instead standardizes technology itself). These technologies link information that identifies itself and describes the content itself directly to itself.
- Test bed for MPEG-21 resource delivery: Provides a software based on the test bed for scalable media delivery and testing / evaluation of these scalable media delivers them in streaming environments.

The MPEG-21 technical report with vision, technologies and strategy describes the multimedia framework and its elements in architecture with functional requirements for their specification (http: // www. iso.ch). Digital Item Declaration is the second part of MPEG-21 (ISO / IEC 21000-2) that determines a unique and flexible abstraction and interoperability scheme for declaring the structure and composition of digital items. Through the Digital Item Declaration Language (DIDL), a digital item can be declared by placing resources, metadata, and their interrelations. ISO / IEC 21000-2 describes this DID technology in four main parts:

- Model: The DID model describes a set of abstract terms and concepts for defining digital items. Within this model, a digital item represents a digital display of a work (for example, a digital music

album, an e-book or a piece of software including configuration and configuration information). As such, the digital item is the thing it behaves (manages, describes, exchanges, collects, and so on) within the model.

- Representation: DIDL is based on terms and concepts defined in the DID model. It contains a normative description of the syntax and semantics of each DIDL element, as shown in XML.
- Schema: A complete XML normative schema for DIDL includes the entire grammar of DID representation in XML.
- Some detailed examples: Illustrative examples of DIDL documents are provided to help understand the use of the specification and its potential applications.

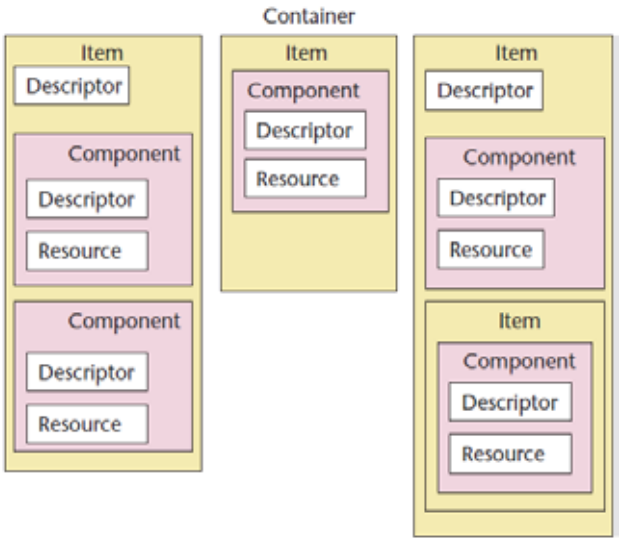
The main concepts in the context of DID include the following:

- Container is a structure that group items and / or containers. We can use this group of items and / or containers to form logical packages (for transport or exchange) or logical shelves (for the organization). Descriptors allow tagging of containers with information that is appropriate for the purpose of grouping (For example, package delivery instructions or category information for a shelf).
- One item represents a group of subprograms and / or components that are related to the relevant descriptors. Items can contain a selection that can be customized or configured. Items can also be conditional (on predicates that are confirmed by selection defined in the election). We are considering an item that contains no sub-items an entity - a logically indivisible work. An item containing a sub-items is a compilation.
- The component connects the resource with a set of descriptors. These descriptors are information related to the entire or part of a specific resource instance. Such descriptors typically contain control or structural information for the resource (such as bit rate, character set, starting points or encryption information), but not information that describes the content within.
- Anchor binds descriptors to a fragment, that corresponds to a particular location or part of the resource.
- Descriptor links information with the enclosing element. This in-

formation may be a component (such as a thumbnail of an image or a text component) or a textual statement.

- A condition describes the enclosing element as being optional and associate it with the selections that affect its inclusion.
- The choice describes a set of associated selections that may affect the configuration of an item.
- The selection describes a specific decision that affects one or more conditions somewhere within an item.
- An annotation describes a set of information about another element of model without modifying or adding that element.
- The assertion defines a fully or partially configured state of the selection by specifying true, false or undecided values for some number of predicates associated with the selection for that choice.
- A resource is an asset that can be identified as a video or audio clip, an image, or text. The resource can also be a physical object. All resources must be located across an unambiguous address.
- A fragment denotes a specific point or range within the source. Fragments can be a specific type of resource.
- The statement is a literal textual value that contains information, but not an asset. Examples of probable statements include descriptive, control, revision tracking, or identification of information.
- The predicate is an unequivocal recognizable declaration that can be accurately true, false or undecided.

**Figure 3.** Elements of the DID model and their relationship, (Burnet et al., 2003)




## 3. RESULTS AND DISCUSSION

### 3.1 Achievements of MPEG 7 standard

Elements that are standardized from the MPEG 7provide broad support for applications (for example, in digital multimedia libraries, in the choice of radio or TV shows, for formatting multimedia space, home entertainment equipment, etc.). Thanks to MPEG 7, except for textual content, audio and video content can be searched on the web. Has widely used because it is available to users and can be applied to an archive of various content. In this way, it offers the ability to buy something on multimedia catalogs only by writing the contents of the required product. The information used to determine the content can also be used to select and filter the material and its advertising. Using multimedia applications, MPEG 7 is applied in the following areas:

- Education (provides the possibility of using a pool of multimedia lessons, is applied for multimedia research of supplementary materials in the teaching process)

- Journalism (using voice, name or face can be explored statements by one politician)
- Tourist information (cultural activities, historical museums, art galleries)
- Fun (searching for various games, karaoke, managing personal multimedia collections at home)
- Screening (human body and character research, forensic medicine)
- Geographic information systems
- Remote sensing (cartography, ecology, management of natural resources)
- Inspections (traffic control, surface transportation)
- Biomedical applications
- Numerical libraries (catalog of images, music dictionary, catalogs of biomedical images, film, video and radio archives)
- Shopping (demand of clothes we like)
- Architecture (real estate, interior design and real estate design)
- Social Applications (scheduling, meetings)
- E - market (personal ads, online catalog, e - store)

User needs and filtering operations often go beyond the frames of the MPEG 7 standard. The search content type is not necessarily always searchable with the same search way, for example, visual content can be searched as content of the music contained in it or by its location. Searching for the necessary information is done by a search engine that establishes the relationship between the query data and the definition of the MPEG 7 standard. Here are some ways to search:

- By playing a several musical note with the keyboard, we can get a list of music content that contain these notes or visual contents in which it has such notes
- By drawing a few lines on the screen, we can get charts, logo and ideograms that contain such lines

- By defining several movements, we can get a list of scenarios that contain such movements
- By recording one passage of one singer, we receive the list of his songs, video clips and pictures.

### 3.2 Achievements of MPEG 21 standard

The key assumption of MPEG-21 is that, each person is considered that as a potential element of a network that includes billions of provider contents, value estimators, packagers, providers of services, consumers and a reseller. In this way, in addition to applications based on client and server, networking between users and the resulting flexibility of user roles is a fundamental part of thinking MPEG-21 from the first days of the standardization process. Interoperability is the driving force of all multimedia standards. This is a necessary condition for any application that requires guaranteed communication between two or more parties. From a more philosophical point of view, interoperability expresses a useful dream to easily exchange any kind of information without technical barriers. In order to achieve this goal, we must standardize both the content structure and the minimal set of communication processes. The key to effective standardization is to create a minimum standard that normatively defines a minimum (but complete) set of tools that will guarantee interoperability. Such minimum specifications provide the space and basis for competitive, proprietary and alternative events (which would not be normative), or tools that do not need standardization in order to obtain interoperability. This enables the incorporation of technical improvements - extending life expectancy standardly, as well as fostering competition in technical and production terms. The standard also has important economic implications, as it allows the sharing of investment costs and the speeding up of application applications. Another advantage is that an open standard reduces the reliability of consumers with standalone solutions, and this is essential if we really want to have a real and transparent use of the multimedia technologies. MPEG is proactive in identifying current multimedia initiatives and supports collaboration in the context of MPEG-21. Examples of anticipated cooperation are Open eBook Forum, International Telecommunications Union, Open Mobile Alliance, etc. The goal of this process is to maximize interoperability, minimize the overlap between concurrent activities and share common technology. In order to ensure that standardization of the large picture includes both technological and user requirements, MPEG has established a formal development process in the following way:

- Define a framework that supports the MPEG-21 vision.
- Identify the critical components of the multimedia framework.
- He understands how the framework components are related and identifies where there are gaps in technology standards.
- It includes relevant (and complementary) standardization bodies.
- Evaluates each of the inaccessible technologies. If they fall under the expertise of MPEG, then MPEG develops the appropriate standards. If not, is engage the other bodies to achieve expected development.
- It integrates relevant available and developed technologies.

Based on requests arising from new cases of use, MPEG-21 standardizes new technologies and generates technical reports for more research areas. It has the following advantages:

- Defines an interoperable IPMP framework that enhances and adds already available IPMP tools defined in the context of MPEG-4 standards.
- Is evaluate the methods for linking technologies.
- Defines general reference software MPEG-21 and software test beds for the delivery of MPEG-21 resources.
- Defines the file format in MPEG-21.
- Is provides specification of event-reporting mechanisms in MPEG-21 that are monitored and enables communication among users about events related to digital objects and / or programs and devices that work on them at any given time.
- Investigates the requirements and technologies for high scalable audio and video coding. In this context, he considers how these developments can be optimally aligned with MPEG-21 in the general case and in particular with the MPEG-21 DIA 19.

One of the key aspects of MPEG-21 is that it has a standard framework, not a complete usable solution. Therefore, multimedia and signal processing communities have many opportunities to use new techniques and solutions within this framework. DIA gives the community a rich set of metadata that describes the context of resource delivery (for example, terminal, network, natural environment, and personal information). Users can use them as input for signal processing algorithms. In all of these areas, MPEG has left algorithms and innovations open to researchers and developers by providing standardized infrastructures that do not interfere with interoperability. MPEG 21 offers its frameworks the advantage of creating compatible solutions for a wide market base that becomes immediately available for interoperability.

## 4. CONCLUSION

In accordance with the requirements of modern lifestyles, the needs of the education system and the way of business of multimedia technology and applications have become an important part of our lives. With these multimedia applications, the creation of electronic contents, the distributions, consumptions and trade is possible. User communities demand interaction of these applications in an interoperable and efficient way. Today, besides the multimedia space, there are many other applications in different sectors that require the development of new technologies that have an integrated structure and which will be able to communicate with one another. These technologies need to process data together, they need to quickly respond to user requests and should provide an upgrade option. All these features with a variety of multimedia applications are enabled in MPEG 7 and MPEG 21 standards. MPEG7 and MPEG 21 standards provide such interoperability by focusing on the integration, correlation and integration of multimedia elements and application structures. These standards with content data, quick response to requirements and needs, multimedia access to online content provide a high level of customer satisfaction today.

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