MPEG-21 Overview

Xin Wang
Dept. Computer Science, University of Southern California

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Agenda

- What is MPEG-21
- MPEG-21 Standards
- Benefits
- An Example
MPEG Standards

- MPEG develops standards for digital representation of audio and visual information

- So far
  - MPEG-1: low resolution video/stereo audio
    - E.g., Video CD (VCD) and Personal music use (MP3)
  - MPEG-2: digital television/multichannel audio
    - E.g., Digital recording (DVD)
  - MPEG-4: generic video and audio coding
    - E.g., MP4, AVC (H.24)
  - MPEG-7: visual, audio and multimedia descriptors
  - MPEG-21: multimedia framework
  - MPEG-A: multimedia application format
  - MPEG-B, -C, -D: systems, video and audio standards
  - MPEG-M: Multimedia Extensible Middleware
  - MPEG-V: virtual worlds
  - MPEG-U: UI
  - (29116): Supplemental Media Technologies

- (Much) more to come …
What is MPEG-21?

- An open framework for multimedia delivery and consumption

- History: conceived in 1999, first few parts ready early 2002, most parts done by now, some amendment and profiling works ongoing

- Purpose: enable all-electronic creation, trade, delivery, and consumption of digital multimedia content

- Goals:
  - “Transparent” usage
  - Interoperable systems

- 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 appropriateness of possible persistent association of information
  - etc.
MPEG-21 Framework

Digital Item Declaration

Digital Item Identification and Description

Content Management and Usage

Transaction/Use/Relationship

Authorization/Value Exchange

Digital Item

Intellectual Property management and Protection

Terminals & Networks

Content Representation

Event Reporting

User A

User B
Fundamental Concept: Digital Item

- A structured digital object with a standard representation, identification and metadata
- The fundamental unit of distribution & transaction in the MPEG-21 framework
- Digital Item = (resources + metadata + structure)
  - Resource: individual asset
  - Metadata: data about or pertaining to the Item
  - Structure: relationships among the parts of the Item
Digital Item (DI)

Structure

Resources
- MPEG-1
- MPEG-2
- MPEG-4

Metadata
- MPEG-7

New Metadata & Resource forms

MPEG-21
MPEG-21 Specifications

- Part 1 - Vision, Technologies and Strategy
- Part 2 - Digital Item Declaration (DID)
- Part 3 - Digital Item Identification (DII)
- Part 4 - Intellectual Property Management and Protection (IPMP) Components
- Part 5 - Rights Expression Language (REL)
- Part 6 - Rights Data Dictionary (RDD)
- Part 7 - Digital Item Adaptation (DIA)
- Part 8 - Reference Software
- Part 9 - File Format
- Part 10 - Digital Item Processing (DIP)
- Part 11 - Evaluation Tools for Persistent Association
- Part 12 - Test Bed for MPEG-21 Resource Delivery
- Part 13 - Scalable Video Coding (moved out of MPEG-21)
- Part 14 - Conformance
- Part 15 - Event Reporting (ER)
- Part 16 - Binary Format
- Part 17 - Fragment Identification of MPEG Resources
- Part 18 - Digital Item Streaming
- Part 19 - Multimedia Value Chain Ontology
Part 1 – Vision, Technologies & Strategy

- A technical report
- Contains the most current information on all parts of MPEG-21
  - The MPEG-21 vision for a multimedia framework 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.
Part 2 – Digital Item Declaration (DID)

- A specification for the normative inclusion of various multimedia elements into a “single” deliverable and consumable package
  - References to resources, descriptions and User choices for access and interactions
  - 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.
Part 3 – Digital Item Identification (DII)

- A framework that supports identification schemes and descriptions
  - No single identification scheme specified
  - 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.
Part 4 – IPMP Components

- Provide specifications supporting the declaration of IPMP processing required for given components of a given DI

- Supporting secure Peer-to-Peer and intra-Peer communications

- Enable development of trust management architecture or framework

- Related standards:
  - IPMP components base profile
  - Media Streaming profile
A machine-readable language for issuing 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
- Highly extensible
  - By extending the language itself, or
  - By adding a new rights data dictionary
- Support a number of common business models in the content distribution and consumption value chain

Related standards:
- MAM (Mobile And optical Media) profile
- DAC (Dissemination and Capture) profile
- OAC (Open Access Content) profile
Part 6 - Rights Data Dictionary (RDD)

- Contains a set of clear, consistent, structured, integrated and uniquely identified terms

- Specifies a structure and core for any rights data dictionary to be defined

- Different RDDs to be registered with an Register Authority.

- Related Standard:
  - DII relationship types
Part 7 - Digital Item Adaptation (DIA)

- A “toolbox” of descriptions for DI declaration, description and/or resource adaptation
  - Usage environment elements
  - Resource adaptation elements
  - Declaration/description adaptation elements

- Related Standards
  - DIA Conversions and Permissions
  - Dynamic and Distributed Adaptation
Part 8 - Reference Software

- Provides a reference implementation of all MPEG-21 normative components
Part 9 - File Format

- Provides a normative method to include a composite DI into a single file.
  - Based on the MP-4 file format
  - Supports the inclusion of resources
  - Supports the inclusion of referenced DIs
Part 10 - Digital Item Processing (DIP)

- Normative methods to declare possible actions on a given DI

- Composed of:
  - DIM (Digital Item Method)
  - DIML (Digital Item Method Language)
  - DIME (Digital Item Method Engine)
  - DIBO (Digital Item Base Operation)
  - DIXO (Digital Item eXtended Operations)

- Related standard
  - Additional C++ bindings
Part 11 - Evaluation Tools for Persistent Association

- A technical Report

- A set of tools useful for the evaluation of different technologies used for the persistent association of information with a given DI or one or more of its components
  - Watermarking
  - Fingerprinting
Part 12 - Test Bed for MPEG-21 Resource Delivery

- Test bed architecture for MPEG media streaming applications
  - Player
  - Server
  - Network emulator
Part 14 - Conformance

- Specification of procedures and data to test the conformance of implementations to MPEG-21 standards
Part 15 - Event Reporting (ER)

- Methods to request the notification of an event occurring during the processing of a DI
- Format and contents of an ERR (Event Report Request)
- Format and contents of an ER (Event Report)
Part 16 - Binary Format

- Defines Binary Encoding of Digital Item Declarations
Part 17 - Fragment Identification of MPEG Resources

- Normative syntax for URI Fragment Identifiers to be used for addressing parts of MPEG Resources.

- The URI Fragment Identifier schemes offer comprehensive and flexible mechanisms for addressing fragments of audiovisual content.
Part 18 - Digital Item Streaming

- To enable the incremental delivery of a DI (DID, metadata, resources) in a piece-wise fashion and with temporal constraints in such a way a receiving User may incrementally consume the DI.

- DIS specifies tools for Digital Item Streaming.

- The first tool is the Bitstream Binding Language, describing how Digital Items (DID, metadata, resources) may be bound into Transport Streams mapped to delivery channels such as MPEG-2 Transport Streams or the Real Time Protocol.

- Related standard:
  - Simple fragmentation rule
Main IP Entities and Relating Actions in the IP Value Chain
Summary: MPEG-21 Benefits

- Supports the creation, distribution and consumption of content that provides a richer user experience than previously possible except on a proprietary basis
- Supports creation at all points in the distribution and consumption chain
- Improves interoperability across applications
- Opens ways for more user interaction with content
Example: DigitalCopyright.hk (1/3)

An online digital content marketplace
Example: DigitalCopyright.hk (2/3)

Data Hierarchy

- 商业网站
  Authenticating and Searching (RSS,RDF)
- 知识产权管理及保护
  IPMP
- 数字内容使用权
  MPEG-21 REL (播放, 印刷, 转载)
- 领域的元数据
  (Dam metadata schema)
- 数字内容描述
  MPEG-21 DIDL
- 数字内容识别
  MPEG-21 DII (ISAN,ISRC,DOI)
- 数字内容
  Raw content

授权请求
- 分发到发行商
- 传递资讯
- 加入个别业界
- metadata
- 使用权制定
- 加入元数据
- 登记内容
- 内容拥有者
- 提供产品
- 版税管理和收集

未完成之元数据
Example: DigitalCopyright.hk (3/3)

**Schools**
- Download encrypted content
- a) Provide IP address
  b) Provide device ID from trusted client application
- Request usage license
- Play content from trusted client application

**HKedCity**
- Upload video content
- specify usage condition and content description
- Storage of Video Content (NAS)
- Update content record Database
- License Server
- Authorize content playback
- Content encryption
- Update content record Database

**DigitalCopyright.hk**
- a) Provide IP address
  b) Provide device ID from trusted client application
- Request usage license
- Play content from trusted client application
Thank You!

● For more information,
  ● Visit: http://www.chiariglione.org/mpeg/

● Literature: