MPEG-7 Overview

- Formally known as Multimedia Content Description Interface
  - Focus on the description of multimedia content
  - Intend to be an inter-operable interface by defining the syntax and semantics of various description tools
  - Among systems and applications used in generation, management, distribution and consumption of audio-visual content descriptions.
Motivations

• Multimedia
• Archive
• Adaptation
• Music/audio
• Graphics
• Movement
• Scenarios
Normative Elements

• “D”: define the syntax and semantic of audio-visual content
  – As low level as shape, motion, texture, color
  – As high level as event, abstract concept
  – Audio Ds, visual Ds and Generic Ds

• “DS”: specify the structure and semantics of the relationships among the constituent Ds or DSs
Normative Elements (cont.)

• Ds and DSs also can be related to creation, production, management and access of audio-visual content.

• “DDL”: allow flexible definition of Ds and DSs
  – Strong candidate: XML Schema
  – Semantic information still needs much more human interaction or textural annotation by humans.
However ....

• MPEG -7 does NOT
  – Specify HOW to extract the descriptions
  – Standardize HOW the descriptions should be used for further processing
  – Require the descriptions to be physically located with the associated audio-visual materials
  – Specify the timing-performance requirements
ISO Standard 15938

- ISO 15938-1: MPEG-7 Systems
  - Architecture to bridge the system to MPEG-2/4, networks and storage subsystems.
  - Preparation of descriptions for efficient transport/storage
  - Synchronization of content and descriptions
  - Development of Conformant Decoders
  - Descriptions in textural or binary forms
ISO Standard 15938 (cont.)

- ISO 15938-2: MPEG-7 DDL
  - Intend to extend XML Schema with following key requirements
    - D and DS declarations
    - Type references
    - Content models
    - inheritance/subclass mechanisms
    - Abstract D and DS schemes
    - More ....
ISO Standard 15938 (cont.)

• ISO 15938-3: Visual
  – Spatio-Temporal locater
• ISO 15938-4: Audio
• ISO 15938-5: Multimedia Description Schemes (MDS)
  – Content organization and user interaction
  – Content management and description
  – Navigation/access and basic elements
ISO Standard 15938 (cont.)

• ISO 15938-6: Reference Software
  – Aims to provide a reference implementation of the relevant parts
  – Experimentation Models (XM)

• ISO 15938-7: Conformance
  – Provide guild-lines and procedures for testing the conformance of MPEG-7 implementations
  – Still open at the current stage
Netflix Experiences (2000-)

• Started with MPEG-2 Transport Stream
  – Gradually shifted to MPEG-4, compatible to H.264 standard with 16*16 macro-blocks
  – HEVC (High-Efficiency Video Encoding) based on H.265, with 64*64 macro-blocks
    • Netflix’s current encoding method
    • Optimization schemes require the hardware/software co-designs
    • A 4K-UHD stream still demands 25Mbps bandwidth
Audio Encoding

• Dolby Digital Plus (DD+)
  • An enhancement from Dolby Digital AC-3
• Supports a range of date rates from 32 kbps to 6 Mbps
• Up to 15 full-bandwidth audio channels
• Home-theater experience is the goal
Client Designs

• Most general computers are not capable of decompressing and displaying MPEG-2 streams on the fly in early 2000s
  – Game consoles machines like PS3 and Xbox COULD !! (because built-in graphic card)
  – 100% of teen-boys play video games, and over 50% of teen-girls do, too.

• Broadband networks improved significantly by telecom, cable and wireless companies