MPEG-21 – Overview

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컨텐츠 유통 체계

Total Solution

다양한 컨텐츠 포멧

다양한 전송 방법

상이한 사용자 단말기

과금 및 지불, 결재

컨텐츠 제공자 vs. 소비자 상반된 관점

식별체계
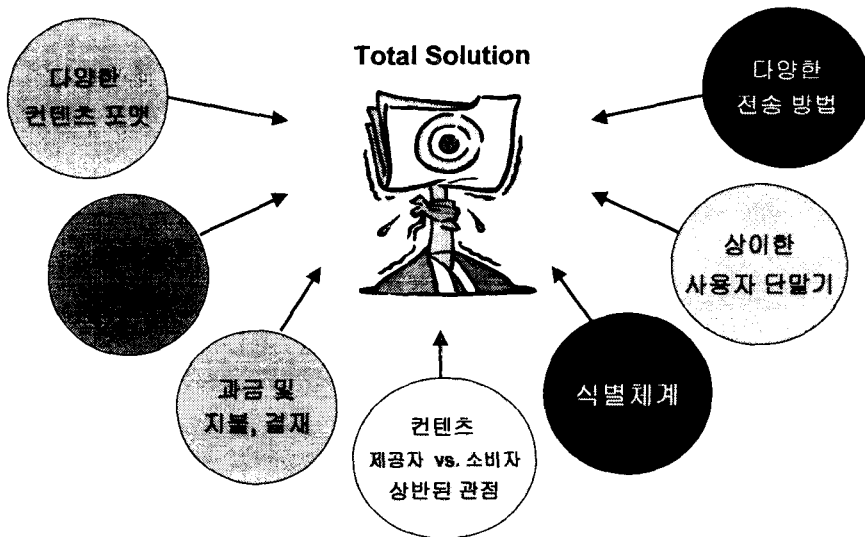
MPEG-21 탄생 배경

Contents & Rights holder

We want....
- **No piracy**
- **No illegal distribution**
- **Safe collection of $$**
- **etc., etc.**

Consumers

We want....
- **Privacy**
- **Simple terminal**
- **Easy to find, pay, share**
- **etc., etc.**

Integrated Framework is necessary !!

MPEG

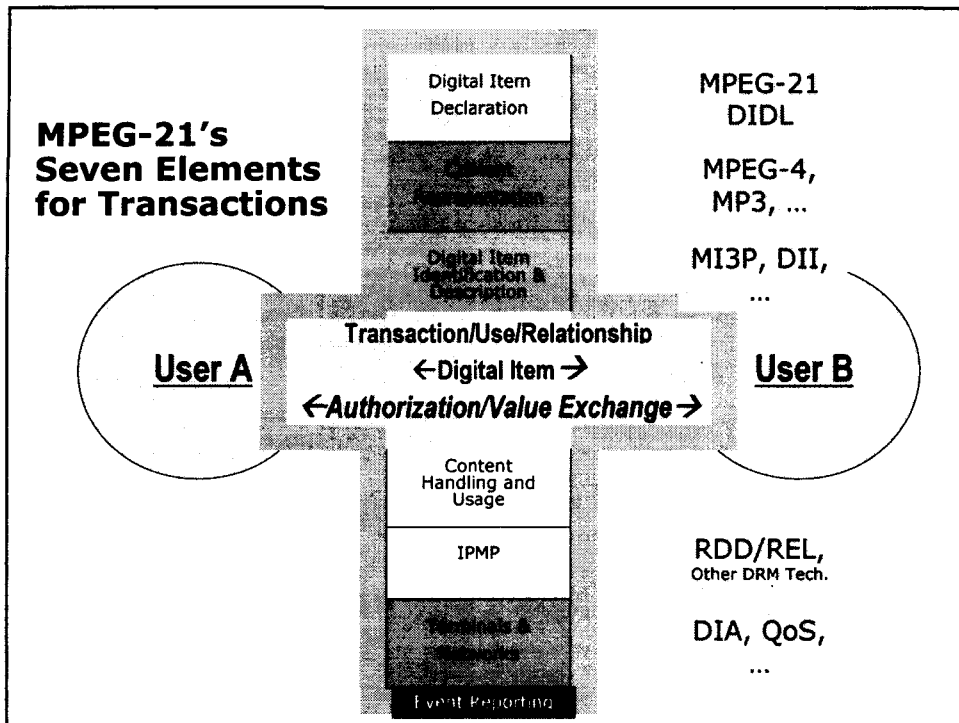## MPEG-21 Multimedia Framework

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MPEG-21 목적

- 멀티미디어 유통을 위한 프레임워크의 주요 요소와 상호 관계를 정의.

- 새로운 규격을 제정함
    - 다양한 네트워크 및 장비를 통한 멀티미디어 객체의 접근, 사용, 가공, 재활용
    - 권리 보호 및 지불 등의 기능이 요구되는 여러 종류의 상거래 모델(Business Model)의 구현
    - 컨텐츠 사용자의 사생활(Privacy) 보호

- 멀티미디어 컨텐츠의 생성, 관리, 전송, 처리, 분배 및 소비를 위하여 필요한 기술들의 조화를 지원하기 위한 통합 표준 확립.

MPEG-21 (ISO/IEC 21000-1)

- 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)
- 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: Event Reporting
** MPEG-21 Testbed

MPEG-21 "Multimedia Framework"

- **MPEG-21 will enable**
  - **All-electronic creation, delivery and trade of digital multimedia content**
  - **Transparent usage of various content types on network devices**

- **For this,**
  - **Documented 'big picture' around any interaction with multimedia content**
    - **'ISO/IEC TR 21000-1: Vision, Technologies & Strategy'**
  - **Identified seven architectural elements**

MPEG-21's Seven Elements for Transactions

Digital Item Declaration

MPEG-21 DIDL

MPEG-4, MP3, ...

MI3P, DII, ...

User A

Transaction/Use/Relationship
← Digital Item →
← *Authorization/Value Exchange* →

User B

Content Handling and Usage

IPMP

RDD/REL,
Other DRM Tech.

DIA, QoS, ...

Event Reporting

MPEG-21 Architectural Elements

- Digital Item Declaration
- Digital Item Description & Identification
- Content Representation
- Content Handling & Usage
- Terminals & Networks
- Intellectual Property Management & Protection
- Event Reporting

Digital Item

- **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

Resources	Metadata
MPEG-1 MPEG-2 MPEG-4	MPEG-7

MPEG-21

Part 2: DID

- **DID = Digital Item Declaration**

- **Realize**
    - *general, flexible* and *interoperable* **solution for all kinds of content in any context.**
    - **uniform way of** *linking* **all types of** *descriptive information* **to any kind of media resource**
    - **ability to intelligently** *manage collections of content* **of diverse types and from all sources**
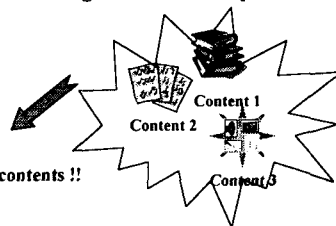

DID
• Need

- **"Digital Item"**의 구성 요소 및 범위를 명확히 할 수 있는 **"정의"**가 필요함
    - o 다양한 **"Use"**를 가능하게 하여야 함
    - o 다양한 형태 및 장르의 컨텐츠를 포함
    - o 명확한 규정 **(Unambiguity)**
    - o 컨텐츠와 이에 대한 설명**(description)**을 모두 포함

Digital Item : 1 content

Digital Item : Multiple contents

Content 1

Content 2

Content 1

We need Uniform way for handling contents !!

Content 3

DID

- 모델
  - **Represent abstract structure of a Digital Item**
    - o **Container, Item, Component, Descriptor, Resource**
    - o **Condition, Choice, Select, Assertion, Statement, Anchor, Fragment**

- 표현
  - **Normative description of the syntax and semantics**
    - o **of each DID element**

- 스키마**(Schema)**
  - **The entire grammar of the DID representation in XML**

Part 3: DII

- Digital Item Identification
- MPEG-21 uses Uniform Resource Identifiers (URIs) to identify
  - Digital Items
  - Metadata Schemes
  - Users
  - Other entities (e.g., territories, rights expressions, terminals, ...)

- URIs allow industry-specific identification schemes to be used within MPEG-21 framework
  - URLs (e.g. http://www.kangwon.ac.kr/mpeg-21.html)
  - URNs (e.g. urn:isbn:0-672-30894-0)

DII

- 필요성
  - 현재 대부분의 컨텐츠는 식별을 위한 **ID**가 없음.
    - o **No name (or ID), no explanation, only content as is**
  - **We need Identification in order to do:**
    - o **IPMP, search, filtering, cataloguing**
- **DII**는 다른 식별체계를 포괄하여 사용 가능한 **generic** 형태
  - **Many *identification systems* have been implemented or are in progress**
    - o **ISBN (Int'l Standard Book Number)**
    - o **ISRC (Int'l Standard Recording Code)**
    - o **ISWC (Int'l Standard musical Work Code)**
    - o **ISAN (Int'l Standard Audio-visual Number)**
    - o **URN, URI**
    - o **DOI (Digital Object Identifier)**
    - o **cIDf (content IDentification Forum)**

Part 4: IPMP

- **IPMP = Intellectual Property Management and Protection**
  - **IP (**지적 재산**)**
    - o 지적, 정신적인 창작활동의 결과인 지식 또는 정보를 표현한 것
  - **Management (**관리**)**
    - o 사용 권한의 부여와 그에 따른 사용 및 유통에 대한 감시
  - **Protection (**보호**)**
    - o 사용 권한이 없는 사람이 그 컨텐츠를 접근하거나 사용할 수 없도록 하는 것
- **Digital Content delivery**
  - **Internet : Napster**
    - o **Music, Video, eBooks, Games**
  - **Digital Broadcast**
    - o **STB with HDD, PDR, DVCR**
  - **Industry is expecting increasing revenue from Digital delivery**
  - **But, there is no proper IPMP systems yet**

IPMP

- Current Situation
  - Most of the e-content is governed by at best rudimentary IPMP systems
  - No de-facto standard IPMP system yet
  - Lack of interoperability between IPMP systems
    - A framework required
  - Requires
    - the freedom to exercise their rights by choosing channels and technologies
    - the freedom to manage their privacy
      - interacting with content anonymously
  - Existing IPMP systems cannot deal with the subtleties of issues related to Intellectual Property Law.

IPMP

- specifies communication protocols for the access to protected Digital Items
  - For creation and consumption of content
  - Standardised messages between 'IPMP Tools'
    - Authentication
    - Cryptographic containers
    - Watermarking
    - Payment systems
    - Key management, ...
- Does not standardise Specific Tools

Part 5: REL

- REL = *Rights Expression Language*

- Based ContentGuard's XrML
- "Programming" language for the creation of rights expressions
- XML Schema based
- Intended for digital and non-digital resources in media and non-media space
- Dependent on MPEG's RDD

Part 6: RDD

- **RDD = *Rights Data Dictionary***
- **An interoperable Dictionary of Terms for use in Rights Management**
- **Includes Descriptive Metadata and Rights Metadata**
- **Machine actionable, therefore automatable**
- **Provides mechanisms for transformation from one schema to another with minimal loss of semantic precision**
- **Provides definitions for MPEG's REL**

Part 7: DIA

○ DIA = Digital Item Adaptation

○ To achieve *interoperable transparent* access to (distributed) advanced multimedia content by
  - shielding users from *network* and *terminal* installation, management and implementation issues
  - allowing the multimedia applications to connect diverse sets of Users,
    such that the *quality of the user experience* will be guaranteed

○ A Digital Item is subject to a *resource adaptation engine*, as well as a *descriptor adaptation engine*, which produce together the adapted Digital Item

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DIA

Digital Item Adaptation
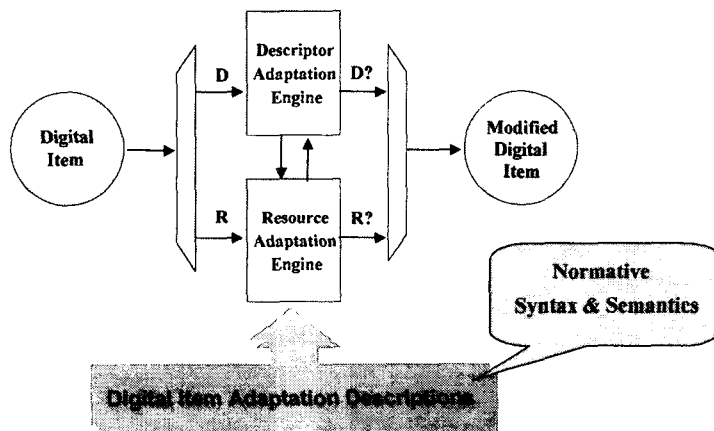
Possible DIA Technologies (examples)

- **DID Adaptation**
  - Using audio instead of text resource
  - Include subtitles into video stream
  - And: Audio description for video scenes

- **Resource Adaptation**
  - Transcoding, bit rate conversion, ...
  - Magnifying
  - Text-to-speech modules
  - Extracting information from resources and presenting it to Users (for EPG)
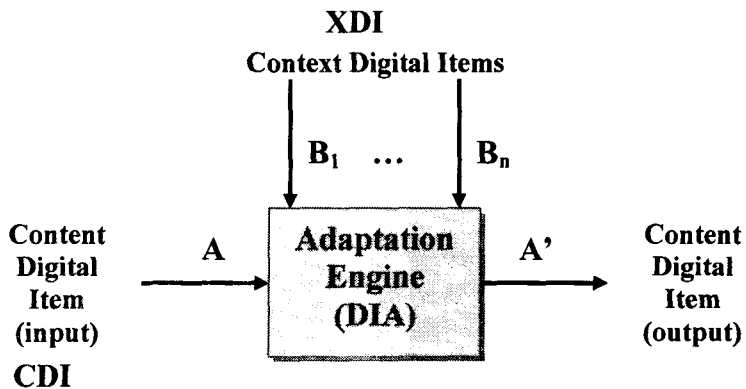
DIA - Status

- **Call for Proposal on technology issued June 2002**
  - After MPEG-internal requirements gathering process

- **Technology selection under way – soCD 5.0**

- **FCD expected for July, 올해 !**

Part 8: Reference Software

- **MPEG-21**의 **Parts**의 기능을 통합적이고 체계적인 소프트웨어로 구현할 목적

- **MPEG-21** 표준 규격안에 기반한 소프트웨어 개발에 관심 있는 단체들의 관련 소프트웨어 제공을 추천

- **CD**에 등록되기 전에 제출해야 함.

DIA processing

XDI

Context Digital Items

B_1 ... B_n

Content
Digital
Item
(input)

CDI

A

| Adaptation |
| Engine |
| (DIA) |

A'

Content
Digital
Item
(output)

Part 9: File Format

- Standardized file format for MPEG-21 Digital Items
  - Combines MPEG-4 features with new MPEG-21 features
  - Will accommodate a valid DID, media resources and references to external resources
- Currently, Working Draft v.1.0 published

Part 10: Event Reporting

- **Event?**
  - **Every interaction with a Digital Item in the multimedia framework**
  - **About User-User, User-Digital Item, Digital Item-Digital Item interaction**

- **What is Event Reporting**
  - **Metrics and interfaces that enable Users to understand precisely the performance of all reportable events within the framework**
  - **Refers to identified Digital Items, environments, processes, transactions and Users**

ERL (ER Language) and ERD (ER Dictionary)
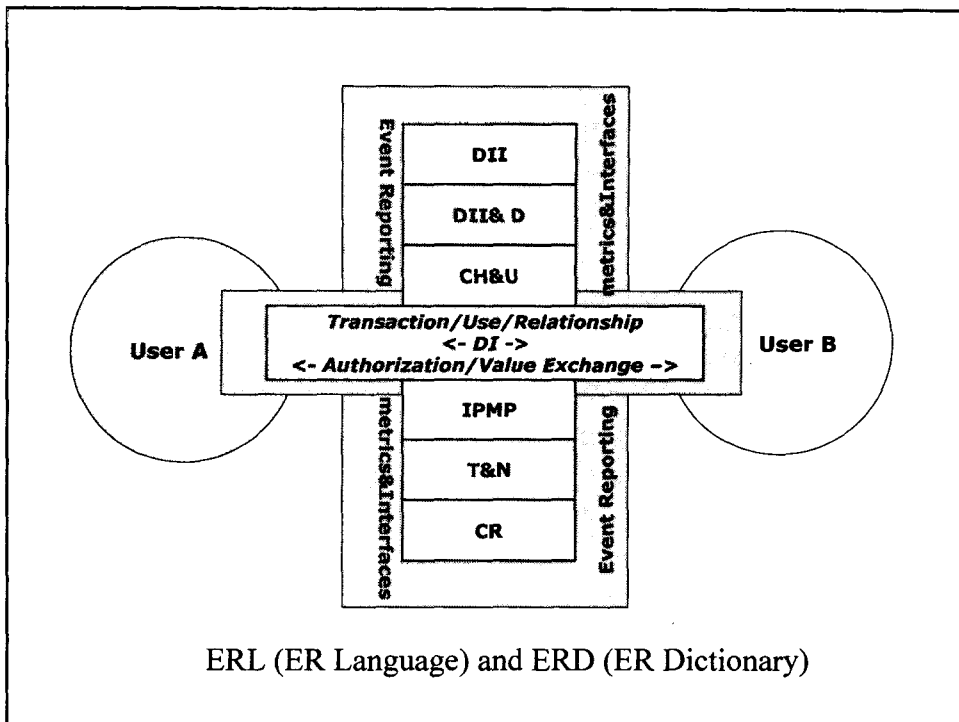
Examples

○ Technical reports
  - Bandwidth usage/Availability
  - Network congestion
  - Load balancing
○ Usage reports
  - Copyright reports
  - Performances
  - Copies
○ Financial reports
  - Proof of purchase
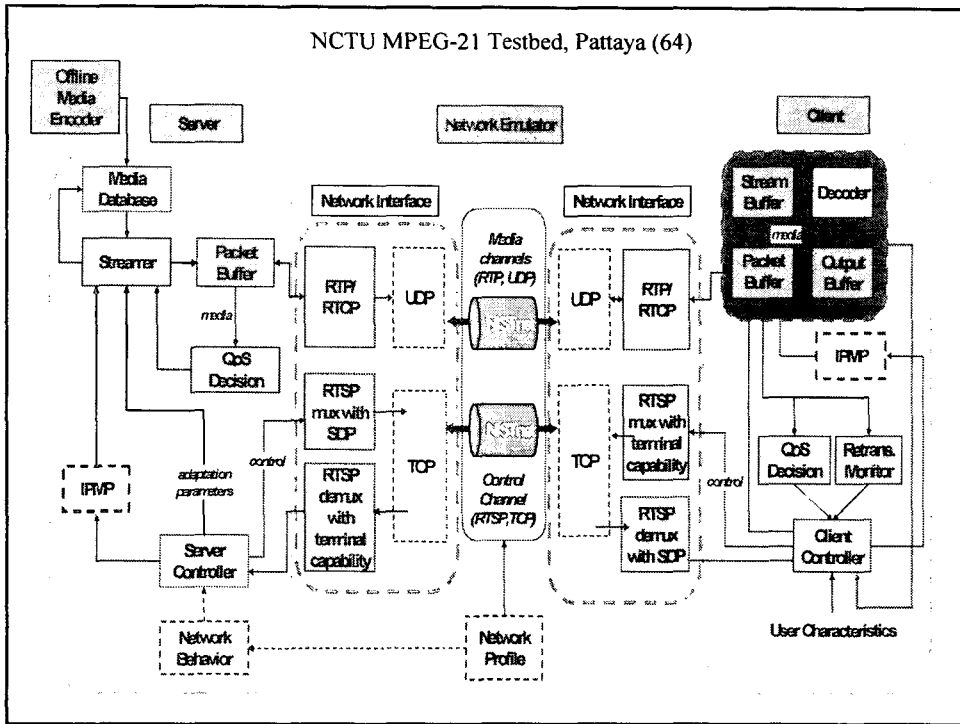 - License Purchase and delivery

Current Status

- Draft Requirements for Event Reporting : Oct. 2002 (62nd meeting)

- Preliminary Call for Proposals issued in Dec. 2002 (63rd meeting)
  - *Requirements document*
  - Current Vision on Event Reporting

- 아직 초기 단계. **RDD/REL**의 응용에 대한 검증필요

MPEG-21 Testbed

- **No Standard**
- **MPEG** 기술을 활용하여 **testbed** 구현함

NCTU MPEG-21 Testbed, Pattaya (64)

MPEG-21 표준화 일정

Part	Title	CfP	WD	CD PDAM PDTR	FCD FPDAM	FDIS FDAM DTR DCOR	IS AMD TR COR
1	Vision, Technologies and Strategy			01/01		01/07	01/09
2	Digital Item Declaration		01/01	01/07	01/12	02/05	02/09
3	Digital Item Identification	01/01	01/03	01/12	02/03	02/07	02/09
4	Intellectual Property Management and Protection						
5	Rights Expression Language	01/07	01/12	02/07	02/12	03/07	03/09
6	Rights Data Dictionary	01/07	01/12	02/07	02/12	03/07	03/09
7	Digital Item Adaptation	01/12	02/05	02/12	03/07		
8	Reference Software						
9	File Format, ER, etc						