

MPEG-21 표준과 콘텐츠 유통



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방송미디어연구부

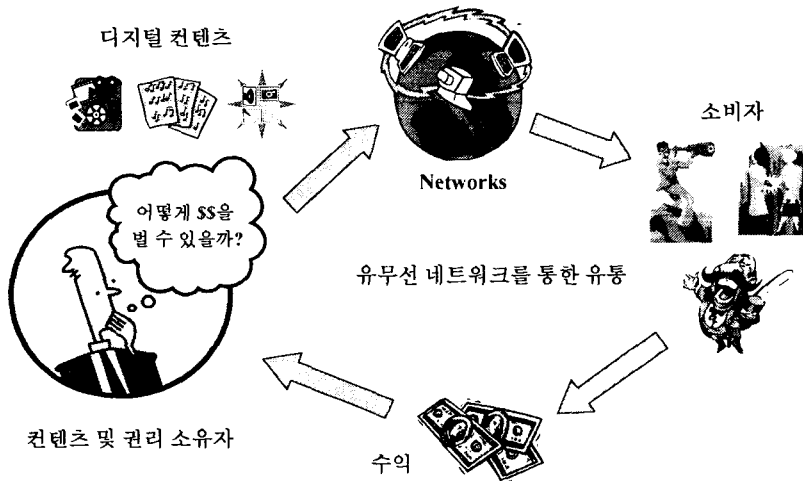
목 차

- 멀티미디어 콘텐츠 유통 체계
- MPEG-21: Multimedia Framework
- MPEG-21 & MOSES Project
- 결 론

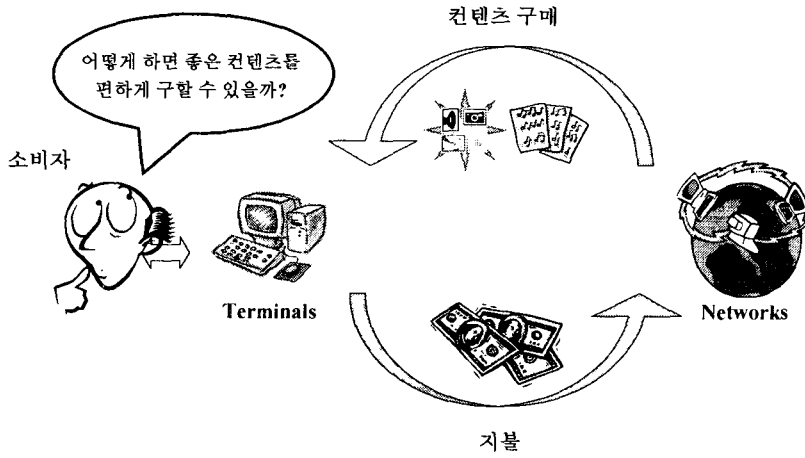
콘텐츠 유통의 주요 요소

- 콘텐츠 포맷
 - 다양한 표현, 압축, 복원, 저장, 관리가 용이한 양질의 콘텐츠
- 식별체계
 - 콘텐츠 분류, 관리 및 검색
 - 유통경로 추적
- 보호 및 관리
 - 불법복제 및 불법유통 방지, 지적재산권 보호
- 전달
 - 다양한 유무선 네트워크에 의한 방송, 통신 및 융합망
- 비즈니스 모델
 - 콘텐츠 제작자, 저작권 소유자 및 서비스 제공자의 수익성 확보
 - 다양한 소비 환경 지원 및 소비자 욕구 충족 필요

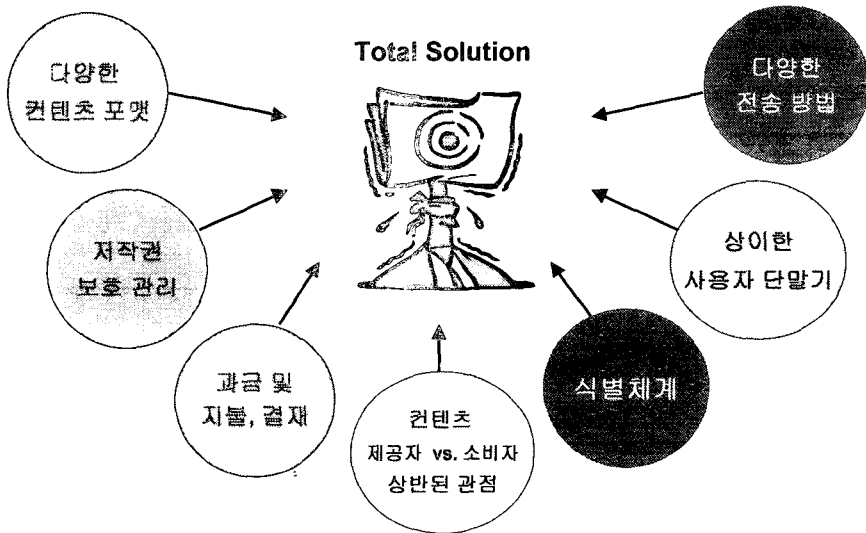
콘텐츠 유통 - 제공자 관점



컨텐츠 유통 - 소비자 관점



컨텐츠 유통 체계



컨텐츠 유통 체계 현황

• 현재의 상황

- 멀티미디어 컨텐츠 유통을 위한 다양한 infrastructure 존재
- 'Big Picture' 의 부재
 - » Infra 를 위한 필수 요소 규정의 어려움
 - » 향후 서비스 향상을 위한 추가 요소 파악의 어려움
 - » 다양한 infrastructure 들에 대한 통합의 어려움
 - » content distributor 의 입장에서 infra 구성
 - 소비자 관점의 부재

• 새로운 요구

- 컨텐츠 생산의 다양화 추세
 - » 개인에 의한 고급 멀티미디어 컨텐츠의 생산
 - » 컨텐츠 생성, 변경, 유통 환경의 다양화
 - » 전달 환경이 복잡화, 미세화.
- Content Management 의 필요성 대두
 - » 디지털 컨텐츠의 효과적인 관리
 - » IPR 보장 환경 조성
 - » Illegal piracy 의 방지

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-21 Multimedia Framework

MPEG-21 비전

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- ‘E-Content’의 상거래 지원을 위한 멀티미디어 프레임워크 정의
- ‘E-Content’의 전달을 지원하기 위한 멀티미디어 프레임워크에 대한 사용자 관점에서의 공통적인 이해를 도출
- 다양한 콘텐츠 제공자를 접근하기 위한 인터페이스와 프로토콜의 통합 및 표준화에 의한 사용자 선택권의 확대(Globalize)
- 다양한 네트워크와 장비를 통한 멀티미디어 콘텐츠 사용의 편의성과 활용성 증대를 가능하게 함.
 - To enable transparent and augmented use of multimedia resources across a wide range of networks and devices.
 - From “PD of Technical Report”(N3500, July 2000)

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MPEG-21 목적

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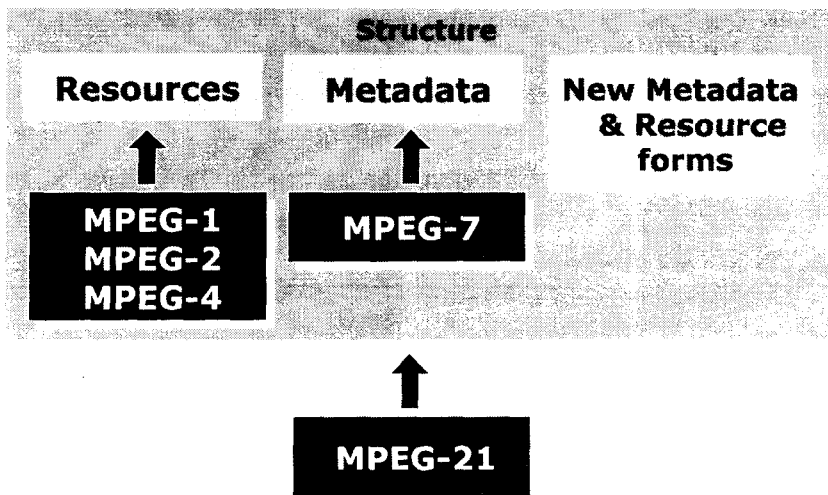
- 멀티미디어 유통을 위한 프레임워크의 주요 요소와 그들 간의 관계를 이해하고, 빠진 요소를 파악함.
- 다음을 가능하게 하는 새로운 규격을 제정함 :
 - 다양한 네트워크 및 장비를 통한 멀티미디어 객체의 접근, 사용, 가공, 재활용
 - 자동화된 권리 보호 및 지불 등의 기능이 요구되는 여러 종류의 상거래 모델(Business Model)의 구현
 - 콘텐츠 사용자의 사생활(Privacy) 보호
- 멀티미디어 콘텐츠의 생성, 관리, 전송, 처리, 분배 및 소비를 위하여 필요한 기술들의 조화를 지원하기 위한 통합 표준을 만듦.

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MPEG-21 주요 정의 (1)

- **Digital Item**
 - the digital representation of “a work”
 - “a structured digital object” with a standard representation, identification and meta-data
 - “the fundamental unit” of distribution and transaction within this 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



MPEG-21 주요 정의 (2)

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- **User**
 - Any entity
 - » That interacts in the MPEG-21 environment or makes use of a Digital Item
 - includes all members of the value chain
 - » e.g., creator, rights holders, distributors and consumers of Digital Items

- **USE (interactions between users)**
 - Creating, Providing, Archiving, Rating content
 - Enhancing, delivering, aggregating, syndicating, retail selling, consuming content
 - Subscribing to content
 - Regulating content
 - Facilitating transactions, regulating transactions

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MPEG-21 (ISO/IEC 21000-1)

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- **ISO/IEC 21000 consists of the following parts, under the general title, *Information Technology — Multimedia Framework*:**
 - 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

Note: Other parts may be added when needed.

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MPEG-21 주요 요구사항



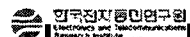
- The ease of understanding the terms of use (“agreements”)
- The enforcement of business and usage rules through the value chain
- The support of regulations and statutes and the incorporation of societal factors as necessary
- The provision of User protection, including reliability of service, statutory rights, liability and insurance for purchase, loss and damage, and escrow arrangements to eliminate risks
- The management and protection of User privacy
- The personalisation of content
- The ability to add metadata as content moves through the value chain
- The verification of the integrity of Digital Items and the provision of means to check when, by which method and by which authority this integrity was verified;
- The ability to track content and transactions;
- And many others ...

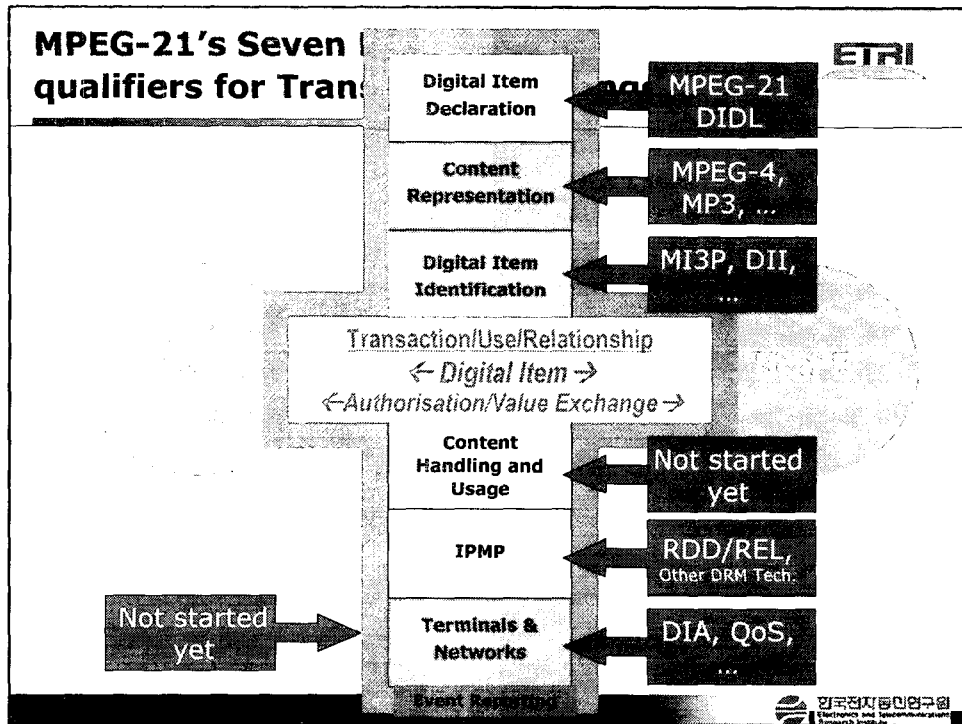


MPEG-21 구조 요소



- **Digital Item Declaration**
 - What structure?
- **Digital Item Identification (and Description)**
 - Which content?
- **Content Handling and Usage**
 - How is it used and delivered?
- **Intellectual Property Management and Protection**
 - How to control rights?
- **Terminals and Networks**
 - How to (interoperable transparent) access the content?
- **Content Representation**
 - How to represent the multiple (coding) format of content?
- **Event Reporting**
 - How to interface and measure the interactions?





Part 2: DID

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- DID = Digital Item Declaration
- Current Situation: There is no
 - 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

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Part 2: DID

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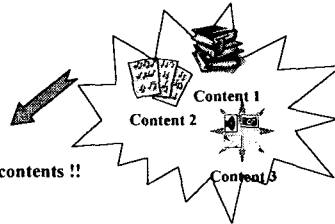
• Need

- “Digital Item”의 구성 요소 및 범위를 명확히 할 수 있는 “정의”가 필요함
 - » 다양한 “Use”를 가능하게 하여야 함
 - » 다양한 형태 및 장르의 콘텐츠를 포함
 - » 명확한 규정 (Unambiguity)
 - » 콘텐츠와 이에 대한 설명(description)을 모두 포함

Digital Item : 1 content



Digital Item : Multiple contents



We need Uniform way for handling contents !!

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Part 2: DID

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• 모델

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

• 표현

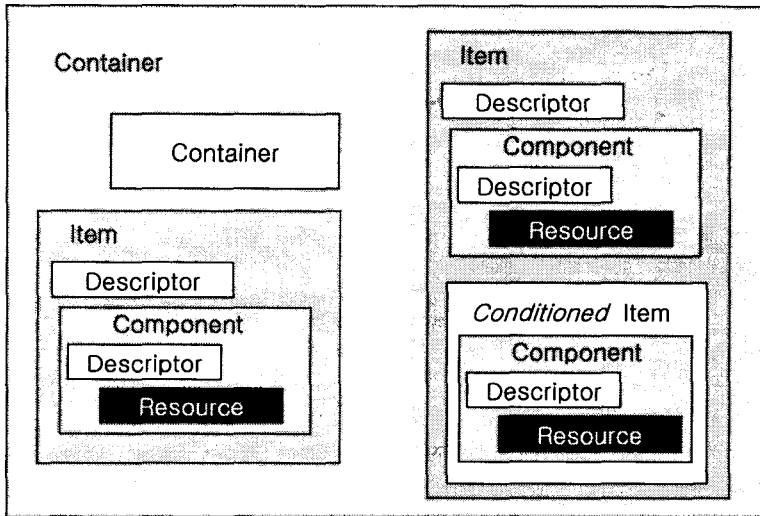
- Normative description of the syntax and semantics
 - » of each DID element

• 스키마(Schema)

- The entire grammar of the DID representation in XML

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Part 2: DID



Exchanging Content vs. Exchanging DIDs

- In MPEG-21, content is exchanged by exchanging DIDs
 - *not necessarily the entire Digital Items*
- The resources can then be located
 - as the DID contains links thereto

Part 3: DII

- **DII = Digital Item Identification**
- 필요성
 - 현재 대부분의 콘텐츠는 식별을 위한 ID가 없음.
 - » No name (or ID), no explanation, only content as is
 - We need Identification in order to do:
 - » IPMP, search, filtering, cataloging
- **M21 DII는 다른 식별체계를 포괄하여 사용 가능한 generic 형태**
 - Many identification systems have been implemented or are in progress
 - » ISBN (Int'l Standard Book Number)
 - » ISRC (Int'l Standard Recording Code)
 - » ISWC (Int'l Standard musical Work Code)
 - » ISAN (Int'l Standard Audio-visual Number)
 - » URN, URI
 - » DOI (Digital Object Identifier)
 - » cIDf (content IDentification Forum)

Part 3: DII

- **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.etri.re.kr/mpeg-21.html>)
 - URNs (e.g. <urn:isbn:0-672-30894-0>)

Part 4: IPMP

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

Part 4: 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.**

Part 4: IPMP



- **MPEG-21 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**

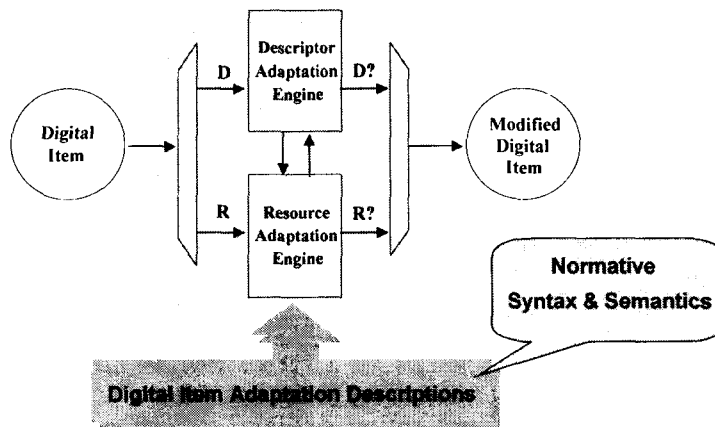
Part 6: RDD

- **RDD = *Rights Data Dictionary***
- **Based on <indec> Principles**
- **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**

Digital Item Adaptation



- **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 and DRM**
 - DIA modules can be governed by DRM (IPMP) Systems
 - For example:
 - » “No Text-to-Speech” business rule will take precedence over legal obligations

Part 8: Reference Software



- MPEG-21의 Parts의 기능을 통합적이고 체계적인 소프트웨어로 구현할 목적
- MPEG-21 표준 규격안에 기반한 소프트웨어 개발에 관심 있는 단체들의 관련 소프트웨어 제공을 추천
- Ref. S/W로 제공될 소프트웨어 저작권 정보는 다음과 같이 표기
 - This software module was originally developed by <FN1> <LN1> (<CN1>) and edited by <FN2> <LN2> (<CN2>), <FN3> <LN3> (<CN3>), ... in the course of development of the <standard> for reference purposes and its performance may not have been optimized. This software module is an implementation of one or more tools as specified by the <standard>.
 - » <FN1>는 제작자의 이름(first name)을, <LN1>는 성(last name)을, <CN1>은 회사 이름(company name)을, <standard>는 국제표준 명칭(e.g. ISO/IEC 14496-1)을 나타냄.

Part 9: File Format



- New Part 9 of MPEG21 created: 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

MPEG-21 Architecture

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- **Open question:**
 - How do the elements fit together?
- **Two approaches so far**
 - Top down – drawing the 'big picture'
(ISO/IEC TR 21000-1)
 - Bottom-up – development of various tools
- **But how do they meet?**
 - Discussions are under way – Digital Item Manipulation Methods may be the answer

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The Future

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- MPEG-21 may have many parts – maybe 21!
- Specifications can be used independently
- Will provide industry – Software companies, device manufacturers, content owners – with tools for content delivery
- Success depends on uptake.

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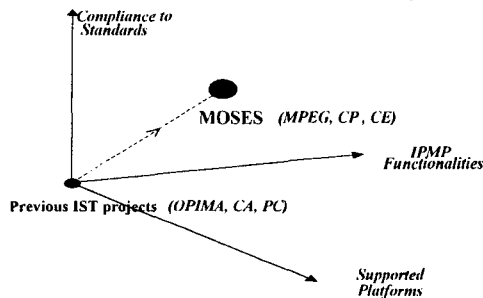
MPEG-21 표준화 일정

Part	Title	CP	WD	CD PDAM PDTR	FCD FPDAM	FDIS 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			02/12		02/07	02/09
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	03/03	03/07	03/09
8	Reference Software						
9	File Format						

MOSES (MPEG Open Security for Embedded Systems)

Objectives

- 콘텐츠 관련 상거래(유통)를 위한 시장배경을 인지하는 것
 - 콘텐츠 보호 및 복사제어
 - 저작권관련 표준화에 적극참여
 - 다양한 business model 숙지
- 선행된 멀티미디어 콘텐츠 보호관련 IST 프로젝트의 결과를 토대로 3개의 기술방향과 연계하여 더욱 발전시키는 일 -> fully interoperable IPMP systems



Motivation



- To develop enabling tools for a market sector which may be of great importance for future economic growth
- To follow up at a European level international standard initiatives, providing European contributions to standard bodies in the field of CA to multimedia content
- To achieve a critical mass in this field
 - To assemble a complete end-to-end secure system at reasonable costs by bringing different expertise from partners

What MOSES will do



- 이전 프로젝트(OCCAM)는 OPIMA architecture(only available, 다양한 IPMP기술을 필요로 하는 business model, simple client-server paradigms)와 conformance 하는 것에 노력
- Extending the OPIMA interfaces and architecture to achieve compliance with the most recent security standards S.A MPEG IPMP Extension & DVB-CPCM for M&C-interoperability
- Expanding the scope as regards business models to encompass operational scenarios
 - full set of functionalities pertaining to IPMP systems implemented and tested (controlling copying, moving, exporting and importing protected content)
- Porting legacy secure infrastructures to devices other than the PC
 - e.g. mobile terminals or STB

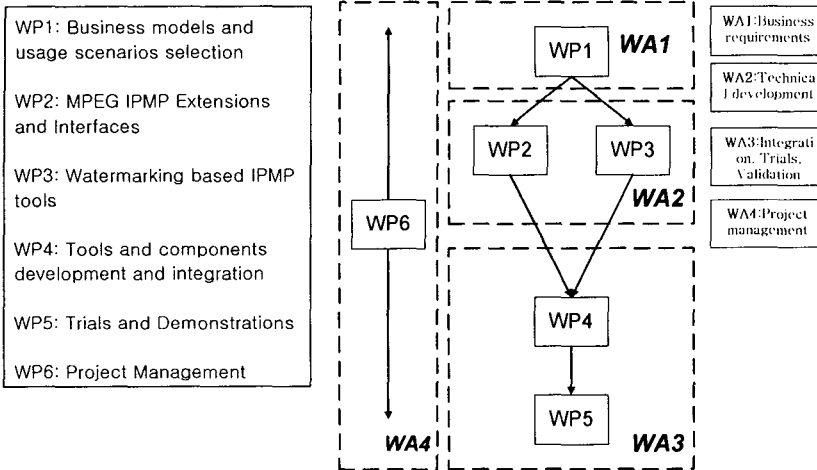
Specific Innovative Development Areas

- Open, secure user environment based on MPEG IPMP Extensions and DVB-CPCM
- Encryption and scrambling, key management and authentication techniques to constitute complete IPMP systems
 - To Implement IPMP tools building upon the MPEG IPMP Extensions for interoperability
 - To make the tools possible to extend their functionality by securely downloading new components
- Creation of Cryptography libraries based on primitive functions(similar to structured audio-> 조합이 가능한 audio content) as adopted by MPEG IPMP
- Watermarking technologies targeted to A/V domain of application in monitoring, copy/access control and fingerprinting

List of Participants

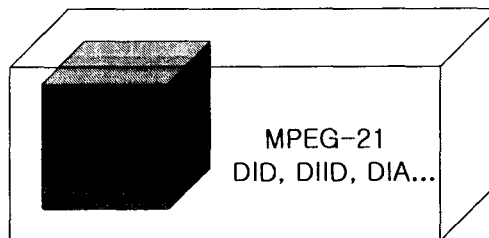
- Central Research Lab (CRL), UK
- Telecom Italia Lab (TiLab), Italy
- Assoc. para Desen. Das Telecomunicacoes e Tecnicas de Informatica (ADETTI), Portugal
- Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland
- Electronics and Telecommunications Research Institute (ETRI), Korea
- EdV, Italy
- ObjectLab, USA

Structure of the Workplan



MOSES 와 MPEG-21의 Relationship

- MOSES -> interoperable IPMP system 구축
 - MPEG-21의 방향을 최대한 흡수
- MPEG-21 -> MOSES + 다른 많은 부분
 - MOSES는 MPEG-21, 7 elements 중 IPMP와 관련



- MPEG-21은 무엇인가 ?
 - integration of standards to support harmonized technologies for the management of multimedia content

- 콘텐츠 유통에서의 그 영향은 ?
 - Key solution to the digital chaos
 - Integration and accommodation of relevant standard

- 표준화 일정
 - Technical Report (Part 1) in Sep. '01
 - DID (Part 2), DII (Part 3) in May/July. '02
 - Divide and conquer
 - Up to 2004?