



Digital Broadcasting Research Division
Broadcasting Media Research Group

2004 디지털 방송기술 워크샵

방송·통신 융합 멀티미디어 프레임워크 기술



2004. 10. 13.
방송미디어연구그룹
김재곤

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Outline

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- 통신·방송 융합 개요
- 통방융합 멀티미디어 프레임워크
 - 개요
 - MPEG-21 Multimedia Framework
 - EU Project: ENTHRONE
- MPEG-21 기반 방송·통신 융합 서비스 프레임워크
- Summary

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방송·통신 융합 - 개요

□ 방송·통신 융합?

□ 융합형 서비스

- 인터넷 방송, IPTV, DMB, Mobile streaming
- 양방향 데이터 방송

□ 방송과 통신 영역의 Convergence

- 콘텐츠, 전송망, 사용자 단말

□ 방통융합 배경/발전 방향

□ 방송의 디지털화 및 통신의 광대역화

- 디지털 방송 콘텐츠의 이종망간 서비스 가능
- BcN 기반의 다양한 접속망
 - 초고속인터넷, 이동통신, 케이블, 휴대인터넷, 지상/위성/DMB방송망

방송·통신 융합 - 개요

□ 방송통신 융합이란

□ 이종망을 통한 다양한 단말의 방송 콘텐츠 서비스

- 이종망 연동 - 방송망, 유무선인터넷, 이동통신망
- 다양한 통합 단말 - TV, PC, PDA, 휴대폰
- 디지털 방송 콘텐츠 - 대화형/맞춤형

□ *UCA: Ubiquitous Content Access* 서비스 제공

- Any Content
 - 사용자가 원하는 콘텐츠, 원하는 형태로 (in a personalized way)
- Anywhere
 - 이종 접속망을 통한 다양한 단말에서
- Anytime
 - ... 맞춤형 방송

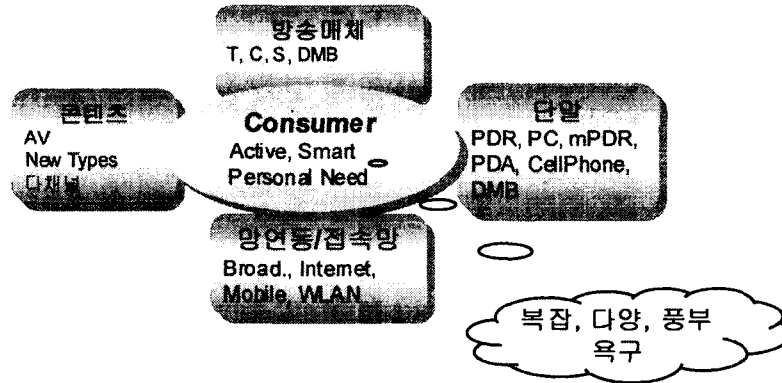
방송·통신 융합 - 개요

- 방송통신 융합 기술 개발
 - 방통융합 Infra-structure
 - BcN - 광대역화/이동성, 이종접속망 연동
 - 방통융합 Info-structure
 - 방통융합 멀티미디어 프레임워크
- 방통융합 멀티미디어 프레임워크
 - 이종망과 다양한 단말로 구성된 방송통신 융합 환경에서,
 - 멀티미디어 콘텐츠의 제작/보호-전달-유통/소비의 단대단 서비스를 위한
 - 포괄적이고 체계적인 상호연동 가능한 멀티미디어 서비스 골격
 - MPEG-21 Multimedia Framework
 - Interoperable data model
 - UMA: Universal multimedia access
 - ENTHRONE
 - End-to-End QoS through Integrated Management of Content, Networks and Terminals

- 통방융합 멀티미디어 프레임워크
 - 개요
 - MPEG-21 Multimedia Framework
 - ENTHRONE

개요 - 배경/필요성

- 방송과 통신 융합 가속화
 - New multimedia usage context



- Mass market of audio-visual services

개요 - 배경/필요성

- Successful mass market provision of content services
 - for the content/service providers and network operators
- End-to-end QoS over heterogeneous networks and terminals is a key element
 - *E.g., content providers want their content to reach customers with high quality and in a timely, secure manner*
- No complete and unified solution - **big picture**
 - to enables the end-to-end delivery of services over various types of networks at a guaranteed quality level
 - many elements (standards) exist
 - only partial solutions for certain cases
 - Certain types of networks, services, terminals, a single network operator
 - MPEG-21 will fill gaps and allow existing components to be used together, thereby increasing interoperability

개요 – Vision & Goal

□ MPEG-21

- to define a normative open multimedia framework to enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities
- Goals
 - provide access to information and services from almost anywhere at anytime with ubiquitous terminals and networks
 - identify, describe, manage and protect the content in order to support multimedia delivery chain that contain content creation, production, delivery and consumption

개요 – Vision & Goal

□ ENTHRONE

- Proposes an integrated management solution which covers an entire audio-visual service distribution chain
 - including content generation and protection, distribution across networks and consumption at user terminals
- Not to unify each individual entity of the chain, but to harmonize
 - to support an end-to-end QoS architecture over heterogeneous networks, at various user terminals
 - rely on an efficient, distributed and open management architecture
- Goal
 - to bridge the divide between content provision & networking worlds
 - resulting in cross-industry co-ordination on both issues
 - and bringing focus to mutually advantageous standards, MPEG-21

□ MPEG-21: Multimedia Framework

- Basic Concept
- Key Elements
- Use Case Scenarios

Basic Concept

□ Digital Item - what

- A structured digital object with a standard representation, identification and metadata
- The fundamental unit of distribution and transaction in the framework
- Digital Item = (resource + metadata + structure)
 - Resource: individual asset, e.g., MPEG-2 video
 - Metadata: descriptive information, e.g., MPEG-7
 - Structure: relationship among parts of the item

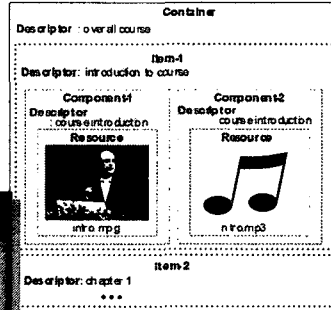
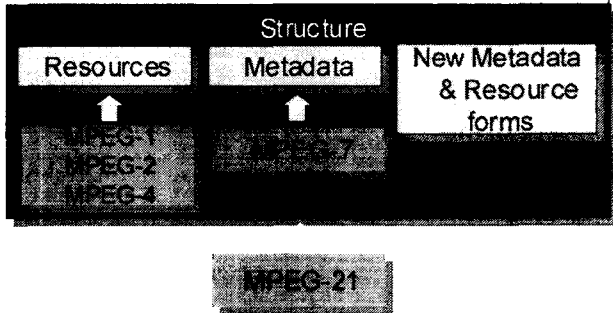
□ Users – who

- Users in the content value chain seamlessly exchange content in the form of “Digital Item” across networks and devices
- Can be creators, consumers, rights holders, content providers, distributors, etc

Basic Concept

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- Digital Item
 - E.g., educational package



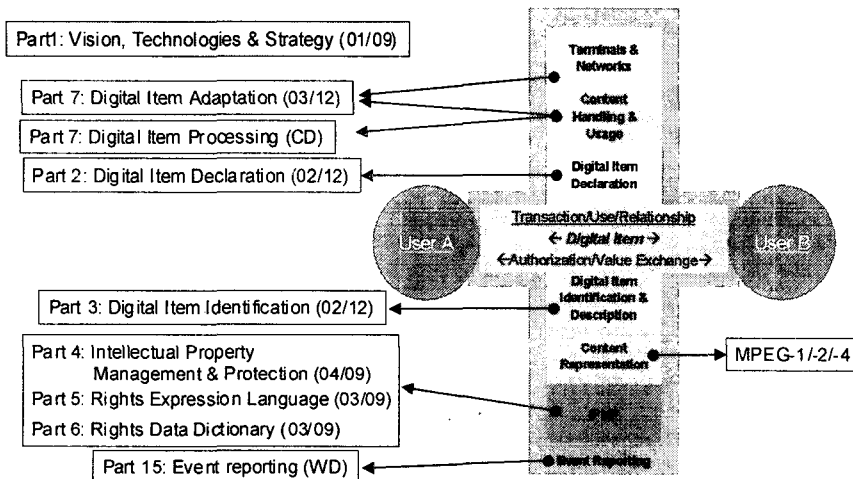
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Key Elements

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- Key elements and standardization status



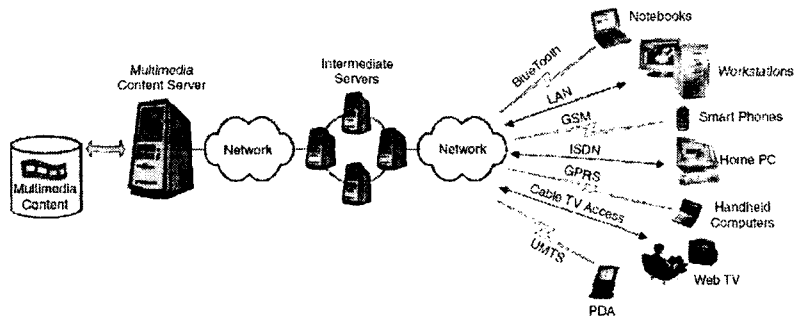
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Use Cases: UMA

□ Universal Multimedia Access (UMA)

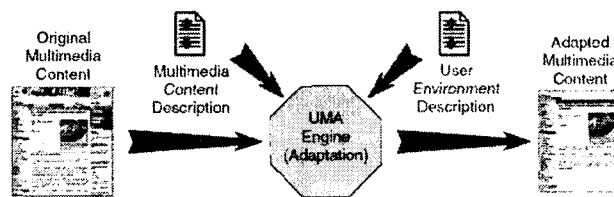
- Different terminals access rich multimedia content through different networks
- Different usage environments
 - Terminal capability, Network characteristic, User preferences
 - Natural environment of user (location)



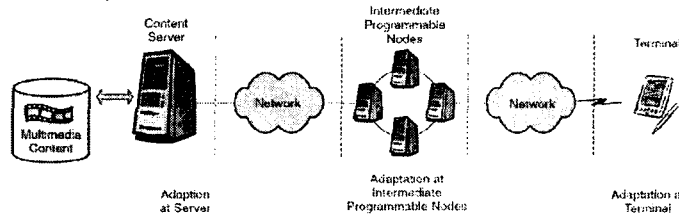
Use Cases: UMA

□ Related Element: DIA, DID

- Adaptation DI to usage environments

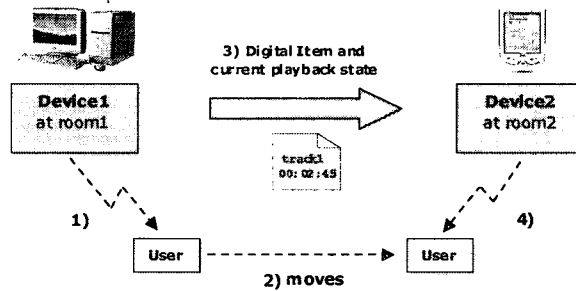


- at different places



Use Cases: Session Mobility

- Transfer of configuration-state information and/or application-specific information (rendering states)
 - Enables the Digital Item to be consumed on the second device in an adapted way
 - by allowing reconfiguration of transmitted DI session to meet requirement of new host



- EU ENTHRONE Project
 - Overview
 - Main Objectives
 - Technical Objectives

Overview

- *End-to-End QoS through Integrated Management of Content, Networks and Terminals*
 - IST Project of European Union (EU)
 - Project duration: 2003. 12. ~ 2007. 11.
 - Participants
 - Content providers and broadcasters: RBB, IRT, TDF
 - Network operators: France TELECOM, T-SYSTEMS
 - Manufacturers/suppliers: THALES, OPTIBASE, NDS, ROHDE & SCHWARZ, NEC, EXPWAY, BSOFT
 - Research institutes: ETRI, INESC, DEMOKRITOS, PRISM, INRIA
 - Universities: EPFL, U. of LANCASTER, U. of BUCHAREST



Main Objectives

- Investigate and develop an integrated solution that can
 - manage the functionality of various entities in the digital information distribution chain
 - from content/service generation to user terminals
 - using heterogeneous networks and based on the end-to-end QoS approach
- Bring together relevant and complementary concepts and technologies to achieve the end-to-end delivery of content
 - resource management
 - network convergence
 - end-user terminal interconnection
 - QoS mechanisms

Main Objectives

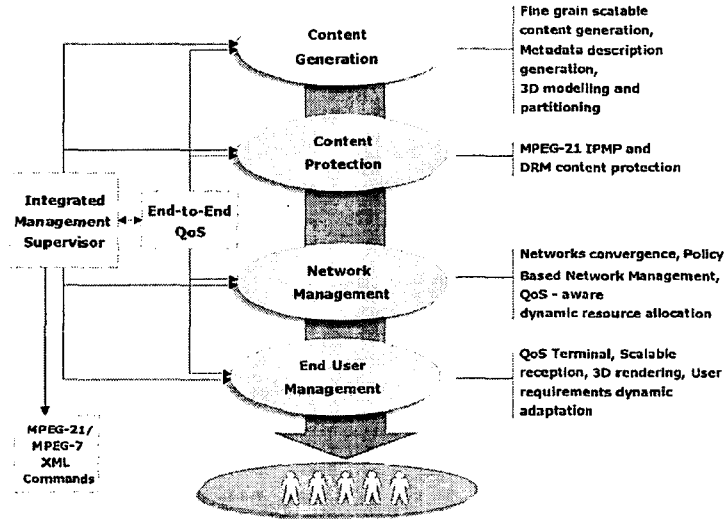
- New technology challenges
 - A complete solution capable of managing the resources across a wide range of networks and terminals
 - Integration of components and standards to facilitate harmonization of 'technologies' for the creation, protection, distribution and consumption of digital services
 - Guaranteed end-to-end quality, implying interoperability, consistency and reliability between different resources
 - Fine Granular Scalability of content generation for seamless rendering across networks and terminals
 - A Business Model within which the various actors are able to collaborate and profit

Main Objectives

- Develop an overall solution, an integrated management architecture
 - incorporating tools, technologies and standards in an integrated management concept
 - implementing MPEG-21/MPEG-7 features and supporting
 - content generation and protection
 - broadcasting and streaming of audio-visual services
 - adaptive end-to-end QoS for scalable audio-visual flows on heterogeneous networks
 - end user terminals management
- Main aspects to be addressed
 - unified, adaptive end-to-end QoS approach
 - scalable protected content generation
 - distribution over the heterogeneous networks and diversity of user terminals

ENTHRONE Activities

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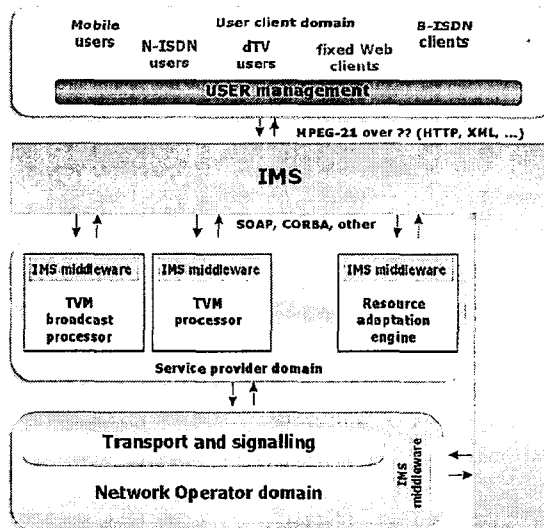


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Conceptual System Architecture

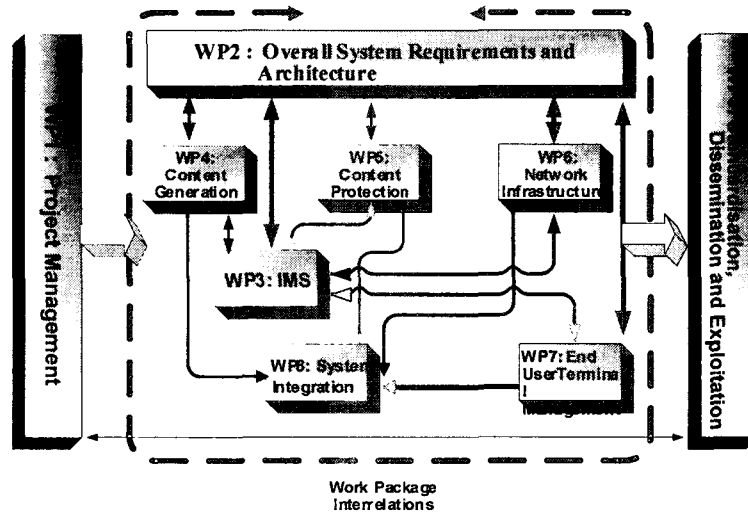
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Technical Objectives



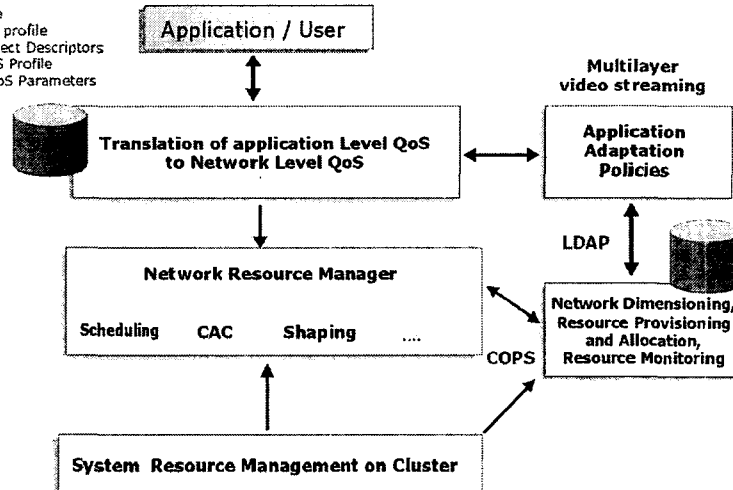
End-to-end QoS

- Definition and implementation of the end-to-end QoS Signaling
- Translation of Application-level QoS into network system-level QoS
- Integration of MPEG-21/MPEG-7 metadata such as QoS profile in the network resource allocation policy decision process to build accurate adaptive end-to-end QoS strategies
- Support scalability aspects concerning content generation and protection and adaptation to network and terminal characteristics
- Service Level Specification Management for QoS guarantee
- Enforcement of policy and priority strategies to the network segments, using Bandwidth Brokers

End-to-End QoS Management

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- Metadata:
- User profile
 - Application profile
 - MPEG4 Object Descriptors
 - MPEG7 QoS Profile
 - Network QoS Parameters



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IMS

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- IMS : Integrated Management Supervisor
 - central to ENTHRONE architecture
 - the distributed end-to-end QoS manager
- IMS approach
 - allows all the "negotiation" between all the heterogeneous parts to agree on a way of inter-working which the main objective is to ensure the user request to be properly addressed with *optimized resources*
 - scalable content generation, protection, networks routing and/or cooperation, networks resources allocation, reception facilities switching, content availability & usage rights, etc

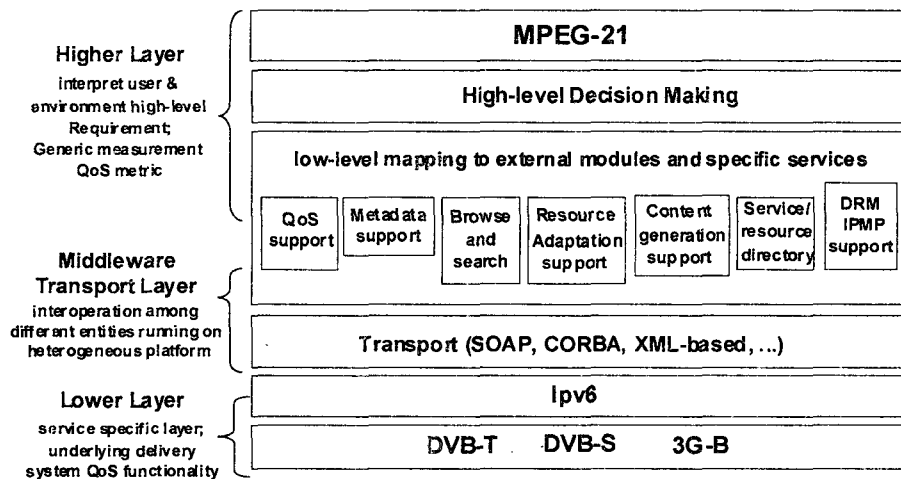
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Main Purposes of IMS

- Provide the management of
 - the content generation and protection
 - the network configuration and exploitation
 - the user terminal interaction with the system
- Control over hybrid content production and management
 - media + metadata
 - communicates with authoring and analysis tools in order to synchronize media production and media descriptions for a consistent data storage
- Implement and manage of a global QoS system
- Provide support for the transmission of MPEG-21/MPEG-7 metadata over a variety of physical media

Layered Architecture of IMS



Content Generation

- Delivery and integrity of multimedia content
 - content generation and delivery mechanisms, including scalable content generation and protection, adaptation to network and terminal characteristics
 - innovative content representation formats with an emphasis on scalable coding techniques
 - Hierarchical representation and implementation of different features
 - efficient and successive processing of queries
 - Generation and sending of additional metadata that enables descriptions of the service (content, location, characteristics, etc)
 - Streaming technologies based on IP and DVB
 - Multiplexing and synchronization of multiple descriptions associated with a content item

Content Protection

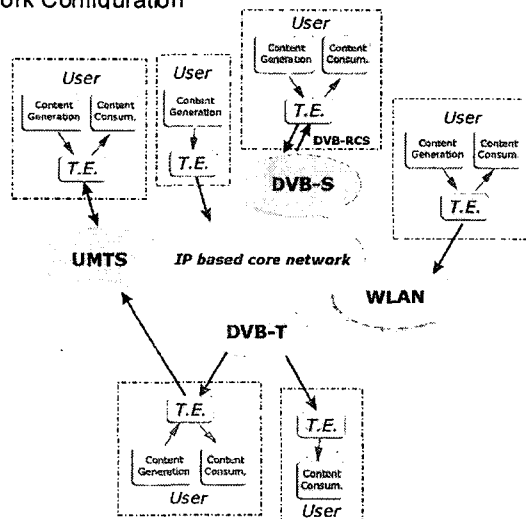
- Incorporation of MPEG-2 and/or MPEG-4 IPMPX capabilities and functionality into ENTHRONE platform (players, servers and authoring tools).
- Improvement of existing and development of new MPEG IPMPX compatible tools for content protection
 - encryption tools, key management tools, authentication tools, etc
- Definition, development, validation and standardization of an interoperable MPEG-21 IPMP framework
 - to support end-to-end security, managed by some higher level layer like IMS
 - Support the process of definition, development, validation and standardization of an interoperable MPEG-21 IPMP framework

Network Infrastructures

- To facilitate efficient content distribution by the underlying network technologies
 - design and implement a system level network interface for resource adaptive applications
 - provide the availability and use of resources in a variety of network domains
 - Develop appropriate networks configurations architecture that is compliant with MPEG-21 features
 - Design and implementation of the appropriate interfaces to enable the communication of network level systems with the IMS
 - Design and develop systems mechanisms for end-to-end QoS approach
 - Extension of network policy based management architectures from only IP networks to other types (DVB, WLAN)
 - IPv6 support for a variety of networks
 - Implementation of Perceived and Network Quality Meters
 - Design, development and implementation of the QoS monitoring agents

Network Infrastructures

- Overall Network Configuration



End Terminal

- Definition of a MPEG-21 terminal architecture
 - interactions and processing of digital items necessary for the efficient management of the terminal QoS
- Implementation of the MPEG-21 terminal
 - capable to deal with dynamic modification of the requirements, interfacing by means of the MPEG-21 standard APIs, the IMS and the terminal QoS user requirements
- Validation of the architecture of the MPEG-21 terminal for the desired functionality
- Define necessary APIs for guaranteeing the efficient interface of the IMS with the MPEG-21 terminal for a global QoS (network and terminal) management

- MPEG-21 기반 방송·통신 융합 서비스 프레임워크
 - 연구목표
 - 표준기술
 - UMA 시연 시스템

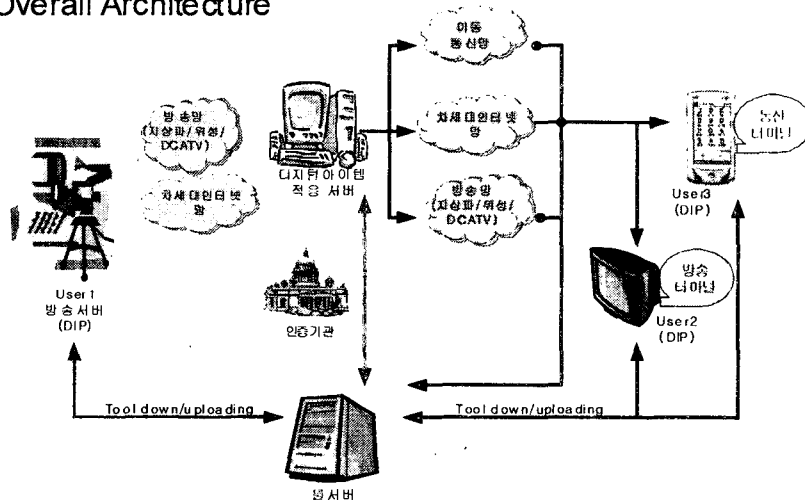
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방송·통신 융합 환경에서 멀티미디어 콘텐츠의 제작, 전달, 소비를 신뢰성 있고 효율적으로 제공하기 위한 MPEG-21 기반 멀티미디어 프레임워크 기술 개발

- MPEG-21 멀티미디어 프레임워크 기반 기술 연구
 - 디지털 아이템 생성, 보호, 전달, 적응, 소비 기술 개발
 - 기술검증용 테스트 베드 구현
- 방송·통신 융합 멀티미디어 프레임워크 기반 UMA 기술 개발
 - 플랫폼 기반 범용 멀티미디어 접근(UMA) 서비스 개발
 - 방송 통신 융합 플랫폼을 이용한 기술 검증 및 시연 시스템 개발
 - EU Project 국제공동연구(MOSES, ENTHRONE)
- MPEG-21 표준화 연구

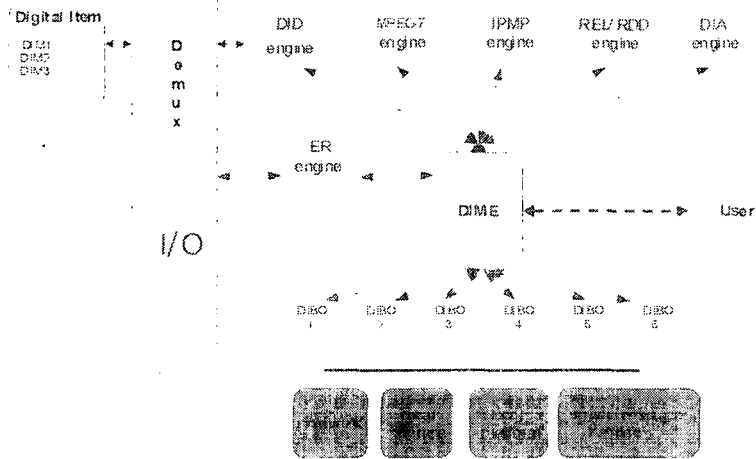
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□ Overall Architecture



표준기술 - DI Player

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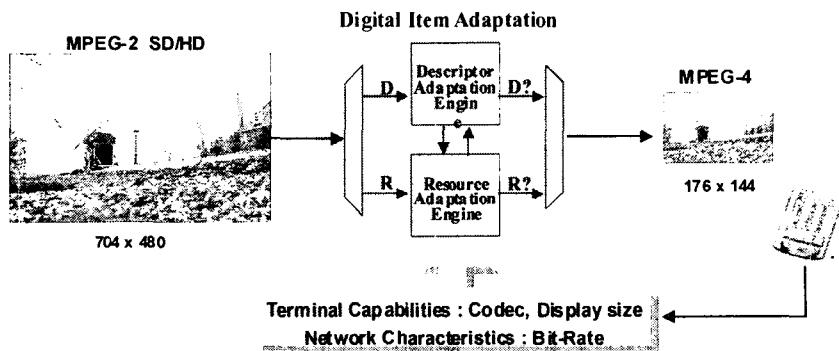
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표준기술 - DIA Engine

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- DIA based resource adaptation
 - Real time MPEG-2 to MPEG-4 transcoding
 - DIA for color vision deficiency
 - Stereoscopic video conversion



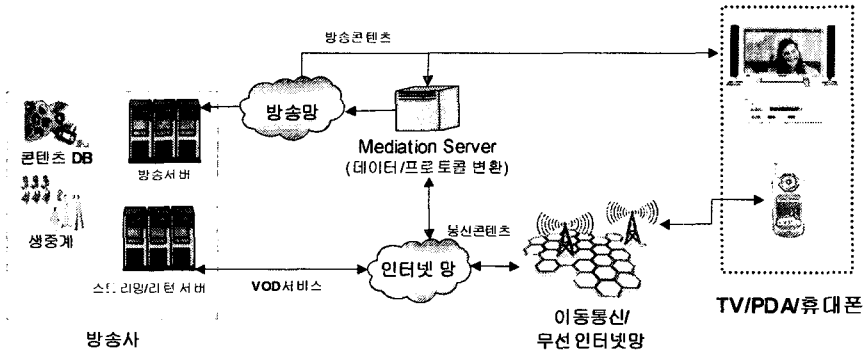
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UMA 시연 시스템

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- Broadcasting streaming delivery over CDMA based on MPEG-21 framework
 - Network-adaptive 3-Layer scalable video streaming
 - Real time MPEG-2/4 transcoding



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Summary

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- 방송통신 융합의 가속화
- 통방융합의 Business Models
 - 이종망을 통한 다양한 단말에서의 콘텐츠 서비스
 - Ubiquitous Content Access – Anytime, Anywhere, Any Content
- 멀티미디어 프레임워크 필수적
 - 상호연동 가능한 콘텐츠 생성/보호, 전달, 적응/소비 제공
- 통방융합 멀티미디어 프레임워크 기술 개발 추진
 - MPEG-21 Multimedia Framework에 기반한 핵심기술 개발
 - Content Adaptation & Personalization
 - MPEG-21 (DIA), MPEG-7, TV-Anytime Forum
 - End-to-end QoS
 - Scalable Video Coding & Delivery, etc
 - UMA 기술
 - EU Project: ENTHRONE

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