

5 디지털 대화형 TV 기술 동향

ETRI 방송기술연구부 안 치 득 박사

디지털 대화형 TV 기술 동향

1999. 6. 11.

안치득

Radio & Broadcasting Technology Laboratory

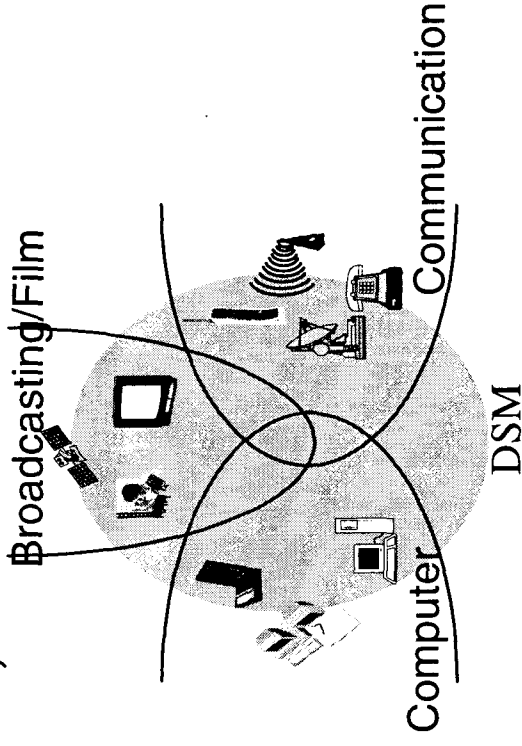
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1. Background
2. Current Issues
3. AICi Approach
4. Conclusion

통신/방송 기술 발전

- ☞ 통신/방송/컴퓨터/가전 기술의 융합 : powerful programmable processor, synthetic information, interactivity
- ☞ 통신/컴퓨터 네트워크의 개방형 구조로의 발전 : two-way delivery --> internet, DVD



- ☞ Robustness : multi-channel, flexible, inter-operable, universally accessible, extensible, error-prone
- ☞ Interactivity : user-oriented, on demand, user-creatable

멀티미디어 기술발전 전망

☞ 표현미디어의 대중화 및 자유화

- You can represent whatever you may imagine.

☞ 방향

- 융통성(flexibility)의 증대 : 통신방송 이종망간 연동,

internet

- 대화성(interactivity)의 증대 : User-friendly, Intelligent
- 이동성(mobility)의 증대 : 소형화, 경량화
- 현실감(reality)의 증대 : Quality, 3D

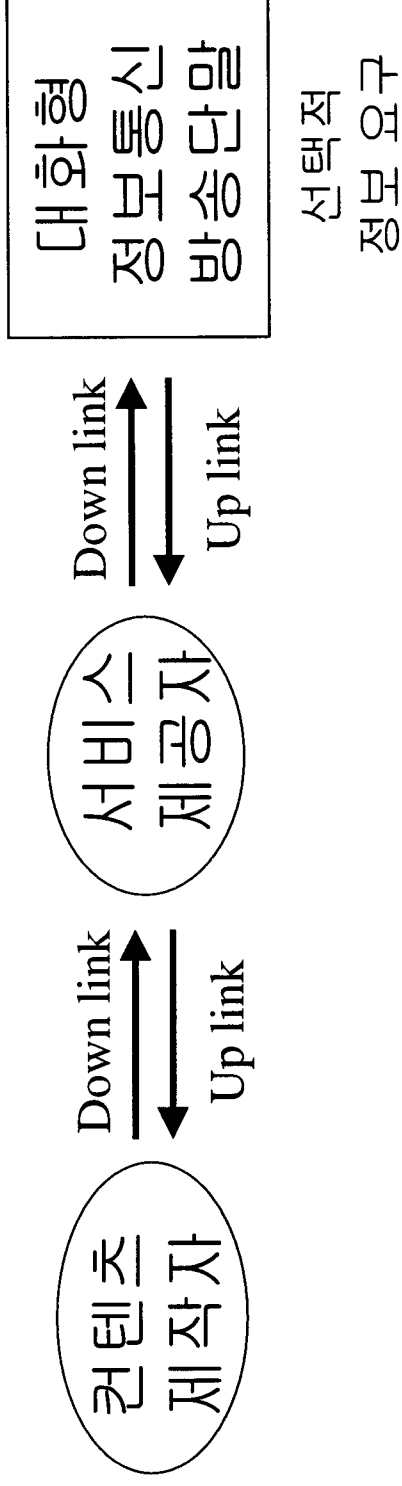
☞ 가상미디어에 의한 서비스 제공

- 시공간 한계극복 --> 세계화?

멀티미디어 서비스 발전 전망

☞ 정보처리 기술의 디지털화

단순 시청형 --> 정보 선택형 --> 정보 요구형 --> 정보 창조형
(국부 대화형) (양방향 대화형)

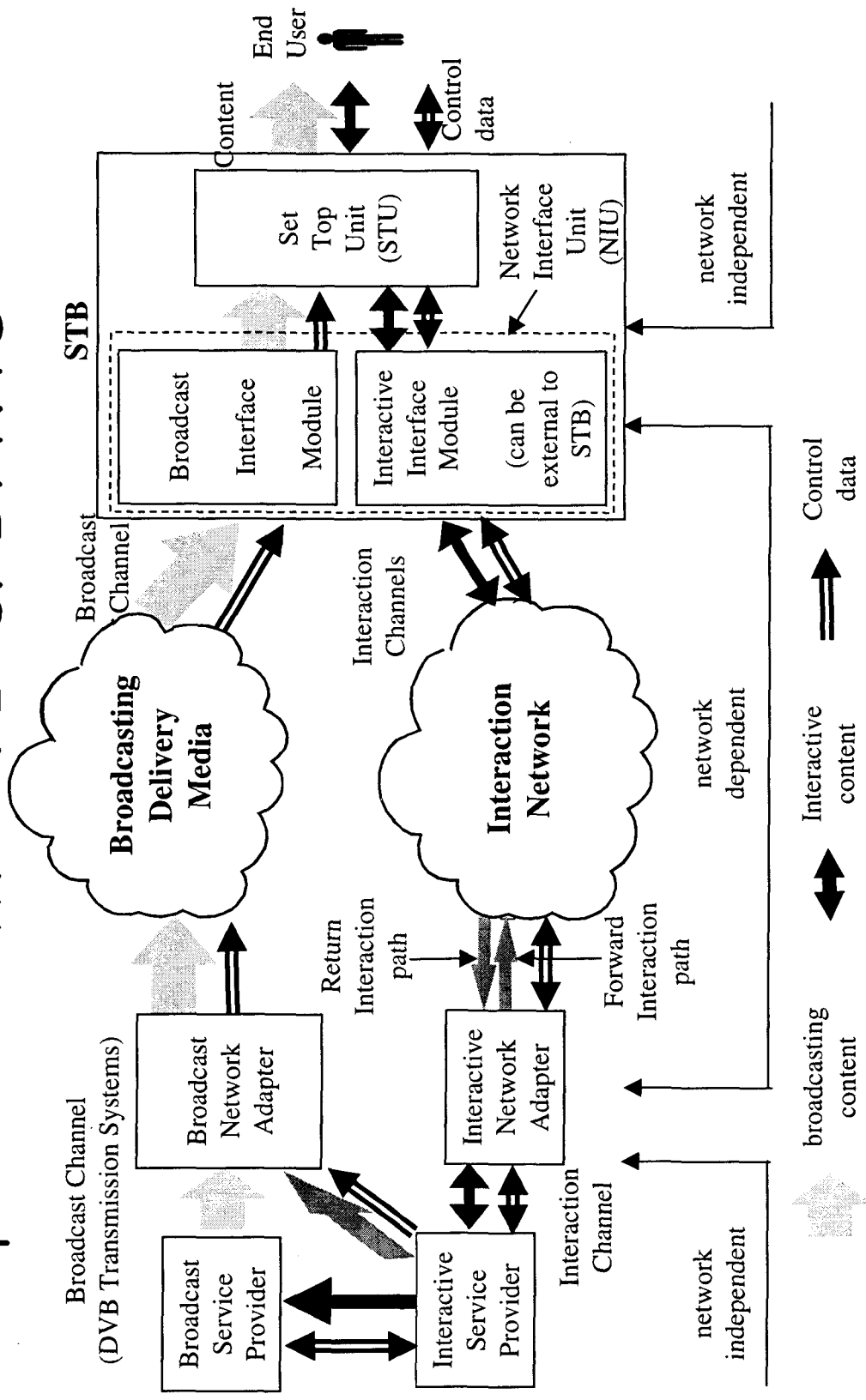


ATSC interactive system model

- o Broadcast channel
 - one-way from the broadcast provider to the user
 - carry content and/or control data required by the interactive application and/or communication protocol to the user(receiver)
 - may include the forward interaction path for interactive services

- o Interactive channel
 - bi-directional between the receiver and the interactive service provider
 - carry both content and control data required by the interactive application or communication protocol
 - forward interaction path for data from the broadcast provider to the user, i.e., downstream
 - return interaction path for data from the user to the broadcast provider, i.e., upstream

ATSC interactive system model adopted from DVB & DAVIC



ATSC-DASE architecture

- o Execution engine
 - Java VM
- o Presentation engine
 - No single specification agreed
 - ==> xHTML, AIC-ML (MPEG-4 BIFS, xHTML, X3D)
- o Content decoders
 - thru Java Media Player API for MPEG-1, 2, QuickTime, AVI, WAV, AU, MIDI, and MPEG-4/VRML
- o System services
 - thru Java API
 - access system services, presentation service

Application scenario – DAVIC

: 디지털 전송 환경에서 전통적인 TV 서비스 기능 향상

1. TV anytime

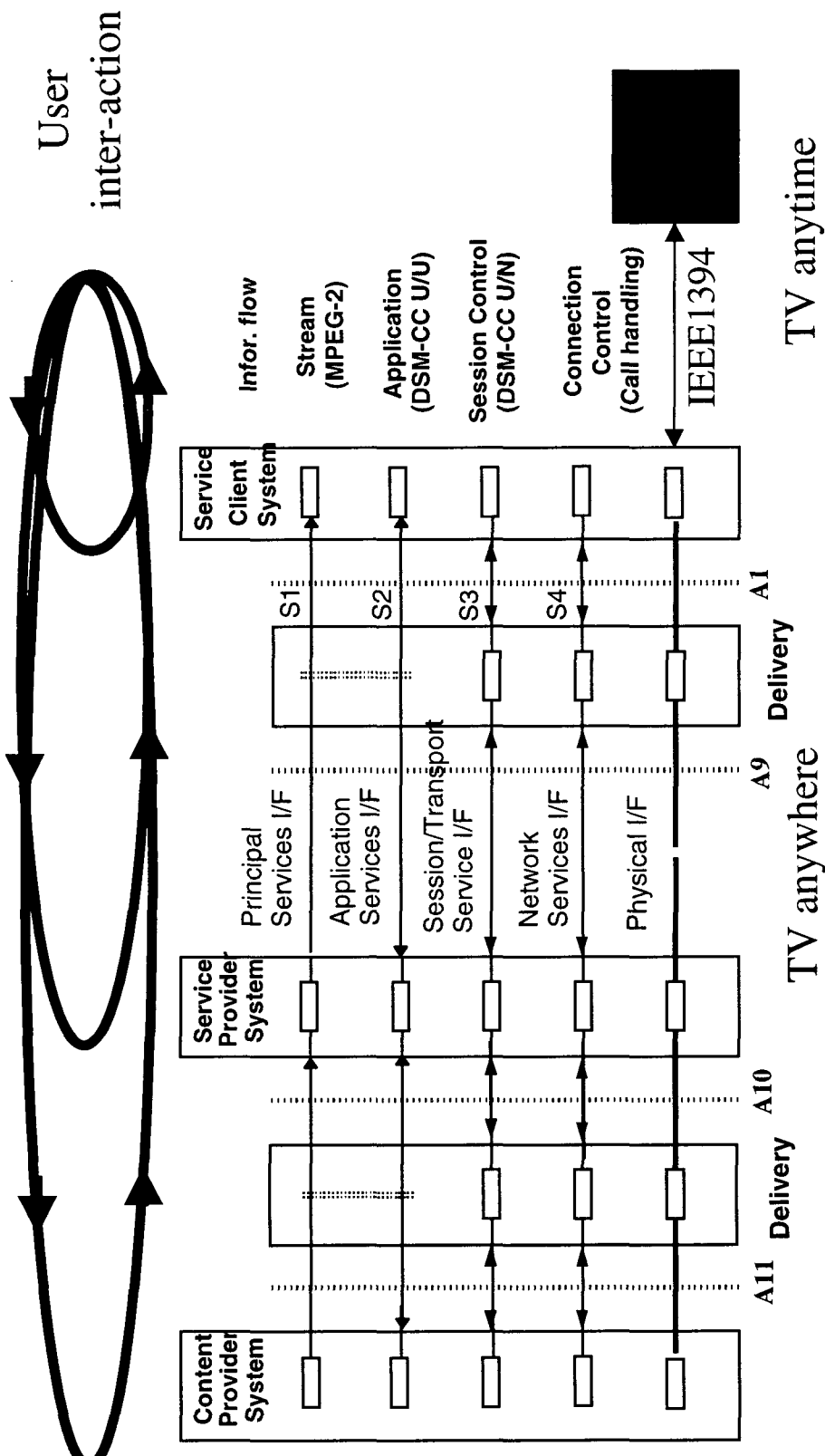
- o User initiated services
 - EPG, Internet connection, Embedded reference, Immediate recording
- o Agent initiated services
 - pre-defined user profile
 - PSIP(Program & System Information Protocol) 및 확장된 정보 이용
- o Video file transfer

Application scenario – DAVIC

- o Content usage
 - Web link, segment jumping, content customization

2. **TV anywhere** : Digital TV on Inernet or mobile networks

DAVIC service reference model



Physical I/F could be anything including PSTN, ISDN, BISDN, ATM-LAN, ADSL, VDSL, FTTC, HFC, MMDS LMDS, Satellite, Terrestrial, CD-ROM, DVD, Tape, etc.

Application scenario – AIC

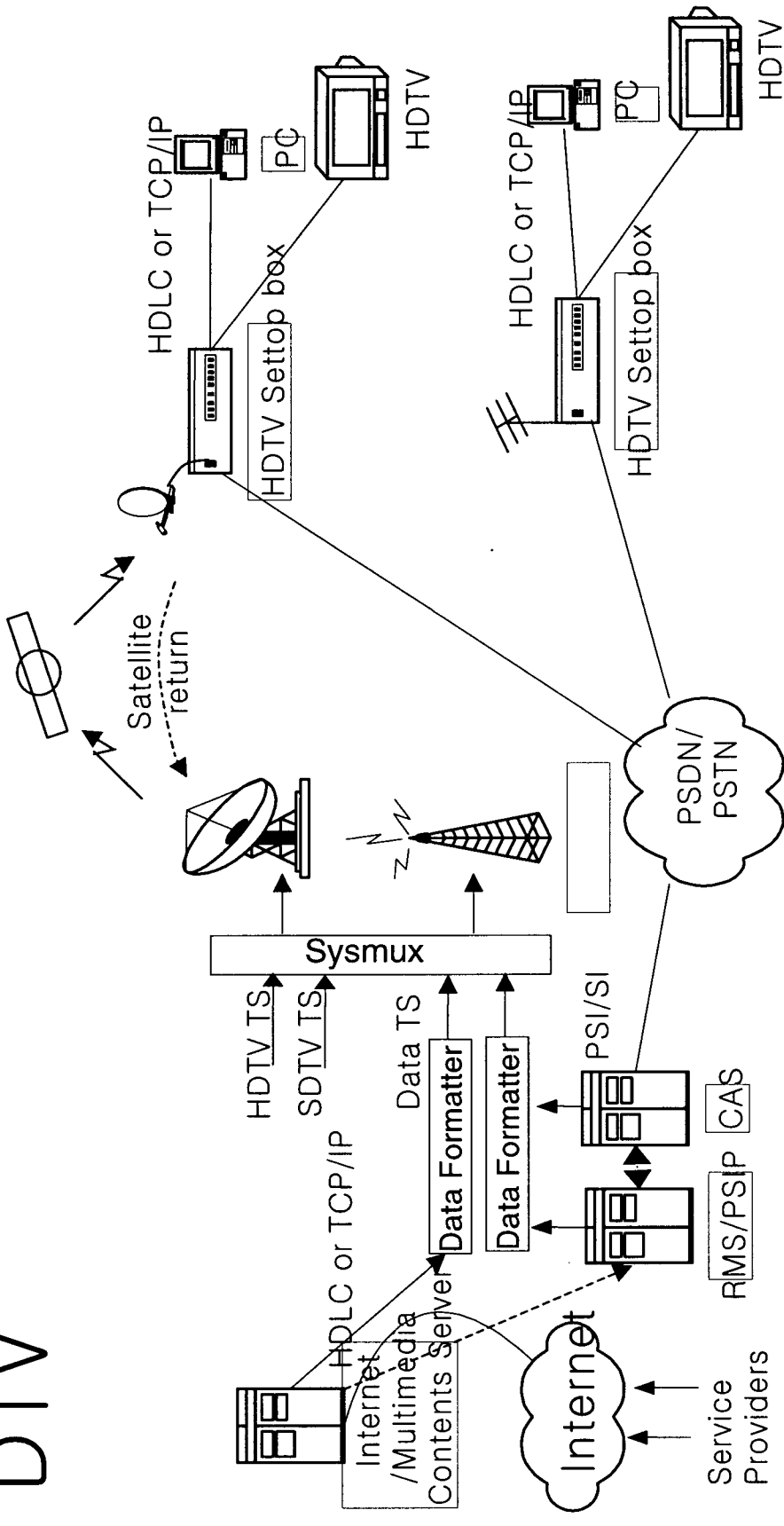
: Digital TV 광고 기능 향상을 고려한 정보서비스 위주

- o advanced EPG, program enhancement
- o buy-me button with ad
- o data ticker
- o interactive home shopping
- o interactive commercial
- o interactive entertainment
- o demographic programming, etc.

Major Interactive Service Activities

- WebTV
- OpenTV
- MS & AT&T
- AOL & DirecTV
- FloraTV
- NMC(New Media Consumption)

Typical environment for interactive DTV



Interactive Service Activities: MS & AT&T

- Killer App: Electronic Commerce
- Platform: CATV
- MS가 AT&T에 50억\$을 투자
- CATV Set-top에 MS WinCE를 탑재
- 예상 가입자 수: 750-1000만
- 미국내 2개 도시에서 공동 시장테스트

Interactive Service Activities: AOL & DirecTV

- Killer App: Electronic Commerce
- Platform: DBS & DSL(또는 PSTN)
- Network: Oracle & National Semicon
- SW: Oracle
- Set-top Box: Phillips
- 예상 가입자 수: 1,700만 이상

FloraTV in U.S.A. - I

- o From 1999. 5.
- o Purpose :
 - o trials of interactive, on-line and e-commerce services over digital broadcasting media and the internet
- o Receiver interoperability thru terrestrial/cable/satellite TV
- o Services :
 - o E-Documentary, E-Classroom, Customized Commercial, Impulse Buy, Interactive Sports, E-Promotion(E-Coupons, E-Rewards), E-TV(Web portal), E-Neighborhood chat rooms, etc.

FloraTV in U.S.A. - II

- o Standards : ATSC, W3C, MPEG, OpenCable, etc.(DVB next)
- o DigitalTV technology : DASE, JavaTV, etc.
- o Web and Internet technology : XHTML, TCP/IP, RTP, etc.
(AICi next)
- o 3D technology : Web3D

NMC(New Media Consumption) in Europe

- o From 1999. 5.
- o Purpose
 - trials of interactive, on-line and e-commerce services over digital broadcasting media and the internet
- o Standards
 - DVB, AICi(MPEG-4, Web3D, XML, Java, etc.)
- o Receiver interoperability thru
 - terrestrial/cable/satellite TV

Issues

- o No broadly agreeable specifications and trials
 - ATSC, DVB, ITU
 - DAVIC, AIC, ATVEF, etc.
 - FloraTV, NMC, etc.

- o Need provisions for the whole broadcasting chain including contents creation, delivery, and client including contents IPMP(Intellectual Property Management and Protection) and CAS(Conditional Access System)

- o PC on TV v.s. TV on PC

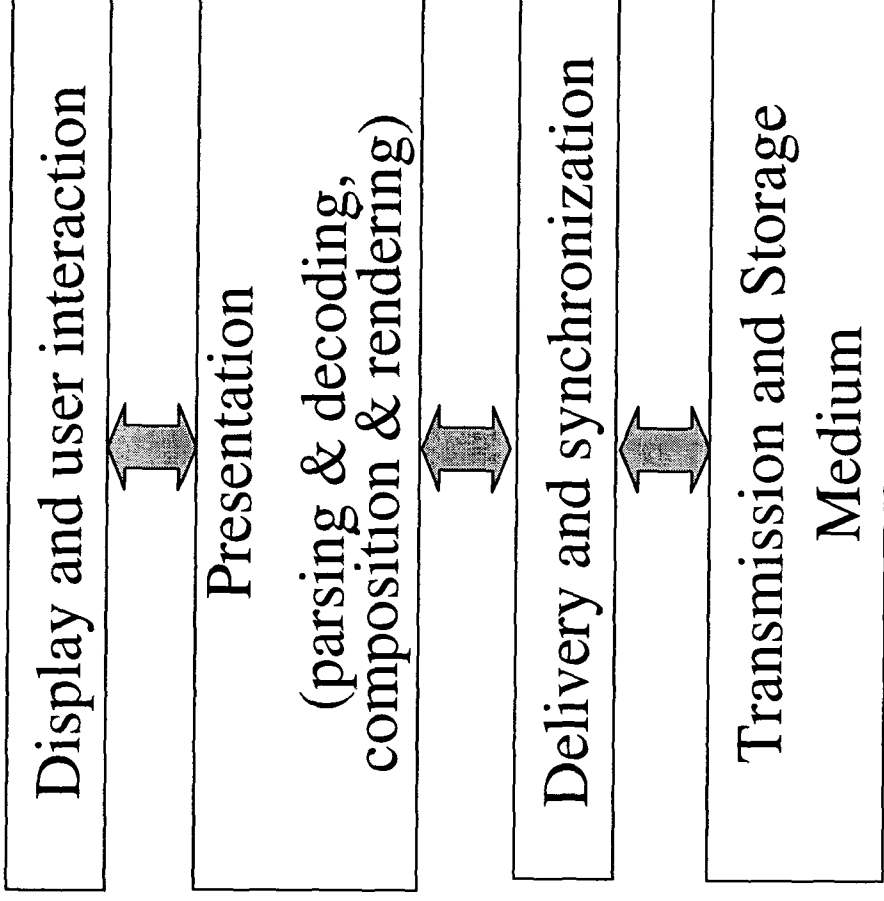
Methodology

- o Need to specify APPLICATIONS/SERVICES first
 - electronic commerce
 - education : sw download etc.
 - data services : EPG, data ticker, interactive ad., interactive entertainment, etc.

- o Define functions to be provided from client side first then delivery chain and service provider

- o Define business models and do field trials

Interactive Terminal – General Architecture



AIC – Purpose

o to integrate interactive content specifications for user devices to offer a range of basic through advanced interactive applications using 3D as well as 2D content, in stored and streamed form

-->to integrate MPEG–4/X3D/JAVA, and xHTML in order to provide interactive broadcasting services over MPEG–2 TS, IP and DSM

AIC Principles

- Delivery in various transport environments
 - including MPEG-2 and IP environments,
 - and combinations of broadcast/interactive delivery.
 - Focus on MPEG-2 TS.
- Presentation engine : AIC-ML
 - integration of MPEG-4, xHTML (XML-ized HTML 4.0), X3D (XML-ized VRML) content.
 - focus on high level session description and BIFS commands and animation.

AIC – Requirements

- o assume MPEG-2 for transport and delivery first and IP next
- o display of xHTML texts and existing HTML
- o display of 2D and 3D graphical elements of MPEG-2/4 I frame, MPEG-4 sprite, JPEG, PNG, etc. with 8bit alpha channel and scalable size
- o playing of natural and synthetic audio with auralization
- o playing of natural video and synthetic visual information with textured on VRML object

AIC – Requirements(continued)

- o synchronization by frame accuracy of visual, audio objects thru MPEG-2 TS or Internet streams
- o composition by pixel accuracy with overlay, transparency, translucency and alpha blending, etc.
- o access time within 1 second for sync. objects or several for elements from a carousel
- o back channel for real-time or non-real-time servers
- o conditional access to contents thru IPMP mechanism

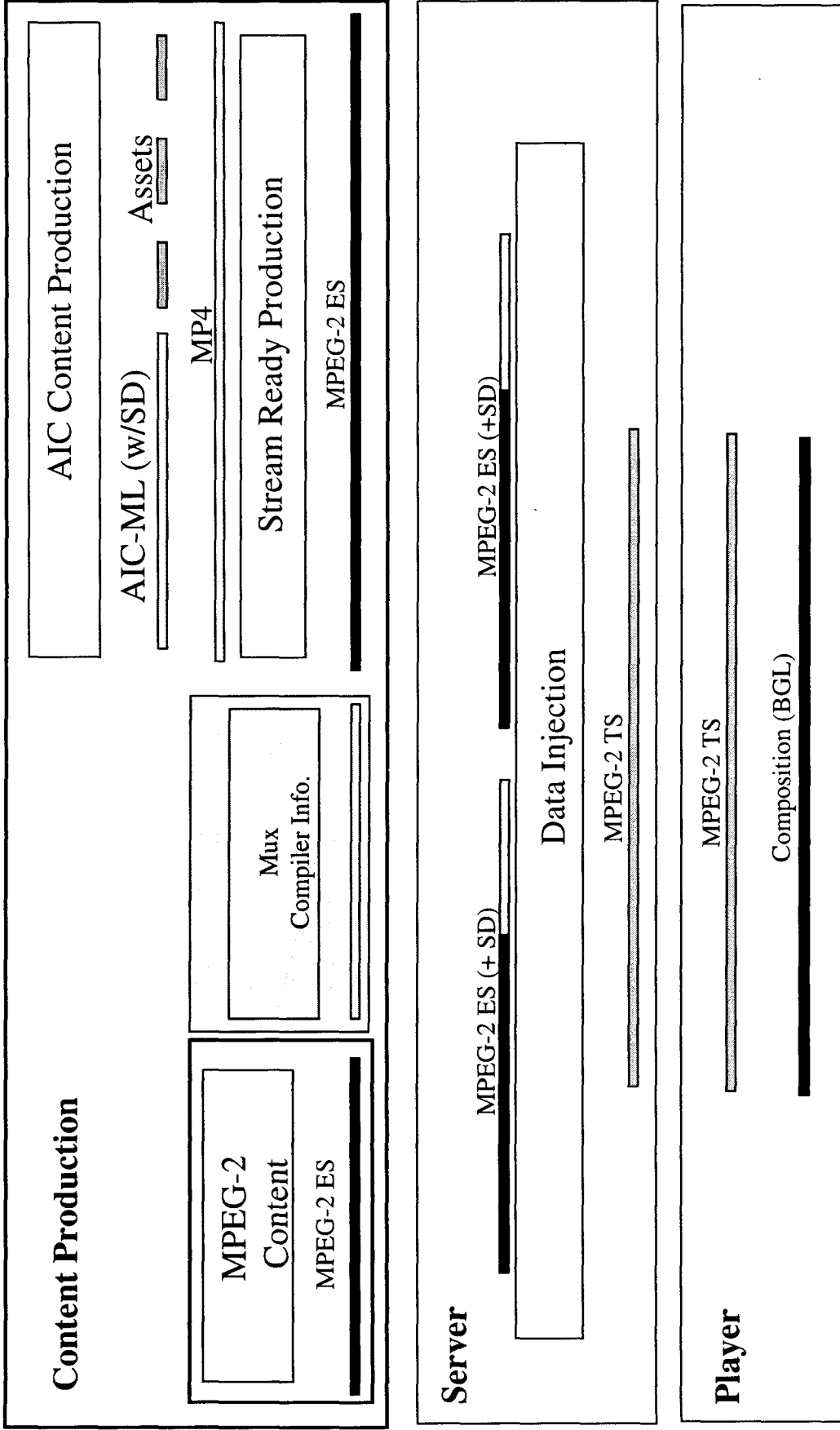
AIC – Requirements(continued)

- o possible upgrading, change, modify, adapt the new presentation engine
- o storage persistence/local storage
- o concurrent multiple applications
- o graceful adaptation of content
- o JAVA–based receiver architecture integration
- o separation between application and delivery, platform independence, efficiency

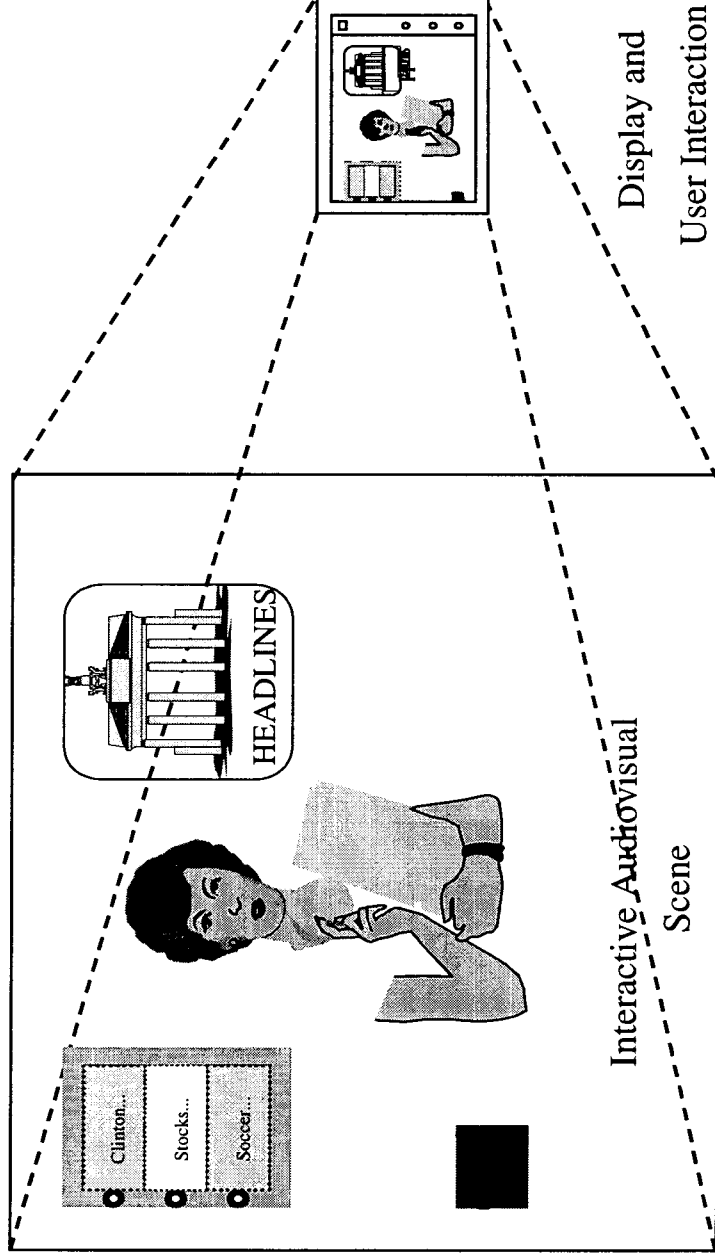
AIC – Architecture – I

- o based on ATSC–DASE & MPEG–4 over MPEG–2 TS, IP and file format for DSM
- o delivery & streaming framework
- o presentation engine(parsing & decoding, object model integration, composition & rendering, ...)
- o application execution engine(session management, ...) by JAVA VM and API

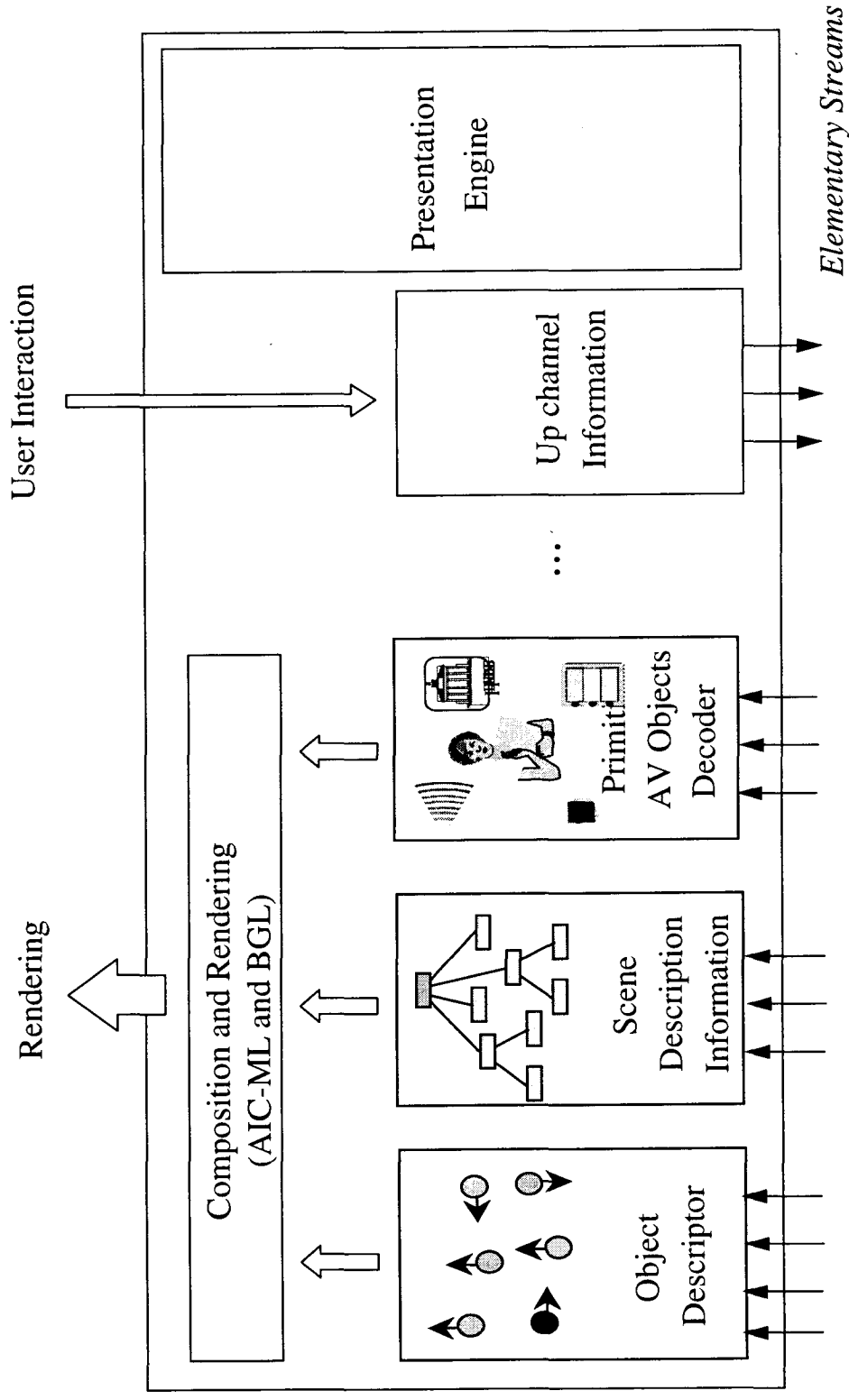
AIC - Architecture - II



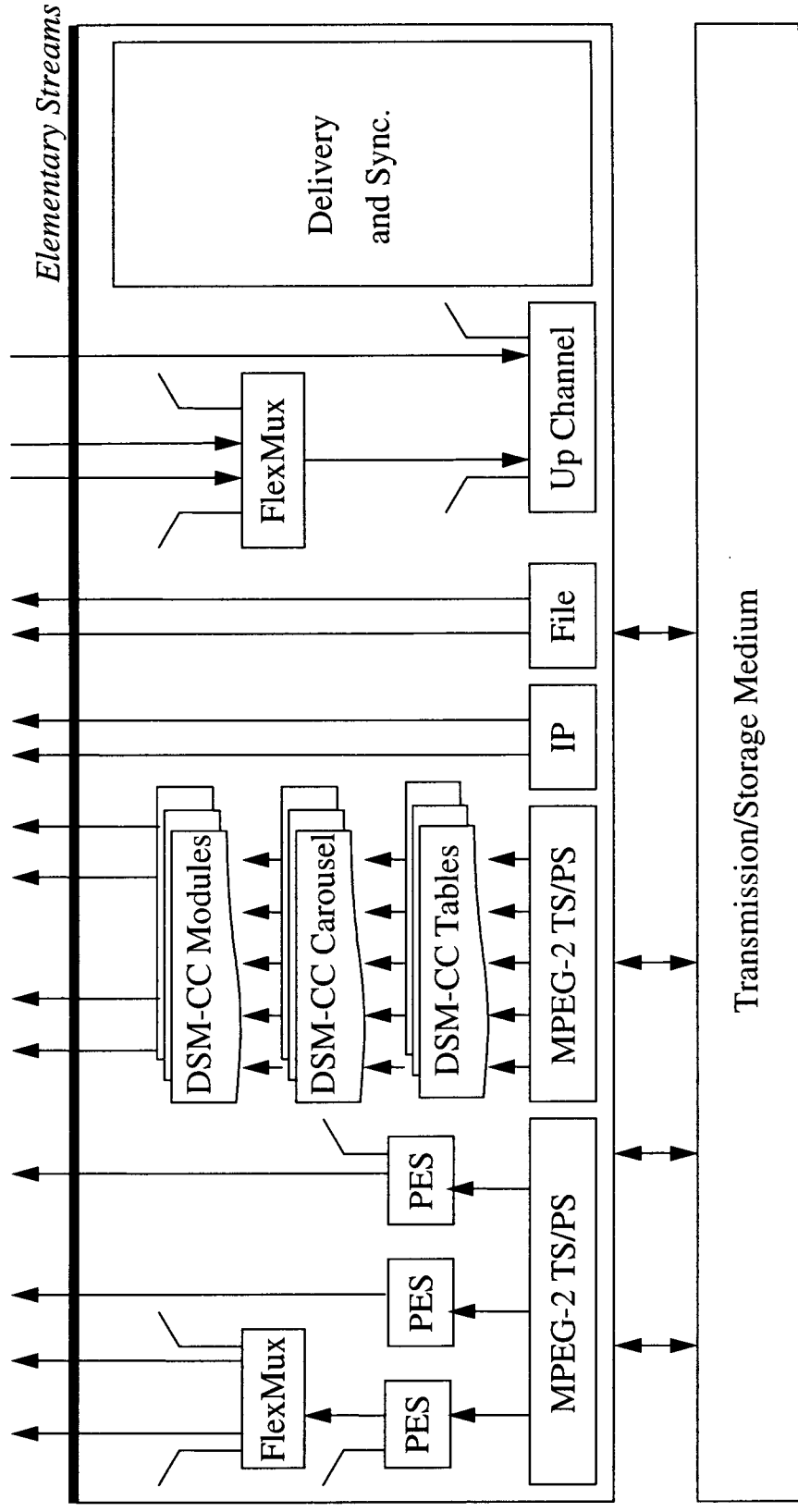
AIC – Display and User interaction



AIC – Presentation



AIC – Delivery and sync.



AIC – Approach

- o rapid integration of existing technology with minimum development only if required
 - : ver 1 spec 1998. 12.
 - ver 1 implement 1999. 3.
 - ver 2 spec 1999. 7.
 - ver 2 implement 1999. 12.
 - (demo : IBC ‘99.9, Western Cable ‘99.12.)
- o profiling from low cost implementation
- o provide scalability between profiles according to decoder complexity and back–channel

AIC – Technical areas

Technical Area	W3C	W3D (VRML)	MPEG
Composition	HTML 4.0 CSS/SXL HTML NG VML/PGML Structured Audio (MMA)	VRML 97 VRML NG VRML profiles	BIFS Structured Audio (MMA)
Synchronization	SMIL HTML+time Script tags Triggers	VRML event model	MPEG Systems (timing, buffering, muxing)
Object Model Integration	DOM XML namespace Object tag XML linking	Proto Script	OD Proto Script
Session Management	DOM? MIME types? TV-URL?		OD (ATSC) PSIP, SDT

AIC – Profiles@Levels

1. Main Broadcasting

- 2D only interactive content
- xHTML or 2D BIFS scene description
- text and graphics overlays, sprites and still images
- speech and high quality audio
- IPMP(Intellectual Property Management and Protection)

2. 3D Broadcasting

- TBD

XHTML

- o an application specific profile of XML
 - collection of DTD(Document Type Definition)
 - w3HTML, bHTML, cHTML

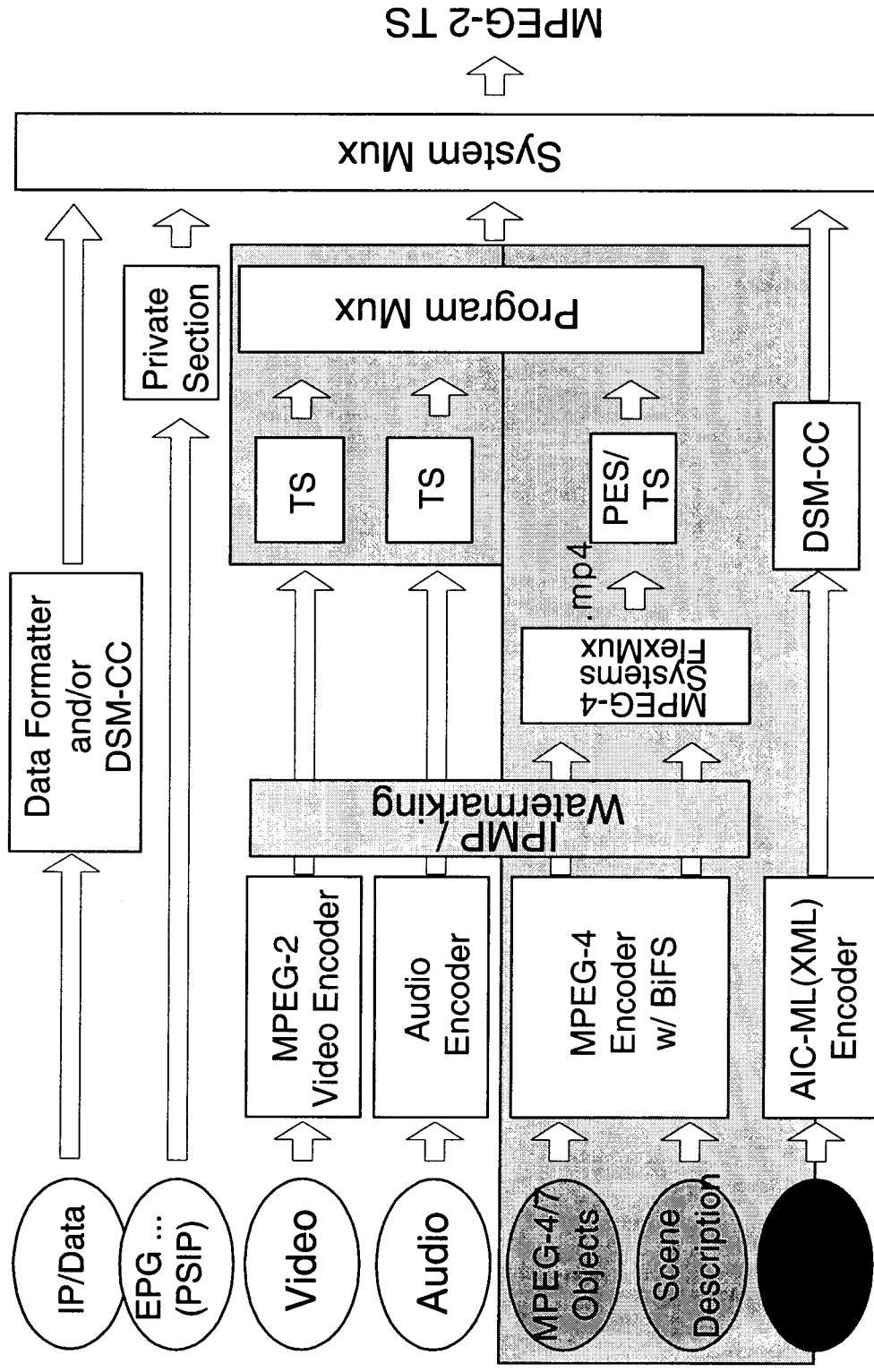
- o from HTML4.0/3.2 subset of elements and attributes are converted to XML then extended for specific applications including interactive TV

- o support
 - various display types : progressive/interlace, LCD, etc
 - various user interaction(keyboard, mouse, remote control, navigation keys/cursors, etc
 - various levels of Internet connectivity

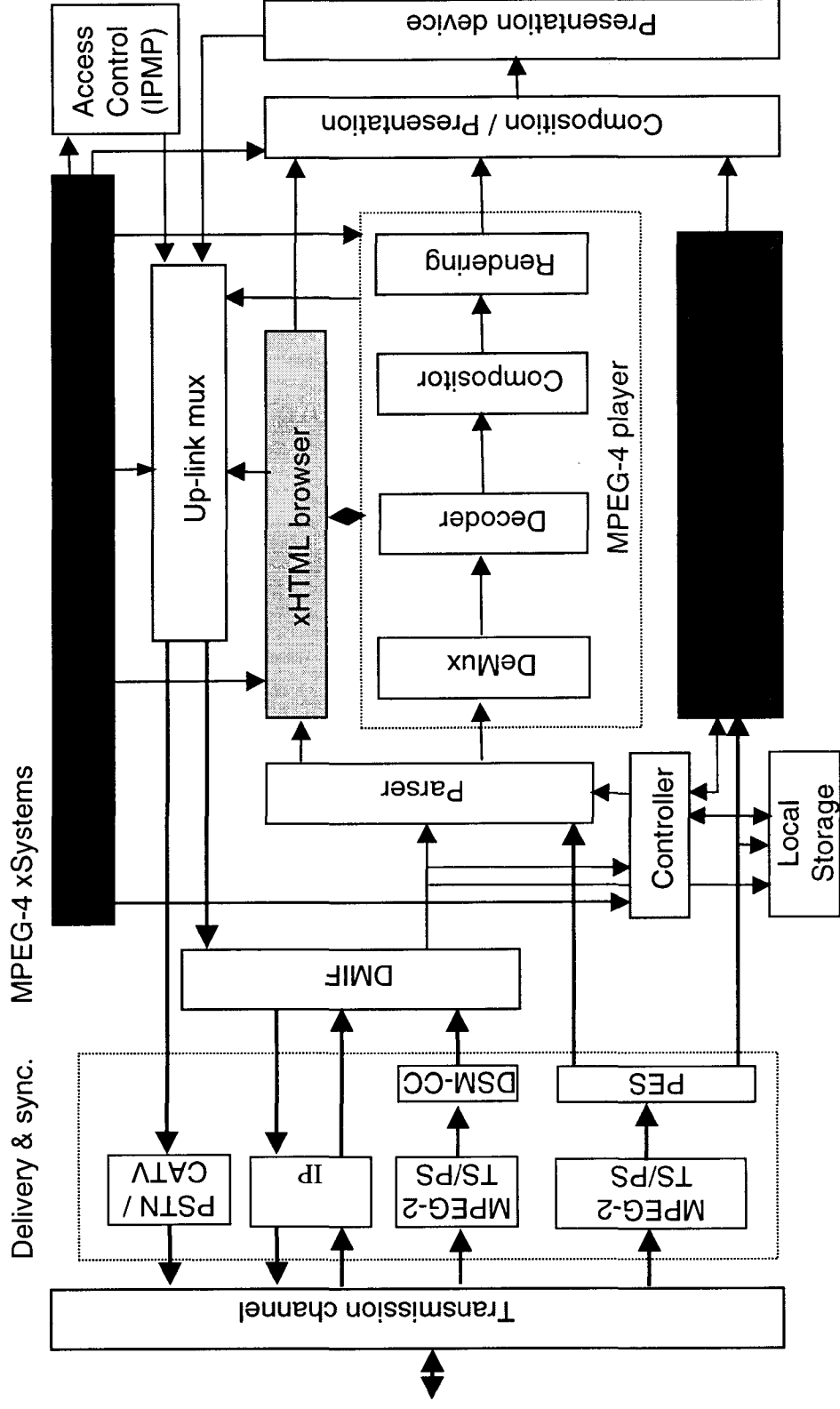
AIC player

- xHTML browser + MPEG-4 player (on Java-VM)
- Display device : PC, TV, information appliances
- Control device : mouse/fewer navigation keys, cursors

Structure - AIC authoring



AIC player - ETRI Architecture ver. 0.1



* Detail specifications shall be provided depending on the applications.

* IPMP : Intellectual Property Management & Protection

AIC player - Functions

- Web surfing : xHTML
- 조명, viewing point, play option 등 조절 : MPEG-4
- User information : password, identifier
- Scheduling : TV anytime
- objects 단위의 처리 : 위치 이동, ON/OFF, priority 적용

AIC player - Functions(continued)

- OCI 정보의 처리 : web과 연결된 search/find
- Multi-stream 정보의 처리 : multi-channel, multi-view point 등에 대한 display option 조절
- File open/save /export
- Bit stream editor와의 연결
- Display device information : 종류, h/w option
- Playing status : for buffer, A/V quality control

* OCI : Object Contents Information

AIC player - Decoder and renderer

- Synchronization
- Buffer management
- OCI control
- IPMP control
- xHTML 파일과 MPEG-4 objects의 결합
- A/V objects의 post-processing : 3D audio 등

Still open Issues

- o Contents production
 - multiple standards and tools : need to harmonize DASE, DVB, W3C, AICi, etc.
 - define contents exchange formats

o Delivery systems

- streaming thru broadcasting, telecommunications, and Internet
- transcoding, splicing, switching(routing) in compressed domain
- contents IPMP, CAS related to E-Commerce

o Client

- universal STBs

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Conclusion

- Necessary technology but not all are available
- To specify what kind of interactive services is the most important : E-Commerce is the must
- Gradual development/deployment of services including required equipments is the way to go
- Join international activities and develop domestic one(s)

