

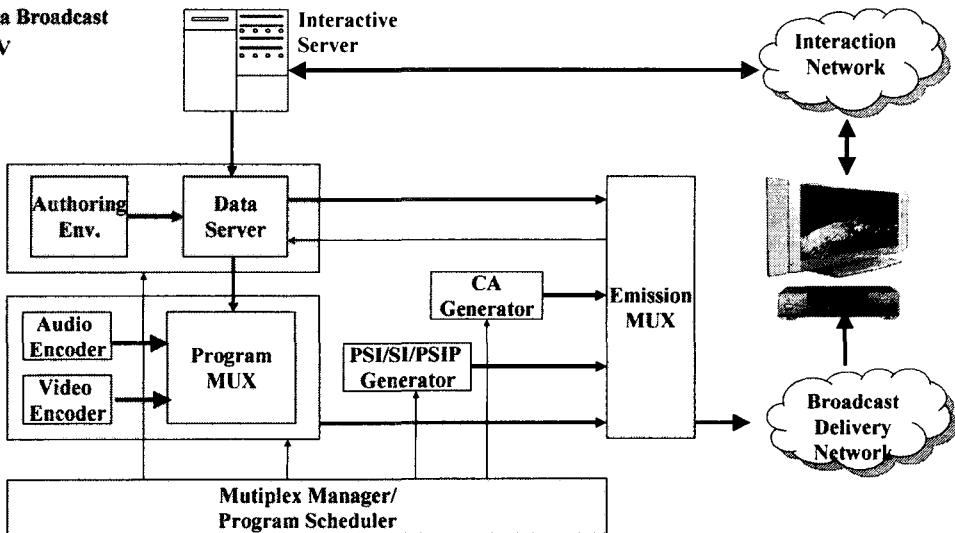
# 데이터 방송 실험서비스와 Middleware 표준화 동향

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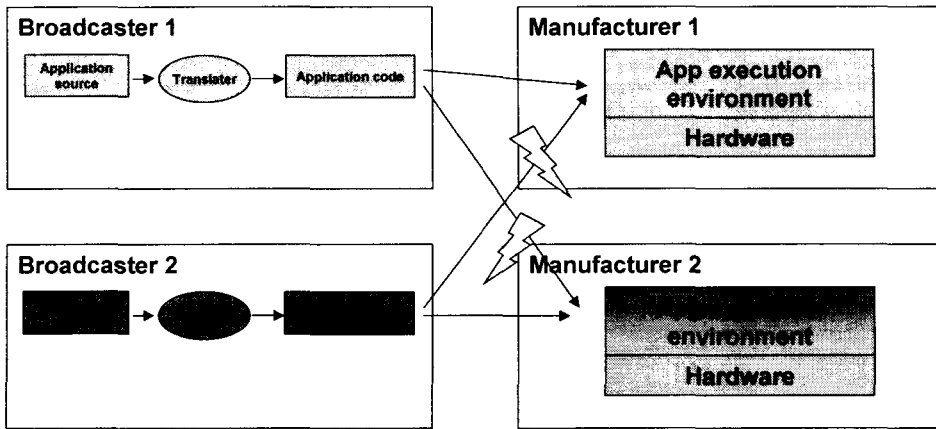
## Interactive Data Service Environment

### Remote Interaction

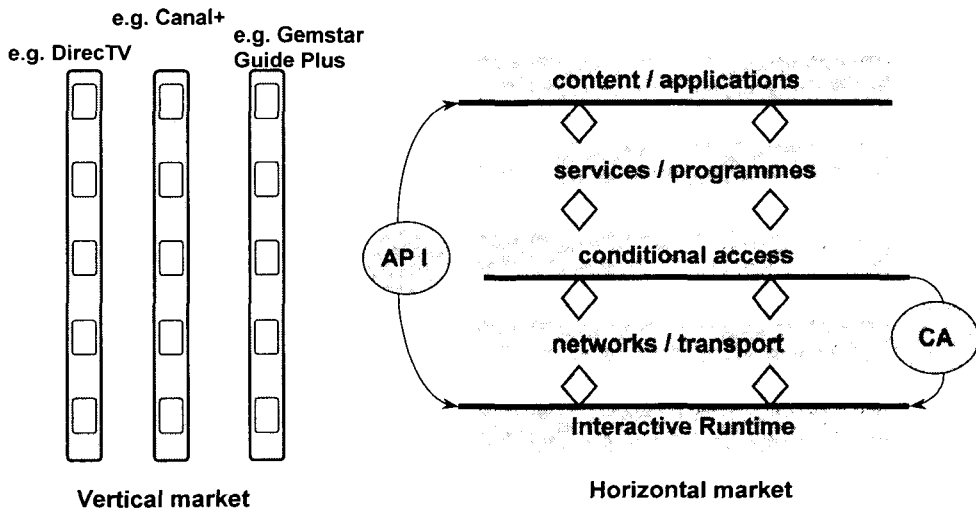
Data Broadcast  
DTV

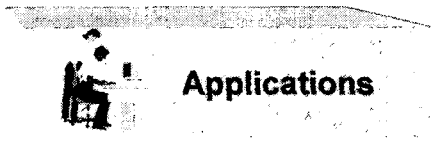


# Interpreted Downloaded Software

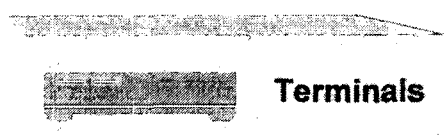


# Vertical / Horizontal Markets

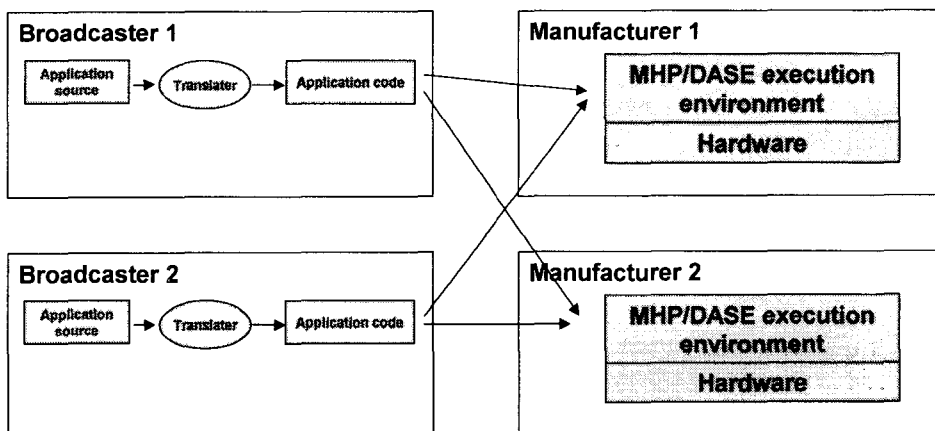




- Various application areas
- Different service providers
- Independent developers
- Different authoring tools



- Independent MHP/DASE stack implementations
- Different hardware platforms
- Different software integrations
- Different kinds of terminals (low-end STB / high-end PC)



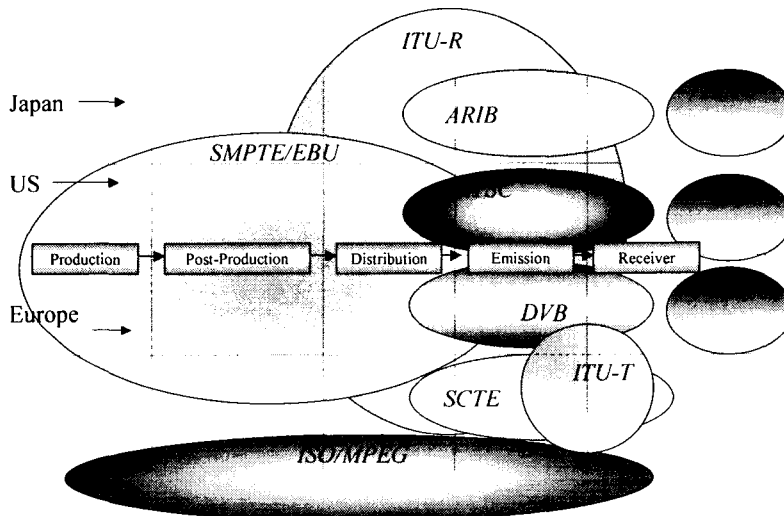
## Why Two Standards

데이터 방송 7

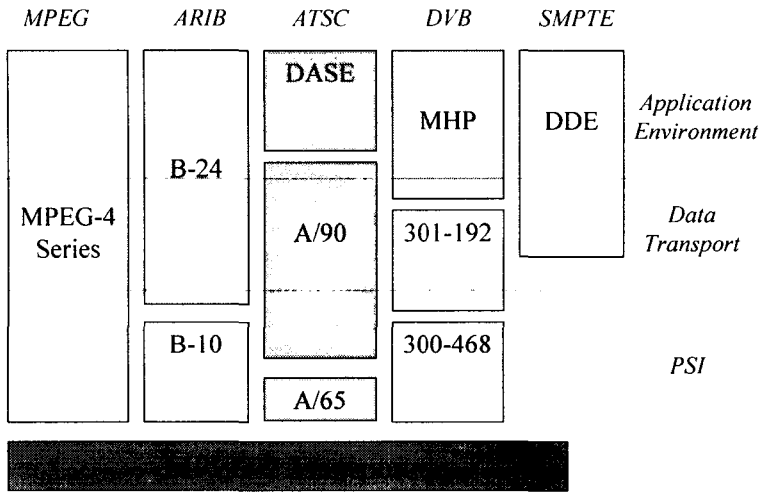
- There is no universally recognized organization in charge of developing these standards. There is no W3C in Television.
  - ITU is recognized primarily for adopting but not for developing standards.
- DVB and ATSC had already developed independently and competitively prior to work on MHP and DASE.
  - A continuation of this independence and competition was inevitable.
- DVB and ATSC do not have the same working process:
  - Unanimous consensus process (DVB) Vs Voting process (ATSC when no consensus)
- First technical choices were not shared between DVB and DASE:
  - DVB first selected Java only whereas DASE selected both Java and HTML.
- Some requirements were not compatible between MHP and DASE:
  - MHP and DASE needed to interoperate with and support other DVB and ATSC specifications and principles, respectively.
- Context for the development was quite different in terms of influences of the participants.

## Interactive Television Standards Body Scope

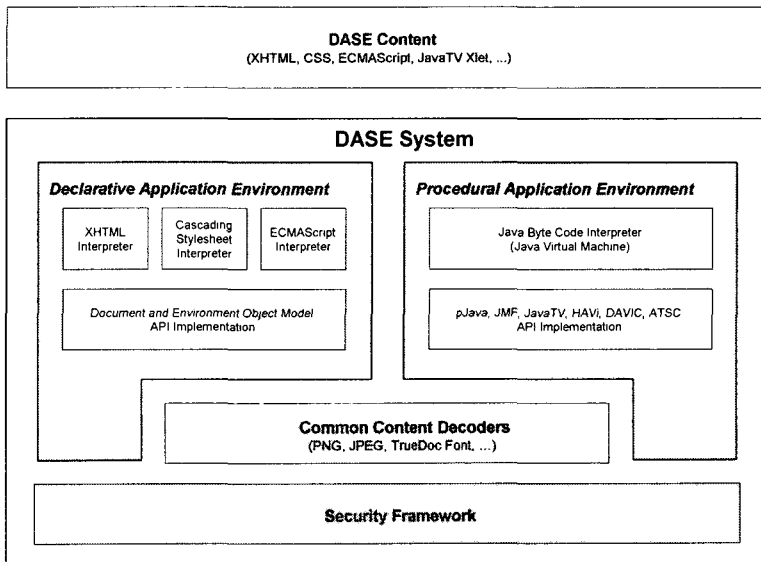
데이터 방송 8



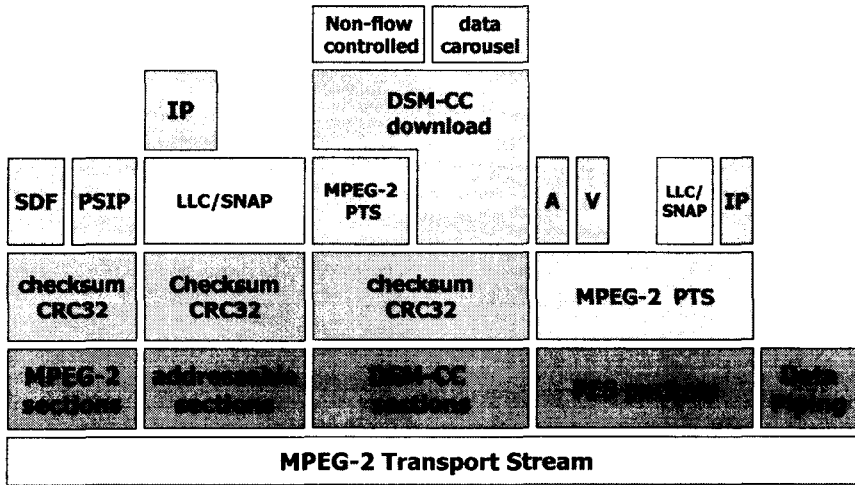
# Comparison of the Standards



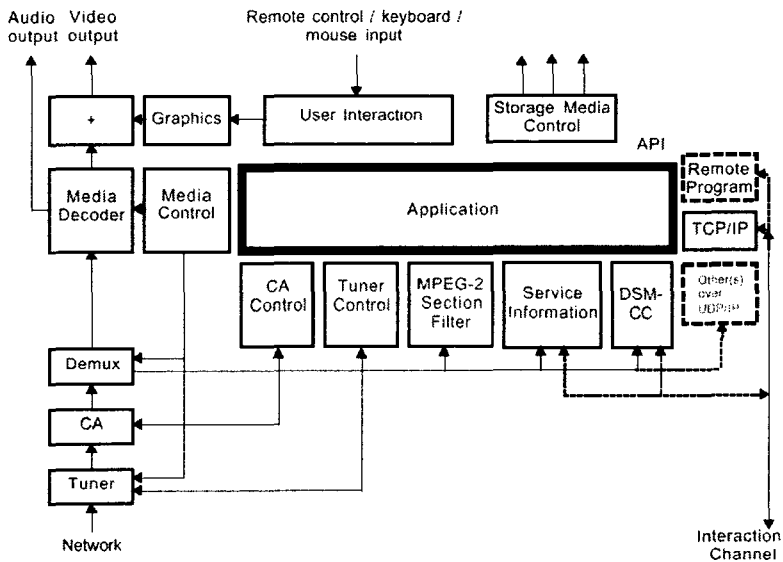
# DASE Architecture



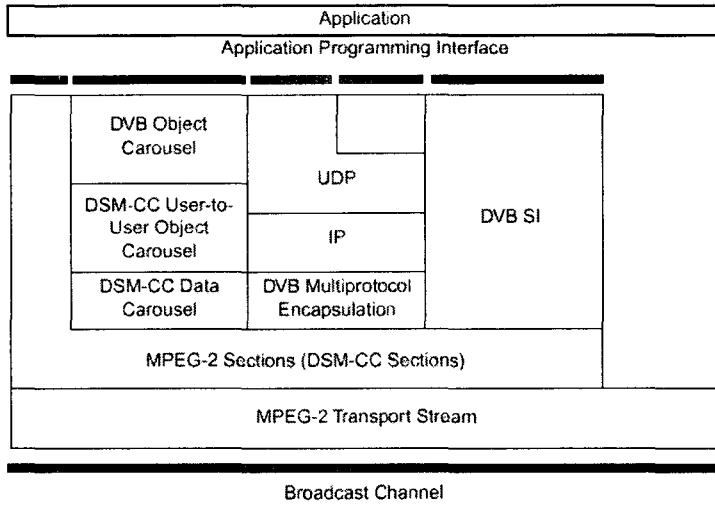
# ATSC Data Broadcast Protocols



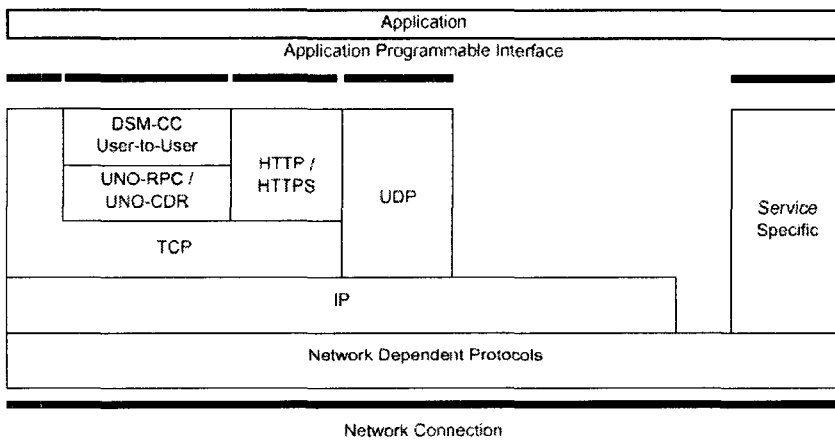
# Interfaces between MHP App and System

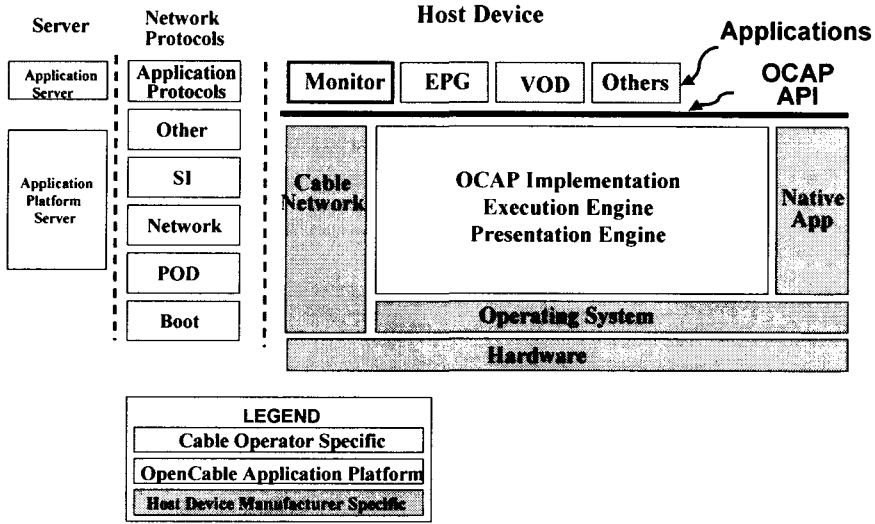


# Broadcast Channel Protocol Stack of MHP

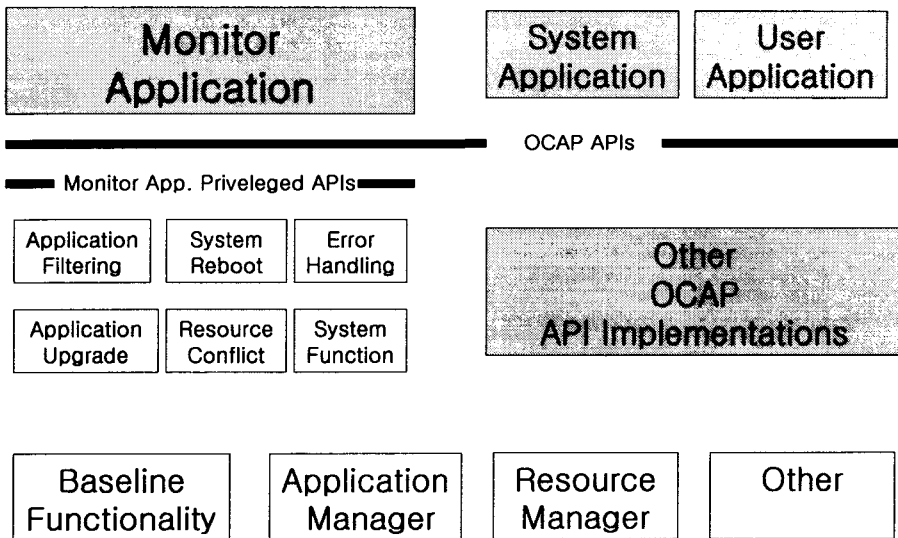


# Interaction Channel Protocol Stack of MHP



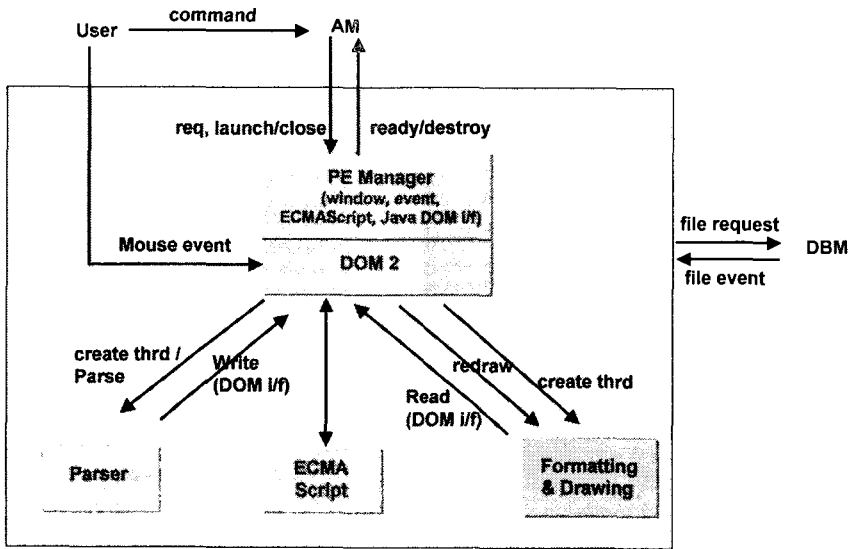


## OCAP Applications

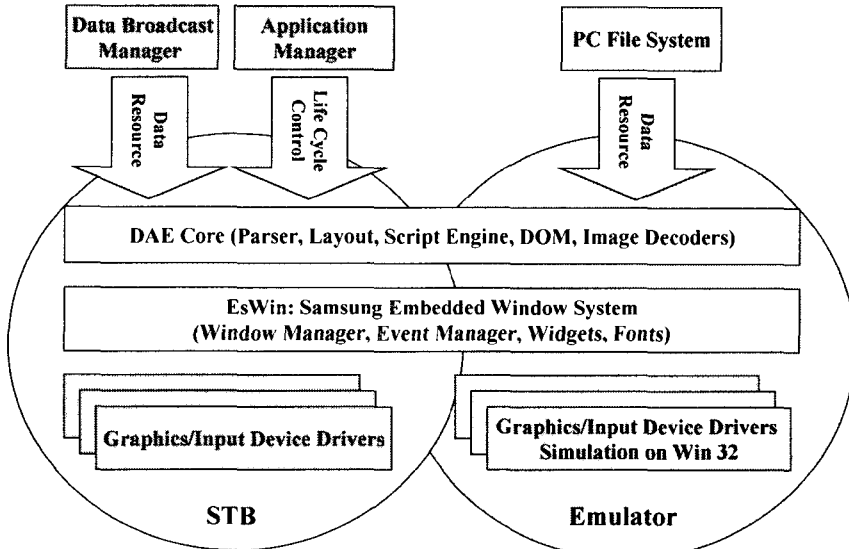




# XHTML Browser Architecture



# DAE on STB vs. Emulator (<http://www.dtv.or.kr/dase/dae/>)



### ■ Java TV APIs

- Java TV API is to provide application developers with the ability to easily build applications that are independent of the underlying broadcast network technology the application will be deployed on.
- An application might be written and then reused in a variety of network environments. The Java TV API is designed throughout with a relatively high level of abstraction from hardware and over-wire protocols.
- Under the hood,
  - Xlet Loader to load java classes from DataBroadcast.
  - Xlet Controller to control the lifecycle of the xlets.
  - Security Manager for access control.

### ■ HAVI 1.1 UI APIs

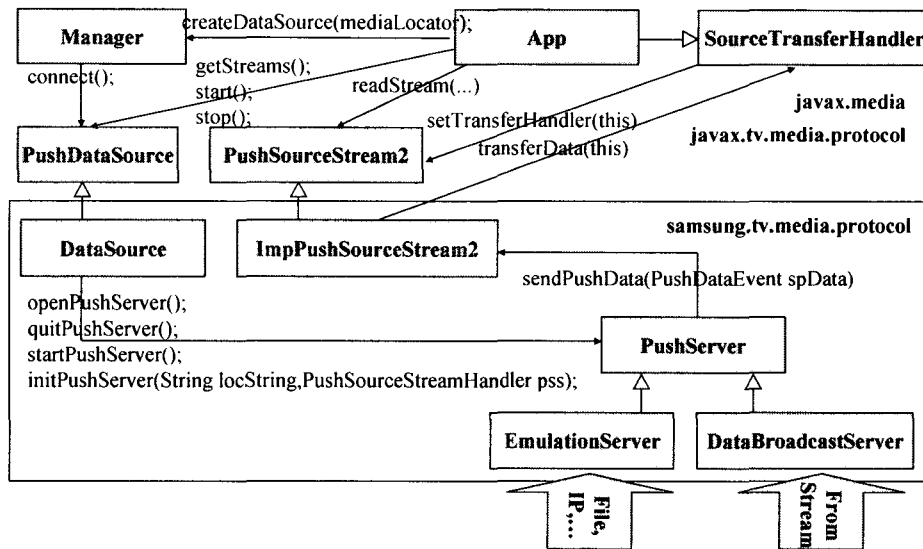
- HAVI UI enables “TV friendly UI” and provides consistent look & feel to the viewer.
- HAVi widgets are implemented (and behave) as lightweight components as specified in the HAVi specification.

## *PAE implementation principles*

- Java interfaces and/or abstract classes for abstracting implementation-specific lower layer services should be defined.
  - The effects of future changes and upgrades of the target platforms and native modules should be minimized and absorbed by these abstractions.
- PAE implementation should be easily bound to not only ATSC but also other standards and protocols.
- More than one physical (such as tuner and decoder) and logical (such as ServiceContext) resources should be considered in the API implementation.
  - For example, multiple tuners (one for playback another for PIP or scanning SI data to reduce the tuning delay) might be needed. High-end product may support Terrestrial/Satellite/Cable media in a single box.

## Implementation Ex. (PushSourceStream2)

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## We have Open Standards!

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- With the advent of open standards, interactive data services are enabled to run transparently across vendor-specific HW platforms.
- But, there are syntactic differences of various degrees among open standards.
  - Applications would not be portable, or would not be useful if limited to a “common core” of identical syntax.
  - Trans-coding may not be impossible, but meaningless or painful at best.
- Anyway, harmonization of open standards is desirable.
  - The “functional intersection” of the standards is large.
  - Middleware components can be reused for MHP and OCAP implementation.
    - Data deliveries are all based on MPEG-2 transport, DSM-CC protocols and similar data encapsulation and signaling mechanisms.
    - Most parts of the user agents to decode and present Declarative (XHTML) and Procedural (Java) Applications are common.
  - With the careful modular design and interfaces, considerable amount of middleware components can be reused without or with minor modifications.

## ***Harmonization Efforts***

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- Why Harmonization?
  - To reduce the cost of receivers by having greater commonality.
  - To create inter-operable and/or reusable contents.
- ITU JRG-1 (in progress)
  - Joint work of ITU-R WP6M and ITU-T SG9
  - It aims at defining a “Common Programming Environment and Application Representation Format” that enables interoperability of applications for interactive television receivers.
- Harmonization of OCAP & DASE (also in progress)
  - Possible goal is to enable OCAP receiver to process DASE application content.
- MUG (MHP Umbrella Group)
  - Answer from ATSC DASE is DASE-1 GEM Compatibility Option

## ***Competition or Harmonization?***

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- DASE/MHP support horizontal markets for interactive television content and receiver middleware
- DASE/MHP trial deployments starting (Korea and Finland)
- Adoption of DASE/MHP depends upon regional decisions; some areas have adopted both for distinct delivery systems.
- Competition between DASE/MHP expected to produce synthesis of best practices which will form interoperable core.

## *Data service is on the Air during the WC!*

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- Data Service is being delivered via commercial OTA DTV signal.
  - World Cup Trial Service will mark a milestone for Korean DTV industry by providing data broadcast services to the public.
  - World Cup Trial Service is the first serious attempt to promote Data Service. Evaluation is open to the public. People will be more educated about the potential of Data Broadcast Service.
- Conformance Specification
  - Written to supplement the ATSC specifications.
  - Both DA (Declarative Application) and PA (Procedural Application) with the most content types of DASE-1 are supported.
- Co-operations and Competitions are being made among the trial participants.
  - Best practices are being gathered after the considerable amounts of trial-and-errors.
  - More serious development and commercialization efforts are expected to follow.
- More details are at:
  - [http://www.atsc.org/sg/S17/T3/WorldCup\\_Trial.pdf](http://www.atsc.org/sg/S17/T3/WorldCup_Trial.pdf)
  - <http://www.atscforum.org/conferences/CITEL/DASE-Richer.pdf>

## *Pictures from the Trial*

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# Data Broadcasting Trial in Korea

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Copyright Korean Data Broadcasting Trial Consortium (July 26, 2002)

**Abstract:**

This document describes Data Broadcasting Trial organized by Korean Data Broadcasting Trial Consortium during the Korea Japan World Cup in June 2002.

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# 1. Introduction

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## 1.1. Summary

ATSC DASE was successfully on the air during the Korea Japan World Cup in June 2002. Three major broadcasters in Korea KBS, MBC and SBS were involved in this trial as they multiplexed data services in real-time with the regular Digital TV program.

The trials were accessed with DASE prototype receivers from Samsung and LG Electronics at public demonstration areas and major retailers in Seoul. The trials were also monitored and evaluated by the DTV professionals who gave promising responses.

## 1.2. Purpose of this document

This document gives brief introductions to the trial. This document is a summary of the report that is being written in Korean by the consortium.

## 1.3. About the Korean Data Broadcasting Trial Consortium

Korean Data Broadcasting Trial Consortium was founded in Jan. 2002 to promote the data broadcast trial and implementation. The Consortium includes:

- Major Korean broadcasters - KBS, MBC, and SBS
- Research institute - ETRI
- Receiver manufacturers - LG Electronics and Samsung
- DTV content and solution providers - Aircode and Alticast.

For more information about the World Cup Trial and data broadcasting technologies introduced in this paper, feel free to contact:

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Kwangkee Lee ([kklee@samsung.com](mailto:kklee@samsung.com)),  
Dongbok Lee ([dblee@aircode.com](mailto:dblee@aircode.com)),  
Joohyeon Ryu ([jhyu@alticast.com](mailto:jhyu@alticast.com))



## 2. Details of the Trial

### 2.1. Specifications

The trials were based on DASE, ATSC Candidate Standards. The supplementary specification, namely guideline for interoperability, was also written. This guideline is still in progress and will be submitted to the Korean standardization body, TTA (<http://www.tta.or.kr/HDnewenglish/main/index.htm>). Summary of the guideline used for the trial is as follows.

Category	Descriptions	
Service Type	<ul style="list-style-type: none"> <li>- 0x02 with A/V/D</li> <li>- 0x04 without A/V</li> </ul>	
Data Service Announcement	<ul style="list-style-type: none"> <li>- EIT for service type 0x02</li> <li>- DET for service type 0x04</li> </ul>	
Max. Data Bandwidth	2M ~ 4M bps	
Data Service Signaling	DST	"application/dase" was not on the air due to the lack of enough internal tests.
Data Broadcast Protocol to carry bounded data resources	- Data Carousel Encapsulation (layer1 and layer2)	
Data Broadcast Protocol to carry real-time data	<ul style="list-style-type: none"> <li>- Data Carousel update</li> <li>- Asynchronous IP Datagrams Encapsulation</li> </ul>	
Data Resource Binding	<ul style="list-style-type: none"> <li>- Multiple Identifier Structure</li> <li>- Multiple Content Type Structure</li> </ul>	Former version of ARM with some modifications was used temporarily.
Application	<ul style="list-style-type: none"> <li>- Pure DA</li> <li>- Pure PA</li> </ul>	Hybrid DA was not on the air due to the lack of enough internal tests.
Identification & naming	<ul style="list-style-type: none"> <li>- "tv:"</li> <li>- "lid://name/path"</li> </ul>	
Graphics Resolution	960 * 540	
Color depth	32bit True color (8:8:8:8)	
Character Set	Unicode(UTF-8)	
Font	Built-in fonts	Downloadable fonts were not considered.
Image Format	<ul style="list-style-type: none"> <li>- JPEG</li> <li>- PNG</li> <li>- MNG</li> </ul>	
Remote Keys	<ul style="list-style-type: none"> <li>- 4 Directional and Color Keys for LG</li> <li>- Pointing Device for Samsung</li> </ul>	
DAE	<ul style="list-style-type: none"> <li>- XDML</li> <li>- CSS-1 and 2</li> <li>- ECMAScript 1.3</li> <li>- DOM1 and 2</li> </ul>	
PAE	<ul style="list-style-type: none"> <li>- Pjava 1.2</li> <li>- JavaTV, JMF, DAVIC, ATSC API</li> <li>- HAVi UI v1.1</li> <li>- W3C API</li> </ul>	

Vendor Properties : "dase.implementation.v endor"	- "Samsung" - "LG Electronics, Inc" - "DAEWOO Electronics, Inc"	

## 2.2. Head-End Systems

Each broadcaster (KBS, MBC and SBS) built its own Data Service Head-End System and integrated it to the DTV Head-End System at their site independently. The Data Service Head-End System accessed DB, retrieved contents and multiplexed data services in real-time with the regular Digital TV program.

For the selected matches, program related data service contents were aired. For non-match programs, independent data services such as real-time traffic and weather information were aired. Nominally, data services were aired 24 hours a day through each DTV channel during the World Cup.

Most contents were authored by Aircode's Authoring system. Contents were encapsulated with the 2-layer data carousel protocol and multiplexed under the control of scheduling system. Real-time information such as statistics was transferred by data carousel update and IP datagram encapsulation.

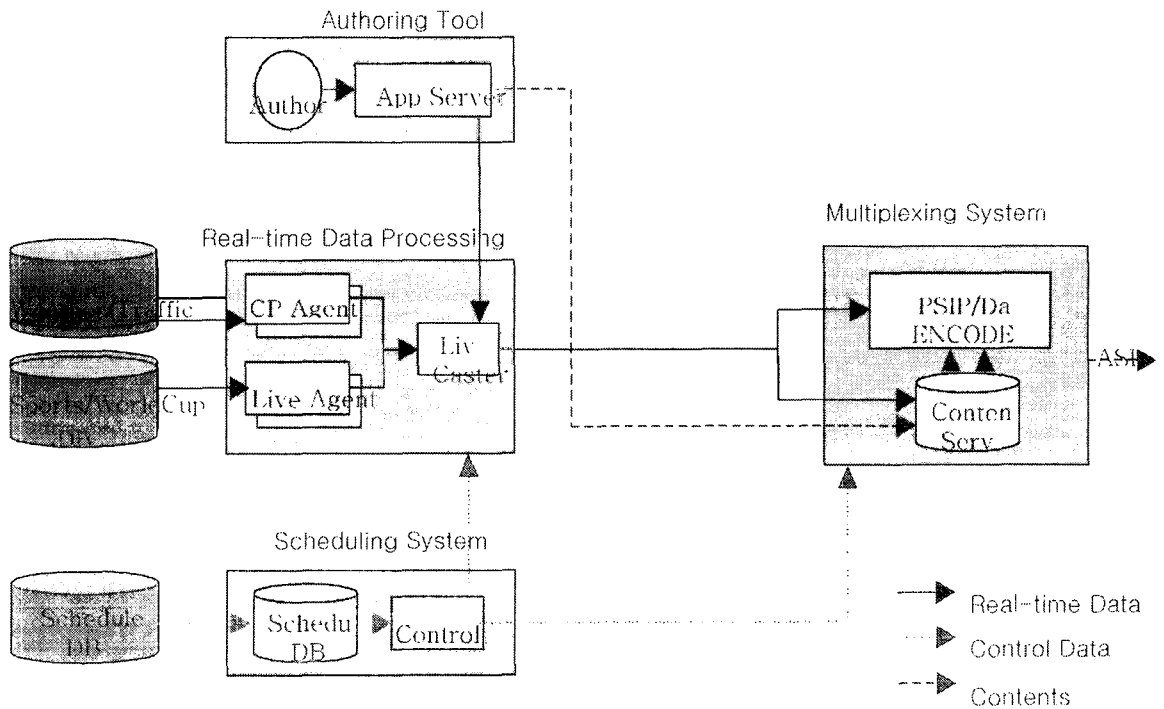


Figure 1. KBS Head End

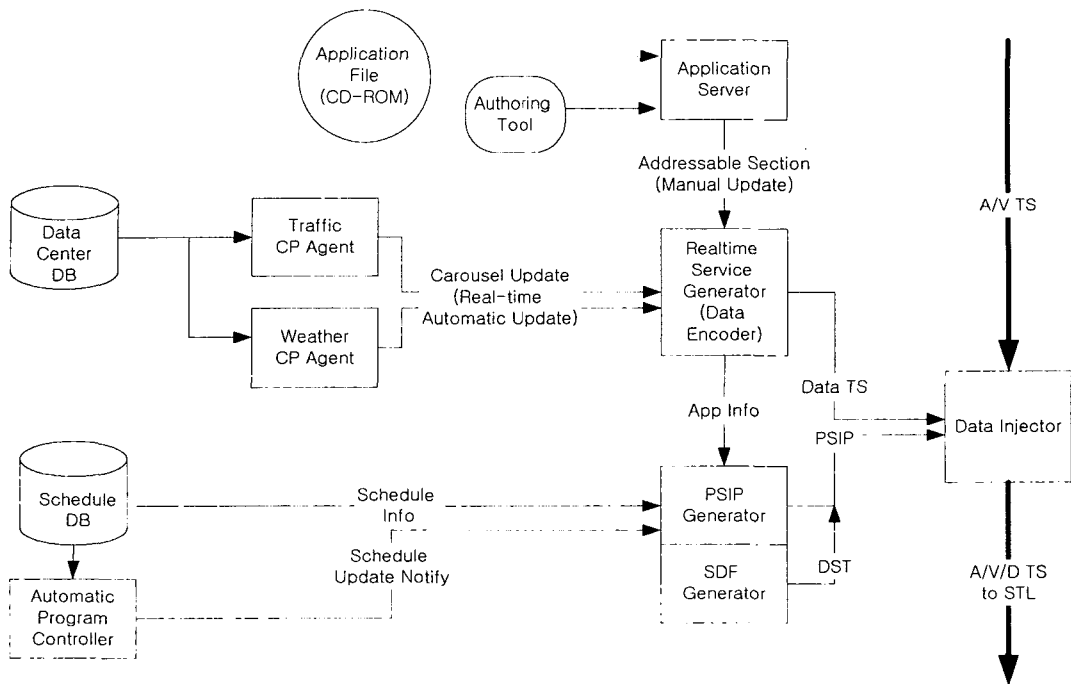


Figure 2. MBC Head End

An example of bandwidth allocation for the service is as follows.

Table/Section	Transmission period (ms)	Bandwidth (bps)
PAT	60	50000
PMT	300	
MGT	120	50000
VCT	300	
STT	900	
EIT	400(EIT-0)	50000
ETT	400(ETT-0)	
DST	400	150000
Carousel		400000
Addressable	30000	50000

### 2.3. Contents

Parts of the contents aired were shared among broadcasters. They include:

- Introduction to the Data Broadcasting Service
- The eve ceremony
- Tournament review, scores
- Match schedules
- Venue descriptions
- Team descriptions
- Star players
- Players' profiles
- Etc.

Each broadcaster aired its own specific contents. They include:

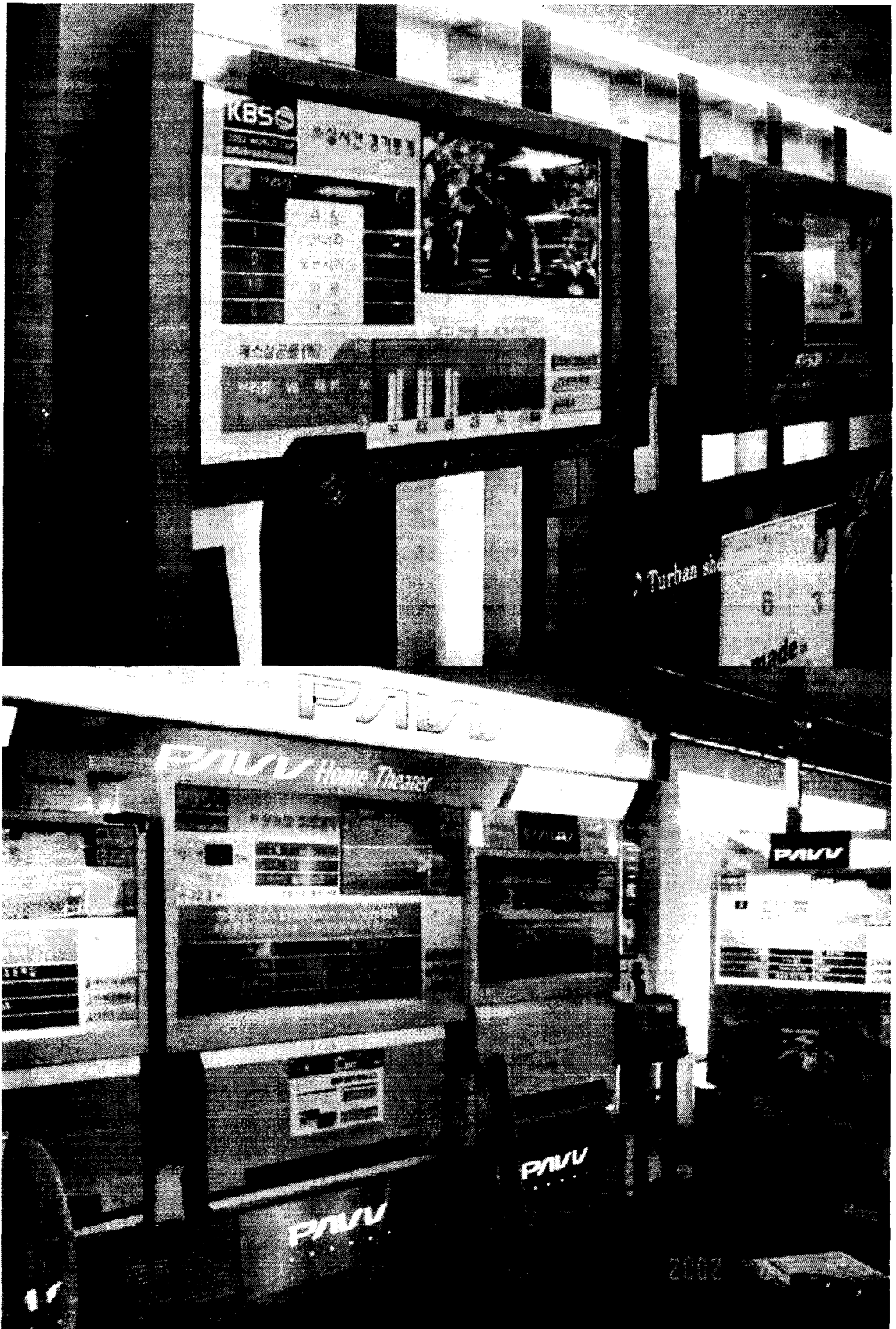
- World Cup News
- World Cup Highlights
- Foul/Shooting estimation game
- Slot machine
- Card game
- Shooting game
- World Cup Quiz
- Weather information
- Traffic information
- Etc.

Each content contained several depth of navigations. Several contents above comprised into a Data Service application (a single A/90 application in ATSC term). Multiple applications (in a single broadcast channel) were also aired.

## 2.4. Receivers

The trials were accessed with DASE prototype receivers from Samsung and LG Electronics at public demonstration areas in eight different cities that hosts the World Cup matches and major retailers in Seoul. The trials were also monitored and evaluated by the DTV professionals including researchers and regulators.





## 2.5. DTV mania's postscripts

" ... a great experience that reminds me of transition from Black-and-White TV to Color TV. I feel confident that data broadcasting is becoming another revolutionary information infrastructure ..."

More details (in Korean) are at:

- <http://www.avkorea.co.kr/webboard/board/BoardMain.asp?BbsID=abcd4&mode=view&page=1&num=195&kword=&ks=&kc=&kw=&group=195>
- <http://www.avkorea.co.kr/webboard/board/BoardMain.asp?BbsID=abcd4&mode=view&page=1&num=201&kword=&ks=&kc=&kw=&group=201>

**KBS** **» 오늘 경기정보**

월드컵 4차  
6월 25일 (화)  
48

대한민국  
승률 54% / 최연 21세

대한민국  
승률 54% / 최연 21세

경기시간 20:00 (KST) / KBS-DTV 2

15:17~18:00	19:00
18:30~19:00	19:30~20:00
19:30~20:00	20:00~20:30

**KBS** **» 출전팀소개**

대한민국  
승률 54% / 최연 21세

2002 월드컵 전차

vs 이탈리아	승
vs 콜롬비아	2-1 승
vs 미국	1-0 승
vs 포르투갈	1-0 승

**KBS** **» 출전선수정보**

대한민국  
승률 54% / 최연 21세

14. 최정민 (FW) **출전 선수 정보**

1-1 최정민 (FW)  
1-2 최정민 (FW)  
1-3 최정민 (FW)  
1-4 최정민 (FW)  
1-5 최정민 (FW)  
1-6 최정민 (FW)  
1-7 최정민 (FW)  
1-8 최정민 (FW)  
1-9 최정민 (FW)  
1-10 최정민 (FW)

14. 최정민 (FW) **출전 선수 정보**

출전 기록

**KBS** **» 스티플레이어**

승률 54% / 최연 21세

2002 월드컵 전차

1-1 최정민 (FW)  
1-2 최정민 (FW)  
1-3 최정민 (FW)  
1-4 최정민 (FW)  
1-5 최정민 (FW)  
1-6 최정민 (FW)  
1-7 최정민 (FW)  
1-8 최정민 (FW)  
1-9 최정민 (FW)  
1-10 최정민 (FW)

출전 기록

**KBS** **» YTV 하이라이트**

승률 54% / 최연 21세

YTV 하이라이트

**KBS** **» 내일 경기정보**

월드컵 4차  
6월 25일 (화)  
48

대한민국  
승률 54% / 최연 21세

경기시간 20:00 (KST) / KBS-DTV 2

15:17~18:00	19:00
18:30~19:00	19:30~20:00
19:30~20:00	20:00~20:30

**KBS** **» 월드컵 카드 게임**

월드컵 4차  
6월 25일 (화)  
48

다음 카드 중 피겨노바는 어디에 있을까?

1-1 최정민 (FW)  
1-2 최정민 (FW)  
1-3 최정민 (FW)  
1-4 최정민 (FW)  
1-5 최정민 (FW)  
1-6 최정민 (FW)  
1-7 최정민 (FW)  
1-8 최정민 (FW)  
1-9 최정민 (FW)  
1-10 최정민 (FW)

**KBS** **» 안기순 워킹보**

2002 월드컵에 최고의 스티플레이어는 누구라고 생각하십니까?

25.5-4명

승률 54% / 최연 21세

KBS >> 날씨

날씨 >> 주간 날씨

월요일	23 ~ 11
화요일	23 ~ 11
수요일	23 ~ 11
목요일	23 ~ 11
금요일	23 ~ 11
토요일	23 ~ 11
일요일	23 ~ 11

KBS >> 주간 날씨

월요일	23 ~ 11
화요일	23 ~ 11
수요일	23 ~ 11
목요일	23 ~ 11
금요일	23 ~ 11
토요일	23 ~ 11
일요일	23 ~ 11

KBS >> 교통

서울특별시

서울특별시

서울특별시

신촌가톨릭병원	영등포구	영등포구교입구
5.1km	←	→ 4.7km
대림상거리	신정3교	신정3교
3.7km	←	→ 3.7km
영등포호터리	신정3교	대림상거리
2.7km	←	→ 2.7km

이동명

KBS >> 2002 행운 이벤트

도전! 20,000

행운권이 펑펑!!

KBS	SBS	7
KBS	7	7
7	KBS	7

포인트

KBS >> 2002 행운 이벤트

도전! 20,000

행운권이 펑펑!!

KBS	KBS	SBS
SBS	KBS	SBS
7	KBS	7

포인트

KBS >> 데이터 방송 정보

데이터 방송 안내

시도별 데이터 방송 현황

시도별 데이터 방송 현황

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KBS >> 데이터 방송 경험하기

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Opinion Poll

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2002 FIFA 월드컵 개최국 선정

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## 3. Future Works

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### 3.1. Contribution to S/17

Korean industry has contributed to S17 in various ways and with considerable amounts of implementation feedback. We appreciate S17 - especially S17 Chair, Dr. Glenn Adams - for taking this feedback seriously. Most issues and comments we have raised were resolved and included into the recent development of the text for Proposed Standard that will be submitted to ATSC T3. To name few:

- Auto-start syntax/semantics
- Data Carousel Binding syntax/semantics
- Mandatory Remote Controller Keys and its use
- Reflecting update of data resources to DAE

### 3.2. Future works

Several issues to lead the data service successful were raised. The consortium plans to focus its efforts to resolve the following issues:

- DASE-1 should be advanced to the ATSC standard as soon as possible. More focused efforts are desirable for DASE-2 progress.
- Receiver performance and stability (ex. Navigation/response speed, ability to handle higher data rate, etc.) should be more improved.
- More efficient (in systems' point of view) and useful (in user's point of view) data services should be sought after.
- Systematic efforts should be made for compliance test.
- Support of the OTA (vendor specific) software delivery mechanism is highly desirable in the real field.
- Default built-in font might be desirable.
- Several errors and/or bugs were found in the streams and data service contents even though they did not bring about serious problems now.

# 4. Appendix

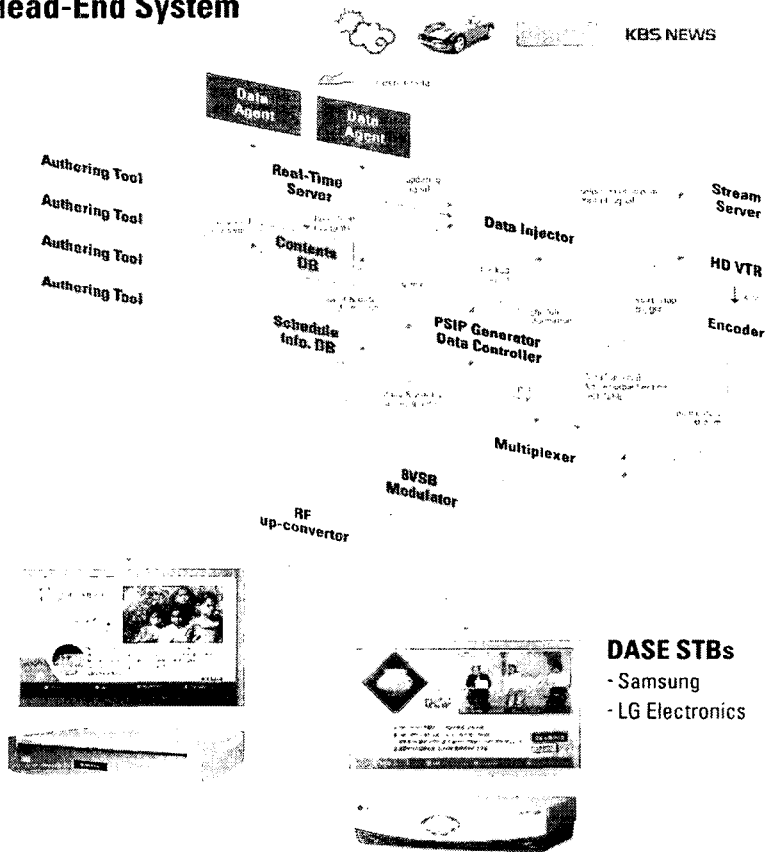
## 4.1. NAB Handout

# Coming Soon\*

# ATSC Interactive TV

Data Broadcasting System  
for ATSC DTV Applications Software Environment (DASE)

**KBS**  
**Head-End System**



## About The Demonstration:

ATSC DASE was accepted as a standard for Terrestrial Data Service in Korea. In June 2002 at World Cup, it will mark a milestone for Korean DTV industry by providing data broadcasting service to the public. This NAB demonstration is prepared by the consortium of companies that will participate in World Cup Data Broadcast trial: KBS (Korean Broadcasting System), Samsung, LG Electronics, Aircode, iCube and Alticast. The NAB demonstration shows all aspects of Data Broadcasting Services based on ATSC DASE standard. At the Head-End system DASE DA (ITM based Declarative Application) and PA (Java based Procedural Application) contents are authored, encapsulated and injected into the HD Video materials according to the broadcasting schedule. Two independent DASE STB implementations are shown to give a glimpse of interactive data services.



### Korea's Representative Public Broadcaster

As the nation's representative public broadcaster, KBS is the leading TV and radio network in Korea. KBS is firmly committed to its mission of providing unbiased and independent public broadcasting with the highest priority placed on the public interest. We continuously endeavor to maintain our competitive advantage through a wide variety of quality programs, the latest broadcasting technology as well as complete audience satisfaction.



Incorporating their experiences in manufacturing IT and consumer devices, Samsung is leading the interactive TV standards and implementation. Please contact Kwangke Lee (kklee@samsung.com) and Frank Romeo (FrankR@sea.samsung.com) for Samsung technologies and products shown at this demo.



LG Electronics is a major global player in electronics & telecommunications, operating 72 subsidiaries around the world with over 55,000 employees worldwide. LGE focuses on Digital TV, CD-RW, DVD, CD-ROM, DVD-ROM Drives, PCs, Monitors, Mobile Handsets, CRTs and PDPs. LGE is strengthening core competencies even more to further its reputation as the "Digital Leader" in electronic products and equipment in the digital era.



Aircode is one of the leading iTV solution provider whose solution can support any open standards for iTV service, ATSC-DASE, DVB-MHP, ATVEF, OCAP and ARIB-BML. Especially, Aircode has developed ATSC-DASE system for Korea's terrestrial DTV service. Aircode provides iTV authoring system (TVSPICE™ Station), transmission system (TVPUIS™ iServer) and iTV Application Suite. Aircode is a company who can provide you and your viewers with joy of interactivity.



<http://www.icube.co.kr>

iCube's specialty is digital broadcasting solution and consulting services for head-end systems. Its Transmission Automation System and CM Bank System are used by most of the broadcasters in Korea.

It is also producing consumer products for multimedia entertainment which include Digital Video Editor, TV receiver card and DVD player.



### Interact with the Future | The Next Level in Digital Broadcasting

Alticast is a pioneer in the field of interactive digital TV, providing end-to-end services and software solutions for the creation, delivery, and reception of interactive television content based on ATSC DASE, DVB MHP and OCAP open standards for digital broadcasting. Alticast is "first-to market" with commercially deployed DVB MHP products for Terrestrial, Cable, and Satellite operators.