Implementation of ISDB-T, the Future of Digital Television in the Philippines

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Manila, Philippines
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TV Asahi
Contents

- Service and Business
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  - Tokyo broadcasting system
  - Nippon television network corporation
- In the case of TV Asahi
Service and Business
Service and Business solution

Service
- Number of Channel
- Video Quality
- Communication
- Target
- Audience Action
- Where

Business
- Source of Revenue
- Advertising Target
- Media
- Potential

Analogue Broadcasting
- Single Channel
- Standard (SDTV)
- Casting
- Viewer
- Passive
- Home

Digital Broadcasting
- Multi Channel / HD
  + High quality (HDTV)
- Interactive
  + Subscriber, Industry
  + Segment, Personal
- Customer
  + Active
- Anywhere
  + Interactive
  + High

Sponsor (Commercial station)
- Mass
- Broadcast
- Low (Stability)
Business and Source of revenue

**Business Positioning**

- **TV Broadcasting**
  - Core business
    - HDTV
    - Multi Channel

- **Data Broadcasting**
  - New Business
    - Additional value for TV
    - New source of revenue

- **One-Seg Service**
  - Pay TV service

- **Contents Distribution**
  - Interactive service
    - TV Commerce
  - New advertising
    - Electric leaflet
    - Marketing research

**Core Competence**

- **Organization Combined with TV program**
  - Confidence for TV Commerce

- **Capability of contents production**
  - Contents for multi-use

**Source of Revenue**

- **Traditional advertising**
- **New advertising**
- **Pay TV service**
Implementation

Broadcast premises
Example of implementation (1)

Tokyo Broadcasting System

Architecture concept
- Two-step approach
  - First step
    - from end of 2003
    - “Add on” system
  - Second step
    - from end of 2004
    - Full digital
“Add on” system

In the case of Tokyo broadcasting system

Current
Analogue Master

“Add on” system
New Digital HD Master

EPG system
SI/EPG

Data Program system

Analogue program

Local area

Digital program

Local area

Network

Osaka & Nagoya
“Add on” system
Appearance

Analogue program
Local Network

Digital program
Local Network
Example of implementation (2)

Nippon television network corporation

Architecture concept

- Full package approach
- Integrated system
  - Production facilities/ Storage media/ Broadcasting system
- Flexible system
  - Long term life/ Expansion request
- Screening
  - Trend technology
Layout

Higher Floor
for Office

Lower Floor

SKY

S2 S1 SV

S3 S4

Circuit center
Media Center

News
CV center

MY

Library 0 studio

Lower Floor

Higher Floor
for Office

SKY

S2 S1 SV

S3 S4

Circuit center
Media Center

News
CV center

MY

Library 0 studio
Flow of HD & SD Signal

- Live relay link
  - FPU/ SNG transmission for Sports events, News
  - Terrestrial Master Cont. analogue & digital
- Studio
  - General-studio
  - News- studio
  - Other studio
- Other media Deliver
- Media Center
- Other media Deliver
- Audio signal is multiplexed with video signal.

- In-house facilities
  - CG systems
  - weather center
  - NNN News Sub
- Koji-machi Annex
  - G studio/ K studio
- HD
  - HD Prog. Dist. Sys
  - Converters
  - HD
  - SD
  - SD Prog. Dist. sys

Audio signal is multiplexed with video signal.
Media center concept

Media Center

Terrestrial Digital
broadcasting

Network
/ Overseas

CATV

Terrestrial Digital
Broadcasting

BS Digital
/ CS Digital

CM Bank

Program Server

Studio Contents

News

Other Contents
Simultaneous Broadcasting

In the case of Live program

- Network
- Live relay link
- Sub out
- Studio
- CG
- DSS
- Data broadcasting

Sub SW

Media Center

Digital program

Analogue Program

Side Cut Letter box

‡‡
Simultaneous Broadcasting

In the case of VTR program

SD contents
aspect ratio 4:3
D2 VTR
Digital β CAM

HD contents
aspect ratio 16:9
HDCAM
HDCAM SR

Media Center

UP conv.

Side cut
Letter box

Down conv.

Digital HD Program

Analogue Program

Digital Program

Analogue Program
In the case of TV Asahi
Migration plan

Architecture concept

- Full package approach
- Full HD & Full digital system
- Contents for multi-use
- Migration from VTR base to Server base
Move to the new site

tv asahi’s Head Quarter moved to new site “Roppongi hills” from Ark Hills premise on Mar. 2003 to secure space to install new digital facilities in addition to the analogue facilities and to commence Digital broadcasting on Dec. 1st, 2003.

Roppongi Hills

Ark Hills

Mar 31st, 2003
Construction of the new building

Building Outline

Construction period: Aug.1<sup>st</sup> 2000– Mar.31<sup>st</sup> 2003

Building Area: 9,469.74m<sup>2</sup>

Number of Stories: 8 stories and 3 stories below ground.

Total Floor Area: 73,700.43m<sup>2</sup>

Power Supply: 66kV Loop Substation

Private Power Generator: Gas Turbine PG. 3,500kVA 6.6kVx2

UPS: 1000KVAx2  Redundant operation
New building

tv asahi has installed full digital broadcasting systems for Analogue & Digital terrestrial television broadcasting at new building.
New building
Technical Design concept

1. Full HD-SDI & Full digital system
2. System total phase management
3. Distributed medium-scale matrix
4. One source-multi use
Digital signal interface

1. Digital HD
   HD-SDI (1080i) BTA S-004B (SMPTE-292M)
   Component serial digital
   1080i/ 59.94Hz

2. Digital SD
   SMPTE-259M (270Mbps)
   Component serial digital

3. Embedded audio
   SMPTE-299M
   8ch: equivalent of AES/ EBU 4pair/ Fs48kHz/ 24bit
Master system
Requirements of Master System

- **Multi format solution**
  - rate-free matrix 1080i/720p/480p/480i

- **Multi channel solution**
  - up to a ceiling of three programs

- **High reliability**
  - three redundant systems
  - current/backup/test or maintenance

- **High flexibility**
  - Easy expansion and renovation

- **Effective use of servers**
  - CM server/program server/CG server
**Required applications**

Segments: 12

Segments: 1

- **SDTV1**
  - MPEG2 MP@ML
- **SDTV2**
  - MPEG2 MP@ML
- **SDTV3**
  - MPEG2 MP@ML
- **HDTV**
  - MPEG2 MP@HL

**Supplemental broadcast**

**One-Seg service**
- H.264 BP@L1.2

**1 segment service for mobile phone**

Time:
- 8:00
- 9:00
- 10:00
Conceptual diagram of Master

Carry-in Guideline
VTR format:
D2/ HDCAM/ HDCAM-SR/ digital β cam/ HD-D5 are acceptable.

Program Server:
Pinnacle systems
MSS900
HD 120H or SD 300H
Raid 3

CM Server:
Sony MAV-2000
HDx1 72H
SDx1 90H
M-Raid 6

VAF system:
Toshiba VI DEOS
Flush memory
Still picture 3600 frame
.tif format
Motion 30min
Audio 8H
.wav format
Audio format:
MIC/ CD/ DAT/ MO/ 6mm
Conceptual diagram

EDPS (management of business & broadcasting data processing system) manages program and CM material data.
Conceptual diagram

Master system
Three redundant system

Necessity of test environment

Seamless system changer

Current use
SYS-1

Back up use
SYS-2
same as Sys-1

Test bed
SYS-3
same as Sys-1

F-SW
Transmitter
**Encoder, MUX**

- HD encoder (MPEG2 : MP@HL)
- SD encoder (MPEG2 : MP@ML)
- 1-SEG encoder (H.264 : BP@L1.2)
- MUX compliant with ARIB STD-B31
## Aspect ratio converter 1

### Example of aspect converting

<table>
<thead>
<tr>
<th>Input format</th>
<th>Output format</th>
<th>HD 1080i</th>
<th>Analog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>Aspect ratio</td>
<td>Sample picture</td>
<td>no designation</td>
</tr>
<tr>
<td>HD</td>
<td>16:9</td>
<td>No operation</td>
<td>D/C letter box</td>
</tr>
<tr>
<td></td>
<td>4:3</td>
<td>No operation</td>
<td>D/C side cut</td>
</tr>
<tr>
<td>SD</td>
<td>4:3</td>
<td>U/C side panel</td>
<td>No operation</td>
</tr>
<tr>
<td></td>
<td>16:9</td>
<td>U/C vertical clearance</td>
<td>No operation</td>
</tr>
</tbody>
</table>
Test environment is essential factor

Necessity of redundant system and test environment

In the digital broadcasting age, test environment is essential factor.

Because in contrast with analog signal performance, in TS signal performance, it is quite difficult to determine the reason of sudden failure.

Therefore redundant system is essential, in the case of sudden failure, system change from current to back up is single correct answer.

Furthermore, system 3 is utilized as test bed for verification of event ignition time.
**TS monitoring and recording system**

**HDD-Raid for 3days full TS recording**

- **MTM400**
  - TS recorder
  - MTM-400 Tektronix SYS-1 TS
  - MTM-400 Tektronix SYS-2 TS
  - MTM-400 Tektronix Manual SW

- **HDD-Raid**
  - TS-1 TS F-SW out

- **MTX SW**

- **Monitor-1**
  - RTX-100 Tektronix
  - TV monitor

- **SW HUB**
  - Thumbnail generating PC
  - Alarm management PC

- **From monitoring point**
  - Ethernet
**SI/EPG system**

**SI: Service Information**
Various information designed to improve the convenience of program selection, specified by the ARIB standard.

- **BIT, SDT, EIT, CDT and SDTT** are generated and sent.

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**In the case of normal**

- ES delivery center sends SDTT to SI/EPC system
- I/F PC receives SDTT
- BDPS generates DS current
- EPG generating application
- OA Data
- Test Data
- DS back up

**In the case of test mode**

- ES delivery center sends SDTT to SI/EPC system
- I/F PC receives SDTT
- BDPS generates DS current
- EPG generating application
- OA Data
- Test Data
- DS back up

**ES: Engineering Service**
**SDTT: Software Download Trigger Table**
Microwave

For transmitting the television program from studio to transmission site, a transport stream studio-to-transmitter link (TS-STL) is primarily used. TS method is 64QAM modulated by ISDB-T format broadcasting TS signal. This method gains the performance of less signal degradation.

<table>
<thead>
<tr>
<th>Transmitter power</th>
<th>0.5W/1W/2W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency deviation</td>
<td>within ±20ppm</td>
</tr>
<tr>
<td>Occupied bandwidth</td>
<td>below 7.6MHz</td>
</tr>
<tr>
<td>Modulation method</td>
<td>64QAM</td>
</tr>
<tr>
<td>Transmission rate</td>
<td>below 40.2Mbps</td>
</tr>
</tbody>
</table>
Optical cable

STL via optical cable

Optical transmitter is available to transmit OFDM signal from studio to transmitter site via optical cable.

• 10-200MHz Bandwidth.
• QAM, PSK or OFDM signal transmission is available.
• Long haul transmission - Optical loss budget is 25dB.
• Fully manageable through Simple Network Management Protocol (SNMP).
• Having console port for setup and monitoring parameters.
• Web-GUI inside- Setup and monitoring parameters from usual Web-browser.
Requirement of SFN relay station

• To implement SFN relay station, following requirement must be met in order to establish synchronism between station-to-station.

• IFFT sample frequency should be synchronized with the studio and the broadcasting station, or among the broadcasting stations.

• Synchronized methods are as follows;

  1. Slave synchronization

     The clock of modulator in each transmitter is synchronized to the clock of MUX in studio.

  2. Reference synchronization

     This method synchronizes the studio and all the broadcasting stations by GPS other than the terrestrial digital broadcast wave.
**Synchronized methods**

**Signal format**: 204 byte broadcasting TS format

**Slave synchronization**
- CLK
- STL
- Microwave
- Delay
- OFDM MOD
- TX

**Reference synchronization**
- ATM Network
- Optical cable
- TS
- Synchronizer
- OFDM MOD
- TX

**Broadcasting premises**
- Re MUX
- Rb-OSC 10MHz (Master)
- GPS

**Transmitting premises**
- Rb-OSC 10MHz (Master)
- TX

**GPS**
- 1 sec pulse

**Microwave**
Transmission
Digital transmission


STL
Optic fiber line x2
backup STL
Micro wave
Digital transmitter system

Example of Transmitter schematic diagram in Tokyo Tower

Other Broadcaster's transmitter

Fiber TERM. → 64QAM MOD → Sync. & Delay → OFDM MOD → SW. & DIST. → SW. & DIST. → 5 kW TX. → EXCH/COMBINER

(5kW 2/3 system digital Transmitter)
**Digital Transmitter system**

- Three 5kw transmitters for redundant operation.

- Output power is 10kW.
Antennas

A number of analogue TV antennas were already mounted on the ideal zone of Tokyo Tower.
Antennas

- Vacancy zone is around 250mH of Tokyo tower. There are no appropriate space except there. Digital antennas were designed, compact size, 6 meters in width and 12 meters in height.
Antennas

A beam pattern synthesis technology realized an omni directional radiation pattern in compact size.
Transmission network chain

To cover the service area all over the country, Broadcasters have to construct many relay stations.
Relay station

Airwave relay station
Thank you for your attention! 
END

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