Navigating the DTV Transition:
How Broadcasters are Using AFD to Maintain Formatting Control of their Programming

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Background

AFD = Active Format Description

- AFD describes the aspect ratio of video signals
- AFD codes embedded in video signals
- Used by display devices to automatically control how pictures are formatted
  - Used widely in Europe

Industry Documents

- ATSC A/53, DVB, Others : AFD Carriage in MPEG2
- CEA-CEB16 : Digital Receiver Guidelines
- SMPTE 2016-1/3: AFD Carriage in Baseband Video (VANC)
Introduction
AFD for the DTV Transition

- New Application for the DTV Transition
  (112 days away)
  - Automatic control of down-conversion
  - Optimum formatting for SD viewers
- How is AFD being utilized to solve Post DTV Transition down-conversion issues?
- What methods are in use by broadcasters?
- How much progress has been made?
Broadcast Television Reception

Today

Television Broadcaster

DTV Signal

Analog Signal

HDTV Set

Analogue Set

ANALOG AND DTV SIGNALS OFF-AIR
Broadcast Television Reception
Post DTV Transition

Television Broadcaster → DTV Signal → DTV Converter Box → HDTV Set

ANALOG SHUTDOWN - DTV SIGNALS ONLY*
Broadcast Station Distribution

Today

INDEPENDENT / CONTROLLED DELIVERY PATHS
Broadcast Station Distribution
Post DTV Transition

Television Broadcaster

Cable/Satellite Provider

DTV Signal

Down-conversion

HDTV Set

Analog Set
Down-conversion Options
Choice between “Center-cut” or “Letterbox”

Original

Center-cut

Letterbox

“CENTER-CUT” IS MOST COMMON CHOICE
Center-Cut Safe Rules
Protects from Center-Cut Down-conversion

48% of Total Canvas
Leonardo da Vinci’s The Last Supper
Original Version
Leonardo da Vinci’s The Last Supper
“Center-Cut Safe” Version
AFD – Active Format Description

Down-conversion Usage

- AFD Flags inserted into HD video content
- Provides Real-time Instruction to Down-Converters
- Used internally by NBC Since 2005

- Being implemented by FOX, PBS, Hearst-Argyle and other broadcasters
- ATSC RP on ATSC to Analog Down-conversion
- Widely supported on professional down-converting ATSC receivers

ALLOWS CONTENT CREATORS TO DECIDE
Broadcast Television Reception

Post DTV Transition

Television Broadcaster

Cable/Satellite Provider

HDTV Set

Properly formatted SD

AFD FIXES THE ASPECT RATIO PROBLEM
# AFD – Active Format Description

## Definition and Usage

<table>
<thead>
<tr>
<th>AFD Code</th>
<th>Aspect Ratio</th>
<th>Description of HD Signal</th>
<th>Original HD Image</th>
<th>Description of Down-converted SD Signal</th>
<th>Down-converted SD Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>16:9</td>
<td>Full frame 16:9 image. Not Center-cut Protected</td>
<td><img src="image1.png" alt="Image" /></td>
<td>16:9 Letterbox in 4:3 Frame</td>
<td><img src="image2.png" alt="Image" /></td>
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<td>Full frame 4:3 Image</td>
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<td>16:9</td>
<td>Full frame 16:9 image. Center-Cut Protected</td>
<td><img src="image7.png" alt="Image" /></td>
<td>Full frame 4:3 Image</td>
<td><img src="image8.png" alt="Image" /></td>
</tr>
</tbody>
</table>
AFD – Today

- Simple Protocol
- Many Touch Points
- Usage is key to success

Implementation Guidelines
1. Authoring / Production
2. Plant Distribution / Data Preservation
3. Local Station Distribution
AFD – Today
Authoring / Production Guidelines

- Focus on HD plant - AFD for down-conversion
- AFD carriage in HD-SDI most feasible today – file based carriage limited
- Define down-conversion format (AFD) for all finished content to be aired
- Insert AFD at Final Stage of HD Production
- Apply fixed AFD code to up-converted content
**AFD Authoring / Production Guidelines**

**Commercial/Program Ingest Example**

- Ask content providers for down-conversion format
- Insert AFD code at ingest point
- Many AFD – VANC inserters available
- Insure Playout Server Supports VANC Record/Playback
AFD Authoring / Production Guidelines

Control Room Examples

- Define AFD code for program/event
- AFD pass through on pre-encoded content
- Avoid cross-fades between AFD’s (switch in black)
AFD Authoring / Production Guidelines
Edit Workflow Example

- Minimal AFD support on NLE systems
- Insert AFD code at final publish point
- Insure VTR configured to pass AFD in VANC
AFD Authoring / Production Guidelines

File-based Workflow Example

- AFD – VANC carriage in file based systems vary
- Transcoding systems supply the “glue”
- Insert AFD code at final publishing point
AFD – Today
Distribution Guidelines

- Focus on HD plant - AFD for down-conversion
- VANC support in SD systems is minimal
- Define AFD carriage to fixed VANC position within HD plant
- Guard against multiple AFD codes in signal
- Avoid cross fades between AFD codes
- Insure End-to-End VANC preservation
- Consider automation control of AFD insertion
Baseband Network delivery with AFD

- Insure AFD data on all content – data pass through
- Insure ATSC encoder supports AFD
- Insert fixed AFD at up-conversion from SD plant – for center-cut
- Local/syndicated HD programming likely center-cut in short-term
ATSC Network delivery with AFD

- Insure AFD data on all content – data pass through
- Insure ATSC encoder supports AFD
Goal: Validate end-to-end AFD delivery and down-conversion

KOB-TV
- Covers entire state of New Mexico with portions of Arizona and Colorado
- 57 translators in service – remaining analog

NBC
- Provides mixture of letterbox/full screen content on SD
- Full Screen: News, Sports, SD Originated Content
- Letterbox: Most Entertainment, HD Commercials/Promos

KOB-TV – Albuquerque, NM
On-air AFD Test: Sept 24-25, 2008
KOB-TV – AFD Test

KOB-TV Station

- NBC HD Distribution (with content specific AFD)
- Fixed AFD code inserted in KOB local signal path
- AFD carried on KOB Broadcast DTV Transmission
KOB-TV – AFD Test
DirecTV and DISH Network

- DirecTV manages LCF (Local Collection Facility) for DISH Network
- Center-cutting at LCF since July 2008
- Switched KOB down-convert from fixed center-cut to AFD at LCF
- Test covered all DirecTV and DISH SD viewers in New Mexico

Recorded from DirecTV SD
KOB provides HD and SD fiber to Comcast

K-Tech down-converting receiver used for off-air backup.

Test covered most Comcast analog viewers in New Mexico.
Virtually all KOB translators to remain analog after Feb ‘09
5 KOB’s translators upgraded with R.L. Drake receiver on DTV feed.
KOB-TV – AFD Test

Off-air

- AFD controlled down-conversion on off-air DTV Converter boxes
- Zenith, Insignia, Dish Network and Panasonic DTV Converter boxes

Recorded from Zenith STB
Conclusions
AFD Implementation

- AFD technology is ready today
- Understand the potential pitfalls
- Wide manufacturer support for HD-SDI, MPEG
- Better support on file-based systems needed
- Start small – simple implementations
Thank you

www.nab.org/AFDReady