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

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SMPTE Technical Conference
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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

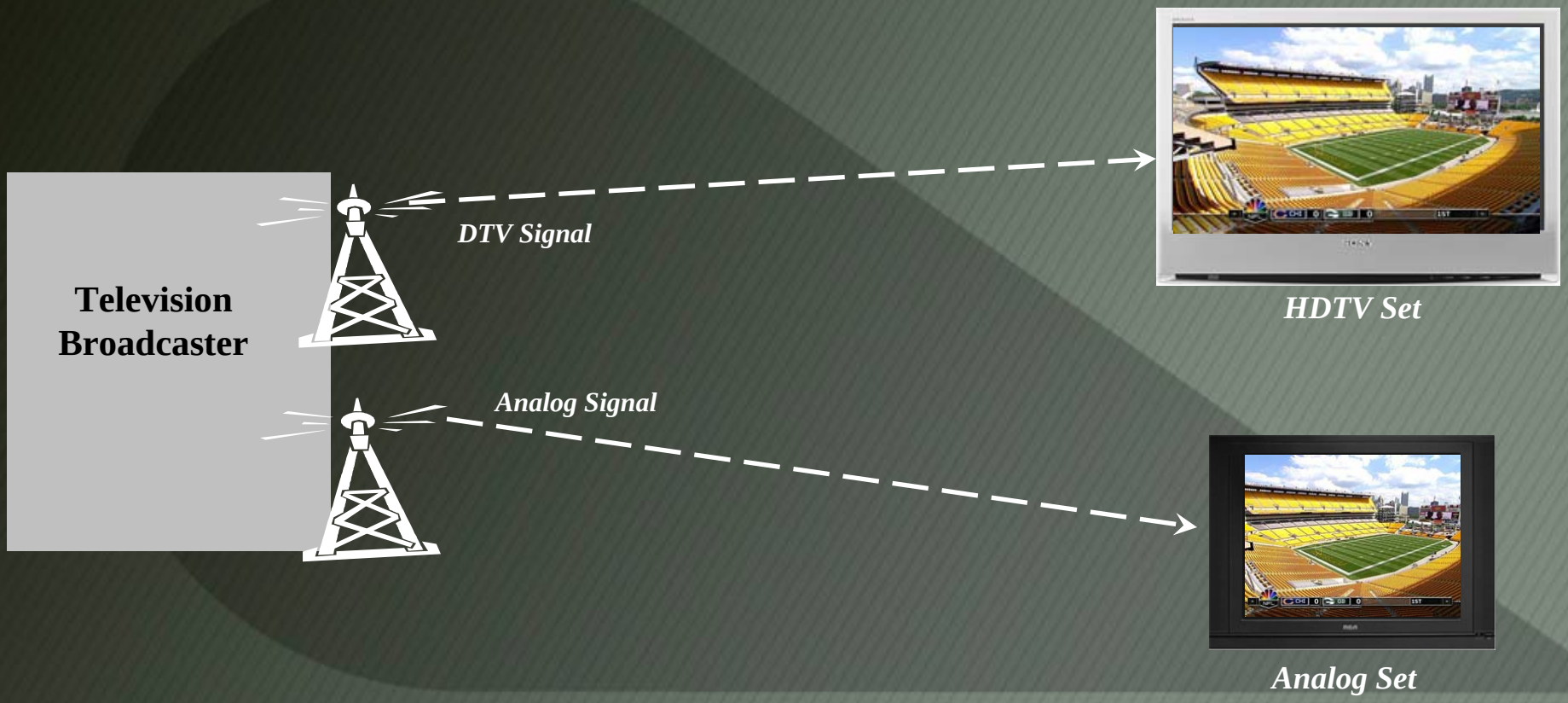
- New Application for the DTV Transition

  (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

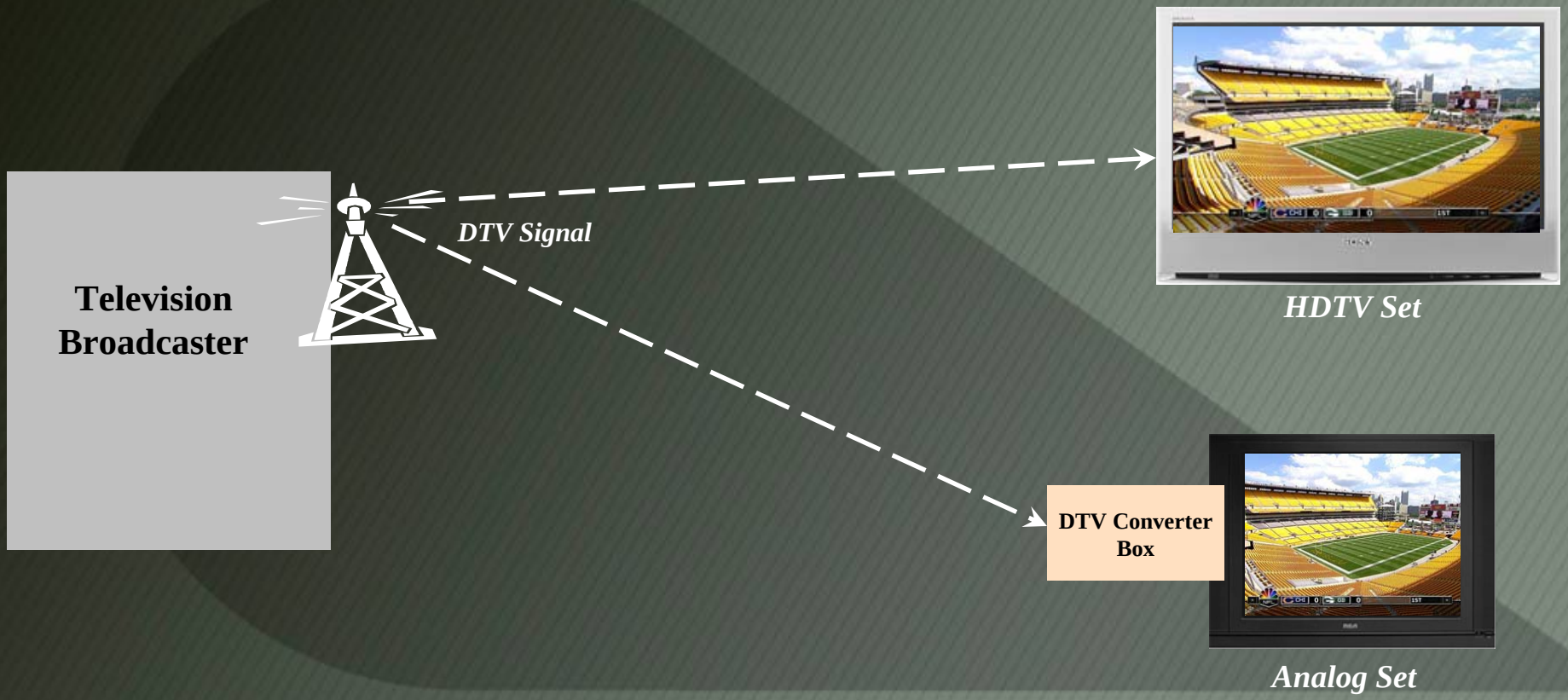
Today



ANALOG AND DTV SIGNALS OFF-AIR

Broadcast Television Reception

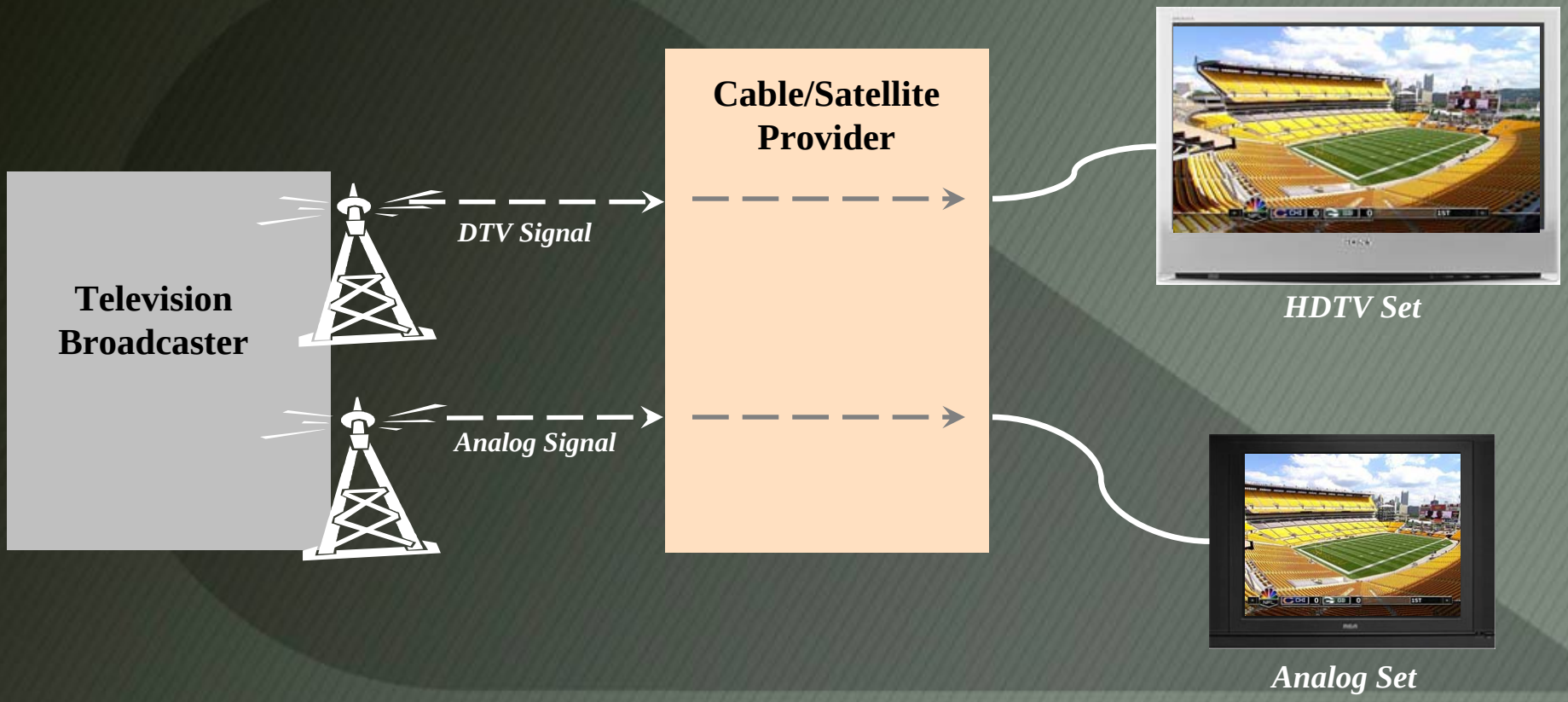
Post DTV Transition



ANALOG SHUTDOWN - DTV SIGNALS ONLY*

Broadcast Station Distribution

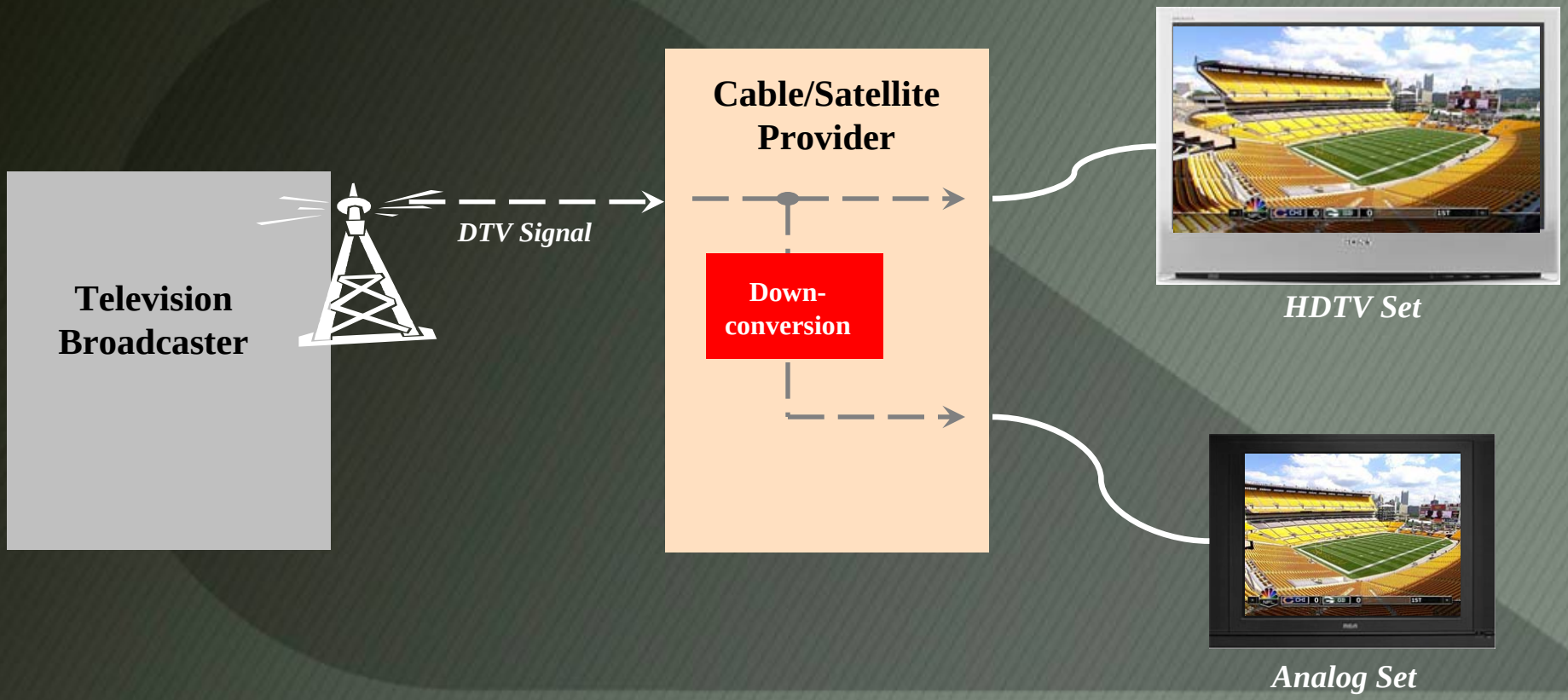
Today



INDEPENDENT / CONTROLLED DELIVERY PATHS

Broadcast Station Distribution

Post DTV Transition



ANALOG VERSION FORMATTED AT HEAD-END

Down-conversion Options

Choice between “Center-cut” or “Letterbox”

	HD Originated	*SD Originated*
Original		
Center-cut		
Letterbox		

“CENTER-CUT” IS MOST COMMON CHOICE

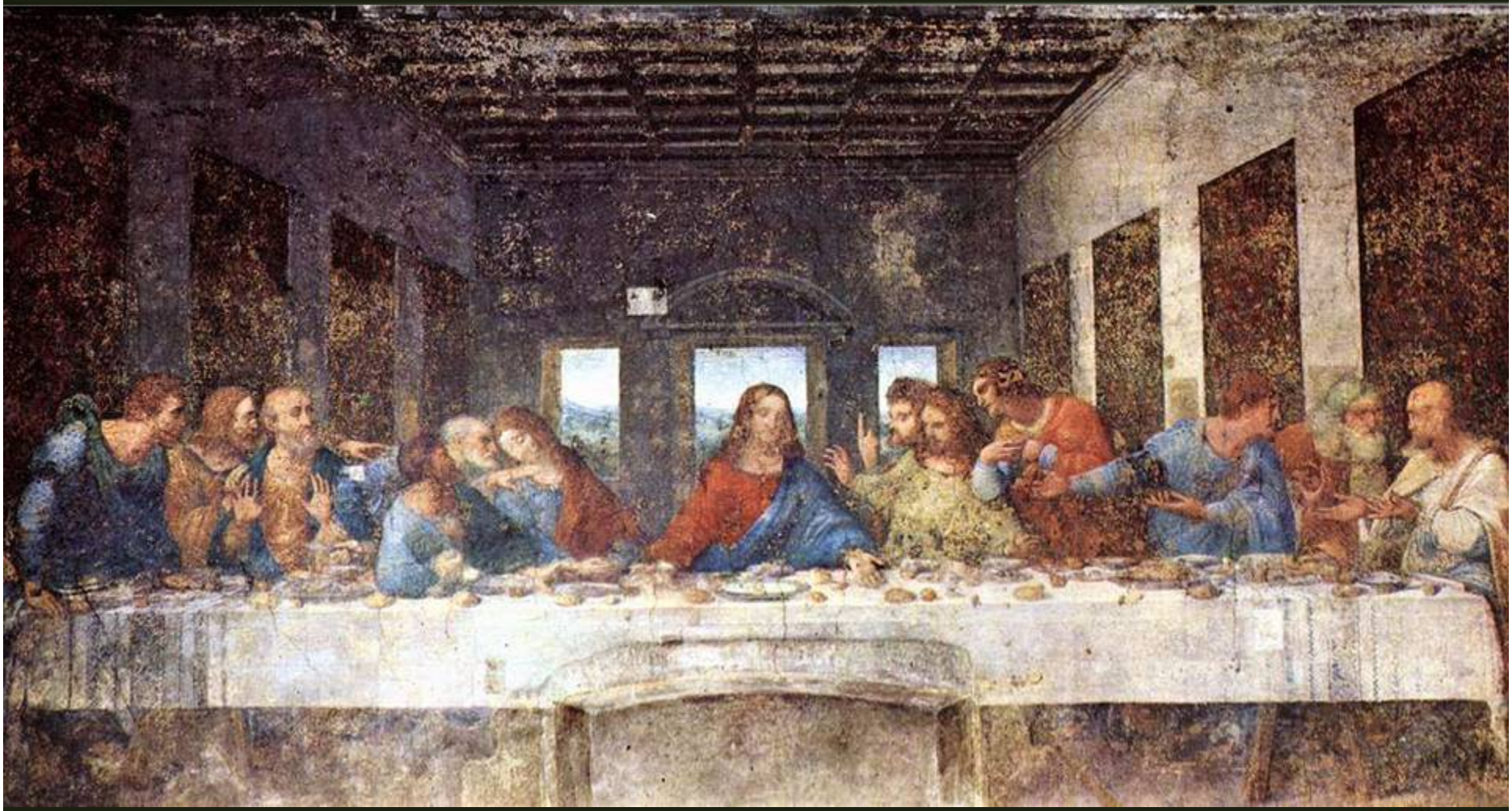
Center-Cut Safe Rules

Protects from Center-Cut Down-conversion

48% of Total Canvas

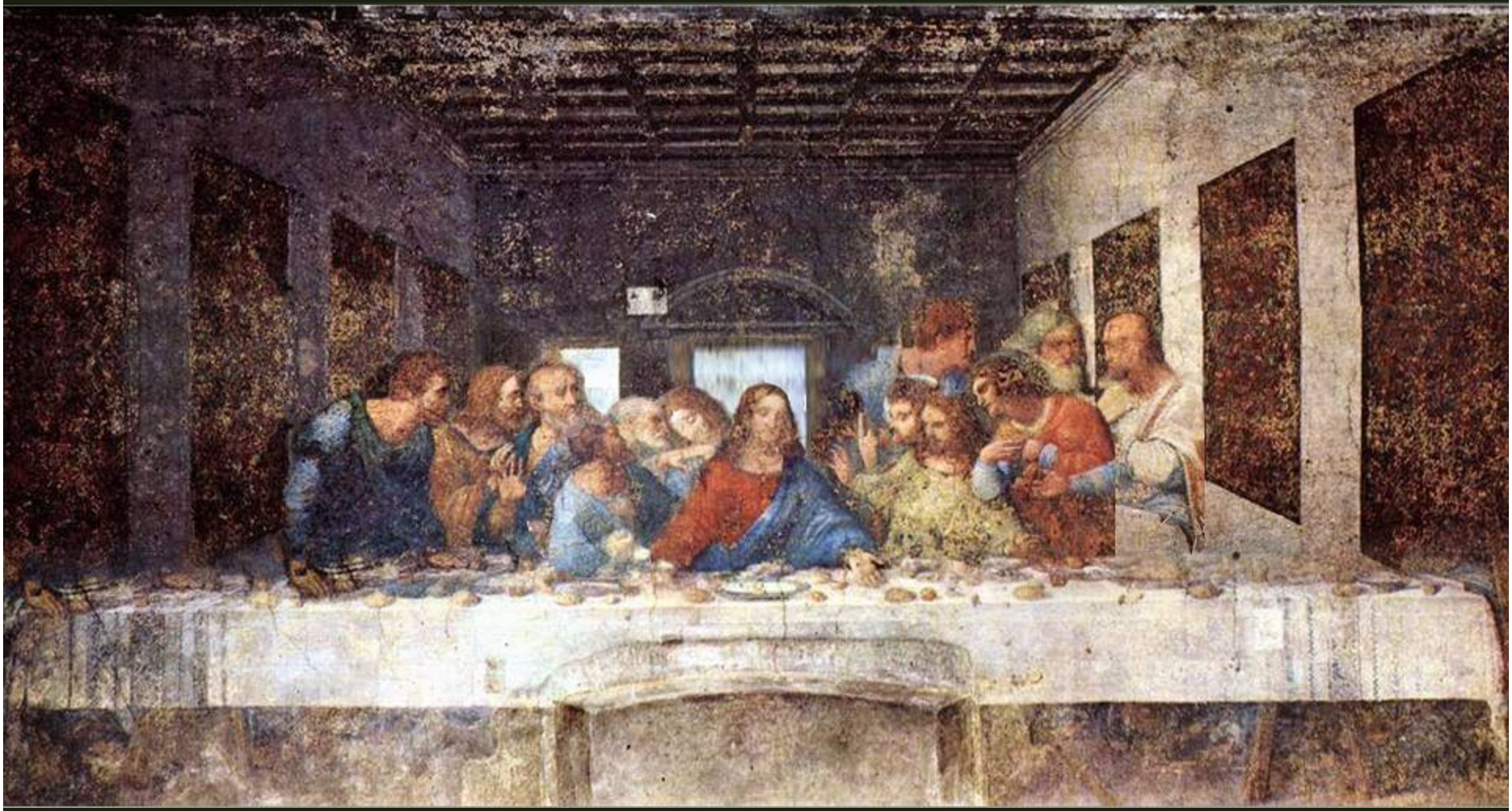
Leonardo da Vinci's The Last Supper

Original Version



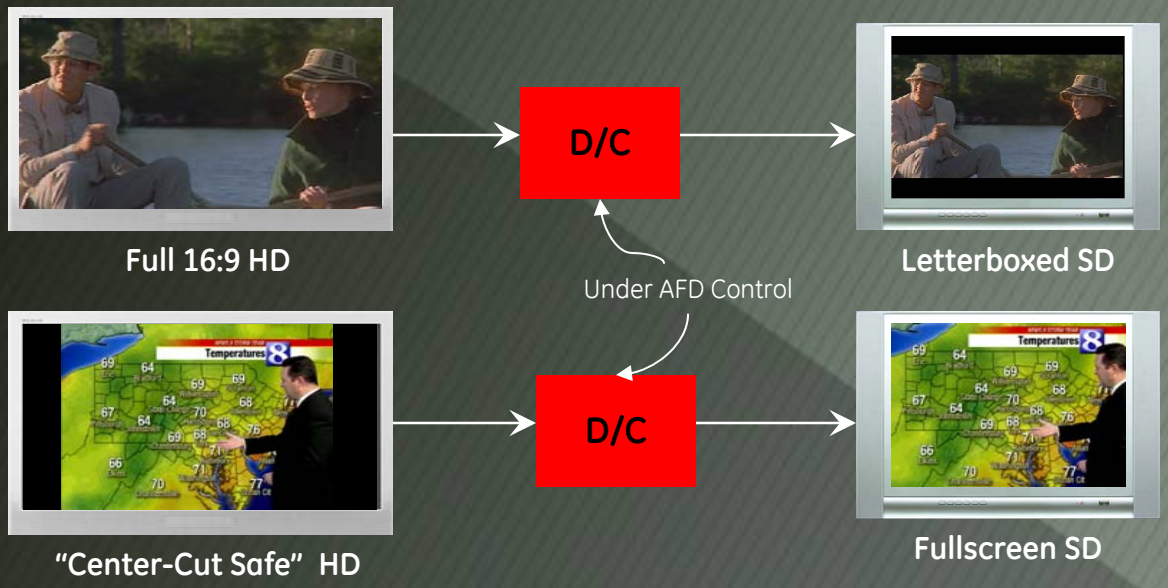
Leonardo da Vinci's The Last Supper

"Center-Cut Safe" Version



AFD – Active Format Description

Down-conversion Usage

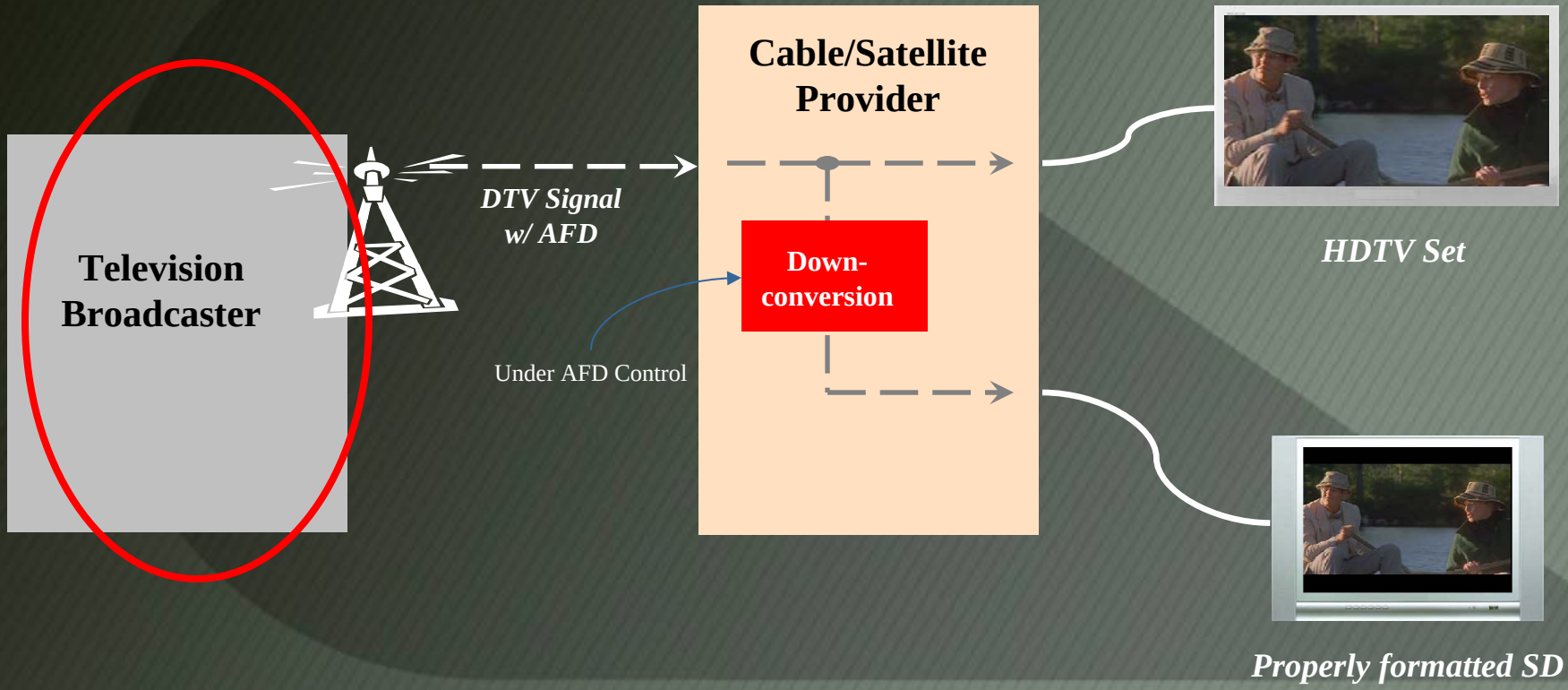


- AFD Flags inserted into HD video content
- Provides Real-time Instruction to Down-Converters
- Used internally by NBC Since 2005
- Being implemented by FOX, PBS, Hearst-Argyle and other broadcasters
- ATSC RP on ATSC to Analog Down-conversion
- Widely supported on professional down-converting ATSC receivers

ALLOWS CONTENT CREATORS TO DECIDE

Broadcast Television Reception

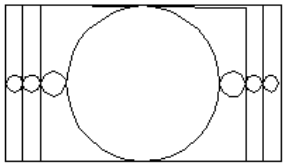
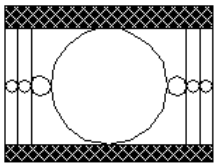
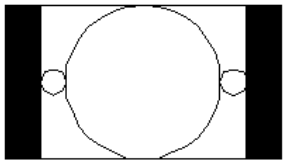
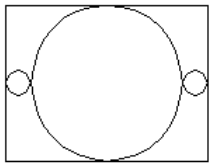
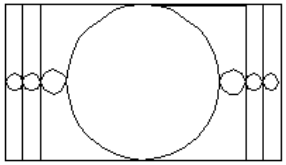
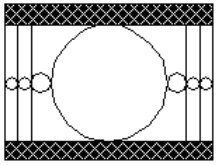
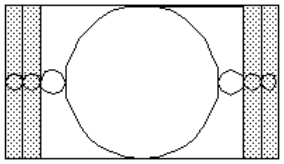
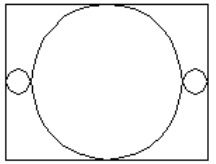
Post DTV Transition



AFD FIXES THE ASPECT RATIO PROBLEM

AFD – Active Format Description

Definition and Usage

AFD Code	Aspect Ratio	Description of HD Signal	Original HD Image	Description of Down-converted SD Signal	Down-converted SD Image
'1000'	16:9	Full frame 16:9 image. Not Center-cut Protected		16:9 Letterbox in 4:3 Frame	
'1001'	16:9	Pillarbox 4:3 image. From 4:3 Originated material		Full frame 4:3 Image	
'1010'	16:9	Full frame 16:9 image. Not Center-Cut protected		16:9 Letterbox in 4:3 Frame	
'1111'	16:9	Full frame 16:9 image. Center-Cut Protected		Full frame 4:3 Image	

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

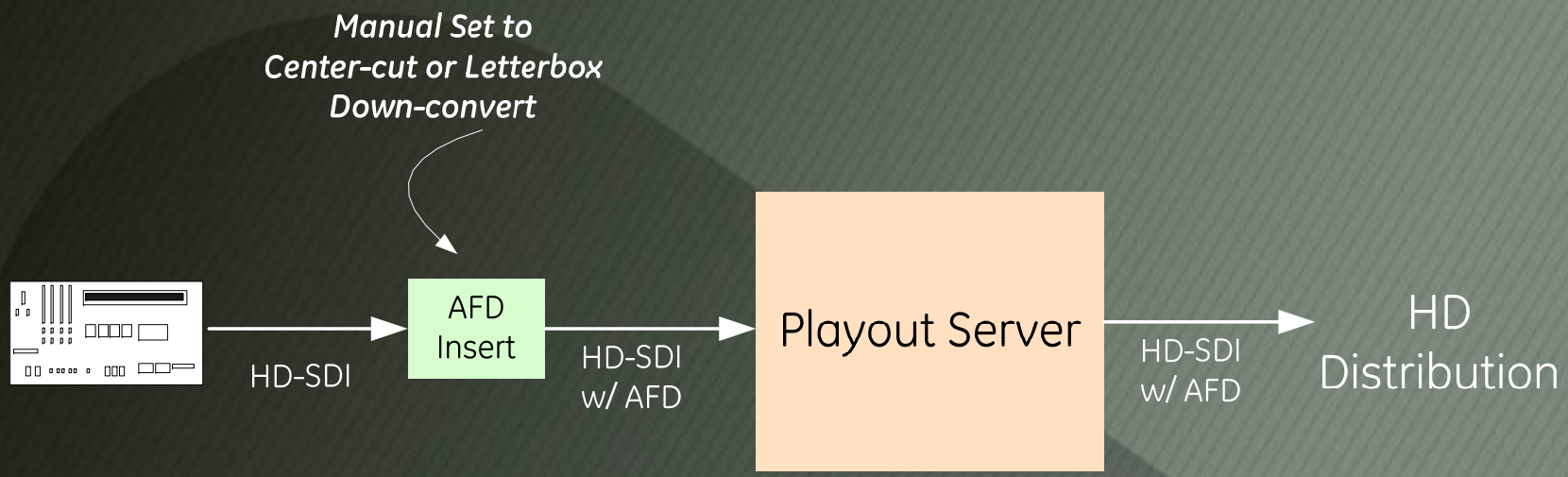
AFD – Today

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

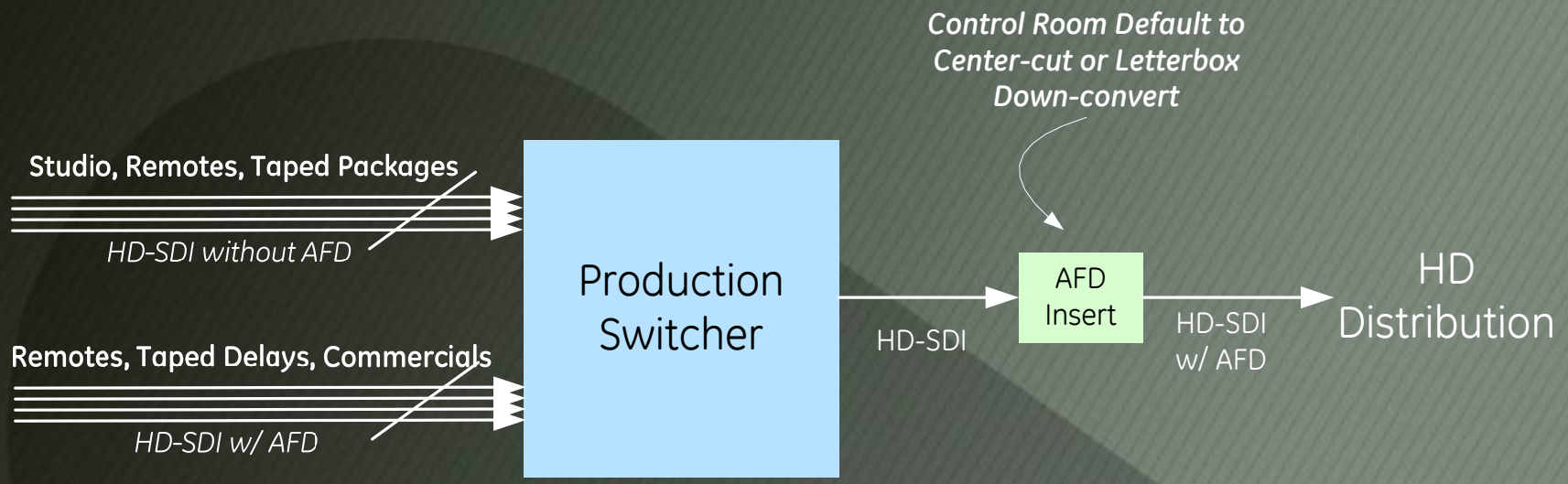
Commercial/Program Ingest Example



- 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

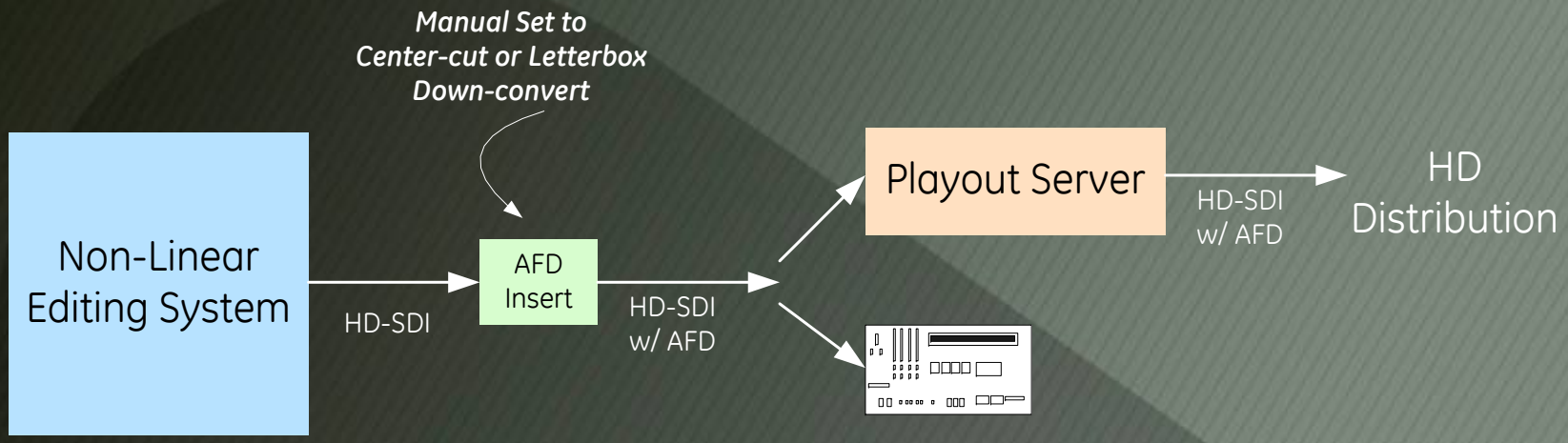
Control Room Examples



- 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

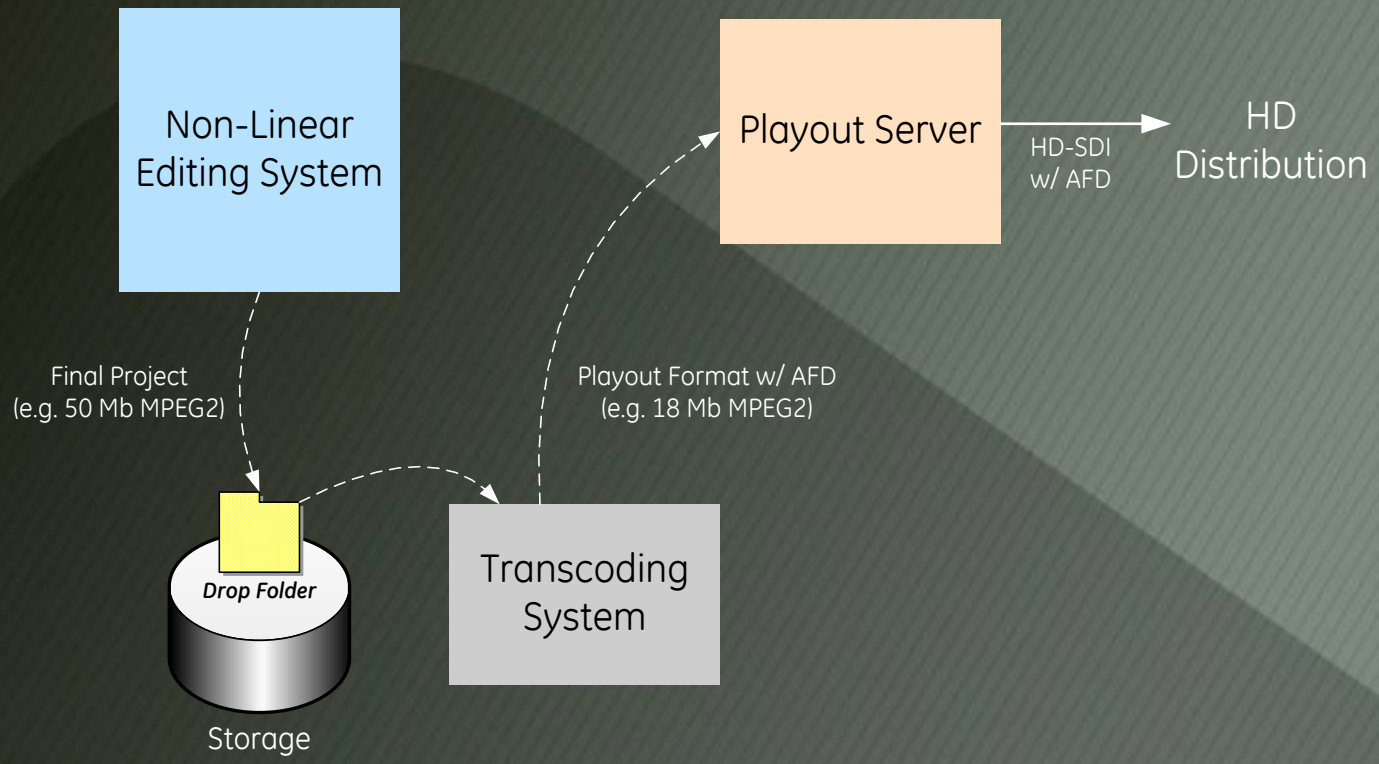
Edit Workflow Example



- 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

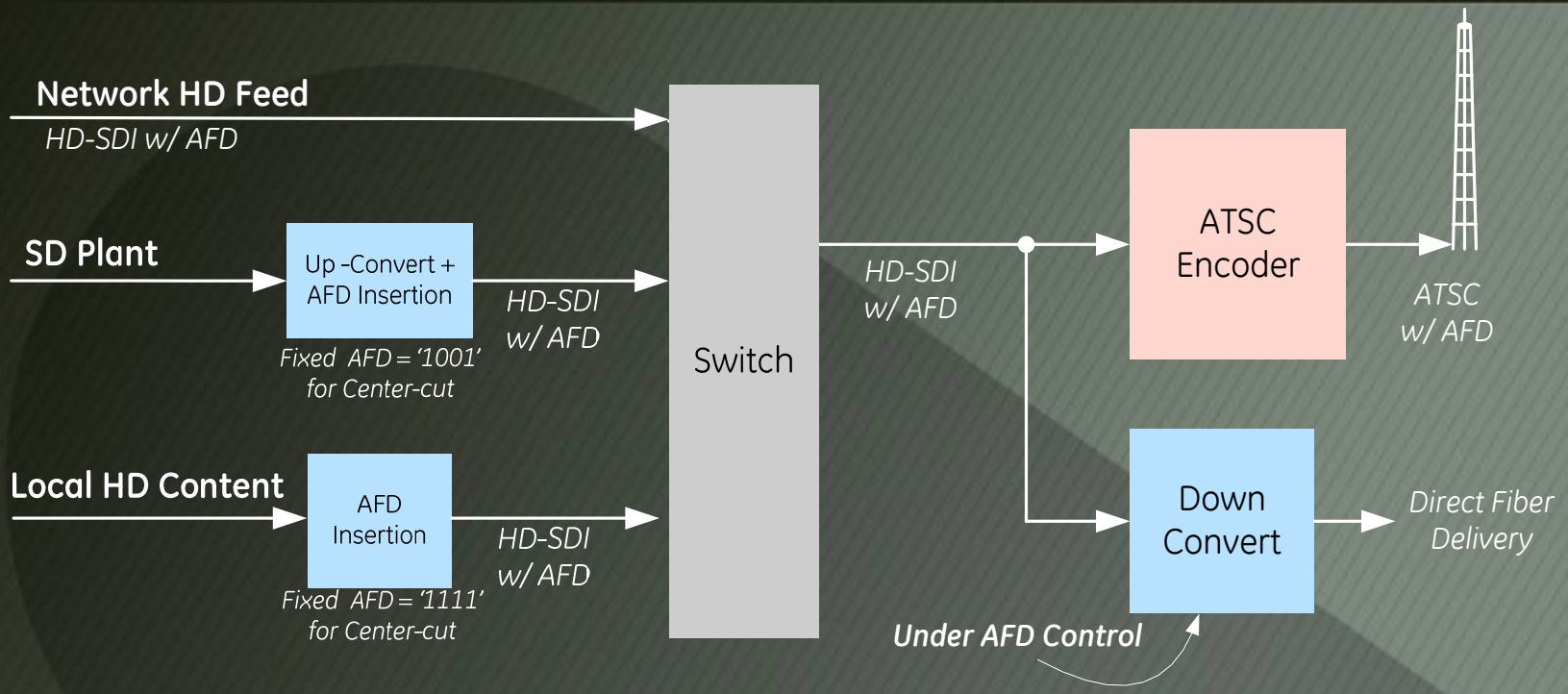
AFD – Today

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

AFD – Today

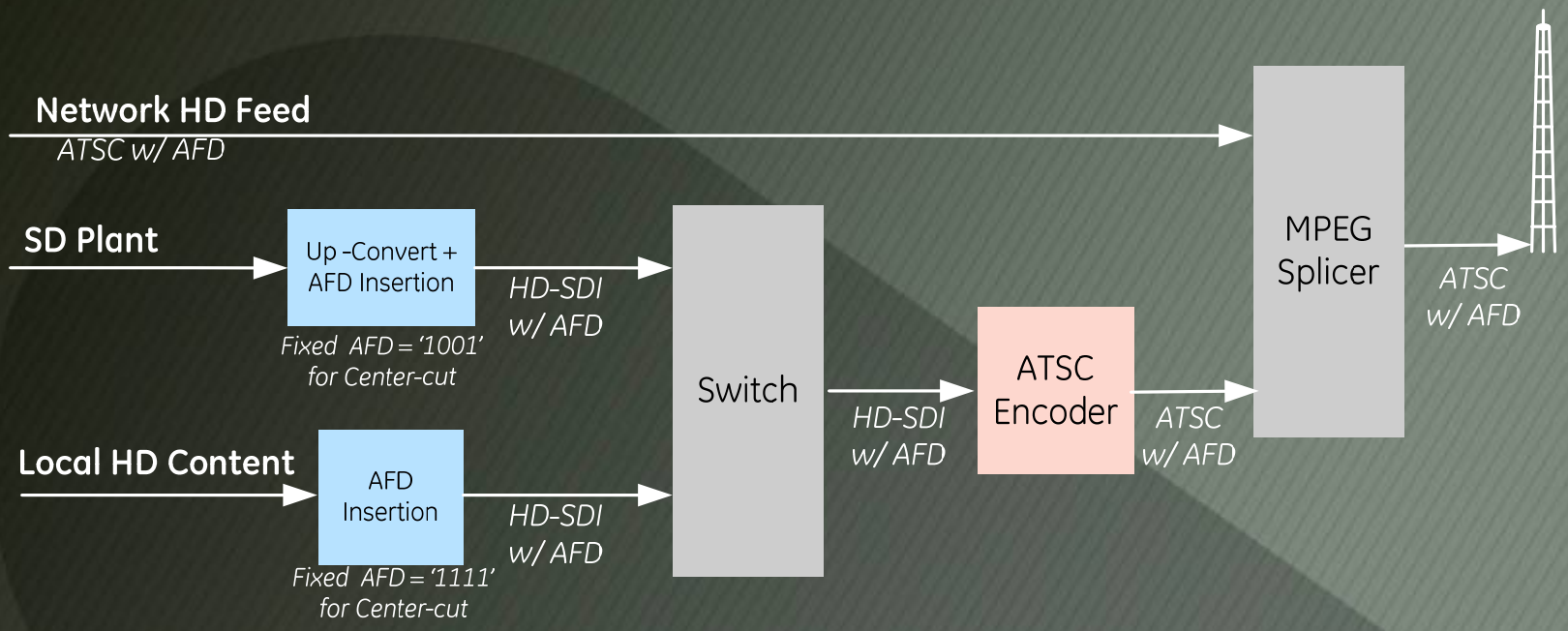
Local Station Distribution Guidelines



- 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

AFD – Today

Local Station Distribution Guidelines



- ATSC Network delivery with AFD
- Insure AFD data on all content – data pass through
- Insure ATSC encoder supports AFD

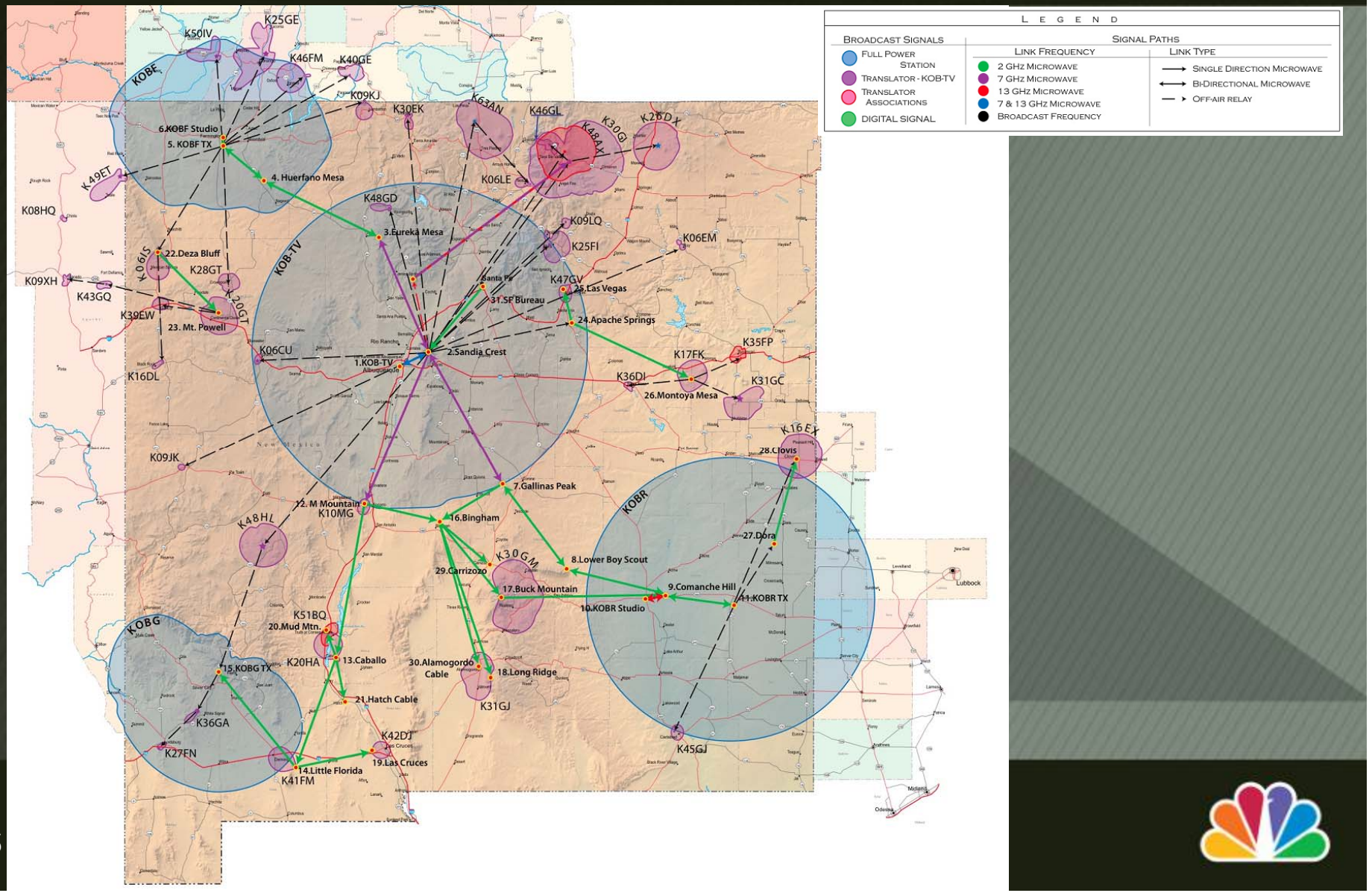
KOB-TV – Albuquerque, NM

On-air AFD Test : Sept 24-25, 2008

- 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

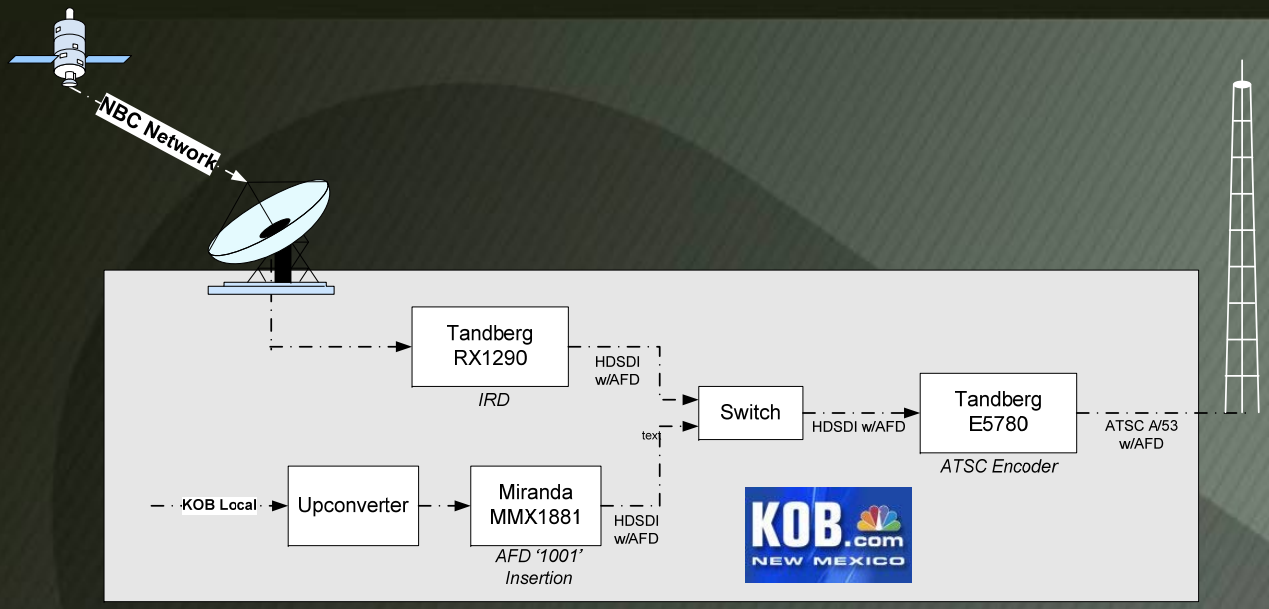
KOB-TV – Albuquerque, New Mexico

Broadcast Network Topology



KOB-TV – AFD Test

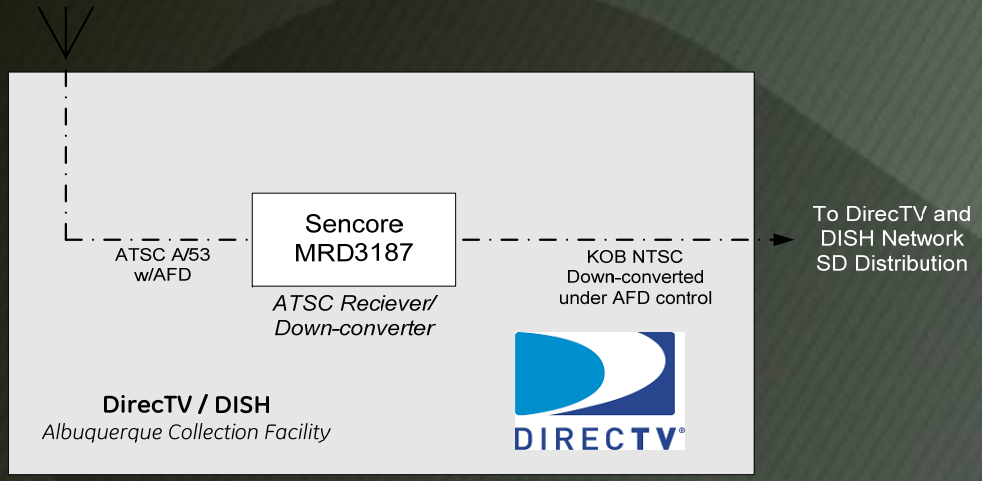
KOB-TV Station



- 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

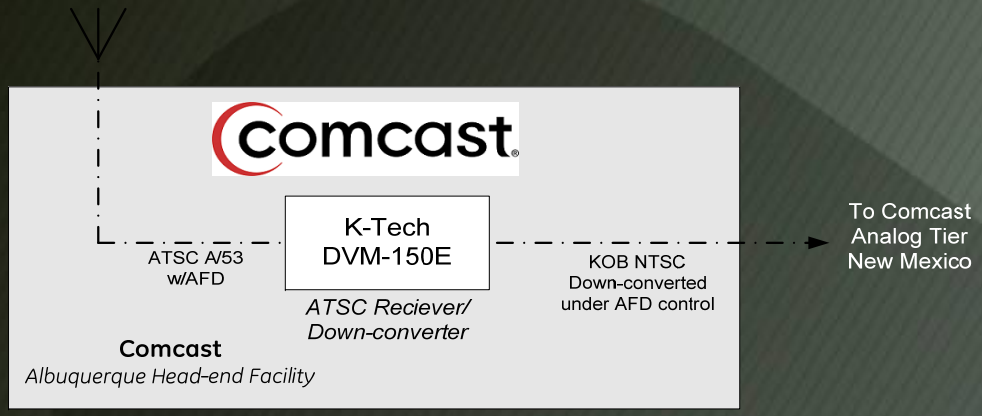


Recorded from DirecTV SD

- 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.

KOB-TV – AFD Test

Comcast

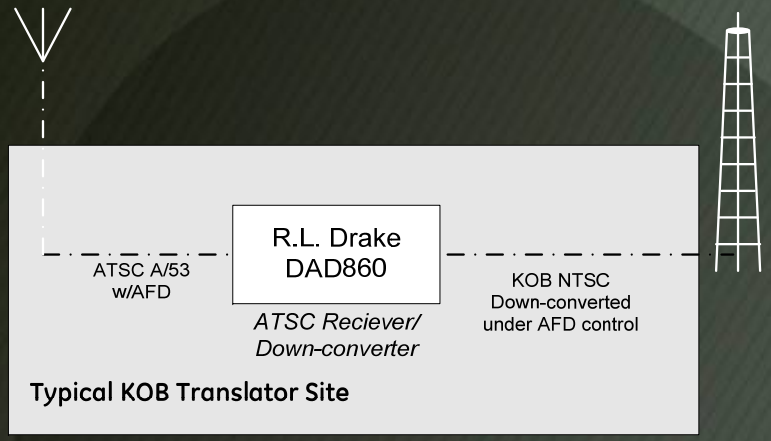


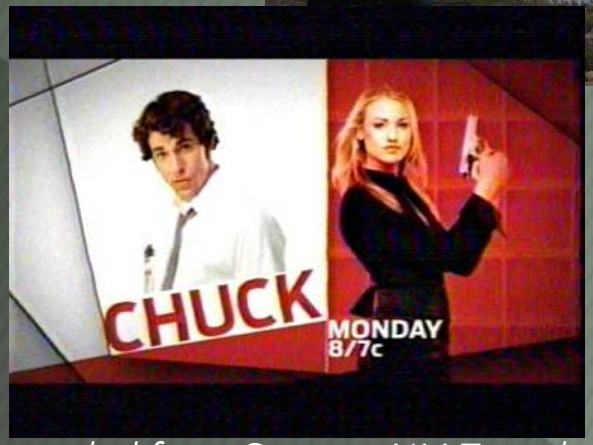
Recorded from Comcast SD

- 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.

KOB-TV – AFD Test

Translators





Recorded from Socorro,NM Translator

- 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

Recorded from Zenith STB

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

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