# METADATA CHALLENGES FOR TODAY'S TV BROADCAST SYSTEMS

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## Introduction

Understanding metadata such as “audio metadata” and “Active Format Description” (AFD) is a challenge until one understands the transport of video, audio and “extra information” in today’s systems. Looking back into how extra information has traditionally been moved in analog NTSC/PAL and 270 Mb/s infrastructures allows one to understand how that “extra information” is carried in 1.5 Gb/s and now 3.0 Gb/s infrastructures. How to find and view metadata using measurement equipment is another challenge as new systems are commissioned. Even if all is ideal and metadata is utilized across the system, there still can be issues.

## Data, Data and more Data

Since all digital signals are considered data, one needs to know how the data is organized. The video and audio portions of the signals are called data essence. For the sake of simplicity, video essence and audio essence will be used in this paper. Metadata is defined as “data about the data” so there is video metadata and audio metadata. Examples are AFD, WSS (Wide-Screen Signaling), VI (Video Index) video metadata and Dolby® E (professional) and Dolby® Digital (AC-3) audio metadata.

What about other forms of data that is extra information? What are they called? These other forms of data are called “data essence.” In defining metadata and data essence, the lines of definition between them may become “blurry.” In the following tables (1, 2 and 3), the various metadata and data essence types are listed. For the sake of simplicity and brevity, only video and audio metadata will be discussed in this paper.

## THE FIRST CHALLENGE: WHAT IS METADATA AND WHERE CAN IT BE FOUND?

## A Historical Perspective — Analog

A historical perspective provides an understanding of how the television video signal has been utilized to carry extra information. For analog, the video signal contains the active picture information and vertical and horizontal blanking intervals (or “blanking”). Blanking intervals carry the vertical and horizontal synchronizing information. The vertical blanking interval contains the vertical synchronizing pulses and “unused” lines of video. The horizontal blanking interval is made up of the front porch, horizontal synchronizing pulse, the breezeway, the color subcarrier “burst” and the back porch.

In earlier analog systems, the opportunity for utilizing the “unused” lines in the vertical blanking interval existed to carry “extra information” in the vertical blanking interval. This situation enabled applications such as closed captioning for the hearing impaired and news/sports/weather/other “teletext” extra visual information. For production applications, time code in the vertical blanking interval enhanced video tape edit decisions. Other applications such as signaling downstream equipment to perform certain tasks were also possible.

As the vertical blanking interval is divided into lines, the data is added line by line — a process that is commonly known as “line selection.” Due to the video signal being interlaced with odd and even lines, as a line is selected, there are the field 1 and field 2 selections. In Figure 1, the blanking intervals for one field of video are shown for NTSC (525) and PAL (625) video signals.

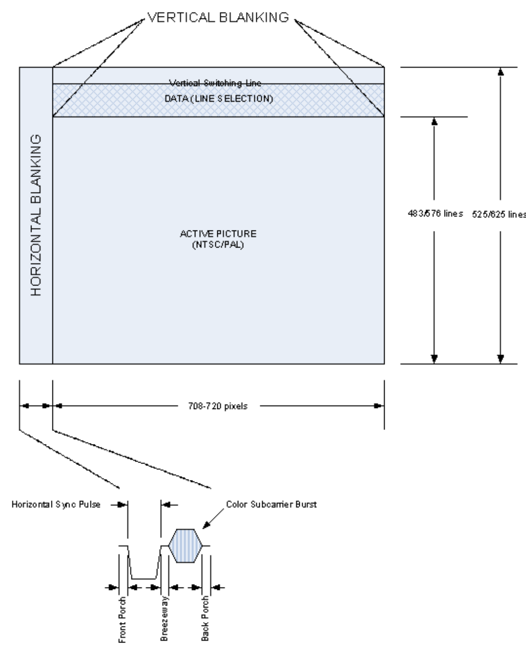


Figure 1

In Table 1, metadata and data essence are shown with locations and the given standard for analog video signals.

| NTSC/PAL VBI Data | 525 NTSC | 625 PAL/SECAM | Notes | Standards |
|---|---|---|---|---|
| Teletext WST Syst. A | NA | Lines 7 to 22 | | ITU-R BT.653-3 |
| Teletext WST Syst. B | NA | Lines 7 to 22 | | ITU-R BT.653-3 |
| Teletext NABTS | Lines 11 to 20 | NA | US-Can. | EIA-516 |
| Teletext WST Syst. D | Lines 11 to 20 | NA | Japan | ITU-R BT.653-3 |
| VITC | Lines 10 to 20 | Lines 6 to 22 | 2 lines | SMPTE 12M |
| VITS | Lines 17 and 18 | Lines | Note 1 | CCIR Rec. 569 |
| VIRS | Line 19/282 | NA | Note 2 | EIA TVSB1 |
| GCR | Lines 19/282 | Line 318 | Note 3 | ITU-R BT.1124-1<br>ATSC A/49 |
| Closed Captions/V-chip/Source ID/TSID | Line 21/284<br>(CEA-608) | In Teletext pages<br>Line 6 to 22 | Note 4: | CEA-608<br>EIA-744 |
| WSS | Line 22/285 | Line 23 | Note 5 | BT.1119-2 |
| 10-field sequence | Line 15/278 | NA | | SMPTE 318M |
| AMOL (Nielsen) | Line 20/283-22/285 | NA | Note 6 | ACN-4031122 & 4031193<br>CEA-2020 |
| Aspect ratio data | Line 20/283 | NA | Note 7 | IEC-61880 |
| PDC<br>(Program Distrib. Contr.) | NA | Line 16 | Note 8 | ETS 300 231<br>ITU-R BT.809 |
| NTSC IP & Trigger Binding | Line 21/284 | NA | Note 12 | SMPTE 361M |

Table 1 (notes can be found at the end of the paper)

## A Historical Perspective — Digital

The move to digital video enabled more data to be added. The “blanking intervals” in analog video signals are analogous to “ancillary data spaces” in digital video signals. There is a vertical ancillary data space (VANC) and horizontal ancillary data space (HANC). Vertical and horizontal synchronizing pulses are now represented by the data word SAV for “start of active video” and EAV for “end of active video.” The amount of “data” increased so that 16 channels of digital audio could be carried, along with the digital video signal, with any other “additional data.” This is known as embedding the audio and data signals into the video signal. By definition, a digital video signal is made of the video essence, the audio essence and any additional data essence or metadata.

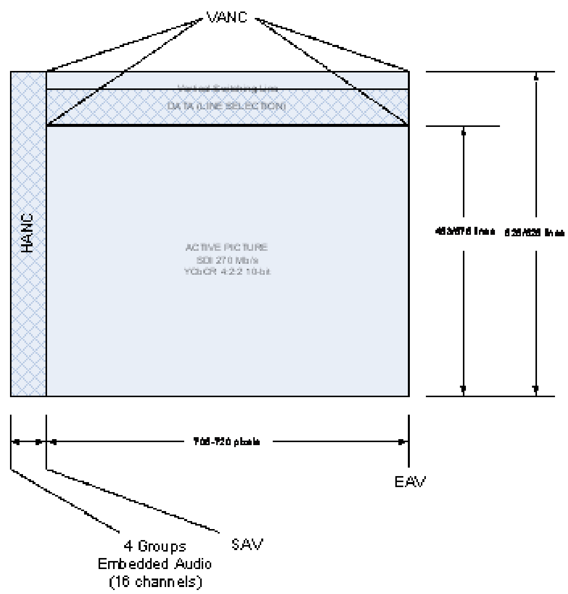


Figure 2

Data Identifiers, (DIDs) and Secondary Data Identifiers (SDIDs) describe the data essence and metadata that are embedded into the digital video signal. The idea of utilizing the VANC as “lines of video” was a simple means of identifying data essence and metadata when digital signals were implemented. The VANC was divided up into “lines,” and any data essence or metadata is line-selected as in analog systems. It is possible to place more than one type of data essence or metadata in one line of video.

In Figure 2, the VANC and HANC are shown for what is known as standard-definition video or referred to as SD-SDI standard definition (480i, 576i) — Serial Digital Interface at a data rate of 270 Mb/s. One frame of VANC and HANC are shown.

In Table 2, metadata and data essence are shown with locations and the given standard for digital 270 Mb/s video signals.

| **SDI VBI Data – 270 Mb/s** | **525** | **625** | | |
|---|---|---|---|---|
| Digital Audio channels | All lines except the line after the switching point | All lines except the line after the switching point | HANC | SMPTE 272M |
| DVITC | Line 14/277<br>Optional line 16/279<br>(Y samples) | Line 19/332<br>Optional line 21/334<br>(Y samples) | In SDI<br>VANC | SMPTE 266M<br>SMPTE 125M |
| Video Index | Line 14/277<br>(Cr, Cb samples) | Line 11/324<br>(Cr, Cb samples) | In SDI<br>VANC | RP-186+<br>SMPTE 125M |
| Ancillary Time Code (ATC) | One VBI line<br>LTC: every frame<br>VITC: every field | One VBI line<br>LTC: every frame<br>VITC: every field | VANC | RP-188<br>SMPTE 12M-2 |
| Closed Captions | Line 21/284 (digitized)<br>And/or<br>One VBI line<br>First field only | Line 22/335 (digitized)<br>And/or<br>One VBI line<br>First field only | SDI-VANC<br>Note 9 | CEA-608<br>CEA-708<br>SMPTE SMPTE 334-1/-2 ETSI TR 101 233 |
| Dolby-E Audio metadata | One VBI line<br>First field only | One VBI line<br>First field only | VANC | SMPTE 2020-1<br>SMPTE 2020-2/-3 |
| VBI Data Services | One VBI line<br>First field only | One VBI line<br>First field only | VANC<br>Note 10 | RP-208/ SMPTE 334-1 |
| DTV Prog. Descrip. | One VBI line<br>First field only | One VBI line<br>First field only | VANC | RP-207/ SMPTE 334-1 |
| AFD and P&S Data | One VBI line<br>Both fields | One VBI line<br>Both fields | VANC | SMPTE 2016-1/-3<br>SMPTE 2016-2/-4 |
| UMID + Prog. ID | One VBI line<br>First field only | One VBI line<br>First field only | VANC | RP 223 |
| ANC Metadata | HANC<br>Multiple VBI lines<br>Both fields | HANC<br>Multiple VBI lines<br>Both fields | HANC<br>VANC | RP-214 |
| ANC Mole | HANC/VANC<br>Both fields | HANC/VANC<br>Both fields | | SMPTE 353 |
| Payload ID | Line 13/276 | Line 9/322 | HANC | SMPTE 352 |
| Film transfer codes | One VBI line<br>First field only | One VBI line<br>First field only | VANC | RP-215 |
| SCTE 104 messages | One VBI line<br>First field only | One VBI line<br>First field only | VANC | RP-2010 |
| DVB/SCTE VBI data | One VBI line | One VBI line | VANC | RP-2031 |
| Equipment and self-checking purposes | NA | Lines 20/333 | VANC | EBU Tech 3267. See Note 11 below. |
| ABC Cue data | NA | One VBI line | VANC | Australia - proprietary |
| ABC Brandnet data | One VBI line | NA | VANC | US - proprietary |
| ARIB Control data | HANC/VANC | | | ARIB STD-B39 |
| CBS Lidia | Line 18 | NA | VANC | CBS document.<br>See Note 13 below. |

Table 2 (notes can be found at the end of the paper)

## A Historical Perspective — Higher Definition

When moving to a higher-definition video signal with a higher data rate and more complexity regarding the “ancillary data spaces”. The video is carried in two streams (A and B). Stream A contains the Y or luminance portion of the signal with its VANC and HANC and the B stream that carries the CbCr or color difference portion with its own VANC and HANC. The two streams (A and B) are multiplexed into the serial data stream as CbYCrY.

Figure 3 depicts the data organization for what is known today as “high-definition” video or referred to as HD-SDI high definition — Serial Digital Interface (720p, 1080i) at a data rate of 1.5 Gb/s. One frame of VANC and HANC are shown.

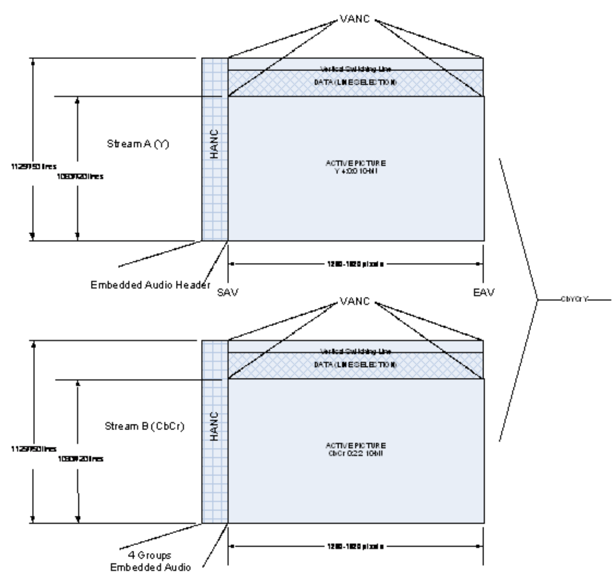


Figure 3: Demultiplexed HD-SDI Showing Stream A (Y) and Stream B (CbCr)

In Table 3, metadata and data essence are shown with locations and the given standard for higher-definition video signals.

| **HD-SDI VBI Data - 1.5 Gb/s** | **720p60** | **720p50** | | |
|---|---|---|---|---|
| Digital Audio channels | All lines except the line after the switching point. Audio data in C-stream. Audio control packet in Y-stream. | All lines except the line after the switching point. Audio data in C-stream. Audio control packet in Y-stream. | HANC | SMPTE 299M |
| Ancillary Time Code (ATC) | One VBI line<br>LTC and VITC<br>Y-stream only | One VBI line<br>LTC and VITC<br>Y-stream only | VANC | RP-188<br>SMPTE 12M-2 |
| Closed Captions | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | HD-SDI VANC<br>Note 9 | CEA-608<br>CEA-708<br>SMPTE SMPTE 334-1/-2<br>ETSI TR 101 233 |
| Dolby-E Audio metadata | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | VANC | SMPTE 2020-1<br>SMPTE 2020-2/-3 |
| VBI Data Services | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | VANC<br>Note 10 | RP-208/ SMPTE 334-1 |
| DTV Prog. Descrip. | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | VANC | RP-207/ SMPTE 334-1 |
| AFD and P&S Data | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | VANC | SMPTE 2016-1/-3<br>SMPTE 2016-2/-4 |
| UMID + Prog. ID | One VBI line | One VBI line | VANC | RP 223 |
| ANC Metadata | HANC<br>Multiple VBI lines | HANC<br>Multiple VBI lines | HANC<br>VANC | RP-214 |
| Payload ID | Line 10<br>Y-stream only | Line 10<br>Y-stream only | HANC | SMPTE 352 |
| Film transfer codes | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | VANC | RP-215 |
| SCTE 104 messages | One VBI line<br>Y-stream only | One VBI line<br>Y-stream only | VANC | RP-2010 |
| DVB/SCTE VBI data | One VBI line | One VBI line | VANC | RP-2031 |
| ABC Cue data | NA | One VBI line | VANC | Australia - proprietary |
| ABC Brandnet data | VBI line 10 | NA | VANC | US - proprietary |
| | | | | |
| **HD-SDI VBI Data - 1.5 Gbps** | **1080i60** | **1080i50** | | |
| Digital Audio channels | All lines except the line after the switching point. Audio data in C-stream. Audio control packet in Y-stream. | All lines except the line after the switching point. Audio data in C-stream. Audio control packet in Y-stream. | HANC | SMPTE 299M |
| Ancillary Time Code (ATC) | One VBI line<br>LTC: every frame<br>VITC: every field<br>Y-stream only | One VBI line<br>LTC: every frame<br>VITC: every field<br>Y-stream only | VANC | RP-188<br>SMPTE 12M-2 |
| Closed Captions | One VBI line<br>First field only<br>Y-stream only | One VBI line<br>First field only<br>Y-stream only | HD-SDI VANC<br>Note 9 | CEA-608<br>CEA-708<br>SMPTE 334M-1<br>ETSI TR 101 233 |
| Dolby-E Audio metadata | One VBI line<br>First field only<br>Y-stream only | One VBI line<br>First field only<br>Y-stream only | VANC | SMPTE 2020-1<br>SMPTE 2020-2/-3 |
| VBI Data Services | One VBI line<br>First field only<br>Y-stream only | One VBI line<br>First field only<br>Y-stream only | VANC<br>Note 10 | RP-208/SMPTE 334M |
| DTV Prog. Descrip. | One VBI line<br>First field only<br>Y-stream only | One VBI line<br>First field only<br>Y-stream only | VANC | RP-207/SMPTE 334M |
| AFD and P&S Data | One VBI line<br>Both fields<br>Y-stream only | One VBI line<br>Both fields<br>Y-stream only | VANC | SMPTE 2016-1/-3<br>SMPTE 2016-2/-4 |
| UMID + Prog. ID | One VBI line<br>First field only<br>Y-stream only | One VBI line<br>First field only<br>Y-stream only | VANC | RP 223 |
| ANC Metadata | HANC<br>Multiple VBI lines<br>Both fields | HANC<br>Multiple VBI lines<br>Both fields | HANC<br>VANC | RP-214 |
| Payload ID | Line 10/572<br>Y-stream only | Line 10/572<br>Y-stream only | HANC | SMPTE 352 |
| Film transfer codes | One VBI line<br>First field only<br>Y-stream only | One VBI line<br>First field only<br>Y-stream only | VANC | RP-215 |
| SCTE 104 messages | One VBI line<br>First field only | One VBI line<br>First field only | VANC | RP-2010 |
| DVB/SCTE VBI data | One VBI line | One VBI line | VANC | RP-2031 |
| ABC Cue data | NA | One VBI line | VANC | Australia - proprietary |
| ARIB Control data | HANC/VANC | | | ARIB STD-B39 |
| CBS Lidia | Line 9 | NA | VANC | CBS document.<br>See Note 13 below. |

Table 3 (notes can be found at the end of the paper)

## The Future – 1080p, 3 Gb/s

Today's systems support analog, digital 270 Mb/s and 1.5 Gb/s with their associated data essence and video and audio metadata. When designing a new system, there is now also 3 Gb/s to contend with and another layer of complexity to be understood. Within the new 3 Gb/s infrastructure, there are different methods of data organization called Level A and Level B. Level A (YCbCr 4:2:2, 10 bit) and Level B (YCbCr 4:2:2, 10 bit) are utilized by broadcasters, and other formats within Level B support formats utilized for production.

Level A follows the same stream format (YCbCr) as 1.5 Gb/s with the exception of supporting 1080p in Figure 4

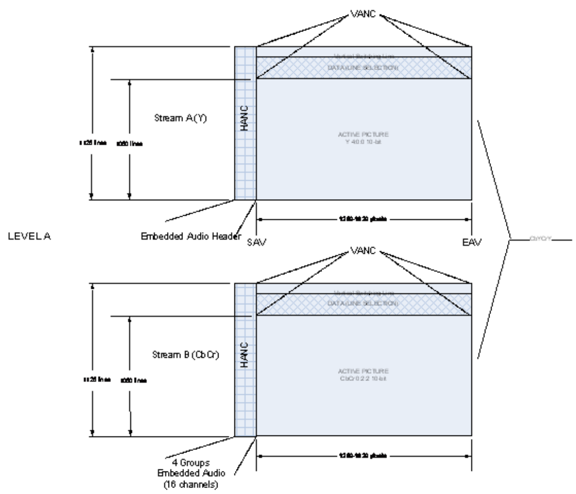


Figure 4: Demultiplexed 3 Gb/s SDI Showing Stream A (Y) and Stream B (CbCr)

In Figure 5, Level B supports "dual link". Dual link can be two 270 Mb/s, two 720p or two 1080i video signals that are the same standard and phase aligned. As well, Level B supports dual-link production formats. This can be utilized for "Left Eye/Right Eye" for 3D TV.

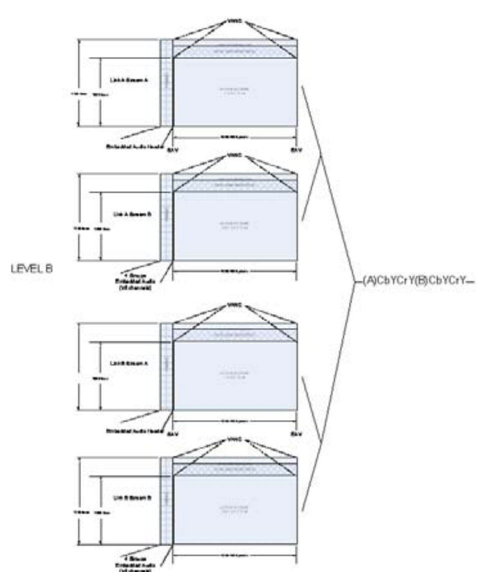


Figure 6: Demultiplexed 3Gb/s SDI Showing Link A and B

In Figure 6, RGB and an associated alpha channel are shown. 16 channels of audio are embedded into Link A, and additional audio channels can be embedded into stream B:

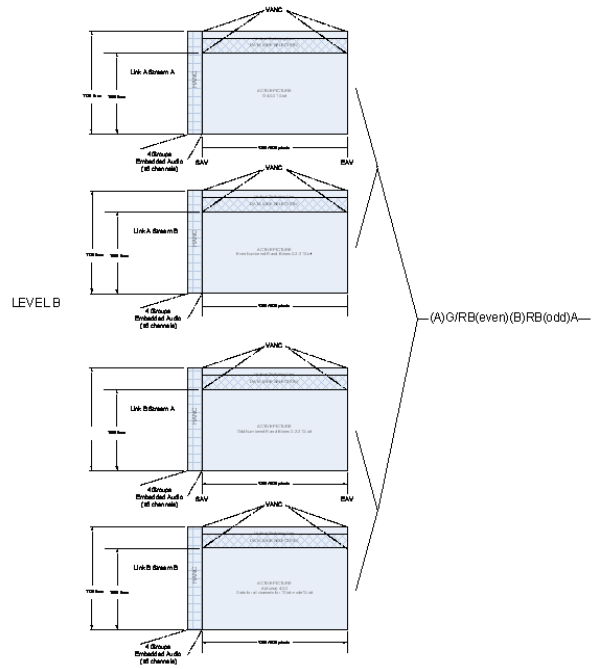


Figure 5

In Table 4, metadata and data essence are shown with locations and the given standard for digital 3 Gb/s video signals.

| **HD-SDI VBI Data - 3 Gb/s – Level B** | **1080p60** | **1080p50** | | |
|---|---|---|---|---|
| Digital Audio channels – First 16 channels: | All lines except the line after the switching point. Audio data and Audio control packet in Link A. | All lines except the line after the switching point. Audio data and Audio control packet in Link A. | HANC | SMPTE 299M |
| Digital Audio channels – Above 16 channels: | All lines except the line after the switching point. Audio data and Audio control packet in Link B. | All lines except the line after the switching point. Audio data and Audio control packet in Link B. | HANC | SMPTE 299M |
| Ancillary Time Code (ATC) | One VBI line<br>LTC and VITC<br>In Data stream 1 first | One VBI line<br>LTC and VITC<br>In Data stream 1 first | VANC | RP-188<br>SMPTE 12M-2 |
| Closed Captions | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | HD-SDI<br>VANC<br>Note 9 | CEA-608<br>CEA-708<br>SMPTE SMPTE 334-1/-2.ETSI TR 101 233 |
| Dolby-E Audio metadata | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | SMPTE 2020-1<br>SMPTE 2020-2/-3 |
| VBI Data Services | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC<br>Note 10 | RP-208/SMPTE 334M |
| DTV Prog. Descrip. | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | RP-207/SMPTE 334M |
| AFD and P&S Data | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | SMPTE 2016-1/-3<br>SMPTE 2016-2/-4 |
| UMID + Prog. ID | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | RP 223 |
| ANC Metadata | HANC<br>Multiple VBI lines<br>In Data stream 1 first | HANC<br>Multiple VBI lines<br>In Data stream 1 first | HANC<br>VANC | RP-214 |
| Payload ID | Line 10<br>Data stream 1 and 2 | Line 10<br>Data stream 1 and 2 | HANC | SMPTE 352<br>SMPTE 425 |
| Film transfer codes | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | RP-215 |
| SCTE 104 messages | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | RP-2010 |
| DVB/SCTE VBI data | One VBI line<br>In Data stream 1 first | One VBI line<br>In Data stream 1 first | VANC | RP-2031 |
| ABC Cue data | NA | One VBI line<br>In Data stream 1 first | VANC | Australia – proprietary |
| ARIB Control data | HANC/VANC<br>In Data stream 1 first | | | ARIB STD-B39 |
| CBS Lidia | Line 9<br>In Data stream 1 first | NA | VANC | CBS document.<br>See Note 13 below. |

Table 4 (notes can be found at the end of the paper)

## The Challenge Continues

Now that we know where the metadata and other data essence are found and which standards they adhere to, the next step is to understand how we see this when we analyze the signal.

For historical reasons, a video line is typically used to describe where metadata may be found. It is important to note that any metadata or data essence should not be embedded into the vertical switching line or in the line after.

The 525, 625, 720 and 1080 formats may use different lines to embed the same metadata when converting between formats, and more than one form of metadata or data essence may be found on a given line  Using video lines to describe where to find the metadata and data essence can be confusing. It is essential to utilize DID/SDID for many types of ancillary data, as some data packets may not be assigned line numbers

The following table shows the DID/SDID for AFD and audio metadata:

| **Services** | **Data Position** | **DID** | **SDID** |
|---|---|---|---|
| Ancillary Data (=291M) | | | |
| Metadata packets | | 2F0h | |
| Dolby-E audio Metadata | Y VANC (the second line after switching line ) | 145h | |
| Active Format Description and Bar Data | Both fields | 141h | 105h |

Table 5

As well, when converting between interlace and progressive formats, metadata may or may not exist on adjacent fields (for interlace) and frames (for progressive). This may cause issues in interfacing equipment.

### What Works Well for Metadata?

Europe rolled out WSS in the distribution channel many years ago to provide information on the aspect ratio, enabling the home receiver to react to the information and optimize the display. This works well and may be applied in other parts of the world looking to roll out a similar means of optimizing displays.

Recently, AFD has been employed further up the chain in the production domain to assist in automatic aspect ratio conversion when up- and down-converting. This also works well, as aspect ratio changes are frame accurate and occur with no disturbances if the equipment was designed to do so. Set-top boxes and TVs using AFD will start shipping in the fall of 2009.

When considering audio metadata, the mechanisms exist today to move audio metadata from production through the entire signal chain and into the home.

### What Doesn't Work so Well for Metadata?

Although AFD reduces the need for human intervention in both the production and playout chains, if there is no metadata, it must be inserted somewhere in the workflow. If all of the content is known, it is simply a matter of an operator identifying the aspect ratio and inserting the correct flag. This cannot be done automatically because there are two things that must be considered. If the image contains black bars either at the top and bottom or on the sides, this could be analyzed; however, there are cases when this will not work. Also, considering how logos are placed when branding a program, the logo may be placed in such a way that should an aspect ratio change take place, it could be cut off or appear to be in the wrong place. An additional layer of operator intervention to examine where a logo is placed and how it will look further downstream is required to get it right all of the time.

Because the FCC did not demand AFD be included in the first round of DTV converter boxes, very few have AFD today; however, several available coupon-eligible DTV converter boxes (USA only) do support AFD. AFD has been part of the ATSC A/53 for many years, but broadcasters have only recently begun to implement it as equipment with AFD capability is now available. The new ATSC A/79 RP covers the use of AFD and other metadata in the conversion process for distribution to NTSC viewers as cable headends. AFD will start to appear in TVs around the fall 2009 selling season; it is now part of the standard, but still not mandatory under the FCC rules.

Regarding audio metadata — even though the mechanism exists to move audio metadata all of the way into the home receiver/amplifier, the design implementation of the home receiver/amplifier may cause issues. Signaling stereo and surround sound switching in the home may result in clicks or pops or noticeable muting of the audio during the switch.

### Example of Metadata in Today's Systems

In Figure 7, a simple signal flow for video and audio is shown. For metadata applications, the idea is to add metadata as early as possible and pass it through the chain, updating it appropriately.

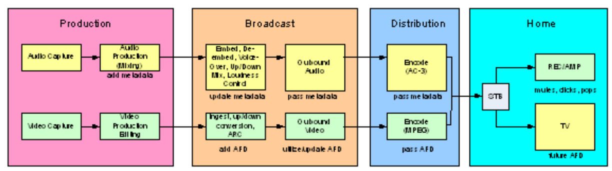

Figure 7

Although today's systems do not yet fully utilize metadata, there are opportunities for simplifying workflow and lessening human intervention in the processing. There are, however, still challenges to achieving an ideal end-to-end implementation with no issues.

### Conclusions

This paper briefly touched on AFD and audio metadata applications in today's systems, but there will be more utilization of metadata in the future. The key to metadata implantation is understanding what it is, how to find it and what it can do to improve workflow. Ensuring that the specified equipment meets the appropriate standards goes a long way toward achieving a successful implementation. Even though "all is good" when a broadcaster hands off the signal into the distribution chain, there may still be issues at the end point in the home today.

###

Thanks to Michel Poulin for his assistance.

Notes for Tables 1-3:

Note 1: VITS Signals include FCC, NTC7, CCIR and UK National Interval Test Signal. They are described in the ITU-T J.63 and EBU R26 documents.

Note 2: VIRS: The Vertical Interval Reference Signal was developed by Philips, Zenith and BTA. It is described in an FCC document (TBD) and in the EIA TVSB1.

Note 3: Ghost Cancelling Reference signal is described in the ITU-R BT 1124-1. It is inserted on one line per field in 525 and one line per frame in 625. It is also described in the ETS 300 732 for 625 systems.

Note 5: WSS (BT.1119) is not used in countries having 525 systems (Japan, U.S., Canada, Mexico).

Note 6: Automated Measurement of Lineups (AMOL) verifies the day and time of telecasts for nationally measured programs on local stations. AMOL includes Nielsen SID information. SCTE indicates the carriage of this data into MPEG TS and provides a reference standard document for the AMOL specifications, ACN-403-1122 and ACN-403-1193.

The CEA-2020 provides some information about the AMOL data. In Section 5.6.2, it is mentioned that "Although lines 20 and 22 of fields one and two are authorized by the FCC for AMOL use, the data can appear in other scan lines due to unintentional shifting caused by tape machines, time base correctors, compression equipment, editing equipment, and the like. For example, although it is specified to expect AMOL on line 20 and/or line 22, it is possible to find these 'signals' shifted up or down one or two lines (or more) and/or shifted to the opposite field location."

Receiving equipment that is designed to pass the AMOL signal, such as compression encoder/decoders, TBCs (time base correctors), etc., is not expected to compensate for shifted AMOL code.

Note 7: IEC-61880 defines aspect ratio information on line 20/283 of NTSC signals. Very limited number of aspect ratio. No correspondence with SMPTE AFDs.

Note 8: Program Delivery Control (PDC) is a data broadcasting system that carries program-related information for exploitation by suitably equipped domestic video recorders. In its simplest application, the program chosen by the viewer will be recorded by such recorders in their entirety, even if the transmission time is different from that published in the program guide (for example, owing to the overrun of a previous program). More advanced applications may, for example, permit recording to be suspended and resumed in synchronism with breaks in program transmission, such as may occur during a feature film in the event of film breakage.

Note 9: This data is located in the active line portion of one line in the VANC. It can be inserted on any line in the area from the second line after the line specified for switching to the last line before active video inclusive.

Note 11: The EBU Tech. 3267 defines only the location of this data. The formatting document is not known at the present time. This may not be in use anymore.

Note 12: NTSC IP & Trigger Binding

Note 13: CBS sends trigger data down SD line 18, which is used for triggering local bugs and other graphics during network programming. CBS calls this system, Lidia, and two manufacturers support Lidia VBI triggering, Harris (Logomotion) and Evertz. (CBS will discontinue Lidia SD in Feb. 2009.)