EBU

OPERATING EUROVISION AND EURORADIO

R 154

PARAMETERS FOR UHD/HDR PROGRAMMES EXCHANGED AS FILES

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Document History

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Main changes since previous version	- References to EBU Tech 3320 and SMPTE ST 2127-10. - Note about HD HDR originated material (special cases). - Audio part split into options A and B from the start. - Extensive information on codec and container formats. - Use of EBU-TT-D / W3C IMSC subtitling (instead of EBU STL). - Easier to read Broadcast Production Audio Template (Annex C). - Extended bibliography. - Glossary of key terms + pointer to online glossary.	

Publication Keywords: UHD, HDR, HLG, ADM, S-ADM, ADM Profile, XAVC, AES3, NGA, MGA.

Intended use and area of application

This document recommends formats and parameters for programmes delivered or exchanged as UHD-files between different partners. The document is intended as a ready-to-use guideline where no other bilateral agreements are in place and can therefore be considered as a basic set of recommendations for UHD-HDR non-live content exchange. These recommendations can also be used as a starting point by broadcasters and production companies just beginning in-house UHD-HDR content production or processing, and who need a simple and concise set of parameters and rules that can be used for tender and/or commissioning purposes.

Please note that this publication's application is for everyday UHD material exchange, the delivery of finalized programmes to the broadcaster as well as ingest, basic post-production and playout from broadcast centres. It is not targeted towards distribution to end users nor is it aimed at high-end UHD movie and feature film production.

The parameters stated in this recommendation may be altered for an individual programme exchange with the permission of the receiving broadcaster(s).

Contents

Parameters for UHD/HDR programmes exchanged as files

Recommendation

The EBU, considering that:

1. Digital television image formats for HDTV and UHDTV have been specified by the ITU-R in Recommendations ITU-R BT.709, ITU-R BT.2020 and ITU-R BT.2100.

2. Modern displays are capable of reproducing images at a higher luminance, greater contrast ratio and wider colour gamut than is conventionally employed in programme production.

3. High dynamic range television (HDR-TV) has been shown to increase viewer enjoyment of television pictures.

4. EBU Tech 3320 specifies minimum performance levels for both HDR and SDR monitors used in television production.

5. Audio signals in files should be accurately and reliably described.

6. EBU R 151 encourages broadcasters to adopt Recommendation ITU-R BS.2076 'Audio Definition Model' (ADM) to describe the metadata of Next Generation Audio (NGA)[1] programmes.

7. S-ADM is specified in Recommendation ITU-R BS.2125.

8. The standardized method to carry S-ADM in the AES3 format along with synchronized audio signals is specified in SMPTE ST 2116:2019 and uses AES3 with SMPTE ST 337 formatting.

9. The standardized method to carry S-ADM in MXF is specified in SMPTE ST 2127-10.

10. The EBU ADM Broadcast Production profile is described in EBU Tech 3392.

And recognising that

11. It strongly encourages innovation in personalised sound experiences (enabled by ADM metadata), providing added value to UHD programmes.

Recommends that,

The formats and parameters listed in **Annex A** shall be used for the file exchange of UHD-TV content.

Annexes B & C are for additional guidance.

[1] SMPTE documents use the term Metadata-Guided Audio (MGA)

Annex A: Parameters for UHD File Exchanges

Note: A glossary for UHDTV is available from the EBU web site at https://tech.ebu.ch/uhdtv/glossary. For convenience, a subset of terms is included on the last page of this document.

Video

Video Parameters

Image Container Shape	16:9
Container Pixel Count	3840 x 2160
Pixel Aspect Ratio	1:1
Frame Frequency	25 Hz, 50 Hz or 60/1.001 Hz
Transfer Function	ITU-R BT.2100 Table 5 (Hybrid Log-Gamma)
Colour Primaries	ITU-R BT.2100 Table 2
Colour Matrices	ITU-R BT.2100 Table 6
Video Format	10-bit 4:2:2 $Y'C'_BC'_R$
Video Range	EBU R 103 Preferred Minimum/Maximum Range

NOTES FOR CLARIFICATION:

- Use of a Standard Dynamic Range (SDR) transfer function is not allowed,
- High Frame Rate (HFR >60 fps) content is NOT recommended at this time for baseline exchange,
- Hybrid Log-Gamma (HLG) is the recommended transfer function in this document,
- resolutions greater than 3840 x 2160 (e.g., “8k”) are not recommended in this document.
- In certain cases, addressing challenging production conditions (low light, difficult camera positions, etc.) means that capturing in HD HDR then upscaling to UHD yields a better image than capturing natively in UHD HDR. For those special cases, it is essential that the format information is signalled adequately so the signal can be processed properly downstream. The use of 1080p must be communicated to receiving broadcasters.

Exposure

Programme productions should follow the exposure guidelines suggested in the signal levels tables of ITU-R BT.2408 when creating video for exchange.

Object	Signal Level %
18% Grey Card[2]	38
Greyscale Chart Max (83% reflectance)	71
Greyscale Chart Max (90% reflectance)	73
HDR Reference White / Diffuse White / Graphics White	75
Light Skin Tone	55 – 65
Medium Skin Tone	45 – 60
Dark Skin Tone	25 – 45
Grass	40 – 55

Video Signalling and Metadata

Video shall have signalling to enable equipment to correctly identify video formats and set their operational mode.

Where appropriate and to assist with signal format and conversion identification, the EBU HLG Colour Bars described in EBU Tech 3373 should be used.

Given the current state of UHD/HDR implementation, where an HD SDR version is required, Report ITU-R BT.2408 '*Guidance for operational practices in HDR television production*' provides guidance on conversion between HDR and SDR.

Graphics elements that have a CICP value indicating that they are *ITU-R BT.2100 Table 5* compliant shall be directly overlaid in the Programme video data stream.

Annex B gives Informative guidance on video as it is used for file exchange.

Audio

Option A: Conventional Channel-based Audio

The finished primary programme mix (in other words: "complete main", "finished composite", "complete mix") shall be delivered as stereo and if suitable for the genre, also in surround (5.1).

Option B: Metadata-Guided Audio (MGA) using ADM metadata

Metadata-Guided Audio (MGA[3]) content should be produced in accordance with one of the following production templates:

- The S-ADM & ADM template for production of Personalized Sound Experience (PSE) content with a focus on accessibility and personalisation use-cases, is described in Annex C as "Broadcast Production Template 1". It consists of a 0+5+0 Music & Effects (M&E) bed, at least one language

[2] The actual signal levels for an 18% grey card may differ significantly where camera painting controls have been applied.

[3] *Metadata Guided Audio (MGA)* is a term introduced by SMPTE, notably in SMPTE ST 2127-1, to describe 'audio essences accompanied by descriptive metadata'. ADM/S-ADM are in this regard specific production formats of *MGA*.
Next Generation Audio (NGA) by contrast is a term rather applied for specific delivery technologies and codecs.

channel, and, if required, an Audio Description channel. Template 1 should be the default template.

- The S-ADM & ADM template for production of immersive audio content is described in Annex C as "Broadcast Production Template 2". It consists of a 4+5+0 M&E bed, at least one language channel and, if required, an Audio Description channel.

To ensure basic compatibility with legacy devices, both templates include a fallback 'Complete Mix' stereo mix.

Note: Details of file-based exchange of this MGA content are given later in this document.

Common Audio Requirements

Audio Parameters

Sampling Rate	48 kHz
Bit Depth	24 bit
Loudness Normalisation	EBU R 128

Synchronisation

To avoid audio "phasing" or even cancellation when multi-channel audio is downmixed, timing differences between correlated audio channels must be no more than 0.2 samples (e.g., the timing between each channel of the six audio tracks of a 5.1 surround sound signal).

Codec and Container Formats

The essence can be packaged and offered in two different Codec and Container Structures:

"XAVC MXF File"

File Structure

The video and audio shall be delivered in an MXF file in accordance with SMTPE RDD 32 (XAVC MXF OP1A file), where the "Class 300" Operating Point of the "XAVC 4K Intra" Profile is used (with "CBG" preferred over "VBR").

Indicative video bit rates for XAVC 4K Intra Class 300	
2160p/25	250 Mbit/s
2160p/50	500 Mbit/s
2160p/(60/1.001)	600 Mbit/s
Audio	
Format	PCM uncompressed
Track content	Each MXF Sound Track shall contain exactly 1 channel

(Another commercial technology, AVCUltra, is based on the H.265 compression format.)

Audio Carriage

If Option A "Conventional Channel-based Audio" is adopted:

- The MXF file shall contain at least eight channels of audio, with the stereo and surround (5.1) content arranged in accordance with EBU R 123:8a as one of the common patterns.

If Option B "Metadata-Guided Audio (MGA) using ADM metadata" is adopted, one of the following solutions should be used:

- All 16 channels in the production template (Annex C) are mapped directly to audio channels in the MXF file, where S-ADM metadata is carried in an audio channel in accordance with SMPTE ST 2116.
- The channels in the production template (Annex C) that contain audio content (13 or 15 channels) are mapped to audio channels in the MXF file, with either:
  - S-ADM metadata carried in the MXF file in accordance with SMPTE ST 2127-10
  - ADM metadata carried in the MXF file in accordance with SMPTE ST 2131 (also see Bibliography Section)

Note: As an additional option, the use of a BW64 PCM+ADM sidecar file (Recommendation ITU-R BS.2088) for MGA content might be useful during the production and post-production processes. Efforts to integrate this approach within the production workflow are being considered.

"Interoperable Master Format (IMF)"

Overview

Where multiple versions of a programme are required, the SMPTE Interoperable Master Format (IMF) is becoming a viable and more flexible alternative to multiple XAVC MXF file deliverables.

Standardised in SMPTE ST 2067 (https://www.smpte.org/standards/st2067), IMF is an object-based format for the delivery and storage of finished audio video masters. At its simplest, it contains audio and video tracks in MXF files and an XML document (Composition Playlist (CPL)) which describes how to play the video and audio together. The CPL is the key to how IMF works and can be used to play back any combination of media and metadata in any order.

IMF allows the reuse of media in multiple versions of a piece of content which simplifies the storage and distribution of that content; as such it is ideally suited to applications like localisation where many derivative versions of a piece of content are created, stored and distributed. IMF supports different codecs through the use of 'Applications'. For example:

- Application #2e (SMPTE ST 2067-21) defines the use of JPEG 2000
- Application #5 (ACES) (SMPTE ST 2067-50) defines the use of ACES for archiving
- Application #6 (AVC) (SMPTE ST 2067-60) defines the use of AVC (H.264)
- Application DPP (ProRes) (SMPTE RDD 59-1) defines the use of Apple ProRes.

An application #6 IMF Composition could be created from an XAVC MXF file (as described above) without needing to transcode the video or audio essence, providing a possible migration path to IMF for users of XAVC MXF files.

For a practical implementation, see footnote[4].

[4] The BBC has adopted IMF using the Application DPP (ProRes) for the delivery of all post-produced UHD television content, and all content supplied since 2020 has been supplied using this format. The BBC delivery specification document is available here: https://www.bbc.co.uk/delivery/technical-requirements#uhdimf.

Audio Carriage

If Option A "Conventional Channel-based Audio" is adopted:

- There shall be an Audio Virtual Track for each of the stereo and surround (5.1) mixes (audio content is carried in IMF Audio Track Files with standard Multichannel Audio Labelling)

If Option B "Metadata-Guided Audio (MGA) using ADM metadata" is adopted:

- One of the IMF Plug-ins for S-ADM (SMPTE ST 2067-203) and ADM (SMTPE ST 2067-204) should be used (also see Bibliography Section)

Access Services

Subtitles

Subtitle carriage is not mandatory. Where required, subtitles shall be supplied according to EBU-TT (EBU Tech 3380), ensuring conformance with the IMSC Text Profile. Metadata may be included, for example, as specified in EBU-TT Part M, Metadata Definitions (EBU Tech 3390).

When using IMF, the W3C IMSC Text Profile shall be used. At this time there is no known requirement that the WCG/HDR colour space is fully used in subtitles; rather, SDR (e.g., RGB) colour space is fine, as long as the RGB colours are correctly mapped to the appropriate pixel colour values at display time. Colours used in Timed Text are defined in sRGB. It should be taken into account that 100% luminance RGB must not appear as 100% luminance in HLG but rather should be aligned to "Graphics White".

Signing

Signing carriage is not mandatory. Where required, the signing shall be delivered as a timecode synchronous separate UHD video file with a monochromatic background to allow overlay.

Annex B: UHD-HDR Video for file exchange (informative)

This Annex is a brief introduction to the requirements for non-live television programme production. For a full discussion on the production of UHD HDR video, ITU-R BT.2390-8 or later may be referenced.

Conversion of non-compliant video for use in Programmes

Video elements in accordance with ITU-R BT.709 or ITU-R BT.2020 can either be directly mapped such that their peak white value is mapped to HDR Reference White (75%) or they can be up-mapped with a highlight expansion which does not significantly affect skin tones.

Video elements in accordance with ITU-R BT.2100 Table 4 (Perceptual Quantization) can be converted in accordance with Reports ITU-R BT.2408 and ITU-R BT.2446

Conversion of graphics for use in Programme

Graphics elements in accordance with ITU-R BT.709 or sRGB can be directly mapped such that their peak white value is mapped to HDR Reference White (75%) in the Programme video data stream.

Exposure Guidelines Note

Exposure guidelines are taken from ITU-R BT.2408 and are important to ensure high quality conversion to standard dynamic range video with static down-mapping. Exposure guidelines may be revised when dynamic down-mapping equipment and HDR production monitors become prevalent.

Annex C: MGA Broadcast Production Audio Templates (informative)

Background notes on the use of MGA and NGA.

Metadata Guided Audio comes along with a fundamental paradigm shift in audio production: Instead of delivering one or multiple "baked" mixes in a production, all elements (IT/ME, Dialogue, AD, etc.) comprising this mix are provided as elements (beds/stems) along with the generated metadata (from the mixing console or DAW as ADM/S-ADM) so that a renderer can generate the desired output formats (2.0, 5.1, 4+5+0, binaural etc.).

This rendering process may take place at the broadcaster (host) before feeding this mix into different distribution channels, or – ideally, when NGA can be provided throughout the chain – on end user devices (TV sets, smartphones, browsers). Only there it unfolds the full potential of the technology, by enabling adaptive playout according to different listening situations (on the go, in the living room), playback set-ups (scalable loudspeaker set-ups, headphones) and even individual preferences and needs (languages, hearing capabilities or visual impairments) through interactive control options.

It has been agreed in several standardization bodies such as DVB and ATSC, that in UHDTV not only the picture will be enhanced, but also audio is to be delivered in a new way, to generate an encompassing media experience. Therefore, NGA solutions have been recommended as the new audio standards for UHDTV. As a consequence, some audio production constraints are to be defined anew applying MGA.

It is possible to accommodate familiar track allocations in the 16 audio channels (the minimum standard for option B audio for UHDTV, reflecting the channel-based audio production paradigm). With the introduction of object-based audio, scene-based audio ("Ambisonics") and hybrid solutions for "Next-Generation Audio" systems, the number of potentially different track allocations becomes very high indeed. This is addressed in the Audio Definition Model (ADM) and its derivative S-ADM (Serial-ADM).

The first step towards practical use cases for the ADM is to facilitate dialogue enhancement. This is generally achieved by keeping speech (for example, commentary or narration) separate from M&E for all content versions, not just when international clean audio is required. It is recommended to use at least a 5-channel surround M&E bed for UHD-TV.

The Audio Definition Model (ADM) is intentionally very generic, to support a wide variety of different application areas. The EBU "ADM broadcast production profile", specified in EBU Tech 3392, constrains the ADM to simplify implementations and to prevent interoperability problems in the production of Next Generation Audio broadcast programmes.

Figures C1 & C3 show the two specific configurations recommended in the context of this document, which can be accommodated in Level 1 of EBU Tech 3392.

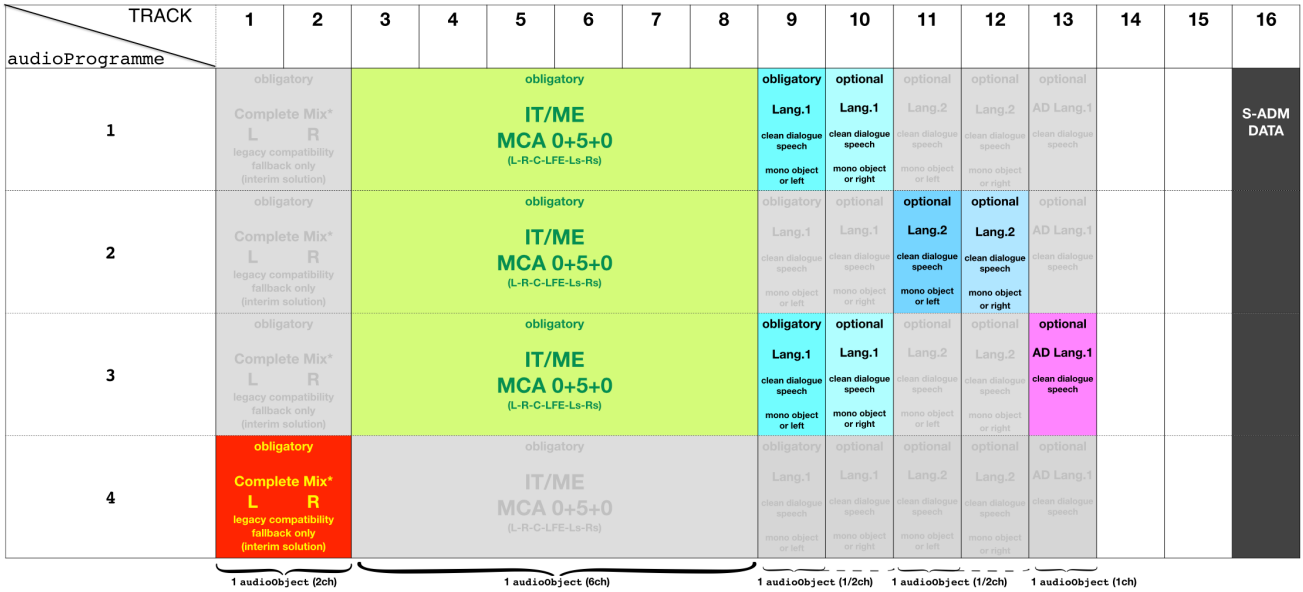
Note: these templates, based on EBU Tech 3392, are illustrative and reflect typical and simple standard use cases in broadcasting. They may can be adapted to production needs and deployment scenarios - or others can be created.

Broadcast Production Template 1: 0+5+0 (aka 5.1) for two languages and one audio description

Based upon EBU Tech 3392 ADM Broadcast Production Profile Level 1:

- 4 audioProgrammes (presentations)
- 5 audioObjects
- 13 trackCount

Note: The amount and understanding of `audioProgrammes` depends on the options actually used



*Ideally created through 2.0 rendering from ADM-Mix. Alternatively, from legacy 2.0 manual mixing

Figure C1: Tracks allocation according to Template 1

Although there are only 11 channels used in Template 1 (ignoring the 2.0 fallback #4), the ADM description with three `audioProgrammes`) can create up to nine different mixes that could be relayed into current channel-based distribution options:

Three formats each with two languages plus one AD:

- 2.0
- 5.1
- binaural

In the purely channel-based world, this would add up to a total of 30 channels, and still would not have the capability of feeding an NGA distribution system to provide personalization and interactivity via SDI.

The graph of the ADM provides a similarly clear and comprehensive view of its structure.

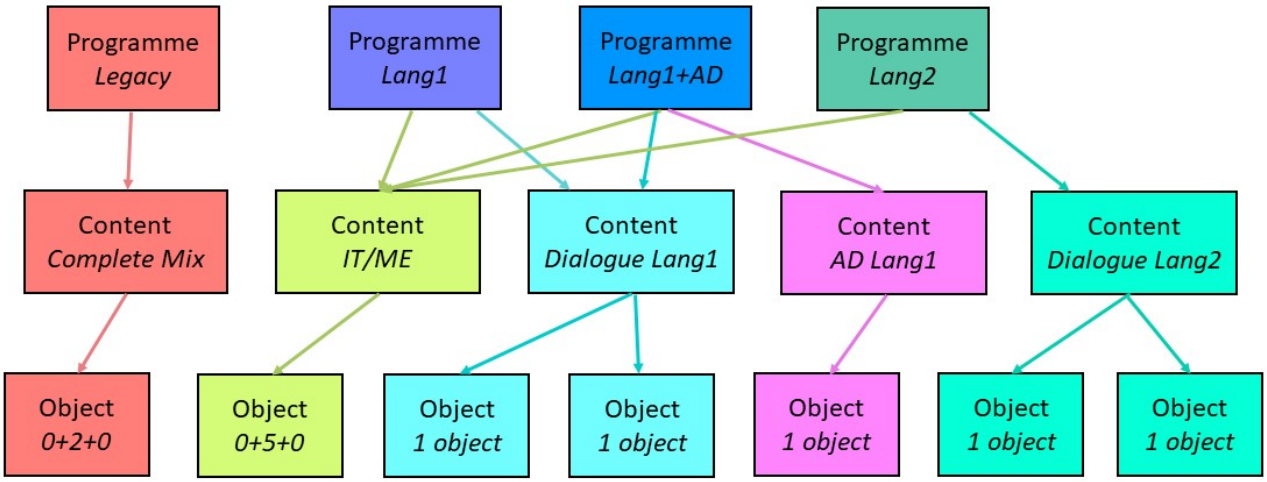


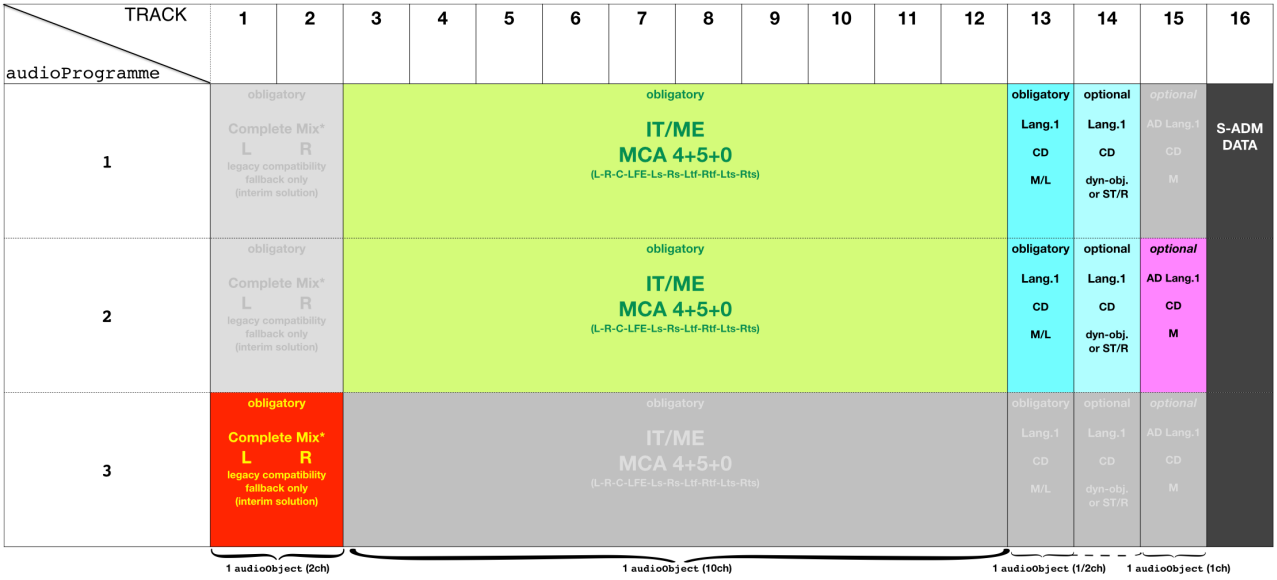
Figure C2: ADM for Template 1

Broadcast Production Template 2: 4+5+0 for one language plus audio description

Based upon EBU Tech 3392 ADM Broadcast Production Profile Level 1:

- 3 audioProgrammes (presentations)
- 4 audioObjects
- 15 trackCount

Note: The amount and understanding of `audioProgrammes` *depends on the options actually used.*



*Ideally created through 2.0 rendering from ADM-Mix. Alternatively, from legacy 2.0 manual mixing

Figure C3: Tracks allocation according to Template 2

The graph of the AXML provide a similar clear and comprehensive view of its structure.

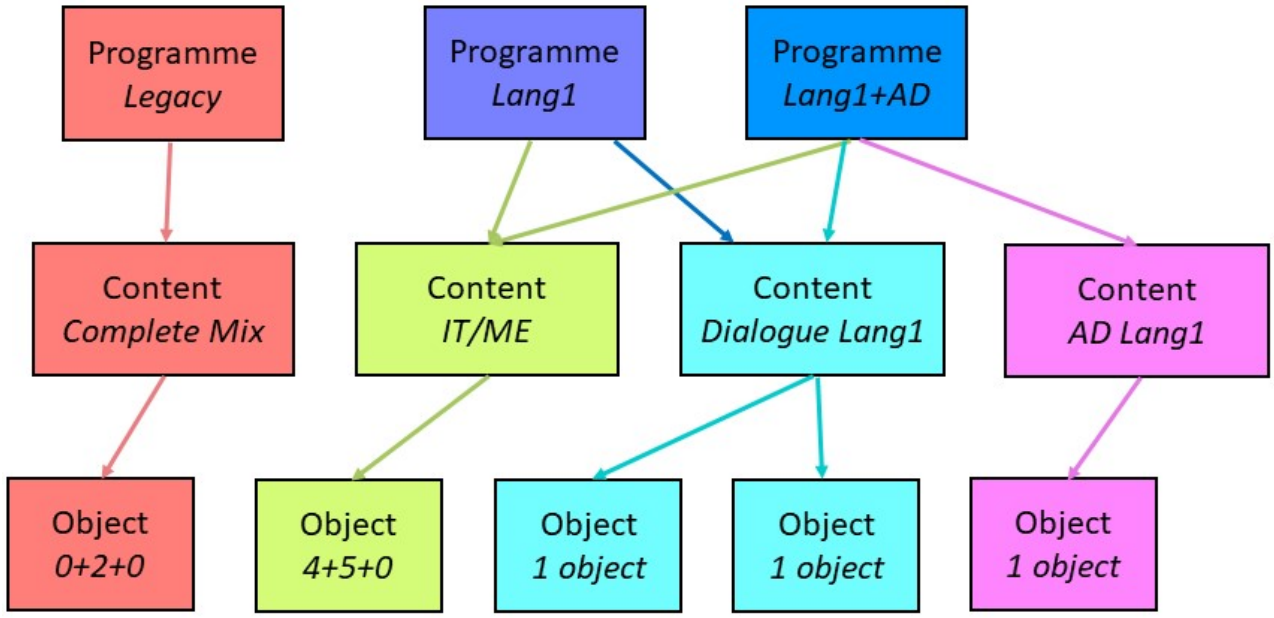


Figure C4: AXML graph for Template 2

For consistency within the production and distribution chain and to ensure compatibility and interoperability between ADM and NGA solutions, ITU Working Party 6B/Rapporteur Group 13 is currently working on a specific ITU-R BS Recommendation establishing an *Advanced Sound System emission ADM and S-ADM profile*. Results are to be expected in the near future.

As a first practical implementation, EBU and BBC R&D have recently published *EAT - EBU ADM Toolbox*, a framework that enables multiple processes to manipulate and convert between different flavours and formats of ADM.

The resources are available at Github:

https://github.com/ebu/ebu-adm-toolbox

Bibliography

EBU R 103	Video Signal Tolerance in Digital Television Systems	https://tech.ebu.ch/publications/r103
EBU R 123	EBU Audio Track Allocation for File Exchange	https://tech.ebu.ch/publications/r123
EBU R 128	Loudness Normalisation and Permitted Maximum Level of Audio Signals	https://tech.ebu.ch/publications/r128
EBU R 151	Recommended Strategy for Adoption of Next-Generation Audio (NGA) Technology	https://tech.ebu.ch/publications/r151
EBU Tech 3285	A format for audio data files in broadcasting	https://tech.ebu.ch/publications/tech3285
EBU Tech 3285-s7	A format for audio data files in broadcasting (Supplement 7 <chna> chunk)	https://tech.ebu.ch/publications/tech3285s7
EBU Tech 3320	User requirements for Video Monitors in Television Production	https://tech.ebu.ch/publications/tech3320
EBU Tech 3364	Audio Definition Model	https://tech.ebu.ch/publications/tech3364
EBU Tech 3372	UHD / HDR service parameters	https://tech.ebu.ch/publications/tech3372
EBU Tech 3373	Colour Bars for use in the Production of Hybrid-Log Gamma (HDR) UHDTV	https://tech.ebu.ch/publications/tech3373
EBU Tech 3380	EBU-TT-D Subtitling Distribution Format	https://tech.ebu.ch/publications/tech3380
EBU Tech 3388	ADM Renderer for use in next generation audio broadcasting	https://tech.ebu.ch/publications/tech3388
EBU Tech 3390	EBU-TT part M, Metadata Definitions	https://tech.ebu.ch/publications/tech3390
EBU Tech 3392	ADM Broadcast Production Profile	https://tech.ebu.ch/publications/tech3392
EBU TR 042	Example of an End-to-End OBA Broadcast Architecture and Workflow	https://tech.ebu.ch/publications/tr042
EBU TR 045	Why broadcasters need an open, codec-independent workflow for NGA production deployment	https://tech.ebu.ch/publications/tr045
ITU-R BS.2088	Long-form file format for the international exchange of audio programme materials with metadata	https://www.itu.int/rec/R-REC-BS.2088/en
ITU-R BS.2094	Common definitions for the Audio Definition Model	https://www.itu.int/rec/R-REC-BS.2094/en
ITU-R BS.2125	A serial representation of the Audio Definition Model	https://www.itu.int/rec/R-REC-BS.2125/en
ITU-R BS.2127	Audio Definition Model renderer for advanced sound systems	https://www.itu.int/rec/R-REC-BS.2127/en
ITU-R BT.709	Parameter values for the HDTV standards for production and international programme exchange	https://www.itu.int/rec/R-REC-BT.709
ITU-R BT.2100	Image parameter values for high dynamic range television for use in production and international programme exchange	https://www.itu.int/rec/R-REC-BT.2100
ITU-R BT.2390	High dynamic range television for production and international programme exchange	https://www.itu.int/pub/R-REP-BT.2390
ITU-R BT.2408	Guidance for operational practices in HDR television production	https://www.itu.int/pub/R-REP-BT.2408
ITU-R BT.2446	Methods for conversion of high dynamic range content to standard dynamic range content and vice-versa	https://www.itu.int/pub/R-REP-BT.2446
ITU-T H.273	Coding-independent code points for video signal type identification	https://www.itu.int/rec/T-REC-H.273
SMPTE OV 2067-0	Overview Document - Interoperable Master Format	https://ieeexplore.ieee.org/document/9521128
SMPTE RDD 32	XAVC MXF Mapping and Operating Points	https://ieeexplore.ieee.org/document/8058105
SMPTE RDD 59-1	Interoperable Master Format — Application DPP (ProRes)	https://ieeexplore.ieee.org/document/9999622
SMPTE Registry	Video Payload ID Codes for Serial Digital Interfaces (SMPTE ST 352)	https://smpte-ra.org/video-payload-id-codes-serial-digital-interfaces
SMPTE ST 2067-21	Interoperable Master Format — Application #2E	https://ieeexplore.ieee.org/document/10064378
SMPTE ST 2067-50	Interoperable Master Format — Application #5 ACES	https://ieeexplore.ieee.org/document/8320049

SMPTE ST 2067-60	Interoperable Master Format — Application #6 UHDTV Program Workflow (AVC)	https://ieeexplore.ieee.org/document/10064375
SMPTE ST 2067-203	Interoperable Master Format — Audio with Frame-based S-ADM Metadata Plug-in	Committee Draft completed; publication expected in 2023.
SMTPE ST 2067-204	Interoperable Master Format — Audio with ADM Metadata Plug-in	Public Committee Draft expected in 2023 for public review. https://www.smpte.org/public-committee-drafts
SMPTE ST 2116	Format for Non-PCM Audio and Data in AES3 — Carriage of Metadata of Serial ADM (Audio Definition Model)	https://ieeexplore.ieee.org/document/8984678
SMPTE ST 2127-1	Mapping Metadata-Guided Audio (MGA) signals into the MXF Constrained Generic Container	https://doi.org/10.5594/SMPTE.ST2127-1.2022
SMPTE ST 2127-10	Mapping Metadata-Guided Audio (MGA) signals with S-ADM Metadata into the MXF Constrained Generic Container	https://doi.org/10.5594/SMPTE.ST2127-10.2022
SMPTE ST 2131	Mapping Audio Definition Model (ADM) and other audio metadata RIFF Chunks to MXF	Public Committee Draft available at https://github.com/smpte/st2131 Review ending no earlier than September 10th, 2023, and no later than March 10th, 2024.
W3C IMSC	TTML Profiles for Internet Media Subtitles and Captions	https://www.w3.org/TR/ttml-imsc/rec

Glossary

ADM Audio Definition Model. A metadata scheme defined in ITU-R BS.2076 for file based (ADM) and ITU-R BS. 2125 for serial (S-ADM) description of audio essences and their relationships.

HDR High Dynamic Range. Describes the ability of a television system to produce, transmit and display a higher contrast range and in particular a higher peak luminance. As a result, more details can be displayed in dark and bright areas of the picture.

HFR High Frame Rate. Term for a frame rate of more than 50 or 60 progressive frames/second (50/60 Hz). With the development of UHD two high frame rates were specified: 100 Hz (for 50 Hz countries) and 120 Hz (for 60 Hz countries). In the cinema sector, 48 Hz is already considered to be HFR.

HLG Hybrid Log-Gamma. HDR camera characteristic (Opto-Electrical Transfer Function OETF) developed by the BBC and NHK. HLG is specified in ITU-R BT.2100 and ARIB STD-B67 (ARIB is a Japanese standards body). The goal in the development of HLG was backward compatibility with SDR (full backwards compatibility requires the same colour space to be used).

MGA Metadata Guided Audio. Term to describe audio essences accompanied by descriptive metadata'. Rather applied for production. E.g., ADM/S-ADM.

NGA Next Generation Audio. Generic term applied for specific delivery technologies and codecs that may transport different audio technologies like Object-Based Audio (OBA), Scene-Based Audio (Ambisonics) and Channel-Based Audio, also in hybrid configurations. Current commercial solutions on the market are MPEG-H and AC-4.

OBA Object-Based Audio. Generic term applied for audio including at least one or multiple 'audio objects', defined and controlled by metadata and potentially interactive.

SDI Serial Digital Interface. A set of digital interfaces specified by the SMPTE for the transport of video signals over coaxial or optical cables.

SDR Standard Dynamic Range. The camera characteristic (OETF) for SDR is defined in ITU-R BT.709 and in ITU-R BT.2020, the corresponding monitor characteristic (EOTF) is specified in ITU-R BT.1886.