Dolby

TDF and Dolby trial personalised Dolby AC-4 audio for France UHDTV

TDF is now broadcasting UHD DTT to trial how Dolby AC-4 personalised sound could be offered on future broadcast services in France. The personalised audio is transmitted as a single stream that is processed in the TV to offer viewers a choice of audio presentations. The trial is evaluating how sound and services are rendered on deployed TVs in real-life conditions. Personalised audio is expected to offer a real step forward for the modernisation of the DTT platform in France, maximising viewer engagement.

The project

TDF and Dolby have worked together since the early days of UHD. "We started broadcasting UHD signals when we installed our broadcasting platform on the Eiffel Tower. In 2014, the first AC-4 standards had already been specified, so we needed to figure out how to use Dolby AC-4 signals to improve the UHD signals broadcast from the Eiffel Tower," explains Jean-François Travers, AV expert at TDF. "At the same time, Dolby worked with OEMs to develop Dolby AC-4's core encoder, which they supplied us to install on our platform and start broadcasting in 2015." This collaboration continued, with Dolby loaning TDF equipment for subsequent experiments.

The final project consisted of broadcasting four programmes with an AC-4 audio component from three channels on TDF's platform – Test UHD 1 (channel 81), Test UHD 2 (channel 82) and Test UHD 3 (channel 83). Each programme had different features representing typical DTT signals expected to be broadcast when UHD officially launches, with different audio service configurations and sequencing. This pilot aims to test AC-4 playback, and switching between different configurations and language options, in real-world conditions.

The programmes broadcasted are:

- Trailer for The Explorers documentary on Honduras in UHD HDR10 with AC-4 stereo audio

- INA (French National Audiovisual Institute) documentary on Paris in UHD HDR10 with AC-4 stereo audio

- Film presentation on the town of Dinard, in UHD HDR10 with AC-4 audio in Dolby Atmos , with choice of languages (French or English)

- The film Aphorism in 1080p HDR10 with AC-4 audio in Dolby Atmos, with a choice of two languages (French or German)

The AC-4 stream delivers each audio element separately

"Technically speaking, the signals we broadcast today have a similar syntax to the future standard signals," says Travers. "So the goal is to introduce AC-4 to the DTT ecosystem, making sure receivers comply with the 2019 specifications from the Forum Audiovisuel Numérique (Digital Audiovisual Forum) for DTT modernisation."

Implementing personalisation

Dolby AC-4 is an audio codec compression format offering new features and a more efficient bitrate than its predecessors. An AC-4 stream can have many sub-elements, carrying different types of sound objects. "One of the
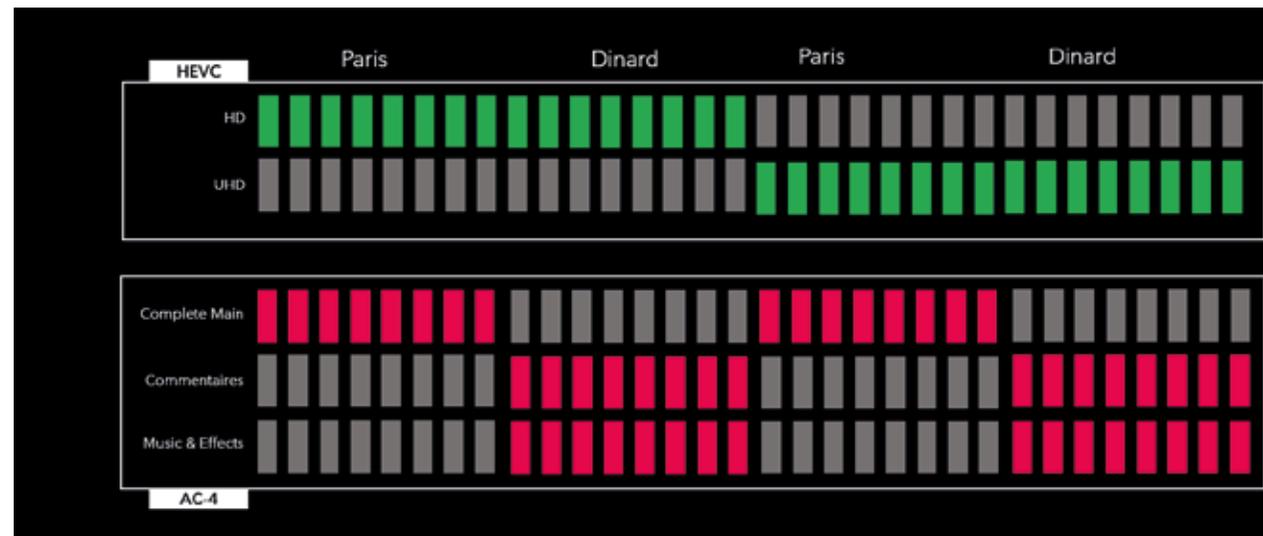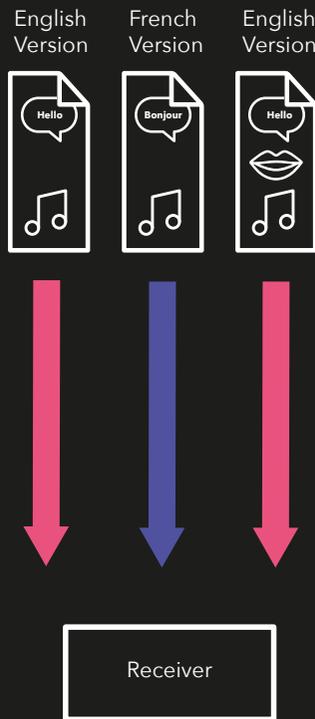
configurations that was used on Dinard and Aphorism is a substream that we call M&E (Music and Effects), which effectively contains all the background sound - the music and sound effects together. This could be in stereo, in 5.1 or in Dolby Atmos. At the same time, each language has its own substream: commentary in French, English, etc. Each audio track is independent, unlike today where everything is mixed together," explains Anaïs Libolt, Broadcast & Entertainment Manager at Dolby France.
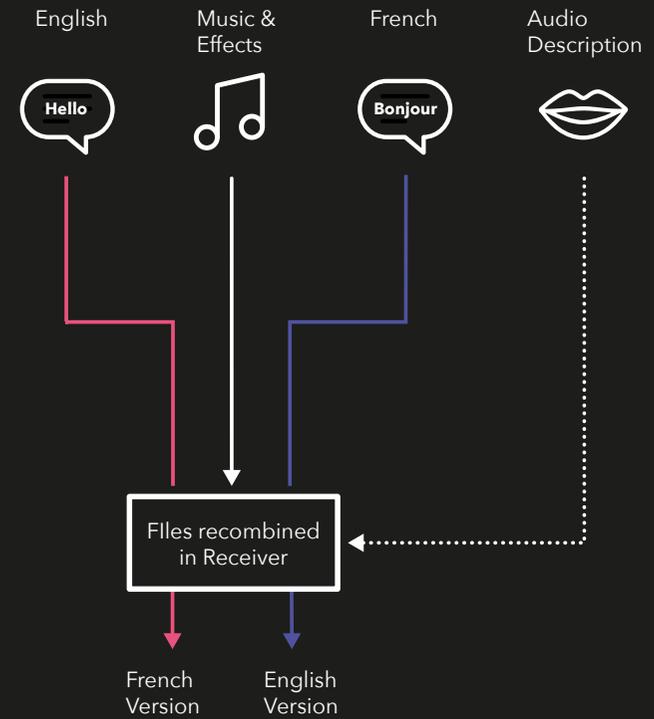
The goal is to massively improve bandwidth efficiency. For example, music and sound effects are only present once in the stream, instead of being delivered multiple times with all of the languages.

Dolby Audio

Current delivery

English Version	French Version	English Version
Hello	Bonjour	Hello

Receiver

One audio stream is required per version. The audio description version is usually experienced in stereo. Each version requires on full delivery file creating duplicate deliveries of individual elements.

AC-4 stream

English	Music & Effects	French	Audio Description
Hello		Bonjour	

FIles recombined in Receiver

French Version   English Version

The AC-4 stream delivers each audio element separately to the receiver.

The receiver then composes the version selected by the viewer.

Viewers in need of audio description can benefit from an immersive experience in Dolby Atmos. With each element delivered once and separately, the new AC-4 codec saves bandwith and open up to many possibilities.

A "presentation" is a recipe that defines how audio elements are combined in the receiver to make a final version. For example, the French commentary might be combined with the M&E to make the French language version.

This enables significantly flexibility in the audio experiences that may be offered to the viewer, while ensuring ease of use by viewers and maintaining control for content makers. Details of each presentation are carried in the AC-4 audio stream, and the available presentations are signalled in the DVB transport stream so that they may be easily presented and selected via the TV user interface.

In the Dolby AC-4 stream structure, all of the presentations available for a given programme are listed in the table of contents (TOC) included in each stream control frame. Each presentation, identified as presentation_id, is connected to multiple substreams.
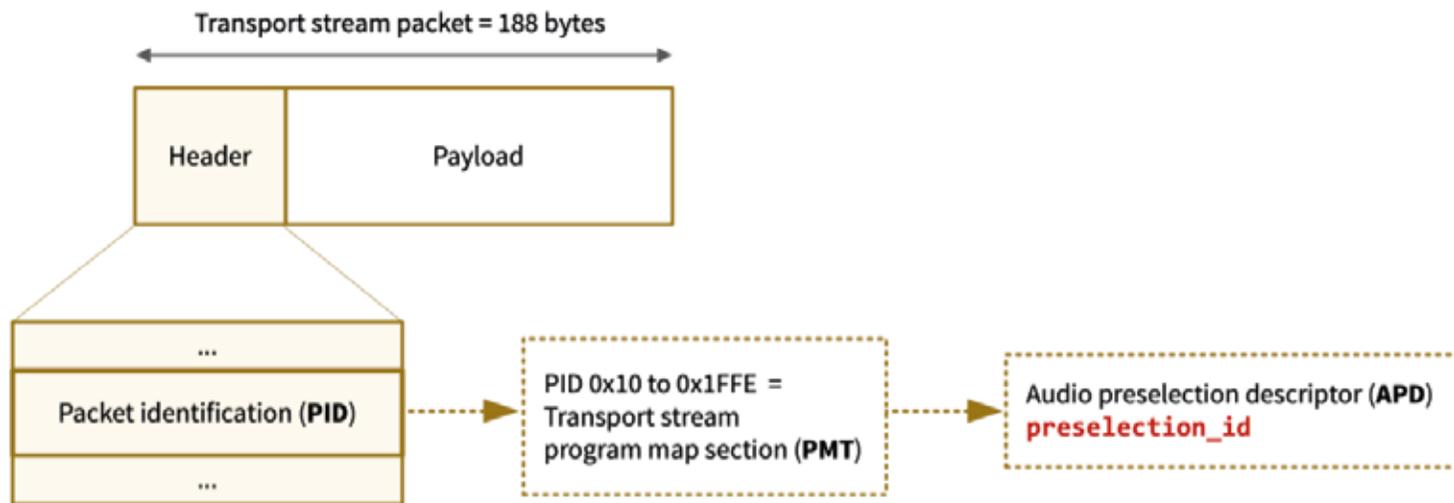
Audio Preselection Descriptor

"DVB signalling includes the Audio Preselection Descriptor, which describes the presentations (referred to as preselections in DVB) that are available in an audio component. This generic descriptor can also be applied to any next generation audio streams, whether AC-4 or MPEG-H" explains Philippe Courboulay, DTT Design Engineer at TDF. "For Dolby AC-4, that means describing the streams in the audio component
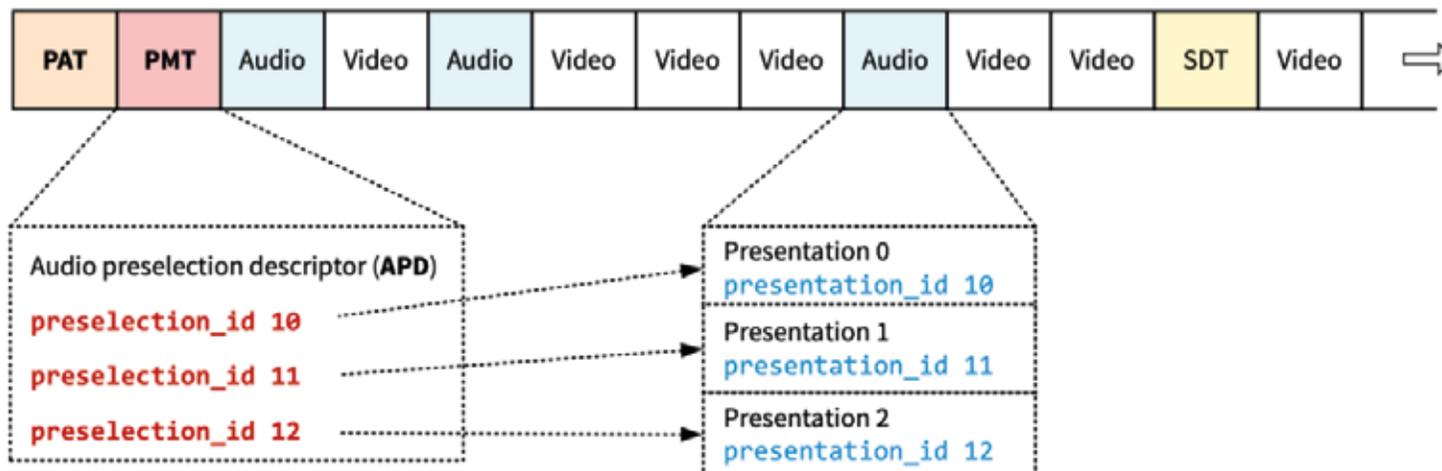
Dolby AC-4 stream structure
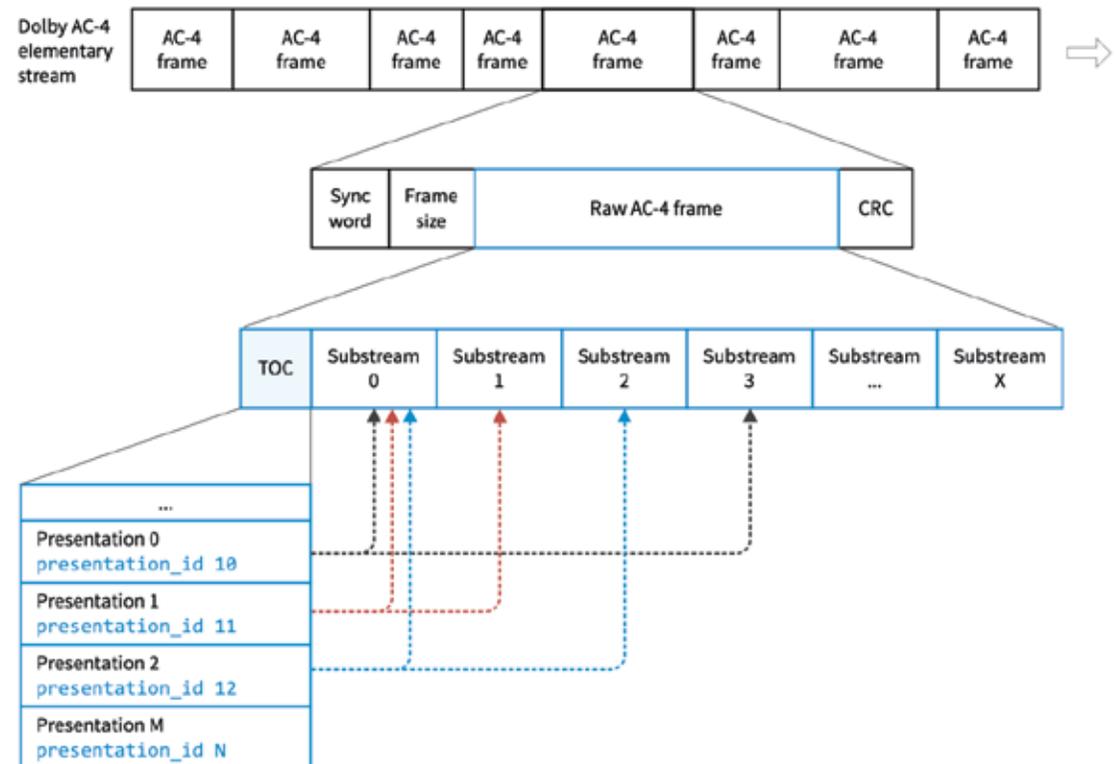
and the different pre-selections. The AC-4 stream itself has its own detailed metadata that will also be decoded by the TV." APD uses this metadata generically and indicates to the TV which mix is needed to match user settings.

Transport stream packet = 188 bytes

| Header | Payload |

...

Packet identification (PID)

...

PID 0x10 to 0x1FFE = Transport stream program map section (PMT)

Audio preselection descriptor (APD) preselection_id

MPEG-2 transport stream

| PAT | PMT | Audio | Video | Audio | Video | Video | Video | Audio | Video | Video | SDT | Video | ⇨ |

Audio preselection descriptor (APD)

preselection_id 10

preselection_id 11

preselection_id 12

Presentation 0
presentation_id 10

Presentation 1
presentation_id 11

Presentation 2
presentation_id 12

Dolby Audio

Note: There are multiple technical tools to read the signalling of an AC-4 and APD stream. For example:

- Mediainfo
- TS Duck
- DVB Inspector
- Dektec StreamXpert

In DVB signals complying with NGA specifications using the MPEG Transport Stream protocol (as outlined in the ETSI EN 300 468 specification), the APD structure is in the Program Map Table (PMT). In the APD metadata, the preselection_id attribute is connected to presentation_id in the AC-4 bitstream. With this link, the receiver can select and present the right information to the user.

So the descriptions are as clear as possible, (for example, "English" instead of "Original version"), a message_descriptor attribute (connected to the APD message_id attribute) may be included in the Service Description Table (SDT) of the stream.

While AC-4-compliant TVs started shipping a few years ago, the availability of information from the NGA stream to the viewer will differ from one TV to the next. User interfaces will change to adapt to this new way of audio transmission.

New settings and services

AC-4 streams offer a variety of services to create an optimal audio experience, but the interface must be intuitive and easy to use for the viewer. Key features include:

- Dialogue Enhancement, with personalised settings that can raise the level of speech for greater clarity
- Choice of language directly in the channel options, without opening the audio menu
- Possibility to add audio description and to control the volume of commentary (i.e. sports commentary)

There are plenty of new opportunities, particularly in terms of accessibility.

"We've been talking about image quality for years, while sound has been a bit of an afterthought. With the improvement of DTT, audio and related services will offer viewers a better experience," says Jean-François Travers. "These new settings and services can also be used across HbbTV. Broacasters will be able to offer this content and associated services via an HbbTV application."

Next step: collect feedback from manufacturers and start a UHD "live" multiplex pilot. "This is what we did in 2008, when we started with three HD channels in the R5 multiplex," remembers Travers.