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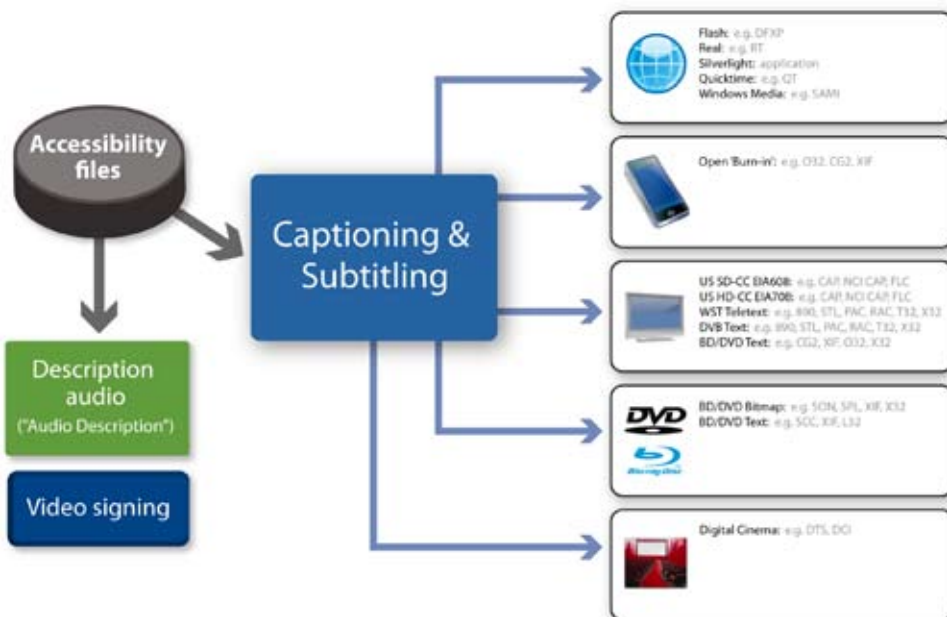
Multilingual Subtitle Creation

Successful subtitle insertion requires a hybrid approach

By Darren Forster, Chief Technology Officer, Softel and Softel-USA

A prominent feature of today's global media world is the increasingly important role played by subtitling. More and more broadcasters are achieving global media distribution through the use of tapeless post-production, storage and playout, and relying on the latest subtitling technologies to make content accessible in regions where dubbing is too costly an alternative and only suitable for premium content such as blockbuster movies. Legislation creates an additional requirement for subtitling for the hearing impaired, although all content providers (including advertisers) are keen

to reach the widest audience possible, regardless of accessibility issues. Now, with the proliferation of internet based video, lawmakers are starting to propose that streamed and downloaded content should also carry subtitles, as broadcast programming does. And in public places such as at airports, in gyms, and other high-traffic areas where sound is muted or where there are high ambient sound levels, subtitles are becoming more widely used. Overall the demand for subtitling is at an all-time high.



Deployment of Captioning & Subtitling to a Multitude of Platforms and Standards

But there are key issues to overcome in achieving the successful and efficient playout of subtitles to an ever-growing array of platforms. There is a very diverse range of video and wrapper formats to be supported, and there are significant limitations with some playout technologies. Although wrapper formats such as Media eXchange Format (MXF) and QuickTime are sophisticated containers for transporting and storing media, broadcast equipment does not typically support the storage of multiple language subtitles in a format suitable for repurposing.

Although there are several newer formats with the promise of being the new all encompassing standard for the future, the massive number of legacy files in the field means any system must cope well with the import, repurposing, and export of a huge number of formats. Broadcasters and content producers have simply invested too much to discard legacy files, with the vast majority being proprietary and often very guarded, vendor-specific formats. So in any subtitling process, great care must be taken when cross-converting formats, to ensure the preservation of metadata and other essential information about the subtitles.

Subtitle processing software can take advantage of existing technologies to embed data, enabling multi-lingual subtitles in a single version of an asset. This can be achieved by utilizing VBI or VANC tracks associated with the media asset, as used by Turner Broadcasting in London to create assets with subtitles in up to twelve languages. Downstream the embedded subtitle data can be converted to a variety of formats including burnt-in subtitles or DVB bitmap subtitles.

Wrapping for diversity and repurposing

Like any aspect of broadcasting, subtitling can be a slow, labour-intensive process if it's done with outmoded methods. So the key to using subtitling extensively and effectively is an efficient workflow that allows broadcasters to shorten the creation and playout cycle and keep costs at a manageable level. All broadcasters have different requirements and processes, and need individually tailored workflow solutions. The subtitling component needs to be integrated into the broadcaster's overall solution and preferably during the initial design of the system. With the goal of supporting a multitude of output video formats, the focus is shifting away from the traditional production systems and transmission chain, towards Digital Asset Management System (DAMS).

To aid format and resolution conversions for diverse distribution formats, content is increasingly stored as a single common "mezzanine" format representing the highest quality version, and all subsequent broadcast and streaming versions are derived from it. This can be wrapped as a universal format for easier exchange, and to further aid repurposing,

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subtitle data should also be stored in a highly generalized form, suitable for repurposing at transmission time.

There are two methodologies broadcasters employ when taking this approach. One relies on the creation of an 'über' subtitle which has as much information as possible related to the subtitle and allows less sophisticated subtitles to be derived. A 'mezzanine subtitle' will often rely on a professional subtitler making informed choices for presentational aspects such as font, colour, positional and alignment information, drop shadow and character edging – sometimes following prescriptive formats or house styles defined by the agency or broadcaster. Such über formats can support the media asset for its lifetime, allowing for elegant, effective and highly automated translation to various output distribution formats.

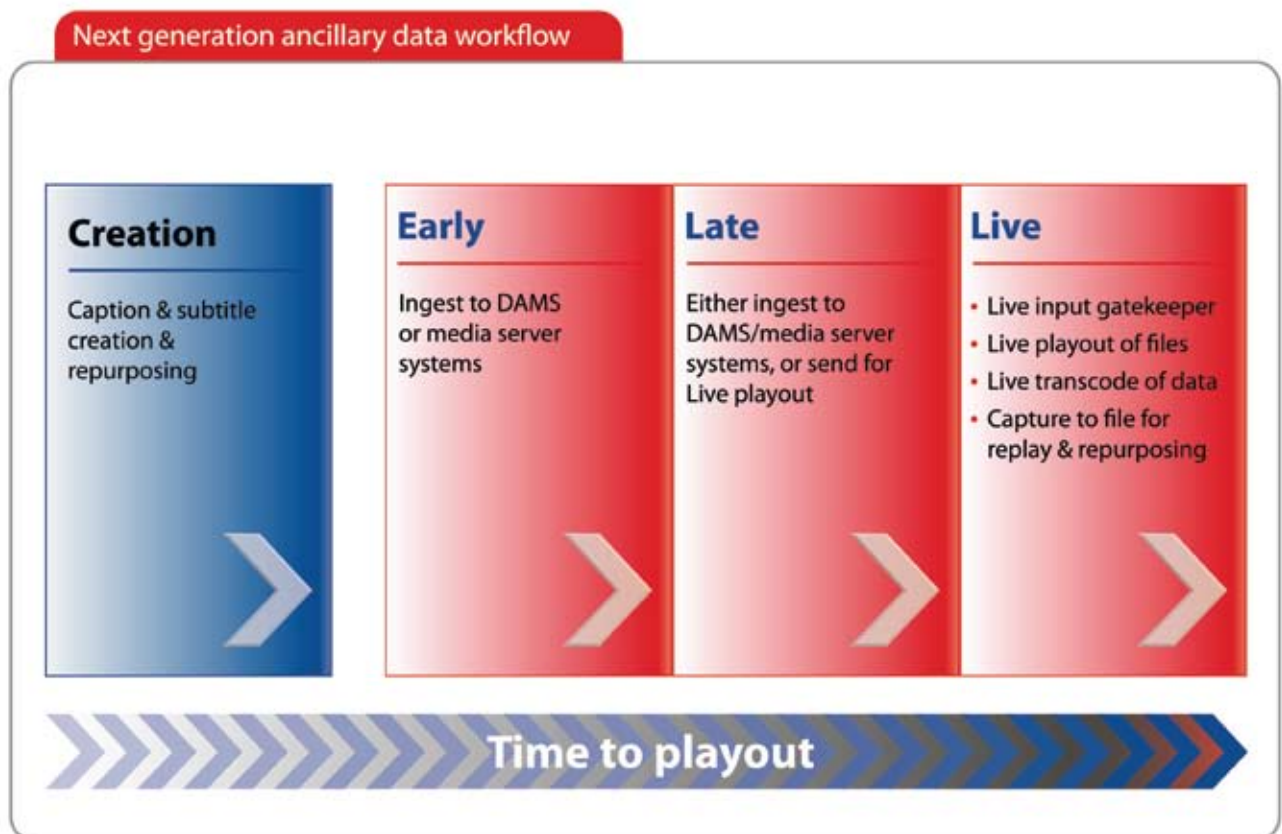
Alternatively, broadcasters may use a transcode method, which relies on a 'lowest common denominator' file (such as a WST Teletext or US style EIA-608 compliant captions) being created, and then 'upconverted' to the target format. It's a quick and easy approach, but it does not take advantage of the sophisticated options available within 'higher-end' standards (such as DVB ETS-300-743, DVD Bitmap or EIA-708).

Many broadcasters choose to adopt a hybrid of the two approaches, implementing some of the capabilities while limiting the overall time dedicated to creating the subtitle by constraining and automating some choices. In any case, it is well worth noting that different standards offer varying levels of control and sophistication.

The good news is that with effective content management, the subtitle data contained in the media wrapper can enhance the asset metadata, providing a rich, searchable source of content-related information. This can further enhance efficiency for logging and research, as well as enabling monetization of content – thus making the subtitling process continue to deliver value throughout the future of the asset.

Early, late or live binding for delivery

Once the created subtitle file is signed off for delivery, it must be 'bound' to the content to enable it to be presented to the viewer when they watch the programming.



Binding of Captions & Subtitles.

This binding can be done at one of three stages in the process:

- Early binding: here, the pre-prepared file is matched to the programming well ahead of transmission
- Late binding: here, binding occurs near to air time and is only possible thanks to faster-than-realtime encoding techniques
- Live binding: for either truly live content or for pre-prepared content which only becomes available very close to airing making it impossible to prepare subtitles in advance, a live bind is employed

The traditional method for subtitling for pre-prepared content was to 'early-bind' by creating a sub-master tape with the subtitles encoded into the VBI space on the tape by inserting into baseband video. Although this was an appropriate method when single linear channel broadcast TV was the only form of output, and it is still possible to do subtitling this way, it is now outmoded because it's so time and labour intensive when linear broadcast television is only a single output in what can be a technologically diverse list of distribution requirements. Instead, files are now either sent for time-of-air transmission (a live bind), or are transcoded into a file-based video asset (during early or late binding).

		AREA OF WORKFLOW		
		Preparation	Binding	
Task	Caption & subtitle Creation & Repurposing	Early Binding	Late Binding	Live Binding
	Create caption & subtitle files in various formats ready for ingest, distribution or transmission	Optionally either create tapes or ingest caption & subtitle data to asset management or video server	Determine whether there is time to late bind (per early bind) or if live binding is necessary	Encode/ingest or inject captions & subtitles at time-of-air/stream; input security; capture for repurposing

Areas of Workflow.

Time-of-air transmission generally involves systems which integrate with the automated workflow of a master-control facility, with the subtitle playout system approving files in advance, and then airing the correct file at the right time automatically, either with or without timecode.

The time-of-air system can also be used as a 'gatekeeper' for real-time subtitling, with the system authenticating the subtitler and their work slot prior to allowing pass-through to air. This system of checks is useful given the distributed and freelance nature of real-time subtitling.

A hybrid of ingest and time-of-air methods has become increasingly popular, and results in ingest to the video asset whenever possible, with time-of-air playout where appropriate. The time-of-air subtitle system receives the playlist information directly from the automation system. Issues such as missing files, missing timecode, media lacking encoded subtitles or metadata can be reflected directly back to the automation system to ensure master control staff take immediate remedial action. Where the automation playlist indicates that the video asset already contains subtitle data the time-of-air subtitle system can check that it is complete and QC the subtitles, flagging any errors appropriately. The time-of-air subtitle system can also provide interfaces to other ancillary data signals and XDS information such as

wide-screen signalling, vChip parental controls, Broadcast Flag information, DRM controls such as CGMS-A data, Digital Program Insertion (DPI) data, and others.

Broadcast equipment technologies continue to roll out at a rapid pace and it is important that ancillary data (such as subtitle data) is supported in all equipment in the transmission chain. Systems have to remain interoperable and ideally include Application Programming Interfaces (APIs) developed to assist in the exchange of data around the modern workflow.

The MXF format provides an open standard wrapper for broadcast media including ancillary data, and many equipment vendors support it, enabling seamless workflows. MXF is an extremely flexible specification and most broadcasters who use the standard design a profile or 'shim' to remove some of the ambiguity from this comprehensive and far-reaching standard. Any profile used should define the way subtitling data is supported.

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Adapting to moving targets through Subtitle transcoding

When broadcasters want to generate multiple versions of the same content for alternative non-broadcast distribution – such as for online video – distribution methods must employ a variety of subtitling technologies, all of which must be supported in a holistic way by the subtitling system.

Implementing a mezzanine video format as described above and including the über subtitle file, the subtitle data component can be transcoded appropriately at the same time as the video, ensuring the same or better quality as in the broadcast version. In addition to supporting different output distribution formats, workflow often needs to provide for 'reversion' outputs where the video asset is manipulated time-wise or split in different program segments. This 'reversioning' process is often carried out on a Non-Linear Editing system (NLE) and can effectively destroy the subtitling data, but modern transcoding solutions can avoid this by using the Edit Decision List (EDL) from the NLE to bridge the subtitle data from the original to the final version.

Again the Embedded Data concept plays an important part here as the 'mezzanine' format can be either a rich (i.e. 'über subtitle') or lowest common denominator format; but it is vital that it is unbreakable, to reduce risk and ensure that the translation or hard-of-hearing subtitles reach the viewer correctly. The wrapper provides a means to store subtitle data in a way that makes it transparent to the video and allows multiple languages to be stored within the same asset. This further reduces risk, as well as saving time and storage space through the use of a single asset version.

Utilizing the VBI or VANC tracks that are available in wrapper formats such as MXF rather than the video essence, subtitle data can be stored without having to be encoded into the video essence. So as well as the advantages outlined above, this also ensures that the video remains 'clean' and does not have to be potentially degraded through additional transcoding processes – very useful for all video content.

By implementing an integrated subtitle creation/repurposing, encoding and transmission solution, the subtitle data embedded in the media asset can then be seamlessly transcoded to the desired format at time-of-air or even completely bypassed.

The viewer will enjoy the highest quality of subtitles however they choose to consume their content, and the content provider will reach the widest of audiences.

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