



AmberFin White Paper

# Using AmberFin iCR to make Pinnacle MediaStream and Omneon Spectrum files interoperable



## Use of a constrained application specification for MXF can solve audio and metadata issues with Pinnacle-Omneon conversion

### EXECUTIVE SUMMARY

Many large broadcasters are currently going through a major transition in playout server technology, from the 'black box' units that dominated the market in the early part of the decade to more modular platforms such as Omneon's Spectrum system.

This transition, however, poses a challenge for those companies which have made large investments in content housed on the earlier servers, as the proprietary file formats they use are not fully interchangeable with newer technologies.

This white paper looks at the options for accurately and cost-effectively transferring files between one of most widely-used legacy systems, the Pinnacle MediaStream media server, and Omneon's Spectrum server.

Re-ingesting Pinnacle files directly into Omneon is not considered cost-effective or practical for large file repositories. And most transcoding systems adequately convert video but fail to handle audio and metadata conversion satisfactorily.

A conversion process using the AmberFin iCR® software platform, however, is able to provide flawless conversion of video, audio and metadata at wire-line speeds.

This process involves the creation of a platform-agnostic constrained Material eXchange Format (MXF) application specification, potentially paving the way for anything-to-anything conversion workflows.

**AmberFin iCR is currently the only system on the market that can carry out a flawless conversion of video, audio and metadata information between Pinnacle and Omneon servers.**

### Introduction: the changing media server market

From black and white to color, analog to digital or digital to file-based technologies, it has never been easy for the broadcast industry to stay afloat in an ever-changing sea of technical requirements. And the playout side of the business is no exception, with the last decade in particular having witnessed a number of significant changes. At the end of the 1990s, digital media servers began to take over from traditional video tape recorder playout systems because of the ease with which they could handle advertisement insertions. A burgeoning market for this kind of technology led to the proliferation of vendors, to the extent that by 2002 there were no less than 19 major competing video server companies operating in the United States, with 11 providing products specifically aimed at the broadcast industry<sup>i</sup>.

One of the most successful of these was Pinnacle Systems, which acquired Hewlett-Packard's broadcast video server business in 1999 and by 2002 was one of the three top vendors in the United States, along with Thomson Grass Valley and Leitch<sup>ii</sup>. In 2005, however, Pinnacle itself was bought by Avid Technology Inc. Avid maintained Pinnacle's MediaStream server in its product portfolio, possibly because of the large number of customers using the technology at the time of the purchase, but has now announced it would be ending production in 2008<sup>iii</sup>.



Meanwhile, a new generation of servers has made an appearance. Unlike many of their early predecessors, which were essentially black boxes with a fixed number of inputs and outputs and a fixed amount of storage, the newer servers are built on a modular basis so customers can easily add input or output channels and storage independently. This new, more flexible and cost-effective approach is typified by Omneon and its Spectrum system.

Omneon, which was not even listed in Frost & Sullivan’s 2002 report on the U.S. media server market<sup>iv</sup>, has enjoyed major success in the last half-decade, not least because of promotional activities aimed directly at Pinnacle customers<sup>v</sup>. It currently has customers in 45 countries on six continents, including major broadcasters such as BBC, Canal+, NBC and Turner Broadcasting<sup>vi</sup>. The effective demise of Pinnacle and subsequent rise of Omneon in barely half a decade means many broadcast industry customers now use both platforms side by side. However, this poses something of a problem, because the file formats used by the two platforms are not compatible.

### Conversion challenges

With Pinnacle having been a server vendor of choice for the best part of a decade, but broadcasters increasingly relying on Omneon systems for playout, there is clearly an important requirement to ensure interoperability between the two. Many broadcasters have several years’ worth of material stored on Pinnacle servers and are keen to ensure it does not become obsolete and that all the time, money and effort spent on ingesting that media is not wasted.

Unfortunately, however, while many transcoding system vendors claim to be able to handle file conversions between Pinnacle and Omneon, the reality is that only the video portion of files can be exchanged with any ease; conversion of audio and Vertical Blanking Interval (VBI) or Vertical Ancillary (VANC) information is almost invariably prone to errors, due to a number of important differences in file format including the following:

**Table 1:** Audio and VBI/VANC treatment in Pinnacle and Omneon systems.

AUDIO	
<i>Pinnacle</i>	<i>Omneon</i>
<ul style="list-style-type: none"> <li>Up to eight channels of audio.</li> <li>Dolby E compression at 16 and 20 bits.</li> <li>Fixed audio storage structure.</li> <li>Audio interleaved with video.</li> </ul>	<ul style="list-style-type: none"> <li>More than eight channels.</li> <li>Dolby E compression at 16 and 24 bits.</li> <li>Flexible audio storage structure with track stacking.</li> <li>Audio can be stored separately for easier management.</li> </ul>
VBI/VANC	
<i>Pinnacle</i>	<i>Omneon</i>
<ul style="list-style-type: none"> <li>Proprietary system.</li> <li>Time code stored in VBI/VANC in MPEG Program Stream.</li> <li>Closed captions stored in line 21 inside MPEG Program Stream.</li> </ul>	<ul style="list-style-type: none"> <li>Proprietary system or MXF 436M standard.</li> <li>Time code in VBI/VANC in MPEG User Data or SMPTE 436M (MXF).</li> <li>Closed captions stored in VBI/VANC in MPEG User Data or SMPTE 436M (MXF).</li> </ul>

Owing to the above and other differences in file format and structure, converting Pinnacle content for use with Omneon systems will typically lead to one or more of the following issues:

- Files will not load.
- Files will load but not play.
- Audio ‘popping’.
- Lack of audio-visual synchronization.



- Loss of Dolby E audio.
- No closed captions.
- Closed caption synchronization problems.
- Time code non-existent or not synchronized to video.

These problems are potentially more difficult to solve in certain lesser-used formats, such as uncompressed audio in standard definition or high definition sources. And incompatibilities exist in both transcoding directions; in other words, it is as difficult to get a Pinnacle server to work with Omneon files as it is to do the reverse.

“The amount of content that a broadcaster might hold in Pinnacle format can be quite significant.”

To compound the issue, there are interoperability problems within the Pinnacle product range itself, so that files created with one version of MediaStream might not always work with another version.

### The available options

As stated above, the amount of content that a broadcaster might hold in Pinnacle format can be quite significant: for example, Turner Broadcasting holds about 2,200 hours of programming that needs to be converted. Assuming the broadcaster does not simply want to let this content become obsolete along with the Pinnacle platforms that it uses, there are three options for conversion:

- Playing out the content to baseband from Pinnacle servers and re-ingesting it directly into Omneon systems in real-time. Apart from drawbacks such as loss of metadata, it is fair to say that this approach is simply not cost-effective for any but the smallest of archives.
- Carrying out conversions using traditional transcoding systems. As noted above, this would inevitably lead to a loss of metadata and audio information, and a consequent reduction in quality. There may be some situations where such a reduction is bearable although, again, this is only likely to be so in very small number of situations.
- Implementing a workflow that can offer industry-leading video transcoding and at the same time handle the conversion of audio and metadata in a robust, automated and, ideally, faster-than-real-time fashion. This paper describes such a workflow.

### Flawless conversion

AmberFin has achieved flawless conversion between Pinnacle and Omneon video, audio and metadata using standard iCR software and a constrained application specification of MXF. This process also addresses incompatibility issues on the Pinnacle platform itself. MXF provides a universal open-standard wrapper which can take care of the ‘heavy lifting’ of essences from one platform to another. The constrained specification, called MXF AS02, is being developed by a joint team of users and vendors within the Advanced Media Workflow Association ([www.amwa.tv](http://www.amwa.tv)) for submission to the Society of Motion Picture and Television Engineers (SMPTE) in 2008, with AmberFin, a member, playing a key role.

MXF AS02 has been designed to get around the incompatibilities that have arisen as different parts of the generic MXF standard have been implemented in practice.



MXF was chosen over QuickTime as the conversion medium between Pinnacle and Omneon because it is more suited to integration into automated workflows. For example, MXF's structure includes a program version file which references the program contents. In a situation where, for example, a Web service application has to query an MXF file before processing it, the application need only check the version file, which usually has an average payload of about 20 kilobytes per asset. With QuickTime, in contrast, the application would need to be sent either the entire asset or a reference movie with weak links to the content. Sending the entire file could require a copy of 5 to 50 Gigabytes, increasing bandwidth requirements by a factor of 100,000. Sending the reference movie, meanwhile, does not transmit enough information for the Web service to know everything about the asset. Only MXF provides this level of detail.

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## Benefits of MXF AS02

Because of its non-proprietary nature, MXF AS02 offers a number of benefits as a generic medium for media servers. To take just one example, it is based on the SMPTE 436M standard to store VBI/VANC packets, rather than the proprietary mappings for VBI/VANC data lines, including closed captions, still used by many systems today. This greatly simplifies captioning, as all data can simply be provided in the standard 436M format instead of having to be adapted to the proprietary requirements of different types of server.

Similarly, because SMPTE 436M VBI/VANC data can be decoupled from and re-coupled to the MXF wrapper, there is no need to send the entire MXF file through for captioning; instead, the work can be carried out just on the 436M file, again reducing the bandwidth requirements of the workflow.

The paper specification for MXF AS02 is now fairly robust and furthermore is oriented towards decision makers who have to write and respond to Requests For Information (RFIs), making it a highly accessible standard. A number of vendors, including AmberFin, Omneon, Marquis Broadcast, TransMedia Dynamics (TMD), EMC and Pro-Bel, already have working MXF AS02-based systems and Turner Broadcast is using it to convert between Pinnacle and Omneon directly on demand.

## MXF AS02 and AmberFin iCR

While the MXF AS02 specification provides a convenient wrapper for file transport between Pinnacle and Omneon, the critical conversion functions are down to AmberFin iCR. The iCR system is designed for maximum automation and interoperability so that once a conversion profile has been set by an operator the system can reproduce it exactly on request without further intervention.

Furthermore, the system is capable of carrying out flawless conversions between Pinnacle and Omneon files at four times faster than real-time and without any additional bandwidth requirements, effectively making it possible to mix and match Pinnacle and Omneon servers indiscriminately with iCR acting as universal translator. The speed of conversion means Pinnacle files can be called up and played out on Omneon servers on the fly. Similarly, Pinnacle archives can be updated to Omneon-friendly MXF format in the background during periods of low server utilization.



The conversion can be carried out in both directions, too, so that for example material can be ingested on an Omneon platform and then played out on Pinnacle, or even stored on Pinnacle and played out again on Omneon.

Last but not least, as indicated above MXF AS02 has the potential to become a universal format for different server platforms and iCR offers unrivalled automation and integration possibilities, both of which mean the iCR/MXF combination have benefits far beyond simple transcoding between Pinnacle and Omneon systems.

## Summary and conclusions

Converting Pinnacle files into a format useable by Omneon servers, and other versions of Pinnacle, is a growing problem in the broadcast industry and one that is related to a wider issue of server platform incompatibility. Using MXF AS02 as a universal wrapper and iCR as a conversion engine makes it possible to overcome the issue of interoperability between Pinnacle and Omneon, and at the same time points the way to a much wider level of compatibility between server vendors.

## For more information

To find out more about AmberFin iCR, go to [www.amberfin.com](http://www.amberfin.com) or contact AmberFin directly via [info@amberfin.com](mailto:info@amberfin.com).



## References

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<sup>i</sup> Frost & Sullivan report #A445-74: U.S. Video Server Markets, 2003.

<sup>ii</sup> Ibid.

<sup>iii</sup> Avid Website: End of Life Notification—MediaStream 8000, February 2008; <http://www.avid.com/mediastream.asp>.

<sup>iv</sup> Ibid.

<sup>v</sup> Omneon press release: Omneon Offers Trade-Up Program for Pinnacle Servers, April 16, 2005,

[http://www.omneon.com/news/press\\_releases/2005/050416\\_PinnacleTradein.html](http://www.omneon.com/news/press_releases/2005/050416_PinnacleTradein.html).

<sup>vi</sup> Omneon corporate news archive, <http://www.omneon.com/news/index.html>.

