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Foreword

In this third we have taken a broad view of top level technology developments within the sector. This report is less product & feature focussed as the previous tech watch reports as we have taken time to look at the formats and standards that are emerging and seem to be winning across the industry.

The name of the game these days is interoperability and the industry at its core is changing as companies begin to focus on very specific tools that can plug into a wide range of platforms. This not only changes things for users but also for the companies providing solutions in terms of their business models and how they charge for their technology.

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1. Advances in vision

The first thing to note is that there is not actually much genuine novelty around, simply that screens are getting bigger (none more so than Samsung's 110" monster) and the hype that once belonged to HD, then 3D, then 4K now belongs to 8K (unless you are Sony, in which case it is 12K). But of course increased pixel count comes at a price - even compressed a satellite delivered 8K channel is gobbling up at least 25M of capacity, and that is on selected low challenge content (i.e. the sort of things you show at shows). Wavelet coding edge artefacts were around in abundance if you knew where to look. 4K or HD cut-out from 8K wide angle, as presented by the BBC, is a great plan, and gives viewers the choice of what they watch, especially useful in sports, but if you are archiving the content you have to take the lot, and presumably at reasonable quality. It turns out that high dynamic range (HDR) displays are not

stretching the bandwidth at all - the improvement is in the display technology, although 10-bit pixels are necessary to get the effect - and having seen it in action, the punters are definitely going to want the effect. Cameras are stretching the limits of colour, dynamic range and resolution, and it is this increased content that will have to be archived and preserved if future content re-use is to be effective. And the improvements are not just limited to vision - improvements in surround sound, or 3-D sound as it is being called are expanding the number of channels recorded, with many spot microphones being used at live events and recording sessions.

But the really interesting issues for this tech watch are probably in the way that use of cloud is evolving, the shift to new software based business models and the use of standards across the industry.



2. Advances in storage

With advances in vision 4K, 8K and (16K in the future), emerge requirements for suitable storage and distribution strategies. Content owners are ever more focussed on delivering the best cinematic stories possible, and 4K enables this vision by providing digital video in very high resolution, greater texture, higher dynamic range, and photographic image quality to content consumers. A recent white paper published in 2015¹ estimates that there will be a 5.8X increase in digital storage capacity used in the entertainment industry over the next few years and a 4X increase in storage capacity shipped next year from 26,756PB to 102,661PB. This presents a significant challenge in terms of archival and preservation of 4K content. For example: ingest and archival of 4K RAW footage will require 136MBPS per stream. My observation at IBC was that storage and archival vendors were well prepared for these future challenges. There was an emergence of high performance storage solutions which could handle 4K footage captured at 60fps and with room for scalability of up to 120fps. Low latency solutions offering speeds of up to 300Mbps were on display. The other main feature in preparation for archival of 4K and 8K content was the emergence of hybrid and intelligent storage facilities. These included options for online, cloud based storage for immediate production content and tape and disk based solution for content infrequently used, all accessible via a single point of entry. Finally there was strong focus on interoperability, as content will need to be shared, and collaborative working environments will be a norm in the future for ingest and processing of 4K content. The use of object based storage (different from file based storage as each object can consist of one or more digital files and associated metadata) e.g. AXF object formats was current trend regarding this aspect. Object storage presents a cost-effective extension to file-based storage for large disk archives which rely on highly automated processing activities.

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¹ 4K: What you need to know and why it matters. Quantum. [www: http://emea.forms.quantum.com/Surveys/53/D51D98D126043C06/4K_White_Paper_Adwords_UK.aspx?gclid=CJ_JjLTP_8ICFSMFwwodBYkAqw](http://emea.forms.quantum.com/Surveys/53/D51D98D126043C06/4K_White_Paper_Adwords_UK.aspx?gclid=CJ_JjLTP_8ICFSMFwwodBYkAqw) (last accessed: January 2015)

3. The 'cloud' is growing up

Cloud used to mean Amazon EC3 or Google, but increasingly we hear from workflow providers who are prepared to talk about private clouds of one form or another. Whether this is third party bespoke storage, supplier provided facilities or customer on-site facilities, the reality of the market is starting to be accepted, and when providers offer cloud facilities they are increasingly giving the option of managed pay per use off-site facilities, which should suit smaller archives or those with limited resources, but who are concerned about relying on big US operated public cloud offerings. Partly this is driven by the need to provide services that are robust to the contractual requirements of the big Hollywood majors for absolute security, but the knock-on effect should be a benefit across the industry. Several of the companies who have shown digital asset management solutions that we have reviewed in recent tech watch reports (such as Front Porch) have evolved their managed storage service offering over the past year and this business model seems to be moving forward. The cost benefits of shared infrastructure and operational efficiency of outsourcing storage is clear however the product features of basic 'cloud storage' services such as S3, Glacier and Azure were not particularly compatible with the usage requirements of audiovisual archives due to the large data overheads and the data i/o costs associated. The managed storage service model can provide the features required to support an Archive which are quite different to those of the traditional 'cloud' customer. While the promise of cloud storage is attractive it has taken a while for the term and the requirements specific to audiovisual archives to emerge and balance, this seems to be well underway and 2015 should see these offers becoming more structured and visible within the marketplace.



4. The software toolbox

In discussion with several companies that have been moving towards software products and away from their more traditional hardware products there are some interesting developments. The move to provide a software-only offering based on commodity IT platforms means a simpler, less locked-in life for file-based archives, but it also means that software products are becoming more open and more standardised. Even those companies with proprietary interfaces are talking about opening up their APIs to allow the use of services and plug-ins from other providers. Leading examples of this approach can be seen with the various encoders and file QC tools on offer at IBC, most of which are marketed to plug into a wide range of DAM and Workflow Automation systems. This opening up of APIs is delivering a modular and flexible means of solution development and forging relationships between technology providers across the workflow chain. These companies are working together to combine tools and overcome the barriers and issues of integration creating a 'toolbox' type approach to building solutions. This is definitely good news for the users, since it means that the cost of managing and maintaining file based workflows is coming down, and there is much greater freedom of choice available over what form that workflow will take. But it also means that the workflow design can be more of an issue, and local consultancy or the services of an outside integration company may well be needed to get a working system. This isn't of course such a problem, since there were several integration companies in evidence who are able to offer such services, with some of them better able to respond to smaller installations than others.

Analysis of workflows and risk management will be more important than ever. The impact on providers of software services is that they are no longer seeing a business based purely on high-value sales to traditional customers, but they are moving towards a service-provision business model that is more accessible to a wider customer base. Of course this does mean that the IT infrastructure providers will have a field-day, but there was an oft-repeated caution from several of the vendors we approached who maintained that their software is optimised to run on a given hardware configuration, and whilst they can't force the customers to equip their facilities with the best hardware for the job, there were recommendations that should be followed to get the best result – and get sympathetic support from the provider.

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5. Use of standards

It is very rare to meet a workflow provider that isn't committed to using MXF, although only a sub-set of those are actively involved in developing the standard. Nonetheless, straightforward interpretations of the standard are being used, and with the opening up of APIs to allow inter-vendor exchange of content, MXF is definitely the exchange format of choice. There are companies offering an increasingly sophisticated array of MXF test, validation and legaliser functions (e.g. CubeTech, Dalet-Amberfin or MOG) and, as I have already noted, with the opening-up of APIs and middleware to third party applications, the possibility is now there to build a bespoke archive workflow with QA and tracking controls specified by the user, rather than the workflow provider. Validation can also be undertaken in the cloud as files are delivered through tools from companies such as Aspera and Signiant who were also promoting file standard and format checking applications at IBC such as Orchestrator and CloudSpeX respectively.

Fraunhofer IIS were showing their EasyDCP development and its relation to IMF (the universal format for internal data exchange during production and post production). The enhancement of IMF they are offering, referred to as the Interoperable Master Package (IMP) format can be used for manufacturer and equipment independent exchange of content. Content package information is maintained in a separate XML package, providing a means for maintaining

information about archived file-based content.

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Although only progressing through standardisation at the moment this looks to be an effective future approach to long-term preservation of content readability in addition to its role as an exchange format. Similar comments can be made regarding the DPP (Digital Production and Partnership Initiative) who have published guidelines for delivered content incorporating common metadata standards, intended to enable interoperability between systems and ensure common information around the files. These guidelines have been produced in close association with the Advanced Media Workflow Association (AMWA) and its AS-11 standard for delivery of finished file-based programming. From discussions at the show it was clear that these are standards to watch and take notice of as more and more

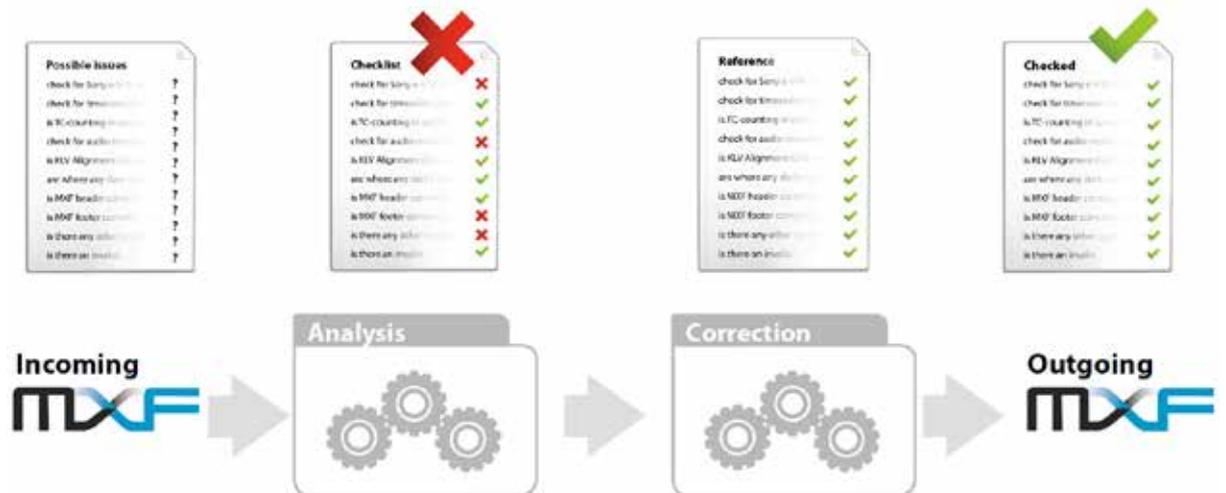


Exhibit 1: The MXF Legaliser process from CubeTech

manufacturers and service providers adopt the standards and provide interoperable products. One of the companies to receive AMWA certification for the integration of the AS-11 standard within its Content Agent product was Root6 Technology.

We should anticipate seeing more integrated production, metadata creation and content archiving as the workflow models evolve to respond to the changing file-based production processes and the new business models associated with them.

So we can see that the world is currently in a state of evolution rather than revolution, and that changes are arriving step-by-step rather than with new technologies. There are some new approaches around, such as TICO, the newly proposed compression format from IntoPix. This is not yet standardised but was being launched at the show as a low delay 4k 60P encoding format. This could have an effect on archive requirements, since not only is it another format to handle, but the re-coding implications if content is transcoded for re-use are not known, and is a good example of an emerging technology that could have a secondary impact on archives.



Exhibit 2: One of the companies to receive AMWA certification for the integration of the AS-11 standard within its Content Agent product was Root6 Technology.

Conclusions

There are clearly developments in both production to distribution work-flows on the one hand and consumption and user involvement on the other. The traditional “linear” production flow is giving way to a more integrated production philosophy – with pre- and post-vis on set and multiple versions of content being produced. There is more complexity in virtual productions, with some approaches verging on mixed reality (see for example the VizRT mixed reality studios or the demonstrations of virtual 3d from BrainStorm), and with productions being factored for viewing on Very Large Devices through to tablets and mobile phones. User interaction and live contribution is being increasingly used, leading to more complex multi-strand productions that will demand a different approach to archiving and metadata management. We need to look towards a world where archiving is more closely coupled to the content production process, rather than being a post-process, and this is something that is not yet being considered in the content production world being presented at shows like IBC. We are seeing a lot of beneficial changes in technology, standardisation and business approach. Maybe what is now needed is a fresh look at the way that archives are perceived, whether that is for altruistic, legislative or commercial reasons, and we should look for ways that these changes can be used to the benefit of both large and small archives to retain and deliver value in the evolving world of content creation.

PrestoCentre's TechWatch Reports are about identifying the technology trends and business issues which exist in digital AV archiving and finding a way to bring clarity in a language that is accessible to non-specialists.

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