

Blu-ray Discs

The 4K battle has begun



The Blu-ray Disc Association is being accused by some of dragging its heels over adding support for 4K but, as BILL FOSTER from Digital Decoded explains, there are several good reasons why launching another format upgrade now could actually risk compromising Blu-ray's future potential.

With the consumer electronics industry shifting its focus from 3D to the 4K Ultra High Definition TV (UHDTV) format – also known as Quad HD or UHD-1 – there is considerable pressure on the Blu-ray Disc Association (BDA) to upgrade the BD format to provide content for the growing range of UHDTVs.

However, at the time of writing (early September 2013) the sole response from the CE manufacturers has been Sony's introduction of an upscaling BD player to complement its recently-introduced line of Bravia UHDTVs. Alongside these, Sony Pictures Home Entertainment (SPHE) has released the 'Mastered in 4K' series of BD discs designed to show off the enhanced resolution and colour depth capabilities of its sister company's new TVs.

So what might be stopping the other BD supporters from getting on the 4K bandwagon? While it's hard to second-guess the strategies of these companies (in many cases you could be forgiven for wondering whether they actually have any strategies!), I would suspect it is largely because there isn't actually an official set of standards for UHDTV upon which to base their products.

The H.265 solution

UHD-1 is derived from Digital Cinema's 4K (4096x2160 pixel) format, but for TV the pixel count is reduced to 3840x2160, this being exactly four times that of HDTV – hence 'Quad HD'.

All 4K content, whether it be for cinema or

TV, is progressively scanned, not interlaced. 3840x2160 resolution progressively scanned at 60 frames per second (60fps) generates a native data rate of 12 gigabits a second (12Gbps), 8 times the 1.5Gbps required for 1080i/60. Leaving aside the broadcast infrastructure issues this creates, it is also a potential problem for Blu-ray given its current maximum video data rate of around 60Mbps and 50GB capacity limit.

Fortunately, help is at hand in the form of a new video compression standard and successor to H.264/AVC – HEVC (High Efficiency Video Coding), also known as H.265. This can reduce data rates by a further 30-50% which, when combined with the increased efficiency achieved when coding higher resolutions and progressive rather than interlaced pictures, means data rates after compression do not rise by the same amount as their native equivalent. It has been suggested that an 8x increase in native data rate could be as low as 2x after compression.

It should be relatively easy to up the current peak data rate of 60Mbps for video on a Profile 5.0 BD disc to 80Mbps as part of a new 4K format. The maximum 50GB capacity is a potential limitation but, whilst TV material will often need a higher data rate than movies, programmes typically run for one hour and series could be spread across multiple 50GB discs without affecting the viewing experience (or the cost) significantly.

For content that does require additional capacity, the recent announcement from tool maker Singulus of a machine capable of replicating 3-layer, 100GB discs is a clear sign that this issue is already being addressed. It must also be assumed that, once a 33GB layer has been added to the BD-ROM specification, it should be possible to produce 2-layer discs with a 66GB capacity on existing BD lines, thus avoiding the complexity of more adding more layers for many releases.

This assumes, of course, that the BDA decides to support the higher frame rate requirements of UHDTV. To date it has treated TV content as very much the poor relation, with support being limited to 720p at 50/60fps. It may decide to continue with this policy, particularly as there are now many within the movie industry who maintain that the advent of streaming means TV content on packaged media is no longer a viable business.

Of course that could all change if the movie industry follows Peter Jackson's lead and adopts 48p more widely, or even 60p as proposed by James Cameron. Cinema-goers are currently divided on the viewing experience created by higher frame rates, and so its future is by no means a given at present, but not

providing support for these developments in any new higher resolution format could be short-sighted.

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confusion into the mix, recent trials conducted by the UK's BskyB and Sky Deutschland have highlighted that 50/60p may not be sufficient for football and other fast-action content; they are suggesting 100/120p may be more appropriate. The BBC has even put a case for 300p – being divisible by 50 and 60 it would enable a single world standard.

On the other hand, not all TV content may actually need higher frame rates. Whilst sport would certainly benefit, the amount of sports sold on packaged media is small compared with drama and natural history documentaries like *Planet Earth*, which can be shot at 24-30fps without detriment to the viewing experience.

A question of gamut and frame rate

Another element being discussed very seriously by content creators, and which many feel is equally if not more important to include in any new format, is a greater 'colour gamut', that is the range of colours which can be captured and displayed via a TV system. Deep Color, also known as x.v.Color, uses 10-bits per primary colour and is supported by a growing amount of broadcast equipment and, importantly, the HEVC codec. The increase in colour gamut that 10-bit delivers – 1.7 billion colour variations against 16.78 million for today's 8-bit – will hopefully be sufficient to satisfy demand without having to go any higher.

Provision for higher frame rates and colour gamut (up to 12-bit) is already included in the International Telecommunication Union's recommendation BT.2020. Along with MPEG, the ITU sets the standards for broadcasters so its recommendations carry significant weight. Unfortunately, it doesn't appear that the manufacturers of the UHD TVs currently on the market have



discovered this document, or perhaps have chosen to ignore it, because none of the current models support its full range of recommendations.

Another important element in the equation is the HDMI connection. HDMI Licensing has not yet provided any precise details of the next iteration, or what it will be called. Unconfirmed sources refer to 'HDMI 2.0' as supporting 4K up to 60p. Unless that is incorrect, or is changed prior to final publication, anything higher than 60fps would not be supported by the next generation of consumer products, at least not without a proprietary interface. This could explain why the original 2H 2012 target date for the next HDMI version (later amended to first half of 2013) has slipped.

Meanwhile, although HDMI 1.4b supports enhanced colour gamut (up to 16-bits per primary colour) it only does so up to 24p at 4K, so even if the TV can display 100/120Hz or higher its input is limited to 24 frames per second at Ultra HD resolution. Unless set top boxes and 4K BD players can be fitted with some form of frame rate reduction system, early adopters may need to buy another TV if they want to watch UHDTV and not be limited to 24p movies or TV drama and documentaries. (Someone I know who has had the opportunity to look inside one of the new UHDTVs tells me that the input board is removable, which would suggest an upgrade may be possible once standards are settled.)

Despite the growing penetration of 4K cinema projectors, only a few movies are being shot natively in that format. Even when they are, most of the special effects are created in 2K resolution due to the huge amounts of data that would have to be manipulated and stored if 4K were used.

Scanning movies originally shot on film at 4K provides another source of content, and a reasonable library of masters already exists in this format, but when it comes to TV productions there is no catalogue to draw upon. Some dramas have been produced using 4K cameras, but in many cases only the HD video output has been stored, the camera's larger 4K sensor being used solely to create a movie-style look and feel. Where the 4K data files have been retained it might be possible to re-edit a production in the Quad HD format if the budget was justified, but the number of titles where this could be done will be very limited.

BDA - towards setting a new format?

The lack of any standards is obviously not deterring the CE industry from moving to 4K – the threat of sub-\$1,000 displays from China undoubtedly creating some urgency to get sets

into the market while there's still a vestige of profit margin left. Whether the majority of consumers will greet these new higher resolution TVs with any enthusiasm is also a matter of debate. It's widely acknowledged that there's little perceived difference between HD and Quad HD on a display under 60", and in Europe and many other countries outside the US these huge panels are impractical for the average household.

For the BDA, all this obviously creates a major dilemma: do they succumb to pressure to launch a format which, in essence, isn't actually a format yet, or wait until all the various elements needed for a fully joined-up, end-to-end solution are in place and standardised? The latter would be the wise choice, however the con-



sumer electronics industry is not renowned for wise choices and it is inevitably putting pressure on the BDA to make a decision.

The BDA has indicated that there will be an update in "late September." Let's hope they deliver on that promise because the longer it holds back on making a decision the more likely it is that some CE company will break ranks and launch its own 4K solution.

Whatever the outcome, I would like to make a plea to SPHE, and any other company considering the use of "Mastered in 4K": can you please find something else that explains better what's going on? The concept is fine – the phenomenon of perceived higher resolution when an image is downscaled from a higher resolution source is well known from the SDTV days – but the present wording implies that the discs actually contain '4K' material, at least it does to the majority of consumers. You only have to take a look at the online forums to see the confusion it's causing, and it is something which is likely to create a legacy problem when the real McCoy finally makes an appearance. ■



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