

RELAY GOLD

You don't simply go to watch sport anymore: a pork pie; a programme; a parking ticket. Today you enter a world of AV, as though Augmented Reality has altered the doors of perception. It extends from theatre, in one direction, and from broadcast in another, and rests upon a timecoded digital backbone. At any point, usually at the beginning and the end, it can accommodate quite a show, because the electronic pulse is there to give it a heartbeat.

That's how Olympic Games, Commonwealth Games, World Cups and scores of other global crucibles of sport extend their reach beyond the TV and the touchline and embrace the entire audience in a themed, choreographed and sometimes sponsored kaleidoscope of AV, and this industry is beginning to break a few records and win a few medals.

OPENING REMARKS

Birmingham Ceremonies is an organisation formed by the coalition of Gary Beestone Associates (GBA), a team of theatre, event and project management experts, and Done+Dusted, a TV production and event staging company. It came into existence to deliver opening and closing ceremonies for the 2022 Commonwealth Games - a kind of budget Olympics for patches of the world where the UK can still stick its pins in the atlas.

This happened precisely because all involved believed passionately that these occasions should be more than the sum of their parts. Here was an opportunity to project beyond the individual disciplines of broadcast, theatre or staging and create a new benchmark for integrated event AV by joining forces. Batons at the ready: this was a sprint relay with joined-up thinking.

Gary Beestone, founder of GBA, became technical director while his broadcast equivalent was Done+Dusted CEO Simon Pizey. Add artistic director/producer lqbal Khan, and you have a tribunal of performance sculptors leading the charge - under the watchful eye of executive producer Zoë Snow, also a director at GBA. The team also included *Peaky Blinders* producer Steve Knight and Done+Dusted's Hamish Hamilton, whose track record contains a notable bit of previous at this game: the London 2012 Olympics, working with Danny Boyle.

The concept of integrated media was foremost from the earliest planning stages, according to Beestone. "We had Augmented Reality in the broadcast," he says, "integrated VT footage connecting the interior and exterior of the stadium, choreography in sync with the audio . . . and rather than doing that in a rush with live rehearsals and then the show, a lot of those discussions took place in the six to eight weeks leading up to the tournament to link everything very tightly. It was a real ambition on this project to make the broadcast experience and the stadium experience as close as possible."

An audience of 30,000 witnessed the ceremonies inside Birmingham's Alexander Stadium, drawn by the local flavour of the artists and content: a celebration of the Midlands and its contribution to popular culture and industry. More or less the same AV systems were used for the two ceremonies and



To move a 12m metal bull through a city, you need a police escort. For everything else, discovers Phil Ward, you need Birmingham Ceremonies Ltd...

the sports presentation throughout the Games, although extra speakers were hung for the closing ceremony while the on-field reinforcement was of course removed for the week of track and field events.

CODE OF CONDUCT

The ceremonial AV once again consisted of timecoded sequences divided into modules, allowing for delays and interruptions, but all the original code was generated by Merging Technologies' Ovation media server and show sequencer, under the watchful eye of sound designer Scott Willsallen. From this source, all video, pyro, fireworks, lighting, special effects and audio took their cues, even if individual sequencers carried different programme material: Ovation for multi-channel audio playback, for example; Pixera for video; and grandMA3 for lighting.

"It's all on timelines," Willsallen explains, "and the transport for those timelines is controlled by our playback system, as a function of timecode. Musical structure works in bars and beats, not minutes and seconds, and must remain intact. So, it makes sense that the time domain is controlled by music, which means controlled by the audio playback. That timecode then becomes a really robust, generic timing signal that everybody uses to synchronise to the show music."

The labyrinthine comms infrastructure as designed by James Breward was handled by Team Audio, the UK specialist founded by Alison Dale and Mark Isbister, with every volunteer and dancer on FM receivers and every professional on in-ears. Isbister confirms that Birmingham saw the largest Riedel Bolero wireless intercom network in the UK since London 2012, but explains that it was an additional user interface into Riedel's Artist digital intercom matrix. "It extended the seven-frame matrix wirelessly to many more users across the site," he says. "It unifies the different ways of communication, such as over 30 channels of walkie-talkie or the seven channels of FM, making it a seamless platform regardless of the hardware you have. Delta also provided 'level 2' IEMs connected to the comms, used by directors, choreographers, monitor engineers and so on."

Even the comms took the timecode and fed it to timecode readers at every station on the system. "It means any operator on a wired pack can see the show code, from show caller to pyro or anything," Isbister continues. "Delta also relayed the show code to any physical device, such as a media server or a lighting console, but otherwise any visual reference was piped through the same wire used for the comms panel. It's complicated getting all the different departments locked in, but once they are it's seamless.

"The collaboration between Done+Dusted and GBA was the key to it all. Normally show comms would do their thing, and then broadcast would have their own box of tricks, which can cause friction. This way, there was one network for everyone across the whole site - which is why we were handing out 148 beltpacks! I think the producers are realising that this is something the whole thing can hang from, rather than being a small part."

"Because of the nature of the show, that comms infrastructure is what made delivering it possible on the budget and schedules





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 Left: Video production manager Nick Joyce
Right: Gary Beestone, technical director we had," adds Beestone. "There's no way a conventional radio system could have coped. Team Audio is a world-beating service."

One such beneficiary was Critical Mass, the West Midlands collective that provided dancers and performers of varying disabilities. "They were able to drive onto the platform, using numbered LED screens to locate wheelchair positions in readiness for their choreography," explains Beestone. "It was a great example of the integration of technology and live performance that's so important to us."

RAGE WITH THE MACHINE

The 'tower' was a telescopic structure built by Total Solutions. "The design coordination challenge was to integrate the three screens wrapping threequarters of the way round the tower, over three tiers, as we went straight into rehearsals inside the stadium," reveals Zoë Snow. "Again, that use of video was key because we designed the show early, in order to get it built in time, and integrating our video and lighting options gave us a great amount of flexibility."

The screens used for the opening ceremony were Roe Visual's Black

Quartz 4.6mm LED, but for closing it was Roe's CB5s, the outdoor version of the company's Carbon series of LED panels, plus Glux Batten 10mm LED video panels. "We had to run closing rehearsals in parallel with the opening ceremony, so the main issue was availability," explains Nick Joyce, video production manager, who handled systems management for video, lighting, special effects and broadcast while video designer Tal Rosner designed and animated all the video content screened inside the stadium.

Creative Technologies supplied the LED products including robust, IP-rated floor panels for outdoor use in the 'bullring' that housed 'The Raging Bull', a 12m-high animatronic oxen. CT also supplied the Pixera media servers by AV Stumpfl.

"A lot of traditional Sony 4K camera channels were used," continues Nick Joyce, "but the key takeaway was the chance to deploy the Sony Venice with the new 700 Protocol, allowing remote paint control, iris control and other enhancements. It really gives a beautiful look. Pixera is a relative newcomer for shows of this size, but they performed really well, handling the pre-rendered



content that Tal and his team designed while Done+Dusted were responsible for all the VTs that were cut into the show."

Much 4K content was created on iPhones and iPads in the run-up to the Games, adding local flavour. "It's consumer-grade equipment," says Joyce, "but it's getting to such a level that it can be a part of all this, provided colour correction is handled properly. Even some of the professional VTs were shot in a similar style to achieve an authentic, approachable feel across the board, and the use of Steadicams added to the fly-on-the-wall mood."

Rich Gorrod, production manager at Production Resource Group (PRG). handled lighting as designed by AI Gurdon, and provided a European debut for the Proteus Rayzor Blade L by Elation Professional, a combination of linear wash, strobe and SparkLED FX inside a compact IP65 linear fixture used around the inside of the bullring. "We took the timecode, but we were on a [MA Lighting] grandMA3." Gorrod explains, "which we've done since Sochi 2014, but more products use it now than ever before. It's definitely become more joined-up writing! These ceremony shows depend on it, because it joins departments together and gives you more time to troubleshoot."

The fixture list has a more familiar look to it: some 212 Elation's Proteus Maximus and Excalibur IP65 LEDs; PRG's proprietary Best Boy HP, Bad Boy and Longthrow fixtures from the GroundControl Followspot System; SGM's P6 RGBW wash/strobe/pixel lights and Q7 LED flood blind strobes; and Cameo's Zenit W600 outdoor LED wash lights. "The ceremonies elevate the whole tournament," adds Gorrod, "and have become an application in their own right - one that has to combine so many disciplines."

TRACK AND FIELD

The main audio system for the ceremonies was L-Acoustics K2 and KS28 - 24 arrays of four and four balanced against an L-Acoustics Kara system for sport. Scott Willsallen explains: "The Organising Committee determined early on that the ceremonies and the sport for Alexander Stadium would be one system, one contractor -Delta. Originally this meant a lot of Kara, and some Kiva II. off the catenaries at either end and off the East and West roofs, to cover all the seats from a flown position for the sport. We then looked at it from the ceremonies point of view and added the field-of-play loudspeaker system - which meant switching off just

over half of the flown system in order to use the temporary overlay."

There were also changes between the opening and closing ceremonies, Beestone explains. "The athletes are 4,000 members of the audience, but they're in the middle of the stadium so it's almost impossible to serve them with audio without compromising the broadcast and stadium mixes. However, for the close there was a huge stage in the middle of the field so we invested heavily in the audio for the athletes' experience. It's meant to be a party and a celebration of them, so it needed additional audio. There was a field-ofplay audience of about a thousand for the opening, and Scott and I had a long conversation about dispersion to them without affecting the seating bowl."

"It had to look OK, load in really quickly and sound good," adds Willsallen, "so we used four arrays of L-Acoustics KS28s with K2 on top, and eight arrays of KS28 vertically with Kara on top for two smaller satellite staging areas."

"The biggest challenge for the live music is the limited stadium soundcheck and rehearsal time, particularly for closing," adds Beestone. "We did dress rehearsals



POWER GAMES



Planning the power for the largest event in the UK since 2012 against a backdrop of COVID, supply chain issues, dwindling numbers of crew and sky-rocketing fuel prices was not without its challenges. The task of making it all happen fell to the OC's head of energy (and LSi contributor), James Eade.

With Birmingham 2022 working towards being the first carbon neutral Games, Eade's team wanted to ensure they could make a difference to the carbon footprint. This involved challenging the traditional methods and mindsets. Resilience is crucial for such an event, and back-up power is needed for all manner of reasons, not just spectator safety. "Many of the functional areas within the OC had stringent requirements," says Eade. "With worldwide TV and online spectator numbers in the billions, broadcast is a pretty key service. But then, so are the networks that link all the venues together for results, timing and scoring. Even fridges for doping checks had to be backed-up . . . "

The approach Eade and his deputy Dan Pratt took was to use grid power first, generators second. "We were lucky to be hosting this in the UK," says Eade. "The National Grid is pretty robust generally, so we reviewed all the supplies to the venues with Western Power Distribution and worked out whether we could get away with just UPS back-up for critical supplies in venues or whether back-up generators were needed." This planning reduced the generator count significantly, but even so 122 were still needed to provide 26MVA of prime-running and stationary back-up given the scale of the event.

"We really wanted to do something more significant on the generation front, but as with so many projects our budget limited us," Eade explains. "We looked at hydrogen sets, but these are still limited in capacity and because hydrogen has a low energy density compared to diesel, we'd also struggle to find room on site for storage." They did manage some wins though. "Wasteful generation was a target. We used more, smaller sets in a load-on demand configuration. We also added a lot of battery storage, about 3MVA, which reduced generator running time significantly. In the build period, for example, the generators powering the Ceremonies production areas ran for about two hours a day, just to charge the batteries. The fleet of 122 generators (26MVA) ran on HVO which reduced our carbon footprint by over 1,000 tonnes."

120kW of solar generation was deployed at Victoria Park, home of the lawn bowls. This produced about a third of the total venue consumption which made a significant difference. But it was a challenge to link together the solar arrays, generators and battery storage, as Eade comments: "With the generators running, when the sun came out they 'saw' the solar generation as reverse power and shut themselves down, which was not ideal!"

With a peak of over 200 crew across 26 venues, around 2,000 distribution boards and 500,000m of cable, the logistics were significant. Eade concludes: "The lights stayed on and the cameras kept rolling. We survived!"

at Longbridge, the former industrial plant, with a 1:1 scale model of the stadium, but obviously there's more opportunity inside the stadium before opening than before closing. We had 16 hours from the end of the athletics! The fibre-optic infrastructure was still there, but then you need to reinstate the full staging of a live-broadcast show . . . that's a bit terrifying. We did two nights at Longbridge, and then everything had to be dog-searched and sealed into trucks for transporting into the stadium. But the team did a fantastic job: we managed to fit in all the rehearsals on closing day, which doesn't often happen. And bear in mind Ozzy Osbourne was only confirmed six days before . . . "

This meant new audio and video content, a new show structure and reprogrammed fireworks, but "completely worth it," according to Beestone. "We were willing to take a risk because the rest of the show was so solid by this point, and we knew it would be such an amazing moment to conclude everything with a local hero like this. Timecode is such a brilliant tool, but as soon as you add anything you're in danger of unravelling everything else. Fortunately, Zoe and I have worked on a lot of immersive experiences and shows that depend on it, and we were able to guide the teams through it."

"It's all about how you put those contingencies in place," adds Snow, "and Scott is amazing at preserving the live, spontaneous feel of each performance in the midst of all this show control. You have to navigate exactly when and where every single live microphone comes in to play, and how to balance that with playback - and to decide what's best for the stadium mix and what's best for the broadcast mix. To do that with limited rehearsal time is an even bigger challenge. It was necessary to have some instrumentation pre-recorded, and the artists were completely on board with that to achieve the best sound. In fact, most of them went into the studio to prepare those tracks for the occasion and get them sounding the best they could for everyone's overall experience."

CLOSING STATEMENT

"The most significant thing," reflects Willsallen, "is that the team that pulled it together was a combined broadcast and event production group in one house. That's a new development with, I hope, far-reaching consequences. The next step would be to use an entertainment-based broadcast facility rather than augmented sports broadcast facilities."

"Both Zoe and I have theatre backgrounds," adds Beestone, "and we were very keen to blend the big stadium spectacle with quite intimate storytelling so that the audio, video, lighting and movement told the story in quite a theatrical way. We didn't want a rigid, formulaic pageant. I also wanted to make sure the opening and closing ceremonies were connected throughout the duration of the Games, so we had a police escort to move the bull after the opening to Centenary Square right in the centre of Birmingham - visible in the background from the BBC location studio, so we continued its illumination. It now has its own Twitter account . . ."

Raging Bull remains in the square as LSi goes to press, with his permanent resting place yet to be decided. But his entrance captured the imagination and summed up everything these Games meant for sport AV - and for Gary Beestone. "It's because everything came together at that moment," he concludes, "audio, lighting, pyro, puppetry, the video screen content at that moment . . . It fascinates me, as a technical director, how powerful it can be when all those things are perfectly synchronised. It creates a unique moment."