



There are digital and human changes afoot at Cadac, discovers Phil Ward . . .

# New Year's Resolution

According to the definition by National Instruments, the Fast Fourier Transform (FFT) digital audio measurement technique "does not yield a continuous spectrum". At Cadac Consoles - one of the UK's leading mixer makers - neither does the Ferriday Fletcher Transform, an event that has put its own mark on our blocks of time domain data.

Until recently, Richard Ferriday was Cadac's go-to mouthpiece for explanation of the company's advanced digital mixing solutions - solutions that have been steadily making ground on stiff competition in a crowded market. By a process of organic adjustment, however, Ferriday has now moved on - with further ramifications for those left behind.

Behind the scenes at Cadac, indeed for some 25 years at the company, Nick Fletcher has been rising through the ranks as those solutions evolved, and has given three generations of mouthpieces something to say: from Ferriday back to Bob Thomas and, of course, all the way back to company cofounder Clive Green himself.

Fletcher worked with Green on the classic J-Type console, having joined from a five-year apprenticeship with British Aerospace as a local Luton lad. "Clive was an analogue technology man, through and through," he says. "When we began work

on the programmable modules for the J-Type he handed over the details to my colleague Philip Jones and myself. When we worked on analogue circuitry he was fully engaged, but he drew away from all things digital. It didn't interest him, so he never really pushed it until it was almost too late. But he put Bob Thomas in place, and Bob managed to sell Cadac to foreign investment despite the poor state the company was in."

## KING'S RANSOM

Just before the financial meltdown of 2009 Mr Wang, the owner of Chinese manufacturing resource the Soundking Group, acquired Cadac and made the two operations synergistic in the obvious way: globalised investment, productivity and exportation while nurturing intellectual property developed in Britain.

"We were working on the S-Digital console at the time," continues Fletcher, "but just as it was becoming a viable proposition it was scrapped.

I believe it would have put us back in the game, but it was not to be. Mr Wang's model was Yamaha, beyond the PM1D and making several smaller modules for different applications. You have to be able to make things in very large quantities to make that work."

Now he finds himself a little more in the spotlight, and appears to be warming to it. Since 2013 he's been R&D director, and may finally be in a position to place a true steer on Cadac's progress. "I started as a test engineer, and I guess I was so enthusiastic they gradually let me move on to PCB layouts,



↑ Cadac's CDC Seven and CDC Six consoles



Photo: Lorenzo Moz Ortolani

↑ The CDC Eight in a live environment (photo: Lorenzo Moz Ortolani)

← L-R: Emily Watson - digital design engineer, James Godbehear - marketing manager, Nick Fletcher - R&D/sales & marketing director, Peter Hearl - senior design engineer

schematic diagrams and front panel designs," he recalls. "In the end, Clive just let me get on with it. I designed the S-Type more or less single-handedly."

The truly analogue dimension of a digital console is the surface: the workflow, the human interface. This was Fletcher's contribution to the S-Digital, although it was not immediately grasped in the Soundking boardroom. It was incoming CEO David Kan who saw Fletcher's potential and immediately put him in charge of R&D, since when both the CDC Six and the CDC Seven have come to fruition in the wake of the game-changing CDC Eight from 2011.

In 2015 the new CDC Six introduced a 64-input, 56-buss format described as 'medium' and occupying the competitive neighbourhood of price points. It advanced the gesture control devised for the CDC Eight with a 23.5" touchscreen that replaced many of the space-consuming physical surfaces, and continued the progress of MegaCOMMS, Monitor Mode and SoundGrid.

In late September this year at the Los Angeles AES Convention the world got to meet the CDC Seven, another offspring of the Eight, but this time combining all of the advancements in control of the Six but adding more access points: 36 faders, an extra touchscreen with a 16:9 aspect ratio, and 96 inputs. The buss count stayed at 56, 48 of them configurable. MegaCOMMS, Monitor Mode, Mix Focus and SoundGrid are all retained, with the incremental improvements that all things IT-based gather year-on-year. "But bear in mind that we can add those improvements to all the consoles as they happen," adds Fletcher. "While the signal architecture may change with various adjustments to I/O and access, the progress in networking and routing is applied to every console."

## FULL CAPACITY

The mixing environment, of course, is more complex and demanding than ever before. Digital consoles, beginning with the PM1D, doubled in input capacity overnight and even Cadac's wraparound J Series - if you cascaded the frames - could offer you over 100 inputs. There is some scepticism aimed at the 'limitless' possibilities of today, not least from Richard Ferriday, so is Cadac still in the flagship game?

"That is the aim," says Fletcher. "But at the same time we could offer more in the way of cost-effective solutions. There's no doubt there was a 'halo' effect surrounding Cadac desks at one time, and there still is in many regions of the theatre market. We need to get that back."

Every year sees the launch of components added to MegaCOMMS, Cadac's signature 'infrastructure' product. With Dante on the march, and the new AES protocols drawing more commitment from every corner of the industry, Cadac's System Network is "a proprietary adaptation of non-proprietary protocols," according to one source. This network takes the channel count over 3,000 at 96kHz/24-bit, with a total system latency of just under 0.4 milliseconds, while the signal path is the acknowledged 'audio-superior' TDM rather than Ethernet. In the rather old-fashioned terms of channel count, that equates to 128 channels of 96kHz audio in full flow around a site, with equably premium cabling.

"We're in favour of using our proprietary system for the backbone," says Fletcher, "but we are incorporating others - particularly MADI and Dante, which are the two most popular forms of alternative networking. We're now supplying 1U interfaces that allow you to link with those two, but we also have others that interface with AES/EBU. Some of them are built in



- ↑ Cadac's MegaCOMMS network units - Dante, MADI, Optical and Router
- The Waves SoundGrid interface.
- ↓ Cadac's CDC Six in a theatre environment

as an intrinsic part of the console, but we now have a 2U rack that offers another 36 AES channels.

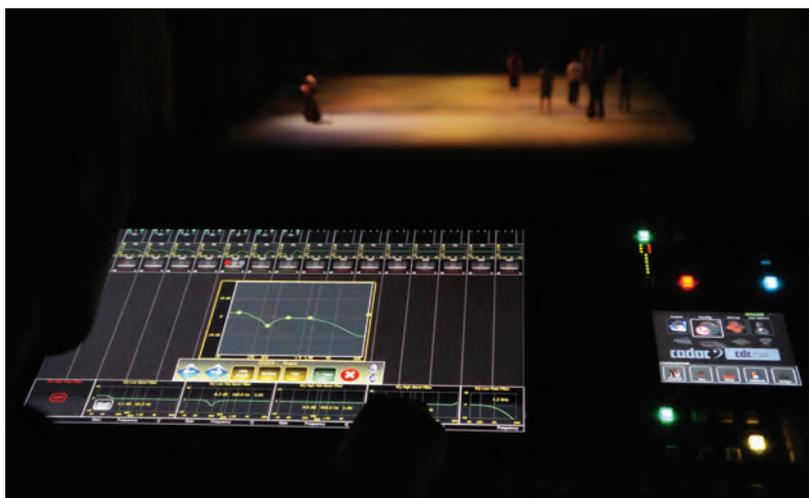
"We still see the workflow as a combination of network capacity and mixing capacity," Fletcher continues. "We are looking to make a bigger mix engine for Cadac, but it is also about what kind of network you have alongside. There's still quite a lot of mileage in taking our own technology further. MegaCOMMS can expand and our mixer technology is FPGA-based, so there's a lot of room for making it quite a lot bigger."

#### ACCESS ALL AREAS

And smaller: this is a unique combination of user interface, network and mix engine, developed at Cadac, which now forms the basic formula for an expanding range of consoles in every direction from large to medium to compact. The niche applications beckon but, for complex theatre and large-format applications, until perhaps a whole new paradigm appears on the horizon, there are other techniques under consideration.

"What we're looking at is the possibility of being able to cascade consoles through our MC Router, the 2U block with 12 pairs of MegaCOMMS ports," says Fletcher. "We've had trials in which, for example, one console is predominantly handling the main mix while the second one prepares a band mix which then feeds stems back into the main console, pre-mixed. This is all possible through the MC Router. It's complex, but we're working towards making it as simple and seamless as possible.

"It can actually make things simpler for the end user: for instance, a theatre show tends to have hundreds of cues in the cue list but the reality is that the



band mix probably only needs 10 or 12 cues as songs change. So you can simplify the show by keeping those 12 cues on the second console, sync'd off the first one and only changing at those relevant moments. It saves you having to programme all that data, which doesn't change very much throughout the band mix, throughout the whole of your show."

The rationale of the CDC range is pretty clear. "It's all about scalability," asserts Fletcher. "The Six has 20 faders: a bank of 16 that you can change in layers and four master faders, although all of them can be now be reprogrammed. You can create all kinds of custom layers. There are 64 processing channels on the inputs and 56 output channels, of which 48 can be

anything you want between sub groups, auxes, matrix, stereo, mono . . .

"The Seven has 36 faders: 16 on the left and 16 on the right and the four master faders in the middle. The two large touchscreens can be used independently of each other - you can be looking at channels on one and outputs on the other - and with our new v4 software you can programme any of those faders to be anything, as on the Six. It has 96 input processing channels to the 56 output. This is to be compared with the 128 inputs and 64 outputs of the CDC Eight, which was conceived as the original flagship."

"Our user interface is completely different to everybody else's," points out James



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*- Nick Fletcher*

Godbehear, marketing manager. "It's very touchscreen-driven and it's based on what our designer Pete Hearl calls the 'glass cockpit' - an airline pilot's need to be faced by only the instrumentation he needs at any given precise moment, and not to be bombarded by unnecessary information. It means that most people could work out, unaided, how our consoles work in about 15 to 20 minutes."

#### SHOW TIME

When Cadac's J Series dominated the theatre industry, the company wrote a piece of software for PC called SAM - Sound Automation Manager. It was developed with input from many leading sound designers who worked on shows like *Starlight Express* and *The Lion King*. Such was its popularity and capabilities, the program was rewritten to work with the new digital consoles.

Originally SAM ran on an external PC, and by connecting it to MIDI hardware it was possible, via MIDI, to use it to control a show using other branded consoles. During a run of *War Horse* at the Lincoln Centre in New York, for example, the FOH engineer was mixing on an SD7 while running SAM running on a laptop: SAM's automation was running the SD7.

For quite a while many felt that high-end automation was better isolated on a separate laptop, and not contained within the console that would already be handling a standard level of complex automation. Where a sound designer had considerably more sophisticated requirements, he could turn to SAM as an external resource fully compatible with the platform in front of him. Cadac drew a line between mixing the show and confronting the operator with this kind of advanced cueing, but times - and technology - have changed.

"We have decided not to develop SAM as a separate product due to the advances in processing power," reveals Fletcher. "Historically it was necessary to have SAM running on a PC attached to our consoles because, for instance, in the case of the J-type Central Control Module there was 'only' an 8-bit, 16MHz microprocessor in the unit - which was capable of running the internal desk automation but could not run the complexities of SAM as well. Now, however, the PC within the console is more than capable of carrying out this as well, and it means that we're not trying to develop two separate automations systems at the same time."

#### TABLET CURE

Another considerable challenge to mixing architecture these days comes in the form of the iPad with an audio interface connected to it. Add to that iPhone apps, and it seems possible that quite soon an iPhone dock will be configured as a multi-

channel audio device. The take-up of tablets and smartphone apps is a very cost-effective way of increasing the reach of mixing techniques throughout a venue or site, but in the very early stages of this technology Cadac integrated the gesture control aspects of iOS screens into its comprehensive rethink of the console operating system itself, specifically in the CDC Eight and CDC Six consoles.

The rationale behind this was to exploit the advantages of gesture control in the console user interface while avoiding the two main limitations of the tablet: the reduced surface; and the questionable reliability of data via consumer electronics. At the same time, with the CDC Eight coming to market a year after the launch of the iPad, people were ready for this new interface concept. The question that remains is how far it will challenge the fader: the fundamental hardware controller that haptic technology cannot match in physical sensation and the muscle memory engrained in the hands of engineers engaged in split-second decisions

"I believe tablet mixing is something we are embracing directly with our innovative, large - 23.5" - touchscreens around which our interface is based," Fletcher confirms, "including our sweep gesture for scrolling through channels and other parameters. In fact, our interface is heavily based around touch control via the screen, in combination with the encoders next to the screen. We have many more ideas in the pipeline and will be adding to these features in future releases. We also have the imminent release of our iPad software, to allow remote control of all our current consoles."

Clearly, as it adjusts to new market realities and new working methods, Cadac is pushing all the right buttons. The next cue awaits . . .

"Rather than concentrating on theatre in particular, we've developed a range of consoles for any live sound application," concludes Fletcher. "They all come with a 64x64 Waves SoundGrid interface card as standard, which goes down well with all types of live sound engineer. At the same time there is that specific something that people recognise about Cadac, whether it's from its recording studio origins, or its days as the default theatre console - or even the occasional live tour that could afford a J-Type on the roster - the sound quality. The Cadac was always the best sounding console, period. It's that historic position that we have re-established with a next generation user-interface, digital design. We have married the easiest operating system ever, on a digital console, with what people are telling us is an even better iteration of the classic Cadac sound."

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