

dCS Varèse

First seen at the UK Hi-Fi Show *Live* in 2024, dCS's multi-component Varèse streaming solution aims to pitch digital audio into another league. Has it succeeded? You bet...

Review: **Andrew Everard & Paul Miller** Lab: **Paul Miller**

The French/American composer Edgard Varèse, from whom this latest dCS digital product takes its name, described his music as 'organised sound', challenging reactionary critics who likened his compositions to 'no more than noise' by saying 'what is music but organised noises?'.

Well, clearly dCS feels those noises need quite a bit of organising, for its latest digital music front-end comprises no fewer than five units, for a total price of £217,500, and a further 'box', an SACD/CD transport, to come this year to swell the stack again. Somewhat understandably, the company says the Varèse set-up will only be made in limited quantities.

STANDING ORDER

Five boxes, just to perform the functions of network playback and DAC? We're a long way from the familiar idea of a conventional digital-to-analogue converter

here, and indeed from models such as the company's Bartók, Rossini and Vivaldi [*HFN* Apr '23, Sep '19 and Jun '22], the last of which, as the Vivaldi One, has been the digital workhorse of the *HFN* reference system, latterly in its upgraded APEX form, for a very long time. So, what's going on with this new

'Music System', occupying an entire rack at the back of the room [p39]? And indeed, where do we start?

Well, the Varèse system comprises a User Interface – the unit with the colour, touch-sensitive display – at £20,000; the £75,000 Core, which does all the heavy (DSP) lifting; a pair of Mono DACs at £90,000; and a separate Master Clock, adding £32,500 to the bill. And if all those boxes suggest a nightmare of cabling and fault-finding when hooking it all up, dCS's designers have that sorted: a unified 'bus'

'Hooking up this complex system is, in practice, blessedly simple'

system links everything together in a single run of cables from unit to unit.

Called ACTUS (Audio Control & Timing Unified System), this feeds out from the Core to the other components via custom cables using multipin connectors supporting six twisted pairs of copper cable. These carry asynchronous and error-corrected audio signals, control data and that master clock signal, sent via the new dCS Tomix protocol introduced with the Varèse stack, of which more later. In

purely practical terms, connecting up this potentially fiendish and complex system is actually blessedly simple.

MASTER OF CEREMONIES

At the heart of the Varèse – and the largest of these solid alloy enclosures, all with eye-catching, sculpted fascias – is the Core. The other components meet here via eight of those multicore connectors on its rear panel, and it handles most of the signal processing for the whole system before the data is output to the Varèse's two Mono DACs. In addition, the Core has a USB-A input for external drives, plus an Ethernet connection for access to streaming services and music on local storage. The platform will also support extra modules via three internal slots [see pic, p47]. The initial expansion module is expected in the first quarter of 2025 and will include three AES inputs, a USB-B computer port plus Word clock and S/PDIF outputs, and RS232 and 12V system triggers.

Next up is the User Interface, which provides access to the setup and operation of the Varèse system as well as that huge display, which has touchscreen operation.

LEFT: The Varèse's 'Tomix' Master Clock system is based around two OCXOs (Oven-Controlled Crystal Oscillators) centred on 88.2kHz and 96kHz [far right], a Xilinx Artix 7 DSP [centre] and PSUs headed up by two Traco Power isolated AC/DC converters



STREAMER/DAC

VARÈSE UNWRAPPED

Pictured right, the Varèse Core is the largest component in the system – all the calls between the boxes are integrated here, and the Core will also generate the system clock if dCS's external Varèse Master Clock is not connected. As the system hub, the Core is home to all the 'core' upsampling, the primary digital filtering and a good deal of the modulation (the truncation and the noise-shaping), but *not* the bit mapping as this happens on a dynamic basis within the latest Ring DACs. More about this later...

Between the Core and Mono DACs, dCS's proprietary ACTUS link sends the high speed noise-shaped data stream, the clock and control lines. dCS's own Tomix clock system employs two Oven-Controlled Crystal Oscillators (OCXO) at 88.2kHz and 96kHz, respectively, with its onboard FPGA calculating an absolute time stamp and embedding its own clock in all inter-box data streams without inviting any data-related jitter.

RINGING THE CHANGES

Within each Mono DAC, the summing, gain and output stages are all based on those seen in the Vivaldi APEX [HFN Jun '22]. The summing and primary filtering stage is op-amp based (a cascade of Linear Technology and National ICs), optimising both input and output parameters, and it's here that the 0.2V, 0.6V, 2V and 6V gain options are set. Some final analogue filtering also acts above 150kHz to ensure any residual stopband artefacts are gently polished off.

Before all this comes the Ring DAC stage itself, and although the resistor matrix and latches are unchanged both are now arranged as 2x48 current source rings – a pair of Ring DACs within each Mono DAC – running in differential mode with all the potential for reduced noise, even-order distortion, etc, this implies. For the APEX update, dCS paid particular attention to the latches that address the matrix, tightening up the clocking and reducing the source impedance of the reference PSU, resulting in a measurable reduction in low-level phase noise. However, the current drawn from the reference supply was still signal dependent, and a possible source of correlated ripple – this now avoided by the Varèse's differential mode which ensures the current flow is now signal independent. There's also more attention paid to the very high frequency matrix switching 'noise' – particularly important with the M1 and M3 mapping options which run at twice the rate of the legacy M2 mapper.

DECODING THE MATRIX

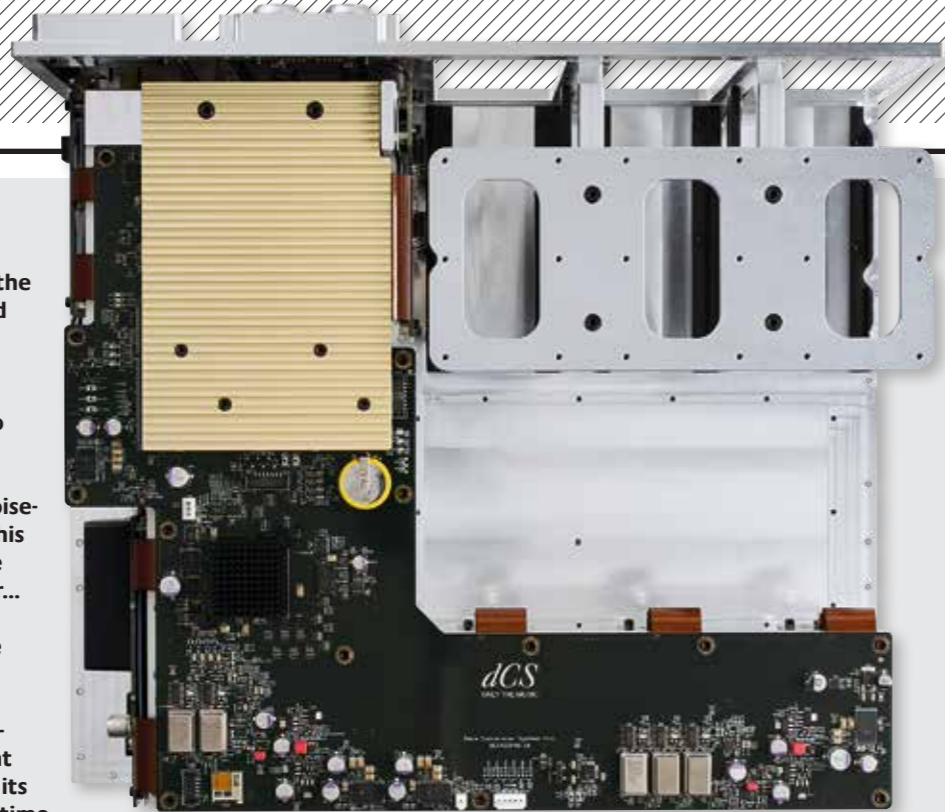
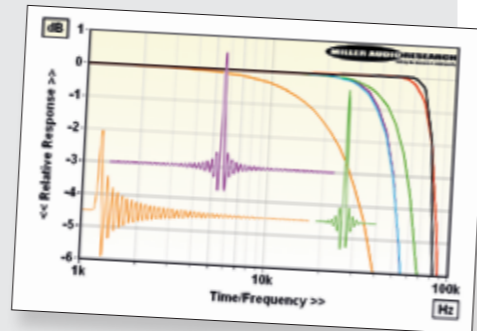
To understand why the mapping of data to the matrix is key to the Varèse's *sound*, we need to remind ourselves how the Ring DAC works. The Varèse Core truncates incoming LPCM data (and converts DSD) to an average wordlength of 4.6 bits and these 24 (or 2^{4.6}) possible values are then mapped across 48 notionally identical current sources that comprise the Ring DAC. This matrix of resistor elements is visible in the Mono DAC's lid-off shot [page opposite], as are the fully balanced, APEX-derived analogue output stages.

For the Ring DAC to be truly monotonic – like a pure 1-bit DSD DAC – these 48 separate current sources would need to be absolutely identical in size, which they are not, so dCS 'randomises' the mapping of bits to these elements. Fixed digital errors, otherwise realised as harmonic distortions, are thus traded for an inaudible increase in noise.

In practice, this sample-by-sample selection across the matrix is not truly random but is a choice based on the historical and current data flow. This is *dynamic* because any mismatch between current sources – including thermal or age-related drift – remains the enemy of monotonicity.

F-F-FILTERS

dCS's adaptive digital filters, F1 to F6, are retained in the Varèse [Inset Graph: F1, black; F2, red; F3, cyan; F4, green; F5, orange; and F6, purple]. For lower 44.1kHz-192kHz rates, F1-F4 are linear phase for all sample rates and offer responses of -22dB/45kHz (but flat to 40kHz), -0.6dB/45kHz, -12dB/34kHz and -10.5dB/45kHz, respectively, with 96kHz media and -13dB/90kHz, -7.0dB/90kHz, -14dB/68kHz and -17.6dB/90kHz [black, red, cyan and green traces], respectively, with 192kHz files. F5 is the outlier here – a fast minimum-phase filter [orange traces] – that rolls away early to -1.5dB/20kHz and -14dB/60kHz media. F6 is a fast apodising/linear phase type [purple traces] with very extended ringing but a full >125dB stopband rejection and responses that match F5 at ±0.02dB/20kHz, and -3.9dB/45kHz (flat to 43kHz) with 48kHz and 96kHz files, respectively, and F3 at 192kHz where they both roll away to -14dB/60kHz. PM



LEFT: Inside the Varèse Mono DAC with dual PSUs [left] powering the Xilinx DSP [heatsink], Ring DAC's differential matrix of 2x48 resistor current sources [centre right], and mixed op-amp based analogue output stage [top right]

all this together is dCS's Tomix clocking technology, synchronising the timing within both left and right mono DACs.

The Varèse will play music from UPnP sources such as NAS drives, as well as streaming services including Qobuz, Spotify and Tidal Connect. These can be accessed via dCS's new Mosaic ACTUS app, which also introduces plenty of setup flexibility [see boxout, below]. You can go deep into the operation of the Varèse system, or just use it as is, when it demonstrates dCS's intention to create an ultra-high-end player system that's simple to use.

Firmware updates are delivered 'over the air' via the Core's Ethernet port and, while the review process was underway, the Varèse became Roon Ready, allowing yet another way to operate it – choose between touchscreen, remote handset, app and now Roon.

VANISHING ACT

Connected to the Constellation/Wilson Audio Alex V SP reference system in the HFN listening room, the Varèse immediately created an impression of – well, nothing. Never have we known a set-up so capable of dispelling any thoughts of music being played through a hi-fi system, to the extent that it's impossible to drill down and analyse exactly what this five-box front-end is doing so well.

Even with a familiar and much-used test-track such as Lake Street Dive's take on the Jackson 5 hit 'I Want You Back', from the band's *Machine EP* [Signature ↗]

A Bluetooth antenna connects to the ring-shaped, rechargeable remote handset [p47], and the User Interface also provides access to AirPlay and Google Cast services. However, this unit is very simple when it comes to connectivity: aside from that antenna, there's just a single ACTUS data socket on its rear panel.

The Master Clock is similarly elegant in implementation. It's designed to work with the Core and the Mono DACs to deliver increased performance, by providing an ultra-low jitter reference to which the Varèse system synchronises and connects to the Core via another ACTUS cable and a dedicated 'clock socket'. Again, the ACTUS port is the only connection on the Master

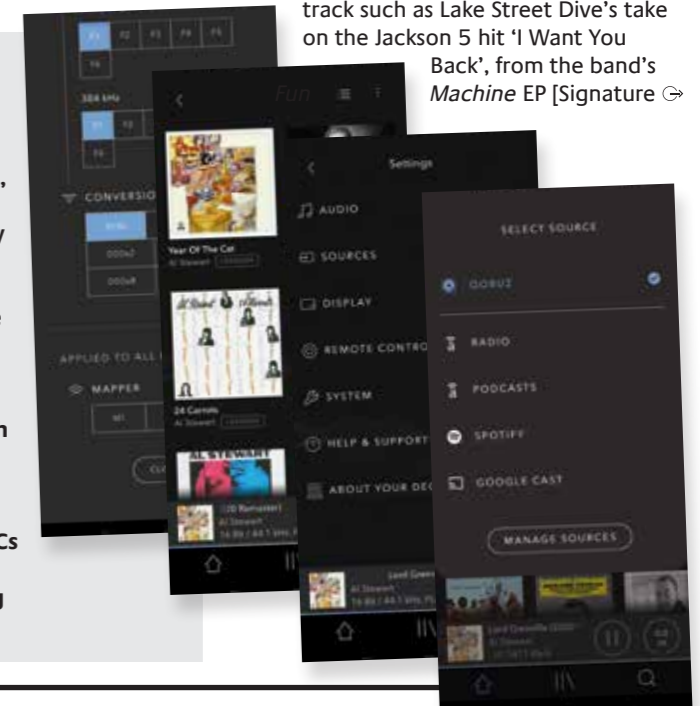
Clock, aside from the IEC mains input found on all the Varèse units, and like the other components there's a button under the front edge for on/standby functions.

TWO'S COMPANY

The Mono DACs, while unusual in themselves, are the most recognisable components in terms of connectivity. Yes, the only inputs are a single ACTUS socket on each DAC, but at least the outputs are standard RCAs and XLRs – two of each on each DAC, which arrive pre-designated as left and right units. Within each unit is the latest iteration of dCS's Ring DAC technology, now named Differential Ring DAC [see 'Varèse Unwrapped', left]. Holding

MOSAIC ACTUS

It's possible to handle the Varèse's basics using the remote handset [p47], or by tackling the navigation unit's touchscreen, but by far the most convenient point of access is the Mosaic ACTUS app. The dCS Mosaic app has been with us for some years, but this new ACTUS iteration has been refined, extended and reimaged in tune with the Varèse's concept of ultimate quality combined with ease of use. As well as providing a playback interface, the Mosaic ACTUS app lets you dive deep into the Varèse's settings, starting with simple attributes such as the line output level, display brightness, power management and hiding or showing input sources, as well as letting you find and index UPnP libraries. Go deeper and you can choose optimised signal paths for DSD and PCM content, opt for dCS's own favoured path or even set up your own, and select from a range of filters for PCM and DSD content. Further options are also available for the Varèse's PCM-to-DSD upconversion, and you can even adjust the 'mapping', which governs how data is presented to the Ring DACs [see PM's discussion, left]. And to stop others fiddling with your meticulous setup, you can lock all these system settings, limiting access to music control, volume, and power.



STREAMER/DAC

RIGHT: So much tidier than the original Vivaldi stack [HFV Feb '13]! The User Interface [top] connects via BT to the remote [p47] and via an ACTUS umbilical to the Master Clock [below]. The Core [bottom] hosts USB-A and wired Ethernet (no Wi-Fi) inputs, with ACTUS outputs to the Mono DACs [above]. The Mono DACs each have dual analogue outs on XLRs and RCAs

Sounds SIG 2048], the impression was simply one of 'rightness'. Everything sounded as it should, from the presence of the musicians to the sting of cymbals and the breath in Mike Olson's trumpet, to the resonance of Bridget Kearney's upright bass and, of course, the soulful vocals of Rachael Price, so palpably solid despite being carved in nothing but air. There was absolute focus to the sound of this stunningly unadorned recording, and the performers were just there, with not a hint of colouration being introduced.

FANTASTIQUE SOUNDS

After just that one track, it would be possible to identify what this new dCS digital system achieves: in plain terms, it makes everything else, analogue or digital, sound just a bit fake, in that you can tell what the electronics are doing. There's a lot more going on in this five-box system than any other digital front-end you could name, but it's all completely inaudible. Yes, you could play around with the signal path and digital processing options on offer – you've spent all that money on them, so why not? – but the effects will be minimal by comparison with the essential impact of what the Varèse presents.

It doesn't take long for one's analytical faculties to be put to one side as something akin to a sense of wonder sets in. Playing the Cleveland Orchestra/Welser-Möst recording of Berlioz's *Symphonie Fantastique* [Orchestra's own label, TCO0013D, 96kHz/24-bit], any thoughts of this being a test warhorse, judging its performance by comparison with others, were soon dispelled. Instead, the attention was on the convincing picture being created of the orchestra in a concert hall.

Even in the opening movement there was such powerful weight in the low strings, and so strong a feeling of the air being energised by the soundwaves, that we were instantly captivated. The strings were entirely fluid, with both rosin bite and that effortless glide, just as the woodwinds were magnificent and the brass startling thanks to the Varèse's speed and attack. And that soundstage! The soft rumble of the timpani was clear and ominous, and the drama of the music wonderfully conjured – but above all the



whole thing was just totally effortless, the music flowing unhindered.

Reading dCS's press information while listening to the Varèse stack saw another piece of this five-piece jigsaw falling into place. Yes, the intention of the designers was to create a high-end digital playback system that was as simple and intuitive as possible to operate, but this set-up goes further in that it's so damn easy to *listen* to. Nothing about the sound catches the attention, or makes you wonder whether an element could be handled just that little bit better, or even differently.

Instead, the focus is thrown entirely on the performance and the recording, which is absolutely as it should be.

FEELING FRESH

With the Varèse, it'd be so easy to fall into the old clichés about veils being lifted, windows cleaned, and doors opened, but instead the pleasure of listening to it is to do with losing yourself in the music. The 35th anniversary release of Eric Clapton's *Slowhand* album [Polydor 0600753407202] came up fresh right from the opening chords of his cover of ↻

LAB REPORT

DCS VARÈSE

Comparisons with the Vivaldi APEX [HFN Jun '22] show small, but measurable, increments in performance linked to the Ring DAC's new differential operation. For example, the 5.88V maximum output (6V mode) has not changed, nor has the sub-1ohm balanced source impedance, but distortion through bass and midrange has witnessed a reduction in 2nd harmonic from 0.00004 to 0.00003% over the top 10dB of the Varèse's dynamic range [see Graph 1, below, and note the shifted 0dB to -140dB Y scale]. Such figures are of technical interest only, of course, while the 20kHz figure remains unchanged at 0.0001% as this is a function of the final analogue output buffer and not a digital non-linearity. However, the Varèse's balanced Ring DAC has delivered a 1dB uplift in A-wtd S/N ratio from 117.1dB to 118.1dB while low-level resolution is now good to ± 0.2 dB at -120dB. Again, this is all reflective of a state-of-the-art DAC.

The Vivaldi APEX's elimination of random jitter/phase noise exposed an increase in correlated jitter of 120psec (48kHz/24-bit data), so it's gratifying to report the Varèse having its cake and eating it – the phase noise remains banished while the Vivaldi's ± 5 Hz, ± 7 Hz, ± 9 Hz, etc, sidebands are fully suppressed by this differential Ring DAC. A mere ~ 5 psec of jitter remains at ± 1.95 kHz and ± 100 Hz (PSU) over all sample rates [see Graph 2, below]. The frequency response(s), stopband rejection and time domain behaviour all depend on your choice of dCS's six custom digital filters though, as a rule, the linear phase F2 filter offers the flattest responses, out to ± 0.00 dB/20kHz, -0.62 dB/45kHz and -7.0 dB/90kHz with 48kHz, 96kHz and 192kHz media, respectively, at the expense of the poorest (-3.7 dB) image rejection. All filters passed the intersample clipping test. PM



ABOVE: Inside the machined alloy case of the Varèse Core showing the (screened) main PSU and USB-A/Ethernet digital inputs [far right] with ruggedised bays [near left] waiting for the optional digital I/O expansion modules to be fitted

'Cocaine', the guitar and vocals so characterful as they occupied their space in the soundstage. Later on in the set, the goodtime bounce of 'Lay Down Sally' simply boogied into the room, those backing vocals by Marcy Levy and Yvonne Elliman bell-like and oh-so crisp. The depth of texture in what are relatively simple mixes was just spectacular.

'I SHOULD HAVE LISTENED...'

Stepping things up in scale with the 'Funeral For A Friend/Love Lies Bleeding' sequence from Elton John's *Goodbye Yellow Brick Road* [40th anniversary remaster, Mercury/Universal 375 858-9], and the intensity of the sonic picture the Varèse stack created was such that the effect was room-filling, almost surround-like.

The ARP synthesiser growled and flew high, and the classic Elton John band – Dee Murray on bass, Davey Johnstone on guitar and especially the punchy, weighty drums of Nigel Olsson – drove things hard, as vibrant as when they were recorded all those years ago. Yes,

times and some attitudes have changed, but the sound throughout this set is sensational thanks to Gus Dudgeon's original production and Bob Ludwig's remastering – and the Varèse system unleashed all this wonderfulness into the room.

THE STUFF OF DREAMS

The superbly recorded jazz of the Tord Gustavsen Quartet's 2012 *The Well* album, one of those characteristically fine ECM releases [ECM 2237], tingled the spine again

with the finesse of its presentation. Gustavsen's piano could have been in the room, focused and dynamic against the swish of Jarle Vespestad's cymbals and the gentle

interjections of Mats Eilertsen's bass. The building of presence and ambience, supporting truly 3D soundstaging, gripped the attention in the manner of an intimate live performance. It's all delicious stuff... albeit the stuff of dreams. ☺

“Lay Down Sally” simply boogied into the room’

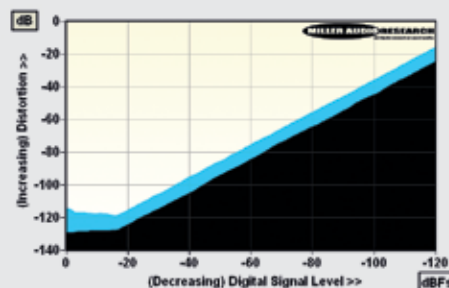


ABOVE: Spin the Varèse remote's centre rotary for volume. Touch-sensitive glass screen around the edge offers pause, play, skip and mute via a finger tap

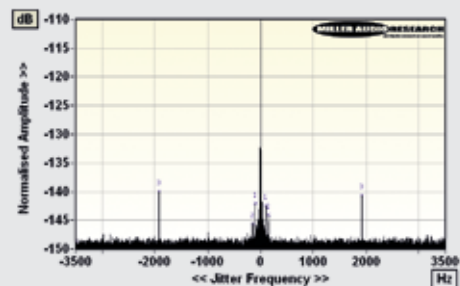
HI-FI NEWS VERDICT

A towering stack, a lofty price – and a monumental achievement: the Varèse does that rare thing of setting new standards and making all that has gone before sound – well, a little broken. The immediacy of the sound, and the way it steps aside to let the music flow, is nothing short of remarkable. You should hear it in action, but prepare to be disappointed in your own system. Sometimes life's like that.

Sound Quality: 94%



ABOVE: Distortion versus 48kHz/24-bit digital signal level over a 120dB range (black, 1kHz; blue, 20kHz)



ABOVE: High resolution jitter spectrum (48kHz/24-bit data, via USB-A port). Very minor sidebands only

HI-FI NEWS SPECIFICATIONS

Maximum output level / Impedance	5.88Vrms / 550mohm (XLR)
A-wtd S/N ratio (USB-A, re. 0dBFS)	118.1dB
Distortion (1kHz, 0dBFS/-30dBFS)	0.00003% / 0.0001%
Distortion & Noise (20kHz, 0dBFS/-30dBFS)	0.0003% / 0.0003%
Freq. resp. (20Hz-20kHz/45kHz/90kHz)	+0.0 to -0.0dB/-0.6dB/-7.1dB
Digital jitter (48kHz / 96kHz / 192kHz)	5psec / 5psec / 2psec
Resolution (1kHz @ -100dBFS/-110dBFS)	± 0.1 dB / ± 0.1 dB
Power consumption	110W (2W standby)
Dimensions (WHD) / Weight (Total)	444x768x450mm / 101kg