The increase in demand for digital-to-analogue converters has been meteoric, boosted by the growth in computer audio, media servers and streamers, and the increasing need for digital files to be handled with sonic care.

USB DACs have led the charge, offering significant sonic gains from computer-controlled audio sources via their now ubiquitous asynchronous USB inputs. Today's DACs typically offer a wide array of digital inputs, and the ability to handle the full spectrum of digital files — from lossy MP3s to high-end DSD.

I've been using Musical Fidelity's talented M1 DAC for SPDIF and USB-transferred media files ever since I reviewed it almost two years ago now. It's a DAC that punches well above its weight, with a sober, sleek and unadorned conversion approach that neither adds nor subtracts, but makes full use of what the signal has to offer.

In short, it's an honest device, perfect for its role as a reviewing reference role. The M1 uses a pair of Burr-Brown DSD1796 DAC chips in a dual-differential, 24-bit Delta-Sigma configuration that upsamples all incoming data to 192 kHz/24-bit before converting the data stream to analogue audio.

The new PS Audio PerfectWave DirectStream is an altogether more complex, and technically intriguing design. It converts all incoming data to Direct Stream Digital, or DSD — more commonly known as the high-res format employed to create Super Audio CDs.

Instead of the usual OEM chipsets, the DirectStream uses a custom-coded field-programmable gate array (FPGA). The code is the work of former Microsoft engineer Ted Smith, who consults for the PS Audio team on the DirectStream project. It was Smith's original, own-built DAC utilising this configuration that started the DirectStream ball rolling back in 2011.

The core focus of his conversion methodology is jitter reduction. In simple terms, effectively addressing jitter prevents distortion and improves sound quality. It also means that aspects such as the quality of the incoming data, and the cables used to transfer that data, become less critical than in conventional designs.
Smith’s conversion path employs a single master clock design that upsamples all incoming data to 30-bit/28,224 MHz — or 10 times standard DSD — before data processing commences. The signal is then downconverted to double DSD (5,6 MHz) for noise shaping.

A digital volume control adds 20 bits to the data’s 30-bit word length, for a 50-bit data stream in the interests of signal precision without any need for rounding, dither or trimming. An extra bit is added to prevent PCM saturation while providing additional headroom.

Delta-sigma modulation returns the digital signal to single-bit DSD, but still using the double DSD 5,6 MHz sampling rate. Finally, the output stage comprises high-speed video op amps, chosen for their rapid switching capability, and a custom-made high-bandwidth audio transformer, which provides both galvanic isolation and passive low-pass filtering.

There’s a lot more technical intricacy to the design and its execution, outlined in detail in the DirectStream’s product description section on the PS Audio website (www.psaudio.com/directstream-dac) and in the product manual, on offer in the website’s download section.

In typical PS Audio fashion, the Direct Stream is attractively crafted, with an all-metal casing (offered in black or silver), and a black lacquer-finished MDF top plate. The front panel is dominated by a 95 x 55 mm colour touchscreen display. The PS Audio logo on the left lights up on switch-on, but also acts as a standby mode selector.

The rear panel offers the expected digital inputs: AES/EBU, SPDIF coaxial and Toslink, and asynchronous USB Type B. More unusual is the presence of two I2S inputs, which allow the direct use of single or double-rate DSD data streams, thus overcoming the 24-bit/192 kHz limitation of coaxial SPDIF and AES/EBU.

The problem with the I2S interface, which uses HDMI cables (but is not compatible with HDMI Audio) is that it’s not widely adopted. PS Audio’s own PerfectWave transport and NuWave phono converter are among those, but most current ancillaries don’t.

Personally, I’d have liked at least one more coaxial and/or AES/EBU input, arguably at the expense of the Toslink optical (which is limited to 24-bit/96 kHz anyway), and even one of the I2S sockets.

Also available is a network bridge, which slides into a rear receptacle much like a computer card, and adds network media server capability to the DirectStream. It adds an Ethernet connector to the rear panel, and is compliant with UPnP controllers, allowing access to NAS-based music libraries on home networks via a player such as JRiver Media Centre, for instance. I didn’t review this aspect, although it’s a promising addition to the DAC’s list of talents.

One more aspect worth noting before I get onto the actual review: because

**VITAL STATS**

<table>
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<tr>
<th>Description</th>
<th>Specification</th>
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<tr>
<td>Digital conversion</td>
<td>Delta Sigma (DSD) single-bit, double rate</td>
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<td>Frequency response</td>
<td>20 Hz – 20 kHz (± 0,25 dB)</td>
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<td>Digital inputs</td>
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<td>Analogue outputs</td>
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<td>Dimensions (WxDxH)</td>
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<td>Weight</td>
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**PRICE** .................................................. R75 000

**VERDICT**

A vibrant, powerful, compelling sound that challenges the mind and touches your soul. No other DAC I’ve heard sounds quite as lifelike. A new benchmark — and still improving.

**SUPPLIED BY**

<table>
<thead>
<tr>
<th>Company</th>
<th>Contact Details</th>
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<tbody>
<tr>
<td>PL Computers</td>
<td>082 578-5708</td>
</tr>
<tr>
<td><a href="mailto:paul@plcomputers.co.za">paul@plcomputers.co.za</a></td>
<td></td>
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<tr>
<td><a href="http://www.psaudio.com">www.psaudio.com</a></td>
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**OUR RATING:** 93 / 100

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the vast differences between PCM and DSD you’d usually notice when comparing CD to SACD on a universal deck were not nearly as marked with the DirectStream in charge — because it made those PCM files sound so much better.
the DirectStream employs a FPGA rather than OEM DAC chips, it can accept firmware updates, which suggests that its sonic capabilities can be upgraded as new coding and algorithms become available.

This was demonstrated to jaw-dropping effect towards the end of my review period when new firmware was released, immediately ramping up the already impressive sound quality of the DirectStream by a further few, significant notches.

My listening notes instantly became obsolete, and therefore, what follows is based on firmware version 1.2.1, and not 1.1.9, the version I downloaded and installed on receipt of the machine.

Even so, it’s worth noting that, even before the most recent firmware update, with 1.1.9 still installed, the DirectStream’s delivery was instantly compelling. There was something so lucid, so inviting about the DAC’s performance that it took me completely by surprise.

Frankly, I’d expected a good DAC, yes — and one that seemed to offer some key capabilities, including accepting DSD data streams. But while I’ve become used to DACs that sound precise, clean and even analytical, the DirectStream sounded smooth, musical and somehow more forthcoming of coherently presented detail.

I was particularly enamoured by the PS Audio’s grasp of the music’s essence. There was a realness, an authenticity to its sound that was more music than hi-fi. I hesitate to use the word organic, for fear of being fed lentils and wholegrain bread for the rest of my life, but that’s what the DirectStream’s sound reminded me of.

And then, firmware update 1.2.1 came along — and what had been an excellent and endearing DAC became an exceptional one. Firmware updates are typically intended to address shortcomings not previously identified, or perhaps to add new features. But this update really put the cat among the musical pigeons.

The most obvious, and most important differences were a further opening up of the soundstage linked to even closer attention to fine detail, and even more holographic imaging. Simultaneously, bottom end extension and control improved to such an extent that the system took on a completely different, more authoritative character.

So, the listening notes that follow are based on this latest firmware version (at the time of writing) but it also highlights PS Audio’s ongoing ability to tweak and improve the DirectStream’s performance.

I listened to the DirectStream using both its USB and coaxial inputs, the latter via Musical Fidelity’s V-Link 192 USB-to-coaxial converter, and while the coaxial interface sounded fantastic, the USB link-up was marginally better — slightly airier, with slightly faster attack.

Most of the source material consisted of WAV and FLAC files of varying resolution, but I also played some DSD128 DSF files using the DSD-over-PCM method provided for by Audirvana.

I have to say that the results were uniformly excellent, even from plain old 44,1 kHz/16-bit Red Book WAV files. Yes, DSD source material typically sounded crisper and better dimensioned, but that could well just be because they were recorded with greater care.

Still, the vast differences between PCM and DSD you’d usually notice when comparing CD to SACD on a universal deck were not nearly as marked with the DirectStream in charge — because it made those PCM files sound so much better.

On Arno Carstens’ latest (and to my mind best) release, Lightning Prevails,
‘Bubblegum On My Boots’ is a powerful recording with a close-miked guitar, focussed vocals and airy strings. The DirectStream snapped everything into fine, clear focus, opening up the soundstage and allowing every nuance to come to the fore. The guitar's lower registers were almost palpable, and Carstens’ vocals were rendered with uncanny presence. Vitally, the DirectStream never lost sight of the overall performance, presenting the music with thrilling coherence, timing and pace.

I’m not one for electronic dance music, but somehow, Daft Punk’s Random Access Memories is addictive — and it sounds pretty good, too! ‘The Game Of Love’ features the kind of deep, dark bass that can be overwhelming, but the DirectStream wasn’t in the least intimidated, delivering the substantial bottom end with real control and authority. The percussion, presented with slam and perfect pace, dominated the expansive, inviting soundstage that seemed to almost wrap itself around the listening position. What can sound ponderous and heavy on other systems was delivered with impact and confidence, while the upper-end detailing emphasised the space and air of the sound.

Leonard Cohen’s magnificent new release, Popular Problems has been spending a lot of time on my home and office systems, but his earlier Ten New Songs has long been a firm favourite of mine — not only because of its lyrical richness, but also because the bass-biased sound demands a system with unusual bottom-end resolution and control. ‘A Thousand Kisses Deep’ links a typical, Cohen-esque seductive shuffle to the kind of bass line that can rattle windows and disembowel small animals. I don’t think I’ve ever heard the V1.5s reach down so low, and yet sound so controlled — it sounded (and felt) as if someone had swapped them out for the bigger B1s. But the DirectStream didn’t allow that rich, saturated bass to run amok: it was delivered with authority and ample control, allowing Cohen’s gravelly vocals (and the delicate sheen of co-star Sharon Robinson’s voice) to soar high above this solidly rendered foundation.

More importantly, it revealed details and subtleties I hadn’t noticed as individual elements before: the shy emergence of a cello from the depths of the music, the gentle embellishments of guitar, and the strings presented as little more than a soft sigh on the fringes of the soundstage. I was spellbound!

For a bit more complexity and scale, I turned to the Günter Wand/NDR recording of Beethoven’s Symphony No.7 on SACD. It sounded suitably majestic, with powerful dynamics and a convincing sense of scale and presence.

The DirectStream really allowed the music to flex its muscles, while doing full justice to the verve and charisma of the recording. The sweeping, symphonic vistas were rendered with spectacular space and air, while retaining the subtleties and the finely embroidered nuances of the music.

The PS Audio DirectStream is a musically authentic, thoroughly engaging and ultimately compelling DAC that elevates the listening experience to an entirely new level. Its treatment of any digital material, regardless of format, is quite astounding — even MP3s and Internet radio sounded vibrant and exciting. Its talent for clarity and resolution allows access to the full spectrum of information, yet never loses sight of the underlying emotion and musicality. Thus, the final result sounds more like real music than anything I’ve heard in this product category, regardless of price. That alone means it sets a new benchmark in my books — which is why the review sample won’t be leaving my equipment rack anytime soon.

Deon Schoeman