

Introduction to Audiophile computers, disc players, and streamers

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Many audiophiles today are very leery about a foray into “computer audio.” They are either long-time analog enthusiasts (especially the older ones), or they have for quite some time come to rely on a rather expensive disc player. At audiophile shows we often see someone walk in and ask to play a particular CD or SACD. But, first ripping the disc to a hard drive is something that is not to be done, because computers “do bad things to discs” – an actual quote from someone at a show.

At the same time, many audiophiles with a good quality disc player are interested in something they call “streaming”, although they are not quite sure what that means. They are interested in the “ease of use” of streaming. Many of these folks think of streaming as “requiring a computer”, and they are often not interested at all in what a good quality audiophile computer can do, and how, indeed, it can potentially make their audio system sound better than any other music delivery system.

We think what is missing is a clear picture of how digital music exists after it is “mastered”, and what are the many choices involved in how to get some semblance of the Master file into the DAC portion of the user’s player or, best, into a new generation, separate DAC (digital to analog converter).

First and foremost, many audiophiles have no idea that, today, almost all music is mastered to a **computer file**, and this has been going on for a long time. This computer file resides in computers at the home office of the media company – Sony, Deutsche Gramophone, Linn, Channel Classics, and the many other companies that manufacture the finest discs out there. What the user needs is a fuller understanding of all the ways the original computer file can make it to the DAC section of the player, or make it to a modern, stand-alone DAC – a process that is absolutely critical to hearing the very best digital audio. We find it easiest to break down the process into the following major 4 STEPs (and show each of the choices involved in accomplishing the 4 steps) –

- Making the computer file
- Acquiring the computer file (for the consumer), which is the same issue as how to distribute the computer file to the customer (if you are the media company).
- Storing the computer file (for the consumer)
- Playing the computer file

To be clear, PLAYING the computer file in our taxonomy is simply sending some stream of computer file information to the DAC. So, by “playing”, we mean that the process includes, but is by no means limited to, nothing more sophisticated than the turntable in a CD player. But, this seemingly simple process can be done in a variety of ways and can result in a very dramatic difference in the quality of the analog output that comes from a given make and model of DAC. The player can be something with many names – disc player, server, streamer, computer – and ever more marketable names that serve mainly to confuse the user.

1. MAKING the master computer file (the album of tracks). We won't analyze this process at all, but simply note that the overwhelming majority (way more than 95%) of master computer files actually have file extensions of < dotWAV>. WAV is synonymous with PCM, which is one of the two types of native computer file for audio. The other native audio type is DSD (Direct Stream Digital). Most of these master audio computer files in DSD format, however, were originally a WAV file, and have been substantially compressed into a much more manageable DSD file whose file extension is <.DSF> or <.DFF>. Yes, there are some master computer files that were indeed mastered in DSD, but their numbers each year are small in relation to not only the stock of old PCM albums but also the flow of new PCM master computer files. We have no preference for whether the master computer file should be PCM or DSD. There are good and bad master computer files using either format.

We also note that over the more than 3 decades of digital audio mastering, there have arisen several forms of special encoding for the music computer file. As just one example, special encoding is found in HDCDs, which have almost disappeared, partly because only a couple of DAC manufacturing companies now have the rights to decode HDCDs. The basic file extension for this music, however, still is dotWAV...it is a PCM file.

Also, WAV files, which are uncompressed, are often converted (or "transcoded") to compressed files, with names such as FLAC, MP3, ALAC, etc. And some of these compressed files are said to be "lossless" – when played there is, theoretically, no loss of quality.

In short, although today's older generation might think that "computers are a bad thing", he or she has been listening to computer files for more than 3 decades. And on "CD Players" that might cost well in excess of \$25k.

Please note that the CD being played on the expensive CD player does NOT contain the WAV master computer file but rather another computer file whose "file extension" (i.e., its type of computer file) is <.CDA>. This type of computer file is meant to be played only via a spinning CD. You can copy the CDA file to your computer but, to use an example, JRiver Media Center (media software) cannot play the CDA file unless it is being played from the CD itself. In effect, the master computer file is transcoded to CDA and placed on the CD (a process called "burning"). There are problems with playing the associated CDA file via a CD turntable that we will discuss later.

2. How the computer file is ACQUIRED by the consumer. In the minds of the media creator, they tend not to think about STORAGE, per se, but rather how to deliver ("distribute") the computer file to the user. The user, in turn, must think about how to ACQUIRE the computer file and whether, and if so how, to STORE the computer file locally in his own home.

For over 3 decades, the distribution process to the consumer was synonymous with how the consumer STORED the computer files. That is, the media company "burned" the computer files to Compact Disc ("CD") and physically delivered this disc to the user, first via retail music stores, then online CD sales. The user kept huge racks of these CDs in a room in his house and, often laboriously looked at thousands of jewel-case album

covers to decide which album he wished to listen to right now. Same thing with SACDs, whose native format is DSD. Same thing with Blu-ray discs, which, for music videos, typically use specially encoded forms of PCM – such as DTS HD Master™, and Dolby Digital TrueHD™.

The consumer, meanwhile, never really thought about the QUALITY of these discs, either with respect to how they might compare to the master computer file, or how they were delivered to his doorstep, or even that the disc itself was a form of personal STORAGE and not the best form of storage.

It is unfortunately a fact that today's audiophiles are very confused about what it means to Play the computer file and, in turn, do not fully understand how to Store the computer file, if at all, before playing it. Many new terms of art have arisen, such as streaming, downloading, audio by wifi, integrated amplification (with what we call Players, DACs, pre-amps, and amps all in the same box...or even within another box called a Speaker), and new terms of art are being invented for marketing reasons at an alarming rate. In fact, we view a "computer" as any box that might do any of the 3 actions (out of our total of 4) that are determined by the consumer himself. That is, for purposes of this taxonomy, we look at everything from the point of view of the CONSUMER's 3 necessary functions – ACQUIRING the computer file, STORING what is sent to him, and PLAYING the computer file.

So, let's talk first about the most common way for the audiophile to receive, store, and play the computer file – via a disc player (including the latest universal disc players, that play CDs, DVDs, SACDs, and Blu-ray discs). Immediately, we want to let the user know that the disc he is using has several impediments that lower its quality below that of the master computer file:

- a) The function of the disc as a storage device is often accompanied by scratches, lost discs, and just plain dirt that can significantly reduce audio quality. Thus, ripping the disc to store on a computer is typically not optimal, unless done when the disc is fresh out of its pack AND cleaned properly before ripping it.
- b) The playing of the disc typically is accomplished by a box that has two parts – a disc turntable (transport) and a DAC section. When current is applied to the turntable, its speed is NOT constant and thus the flow of data to the DAC is not constant. Or put another way, every time you play the CD you are hearing a slightly different version of each track.
- c) The DAC section of the CD player is invariably not as good as a stand-alone DAC made by the same maker, nor can the user easily trade-up to a better DAC section of the player. Trade-ins of DACs are common, as are sales of DACs in the secondary market. And -- read carefully now -- we believe that DACs are now the single most important part of any audio system, right up there with the left and right speakers. Therefore, anything that can separate the DAC process from the Acquiring, Storage, and Playing processes is a good thing. We want the consumer to begin to think about DACs as something that he will look to as the first thing to upgrade when he gets his next bonus.

This view of the importance of the DAC is NOT widely held; indeed, many audiophiles have a pair of \$20,000 speakers for which they are using a \$2000 DAC – and they think it can't possibly get any better. In fact, we believe that the entire Front End – audiophile computer (or “server”), digital cable between the computer and the DAC, and the DAC to which that digital cable is connected – are MORE important than the speakers (!!) until we get up to speakers in the \$100k range and above. And even there, it is not at all unreasonable to say that the sum of the prices of the DAC, the digital cable connecting to the PLAYER, and the player itself (which will, eventually, always be a real computer) should easily be in excess of \$35k (for those \$200k speakers). And we apologize to all our friends who make speakers for a living.

Now let's talk about processes for ACQUIRING the computer file, in the context of STORAGE processes that do NOT involve a disc.

These “non-disc” processes include streaming, downloads, and *ripping*.

- 1) STREAMING. Boy, if there is one really misused term it is streaming. Most users, we believe, think of streaming as the sending of an audio signal over the internet. Think iTunes, Spotify, Pandora, etc., and now Tidal. In fact, streaming as we use the term does not involve sending ANY audio signal. It is simply the sending of the computer file over the internet in real time, with the PLAYER doing the playing in real time (i.e., converting the computer file to an SPDIF or AES or USB stream to the DAC in real time). Streaming, as we, and most writers use the term, is therefore troubled by several shortcomings:

- The quality of the computer file being streamed is now no higher than CD quality (1411 kbps – i.e., 44.1khz/16bits) – see footnote on MQA.
- Internet speed of your home router, and the speed (bandwidth) of your ISP, can vary during the streaming process, causing audio artifacts or worse, a loss of signal for a few seconds.¹

Please know that, although we regard Tidal as the very best streaming service currently in use, its streams do NOT sound as good as a well-done rip of a CD – not by a lot. And, of course, Tidal does not stream any high-definition computer files such as DSD files or WAV files up to 192/24.² But the vast majority of audiophiles do not have DACs good

¹ There is, of course, some buffering going on, as Tidal sends the cd-quality audio file to your home's player (whether that is a box called a computer, or a box called a streamer, or a box that has several digital audio functions all lumped within a single chassis costing \$99). However, buffering technology for a computer file sent over the internet is not as perfect as playing the file from the RAM in a computer when the computer file already exists on a local hard drive.

² Tidal is now using MQA™, a relatively new process for a) taking into account the kind of analog to digital equipment used within the mastering process, and b) compressing the resulting file to a very small percentage of its original size, therefore allowing for the first time the streaming of what otherwise would be enormous computer files. There are very few MQA-encoded full albums for downloading, and so, for the time being, MQA has its greatest application in

enough to make these comparisons apparent. When you've been told by your friendly dealer, for more than 3 decades, to spend at least half of your budget on the speakers, there isn't much left for the most important part of your system – the DAC, the digital cable connecting it to the computer, and the computer.

What is really worrisome in our minds about Tidal is that the marketing and writing suggests that the quality is “CD-quality” – but, really, Tidal can be called “CD-quality” only in the context of those relatively poor DACs or disc players' DAC sections. We use Tidal ourselves mainly to hear new music that we might want to download or buy the CD and rip it. And even that function is not as useful as receiving the various newsletters from the various high-definition download sites.

Most importantly, just remember that the streaming process involves STORAGE on a website computer, and then SENDING that computer file via some very complicated and often “hinky” process called the Internet. Indeed, if you want some background music for entertaining lots of guests, the quality of streaming is just fine – but not as good as making a 200-track playlist of ripped CDs that might even get some of your guests to stop chatting about inane subjects often discussed on Twitter and Facebook – and actually listen to the music.

- 2) DOWNLOADING. Downloading's main difference from Streaming is that Streaming occurs in real time, while downloading involves taking the time to acquire the computer file from the download site first and SAVING it to some sort of storage device – usually a storage drive inside a computer serving as a PLAYER (not very good for audio quality because of the EMI associated with storage drives inside of a computer), or a USB connected storage drive outside the computer (better), or a Network Attached Storage (NAS) storage device, which best from an EMI perspective (although NAS computers typically are too noisy to have within the listening room itself). The very best process is storing on a Solid State Drive (“SSD”) which has no moving parts. But these are extremely expensive in large sizes and are not really necessary if playing is done by first moving the computer file into RAM when playing.

Why is DOWNLOADING so much better than STREAMING?

- First, DOWNLOADING, since the computer file is not being played in real time, allows for the use of very good double-checking features within the downloading software (software that resides on the website computers of the downloading service). This software improves the chances of a bit-perfect

Tidal's Masters streaming process. Do streamed MQA files sound as good as downloaded MQA files; essentially no such comparison are readily available at this time. So don't think that you can get FULLY the quality of the very best hi-def albums via Tidal streaming. The jury is still out. But MQA as a form of hi-res music compression/improvement is here to stay, we believe.

transfer of the audio computer file on the company's server to the user's hard drive. Indeed, depending on your internet speed, the download of a CD album that plays for an hour, could even take over an hour to download. Faster internet speeds are a great boon, because the double-checking software can still do its job while the download of the file can occur in much, much less than an hour.

- Finally, only by downloading can you obtain most truly high-definition computer files – e.g., 192/24 or DSD files. Some hi-def files are distributed by DVD but these are small in number.

3) RIPPING. As we explained above, the ripped CD, stored as a WAV file on a storage drive is superior to the actual CD. This simple sentence is not widely accepted yet, but will be in time. To repeat, this is because, when the CD transport within the CD player sends its PCM signal to the player's internal DAC, the flow is not placed into RAM before playing the way it is done in a computer. RAM is a perfect buffering process found mainly in audiophile computers, some of which are called "servers".

Recently, some CD players have been designed to send the PCM file to a RAM section within the player, before the digital to analog process. But the overall quality of these special CD players (i.e., their DAC sections) usually do not compare with the stand-alone-DACs that we use in our high-end audiophile business. Thus, when the typical audiophile hears for the first time the audio quality of the ripped CD played through an audiophile quality computer into a quality stand-alone DAC, he stops using his CD player and sells it for what he can get in the secondary market. And he immediately goes back and rips ALL of the rest of his CD collection.³ We remind the user to CLEAN all those CDs before ripping them. A lot of what looks like scratches are really dirt that can be removed by the proper cleaning techniques.

Additionally, it is important to note that the ripping of a CD is subject to the same issue of playing the CD from a CD transport – anomalies in the speed of the transport itself.⁴ Thus, it is very important, as the quality

³ We do not touch on the legality of ripping discs, even for the use solely by the owner of the disc. We do not condone ripping that is illegal. We are not lawyers and cannot offer you legal advice. We can say, however, that the media industry appears to be OK with ripping CDs. And, today, you can go to Wal-mart to have certain Blu-ray discs "ripped." In fact, the media industry's main way of controlling Blu-ray copying is to require a licensing fee to be paid by any computer manufacturer who installs a Blu-ray optical drive in the computer. Among high-end media servers, Baetis Audio is the only one to be licensed to install such optical drives. The drives, of course, are also licensed for installation in "universal disc players" which can't play all types of media as can an audiophile computer.

⁴ Many audiophiles don't want to "rip" a CD because they think that ripping means "playing" and "recording" what is on the CD. Therefore, the rip must be inferior to the CD itself. This is not correct. Rather, "ripping" means transcoding (converting) the <.cda> computer file on the CD back to the <.wav> computer file that was used to manufacture the CD in the first place; while storing the WAV computer file somewhere. Since the <.cda> file can only be listened to via a spinning transport, the transcoded WAV file can, potentially, sound way better than the CD it comes from!! This simple misconception is what keeps many audiophiles from ever hearing their CDs in the best

of your overall audio system rises, to use ripping software that involves a good double-checking system. dBPoweramp™ is commonly thought of as the very best such ripping software, because of its AccurateRip™ function. When used in Ultra Accurate mode, this programming results in the best rip quality for CDs.

Now that we have explained the creation and distribution process of digital music, the most important thing we have to contribute is this.... in our experience, downloading the computer file from a downloading site that is well designed, has the best double-checking procedures to assure a bit-perfect download, and has a catalogue of titles that interest you, is at once the best way to ACQUIRE the music, STORE it, and later PLAY it.

Ripping can be a very close second, provided that you use the best CD ripping software or Blu-ray ripping software. SACDs can also be ripped but only by stand-alone professional ripping services or truly dedicated DIY rippers.⁵

But streaming, as we have defined it, does not remotely compare in audio quality to the other two ways of acquiring, storing, and playing the computer file.

We are also highly concerned about the manner in which artists are compensated. Our belief is that downloading, because it consists of selling a single album or track for just compensation, is both the fairest way of compensating artists and the way of providing greatest audio quality for those listeners to whom higher quality audio is important.

3. STORING the computer file and PLAYING it can be treated together. Many Players are now really nothing more than simple computers with some internal storage drive(s). Some of these Players, not only have internal Storage, but also can Acquire the computer file via connection to the internet. Some even have internal DACs. We view these specialized audio devices as stop-gap products for the consumer who has yet to fully understand today's options (and might not buy anything with the word "computer" attached to it until he reads a white paper like this one). In the long run, as Lord Keynes said, we all will be using computers for the highest quality audio.

Here are some of the problems with the manner in which these Playing boxes handle the computer file

- a. Acquisition of the file may be constrained to streaming or from a storage drive; downloading may not be possible without a second computer.
- b. For those boxes that can Acquire via Downloading, there is usually no way to upgrade the internet connection process (e.g., they may do so only via wifi)

possible way. And, unfortunately, many, many audio dealers have the same misconception. When you rip the CD in sub-optimal fashion (using free ripping software), and play the resulting WAV file back via an ordinary factory computer, we can see why this belief – that the CD itself is the best way to hear the music -- has remained strong even in the second decade of this new century. This is also why streaming via Tidal can sound better than the CD being played by a CD player, even though the streamed file does NOT sound as good as a properly ripped CD played via RAM from an audiophile computer to a separate external DAC.

⁵ See previous footnote; we do not make or install any unlicensed decryption software.

- c. The downloaded file may be stored internally in a small hard drive that cannot be upgraded or added to (or easily replaced when it breaks).
- d. The Playing box may have no way to rip a disc except through a separate device called a computer, and very few of these can rip a Blu-ray concert. Plus, the optical drives in most of these all-in-one boxes or factory computers are typically quite low quality. For example, the wholesale price of the outboard optical drive for a Macbook Pro™ is about one-fourth the wholesale cost of the best optical drives used in our Baetis Reference media servers.
- e. The player box cannot send all music formats to the DAC (this is the most damaging, since this “limited format” condition is quite common among these combination devices).

This list is attenuated in order to stick to the main issue of why the computer file is best acquired by, stored by, and played by something that is, at its heart, a real, powerful, computer.

What about STORAGE devices for the consumer? We will summarize our views quickly:

- a. Storage drives inside of a computer or inside some other sort of Player subject the drive to EMI as the user initiates the process of sending the computer file to the Player. All storage should always be outside the computer (the player). Like all things digital, there is no consensus on this issue. This storage issue does not matter much if the user’s system is of low quality (budgets matter, and when the budget is low, things such as EMI become less important). Some of these storage drives inside of servers costing well over \$15k are not even SSDs but rather spinning storage drives, which generate much higher EMI and physical noise.
- b. A USB3.0 storage drive, or six of them plugged into the rear of the Player/computer is just fine for most VERY good systems. You can upgrade the cables connecting these USB drives to the computer; the very best cables cost about \$25 each, if you wish.
- c. Best is NAS storage (“Network Attached Storage”) in which the NAS drive is connected to the player/computer via CAT7 cable. This type of cable is double EMI shielded, compared to CAT5 or CAT6. The Ethernet cable should be connected through a quality Gigabit Ethernet switch to the player/computer. Unfortunately, most NAS computers are very noisy and should be kept in an adjoining room or closet to the main listening room.

4. PLAYING the computer file

Here, we are quite biased because we are part of the audiophile computer manufacturing industry. We want to point out that every major audiophile magazine’s staff of writers contains a majority that uses audiophile computers or factory computers every day to play music and audition DACs. Our own belief is that there is no disc player, streamer, or all-in-one box in the world that can produce the quality of music that compares with an audiophile computer playing the computer file to a good, separate DAC, via a good digital cable.

Furthermore, the quality of some of these DACs, cables, and computers will come close to equaling that of the very best analog systems and will be better sounding than MANY analog systems, even very expensive ones. Yes, there are difficulties in educating an analog enthusiast in how best to accomplish acquiring, storing, and playing computer files ... but the very finest audio systems today have both analog and digital capability.

The best “playing boxes” today are called by various names – music servers, media servers, audiophile computers – these are the main terms of art. They all must do the following minimum things:

- a. Manage a library of computer files
- b. Acquire, retain and manage all the metadata associated with a music album, ranging from cover art to composer, artist, etc., and even a PDF version of the CD booklet.
- c. Easily allow the user to “call for” any computer file from any storage drive anywhere.
- d. Then, playing becomes the process of changing the computer file into a stream of some kind of *audio signal*. The major types of audio signals (the flow of information to the DAC) are USB signals, SPDIF signals, AES signals, and (for multi-channel DACs called “pre/pros”) HDMI signals. Some DACs also accept the raw audio file without any transformation into, say, a Sony-Philips digital interface signal, via Ethernet port.
- e. The player software must be able to play (convert to a USB, SPDIF, AES, or HDMI signal) ANY possible audio format – including PCM and DSD, along with any encoded PCM – no matter the sampling rate or bit depth (e.g., 44.1kHz sampling rate on up to 352.8 or higher rates, and bit-depths from 16 on up to 32-bit bit-depth or higher). When SACDs are ripped, or when native DSD files are downloaded from websites that contain albums mastered in DSD, these files are sometimes the WAV equivalents of 352.8kHz/24 bit files. Sometimes the downloading site will send a native DSD file in DSF or DFF format. There are already a few DACs that will play these resampling rates natively, without down-sampling. So, be careful about what the player can handle.⁶ Better to upgrade the DAC, as newer and newer capabilities are designed, plus upgrade the software in the computer or server, than continually having to upgrade the DAC as well as the disc player or server.⁷

⁶ We want to emphasize that all formats should be playable by the “playing box”, because there are truly great performances in both DSD and in PCM – neither format has a monopoly on quality. And this is recognized by most everyone in the business. For example, Cookie Marenco of Blue Coast fame, one of the country’s leading producers of native DSD master files says the following (in the context of an album mastered in PCM and sold on her website) – “After several blindfold tests, it is our opinion that the 96/24 WAV files sound the best, followed by DSF and after that the FLAC 96/24. The difference is minimal. We suggest you purchase files for your best performing home DAC. The DAC will make more difference than the file type.” In highest-end digital audio, everything matters, and here is a renowned engineer saying, yes, both master WAV and DSD can be better than FLAC. Please keep in mind, this is NOT the same thing as saying don’t rip a CD to FLAC; rather it is saying don’t get the CD to begin with get whatever is the master format to begin with.

⁷ There is also a LARGE disagreement about the best way to play DSD files. We believe the audiophile computer MUST be able to transcode DSD to PCM on the fly, if not beforehand, because such transcoded DSD often sounds the best – beating out DACs that advertise that they “play native DSD.” Do your homework and, please, deal with companies that will allow you an in-home audition. We have a separate white paper on our site dealing with DSD vs. PCM.

(The list above should be the basic capability of the server, but other duties are quite useful.)

- f. The computer (server) should also be able to rip (copy) certain discs (CDs and Blu-ray concerts), or the user needs to do this on a second computer with adequate quality optical drive.
- g. The server should also be able to access any download site for downloading both regular definition files (the 44.1/16 WAV files that are better inherently than the CDA files on the CD) and high definition files (including 88.1/24; 96/24; 176.4/24; 196/24 plus all the variations of DSD hi-def files. Again, this can be done by a second computer.
- h. The server should be able to access any streaming site on the web, not just Tidal, but Pandora, Spotify, Netflix, and anything else that comes up (seems like new streaming services appear weekly). By the way, have you ever listened to, and watched, a live performance of the Berlin Philharmonic? The audio quality exceeds that of Tidal, when played through an audiophile computer, although the Berliner engineers do not apply the term “streaming” to the sending of the computer file.

Of course, the user need not buy, in a “server,” a box that has all of these capabilities. The MAIN issue is how well does the server play? – what is the quality of the digital audio stream it sends to the DAC? We do not have space to get into detail on this latter issue, but, like anything else in digital audio, it is a VERY complicated process with nothing approaching a consistent taxonomy let alone any kind of consensus. All we can say in the space allotted is that

- Not all servers or computers sound alike; there are very significant improvements as price goes up (although, like anything in audio, a high price is not a guarantee of high audio quality).
- The server and the DAC work together to produce the analog signal going to the amps and the speakers -- and not every computer/server digital output works or sounds the same with all the digital inputs of a particular brand and model of DAC. Be especially wary of which of the DAC’s digital inputs the magazine writer uses when he reviews the DAC (or the server/player).

The fact is that the vast majority of audiophile magazine writers use the USB output of a factory computer to play to the USB input of a particular DAC. That DAC might sound entirely different (worse OR better) if some other digital input of the DAC is used. More to the point, the DACs that are regarded as the best in the world, typically design their AES inputs to sound the best. If you are the proud owner of one of these DACs, you should be especially aware of how your server sends out its AES signal (if it even has one). Many owners of DACs with fine AES inputs still send their AES signal not from a server with an AES output but one that sends out only a USB signal, then this USB signal is sent through a second box that “converts” the USB signal to AES. There are as many of these USB converters as there are servers or DACs. And, of course, many, many DACs have a USB to SPDIF (or AES) conversion process as the first step in their own circuitry.

So always ask yourself the following question – if I am using a good DAC, is there a server out there that sounds better through its AES output into my DAC, rather than through the USB port of my factory computer into a very good USB to SPDIF converter box?

We hope this summary is useful to folks who are looking for better sounding audio than their current system. Baetis Audio builds a range of media computers at all price points. And there are MANY companies in this marketing space. So, please, be careful, do your homework and, most of all, don't believe everything you read on the internet or in a hi-fi magazine except for our own reviews, of course ☺.