

digital den

**THE ONGOING QUEST FOR THE
PERFECT PORTABLE-AUDIO SYSTEM
HOLDS EXAMPLES OF ENGINEERING
TRADE-OFFS FOR DESIGNERS
OF SIMILAR PRODUCTS.**



How to stop worrying and love compressed audio

By Brian Dipert, Technical Editor

With lots of work- and family-related travel, we all get lots of opportunities to indulge our love of music. And, as owners of CDs, we're always searching for the perfect portable-audio playback system. The story of this ongoing quest not only shows the improvements that the industry has made over the last few years in digital-audio-products, but also holds instructive examples of engineering-trade-offs for designers of similar products.

EDN decided in early 2003 to "rip" a CD library to an organized collection of digital-audio files, which we stored on a Toshiba Magnia SG-10 server appliance. We then hid all those dust-collecting and space-consuming discs in a closet. Aesthetics wasn't the only motivation: By putting the tunes on a server that a LAN could reach, we could access them through our computers and Voyetra Turtle Beach Audiotrons—even listening to different music in different offices at the same time. The digital archive would also make it easy to copy music to portable audio players to take tunes with us

on the go. The project didn't call for optimum musical quality. The high ambient noise in most mobile-listening environments masks whatever subtle details a high-bit-rate music rip might retain, and we could always remove the original CDs from the closet for critical listening situations.

On the other hand, ripping and tagging—adding artist and track metadata to audio files—is time-consuming. We didn't want to end up with audio quality so bad that the project would be useless. Microsoft had just released Version 9 of Windows Media Audio, and earlier testing had assured us of the codec's capabilities. We settled on a 96-kbps constant bit rate for the broadest possible compatibility versus the variable-bit-rate option, which we estimated would give us equivalent quality to MP3 at 160 kbps with most music types. A 40%-per-file size reduction is a big deal when you multiply it by more than 9000 audio files.

HARDWARE CHOICES

If Apple had released Windows and AAC support for its

iPods when we started ripping our library, we might have been tempted to go that route. In retrospect, we're glad we didn't have the option. Fans of the iPod might disagree, but iPods seem to be vastly overpriced for what they deliver compared with other products. For example, the Creative Nomad II lets users also listen to WMA-encoded tunes, but, like its predecessor, it relies on a now-defunct SmartMedia card for storage expansion. With its limited



The Nomad MuVo² measures 2.6×2.6×0.8 in.

storage and pokey USB 1.1 interface, the player is useful for totting only a few albums' worth of tunes at a time.

We could have employed Pocket PCs as our audio players. For example, the iPaq 3835 accepts Secure Digital cards, which are now available in multigigabyte densities, and expansion packs add support for PCMCIA and CompactFlash cards. The Pocket PC OS comes with WMP (Windows Media Player), and Conduits Technologies' Pocket Player nicely expands on WMP's capabilities. Finally, Creative Engineering's CEPlaylist neatly sorts stored music and offers numerous ways of organizing it for playback.

Creative Technologies' first-generation 6-Gbyte Nomad Jukebox, which the company based on a 2.5-in. hard-disk drive, boosts the amount of music travelers can carry on trips. The svelte iPod's form derives in large part from its use of 1.8-in.—and, now, with the iPod mini, 1-in.—drives. For a long time, Apple gobbled up every drive that partner Toshiba could make, forcing other player manufacturers, such as Creative, to base their players on larger and more power-hungry drives. Consequently, the Nomad Jukebox suffered from short battery life. Its storage capacity is also insufficient to store some users' music libraries. They might consider switching to its successor, the 40-Gbyte Nomad Jukebox 3, which Creative introduced in 2002.

The player, "NJB3" for short, includes a number of incremental improvements—some big and some small—over its predecessor. Although Creative still based it on a 2.5-in. disk, the player's RAM buffer is twice as large, which allows the drive to spend a higher percentage of the time in its lowest power standby mode. Couple this feature with the player's use of one or two lithium-ion batteries at a time, and the NJB3 delivers more than 10 hours' worth of continuous operation at moderate listening levels.

The player provides fast downloads through its IEEE-1394 connection and supports USB 1.1. Finally, the NJB3 captures audio via its S/PDIF and analog-audio inputs, storing it in either MP3 or WAV format. For this reason, the player has proved popular with tapers, who use it to record lectures, concerts, and other audio presentations. See the "njb3tapers" discussion group on Yahoo.

Improvements aside, the NJB3 is still large. It's shaped like a portable-CD player, measures 4.84×5.12×1.38 in., and weighs 10.2 oz without a battery. Anyone who had to trudge around the Consumer Electronics Show or any other trade show with it strapped to his hip and trying to jam it into carry-on baggage would clearly see the appeal of Apple's iPod.

Fortunately, the availability of 1.8-in. hard disks has improved, and Creative has consequently launched several families of players based on them. The *EDN* project is now using the company's 60-Gbyte Nomad Jukebox Zen Xtra. This unit eliminates its predecessor's IEEE-1394 port but upgrades the USB connection to 480-Mbps USB 2.0. And, at 4.4×3×0.86 in., it easily fits into a shirt or pants pocket.

Creative claims that the Zen Xtra has 12 hours



The HeadRoom's BitHead external headphone amplifier produces crisp, tight sound.

of battery life. But it lasts on a coast-to-coast round trip with juice to spare, and replacement batteries are compact and light. Couple the Zen Xtra with either a cassette adapter or an FM transmitter, such as Belkin's TuneCast, and the music exiting the player's headphone jack can fill an automobile, as well.

Those with more moderate storage needs might consider Creative's 4-Gbyte Nomad MuVo², measuring 2.6×2.6×0.8 in. and weighing 2.5 oz without a battery. Its battery is compatible with the Nomad Zen Xtra. Rio and an increasing number of other vendors also offer players that fit into this storage-space category.

All of Creative's products come with Creative's MediaSource (formerly, PlayCenter) software. Various discussion groups and enthusiast sites, such as www.nomadness.net, document complaints about the program's stability and clumsy user interface; however, *EDN* has never tried it, although some other sources state that it has improved. Some of us have used and been happy with Red Chair Software's Notmad Explorer, which we use with Microsoft's Windows Media Player. Red Chair also makes programs that support the iPod under Windows, along with Dell, iRiver, and Rio players.

Notmad Explorer neatly integrates within Windows Explorer. The program allows a user to browse, synchronize, and edit the player's contents; alter the unit's various settings; and create playlists. Microsoft's free Portable Audio Devices Power Toy for Windows XP and Media Player 9 performs similar functions, albeit in a more simplistic manner and for a more limited set of devices. The Nomad MuVo² doesn't strictly require additional software because Windows XP recognizes it as a USB drive. Other Creative products use a proprietary file system, therefore requiring intermediary translation software.

JUICE AND CANS

The NJB3 includes both a headphone jack and dual line-out ports. These ports exist to drive multiple sets of speakers, befitting the player's ability to generate pseudo-surround-sound from a dual-channel audio source. The line-outs also provide a means for bypassing the player's cost-constrained internal amplifier in search of improved sound quality.

We tested The HeadRoom's BitHead and Total BitHead and XY Computing's SuperMini, SuperMicro, and SuperDual external headphone amplifiers. The units all produce crisper, tighter, and, in some cases, louder sound than the NJB3 alone can provide. They differ from each other in size, weight, battery life, distortion, other technical specifications, and supplemental features.

XY's products, for example, offer a XinFeed mode, which injects a small amount of one



The 60-Gbyte Nomad Jukebox Zen Xtra easily fits into a pocket.

channel's audio into the other channel and vice versa—a practice that allegedly reduces listeners' fatigue during extended headphone use. The HeadRoom sells carrying cases that snugly accommodate players and the headphone amp. The AirHead line operates only as a headphone amp, but the BitHead products also provide USB-audio connections that enable their use with PCs. Unfortunately, the Zen Xtra provides no line output, negating the impact of an external headphone amplifier.

Remember that any audio system is only as good as its weakest link, so beware of the quality-sapping effects of a subpar set of headphones. Long-time microphone manufacturer Shure a few years ago broadened its transducer expertise to include in-ear headphones for musicians who want to forgo traditional on-stage monitors. More recently, the company migrated its headphone technology downward to more consumer-friendly prices.

The high-end E5c headphones weigh only 1 oz, provide each ear with dual high-energy microspeakers, and feature an inline crossover. They offer excellent sound quality, and, at a suggested price of \$499, they should. In addition, inserting the earphones and winding the form-fitting wire around the ear takes lots of practice. (Shure provides a Macromedia Flash tutorial on its Web site.) Users might have to experiment with several types and sizes of sleeves before they find a combination that provides sufficient passive ambient-sound isolation.

On the other end of the price spectrum, the \$99 E2c headphones feature one dynamic speaker per ear. The midrange \$179 E3c model upgrades each ear's transducer to an extended-frequency-response, high-energy microspeaker.

Pragmatically, the lower end Shure products will most likely be sufficient for all but the most critical listening environments, especially if the audio has undergone quality-degrading MP3, AAC, WMA, or equivalent lossy compression. We used the E5cs, for example, when we evaluated various audio hardware, software, and compression algorithms. But Koss' \$20 "The Plug" is easy to insert and offers impressive sound for the price.

TUNES

After we tested the Apple iPod, we found that high price is not the only problem with it. Its preferred audio codec, AAC, so far lacks widespread industry support, thereby limiting the types of equipment on which consumers can play their audio. Furthermore, Apple has been loath to license its FairPlay DRM (digital-rights-management) scheme, which encrypts any tracks you purchase from Apple's iTunes Store, to competitors. The same scenario is the case for RealNetwork's Rhapsody—at least until Apple puts a stop to it. Users of the iPod can play their iTunes on gear that doesn't support FairPlay-protected AAC but only after a convoluted process: Burn the tracks to a CD; rip the CD back to uncompressed audio files; recompress the audio; and tag the audio files with artist, title, and other relevant info. Realize, too, that this process puts audio that AAC has lossy-compressed through yet another lossy-compression-conversion step, degrading audio quality.

WMA, conversely, is the format of choice for a number of online music services: BuyMusic.com, the Musicmatch Music Store, Napster, RealRhapsody, WalMart.com, and Microsoft's new MSN Music Store. These sites also sell encrypted files—this



The E5c headphones offer exceptional sound for \$499.

time with Microsoft's own DRM scheme, but Microsoft has seeded the industry with support for its scheme. And, if support is nonexistent, users can always use the burn-to-CD-then-rip procedure.

Users should always burn an audio-CD copy of any music they buy online, regardless of the format, just in case they lose the files to a hard-drive crash; the format becomes obsolete; or the company goes out of business, as did Liquid Audio and a2b music.

Moscow-based Allofmp3 provides an alternative that's fiscally attractive, flexible, and format-inclusive. The catch? It's legally and ethically questionable. The site rivals iTunes in breadth of selection and ease of navigation and provides DRM-free files. The site's servers start with a high-quality, 384-kbps, variable-bit-rate MP3 source file, which the site transcodes on the fly into the user's choice of a range of both lossy and lossless formats. An optional feature, Online Encoding Exclusive, available with some tracks, starts with the original lossless audio-CD data.

The site incredibly charges only \$5 for 500 Mbytes of downloads (\$10 per 500 Mbytes for Online Encoding Exclusive), and the company offers some free albums in its collection.

Allofmp3 exploits a loophole in Russian copyright legislation. And, considering that the company has been in business since 2001 without becoming the object of legal action by the RIAA (Recording Industry Association of America), users might conclude that the government won't easily close this loophole. Controversy exists over whether Allofmp3 has the right, via its agreement with The Russian Organization for Multimedia and Digital Systems, to sell its wares outside Russia. A Google search for "allofmp3" reveals many conflicting opinions on the issue. □

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