

Squeezebox

An Affordable High-Resolution Digital Jukebox

BY RICH SIEGEL

Historically, audiophiles have declined to use computers for music playback. This has been for two compelling reasons: first, computers are not suited for use in a listening room (which, in a well-balanced household, is also the living room or family room). Compared to sleek stereo equipment, computers are ugly, noisy, hard to use, and difficult to integrate into a high-quality audio setup (the existence of PowerBooks and Mini-ITX PCs notwithstanding). The second reason has to do with the nature of audiophiles. As a group, we spend a lot of time and money in pursuit of high-quality components, and the analog sound outputs in today's computers just aren't up to snuff.

Enter the \$299 Squeezebox, from Slim Devices (www.slimdevices.com, 650/210-9400). Squeezebox addresses these problems by putting the user interface and high-quality playback electronics into a compact and attractive package that obtains the music from a server computer in another room (out of sight, out of mind, and out of earshot). The Squeezebox can natively play back MP3 files, thanks to its onboard MP3-decoding hardware, and it has an onboard digital-to-analog converter and analog



outputs. But where it really shines is in the playback of high-quality uncompressed digital audio. The player features on-board optical (TOSLINK) and coaxial (75-ohm) S/PDIF outputs, so you can use it as a high-quality digital source in a high-end audio system.

Setting Up the Software

The Squeezebox package doesn't include Slim Devices' SlimServer software. Instead, the company includes a leaflet instructing users to download the software from its Web site. The reasoning behind this becomes clear when you visit the site: SlimServer is a rapidly evolving open-source project. The server software is written in Perl, which makes a lot of sense: every supported platform (Mac OS X, Linux, and Windows) includes a Perl interpreter, and by shipping the server as executable source code, Slim Devices has made it possible for interested customers and developers to refine the product and add value to it by contributing new features, refinements on existing features, skins for the

Web interface, and bug fixes. The adventurous can download daily builds, which include untested additions and fixes.

The SlimServer software is not particularly demanding of computing resources: any computer that's less than five years old can act as a SlimServer host, provided it has enough disk space to hold all of your music. I originally installed SlimServer on a 1999-vintage 400MHz Power Mac G4 running Mac OS X 10.2, and it performed nicely. Subsequently, I replaced the machine with a dual-1GHz Power Mac G4 running Panther. This is overkill for serving a Squeezebox, but the machine has other duties (such as hosting Xcode-distributed builds), so SlimServer puts its spare power to good use.

Unlike its MP3-only predecessor, the SliMP3, the Squeezebox natively supports both MP3 and raw uncompressed audio. So as I was anxiously awaiting my Squeezebox's arrival, I spent several days with iTunes, importing AIFF files from my entire CD collection, creating a few playlists, and getting things organized. (For more on my decision to use AIFF, see "Sound Quality versus Space versus Bandwidth.") I used iTunes for the job because Slim Devices offers a bonus for Mac users: SlimServer can read the XML files iTunes generates for your music library, so you don't have to do any configuring if you have an existing iTunes music repository. Better still, you can access your iTunes playlists from the Squeezebox, and new songs or playlist changes automatically become available to SlimServer when you add or change them within iTunes.

The only shortcoming is that although Squeezebox can play AAC files you've created by importing CDs (SlimServer can transcode them to a raw audio stream or MP3 format), it cannot play the protected

AAC files from Apple's iTunes Music Store. This is a limitation that is tricky for Slim Devices to address. Although QuickTime does allow authorized users to convert protected AAC files to AIFF, circumventing Apple's copy protection to play back those files might put Slim Devices at odds with the Digital Millennium Copyright Act, and certainly wouldn't earn the company any friends within Apple.

When my Squeezebox arrived, I downloaded the disk image for use in Mac OS X, and double-clicked on the installer application. As with any well-executed Mac software product, the installation was completely intuitive and painless. The installer allows you to select whether to make the server controls (provided in the form of a preference pane) accessible either only to the current user or to all users; the latter option requires authentication to install in /Library.

The preference pane (see "Easy Preferences") provides controls for starting and stopping the server manually, or you can configure the server to start up at system boot if you desire. You can also click on a button to open the server's Web interface.

The SlimServer Web interface allows you to configure the server and adjust player behaviors; it's an alternative to the Squeezebox's remote.



Easy Preferences After a simple install, Slim Server runs in a preference pane. Click on Web Access to configure the server via the Web.

Sound Quality versus Space versus Bandwidth

When storing digital music for playback on a home audio system, the discerning listener must decide which is more important: conserving disk space or getting the highest possible playback quality. Compressed encodings such as MP3, AAC, and Ogg Vorbis are all space-efficient to varying degrees, but they achieve this efficiency by discarding data that you can never recover. This is undesirable for an audiophile: it's axiomatic that the more information you store, the more detail will reach your ears. Furthermore, disk space is increasingly cheap—well below a dollar per gigabyte when purchased in quantity.

I decided to store my music in raw uncompressed audio, via tried-and-true AIFF files. It preserves all of the original audio data from the CD, and since it's uncompressed, it requires very little CPU power for playback. The catch is that streaming AIFF files to your Squeezebox will saturate a typical 802.11b (11-Mbps) wireless network, so if you want to go this route, you'll need to connect the Squeezebox to the music server via Ethernet (Slim Devices recommends a 100-Mbps switched Ethernet LAN for uncompressed audio playback).

What about FLAC? The Free Lossless Audio Codec (<http://flac.sourceforge.net>) is a promising open-source project that provides efficient compression of audio files (typically around 40 to 50 percent) without discarding any data. SlimServer supports FLAC by decompressing it before sending it to the player, which reduces disk-space usage on the server but doesn't address the issue of network saturation. For this reason, and because I consider AIFF more future-proof by virtue of its simplicity and built-in Mac OS X support, I elected to stay with AIFF for my own music server.

Future versions of the Squeezebox firmware and SlimServer software may support FLAC on the fly. In this setup, the server would compress raw (AIFF or WAV) files to reduce network bandwidth utilization, and then the player would decompress the files for high-resolution playback.

Setting Up the Hardware

As shipped by Slim Devices, the Squeezebox package includes everything you need for basic hookup and use: a power adapter, an infrared remote with batteries, an Ethernet cable for connection to wired LANs, and a stereo pair of RCA interconnects for the analog outputs. The package also includes a small, well-written manual and an “MP3 Is Not a Crime” bumper sticker. (Slim Devices donates 10 percent of its profits to the Electronic Frontier Foundation [www.eff.org].) The Squeezebox itself is a smallish black plastic box, with a display window on the front and a few connectors on the back (see “Dark Side of the Squeezebox”): power, Ethernet, an 802.11b antenna, and one stereo analog (RCA) and two digital S/PDIF outputs (coaxial and TOSLINK). The box itself is nicely finished; the designers at Slim Devices elected to use a matte-black coating, which feels slightly rubbery to the touch. Because of its curved top and small size, you can't place anything on top of the Squeezebox, so it will end up sitting on your equipment stack (or on any suitably sized horizontal surface).

Installing the Squeezebox hardware requires just three steps: you connect it to your network, attach it to your stereo, and plug in the power adapter (it doesn't have a power switch). Network setup is trivial. If you're using Ethernet, plug in the supplied Ethernet wire. If you prefer wireless, just screw the external antenna mast into its connector on the back of the Squeezebox.

Connection to the stereo is likewise simple: if you're connecting to the analog inputs of a stereo receiver, use the supplied stereo cable. The Squeezebox also has a standard stereo minijack (3.5mm) for plugging in a pair of headphones or

powered speakers—this is a great way to make a compact office stereo. For this review, I wanted to evaluate the Squeezebox's quality as part of a high-resolution audiophile system, so I connected my coax digital interconnect from the input on my D/A converter to the appropriate port on the Squeezebox.

The SqueezeBox manual provides step-by-step setup instructions, but by and large there's no need to refer to them: after you plug in the Squeezebox, it guides you through the process, including network selection (Ethernet or wireless), IP configuration (manual or DHCP), and music-server location (manual or automatic). If you're using Squeezebox on a wireless network with WEP, you will need your Network Equivalent Password, a sequence of hex



Dark Side of the Squeezebox

In addition to standard analog ports, the Squeezebox offers coaxial and optical outputs.

digits corresponding to the password string. The means for obtaining the password vary from one wireless network to the next, so the Squeezebox's installation instructions don't tell you where to find it. Refer to your wireless access point's setup instructions for details. In Mac OS X, you can get this information from the Airport Admin Utility: open your Base Station, and then select Equivalent Network Password from the Base Station menu.

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Using and Listening

Once you've set up your server and plug in your Squeezebox, it's time to do some listening. The Squeezebox's design makes this quite convenient: it has a well-designed remote and a simple interface, and you can easily read its bright vacuum-fluorescent display from across the room, especially in reduced lighting. Using the remote (there are no buttons on the Squeezebox itself), you can browse your music by artist, album, or genre, as well as browse your saved iTunes playlists. The Squeezebox

also provides the means to search for an artist's name, an album's title, or a song's title.

Entering letters with the remote control's arrow keys is by no means as quick as doing so with a keyboard, but it's a relatively painless process. The remote's interface also works reasonably well with large music libraries, even given the device's simplicity. If you've ever operated a CD player, the Squeezebox will seem familiar: the play, pause, fast-forward, rewind, and stop functions are all close at hand and work as you'd expect. The remote includes a volume control, but for testing purposes I bypassed the Squeezebox's digital volume control so that audio would take the shortest possible path from the Ethernet connector to the Squeezebox's digital output.

You can also control the Squeezebox using the SlimServer Web interface. I don't keep a PowerBook next to my listening seat, but if you do, you'll have access to more control than the remote alone can provide.

I listened to a variety of genres and artists, and I compared the playback from the uncompressed files on the Squeezebox with the same music played from the original CDs on my CD player. I couldn't hear any difference. This is as it should be; in my system setup, the Squeezebox is simply moving the bits unchanged from the AIFF file stored on the server to the S/PDIF input on my D/A converter, and the bits in the AIFF file are the same as those on the original CD.

After finishing my critical-listening tests, I did some experimentation with alternative setups. The SlimServer software provides the ability to transcode files stored on the server; in particular,

Associated Equipment

What I Used in My Listening Tests

Server	Dual-1GHz Power Mac G4; 1GB RAM; music stored on 240GB RAID 0 (striped) disk; Mac OS X 10.3.2
Networking	Switched 100-Mbps Ethernet
Sound System	
D/A Conversion and Switching	MSB Technology Link III/P1000 and Digital Director (www.msbtech.com)
Analog Switching and Amplification	Goldmund SRP2 preamplifier and SR2 power amplifier (www.goldmundusa.com)
Speakers	Bowers & Wilkins Matrix 802 Series 2 (www.bwspeakers.com)
Power Cables and Interconnects	PS Audio Micro Lab Cable (www.psaudio.com), Nordost Red Dawn analog interconnect and Moonglo digital interconnect (www.nordost.com), Monster Cable M2.4s Biwire speaker cables and M1000D digital interconnect (www.monstercable.com)
Comparison CD Transport	Meridian Audio 506 (www.meridian-audio.com)

it will convert any non-MP3 compressed file format to MP3 on the fly using the LAME MP3 encoder (<http://lame.sourceforge.net>), and then send the resulting MP3 data to the Squeezebox for playback using the unit's onboard MP3 decoder. I experimented with this capability by changing one of the SlimServer's configuration files (convert.conf in the server package), so as to convert AIFF to MP3 when playing back on the Squeezebox.

This approach trades off sound quality for reduced network bandwidth, so if you're picky about audio quality, I recommend that you stick to raw uncompressed audio. Even with a high-quality outboard D/A converter, the AIFF playback sounded better than MP3 playback.

Conclusions

It's clear that Slim Devices has produced a product with a focused purpose: playing back music with a maximum of convenience and a minimum of fuss. The company has also spent its money wisely: rather than producing an expensive aluminum box with audiophile snob appeal, it focused its efforts on the guts of the machine and its server software.

The Squeezebox is an admirable product, an excellent choice for audiophiles (and for anyone else who cares about the quality of sound playback). With it, you can make the most of any stereo, from an inexpensive pair of powered speakers to a top-of-the-line sound system. ☘

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