



# **In-depth look into Low-Cost Home Media Clients**

First Edition

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## Chapter 1 Introduction

Building a network to serve up media files in your home is like putting together a jigsaw puzzle. Most likely, you already have many of the puzzle pieces in place, including a PC full of media files (a.k.a. the server) and a home network.

But so far, the client-device that sits in your living room and talks to the TV, home theater or stereo is still a work in progress. Sure, you can use a PC, but for simple audio and video playback, a PC is overkill – and too ugly for the living room to boot.

Some early attempts at doing a thin client have been too thin, they lacked sufficient power and feature sets to make them compelling enough to succeed in the mainstream market. Dell had an audio-only player, which was interesting, but it lacked versatility and was expensive.

But now we're seeing a variety of media clients arriving on the scene, many of which are powered by embedded versions of Linux.

Each takes a different approach to the fundamental problem: where do those huge media files live? Some clients store all the media locally, while others opt to stream them from a server elsewhere in the home. Each has its respective ups and downs.

But is there one device that perfectly balances features, performance and price? And, does it have to be PC-based? Both the PC and CE industries are leeching into each other's territory here – with radically different approaches. Because these two evermore-intertwined industries are still trying out different approaches to this problem, the precise solution isn't here yet.

In this paper we're going to analyze and compare several different types of thin media clients, plus we'll compare them to repurposing an old laptop or desktop.

## Chapter 2 Interface Description

Since this is an emerging market, the thin media client means different things to different people. So for the sake of this comparison, here's a wish list of the things we think these appliances need. The first three high-level items are:

1. It has to be conversant in multiple media types, including audio, still images and video.
2. The interface has to be easy to use and readable on a TV or your living room display device.
3. Everyone in the family must be able to use the basic playback/record features without taking a six-week intensive training course.

Now let's drill down a bit and get more specific about what we'd like this little box to do for us:

- Play Wave, MP3, WMA, AAC and OGG audio formats. [Why OGG -- just because it's open? Will OGG become commonplace among CE devices? Currently there is huge backing for this standard in the open source arena, so maybe it will.]
- Play DivX, WMV, MPEG-1, MPEG-2, and MPEG-4 video formats.
- Use 802.11b wireless networking, at least for streaming audio. We'd prefer 802.11a/g here because streaming video over 802.11b is a problem, since the standard still lacks QoS (quality of service) features to guarantee consistent packet delivery. However, in ad hoc testing we've been able to stream 1Mbit/sec video streams over 802.11b and playback was relatively smooth, provided there was no other traffic on the segment. Of course, 1Mbps isn't exactly DVD quality, but for standard TV viewing it may be acceptable. Because all traffic is given best-effort treatment, additional traffic can cause hiccups in the video playback on the client side. But don't blame us if the favorite television program suddenly breaks up and stutters because your kid picks up a cordless telephone.
- Have a remote control.
- Have at least some persistent storage, though not necessarily a hard-drive.
- Not very expensive, less than \$400 for a consumer-bought device. This is, after all, a CE device, rather than a PC, even if it is using PC hardware. The price should be in line with decent entry-level home audio/video gear. Note: that the custom installer market can bear a somewhat higher price.

Now, we know nothing fulfills all of these needs yet, but we've come close. Ironically, the closest CE device we've found to our ideal is still a PC.

One way to solve some of the feature/functionality problems is to make this client also operate as the home media server, or "media furnace." We'll explore that option in this article, looking at Via's EPIA M10000, both as a DIY solution and an end-user device.

Interestingly, two companies have created HTPCs based on the M10000, one based on Linux and the other on Windows XP Media Center – and we analyze them here.

We're going to take you on a tour through six devices, each of which fills out at least some pieces of the puzzle, but none of them is really the single killer device. Some of these products are not yet shipping, so we can't fully rate them until we have final hardware in our hands, but we can still give you a good idea what these devices can (and can't) do.

We first look at four downstream clients, which assume you have a network in place, whether wired or wireless. In addition, most of these also assume you have Internet access, for radio and in some cases CD liner notes. These are interesting because of their low prices, and their amenability to living in your home entertainment center. Because these don't use especially high-clocked processors, there's little or no fan noise, and all of these devices have form-factors that make them easy to install in your component rack.

**Those four products are:**

- Turtle Beach Audiotron
- Linksys Digital Media Adapter
- Prismiq Media Player
- TiVo Series II

We'll then focus on PC-style alternatives, to see how they compare and contrast. Ideally we would like to find a non PC-based thin media client with a very small form factor, a TV-friendly UI, persistent storage and at least some Internet awareness. But we haven't found that yet. As it turns out, PCs can cover all of these bases and then some. But the problems are cost, size and noise. The options we present here at least attempt to solve some of those issues:

- Older Desktops and Notebooks
- Acer TMC100 Tablet PC
- EPIA M10000 devices
- Media Center PCs



### 3.2 LinkSys Digital Media Adapter Preview



LinkSys, recently acquired by Cisco Systems, is better known as a company that makes solid home networking gear. But as the lines of demarcation continue to blur between the PC and CE markets, LinkSys is getting into the media client business. Details as to when the company's new Digital Media Adapter will ship and its pricing remain vague at this point, although we expect this product to be shipping toward the end of summer 2003.

The Linksys Wireless Digital Media Adapter will play MP3 and WMA digital audio content, and display JPEG still images. The device is based on an Intel reference design that implements Intel's XScale PXA250 application processor and run either WindowsCE or embedded Linux. This unit will also leverage Universal Plug and Play (UPnP) technology to allow it to self-configure and play nice with other UPnP devices on the network. This should make it easier for a non-techie to set up.

LinkSys' new baby will include a TV-friendly UI for selecting music and pictures from your digital media library. It also adds 802.11 to the mix, which frees you from having to pull Cat-5 cable into your living room. But it will not support streaming video, in part because reliable Quality of Service over 802.11 won't arrive until the IEEE working group ratifies the 802.11e standard. Also, we don't know now whether the Digital Media Adapter will include a remote control.

If LinkSys can deliver this product for around \$100-\$150, it could be one of the best ways to get audio and digital pictures into your living room.

<b>Product:</b>	LinkSys Digital Media Adapter
<b>Web Site:</b>	<a href="http://www.linksys.com">www.linksys.com</a>
<b>Pros:</b>	Wireless; Low Cost
<b>Cons:</b>	No Video
<b>Summary:</b>	When it ships later this year – if it delivers on the promise – this should be a strong contender

### 3.3 Prismiq Media Player

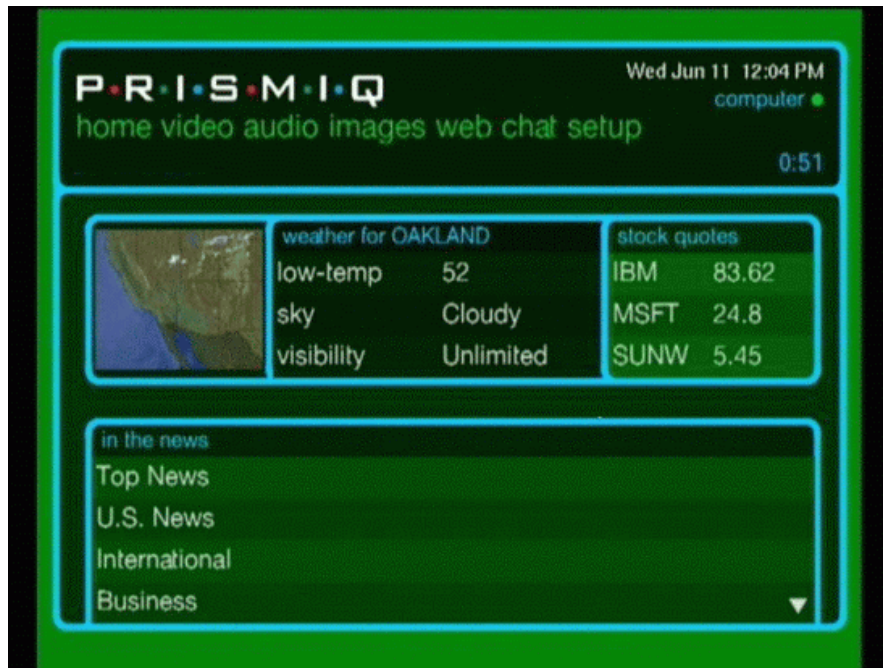


The AudioTron delivered digital audio over Cat-5, but without a TV-based interface. We expect Linksys will add wireless to the mix too. But if you want it all now, along with video, Prismiq's interesting little box does it all now, for \$250.

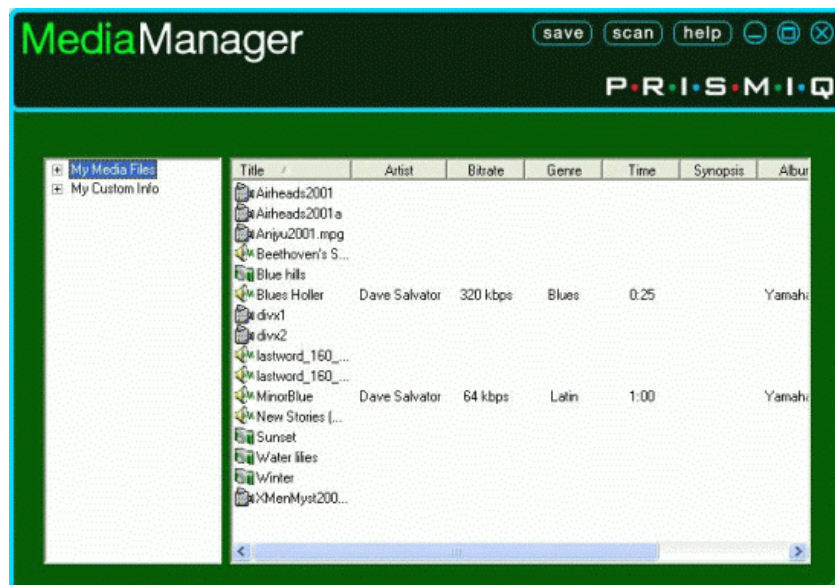
Prismiq's media player can play MPEG-1 and MPEG-2 using hardware and MPEG-4, DivX, and future video codecs using software. On the audio side, it can play MP3, MP2, and AC3 formats (using hardware), and wave files and future audio codecs (using software). It can also play Shoutcast and WMA Internet radio streams. The Prismiq player can also display JPEG, GIF, and PNG still images. This is the most feature-complete home media appliance we've seen – although a PC is still better.

The box is based on an NEC 32-bit MIPS CPU that has an integrated MPEG decoder. There's 16MB of flash ROM as well as 64MB of system memory. A CardBus slot on the unit's back panel allows you to plug in a wireless Ethernet adapter, and the media player supports a good number of wireless Ethernet cards.

Based on an embedded version of the 2.4 Linux kernel, the Prismiq player gives you an easy to navigate TV-based UI.



Here you see the default "desktop," which presents localized weather, stock quotes and news headlines. The text is pretty legible, however, reading regular web pages with Prismiq's web browser can be pretty painful. To be fair, this isn't Prismiq's fault, but rather is due to the low resolution of NTSC television. Unfortunately, the Prismiq player has no HD-class video outputs (VGA, DVI, component), so the best you can do is S-Video.



In order to stream audio and video, you have to run the Media Manager application on at least one PC on your network. This program, which is more like a system service, is the "eyes and ears" for the set-top box. Without it, the player is essentially blind and deaf.

Our biggest problem with the Prismiq player is that it lacks any local storage. That means Web page bookmarks, stock lists, and weather settings have to be stored on the PC rather than the player.

Why no local storage? We suspect it has to do with money. The player is selling for \$250, and adding even a modest hard-drive would push the price up at least \$100. However, we'd like to see a small amount of flash memory added to the system, along with a SmartMedia, SD or CompactFlash card reader for displaying freshly taken digital pictures.

During testing we were able to use the Prismiq to play all the advertised media types. Before we could play any of them we had to scan our host PC's hard-drive with the bundled Media Manager app. You run the application on just one PC, but it not only catalogs local media files, it also supports shared volumes from other PCs on your network.

We tested the Prismiq using standard Ethernet, so that we could look at several clips with higher bit rates without having to worry about a wireless network causing hiccups during playback. Video playback quality was solid, and we saw no interlace-based artifacts. The playback begins initially in a framed window that eats part of the UI, and then goes full-screen. Having a button on the UI that simply said "full-screen" would be a helpful addition.

While navigating the UI the player's overall performance felt a bit sluggish at times, particularly when using the integrated web browser. We attribute part of the slow performance to the inexpensive and low-clocked MIPS CPU that forms the heart of the system.

The Prismiq player also includes the GAIM open-source AOL Instant Messaging client, so you can use AIM in your living room. Of course to really use this feature you'll need a keyboard, which is sold separately for \$50. AOL is in the nasty habit of changing its protocols to try and lock out non-AOL clients (like GAIM and Trillian), but the Prismiq has upgradeable firmware so that when a GAIM update becomes necessary Prismiq can implement the needed changes.

A remote control is included with the Prismiq media player.

We really liked this device. It's the closest to media client Nirvana we've found yet, but there are still some holes in its feature set. Most notably absent is support for either WMA or WMV formats. It also currently lacks support for Ogg Vorbis, an increasingly popular open-source audio codec. Given that Prismiq can add in additional formats via the Media Manager software we hope that the company will address these shortcomings.

A company official stated that WMA support is already in the works, and that WMV and Ogg Vorbis support are in the roadmap.

Prismiq has just made available the 3.1 version of its firmware, which adds support for 802.11a and 802.11g cards, bringing much faster wireless networking to the Prismiq Media Player. This added support would also allow higher bit-rate video streams to be played by Prismiq via wireless, although the usual issues with 802.11's Best Effort architecture will still be present.

For \$249, this is a pretty complete product, even though it's missing a few things and requires a PC to operate. But all told, it's still the best thin media client we've seen whose price tag is south of \$300.

<b>Product:</b>	Prismiq Media Player
<b>Web Site:</b>	<a href="http://www.prismiq.com">www.prismiq.com</a>
<b>Pros:</b>	Audio, stills, video and a web browser all in a single, compact package.
<b>Cons:</b>	Lacks local persistent storage; No support for WMA and WMV file formats; sluggish performance navigating through the UIs.
<b>Summary:</b>	The best thin client appliance we've seen for under \$300.
<b>Price:</b>	\$249
<b>Score:</b>	8/10

### 3.4 TiVo Series II Plays PC-based Media



This could be the best device of all. A great Personal Video Player, along with the ability to play digital music, photos and movies from your PC. Too bad it's so expensive.

If you're looking to playback digital media from your PC onto a TV or home theater, the new series II TiVo has a lot going for it. It includes: a very easy to use interface, good video quality, an electronic programming guide (EPG), and ad zapping features.

The original TiVos lacked any ability to playback other content. But because it runs Linux, a strong community of dedicated TiVo hacker-enthusiasts has been able to get the TiVo to do other things, and provided a wealth of information for TiVo tinkering, including adding an Ethernet card to the original TiVos.

For owners of Series 2 TiVos, the \$50 Home Media Option (HMO) allows you to connect the TiVo to your home network, where it acts as a media client. With this option installed, the TiVo can stream digital audio files, and display digital pictures from a PC elsewhere on your home network. There's support for 802.11 via a LinkSys USB adapter, or you can use traditional wired Ethernet via a USB Ethernet adapter. It's annoying that TiVo doesn't include Ethernet as standard equipment in this day and age, but instead makes it an upsell, but the HMO feature package is a sufficiently interesting to warrant the purchase of the additional hardware.

You'll need to run TiVo Desktop software on your PC or Mac to serve up the digital content, but this software only needs to be running on one machine on your network. The very nice thing about this new package is that the TiVo can also act as a video server, allowing you to view PVRed content on any PC on your home network. The other noteworthy feature is that you can schedule recordings remotely via the Web.

A Series 2 TiVo currently goes for around \$250 with 40 hours of recording capacity. The addition of the Home Media Option pushes the price up to \$300, plus the monthly EPG subscription fee, which is either \$13/month, or \$300 for a lifetime (of the TiVo, not you) subscription. Altogether, that adds up to \$600 for what is a very capable box.

If you're looking for minimal muss and fuss, the TiVo route is a good way to go, and is probably the easiest product for getting spousal buy-in. And, if you get the urge to tinker, TiVo's Linux roots and dedicated community make that an option as well.

<b>Product:</b>	TiVo Series II
<b>Web Site:</b>	<a href="http://www.tivo.com">www.tivo.com</a>
<b>Pros:</b>	Easy to use, affordable, and even hackable.
<b>Cons:</b>	Monthly subscription fee, expensive
<b>Price:</b>	\$250, 40-hour capacity; \$50 Home Media Option; \$13/month EPG subscription

### 3.5 Older Desktops and Notebooks

In the same way that an aging desktop system can be repurposed into a modest home file server, that same desktop system could be "put out to pasture" as a media playback device in your living room. With its older CPU, this machine won't be ideal for extensive media encoding, but as a playback device, just about any Pentium-III-based system will have enough horsepower to render audio and video, including DVD playback.

You will need a graphics card with TV output, though, if you want to drive a standard-resolution TV. You'll also want some kind of full-screen TV-friendly UI, like MyHTPC, ShowShifter, or SnapStream 3.0. Of these three, MyHTPC ([www.myhtpc.net](http://www.myhtpc.net)) has the advantage of being free, and its XML-based interface is highly customizable. Another upside to going this route is that it can be a low-cost, or effectively free way of getting a highly configurable and versatile media client where you want it.

Many desktop ATX cases will actually fit in A/V component racks, and these cases can be found for well under \$100. If your entertainment center has a closing door to house your components, you also get some acoustic shielding from the PC's fan noise. Noise is less of an issue with many older systems, because the slower processors generate less heat, and thus require less cooling.

Another candidate for media client duties is an aging laptop that you're about ready to retire. Any P-III-based system will get the job done, and you can decide which OS you want to use, depending on which multimedia features you want the client to support. Again, some kind of analog video output (composite/S-video) is essential if you want to play back video content on your TV. One downside here is that some laptops' TV output quality is pretty bad. So you'll need to see if your old laptop's TV output picture quality is up to snuff before going this route.

If you're looking for high-quality audio -- particularly digital audio, you'll also want a good sound card. You can find a good external USB device that provides high-quality analog and digital output. We recently looked at two of these devices and found them to be quite decent audio solutions: the Xitel HiFi-Link ([www.xitel.com](http://www.xitel.com)), and M-Audio's Sonica ([www.midiman.com](http://www.midiman.com)).

### 3.6 Acer TMC100 Tablet PC



We will briefly look at Acer's new TMC100 Tablet PC that runs Windows XP Tablet PC Edition, to see if it could act as a not-so-thin media client. The answer is it can, but it's just about the most expensive way to go, since the base model checks in at around \$2,100.

Tablet PCs could be more like a souped-up version of the Archos AV320 portable media player with PC capabilities and network connectivity. But again, the high price makes this option prohibitively expensive, unless you were planning on getting one of these machines anyway. In that case, acting as a media client around the house could be one more role a Tablet PC could fulfill.

The other issue is A/V I/O. The Acer TMC100 has a stereo line-out jack, but lacks a digital audio output, and also missing is any kind of analog video output (composite or S-Video), so you won't be able to connect it to your TV for viewing video content.

The unit's 10.4" XGA-resolution display can do a fine job playing back digital video files, and audio output was clean enough in headphone listening tests, but this unit is really designed to do other things, and because of the cost of the touch-screen, this product's high price makes it a poor candidate to be used solely as a media client.

As prices begin to come down on units like the TMC100, they may become better suited for use as media clients, in addition to their other more corporate-type duties, but until then, this isn't the way to go.

### 3.7 EPIA M10000 devices

ITX-based PC Attempts to Solve the Media Client Problem, we were impressed with just how small Via had managed to make a motherboard/CPU combo with integrated graphics, audio, USB 2.0, Ethernet and FireWire. However, we did find that the graphics performance on video playback was less than stellar, and as such, the EPIA M10000 with Via's base graphics drivers isn't an ideal solution as a media client.

However, two companies are currently plowing ahead, developing media PCs using the EPIA M10000: Interact-TV's Linux-based Telly and OneBox's Media Center PC, which despite its name, does not use Windows XP Media Center. The boxes are priced at \$900 and \$1,000, respectively, and as such, they are a good bit more expensive than our \$400 target price. But because you use them as both media client and server – storing all your digital media on their internal hard drives, some of this additional cost can be justified.

**Telly:** At present, the \$900 Interact-TV's Telly is available only via direct order on the company's (<http://interact-tv.com/products.php>). Company officials are looking for a larger OEM to aggressively market the design, with Interact-TV providing guidance on system integration issues.

**OneBox:** OneBox isn't yet shipping its \$1,000 Media Center PC, but again, as soon as review hardware becomes available we'll be testing this unit as well. We took an early look at the device at a trade show recently, and liked what we saw

### 3.8 Media Center PCs

System makers like HP and Alienware are currently selling Media Center PCs based on Windows XP Media Center (XPMC). We've been fairly impressed with this living room-targeted version of Windows, and because this device is a PC, you get the versatility and configurability to have this system act either as a media client or server, or both. The problem is one of cost. Base systems using XPMC start at around \$1,500, and escalate from there.

Currently, Microsoft isn't selling standalone versions of XPMC, so the only way to get it is by buying one of these systems. We hope that Microsoft will revisit the decision not to sell XPMC directly to consumers, and that pricing will be inline with Windows XP Home, where the OEM version can now be had for around \$90.

HP sells a thin client that connects up to any PC, which serves audio and pictures, and the plan on having a video-capable version -- which may only work with its media center PCs -- later this year. That device costs \$200 for the Ethernet version, and another \$100 for the wireless option. The HP interface is text based, simple to use and boring.

Finally, Sony sells its own solution for the digital media server and client problem. If you purchase a high-end Vaio, you get TV tuner capabilities, along with TiVo style PVR and a photo, video and audio server. Another \$200 gets you a Sony thin client, which also supports 802.11a and streams audio, video, TV and photos to a TV or home theater elsewhere in the house. The software works well, and the TV interface is nicely done. But again, you have to buy into Sony's vision 100%.

## Chapter 4 Picking the Right Thin Media Client

What's the right product to buy? We're impressed with TiVo and the Prismiq, but still see PC alternatives as offering the best mix of features.

There are a lot of different ways to get a media client into your living room, and each one is a study in tradeoffs. Of all the offerings we surveyed here, there are two shipping products that come closest to satisfying our ideal: Prismiq and TiVo with the Home Media Option. We also found that a repurposed desktop or laptop PC offers another decent way to get your audio and video files flowing into your living room. This is a good option if you've got a machine you're about ready to retire anyway.

Finding the right media client is a tough balancing act between power, features, and cost, and it's also a function of what features you really want. There's also the matter of whether you want this to be a "tinker box," or a CE device that you leave well enough alone and just enjoy.

Going the PC hardware route obviously opens up a lot more tinkering opportunities, though the TiVo is also a tweakable, and less expensive system. The Prismiq media player is an interesting alternative if you already have a PC-based TiVo app like SnapStream or ShowShifter, since you can stream that video to your TV and play it via the Prismiq player. We expect to see more Prismiq-like devices in the coming months that offer up audio, digital pictures and video in a compact, affordable package. Once you decide what features you really want, and what your budget is, there's a media client that's the right fit for you in this vast array of options.

### **What to Buy**

**No Muss-No Fuss:** If you don't already have a PVR app running somewhere in your house, or you own a Series 2 TiVo, then the new Home Media Option package offers up some very cool added features to an already-cool product for \$50 bucks. We need to spend some more time playing/living with the TiVo HMO package, but at this point, it looks very encouraging.

**Lean and Mean:** Prismiq's media player is a good option if you already do your PVR recordings using a PC, and want to get that video content, along with audio and digital still images into your living room.

**The PC Way:** Buying a new PC will put you well over the \$400 price ceiling we're aiming for, but it is certainly a valid option. A better way to go is to repurpose an aging desktop, or possibly laptop, to act as your media client, since you can go this route with little or no cost.

Small form-factor PCs are an interesting possibility here, like Via's EPIA M10000, or one of Shuttle's XPC-based systems, but again, unless you're harvesting components from existing systems, the costs here may be more than you want to spend for a media client box.