Thoughts on Building a Home Theatre PC

Introduction

This document outlines my thoughts on building an HTPC - I haven't actually built one yet, but some people may find these thoughts useful.

Why build an HTPC?

The usual answers to this question centre around convergence of all the media formats in your home (CD, DVD, TV etc.) into a single device thereby making control/access easier. In my case there were a couple more reasons:

- We have a High Definition TV – but we are only using Standard Definition inputs (TV and DVD)
- It would provide a server for home use (accessed by the other notebooks in the house).

High definition video could come from one or more of the following sources:

- Blu-ray
- Freesat HD
- Freeview HD
- Pay TV service (Sky or Virgin Media)

So, what would it cost to simply buy a Blu-ray player and a Freesat recorder?

- Blu-ray player £135
- Freesat HD (500GB) recorder £290

Therefore, we could get equivalent HD functionality by spending £425. Alternatively, we could get the superseded models of Panasonic's do-it-all HD recorder for around £500, or the new models for £830. Of course, the Panasonic's allow recording onto Blu-Ray media, so they aren't an exact substitute.

So, the above give a reasonable budget to work with. Can we build an HTPC for similar money that will provide equivalent functionality?

Criteria

General

What do we want this HTPC to do? What are the limitations we have to work within?

Here is one list:

- Must play all existing media (FLAC, WMA, AC3)
- Must add Blu-ray and FreeSat HD sources
- Must allow recording of FreeSat
- Must be unobtrusive in the living area
  - Maximum size of 445 x 370 x 134 (WxDxH)
  - Must be (nearly) silent
  - Must not be garish
- Does not require gaming ability.

This criteria of being unobtrusive is actually the most difficult to achieve.

Operating System

We want Blu-Ray and Freesat HD playback. This means we need to decode video using the H.264 codec – which is proprietary, and effectively unavailable under Linux. While there are some reported cases of people getting Blu-Ray to work under Linux, the simplest thing here is to use Windows 7.

Chipsets and Graphics

Before going to the chipsets themselves, there is the choice of whether to use integrated graphics or a standalone video card. Integrated graphics do not have a good reputation when it comes to either game playing or any other graphics intensive application (such as Blu-Ray playback). But integrated graphics do have advantages for HTPC use:

- space-saving
- lower overall heat output
  - less need for cooling
  - easier to keep the system quiet.

For standalone graphics cards, the space restrictions almost certainly mean that we would need a half-height card (or a riser card coupled with sufficient space in the case for the sideways mounted card).

For the purposes of this exercise, we will only consider integrated graphics solutions. So, what is chipsets are available that can provide Blu-Ray playback? Relatively few ….

AMD-780G	ATI Radeon 3200	(superseded)
AMD-790GX	ATI Radeon 3300	(superseded)
AMD-785G	ATI Radeon 4200	
AMD-880G	ATI Radeon 4250	
AMD-890GX	ATI Radeon 4290	

Nvidia GeForce 9300
Intel G45

You might also consider the Nvidia ION chipset (GeForce 9400M).

I've looked more into the AMD side of things, so you may find others that support Intel processors.

The Nvidia GeForce 8200 is sometimes also mentioned. However, this does not appear up to the standards of the other chipsets mentioned. For example, see:

http://www.tomshardware.com/reviews/avivo-purevideo-clearvideo,2408.html

For the purposes of this exercise, I will mostly be looking for AMD 785G chipsets.

Computer Case and Power Supply

What does a case do?

- It holds all the parts together
- It is the visible part of your PC
- It contributes to the efficiency of cooling of your components

- It impacts on the "noise footprint" of the PC.

Ideally, we want a case that is:

- attractive
- easy to access
- allows good cooling of components
- quiet
- will fit in the space available.

Returning to the original specification, "normal" PC's are not suitable. They are both too large, and don't fit into the living room environment. So, the search mostly centred on HTPC cases.

The Antec Micro Fusion Remote case was the prime contender. It was small(ish), designed to be used in an HTPC context (so it looked the part), and came with a remote control and software. However, at 410 mm deep, this case is 40 mm too long for the available space.

In fact, the size requirements turn out to be quite restrictive. Because space is restricted in all three dimensions, few mATX cases actually fit. In particular, the height and depth dimensions are problematic.

Even those mATX cases that technically fit have problems. Take the InWin BL series of cases – these are 365 mm deep. This fits in the available space (370 mm) – but doesn't allow any space for cables. If we allow 50 mm (2 inches) for cables, then the available depth is actually only 320 mm (or 340 mm if we allow overhang at the front).

No mATX cases were found that actually meet this restriction. Therefore, we need to look at mini-ITX cases.

Mini-ITX cases bring their own set of problems:

- Most ITX cases require use of slim optical drives. Blu-Ray drives in this format are few and far between, and priced to match.
- Most ITX motherboards are for the Intel Atom CPU, with the Via C7 being the next most common CPU. There are relatively few motherboards for either Intel or AMD desktop CPU's.
- Accordingly, many ITX power supplies are for 120 Watts or less.
- ITX motherboards tend to be more expensive than ATX or mATX equivalents.
- There are few expansion slots available in the ITX format. This makes it all the more important to use integrated graphics (so that expansion slots can be used for other cards).
- The confined space of an ITX case makes cooling more important too.

Well, there are many ITX cases that will fit into the available space – which should I consider?

The case that has most caught my eye is the InWin BP655. This is a little bit bigger than many ITX cases allowing it to use a full size Blu-Ray drive (and 3½ inch hard drives). It also comes with a 200 Watt power supply giving it ample power for desktop CPU and chipset.

Some reviews of this case note that the fan and/or power supply are noisy. Other reviews say they are extremely quiet. That range of comments goes for most case reviews I have seen.

ITX Motherboards and CPU's

Scan Computers (www.scan.co.uk) have an ITX motherboard using an AMD785 chipset. This is the J&W Minix 785G-SP128M board costing £91.40 including VAT. This is an AM2+ motherboard (using DDR2 memory), and is somewhat more expensive than an equivalent mATX board. (Review at: http://vr-zone.com/articles/does-size-really-matters-/8216-1.html)

Alternative motherboards include the Zotac GF9300-I-E for Intel Core 2 processors (£117.09), the Intel BOXDH57JG for Intel Core i3 or i5 processors (£102.89), or one of the many Nvidia ION/Intel Atom motherboards (e.g. Zotac IONITX-G-E for £110.91 including the Atom CPU).

The cheapest option is clearly the ION/Atom combination, but won't provide the performance of the desktop CPU's.

A suitable CPU for the AMD chipset is the Athlon II 250 (£53.67). If higher performance is desired, then alternative chips include Athlon II X3's, Athlon II X4's, or any of the Phenom range (although you need to balance the extra performance against the higher power consumption and heat in these more powerful chips). Alternatively, you could opt for the less powerful 240 version of the Athlon II, or one of the energy efficient versions (say the 235e).

Configuration So Far

Here's the configuration so far (plus a few other bits):

InWin BL655 Case	45.87
J&W Minix 785G-SP128M Motherboard	91.40
AMD Athlon II 250 CPU	53.67
2 GB Corsair TwinX DDR2-800 Ram	54.80
Samsung EcoGreen F3 500 GB Hard Drive	38.20
Samsung Blu-Ray/DVD/CD Combo Drive	66.95
Keysonic Notebook style wireless keyboard	31.71
Windows 7 Home Premium 64 bit	82.33
TOTAL	**464.93**

Some of these components are available cheaper elsewhere. However, I've priced everything from Scan computers because they have that motherboard available.

So far, we are around £40 more than the blu-ray/freesat combination outlined at the beginning of this exercise – and we don't have the TV tuner(s) yet.

Satellite TV Card

The J&W board has one PCI-e slot available for expansion. Otherwise, connections to peripherals can be made via USB 2.0.

So, what HD Satellite cards are available? HD requires use of the S2 protocol, so any cards marked DVB-S are NOT suitable. We need DVB-S2.

From Prof Tuners (www.prof-tuners.com), there is the choice of the Prof 8000 (PCI-e) or the Prof 7500 (USB). We'll choose the 7500 both because it is easier to connect and it is cheaper (USD65.60 = £45 + P&P).

TBS (www.tbsdtv.com) are advertising the TBS DVB-S2 Q-Box II for US$99 (about £67 + P&P). Interestingly, this advises that Linux drivers are available for this product.

Total Package

If we add a single tuner to the cost outlined above, we have a total cost of around £510, while a second tuner would take the cost to around £555. Of course, it might be better to make the second tuner a DVB-T2 tuner – when they become available.

Is this worth it? Maybe. It costs more than the blu-ray/freesat combination outlined at the beginning, but it is more capable also.

On the other hand, I would tend to specify any build a little higher than what I've used here – possibly with 4 GB of ram; probably faster ram (the board can use 1066 ram); and definitely with a larger hard drive (1.5 TB). The larger hard drive would add about £30; another 2 GB of ram adds £50; with faster ram adding a further £10. That's another £90 all up.

A useful comparison is the Dell Zino HD. This is an ITX form factor computer based on the AMD 780G chipset. One of the current bundles has this PC available with an AMD 6850e processor, an ATI Radeon 4330 graphics card, a blu-ray drive, 6 GB of ram, and a 1 TB hard disk for £549. That is just slightly more than the base configuration priced here plus the upgrades outlined above, and has more ram, but less disk, and lower processor performance than the HTPC build. The Zino HD gets slightly mixed reviews (especially the versions with the lower performance processor and without the discrete graphics), but as specified above could perform almost as well as the HTPC build.

Other Thoughts

It has become apparent while looking into HTPC's, that it is much easier to build a quiet PC if it is large (or at least a standard size).

In general, small fans (in small cases) have to turn much faster than large fans (in larger cases) to move the same volume of air. In turn, that higher rotational speed means small fans will be louder than the large fans. Therefore, 12cm fans will be much quieter than 6 or 8 cm fans.

Large cases can also use sound absorbing materials to reduce noise.

Therefore, if you have room, you can use one of the larger HTPC cases which are designed to be quiet. Alternatively, if you don't mind a "real" computer near your TV, you can use something like the Antec Sonata III which consistently gets good reviews for silence.

Finally, if you don't want blu-ray, then the cost of the build can come down substantially. Firstly, a DVD drive is much cheaper than a blu-ray drive. Secondly, you can dispense with Windows completely, and use Linux (depending on the availability of drivers for the TV cards).

Useful Websites

www.quietpc.com
www.silentpcreview.com
www.avforums.com
www.tomshardware.com

xbmc.org
www.mythtv.org
www.team-mediaportal.com