



How To Build a Great Media Center for Your Home



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Why an eBook about Media Centers?

Media centers hold many advantages over most common household devices. They can* allow you to:

- Keep watching your regular television channels
- Keep playing your regular CD and DVD media – perhaps even BluRay
- Play video, audio and picture files on your television, like avi's, mp3's and jpeg's
- Stream files to your television from another computer
- Stream video and audio from internet services, like YouTube and Pandora
- Grab other information of the web, like subtitles and reviews

The media center market is certainly a crowded one, though. From brand boxes like the Apple TV to custom built powerhouses, a normal user has to make a lot of decisions, and when these decisions involve money a guide can come in pretty handy.

*Depending on the software used

What do I need?

The first question you have to ask yourself is what do you want the media center to be capable of. Do you want it to merely serve your music collection and the occasional rented movie or DVD? Or do you want it to record multiple channels, rip and store all your DVDs, and encode all your music collection in lossless audio formats such as FLAC? How much time are you prepared to spend building and tweaking the media center? And lastly, how much money are you willing to spend?

Once you've answered to the questions above you are ready to choose one of the four paths possible:

1. Buy an AppleTV or a similar integrated media center solution. It requires the minimum amount of time and effort and is usually pretty cheap. Most consumers will be satisfied by the range of outputs/inputs as well as performance.
2. Build a custom PC by selecting hardware components that suit your needs, assembling them and installing custom software like MythTV. This method involves at least 10 hours of work and advanced technical skills, especially when dealing with Linux-based setups.
3. Buy a media center extender that will enhance the capabilities of your PC. This device will connect to your existing hardware and will enable greater storage, connectivity and playback functions. A very popular MCE is the Xbox 360.
4. Recycle and upgrade an older PC with standalone software. This method is restricted to users with low expectations – older graphic cards, motherboards and CPU's don't offer sufficient speed for high definition content or perks like optical audio output.

This eBook is about building a media center, but from a reader's perspective, I don't think the other options available should be ignored. While most of MakeUseOf readers are comfortable building PCs, installing operating systems and software, not everyone has the time or the technical skills necessary for building a media center. So let's take a brief look at the alternatives before delving into how-to part.

Apple TV

The Apple TV is a complete media center solution that benefits greatly from integration with iTunes, the iTunes Store and of course, an easy to use, elegant design for both hardware and software. If you have other Apple hardware at home – such as an iPod or a Mac – the Apple TV integrates beautifully for a seamless experience. A good example of this kind of integration is the iPod touch which can be configured to work as a remote control, connecting through the wireless network. It can also stream music wirelessly to any speaker system connected to AirTunes [<http://en.wikipedia.org/wiki/AirPort>].

While it works best in an Apple environment, the Apple TV also syncs with iTunes for Windows.



Photo credit: niallkennedy [<http://www.flickr.com/photos/niallkennedy/351993015/>]

The Apple TV can receive content from a number of sources by default: iTunes store, YouTube, Flickr, MobileMe. There is also a significant online community dedicated to developing various hacks that improve the capabilities of the device, including a wider array of video and audio codecs as well as BitTorrent integration and support for various third party media center applications like Boxee [http://howto.wired.com/wiki/Hack_Your_Apple_TV_With_Boxee].

It can output 5.1 surround sound via a digital optical/HDMI port or stereo via multiple analog (RCA connector) audio ports. It supports video output through either High-Definition Multimedia Interface (HDMI) or component and requires an enhanced or high-definition widescreen TV. The maximum output resolution is 1080p/1080i at 60/50 Hz but the maximum video resolution is limited at 720p. While it's not the best resolution available, the difference between 1080p and 720p is not noticeable on screens smaller than 70 inches.



Photo credit: Apple Inc. [<http://apple.com/>]

One of the biggest issues with the Apple TV is the lack of a TV tuner and therefore any PVR (personal video recorder) capabilities. These capabilities could be potentially added with an external tuner and a newer version of the firmware (Apple TV operating system).

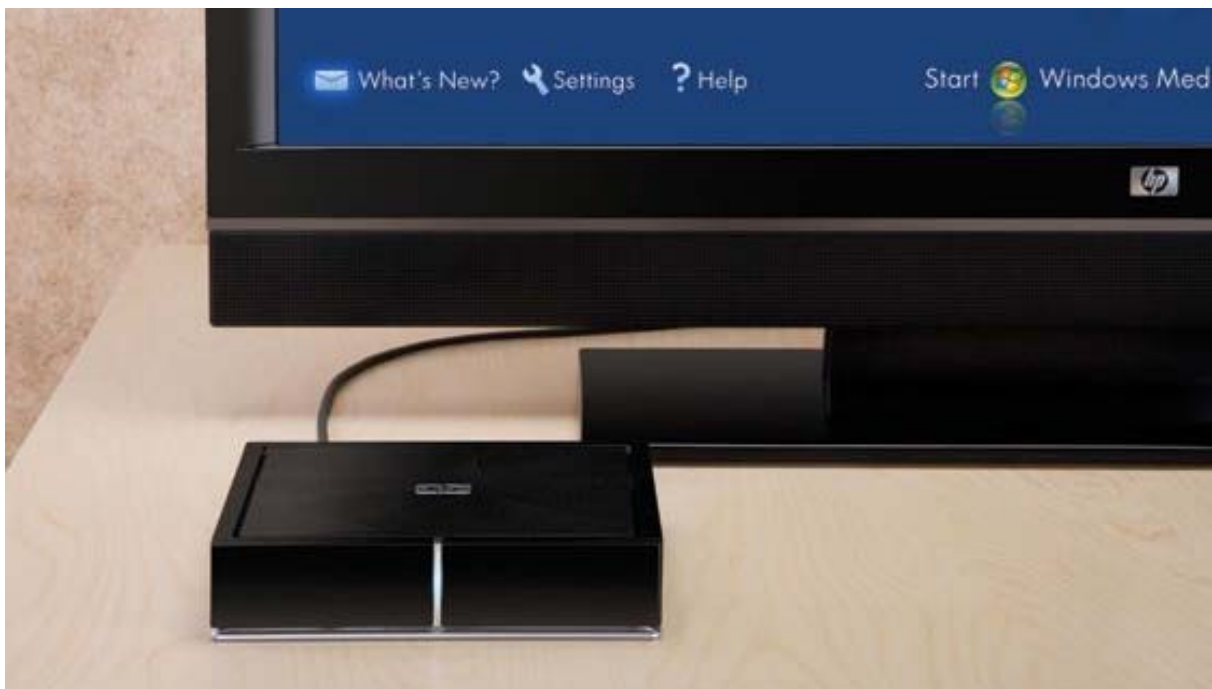
The Apple TV is available in both a 40GB \$229 and a higher-end 160GB \$329 version. It can access resources from any computer with iTunes, and stream content over the network provided it's fast enough (for example streaming high-definition movies over a 802.11g wireless network is prone to lower frame rates and buffering). A higher capacity Apple TV is preferable when using a slower network.

Photo formats supported	Audio formats supported	Video formats supported	Connectivity
JPEG, BMP, GIF, TIFF, PNG	AAC (16 to 320 Kbps); protected AAC (from iTunes Store); MP3 (16 to 320 Kbps); MP3 VBR; Apple Lossless; AIFF; WAV; Dolby Digital 5.1 surround sound pass-through	<ul style="list-style-type: none"> H.264: 1280 by 720 pixels at 24 fps, (960 by 540 pixels at 30 fps) in .m4v, .mp4, and .mov file formats MPEG-4 in .m4v, .mp4, and .mov file formats 	<ul style="list-style-type: none"> 10/100BASE-T Ethernet USB 2.0 802.11n wireless networking Built-in IR receiver (works with included Apple Remote)

Xbox 360 and Media Center Extenders (alternative)

Basically, the media center *extender* is a piece of hardware that's about the size of a set top box that makes the link between a computer with Windows Media Center and the television. This might be an alternative solution for less techie people who don't want to build a dedicated media center. It can connect via a wireless or wired network to your computer and forward the media library and the Windows Media Center interface to the TV.

If Windows Media Center is already on my computer, why buy an extra piece of hardware? That's a perfectly reasonable question. - Because you don't want to have a noisy, dedicated PC, in the living room. Instead, you keep the PC in your room and install a relatively cheap device that bridges the gap between the two.



With a device like this HP Media Smart Connect, you can use the Media Center and its features (such as view photos, videos, listen to music, watch live television and use DVR functions, watch recorded TV, etc.) on the television. One notable caveat is that some of these extenders don't come with TV tuner cards. You will have to buy one and install it in your PC or laptop if you want to watch and record TV programs. You will also need to keep the PC powered on while the MCE is expected to serve content to the TV. More information about Media Center Extenders is available from Microsoft at [<http://www.microsoft.com/windows/products/winfamily/mediacenter/features/extender.mspx>].

For a list of hardware that was approved by Microsoft for full compatibility and features visit: [<http://www.extenderforwindowsmediacenter.com/products.html>]. There are other alternatives available but these are preferred.




The Microsoft Xbox 360 gaming console contains software that emulates a media center extender. To connect the Xbox to the Windows Media Center PC follow these simple instructions available at [http://support.xbox.com/support/en/us/nxe/xboxlive/troubleshooting/NetworkHelp_mcpc.aspx].

Choosing Your Media Center's Hardware

So you want to build a real media center system? Choosing the hardware is always a tedious process that forces you into compromising between quality, performance and cost. Generally speaking, a media center should cost around \$800-1200 to ensure a pleasant experience at the current standards.

More factors come in to the equation when deciding on the case and the cooling system: design, compactness, noise. The case is essential when building a media center PC. You want a compact, low-profile design that will let you install some high performance parts without overheating. The cooling system should be as silent as possible. If you have the skills necessary to install it and the money, you should definitely go for liquid cooling. And remember, the larger the fan diameter is, the quieter it is.

You also want to make the configuration as future-proof as possible. Even if it seems that you won't need the extra performance now, think about updates to the software and more demanding media formats. Here's the system I configured over at Newegg [<http://newegg.com/>]:

Product	Specifications	Price
	SILVERSTONE Black Aluminum / Steel LC13B-E ATX Media Center / HTPC Case – Retail 2 x 80mm fans, 2050rpm, 21dBA Height 6.8"; Width 16.9"; Depth 17.3"	\$104.99 [newegg.com/...]
	Intel Core 2 Quad Q8200 2.33GHz 4MB L2 Cache LGA 775 95W Quad-Core Processor – Retail LGA 775 Socket; 1333MHz FSB; 4MB Cache; 45 nm	\$159.99 [newegg.com/...]
	CORSAIR 2GB (2 x 1GB) 240-Pin DDR3 SDRAM DDR3 1333 Dual Channel Kit Desktop Memory Model TWIN3X2048-1333C9DHX – Retail With Heat Spreader	\$49.00 [newegg.com/...]

	<p>ASUS P5QC LGA 775 Intel P45 ATX Intel Motherboard - Retail</p> <p>Intel P45 Northbridge; Intel ICH10R Southbridge; DDR3 1333 / DDR2 1066; 1 PCI Express 2.0 x16</p>	<p>\$124.99</p> <p>[newegg.com/...]</p>
	<p>Sony Optiarc Black 5X BD-ROM 12X DVD-ROM 32X CD-ROM SATA Internal 5X BD-ROM & 12X DVD Burner Model BC-5100S - OEM</p>	<p>\$94.99</p> <p>[newegg.com/...]</p>
	<p>Seagate Barracuda 7200.11 ST31000333AS 1TB 7200 RPM 32MB Cache SATA 3.0Gb/s 3.5" Internal Hard Drive - OEM</p>	<p>\$89.99</p> <p>[newegg.com/...]</p>
	<p>ZALMAN CNPS 9700 NT 110mm 2 Ball Ultra Quiet CPU Cooler - Retail</p>	<p>\$54.99</p> <p>[newegg.com/...]</p>
	<p>Antec EA750 750W ATX12V version 2.3 SLI Certified CrossFire Ready 80 PLUS Certified Active PFC "compatible with Core i7" Power Supply - Retail</p>	<p>\$109.99</p> <p>[newegg.com/...]</p>
	<p>NVIDIA N9600GT-MD1G GeForce 9600 GT 1GB 256-bit GDDR3 PCI Express 2.0 x16 HDCP Ready SLI Supported Video Card - Retail</p>	<p>\$80.99</p> <p>[newegg.com/...]</p>
	<p>D-Link DWA-552 IEEE 802.11n (draft) IEEE 802.11g IEEE 802.11b 32-bit PCI Xtreme Desktop Adapter Up to 300Mbps Data Rates Wired Equivalent Privacy (WEP) Wi-Fi Protected Access (WPA, WPA2) - Retail</p>	<p>\$54.99</p> <p>[newegg.com/...]</p>
		<p>TOTAL: \$924.91</p>
<p>At 6/20/2009 from Newegg excluding mail-in rebates, including instant rebates</p>		

	<p>[OPTIONAL] Creative Sound Blaster X-Fi Titanium Fatal1ty Professional 70SB088600002 7.1 Channels 24-bit 96KHz PCI Express Interface Sound Card – Retail</p> <p>Higher end audio output (SPDIF via TOSLINK).</p>	<p>\$139.99 [newegg.com/...]</p>
	<p>[OPTIONAL] Rosewill RCR-IM5001 USB2.0 75 in 1 internal Card Reader w/ 3 ports USB2.0 Hub / eSATA port / Extra silver face plate - Retail</p>	<p>\$19.99 [newegg.com/...]</p>
	<p>[OPTIONAL] Hauppauge WinTV-HVR-2250 Dual TV Tuner / Encoder 1229 PCI-Express x1 Interface – Retail</p> <p>Supports Windows 7</p>	<p>\$112.99 [newegg.com/...]</p>
	<p>[OPTIONAL] Anyware GP-IR02BK Vista 2 channel IR Remote Control</p> <p>A single remote control gives you the freedom to access your entertainment from anywhere in the room. The friendly Mediate Center on-screen menus are specially designed for remote control interaction, delivering a fun, engaging and integrated digital media experience.</p> <p>Designed for WMC. Comes with USB Infrared receiver.</p>	<p>\$26.99 [newegg.com/...]</p>
	<p>[OPTIONAL] Microsoft Wireless Entertainment Desktop 7000 – Retail</p> <p>up to 30 feet away, 2.4 GHZ Bluetooth Wireless Keyboard and Mouse; 101 normal keys and 18 function keys</p>	<p>\$115.99 [newegg.com/...]</p>

This configuration is hybrid between a workstation, a gaming platform and music/video playback machine. It's a medium-range computer by today's standards, that's capable of doing whatever you want it to do. The only defining characteristic is the enclosure – a sleek ATX case that could be easily installed in the living room.

An edgy decision was the Core 2 Quad, which at the 95W thermal rating isn't quite recommended for building silent systems. I choose it because I wanted insurance for future versions of Windows Media Center and multi-tasking ability. WMC is quite a power hungry application. And considering programmers are gearing towards more parallel processing, 4 cores is a good insurance policy.

The Asus motherboard was chosen mainly for the 3 PCI Express x1 slots and the 4 banks of DDR3 RAM, which allow for future expandability. The copper radiators were also a plus.

The graphics card is mainstream, not very expensive, but provides adequate acceleration for this year's games as well as the DirectX 10 specifications. It's slim enough to fit our enclosure.

2GB of RAM should be enough for this system, and you can always upgrade later – 2 memory banks will be left available. The 1333MHZ bus syncs well with our CPU's FSB.

The hard drive has a significant capacity and is cheap, not the most reliable, but then you're not going to store your documents on it – just lots of high definition content.

The onboard sound card should provide enough fidelity for normal audio setups – I also provided an alternative for the audiophiles that invested \$5000 in their speaker setup. The TV Tuner card is a hybrid model which means it can catch both digital and analog signals – it's optional because most of the content these days comes from the internet. For the photographers out there – get the card reader – it makes life so much easier.

The Microsoft keyboard and mouse combo is an exceptional one, but it's optional for a reason. After you're done setting everything up, navigating through the WMC interface using a keyboard isn't appealing at all. On the other hand – if you also want to play games and surf the web on this machine – you're going to need a wireless keyboard and this one is designed for the living room.

The remote is cheaper and provides a better experience in most situations. Make sure you buy a model that has a sticker or mentions on the packaging that it is compatible with Windows Media Center. While most remotes will work – it doesn't hurt to make sure. Also check to see if they come with a receiver (either Infrared or Bluetooth).

Warning! Building a computer from components is not easy and is not intended for inexperienced non-technical readers. Do not attempt this if you're not familiar with terminology such as FSB, clock speed, memory timings, BIOS, jumpers, SATA or if you don't have a proper static-proof work bench and rubber gloves. Read all the manuals that come with the hardware before attempting to install it. Do not plug in the computer unless you've installed everything correctly and closed the computer case. Do not touch components while the computer is plugged in. Read the MakeUseOf guide on how to build a PC [<http://www.makeuseof.com/tag/the-idiots-guide-to-building-your-own-computer/>] if you have not attempted to build a PC before.

If you're ready to start working – order the parts and build your own media center. In the next section, we'll discuss which software is best suited for you.



This is just a sample configuration – a media center PC I'd build for myself - powerful enough to be put to use for at least 3 years. I choose quality over price – after all, you wouldn't want a power supply unit to fail and burn all the other component.

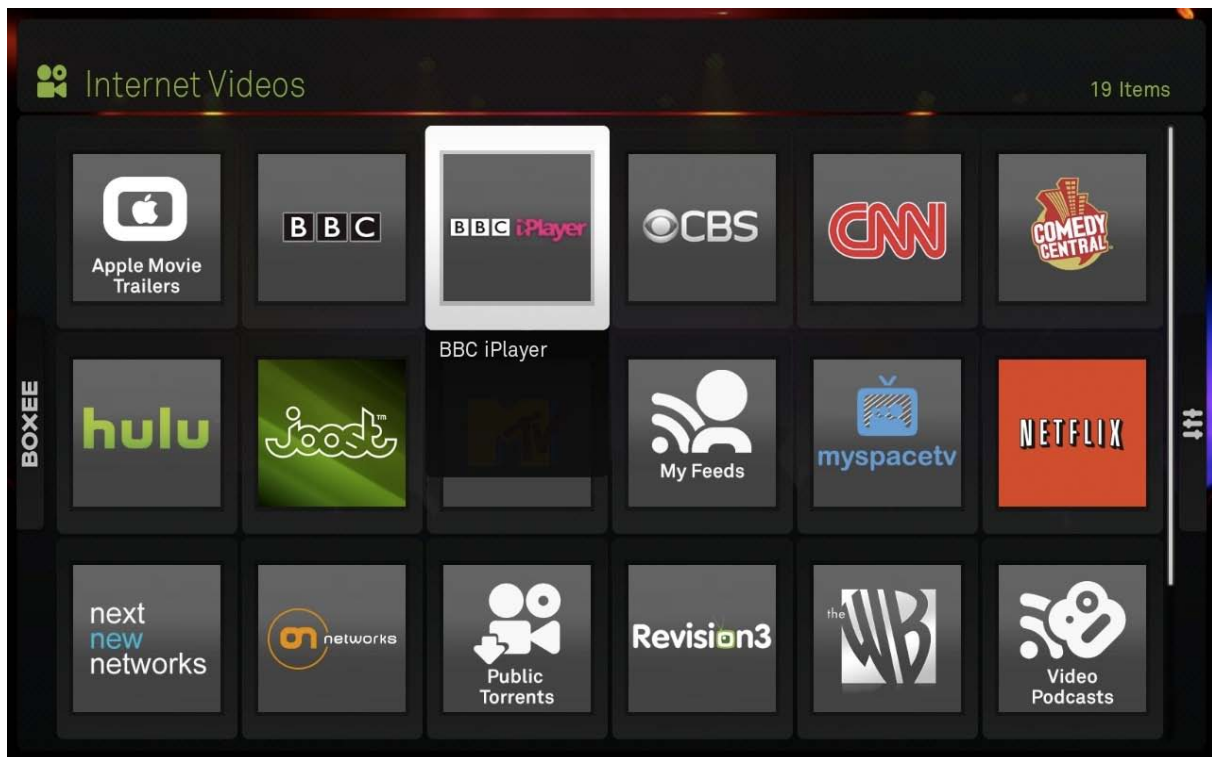
The most important components of a media center are, in this order: the video card, the hard drive, RAM and the processor. For a minimum specification media center, you shouldn't buy any video card cheaper than 70\$, a hard drive smaller than 160GB, RAM less than 1GB and a processor under a 1.8Ghz Intel Celeron Dual Core. A configuration like that would bring the total to less than \$500. But don't expect to play modern games, or record HD video while doing something else. Be careful when choosing the video card to make sure it has at least one DVI, or DisplayPort or HDMI output.

Media Center Software

There are many software solutions available and gladly, most of them don't exclude the others. For example, you could have Windows Media Center, Boxee [<http://www.makeuseof.com/tag/boxee/>] and Hulu Desktop [<http://www.makeuseof.com/tag/hulu-desktop-instant-tv-shows-and-movies-on-your-large-screen/>] running on the same machine. When you want to access content from a different provider or through a different interface just minimize or close the application in question and start the other one.

Boxee

Boxee [<http://www.boxee.tv>] has been getting a lot of attention from the press lately and rightly so. Dubbed the first 'social media center', it brings together the '10 foot interface' for easy and intuitive navigation, integration with numerous web content providers as well as local media playback in one versatile application.

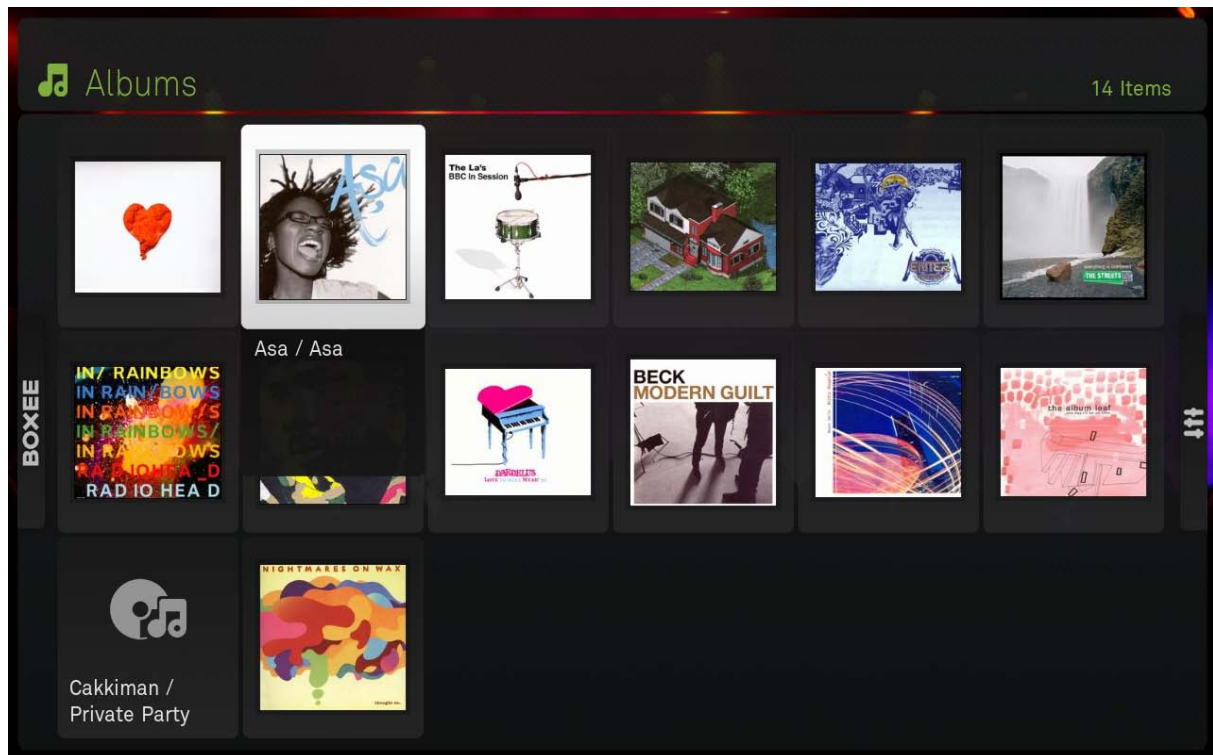


Using its plugin system, Boxee integrates Apple movie trailers, subtitle downloading, BBC iPlayer, Jamendo, Joost, Last.fm, NPR, SHOUTcast, ABC, Blip.TV, CNET, CNN, CBS, Comedy Central, MTV Music, MySpaceTV, Netflix, Revision3, YouTube, Warner Bros Television Network, Flickr and PicasaWeb picture viewing.

Boxee is currently in development and is available for free as an alpha for Windows, Macintosh, Linux and Apple TV. You install Boxee on your computer just like you would install any other application: download the executable from the Boxee website and double click to initiate the installation wizard. It will automatically place a shortcut to the application in your start menu.

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From my own experience I can tell you that it's stable and usable – significantly more comprehensive than Windows Media Center mainly because of the tight integration with web content.



Boxee requires users to create accounts, which form the foundation of the social network. Users can follow the activity of other Boxee users who were added as friends as well as assign ratings to content. This activity feed can be exported into other social networks such as Twitter, Tumblr and Facebook.

It offers playback capability for files from optical media, local hard disk drives, SMB/SAMBA/CIFS shares (Windows File-Sharing), or UPnP (Universal Plug and Play) shares. It also uses the internet connection to retrieve metadata on video and music content via IMDB or CDDB. It also sends play counts to music social network Last.fm. Boxee can in addition upscale the resolution of all 480p/576p standard-resolution videos and output them to 720p, 1080i, or 1080p HDTV-resolutions.

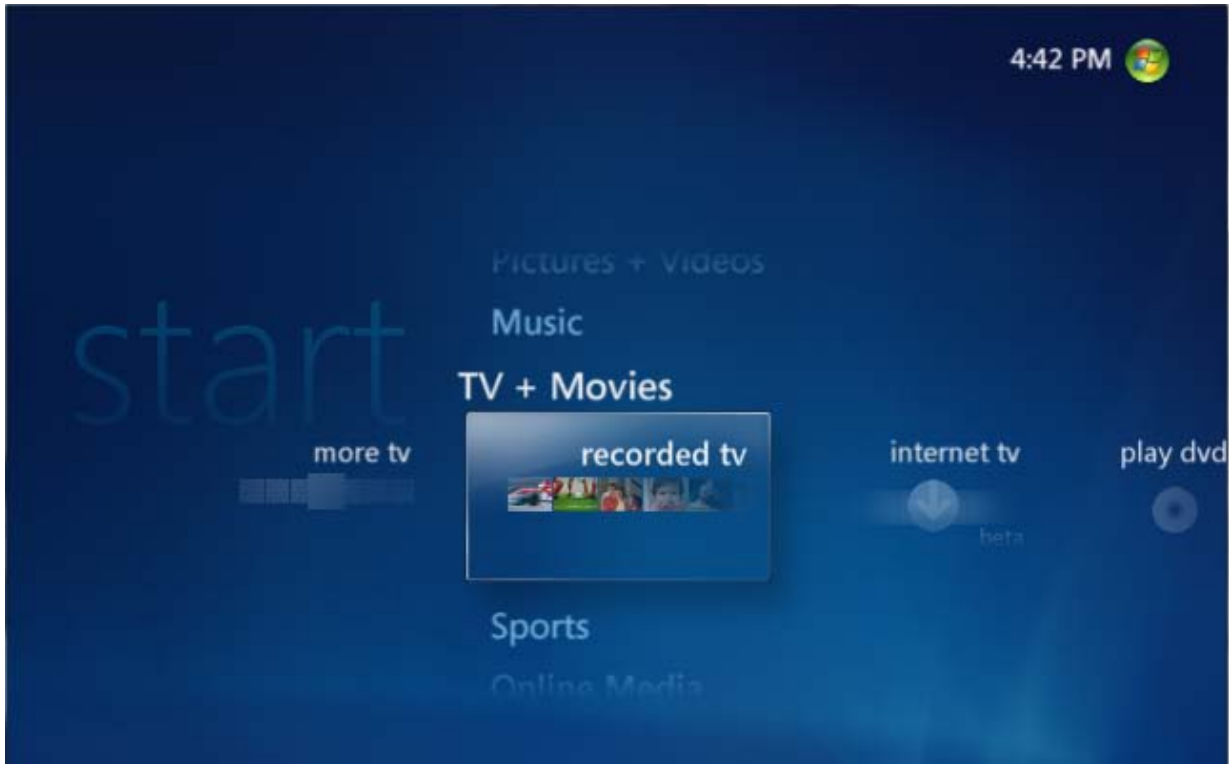
Boxee also features a built-in BitTorrent client, with a streamlined user interface available inside the application. It can support download from any public or private bittorrent trackers via the plugin system.

Although it's a great application, it has some limitations. It can't play audio or video protected with DRM (Digital Rights Management), such as music purchased from the iTunes Music Store, MSN Music or Audible.com.

Photo formats supported	Audio formats supported	Video formats supported	Connectivity
BMP, JPEG, GIF, PNG, TIFF, MNG, ICO, PCX and Targa/TGA	AIFF, WAV/WAVE, MP2, MP3, AAC, AACplus, AC3, DTS, ALAC, AMR, FLAC, Monkey's Audio (APE), RealAudio, SHN, WavPack, MPC/Musepack/Mpeg+, Speex, Vorbis and WMA.	MPEG-1, MPEG-2, MPEG-4 (SP and ASP, including DivX, XviD, 3ivx, DV, H.263), MPEG-4 AVC (H.264, including Nero Digital and x264), HuffYUV, Indeo, MJPEG, RealVideo, QuickTime, Sorenson, WMV, Cinepak.	<ul style="list-style-type: none"> • Internet • Local network • Local hard drives • Optical removable media (CD/DVD) • Solid state media(Flash drives and SSDs)

Windows Media Center

Something you maybe didn't even know you have, Windows Media Center (WMC) [<http://www.microsoft.com/windows/windows-media-center/default.aspx>] comes preinstalled with every computer running Windows XP Media Center Edition, Windows Vista or 7 (Home Premium or Ultimate). Windows Media Center offers about the same functionality as Boxee and has the advantage of being able to use TV tuners to playback and record TV programming.



The interface is simple and easy to use – based on the X and Y axis concept. On the vertical Y axis you have types of entertainment – such as music, online content, and photos – and on the horizontal X axis you got different actions that work in the specific category – playlists, albums, online radio. You can easily navigate it with a keyboard, mouse or WMC certified remote control. By default, WMC doesn't support formats like XVID but it can automatically retrieve the codecs from the internet when necessary. Alternatively, you could download and install a codec pack like FFDSHOW [<http://www.free-codecs.com/download/FFDshow.htm>] which is compatible with WMC and will decode the majority of audio and video formats.

Out of all the media center applications I tested, WMC provides to most consistent experience and while it's a resource intensive application, it does not crash as often as the other solutions. Windows is at the moment the best platform for media centers.

Software Alternatives

Of course the list doesn't end with just these two candidates. Other notable alternatives are:

- **XBMC** [<http://xbmc.org/>], an open-source media center application that is the foundation of Boxee. It is compatible with Linux, Windows and Mac OS X. "XBMC provides a user friendly interface that's intuitive, very flexible, and easy to use. The interface is completely customizable through user-created or downloadable skins."



- **MythTV** [<http://www.mythtv.org/>], an open-source media center application that is compatible with Linux and Mac OS X but unfortunately doesn't offer decoding for encrypted High Definition video streams. The best platform for MythTV is Mythbuntu [<http://mythbuntu.org/>] - which combines the Ubuntu operating system with MythTV for the best user experience. Although it's designed to simplify the installation and configuration process, setting up the TV tuner is still mostly a manual, command line task.



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- **Plex** [<http://www.plexapp.com/>], an open source media center for Intel-based Macintosh computers is also based on XBMC. It has most of the features of Boxee and a very sleek interface. *Photo credit: mac.softpedia.com* [softpedia.com/...]



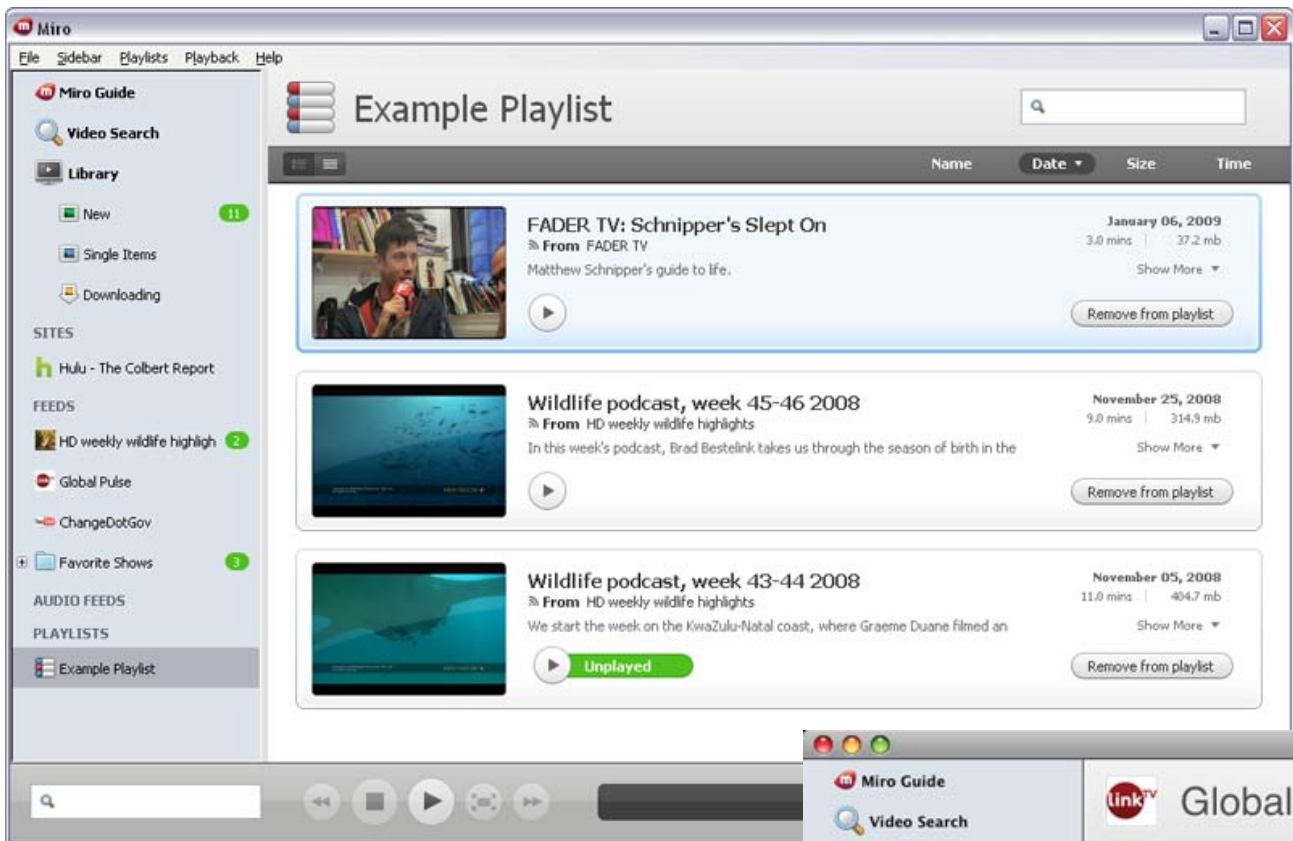
- **LinuxMCE** (Linux Media Center Edition) [<http://linuxmce.com/>] is an open-source project that aims to be the most comprehensive media center/home appliance control solution.” It can control everything in the home, from lighting and climate to surveillance cameras and home security. It also includes a full-featured VOIP-compatible phone system with support for video conferencing.” Of course, such a complex system doesn’t work ‘out of the box’ and needs to be tweaked by someone with a very intimate knowledge of Linux and various control interfaces.



Related MakeUseOf articles

1. Cool Alternatives to Windows Media Center [[Link](#)]
2. Using Your Linux Computer As A Media Center [[Part 1](#), [Part 2](#), [Part3](#)]

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Miro (previously called Democracy Player) is an application developed by the Participatory Culture Foundation that integrates with various internet content sources.

It works on Microsoft Windows, Mac OS X, and Linux and supports subscribing to shows, podcasts via the standard RSS protocol as well as BitTorrent downloads, YouTube, and Hulu through the integrated web browser.

<http://www.getmiro.com/>



Conclusion

If you're thinking about installing one of the Linux-based media center applications like MythTV and LinuxMCE, don't. I know I'm going to get a lot of hate mail for this statement, but I stand by it from my own experiences. Save yourself the time it takes to find and troubleshoot various drivers, install non-free codecs and figure out why the video card thinks we're in 1998. Infrared, card readers, webcams and TV-tuners are a big no-no from a driver support standpoint. Even if you're lucky and your device is supported – you still won't be able to access the device's full capabilities most of the time. I'm still going to cover these solutions because they have certain laudable aspects, but unless you are prepared to spend a week or so tweaking configuration files and compiling drivers, it's not for you.

! My recommendation would be to install Windows 7 or Windows Vista, and use WMC as your primary application. In addition to that you could also install Boxee [<http://www.makeuseof.com/tag/boxee/>], Hulu Desktop [<http://www.makeuseof.com/tag/hulu-desktop-instant-tv-shows-and-movies-on-your-large-screen/>] as well as iTunes for buying/renting TV shows, movies and music. Instead of using a solution like μ Torrent and VLC, I recommend downloading Miro [<http://www.getmiro.com/>].

You've built a versatile media center, capable of playing all the major formats and that's likely to be as useful three years from now. Sure, it may not play all the games but it will still be a capable computer.



Pictured above, Microsoft Media Center Team offices in Redmond. Photo credit: Thomas Hawk [<http://www.flickr.com/photos/thomashawk/2725705054/>]

Remember, you can do much more than view movies on this machine; with the help of the MakeUseOf networking guide [<http://www.makeuseof.com/tag/the-easy-guide-to-computer-networks-pdf/>] you can easily set it up to share folders and use it as a storage and backup for the other machines on the network; stream music to other computers, edit photos and much more.

It's an all-in-one multimedia computer. Find out what else you can do with it by reading more articles related to multimedia [<http://www.makeuseof.com/tags/media/>] or video [<http://www.makeuseof.com/tags/video-player/>].

For example, you could sync almost all of your devices with one application – doubleTwist – [<http://www.makeuseof.com/tag/sync-all-of-your-media-in-one-place-with-doubletwist/>] from the media center, which is quite useful considering you'll have your music, photos and videos stored there.

All I have is my performance, I try to feed in the best of everything that I could possibly do into those 90 minutes and to make a live entertainment show out of it.

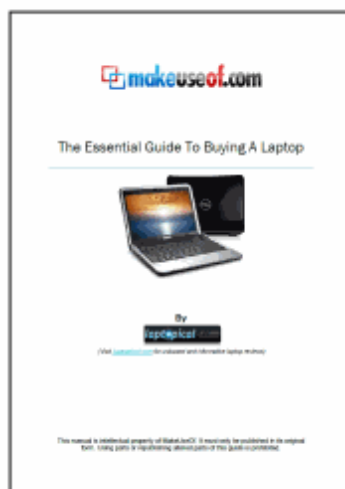
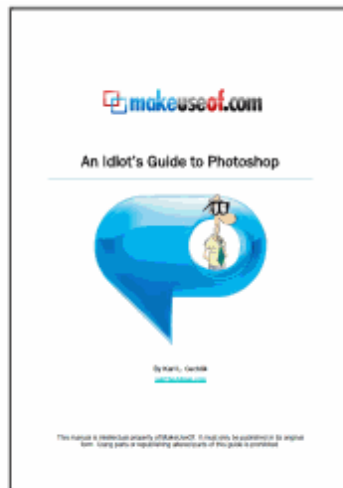
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