Administration/Configuration/Building Guide to the Media Library Box

The Media Library Box is built based on the TP-Link TL-MR3040 Portable 3G/4G Wireless N Router using customized Open Source firmware and a USB flash memory stick.

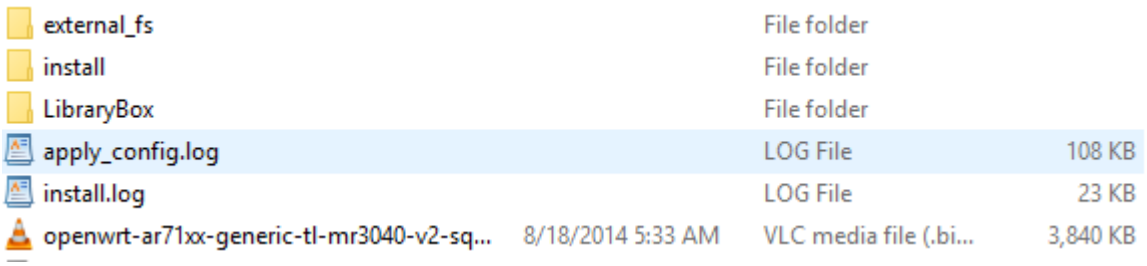
The Media Library Box is a self-contained, self-powered WiFi based portable media distribution system. It allows users to create a full featured 'digital library' from which Gospel/Educational media can be shared on mobile phones, tablets, laptops, desktops in an off-the grid environment without depending on access to internet or electricity. Any device with WiFi capability can connect to the Media Library Box and access/download content with a simple Web browser. It will support up to 30+ simultaneous browsing sessions from different devices.

Contents

Administration:

The Media Library Box content is contained on the USB memory. The USB memory is formatted as a Fat32 file system and is therefore readable and editable on a PC platform.

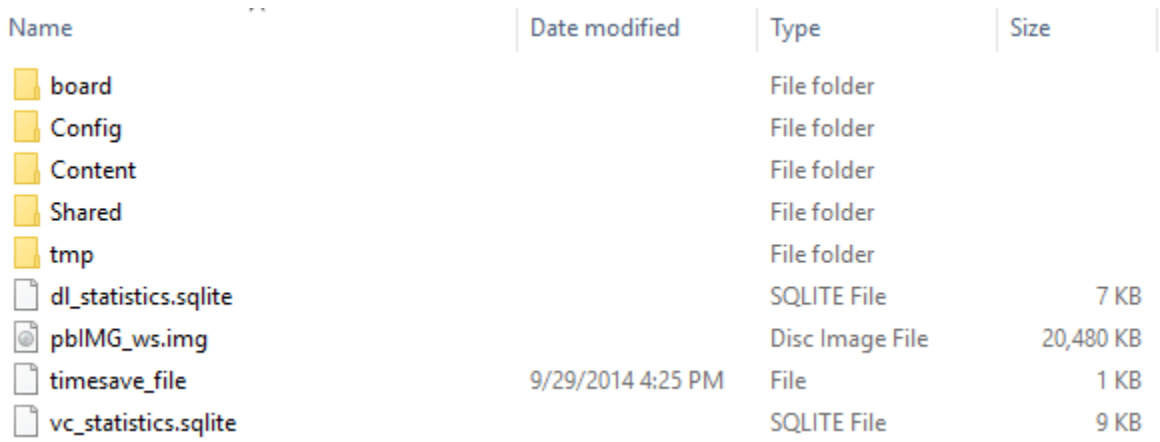
The primary directory contains the following:



Note that the TP-Link TP-MR3040 has been customized with a specific firmware burned into the on board flash memory. This includes a customized OpenWrt open source WiFi access point firmware and is a Linix kernel for embedded devices including util-linux, uClibc and BusyBox utilities as well as other open source tools. As such the base file directory on the USB memory stick includes some file structures to support the OpenWrt Linux firmware. DO NOT delete or alter these directories otherwise the Media Library Box will not boot properly.

Only the folder 'LibraryBox' should be changed for administration of content and/or branding of the main web pages.

The LibraryBox directory contains the following:



Note that all content for users to view/download will be found under the **Shared** directory. Later in this guide we will discuss the Config directory which is used to configure some parameters of the Media Library Box and the Content directory which contains the primary branded home page.

The Shared directory contains the following folders:

audio	The directory for all audio content
software	The directory for all applications
text	The directory for all text files/documents

video The directory for all video files

Files placed under these directories will be accessible/downloadable by the user under these menu elements Audio, Apps, Text, Video. Additionally, other folders or files can be added under the LibraryBox/Shared directory. These will be accessible by selecting the All Files menu item.

Where can I get content?

Content can be created locally or globally. However, you need to ensure that the Copyright of the content is valid for use in the Media Library Box. The objective of the Media Library Box is to allow anyone within the WiFi zone of the Media Library Box to view/download content and distribute to others. This means that Copyrighted material needs to be licensed for this purpose or that the Copyright holder gives specific permission to you for this type of distribution. Any content under Creative Commons license  is able to be distributed by the Media Library Box as long as the appropriate terms and conditions of the Copyright holder (usually attribution) is upheld.

OM Internationally has licensed content for use in the Media Library Box and other devices. A list of this content can be found at:

https://emailnet-my.sharepoint.com/personal/kirk_wilson_om_org/Documents/Shared%20with%20Everyone/Media%20Content%20Available/Media%20Content%20Available%20within%20OM.docx?web=1

Please contact Kirk Wilson (kirk.wilson@om.org) if you would like specific content, or you would like to know if content is available in other languages. Likewise, if you have content in various languages and or license content **please** make it available for use to the whole of OM and contact Kirk Wilson to make it available to others.

How do I load/remove content from the Media Library Box?

When loading content to the Media Library Box, simply insert the USB flash drive into your PC (assuming it shows up as drive E: if not replace E: below with the correct drive letter) and copy the files to the appropriate directory:

E:\LibraryBox\Shared\audio

E:\LibraryBox\Shared\software

E:\LibraryBox\Shared\text

E:\LibraryBox\Shared\video

To remove content simply brows the USB flash drive in your PC and delete the appropriate files under the above directories.

NOTE: do not change or delete the basic folders in the Librarybox\Shared folder structure. This will break the navigation scheme.

NOTE: You must only use single byte UTF-8 characters (basic latin), this means standard file naming conventions with characters between a-z, A-Z, 0-9 and some special characters (,), -, _, {, }, [,] only you can NOT use multi-byte characters such as é, ã, û, etc. There is a maximum file size limit of 2GB.

How do I format audio files for best compatibility with mobile devices?

There are many different audio file formats available, however most mobile devices have standardized on using the MP3 audio format. As such this is the most 'compatible' format that you can use. However, even with MP3 audio formats one can control the Sample rate (Hz) of audio data, the Bitrate (KB/s) of the audio stream and number of channels (1: Mono, 2: Stereo). These differences will affect the quality of the audio played as well as the size of the file and how long it takes to download to a mobile device.

As an example a low quality audio stream in MP3 format may have a sampling rate of 22,050 Hz with a bitrate of 32 KB/s in either mono or stereo. Note that this stream would generate a 10MB file for a 5.2 minute recording in mono format or a 2.6 minute recording in stereo format.

As another example a medium quality audio stream in MP3 format may have a 44,100 Hz sampling rate with a bitrate of 128 KB/s in either mono or stereo. Note that this stream would generate a 10MB file for a 1.3 minute recording in mono format or a 39 second recording in stereo format.

You can convert and or copy audio CD's to MP3 format using a tool such as FormatFactory which is a free converter for audio and video formats. Renewoutreach.com has a great tutorial at:

http://www.renewoutreach.com/quickstart-convert-audio/

How do I format video files for best compatibility with mobile devices?

There are many different video file formats available, however most mobile devices have standardized on using the MP4 format for Smartphones and 3GP for feature phones. Most smartphones are also capable of playing back 3GP formats as well. However, it's important to note that the MP4 or 3GP formats are only 'containers' for information that has been encoded within. Video can be either encoded using MPEG4 (DivX), AVC (H264), H263 codec standards. Likewise, the audio component of a video can be encoded using AMR_NB, AAC, AVI codec standards. Both the video and audio components also can be encoded to various bitrates, sizes, and frequencies providing high, medium or low quality video/audio playback. Note however, that the higher the quality the larger the file size and the longer the download period for any device to get it.

For Smartphones it is best to use an MP4 format with an AVC (H264) video codec with an Autox480 video size, a bit rate of 1024 KB/s, 24 Frames per second, with an automatic aspect ratio. Also, the audio component should be encoded using AAC at a sample rate of 44100 KB/s, in either stereo or mono. This encoding setup would result in a 2 minute video being roughly 154 MB in size.

For Feature phones it is best to use a 3GP format with an H263 video codec at a video size of 176 x 144 pixels, 15 frames per second, 160KB/s bitrate. Also, the audio component should be encoded using AMR-NB at a sample rate of 8000 Hz, in mono format. This encoding setup would result in a 2 minute video being roughly 20.6 MB in size. For feature phones its important to know that not every feature phone is the same size of screen. The above standard is for small screens of 176x144, however, 352 x288 are also popular.

Testing has shown that most iOS devices require AAC audio codecs to be used otherwise the videos will have no sound when played on iOS devices.

You can convert and or copy video CD/DVD's to MP4/3GP formats using a tool such as FormatFactory which is a free converter for audio and video formats. Renewoutreach.com has a great tutorial at:

http://www.renewoutreach.com/quickstart-convert-video/

How do I format text files for best compatibility with mobile devices?

There are no specified text file formats that are compatible with all mobile devices. Simple text (txt) files are by far the most compatible. However, PDF formats may be supported on many Smartphone devices.

Images are generally universally supported in either Jpeg (jpg) or PNG formats.

What is the Apps menu item for and why would I use it?

The apps menu allows you to provide some applications for download to mobile devices. These can and generally will be operating system specific for different devices. Java applications (.jar) are by far the most compatible across mobile devices. However, other formats for specific types of devices include:

.exe - for windows

.dmg - for OSX

.apk - for Android

.jar/.jad - for Java on all devices

.sis - Symbian

.deb - MeeGo (Debian Linux)

One example of using applications in your download would be to provide individual audio MP3's for each chapter of the Bible. However, downloading many many files to get a complete audio bible on your mobile is time consuming. All of the audio files could be zipped together in a 7zip file on the LibraryBox. This file can be downloaded as one component and then un-zipped on the specific device. There are 7Zip applications for iOS (from the apple play store), .dmg for Mac, an .apk file for Android, .exe for Windows, etc. You could provide the .apk, .exe, .dmg file formats on the Media Library Box eliminating the need to be connected to the internet to obtain the application.

A second example is there are printed Bible formats in Java format that are downloadable to feature phones. One such Bible is in Arabic and works on all feature phones which support java (most all).

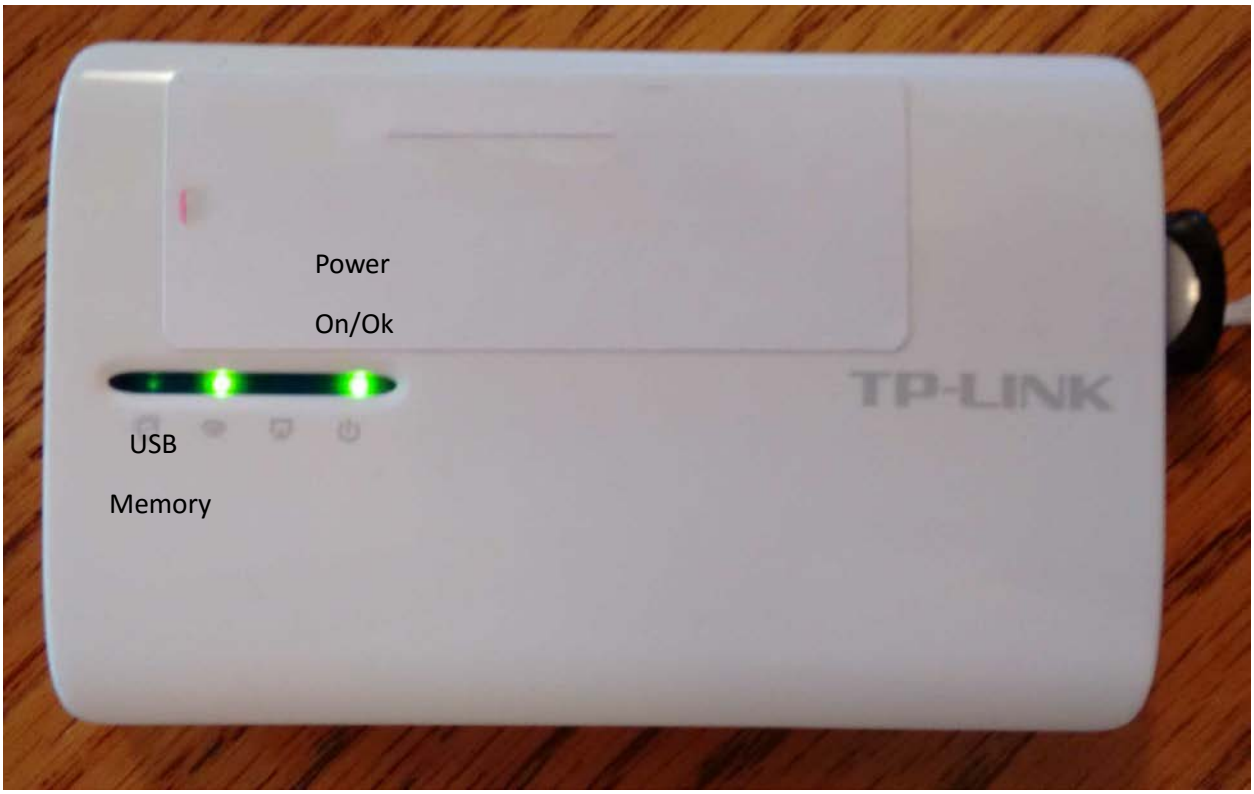
What are the LED's for?

The LED's are used to indicate the status of the Media Library Box. When plugged in for charging the Right most or 1st LED will glow Red/Green (Yellow) when charging and Green when fully charged:

The Power LED also glows RED when the unit is on and the battery is low and you need to charge the unit:

The 2nd from the right LED is the Network Port (10/100 Tx) and will glow/blink when you have a network cable plugged in and data is being transmitted.

The 3rd from the right LED indicates the WiFi is on and will blink when WiFi data is being sent/received.



The 4th from the right LED (left most) is the file I/O led and will blink when data is being read/written to the USB memory stick.

NOTE: If at any time the LED configuration has lit only the **left USB I/O LED (left most) and the Power On/Ok LED (right most)** this would indicate that the unit has been put in a 'power down' safe mode. In this state it will not be operating but be waiting for the power to be switched off. To restart the unit, switch the power off, wait 1-2 seconds then switch the power back on. The unit will then reboot and in 20-30 seconds will return to normal operational mode.

Configuration/Customization:

The Media Library Box has multiple options for configuration/customization of how it operates. These configurations/customizations are performed in the following sub-directories under the LibraryBox directory:

Additionally, some configuration requires access to the Media Library Box via an Ethernet cable or WiFi connection using scripts run under the Linux kernel via SSH or Telnet. This is a more advanced configuration and should only be done by experienced users of Linux.

The basic Media Library Box defaults to the IP address of 192.168.1.1

How do I duplicate the USB flash drive to have different content on different USB flash drives?

The USB flash drive contains an extended file system which is part of the Media Library Box build as well as the content which is made available. You must ensure that the extended file system is present or the Media Library Box will not boot properly. Further, you must not interchange USB flash drives from different versions of Media Library Box software or it will not function properly. However, you can create a second flash drive for any specific Media Library Box by simply formatting the new flash drive to be Fat32 formatted, then copying all of the content from the existing Media Library Box flash drive to the new flash drive. Ensure that you copy all of the files and directories. You can then alter the contents and or configuration files on the new flash drive as above.

If you use slower USB drives (USB 2.0 or 1.0) the entire Media Library Box will take longer to boot and will be more sluggish in operation. Using the latest USB 3.0 or above drives will improve overall performance. (based on the memory read/write times of the device rather than the USB class as only USB 2.0 is supported by the TP-LINK TL-MR3040 device).

Note: the statistics will be affected by changing the USB drive from one to another. To get accurate statistics please reset the statistics counters on replacement.

How do I change the SSID of the WiFi?:

To change the SSID under the LibraryBox/Config directory on the USB key edit the ssid.txt file. Please note that there should be no <CR> or <LF> at the end of the SSID line. A maximum of 32 characters is allowed. However, no special characters (use file name conventions) are allowed. The change will take place on the next reboot of the Media Library Box.

Note: you may have to turn on and wait for the unit to become available – then turn off and on again waiting for the unit to be available before the channel change will occur.

If after an SSID change the WiFi LED does not light, there is an invalid character in the SSID.txt file.

How do I change the channel of the WiFi?:

To change the WiFi channel, edit the channel.txt file under the LibraryBox/Config directory of the USB key. Please not that there should be no <CR> or <LF> at the end of the channel number. Channel numbers between 1 and 12 are allowed. (there is no support for channel 13 or 14). The change will take place on the next reboot of the Media Library Box.

Note: you may have to turn on and wait for the unit to become available – then turn off and on again waiting for the unit to be available before the channel change will occur.

How do I change the security of the WiFi?:

Connect to your Media Library Box and SSH into your unit using the root account. Change the directory to the location of the wireless file you need to modify

cd /etc/config

shut down Wi-Fi with the command

wifi down

edit the content txt file using vi text editor

vi wireless

press i to go into edit mode. Make your edits as needed then press Esc to go back to command mode. Type :w to save your edit and press the enter/return key. Type :q then press the enter/return key to quit editing.

Add/Change the following lines to suit your needs. Under 'config wifi-iface' section:

option encryption 'psk'	- options are	'none' – for no encryption
		'psk' – for WPA-PSK
		'psk2' – for WPA2-PSK
		'wep' – for WEP
		If the line is missing 'none' is assumed
option key '832834aaBj'	- this line is required for 'psk', 'psk2' or 'wep' encryption is used and is set to the pre-shared 64 character maximum key to authenticate with.	
option isolate '1'	- options are	'0' which allows connected devices to
		'see one another' allowing for data to

		be passed between devices. '1' which isolates connected devices from 'seeing one another' and disallowing data to be passed between devices.
option hidden '0'	- options are	'0' which allows the SSID to be broadcast so devices can see the access point and connect to it. '1' which does not broadcast the SSID but still allows devices with preset configuration information to connect to the access point.
option ssid 'This is the broadcast ID'	-options are	any string of 32 characters or less. However, we recommend not changing this in the file but using the SSID.txt file in the /LibraryBox/Config directory as explained above.

To bring the Wi-Fi back up use the command

wifi up

or use the commands

sync

poweroff

Then restart the Media Library Box by turning the power off then on again to apply the changes.

How do I change the password for root access?

Connect your computer to the Media Library Box via an Ethernet cable. Allow the Media Library Box to boot up. Ensure that your computer has obtained an IP address from the Media Library Box (eg: WiFI on your computer should be turned off). Using a Telnet client (such as Putty or a browser with Telnet://)

connect to the Media Library Box IP at 192.168.1.1 If asked for a login, use a username of 'root' and the current 'password'. After logging in run the Media Library Box advanced setup script:

```
sh box_init_setup.sh
```

This will launch a script that will walk you through setting up FTP access and setting a Password and enabling/disabling SSH access (Option 1)

What do I do if I have lost my root Password?

When you received your library box, there was a tag included that gave you the root password for SSH access to the unit. If you have lost the root password and have to be able to change the internal configuration other than what can be accomplished on the USB memory stick. You will have to fully re-install the Library box through a Failsafe boot mode. This means that you will need to obtain the correct re-installation files and put them on the flash drive before you attempt a re-installation. Additionally, this should be done on another USB drive as re-installing on the media flash drive will delete all content.

For help and instructions contact Kirk Wilson.

How do I setup FTP access?

To setup FTP access you will need to SSH into the Media Library Box at 192.168.1.1 using an SSH tool such as Putty.

Once logged in, run the Media Library Box advanced setup script:

```
sh box_init_setup.sh
```

This will launch a script that will walk you through setting up FTP access (Option 3)

This will give you one more menu, this one a bit more complicated. First, enable FTP access using option 1. You must then select a password for FTP by using option 6

After enabling FTP and setting the FTP admin password, reboot your Media Library Box. At this point you should be able to FTP into the box at 192.168.1.1 using any popular FTP application using the username 'nobody' and the password you selected.

How do I change the initial Chat text?

Connect to your Media Library Box and SSH into your unit using the root account. Change the directory to the location of the chatbox file you want to modify

```
cd /opt/piratebox/conf
```

edit the content txt file using vi text editor

```
vi chat_init.txt
```

press i to go into edit mode. Make your edits as needed then press Esc to go back to command mode. Type :w to save your edit and press the enter/return key. Type :q then press the enter/return key to quit editing. Restart the Media Library Box to apply the changes.

On subsequent power off and on cycles the initial chat text will be used.

How do I turn off the Chat function?

To turn off the chat function power off the Media Library Box and place the USB flash drive in your computer. Under the directory /LibraryBox/Config there is a file 'shoutbox.txt' open this file with an editor and change the "yes" to "no" and save the file back on the USB flash drive. Unmount the flash drive from your computer and place it back into the Media Library Box. Power on the Media Library Box and check that the Chat function has been removed.

How do I reset the statistics counters?

To reset the download and user statistics, delete the following two files on the USB drive under the LibraryBox directory:

dl_statistics.sqlite

vc_statistics.sqlite

How do I customize the Web menus?

To customize the initial web menu for either logo, color scheme or menu options, or to change the Statistics and About web pages you will need to edit the HTML pages and/or CSS style sheets. This is an advanced topic and requires knowledge of HTML web coding.

The web pages are located in the LibraryBox/Content directory and consist of:

css folder

dir-images folder

fonts folder

img folder

about.html file

chat.html file

index.html file

stats.html file

The img folder contains the basic logo images and icons. These can be replaced using the same file names but different graphics matching the graphic size to the existing ones. Or can be changed in the .html files and css files.

The primary landing page is governed by the index.html file and css styles

The chat page is governed by the chat.html file and css styles

The statistics page is governed by the stats.html file and css styles

The about page is governed by the about.html file and css styles

There are 7 basic css style sheets that are used throughout and represent 'responsive' designs for screens of different sizes. In particular care must be taken when changing any of the html files or css style sheets to ensure that the 'responsive' design is maintained at different screen sizes.

Also note that presently 16 different localization of languages are provided. If changes are made to the default HTML pages, then additional changes to the language localization files are also required. The language localization is picked up based on the browsers default language setting.

It is beyond the scope of this document to detail how to change the overall look and feel of the web pages. Please engage someone with experience to do this for you. Also see the Media Library Box Web Customization Document for additional details.

Note: The Mime types and associated graphics for the file listing structure is based on customized configuration of the web server and by using customized h5ai written by Lars Jung. This code can be found in the GitHub. For any additional customization on this please contact Kirk Wilson (kirk.wilson@om.org)

How do I put the TP-MR3040 into Failsafe boot mode?

Switch on the TP-Link TP-MR3040

Wait about 5 seconds then press the “Reset” button for ~3 seconds (located next to the USB plug)

The device is now in Failsafe-Mode

You may access it by using telnet to 192.168.1.1

What is Sync setup for Master & Client?

The Media Library Box is designed to allow for automated syncing between multiple Media Library Boxes in a Master – Slave configuration. This is an advanced configuration technique and you should look for documentation/instructions from Kirk Wilson

How do I return the Media Library Box to its original TP-Link TP-MR3040 factory firmware?

The Media Library Box can be re-flashed to its original factory firmware by first placing the original manufactures firmware onto USB drive. Version 3.17.1 Build 131121 Rel.62425n can be found in the root directory of the USB flash drive as file:

TL-MR3040-V2-FW0.0.3-stripped.bin

If you have this file on the USB flash drive you can proceed. Please do NOT download files from TP-Link directly as these files must be trimmed to include only the firmware (not the bootloader) before they can be used.

Boot your Media Library Box and login using SSH. (If you can’t SSH into the Media Library Box, boot into failsafe mode first then telnet into the Media Library Box. You may need to mount the USB drive. Follow the instructions for recovering a bricked-pwd lost LibraryBox)

On the command line execute the following commands:

cd /mnt/usb

mtd –r write TL-MR3040-V2-FW0.0.3-stripped.bin firmware

Once the firmware flash is finished, power down the Media Library Box and remove the USB flash drive.

Reboot the TP-MR3040 and it should boot up in the original mode of operation. You can connect to it via an Ethernet cable using a Web browser (turn off Wi-Fi to ensure you are on the right IP address) http://192.168.0.1 you should be able to see/configure the Web interface.

Note: this is an advanced procedure and could ‘brick’ your device if not done properly.

Building a Media Library Box:

You can build your own Media Library Box from scratch by purchasing the TP-Link TP-MR3040 3G/4G Wi-Fi hotspot and USB memory stick.

It is beyond the scope of this document to provide those instructions. Contact Kirk Wilson for additional information.

Alternatively, you can purchase an already built box from Evenly Distributed or by getting someone else to build it for you.

Please note that the units that OM has been using have been customized both in the landing pages as well as in the directory listing capabilities/view using additional open source tools.

Check out:

H5ai – directory listing tools

Tiddlywiki – open source wiki tool

The Media Library Box units have been built with version 2.1 firmware. To upgrade the Media Library Box to a newer release please contact Kirk Wilson.

Media Library Box Specifications:

The Media Library Box is based on the TP-Link TP-MR3040 and USB flash memory stick. The size of the memory can vary from 16GB to over 128GB in size.

Versions:	2.0 – 2.3
Interface:	10/100 Mbps WAN/LAN Port
	USB 2.0 Port
LED's:	Power, WLAN, Ethernet, File access
Buttons:	Power, Reset, Mode Switch (must be in WISP mode – often glued in place)
Power:	Internal 2000mAh Rechargeable 3.7 V Li-Ion Battery (TBL-68A2000)
	5VDC/1.0A external micro-USB connection
Usable Battery Life:	4-5 hours on a full charge
Dimensions:	3.9 x 2.4 x 0.6 in (100 x 62 x 16 mm)
Weight	3.3 ounce (94g) without USB memory
	3.7 ounce (105g) with USB SanDisk Cruzer Memory 64GB
Wireless Standards:	IEEE 802.b, IEEE 802.11g, IEEE 802.11n (b/g/n)
Frequency	2.4-2.4835 GHz
	Support 64/128 bit WEP, WPA-PSK/WPA2-PSK
Max EIRP	20dBm
Signal Rate	Up to 150 Mbps
DHCP:	DHCP server – 192.168.1.2 – 192.168.1.254
Certification	CE, FCC, RoHs
Operating :	Temp 15C - ~40C, Humidity 0% ~75% non-condensing
Storage :	Temp -20C - ~50C, Humidity 0%~75% non-condensing
OpenWRT	Release 12.09, R36088
Linux Kernal	3.3
CPU	Atheros AR724 @ 400MHZ MIPS 24Kc V7.4
Ethernet/Wireless	Atheros AR9331

RAM	32 MiB
Flash	4 Mib
Serial Port	115200 8n1 Baud (pin 1TX, 2RX, 3GND, 4VCC)
WiFi	Atheros AR9331
BusyBox	V1.19.4
Built In Shell	ash
	Dropbear
	Lighthttpd 1.4.30-2
	Python 2.7.3-2
	Python-mini 2.7.3-2
	Php5 5.4.5-3
	Sqlite3 3071201-1
	Minidlna 1.0.24-1
DHCP:	192.168.1.10 – 192.168.1.250, lease time 12h