# Raspberry Pi Internet Radio

## Compiling and installing the Music Player Daemon

A comprehensive guide how to compile and install the Music Player Daemon

# Bob Rathbone Computer Consultancy
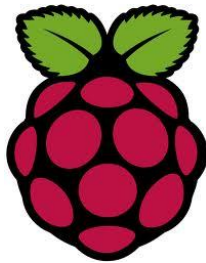
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MPD Version 0.22.9

# Contents

# Figures

# Chapter 1 - Introduction

This manual describes how download, compile and install the Music Player Daemon (**MPD**) for Raspberry Pi on the **Raspberry Pi OS** operating system (Formally called **Raspbian**). It is a supplement to the **Raspberry Pi Constructors Guide** for building Internet radios. However, it can be used for any package which utilises the Music Player Daemon.

The source and basic construction details for the *Raspberry Pi Internet Radio* are available from the following web site:
https://bobrathbone.com/raspberrypi/pi_internet_radio.html

## Motivation for writing this procedure

The Raspberry Pi usually is installed with the **Raspberry Pi OS** operating system. At the time of writing the latest version of **Raspberry Pi OS** is called **Buster** which uses version **5.4.51** of the Linux kernel or later. Unfortunately, **Raspberry Pi OS** is released with a very out-of-date version of the Music Player daemon. This has always been the case to date. The version described in this procedure is **0.22.9** whilst the version released with **Buster** is **0.21.5** which is some twenty-nine versions behind **0.22.9**. The latest version of MPD is also much quicker to load giving a faster start-up time of the radio/media player. Due to its age, it is almost impossible to get support on the older version of MPD.

## Audience

This guide is intended for anyone that wishes to update their Music Player Daemon to the latest version. However, a certain amount of knowledge of the Linux Operating System is required as well as the ability to edit and change system files. This does not rule this procedure out for use by those less experienced but in such a case caution should be applied as the procedure is classed as moderately advanced.

## Pre-requisites

1. **Raspberry Pi OS** Buster installed and updated using **apt-get update** and **apt-get upgrade**.
2. The version of MPD package released with Raspberry Pi OS Buster (**0.21.5**) should be first installed.
3. A reasonably fast Raspberry Pi.

**Note:** During testing an attempt was made to run this procedure on a **Pi Zero** but without success. The problem was that the compile phase took hours to run and seemed to hang. The suggestion is to put the SD card to be upgraded into a faster Raspberry Pi and then upgrade it or run the compilation procedure on the Raspberry Pi Zero overnight.

## Radio software installation

If you have reached this document whilst installing the Raspberry Pi Radio Software (**radiod**) then you should first install and configure the MPD software released with Buster and the radio software as shown in the constructor's manual.

See https://www.bobrathbone.com/raspberrypi/documents/Raspberry%20PI%20Radio.pdf

## Conventions used in this tutorial

Installation of the radio program requires you to enter lines at the command line prompt. This requires you to log into the Raspberry PI as user 'pi'. The default password is **raspberry**.

**Note:** Don't carry out any of the following commands just yet. They are just examples.

```
Raspberrypi login: pi
Password: raspberry
pi@raspberrypi:~$ Last login: Wed Sep  9 12:17:35 2020 from 192.168.1.200
pi@raspberrypi:~$
```

The prompt line is displayed ending with a **$** sign. The **pi@raspberrypi:~** string means user 'pi' on host machine called 'raspberrypi'. The ~ character means the user 'pi' home directory **/home/pi**. In this tutorial if you are required to do something as user **pi** then only the $ sign will be shown followed by the command as shown in the example below:

```
$ mpc status
```

Copy and paste the highlighted text only to the command line. Omit the $ sign.

Some commands produce a lot output which does not need to be shown. In such a case a colon (':') is used to indicate that some output has been omitted.

```
$ mpd -V
Music Player Daemon 0.22.9 (0.22.9)
Copyright 2003-2007 Warren Dukes <warren.dukes@gmail.com>
Copyright 2008-2018 Max Kellermann <max.kellermann@gmail.com>
:
Other features:
 avahi dbus udisks epoll icu inotify ipv6 systemd tcp un
```

Note that when a command is shown with the resulting output the command which was entered is shown in **bold**.

<div align="center">END OF EXAMPLE COMMANDS.</div>

# Chapter 2 - Installing the latest version of MPD

There are two methods of updating MPD.

1. Download the latest MPD source, then compile and install it.
2. Download a ready-made Debian package **mpd_0.22.9_armhf.deb**

To install directly from the Debian package (option 2) see *Installing MPD upgrade from a Debian package* on page 8.

## Compiling and installing the latest Music Player Daemon

This procedure is based upon the following document.

https://www.musicpd.org/doc/html/user.html

You are strongly advised to read both the above document and this one but with caution as either can change. However, there are a number of gaps in the document from **miscpd.org** which can lead to confusion when operating the new version of MPD. This guide has been written for the installation of Music Player Daemon version **0.22.9** dated 19th May 2021.

## Upgrade the operating system

Run the following three commands:

```
$ sudo apt-get update
$ sudo apt-get upgrade
$ sudo reboot
```

## Downloading the source

The source is downloaded from **MusicPd** at https://www.musicpd.org/
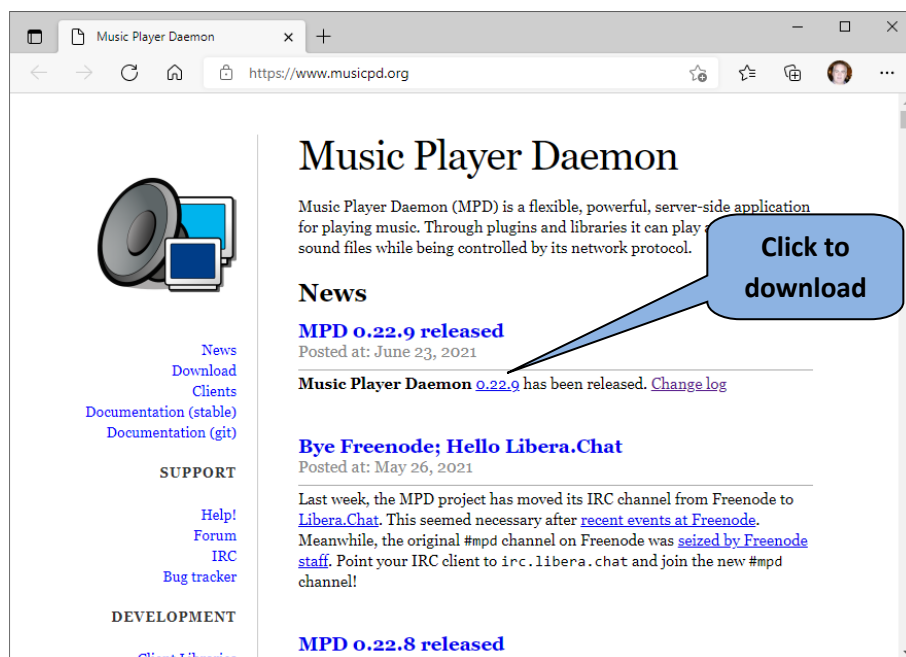


**Figure 1 Music Player Daemon Website**

This will list the latest version of the software; in this case it is version **0.22.9**. If downloading a later version than shown then substitute the version number shown in the following examples with the one you are downloading. Either click on the version number to download the software to your PC, or alternatively right click the version number to copy the link then use **wget** to download it via the command line on the Raspberry Pi.

```
$ cd
$ wget http://www.musicpd.org/download/mpd/0.22/mpd-0.22.9.tar.xz
```

Now unzip the archive

```
tar -xvf mpd-0.22.9.tar.xz
```

This will unzip the archive to a directory called **mpd-0.22.9**.

## Install Ninja and Meso build utilities

This build uses Ninja and Meson.

```
$ sudo apt-get install meson ninja-build
```

## Install pre-requisite libraries

Change to the recently created MPD build directory:

```
$ cd mpd-0.22.9
```

Now install the pre-requisite libraries.  Note that the text below is all <u>one</u> line. Do not copy the $.

```
$ sudo apt install meson g++ libpcre3-dev libmad0-dev libmpg123-dev
libid3tag0-dev libflac-dev libvorbis-dev libopus-dev libogg-dev libadplug-
dev libaudiofile-dev libsndfile1-dev libfaad-dev libfluidsynth-dev libgme-
dev libmikmod-dev libmodplug-dev libmpcdec-dev libwavpack-dev libwildmidi-
dev libsidplay2-dev libsidutils-dev libresid-builder-dev libavcodec-dev
libavformat-dev libmp3lame-dev libtwolame-dev libshine-dev libsamplerate0-
dev libsoxr-dev libbz2-dev libcdio-paranoia-dev libiso9660-dev libmms-dev
libzzip-dev libcurl4-gnutls-dev libyajl-dev libexpat-dev libasound2-dev
libao-dev libjack-jackd2-dev libopenal-dev libpulse-dev libshout3-dev
libsndio-dev libmpdclient-dev libnfs-dev libupnp-dev libavahi-client-dev
libsqlite3-dev libsystemd-dev libgtest-dev libboost-dev libicu-dev
libchromaprint-dev libgcrypt20-dev
```

Press enter to install the above libraries.

## Build the MPD package

The package uses a multi-platform software build system called **meson** from **mesonbuild.com**.
See https://mesonbuild.com/ for further information. Configure the package with the following
command:

```
$ meson . output/release --buildtype=debugoptimized -Db_ndebug=true
```

Normally packages are built and installed with make. In this case the MPD is installed using ninja. For
further information see https://ninja-build.org/. Run the following.

```
$ sudo ninja -C output/release
```

This will take quite a long time as it has at least 660 files to compile. On a Raspberry Pi 4 it will take
about 10 minutes. On slower Raspberry Pi it will be at least twice that.

## Install the MPD package

Stop MPD and any software using it. In this example **radiod** is stopped.

```
$ sudo systemctl stop radiod mpd
```

Finally run the following command to actually install the package.

```
$ sudo ninja -C output/release install
```

This will install the **mpd** daemon in the **/usr/local/bin** directory.

```
ninja: Entering directory `output/release'
[1/2] Installing files.
Installing mpd to /usr/local/bin
Installing /home/pi/mpd-0.22.9/systemd/system/mpd.socket to
/usr/local/lib/systemd/system
Installing /home/pi/mpd-0.22.9/output/release/systemd/system/mpd.service to
/usr/local/lib/systemd/system
Installing /home/pi/mpd-0.22.9/systemd/user/../system/mpd.socket to
/usr/local/lib/systemd/user
Installing /home/pi/mpd-0.22.9/output/release/systemd/user/mpd.service to
/usr/local/lib/systemd/user
Installing /home/pi/mpd-0.22.9/mpd.svg to
/usr/local/share/icons/hicolor/scalable/apps
Installing /home/pi/mpd-0.22.9/AUTHORS to /usr/local/share/doc/mpd
Installing /home/pi/mpd-0.22.9/COPYING to /usr/local/share/doc/mpd
Installing /home/pi/mpd-0.22.9/NEWS to /usr/local/share/doc/mpd
Installing /home/pi/mpd-0.22.9/README.md to /usr/local/share/doc/mpd
```

## Configuring the new MPD package

If you previously installed version **0.21.5** of MPD released with **Buster**, then it will still be present in the **/usr/bin** directory.

```
$ /usr/bin/mpd -V | head -1
Music Player Daemon 0.21.5 (0.21.5)
```

The new version is in the **/usr/local/bin** directory.

```
$ /usr/local/bin/mpd -V | head -1
Music Player Daemon 0.22.9 (0.22.9)
```

The system MPD service unit is no longer **/lib/systemd/system/mpd.service** but is now in **/usr/local/lib/systemd/system/mpd.service.** However, for some reason appears to be unable to find the **/etc/mpd.conf** configuration file.

If MPD doesn't start edit the **/usr/local/lib/systemd/system/mpd.service** (Use sudo vi or nano) Change the ExecStart line from

```
ExecStart=/usr/local/bin/mpd --no-daemon
```

To

```
ExecStart=/usr/local/bin/mpd --no-daemon /etc/mpd.conf
```

Now reload system units.

```
$ sudo systemctl daemon-reload
```

## Testing MPD

Start the MPD daemon and check its status.

```
$ sudo systemctl start mpd
$ sudo systemctl status mpd
```

This should display something similar to the following:

```
● mpd.service - Music Player Daemon
   Loaded: loaded (/usr/local/lib/systemd/system/mpd.service; disabled;
vendor preset: enabled)
   Active: active (running) since Wed 2020-10-07 19:41:35 BST; 21s ago
     Docs: man:mpd(1)
           man:mpd.conf(5)
 Main PID: 16218 (mpd)
    Tasks: 6 (limit: 2068)
   CGroup: /system.slice/mpd.service
           └─16218 /usr/local/bin/mpd --no-daemon /etc/mpd.conf
:
```

Note:  Note ignore any warnings about wildmidi or bind errors.

Note that the version of **mpd** being used is in **/usr/local/bin** and not **/usr/bin**. This is confirmed with the following command:

```
$ which mpd
/usr/local/bin/mpd
```

If you already have a playlist and MPD has been configured for your sound device the first station should start playing. If you don't have a playlist then create one in **/var/lib/mpd/playlists/<playlist name>.m3u**
For example, **/var/lib/mpd/playlists/_Radio.m3u**

```
#EXTM3U
#EXTINF:-1,BBC Radio 1
http://sc59.lon.llnw.net:80/stream/bbcmedia_radio1_mf_p#BBC Radio 1
#EXTM3U
#EXTINF:-1,BBC Radio 2
http://bbcmedia.ic.llnwd.net/stream/bbcmedia_radio2_mf_p?s#BBC Radio 2
#EXTINF:-1,Nashville FM
http://server-27.stream-server.nl:8300/stream#Nashville FM
#EXTM3U
#EXTINF:-1,UK Country Radio
http://s3.xrad.io:8064/#UK Country Radio
#EXTM3U
#EXTINF:-1,Radio Lichtenstein
```

```
http://live.radiol.li:8000/country#Radio Lichtenstein
```

Now load the new radio playlist. Omit the **m3u** extension.

```
$ mpc load _Radio
```

Confirm that it is loaded.

```
$ mpc playlist
BBC Radio 1
BBC Radio 2
UK Country Radio
```

Now play the first station.

```
$ mpc play
BBC Radio 1
[playing] #1/143   0:00/0:00 (0%)
volume: 60%   repeat: off   random: off   single: off   consume: off
```

Adjust the volume as necessary

```
$ mpc volume 70
```

This ends the procedure. If you are running the Rathbone radio software the restart it by rebooting the Raspberry Pi or run **sudo systemctl start radiod**.

## Installing MPD upgrade from a Debian package

The package is currently available in the package directory on the Bob Rathbone web site.
This is an upgrade and **mpd** and **mpc** must be installed first. If you have already installed the Rathbone Internet radio software then this step isn't necessary but does no harm as mpc and mpd are already installed.

```
$ sudo apt-get install mpd mpc
```

Answer yes 'y' when asked to continue.

Install the required libraries. This may take some time if not already installed. Note the following instruction is all one line. Do not copy the $ character.

```
$ sudo apt-get install libsidutils0 libresid-builder0c2a libcurl3-gnutls
libadplug-2.2.1-0v5 libaudiofile1 libyajl2 libiso9660-11 libzzip-0-13
```

Download the MPD update software.

```
$ wget https://bobrathbone.com/raspberrypi/packages/mpd_0.22.9_armhf.deb
```

Now install with **dpkg**.

```
$ sudo dpkg -i mpd_0.22.9_armhf.deb
(Reading database ... 117699 files and directories currently installed.)
Preparing to unpack mpd_0.22.9_armhf.deb ...
Installing MPD
systemctl stop mpd.service mpd.socket
Unpacking mpd (0.22.9) over (0.22.9) ...
Removing MPD
Setting up mpd (0.22.9) ...
Updating MPD configuration
Linking MPD service and socket to systemd configuration
sudo chown mpd:audio /var/tmp/mpd.conf
/etc/mpd.conf exists
sudo chown mpd:audio /etc/mpd.conf
```

Ignore the warnings for **/var/log/mpd** and **/var/lib/mpd**.

Reboot the Raspberry Pi to enable the new version.

```
$ sudo reboot
```

Note: For some unknown reason when **mpd.socket** is run from this package it changes the ownership of the **/var/run/mpd** directory from **mpd:audio** to **root:root** which causes **mpd.service** to fail with a permissions error. To correct this problem the following line has been added to **mpd.service** just before the **ExecStart** statement.

```
ExecStartPre=-/bin/chown mpd:audio /var/run/mpd
```

# Chapter 3 - Building the MPD Debian package

This chapter shows how to create the MPD Debian package using the scripts provided from the following GitHub Repository.
https://github.com/bobrathbone/mpdpackage

Before this can be done you must first download and compile the MPD package from GitHub as shown in *Chapter 2 - Installing the latest version of MPD* on page 4. If this has already been done, download the MPD Debian package scripts from GitHub.

```
$ cd
$ git clone https://github.com/bobrathbone/mpdpackage
```

Now change directory to **mpdpackage**.

```
$ cd mpdpackage
```

Make **build.sh** executable.

```
$ chmod +x build.sh
```

Edit the build script **build.sh**. Find the **BUILD_DIR** definition. Amend this to point to the actual MPD build directory that was used in *Chapter 2 - Installing the latest version of MPD* on page 4.

```
BUILD_DIR=/home/pi/mpd-0.22.9
```

Now run the **build.sh** script.

```
$ ./build.sh
```

If you see an error similar to below, check that you have correctly specified the **BUILD_DIR** definition.

```
Building MPD version 0.22.8
ERROR: /home/pi/mpd-0.22.8/output not found
Check that BUILD_DIR is correctly specified in this script
Aborting
```

If you have correctly specified the **BUILD_DIR** definition the you should see the output similar to that shown in *Appendix B – MPD package build example output* on page 15. The package **mpd_0.22.9_armhf.deb** should also have been created. This can now be installed with **dpkg**.

```
$ sudo dpkg -i mpd_0.22.9_armhf.deb
```

# Chapter 4 - Trouble shooting

## MPD fails to start

### Missing configuration file in mpd.service file

```
$ sudo systemctl start mpd
Job for mpd.service failed because the control process exited with error
code.
See "systemctl status mpd.service" and "journalctl -xe" for details.
```

Check the status

```
$ systemctl status mpd.service
● mpd.service - Music Player Daemon
   Loaded: loaded (/usr/local/lib/systemd/system/mpd.service; disabled;
vendor preset: enabled)
   Active: failed (Result: exit-code) since Fri 2020-05-29 19:30:19 BST;
1min 41s ago
     Docs: man:mpd(1)
           man:mpd.conf(5)
  Process: 1060 ExecStart=/usr/local/bin/mpd --no-daemon (code=exited,
status=1/FAILURE)
 Main PID: 1060 (code=exited, status=1/FAILURE)

May 29 19:30:19 buster03 systemd[1]: Starting Music Player Daemon...
May 29 19:30:19 buster03 mpd[1060]: exception: No configuration file found
May 29 19:30:19 buster03 systemd[1]: mpd.service: Main process exited,
code=exited, status=1/FAILURE
May 29 19:30:19 buster03 systemd[1]: mpd.service: Failed with result 'exit-
code'.
May 29 19:30:19 buster03 systemd[1]: Failed to start Music Player Daemon.
```

In this case **/usr/local/bin/mpd** cannot find **/etc/mpd.conf**. Check that the **ExecStart** statement in **/usr/local/lib/systemd/system/mpd.service contains** the configuration file name.

```
ExecStart=/usr/local/bin/mpd --no-daemon /etc/mpd.conf
```

### Missing Libraries cause service start to fail

A message similar to the following shows that one or more required libraries are missing.

```
$ sudo systemctl status mpd.service
● mpd.service - Music Player Daemon
:
Apr 12 01:54:59 buster04 mpd[3460]: /usr/local/bin/mpd: error while loading
shared libraries: libao.
Apr 12 01:54:59 buster04 systemd[1]: mpd.service: Main process exited,
code=exited, status=127/n/a
Apr 12 01:54:59 buster04 systemd[1]: mpd.service: Failed with result 'exit-
code'.
Apr 12 01:54:59 buster04 systemd[1]: Failed to start Music Player Daemon.
```

Solution: Install the pre-requisite libraries.  Note that the text below is all <u>one</u> line.
Do not copy the $.

```
$ sudo apt install libpcre3 libao4 libmad0 libmpg123-0 libid3tag0 libflac8
libvorbis0a libopus0 libogg0 libsndfile1 libfaad2 libfluidsynth1 libgme0
libmikmod3 libmodplug1 libmpcdec6 libwavpack1 libwildmidi2 libsidplay2
libsidutils0 libresid-builder0c2a libavcodec58 libavformat58 libmp3lame0
libtwolame0 libshine3 libsamplerate0 libsoxr0 libbz2-1.0 libcdio-paranoia2
libiso9660-11 libmms0 libzzip-0-13 libyajl2 libexpat1 libasound2 libaom0
libjack-jackd2-0 libopenal1 libpulse0 libshout3 libsndio7.0 libmpdclient2
libnfs12 libupnp13 libavahi-client3 libsqlite3-0 libsystemd0 libicu63
libchromaprint1 libgcrypt20 libcurl3-gnutls libadplug-2.2.1-0v5
libaudiofile1
```

Press enter to install the above libraries.

Reset failed units mpd service units. and recheck.

```
$ sudo systemctl reset-failed mpd.socket mpd.service
```

Restart mpd service.

```
$ sudo systemctl start mpd.service
```

Re-check the mpd service.

```
$ sudo systemctl status mpd.service
● mpd.service - Music Player Daemon
   Loaded: loaded (/usr/local/lib/systemd/system/mpd.service; enabled;
vendor preset: enabled)
   Active: active (running) since Mon 2021-04-12 02:06:32 HDT; 2min 29s ago
:
Apr 12 02:06:32 buster04 systemd[1]: Started Music Player Daemon.
```

Finally remove any redundant libraries

```
$ sudo apt autoremove
```

# Chapter 4 - Licences, disclaimer and support

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## Support

The author does not directly support the Music Player Daemon software. You are advised to contact the MPD forum at https://forum.musicpd.org/.  However, if you have any comments or feedback about this procedure or document please contact bob@bobrathbone.com

## Acknowledgements and Copyrights

Warren Dukes warren.dukes@gmail.com  and Max Kellermann max.kellermann@gmail.com  and the **musicpd.org** community for their excellent work on the Music Player Daemon.

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# Appendix A – The MPD service file

Below is the service unit for MPD which is used by the **systemctl** command to stop and start **MPD**.

File **/usr/local/lib/systemd/system/mpd.service**

```
[Unit]
Description=Music Player Daemon
Documentation=man:mpd(1) man:mpd.conf(5)
After=network.target sound.target

[Service]
Type=notify
ExecStart=/usr/local/bin/mpd --no-daemon /etc/mpd.conf

# Enable this setting to ask systemd to watch over MPD, see
# systemd.service(5).  This is disabled by default because it causes
# periodic wakeups which are unnecessary if MPD is not playing.
#WatchdogSec=120

# allow MPD to use real-time priority 50
LimitRTPRIO=50
LimitRTTIME=infinity

# disallow writing to /usr, /bin, /sbin, ...
ProtectSystem=yes

# more paranoid security settings
NoNewPrivileges=yes
ProtectKernelTunables=yes
ProtectControlGroups=yes
ProtectKernelModules=yes
# AF_NETLINK is required by libsmbclient, or it will exit() .. *sigh*
RestrictAddressFamilies=AF_INET AF_INET6 AF_UNIX AF_NETLINK
RestrictNamespaces=yes

[Install]
WantedBy=multi-user.target
Also=mpd.socket
```

If installing from the MPD Debian package the following line is added to **mpd.service** during installation just before the **ExecStart** statement. There is no need to add this line yourself.

```
ExecStartPre=-/bin/chown mpd:audio /var/run/mpd
```

# Appendix B – MPD package build example output

```
$ ./build.sh
Building MPD version 0.22.9
Linking output directory to MPD build directory /home/pi/mpd-0.22.9/output
rm -rf output
ln -s /home/pi/mpd-0.22.9/output
/home/pi/mpdpackage

Copying MPD files from /home/pi/mpd-0.22.9
cp /home/pi/mpd-0.22.9/output/release/mpd .
cp /home/pi/mpd-0.22.9/mpd.svg .
cp /home/pi/mpd-0.22.9/AUTHORS .
cp /home/pi/mpd-0.22.9/COPYING .
cp /home/pi/mpd-0.22.9/NEWS .
cp /home/pi/mpd-0.22.9/README.md .
Corrected mpd.service ExecStart statement
ExecStart=/usr/local/bin/mpd --no-daemon /etc/mpd.conf
Set permissions for mpd.conf
sudo chown mpd:audio mpd.conf
sudo apt-get -y install equivs apt-file lintian
Reading package lists... Done
Building dependency tree
Reading state information... Done
apt-file is already the newest version (3.2.2).
equivs is already the newest version (2.2.0).
lintian is already the newest version (2.15.0).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.

Building package mpd version 0.22.9
from input file mpdpkg
dh_testdir
dh_testroot
dh_prep
dh_testdir
dh_testroot
dh_install
dh_installdocs
dh_installchangelogs
dh_compress
dh_fixperms
dh_installdeb
dh_gencontrol
dh_md5sums
dh_builddeb
dpkg-deb: building package 'mpd' in '../mpd_0.22.9_armhf.deb'.

The package has been created.
Attention, the package has been created in the current directory,
not in ".." as indicated by the message above!
Check using Lintian y/n: n
```

When asked to check using Lintian answer **n** (no) as any errors displayed are beyond our control and are primarily due to the locations chosen for MPD.