**pi@raspberrypi:~ $ lsmod | grep snd**

snd\_soc\_bcm2835\_i2s 16384 0

snd\_soc\_core 188416 1 snd\_soc\_bcm2835\_i2s

snd\_compress 20480 1 snd\_soc\_core

snd\_pcm\_dmaengine 16384 1 snd\_soc\_core

snd\_bcm2835 32768 1

snd\_pcm 98304 4 snd\_pcm\_dmaengine,snd\_soc\_bcm2835\_i2s,snd\_bcm2835,snd\_soc\_core

snd\_timer 32768 1 snd\_pcm

snd 69632 7 snd\_compress,snd\_timer,snd\_bcm2835,snd\_soc\_core,snd\_pcm

**pi@raspberrypi:~ $ sudo apt-get update | sudo apt**

apt aptitude-create-state-bundle

apt-cache aptitude-curses

apt-cdrom aptitude-run-state-bundle

apt-config apt-key

apt-extracttemplates apt-listchanges

apt-ftparchive apt-mark

apt-get apt-sortpkgs

aptitude

**pi@raspberrypi:~ $ sudo apt-get update | sudo apt-get install rpi-update | sudo rpi-update**

\*\*\* Raspberry Pi firmware updater by Hexxeh, enhanced by AndrewS and Dom

\*\*\* Performing self-update

% Total % Received % Xferd Average Speed Time Time Time Current

Dload Upload Total Spent Left Speed

100 17910 100 17910 0 0 21547 0 --:--:-- --:--:-- --:--:-- 21552

\*\*\* Relaunching after update

\*\*\* Raspberry Pi firmware updater by Hexxeh, enhanced by AndrewS and Dom

\*\*\* We're running for the first time

\*\*\* Backing up files (this will take a few minutes)

\*\*\* Backing up firmware

\*\*\* Backing up modules 4.14.50-v7+

#############################################################

WARNING: 'rpi-update' updates to pre-releases of the linux

kernel tree and Videocore firmware.

'rpi-update' should only be used if there is a specific

reason to do so - for example, a request by a Raspberry Pi

engineer.

DO NOT use 'rpi-update' as part of a regular update process.

##############################################################

**pi@raspberrypi:~ $ sudo apt-get install git bc libncurses5-dev bison flex libssl-dev**

Reading package lists... Done

Building dependency tree

Reading state information... Done

git is already the newest version (1:2.11.0-3+deb9u4).

The following additional packages will be installed:

libbison-dev libfl-dev libssl-doc libssl1.1 libtinfo-dev

Suggested packages:

bison-doc ncurses-doc

The following NEW packages will be installed:

bc bison flex libbison-dev libfl-dev libncurses5-dev libssl-dev libssl-doc

libtinfo-dev

The following packages will be upgraded:

libssl1.1

1 upgraded, 9 newly installed, 0 to remove and 293 not upgraded.

Need to get 6,076 kB of archives.

After this operation, 15.3 MB of additional disk space will be used.

Do you want to continue? [Y/n] y

Get:1 http://raspbian.mirror.net.in/raspbian/raspbian stretch/main armhf flex armhf 2.6.1-1.3 [414 kB]

Get:2 http://ftp.harukasan.org/raspbian/raspbian stretch/main armhf libssl1.1 armhf 1.1.0l-1~deb9u1 [1,119 kB]

Get:3 http://raspbian.mirror.net.in/raspbian/raspbian stretch/main armhf bc armhf 1.06.95-9 [96.3 kB]

Get:4 http://raspbian.mirror.net.in/raspbian/raspbian stretch/main armhf libbison-dev armhf 2:3.0.4.dfsg-1 [433 kB]

Get:5 http://raspbian.mirror.net.in/raspbian/raspbian stretch/main armhf bison armhf 2:3.0.4.dfsg-1 [744 kB]

Get:6 http://raspbian.mirror.net.in/raspbian/raspbian stretch/main armhf libfl-dev armhf 2.6.1-1.3 [93.0 kB]

Get:7 http://mirror.ossplanet.net/raspbian/raspbian stretch/main armhf libtinfo-dev armhf 6.0+20161126-1+deb9u2 [65.6 kB]

Get:8 http://mirror.ossplanet.net/raspbian/raspbian stretch/main armhf libncurses5-dev armhf 6.0+20161126-1+deb9u2 [245 kB]

Get:9 http://ftp.tsukuba.wide.ad.jp/Linux/raspbian/raspbian stretch/main armhf libssl-dev armhf 1.1.0l-1~deb9u1 [1,387 kB]

Get:10 http://ftp.harukasan.org/raspbian/raspbian stretch/main armhf libssl-doc all 1.1.0l-1~deb9u1 [1,480 kB]

Fetched 6,076 kB in 1min 23s (72.7 kB/s)

Reading changelogs... Done

Preconfiguring packages ...

Selecting previously unselected package flex.

(Reading database ... 115895 files and directories currently installed.)

Preparing to unpack .../0-flex\_2.6.1-1.3\_armhf.deb ...

Unpacking flex (2.6.1-1.3) ...

Preparing to unpack .../1-libssl1.1\_1.1.0l-1~deb9u1\_armhf.deb ...

Unpacking libssl1.1:armhf (1.1.0l-1~deb9u1) over (1.1.0f-3+deb9u2) ...

Selecting previously unselected package bc.

Preparing to unpack .../2-bc\_1.06.95-9\_armhf.deb ...

Unpacking bc (1.06.95-9) ...

Selecting previously unselected package libbison-dev:armhf.

Preparing to unpack .../3-libbison-dev\_2%3a3.0.4.dfsg-1\_armhf.deb ...

Unpacking libbison-dev:armhf (2:3.0.4.dfsg-1) ...

Selecting previously unselected package bison.

Preparing to unpack .../4-bison\_2%3a3.0.4.dfsg-1\_armhf.deb ...

Unpacking bison (2:3.0.4.dfsg-1) ...

Selecting previously unselected package libfl-dev:armhf.

Preparing to unpack .../5-libfl-dev\_2.6.1-1.3\_armhf.deb ...

Unpacking libfl-dev:armhf (2.6.1-1.3) ...

Selecting previously unselected package libtinfo-dev:armhf.

Preparing to unpack .../6-libtinfo-dev\_6.0+20161126-1+deb9u2\_armhf.deb ...

Unpacking libtinfo-dev:armhf (6.0+20161126-1+deb9u2) ...

Selecting previously unselected package libncurses5-dev:armhf.

Preparing to unpack .../7-libncurses5-dev\_6.0+20161126-1+deb9u2\_armhf.deb ...

Unpacking libncurses5-dev:armhf (6.0+20161126-1+deb9u2) ...

Selecting previously unselected package libssl-dev:armhf.

Preparing to unpack .../8-libssl-dev\_1.1.0l-1~deb9u1\_armhf.deb ...

Unpacking libssl-dev:armhf (1.1.0l-1~deb9u1) ...

Selecting previously unselected package libssl-doc.

Preparing to unpack .../9-libssl-doc\_1.1.0l-1~deb9u1\_all.deb ...

Unpacking libssl-doc (1.1.0l-1~deb9u1) ...

Setting up flex (2.6.1-1.3) ...

Processing triggers for install-info (6.3.0.dfsg.1-1+b1) ...

Setting up libtinfo-dev:armhf (6.0+20161126-1+deb9u2) ...

Setting up libfl-dev:armhf (2.6.1-1.3) ...

Setting up libncurses5-dev:armhf (6.0+20161126-1+deb9u2) ...

Processing triggers for libc-bin (2.24-11+deb9u3) ...

Setting up libssl1.1:armhf (1.1.0l-1~deb9u1) ...

Setting up libbison-dev:armhf (2:3.0.4.dfsg-1) ...

Processing triggers for man-db (2.7.6.1-2) ...

Setting up libssl-doc (1.1.0l-1~deb9u1) ...

Setting up bison (2:3.0.4.dfsg-1) ...

update-alternatives: using /usr/bin/bison.yacc to provide /usr/bin/yacc (yacc) in auto mode

Setting up bc (1.06.95-9) ...

Setting up libssl-dev:armhf (1.1.0l-1~deb9u1) ...

Processing triggers for libc-bin (2.24-11+deb9u3) ...

**pi@raspberrypi:~ $ sudo wget https://raw.githubusercontent.com/notro/rpi-source/master/rpi-source -O /usr/bin/rpi-source**

--2019-11-15 12:33:10-- https://raw.githubusercontent.com/notro/rpi-source/master/rpi-source

Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 151.101.152.133

Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|151.101.152.133|:443... connected.

HTTP request sent, awaiting response... 200 OK

Length: 13824 (14K) [text/plain]

Saving to: ‘/usr/bin/rpi-source’

/usr/bin/rpi-source 100%[===================>] 13.50K --.-KB/s in 0.007s

2019-11-15 12:33:11 (1.91 MB/s) - ‘/usr/bin/rpi-source’ saved [13824/13824]

**pi@raspberrypi:~ $ sudo chmod +x /usr/bin/rpi-source**

**pi@raspberrypi:~ $ /usr/bin/rpi-source -q --tag-update**

**pi@raspberrypi:~ $ rpi-source --skip-gcc**

\*\*\* SoC: BCM2837

\*\*\* Using: /usr/share/doc/raspberrypi-bootloader/changelog.Debian.gz

\*\*\* Latest firmware revision: 748fb17992426bb29d99224b93cb962fefbdc833

\*\*\* Linux source commit: f1a1eec4c38d3c36b67c609f6c27805d04dab978

\*\*\* Download kernel source

--2019-11-15 12:34:18-- https://github.com/raspberrypi/linux/archive/f1a1eec4c38d3c36b67c609f6c27805d04dab978.tar.gz

Resolving github.com (github.com)... 13.234.176.102

Connecting to github.com (github.com)|13.234.176.102|:443... connected.

HTTP request sent, awaiting response... 302 Found

Location: https://codeload.github.com/raspberrypi/linux/tar.gz/f1a1eec4c38d3c36b67c609f6c27805d04dab978 [following]

--2019-11-15 12:34:19-- https://codeload.github.com/raspberrypi/linux/tar.gz/f1a1eec4c38d3c36b67c609f6c27805d04dab978

Resolving codeload.github.com (codeload.github.com)... 13.233.43.20

Connecting to codeload.github.com (codeload.github.com)|13.233.43.20|:443... connected.

HTTP request sent, awaiting response... 200 OK

Length: unspecified [application/x-gzip]

Saving to: ‘/home/pi/linux-f1a1eec4c38d3c36b67c609f6c27805d04dab978.tar.gz’

/home/pi/linux-f1a1 [ <=> ] 152.38M 395KB/s in 10m 36s

2019-11-15 12:44:56 (246 KB/s) - ‘/home/pi/linux-f1a1eec4c38d3c36b67c609f6c27805d04dab978.tar.gz’ saved [159780447]

\*\*\* Unpack kernel source

...............................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................

\*\*\* Add '+' to kernel release string

\*\*\* Create symlink: /home/pi/linux

\*\*\* Create /lib/modules/<ver>/{build,source} symlinks

\*\*\* .config

\*\*\* Module.symvers

\*\*\* make modules\_prepare

HOSTCC scripts/basic/fixdep

HOSTCC scripts/kconfig/conf.o

SHIPPED scripts/kconfig/zconf.tab.c

SHIPPED scripts/kconfig/zconf.lex.c

HOSTCC scripts/kconfig/zconf.tab.o

HOSTLD scripts/kconfig/conf

scripts/kconfig/conf --silentoldconfig Kconfig

SYSHDR arch/arm/include/generated/uapi/asm/unistd-common.h

SYSHDR arch/arm/include/generated/uapi/asm/unistd-oabi.h

SYSHDR arch/arm/include/generated/uapi/asm/unistd-eabi.h

CHK include/config/kernel.release

UPD include/config/kernel.release

WRAP arch/arm/include/generated/uapi/asm/bitsperlong.h

WRAP arch/arm/include/generated/uapi/asm/errno.h

WRAP arch/arm/include/generated/uapi/asm/ioctl.h

WRAP arch/arm/include/generated/uapi/asm/ipcbuf.h

WRAP arch/arm/include/generated/uapi/asm/msgbuf.h

WRAP arch/arm/include/generated/uapi/asm/param.h

WRAP arch/arm/include/generated/uapi/asm/poll.h

WRAP arch/arm/include/generated/uapi/asm/resource.h

WRAP arch/arm/include/generated/uapi/asm/sembuf.h

WRAP arch/arm/include/generated/uapi/asm/shmbuf.h

WRAP arch/arm/include/generated/uapi/asm/siginfo.h

WRAP arch/arm/include/generated/uapi/asm/socket.h

WRAP arch/arm/include/generated/uapi/asm/sockios.h

WRAP arch/arm/include/generated/uapi/asm/termbits.h

WRAP arch/arm/include/generated/uapi/asm/termios.h

WRAP arch/arm/include/generated/asm/clkdev.h

WRAP arch/arm/include/generated/asm/current.h

WRAP arch/arm/include/generated/asm/early\_ioremap.h

WRAP arch/arm/include/generated/asm/emergency-restart.h

WRAP arch/arm/include/generated/asm/exec.h

WRAP arch/arm/include/generated/asm/extable.h

WRAP arch/arm/include/generated/asm/irq\_regs.h

WRAP arch/arm/include/generated/asm/kdebug.h

WRAP arch/arm/include/generated/asm/local.h

WRAP arch/arm/include/generated/asm/local64.h

WRAP arch/arm/include/generated/asm/mm-arch-hooks.h

WRAP arch/arm/include/generated/asm/msi.h

WRAP arch/arm/include/generated/asm/parport.h

WRAP arch/arm/include/generated/asm/preempt.h

WRAP arch/arm/include/generated/asm/rwsem.h

WRAP arch/arm/include/generated/asm/seccomp.h

WRAP arch/arm/include/generated/asm/segment.h

WRAP arch/arm/include/generated/asm/serial.h

WRAP arch/arm/include/generated/asm/simd.h

WRAP arch/arm/include/generated/asm/sizes.h

WRAP arch/arm/include/generated/asm/timex.h

WRAP arch/arm/include/generated/asm/trace\_clock.h

CHK include/generated/uapi/linux/version.h

UPD include/generated/uapi/linux/version.h

CHK include/generated/utsrelease.h

UPD include/generated/utsrelease.h

HOSTCC scripts/basic/bin2c

SYSNR arch/arm/include/generated/asm/unistd-nr.h

GEN arch/arm/include/generated/asm/mach-types.h

SYSTBL arch/arm/include/generated/calls-oabi.S

SYSTBL arch/arm/include/generated/calls-eabi.S

CC kernel/bounds.s

CHK include/generated/bounds.h

UPD include/generated/bounds.h

CHK include/generated/timeconst.h

UPD include/generated/timeconst.h

CC arch/arm/kernel/asm-offsets.s

CHK include/generated/asm-offsets.h

UPD include/generated/asm-offsets.h

CALL scripts/checksyscalls.sh

HOSTCC scripts/dtc/dtc.o

HOSTCC scripts/dtc/flattree.o

HOSTCC scripts/dtc/fstree.o

HOSTCC scripts/dtc/data.o

HOSTCC scripts/dtc/livetree.o

HOSTCC scripts/dtc/treesource.o

HOSTCC scripts/dtc/srcpos.o

HOSTCC scripts/dtc/checks.o

HOSTCC scripts/dtc/util.o

SHIPPED scripts/dtc/dtc-lexer.lex.c

SHIPPED scripts/dtc/dtc-parser.tab.h

HOSTCC scripts/dtc/dtc-lexer.lex.o

SHIPPED scripts/dtc/dtc-parser.tab.c

HOSTCC scripts/dtc/dtc-parser.tab.o

HOSTLD scripts/dtc/dtc

HOSTCC scripts/genksyms/genksyms.o

SHIPPED scripts/genksyms/parse.tab.c

HOSTCC scripts/genksyms/parse.tab.o

SHIPPED scripts/genksyms/lex.lex.c

SHIPPED scripts/genksyms/parse.tab.h

HOSTCC scripts/genksyms/lex.lex.o

HOSTLD scripts/genksyms/genksyms

CC scripts/mod/empty.o

HOSTCC scripts/mod/mk\_elfconfig

MKELF scripts/mod/elfconfig.h

HOSTCC scripts/mod/modpost.o

CC scripts/mod/devicetable-offsets.s

CHK scripts/mod/devicetable-offsets.h

UPD scripts/mod/devicetable-offsets.h

HOSTCC scripts/mod/file2alias.o

HOSTCC scripts/mod/sumversion.o

HOSTLD scripts/mod/modpost

HOSTCC scripts/kallsyms

HOSTCC scripts/pnmtologo

HOSTCC scripts/conmakehash

HOSTCC scripts/recordmcount

HOSTCC scripts/sortextable

\*\*\* Help: https://github.com/notro/rpi-source/wiki

**pi@raspberrypi:~ $ sudo mount -t debugfs debugs /sys/kernel/debug**

mount: debugs is already mounted or /sys/kernel/debug busy

**pi@raspberrypi:~ $ •sudo cat /sys/kernel/debug/asoc/platforms**

bash: •sudo: command not found

**pi@raspberrypi:~ $ sudo cat /sys/kernel/debug/asoc/platforms**

3f203000.i2s

snd-soc-dummy

**pi@raspberrypi:~ $ git clone https://github.com/PaulCreaser/rpi-i2s-audio**

Cloning into 'rpi-i2s-audio'...

remote: Enumerating objects: 7, done.

remote: Total 7 (delta 0), reused 0 (delta 0), pack-reused 7

Unpacking objects: 100% (7/7), done.

**pi@raspberrypi:~ $ cd rpi-i2s-audio**

**pi@raspberrypi:~/rpi-i2s-audio $ make -C /lib/modules/$(uname -r )/build M=$(pwd) modules**

make: Entering directory '/home/pi/linux-f1a1eec4c38d3c36b67c609f6c27805d04dab978'

CC [M] /home/pi/rpi-i2s-audio/my\_loader.o

Building modules, stage 2.

MODPOST 1 modules

CC /home/pi/rpi-i2s-audio/my\_loader.mod.o

LD [M] /home/pi/rpi-i2s-audio/my\_loader.ko

make: Leaving directory '/home/pi/linux-f1a1eec4c38d3c36b67c609f6c27805d04dab978'

**pi@raspberrypi:~/rpi-i2s-audio $ sudo insmod my\_loader.ko**

**pi@raspberrypi:~/rpi-i2s-audio $ lsmod | grep my\_loader**

my\_loader 16384 0

pi@raspberrypi:~/rpi-i2s-audio $ dmesg | tail

[ 1693.927314] w1\_master\_driver w1\_bus\_master1: Family 0 for 00.040000000000.61 is not registered.

[ 1747.257745] w1\_master\_driver w1\_bus\_master1: Attaching one wire slave 00.840000000000 crc ed

[ 1747.260474] w1\_master\_driver w1\_bus\_master1: Family 0 for 00.840000000000.ed is not registered.

[ 1785.425084] my\_loader: loading out-of-tree module taints kernel.

[ 1785.435556] request module load 'bcm2708-dmaengine': 0

[ 1785.441156] register platform device 'asoc-simple-card': 0

[ 1785.446744] Hello World :)

[ 1785.519755] asoc-simple-card asoc-simple-card.0: snd-soc-dummy-dai <-> 3f203000.i2s mapping ok

[ 1810.625952] w1\_master\_driver w1\_bus\_master1: Attaching one wire slave 00.440000000000 crc 27

[ 1810.631303] w1\_master\_driver w1\_bus\_master1: Family 0 for 00.440000000000.27 is not registered.

**pi@raspberrypi:~/rpi-i2s-audio $ •sudo cp my\_loader.ko /lib/modules/$(uname -r)**

bash: •sudo: command not found

**pi@raspberrypi:~/rpi-i2s-audio $ sudo cp my\_loader.ko /lib/modules/$(uname -r)**

**pi@raspberrypi:~/rpi-i2s-audio $ echo 'my\_loader' | sudo tee --append /etc/modules > /dev/null**

**pi@raspberrypi:~/rpi-i2s-audio $ sudo depmod -a**

**pi@raspberrypi:~/rpi-i2s-audio $ sudo modprobe my\_loader**

**pi@raspberrypi:~/rpi-i2s-audio $ arecord -l**

\*\*\*\* List of CAPTURE Hardware Devices \*\*\*\*

card 1: sndrpisimplecar [snd\_rpi\_simple\_card], device 0: simple-card\_codec\_link snd-soc-dummy-dai-0 []

Subdevices: 1/1

Subdevice #0: subdevice #0

**pi@raspberrypi:~/rpi-i2s-audio $ arecord -D plughw:1 -c1 -r 48000 -f S32\_LE -t wav -V mono -v file.wav**

Recording WAVE 'file.wav' : Signed 32 bit Little Endian, Rate 48000 Hz, Mono

Plug PCM: Route conversion PCM (sformat=S32\_LE)

Transformation table:

0 <- 0\*0.5 + 1\*0.5

Its setup is:

stream : CAPTURE

access : RW\_INTERLEAVED

format : S32\_LE

subformat : STD

channels : 1

rate : 48000

exact rate : 48000 (48000/1)

msbits : 32

buffer\_size : 24000

period\_size : 6000

period\_time : 125000

tstamp\_mode : NONE

tstamp\_type : MONOTONIC

period\_step : 1

avail\_min : 6000

period\_event : 0

start\_threshold : 1

stop\_threshold : 24000

silence\_threshold: 0

silence\_size : 0

boundary : 1572864000

Slave: Hardware PCM card 1 'snd\_rpi\_simple\_card' device 0 subdevice 0

Its setup is:

stream : CAPTURE

access : MMAP\_INTERLEAVED

format : S32\_LE

subformat : STD

channels : 2

rate : 48000

exact rate : 48000 (48000/1)

msbits : 32

buffer\_size : 24000

period\_size : 6000

period\_time : 125000

tstamp\_mode : NONE

tstamp\_type : MONOTONIC

period\_step : 1

avail\_min : 6000

period\_event : 0

start\_threshold : 1

stop\_threshold : 24000

silence\_threshold: 0

silence\_size : 0

boundary : 1572864000

appl\_ptr : 0

hw\_ptr : 0

#+ | 00%^CAborted by signal Interrupt...

**pi@raspberrypi:~/rpi-i2s-audio $ amixer cset numid=3 1**

numid=3,iface=MIXER,name='PCM Playback Route'

; type=INTEGER,access=rw------,values=1,min=0,max=2,step=0

: values=1

**pi@raspberrypi:~/rpi-i2s-audio $ aplay file.wav**

Playing WAVE 'file.wav' : Signed 32 bit Little Endian, Rate 48000 Hz, Mono

^A^CAborted by signal Interrupt...

aplay: pcm\_write:2011: write error: Interrupted system call

pi@raspberrypi:~/rpi-i2s-audio $