

Gstreamer

gststreamer tools

gst-inspect
gst-launch
gst-editor

media player

VoIP & video
conferencing

streaming
server

video editor

(...)

multimedia applications

gststreamer core framework

pipeline architecture



media agnostic
base classes
message bus
media type negotiation
plugin system
data transport
synchronization

protocols

- file:
- http:
- rtsp:
- ...

sources

- alsa
- v4l2
- tcp/udp
- ...

formats

- avi
- mp4
- ogg
- ...

codecs

- mp3
- mpeg4
- vorbis
- ...

filters

- converters
- mixers
- effects
- ...

sinks

- alsa
- xvideo
- tcp/udp
- ...

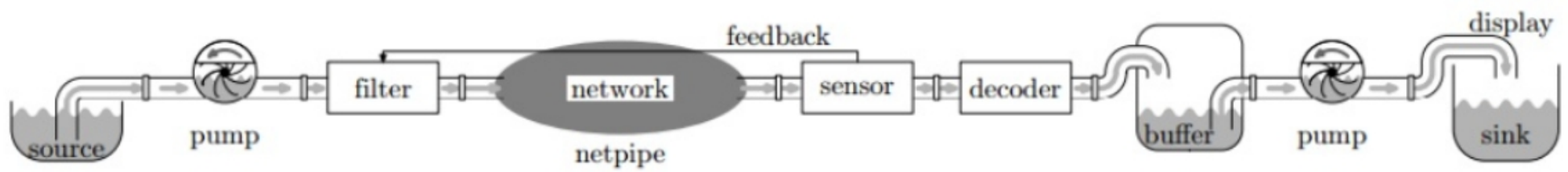
gststreamer plugins

gststreamer includes over 250 plugins

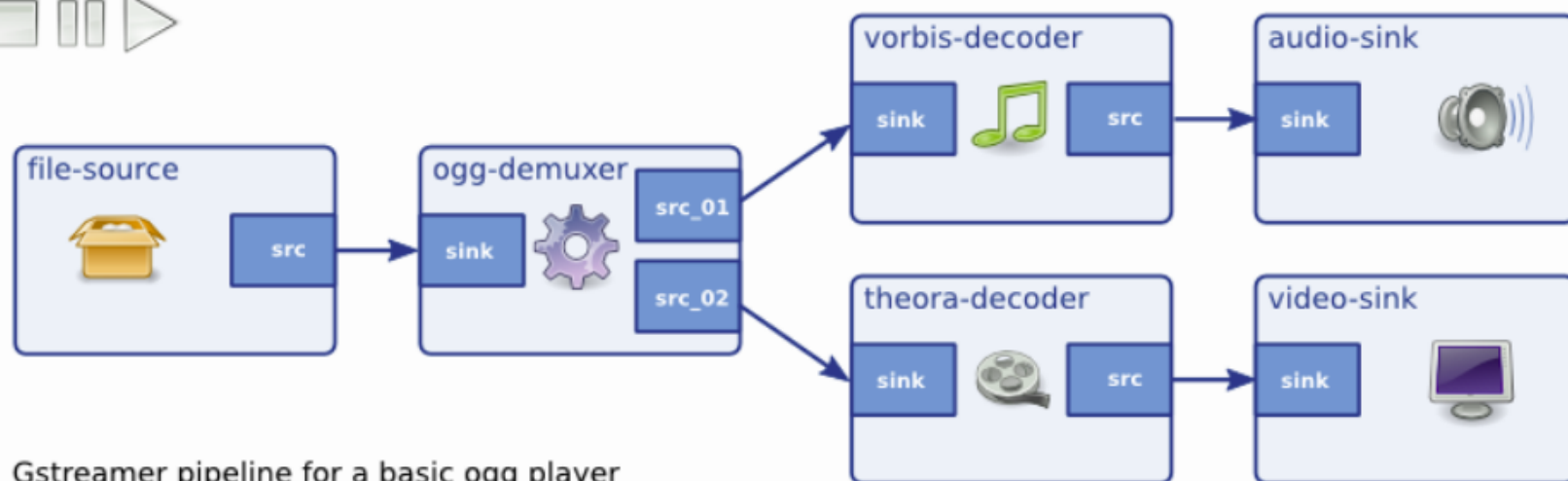
3rd party
plugins

- GStreamer is a framework for creating streaming media applications
- The framework is based on plugins that will provide the various codec and other functionality
-

- `gst-plugins-base`: an essential exemplary set of elements
- `gst-plugins-good`: a set of good-quality plug-ins under LGPL
- `gst-plugins-ugly`: a set of good-quality plug-ins that might pose distribution problems
- `gst-plugins-bad`: a set of plug-ins that need more quality

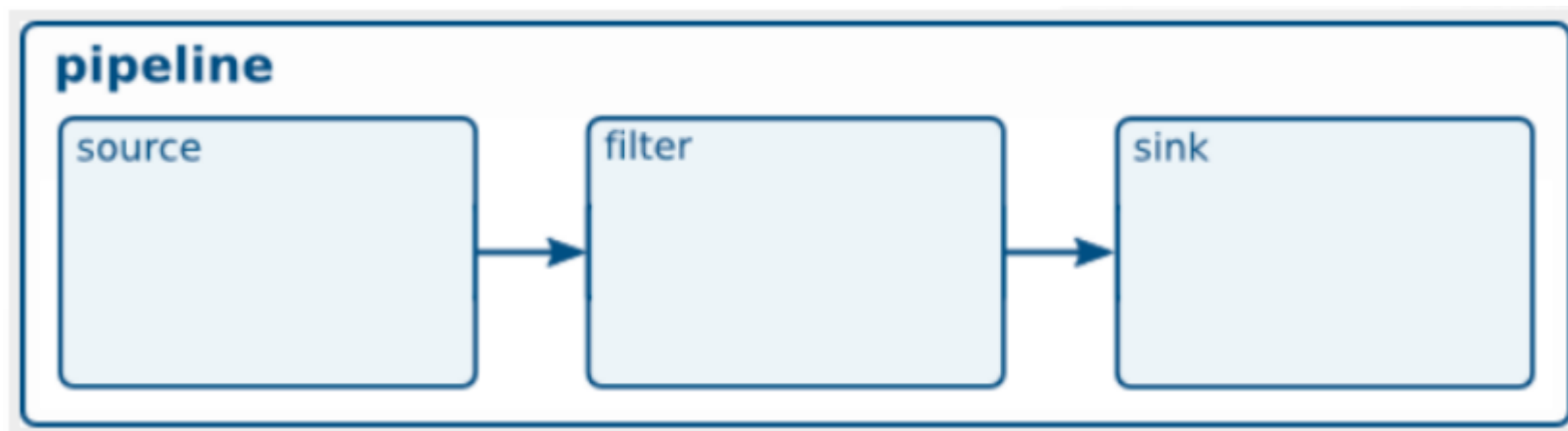


pipeline



Gstreamer pipeline for a basic ogg player

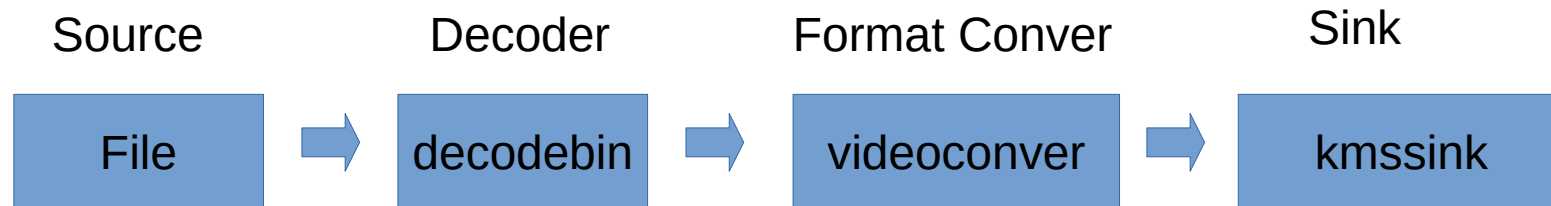
Play Video Test Stream



```
gst-launch-1.0 videotestsrc ! video/x-raw, width=1280, height=720 ! kmssink
```

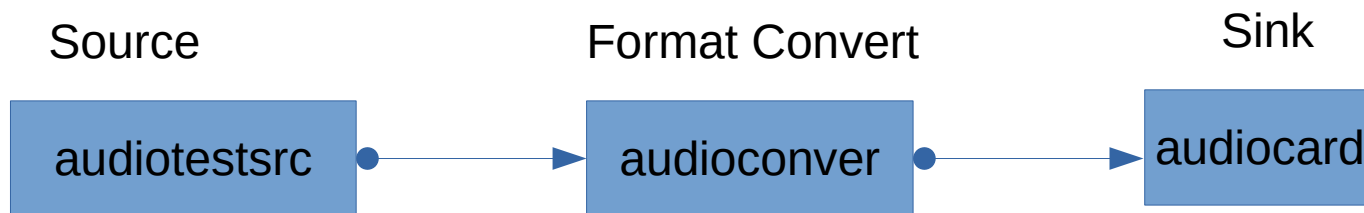
Play a H.264 video

```
gst-launch-1.0 filesrc location=/oem/200frames_count.h264 ! \
decodebin name=dec ! \
videoconvert ! \
kmssink
```



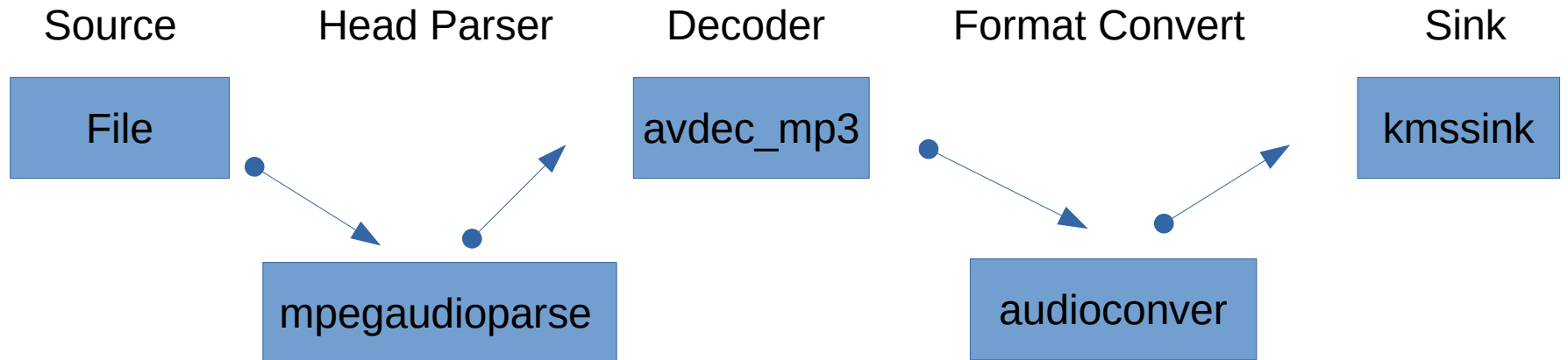
Play a Audio Test

```
gst-launch-1.0 audiotestsrc ! audioconvert ! alsasink device-  
name=realtekrt5651co
```



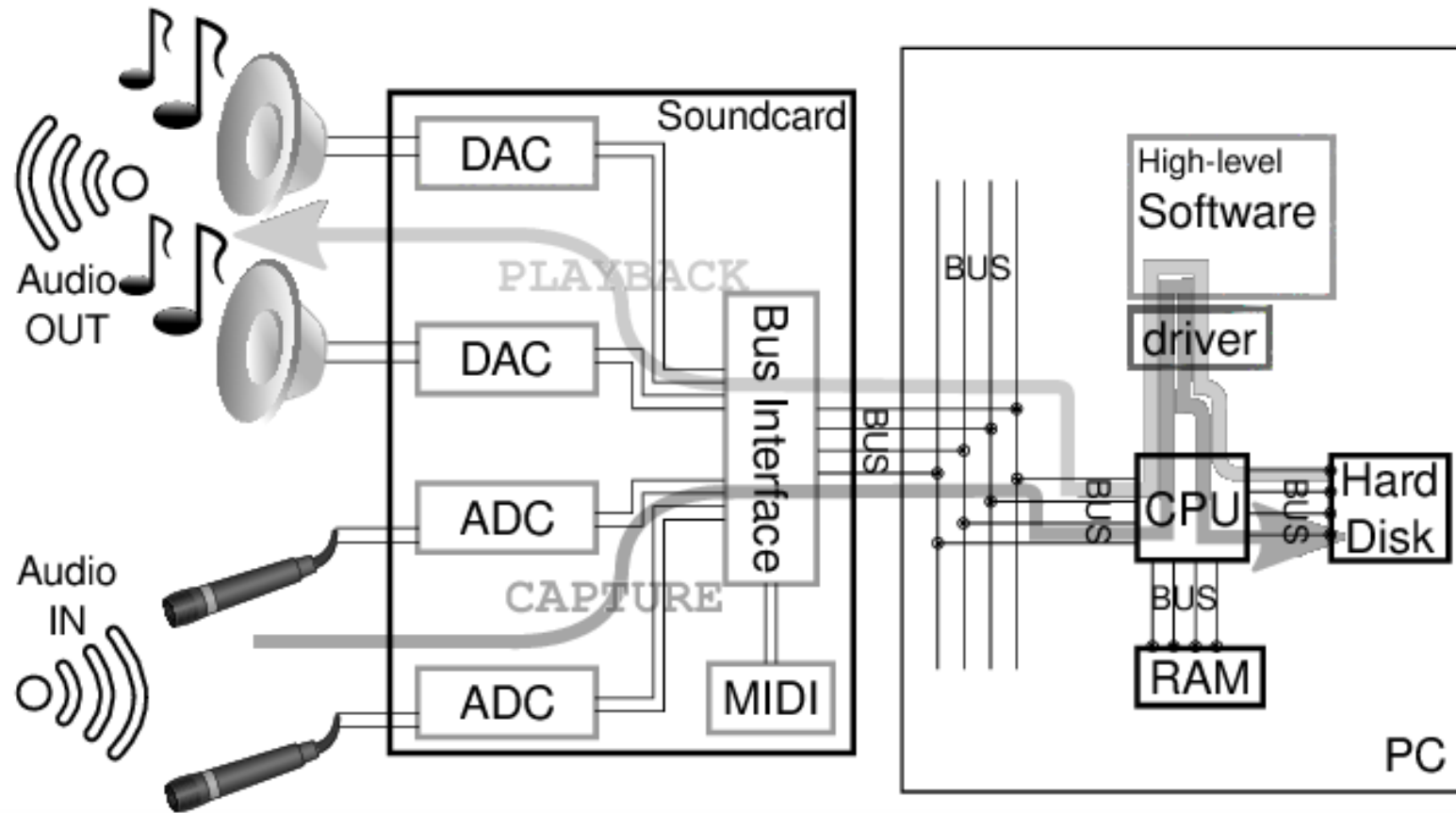
Play a MP3

```
gst-launch-1.0 filesrc location="oem/piano2-CoolEdit.mp3" ! \
mpegaudioparse ! \
avdec_mp3 ! \
audioconvert ! \
alsasink device=hw:0
```



Audio

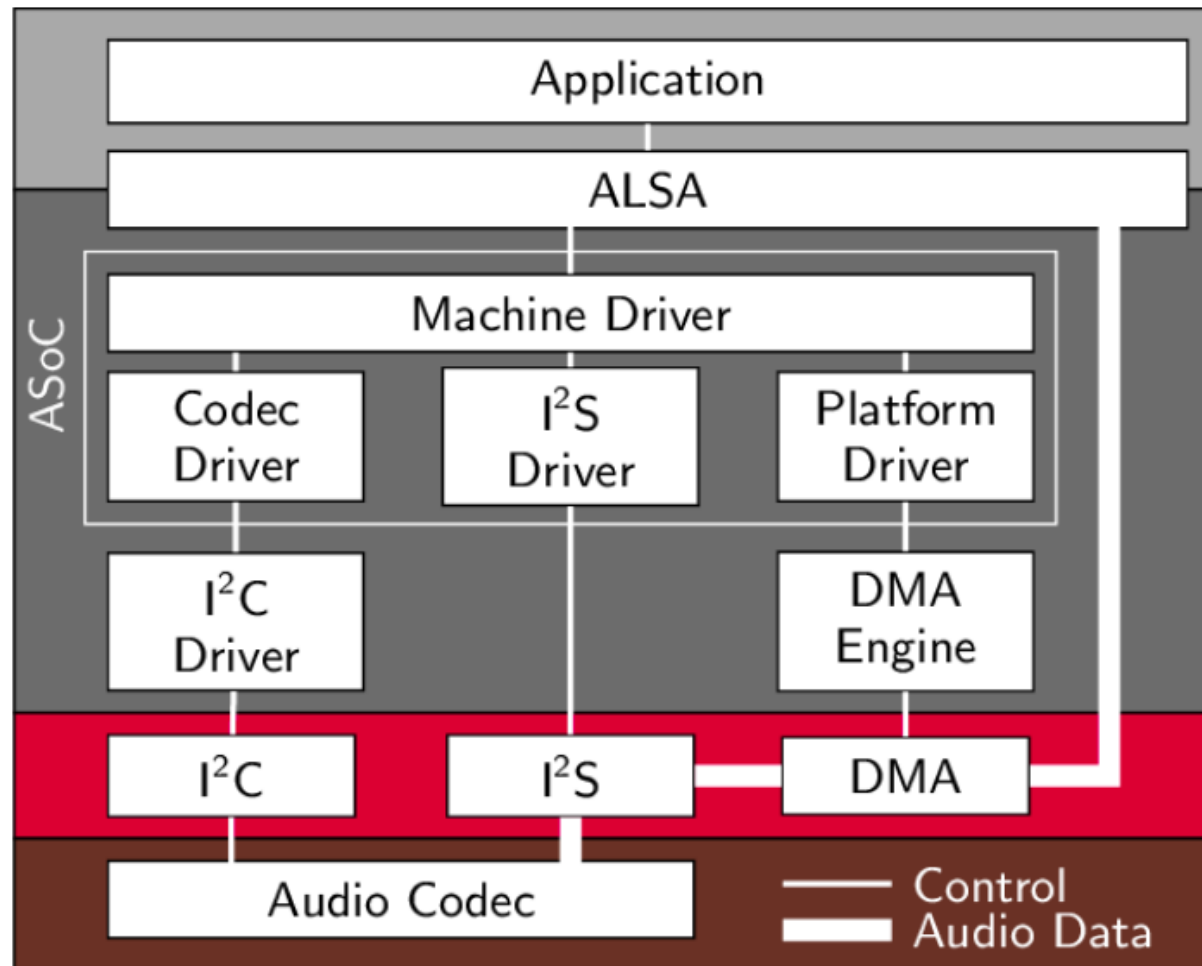
Audio Data Flow



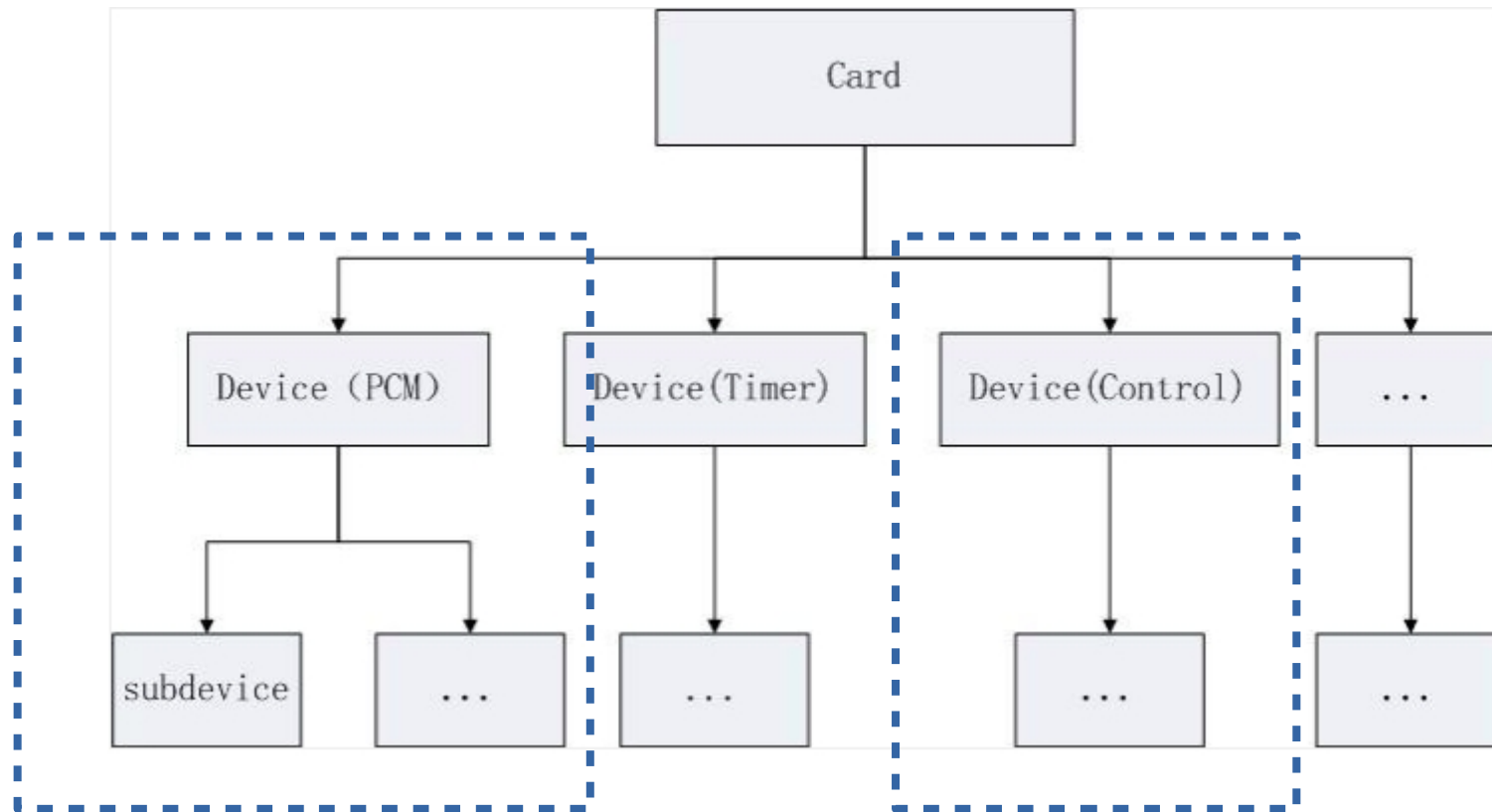
ALSA

- Advanced Linux Sound Architecture
 - Linux kernel
 - Software framework
- sound servers
 - PulseAudio, JACK ...
- ALSA stream is a data flow representing sound
 - PCM (Pulse-code modulation)
- Audio Codec
 - Audio Codec 就是音樂訊號（Audio）壓縮/解壓縮 (Compress/DECompress) 的演算法或程式，前後加起來就是 Audio Codec.
- Parameters of the hardware
 - sampling rate : 44100 Hz
 - sample width : 8 bit, 16 bit, 24 bit
 - sample encoding : endianness
 - number of channels : 1 channel, 2 channel ...

ALSA Overview



PCM



Audio Attribute Under ProcFS

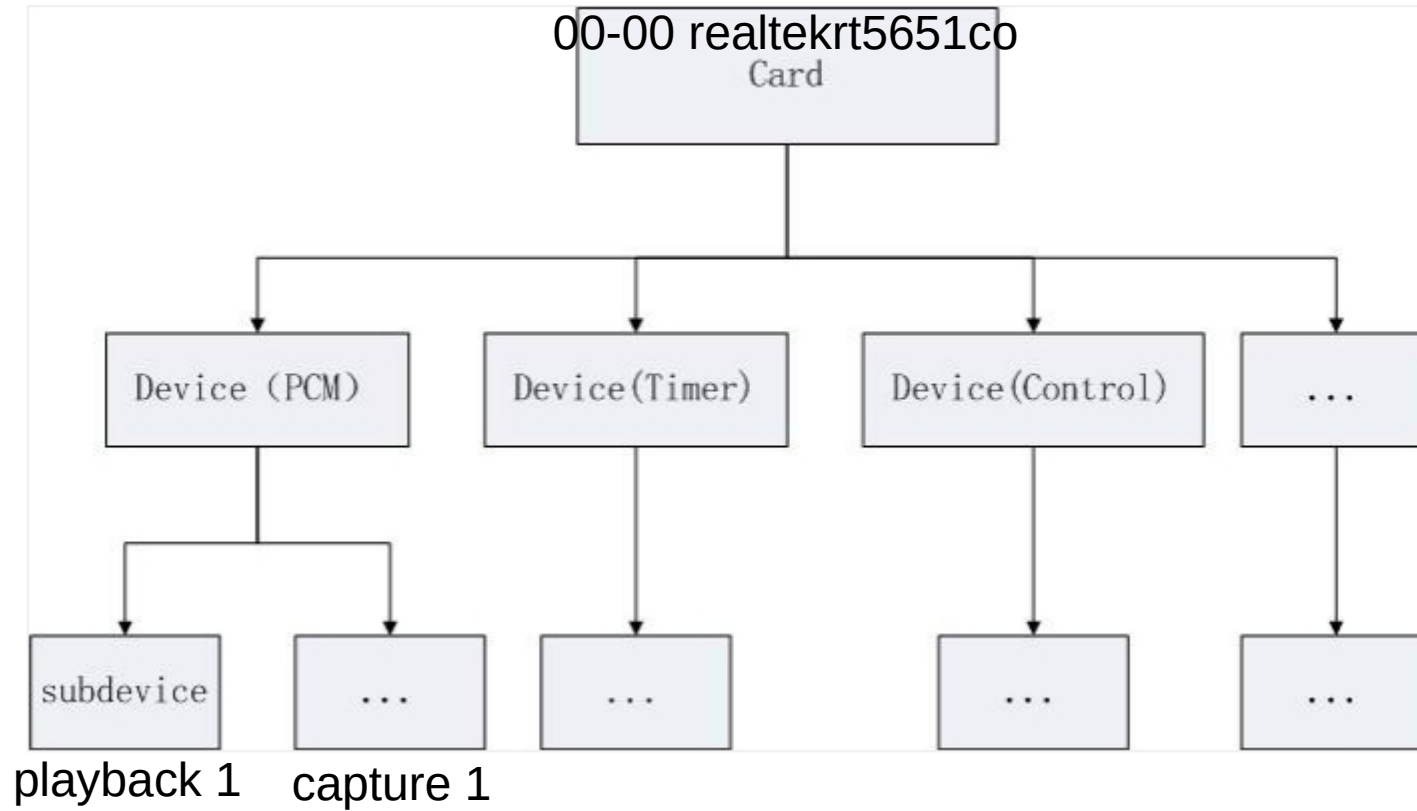
```
[root@rk3399:/]# ls /proc/asound/ -l  
card0  
card1  
cards  
device  
pcm  
realtekrt5651co -> card0  
rockchiphdmi -> card1  
seq  
timers  
version
```

```
[root@rk3399:/]# cat /proc/asound/pcm
```

```
00-00: ff890000.i2s-rt5651-aif1 rt5651-aif1-0 : : playback 1 : capture 1
```

```
01-00: ff8a0000.i2s-i2s-hifi i2s-hifi-0 : : playback 1
```


PCM Device



Audio Attribute Under SysFS

```
[root@rk3399:~]# ls /sys/class/sound/ -l
card0 -> ../../devices/platform/rt5651-sound/sound/card0

card1 -> ../../devices/platform/hdmi-sound/sound/card1

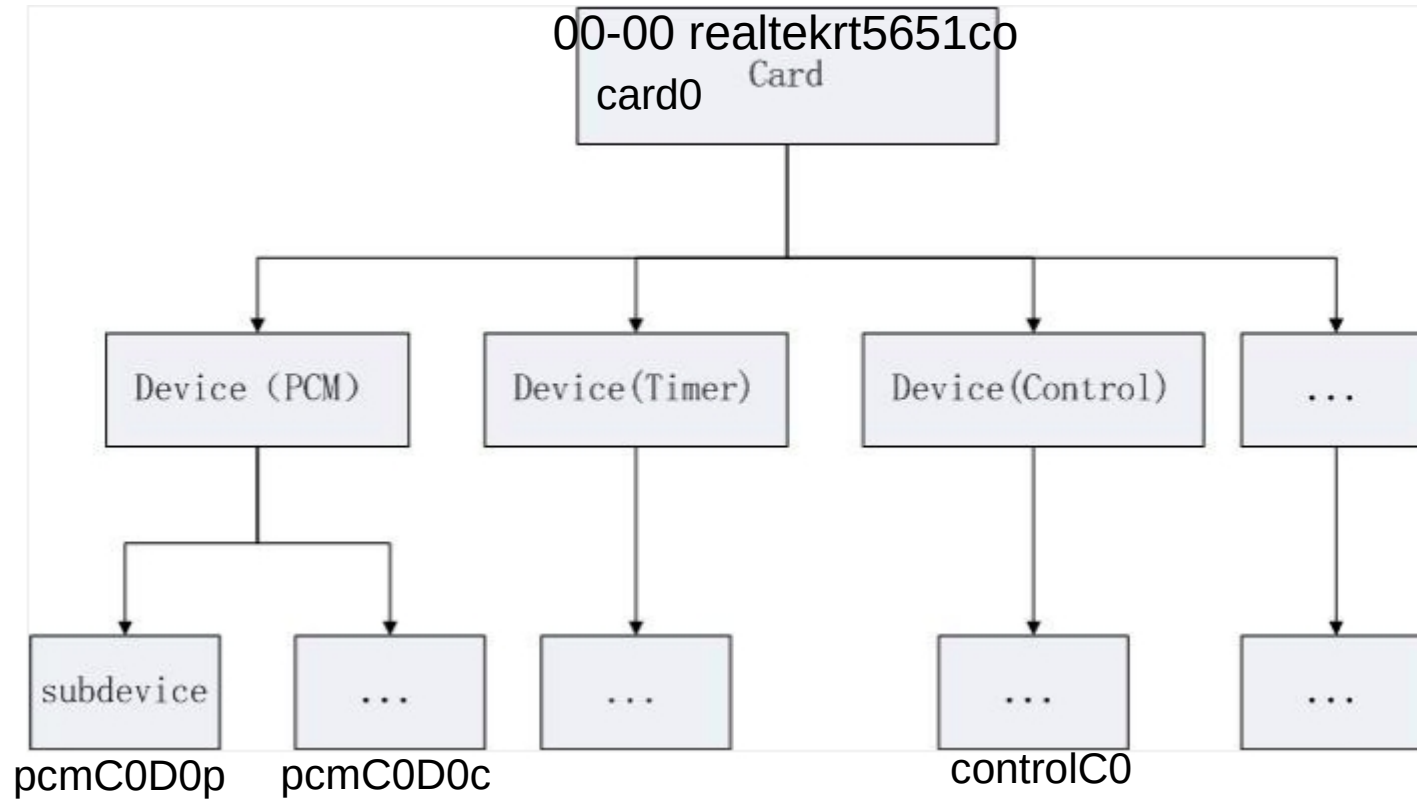
controlC0 -> ../../devices/platform/rt5651-sound/sound/card0/controlC0
controlC1 -> ../../devices/platform/hdmi-sound/sound/card1/controlC1

pcmC0D0c -> ../../devices/platform/rt5651-sound/sound/card0/pcmC0D0c
pcmC0D0p -> ../../devices/platform/rt5651-sound/sound/card0/pcmC0D0p
pcmC1D0p -> ../../devices/platform/hdmi-sound/sound/card1/pcmC1D0p

seq -> ../../devices/virtual/sound/seq

timer -> ../../devices/virtual/sound/timer
```

PCM Device



ALSA Tool

- Aplay
→ command-line sound player for ALSA sound
- Arecord
→ command-line sound record for ALSA sound
- Amixer
→ command-line mixer for ALSA soundcard driver
- Alsamixer
→ soundcard mixer for ALSA soundcard driver,
with ncurses Interface

aplay and arecord (1)

- -l, --list-devices
 - list all sound cards and digital audio devices
- -L, --list-pcms
 - list device names
- -D, --device=NAME
 - select PCM by name

aplay and arecord (2)

- -t, --file-type TYPE
 - file type (voc, wav, raw or au)
- -c, --channels
 - channels
- -r, --rate=#
 - Sample rate
- -d, --duration=#
 - interrupt after # seconds

amixer (1)

[Commands]

scontrols → show all mixer simple controls

```
amixer -c realtekrt5651co scontrols
```

```
Simple mixer control 'Mono ADC',0  
Simple mixer control 'Mono DAC',0  
Simple mixer control 'ADC',0  
Simple mixer control 'ADC Boost Gain',0  
Simple mixer control 'ADC IF2 Data',0  
Simple mixer control 'DAC IF2 Data',0  
Simple mixer control 'DAC L2 Mux',0  
Simple mixer control 'DAC MIXL INF1',0  
Simple mixer control 'DAC MIXL Stereo ADC',0  
Simple mixer control 'DAC MIXR INF1',0  
Simple mixer control 'DAC MIXR Stereo ADC',0  
Simple mixer control 'DAC R2 Mux',0  
Simple mixer control 'DAC1',0  
Simple mixer control 'DAC2',0
```

amixer (2)

[Commands]

scontents → show contents of all mixer simple controls

```
amixer -c realtekrt5651co scontents
```

Simple mixer control '**DAC2**',0Simple mixer control 'Mono ADC',0

Capabilities: cvolume

Capture channels: Front Left - Front Right

Limits: Capture 0 - 127

Front Left: Capture 47 [37%] [0.00dB]

Front Right: Capture 47 [37%] [0.00dB]

Simple mixer control '**Mono DAC**',0

Capabilities: pvolume

Playback channels: Front Left - Front Right

Limits: Playback 0 - 175

Mono:

Front Left: Playback 175 [100%] [0.00dB]

Front Right: Playback 175 [100%] [0.00dB]

amixer (3)

[Commands]

sget sID → get contents for one mixer simple control

```
amixer -c realtekrt5651co sget 'HP'
```

Simple mixer control 'HP',0

Capabilities: pvolume

Playback channels: Front Left - Front Right

Limits: Playback 0 - 39

Mono:

Front Left: Playback 31 [79%] [0.00dB]

Front Right: Playback 31 [79%] [0.00dB]

amixer (4)

[Commands]

sset sID → set contents for one mixer simple control

```
amixer -c realtekrt5651co sset 'HP' 50%
```

Simple mixer control 'HP',0

Capabilities: pvolume

Playback channels: Front Left - Front Right

Limits: Playback 0 - 39

Mono:

Front Left: Playback 20 [51%] [-16.50dB]

Front Right: Playback 20 [51%] [-16.50dB]

amixer (5)

[Commands]

controls → show all controls for given card

```
amixer -c realtekrt5651co controls
```

```
numid=11,iface=MIXER,name='Mono ADC Capture Volume'  
numid=5,iface=MIXER,name='Mono DAC Playback Volume'  
numid=1,iface=MIXER,name='HP Playback Volume'  
numid=4,iface=MIXER,name='DAC1 Playback Volume'
```

amixer (6)

[Commands]

contents → show contents of all controls for given card

```
amixer -c realtekrt5651co contents
```

```
numid=11,iface=MIXER,name='Mono ADC Capture Volume'  
; type=INTEGER,access=rw---R--,values=2,min=0,max=127,step=0  
: values=47,47  
| dBscale-min=-176.25dB,step=3.75dB,mute=0
```

```
numid=5,iface=MIXER,name='Mono DAC Playback Volume'  
; type=INTEGER,access=rw---R--,values=2,min=0,max=175,step=0  
: values=175,175  
| dBscale-min=-656.25dB,step=3.75dB,mute=0
```

amixer (7)

[Commands]

cget cID → get control contents for one control

```
amixer -c realtekrt5651co cget numid=11
```

```
numid=11,iface=MIXER,name='Mono ADC Capture Volume'  
; type=INTEGER,access=rw---R--,values=2,min=0,max=127,step=0  
: values=47,47  
| dBscale-min=-176.25dB,step=3.75dB,mute=0
```

```
amixer -c realtekrt5651co cget numid=12
```

```
numid=12,iface=MIXER,name='ADC Boost Gain'  
; type=INTEGER,access=rw---R--,values=2,min=0,max=3,step=0  
: values=0,0  
| dBscale-min=0.00dB,step=12.00dB,mute=0
```

amixer (8)

[Commands]

cset cID → set control contents for one control

```
amixer -c realtekrt5651co cset numid=11 10
```

```
numid=11,iface=MIXER,name='Mono ADC Capture Volume'  
; type=INTEGER,access=rw---R--,values=2,min=0,max=127,step=0  
: values=10,10  
| dBscale-min=-176.25dB,step=3.75dB,mute=0
```

```
amixer -c realtekrt5651co cget numid=12 3
```

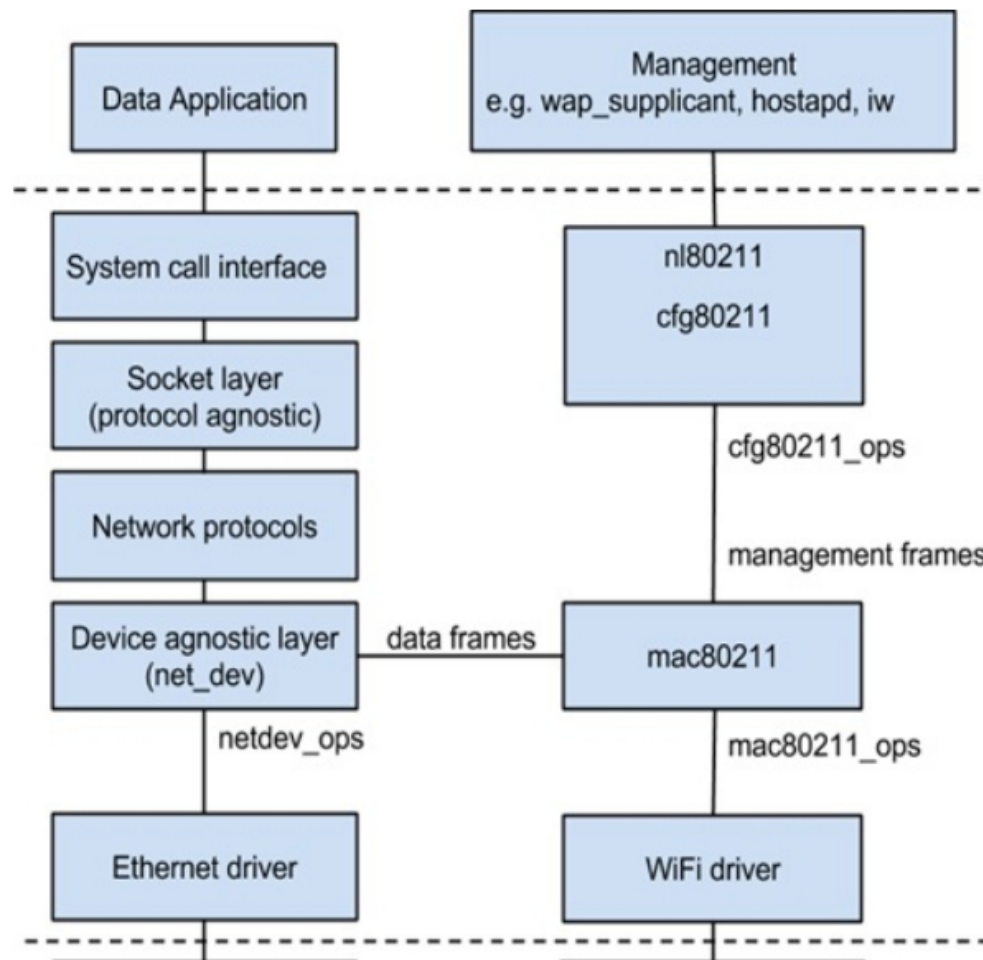
```
; type=INTEGER,access=rw---R--,values=2,min=0,max=3,step=0  
: values=3,3  
| dBscale-min=0.00dB,step=12.00dB,mute=0
```

WIFI

wpa_supplicant

- wpa_supplicant
 - WEP, WPA and WPA2
- It is the IEEE 802.1X/WPA component that is used in the client stations

Linux Wireless Networking Architecture



wpa_supplicant

