

SIP phone

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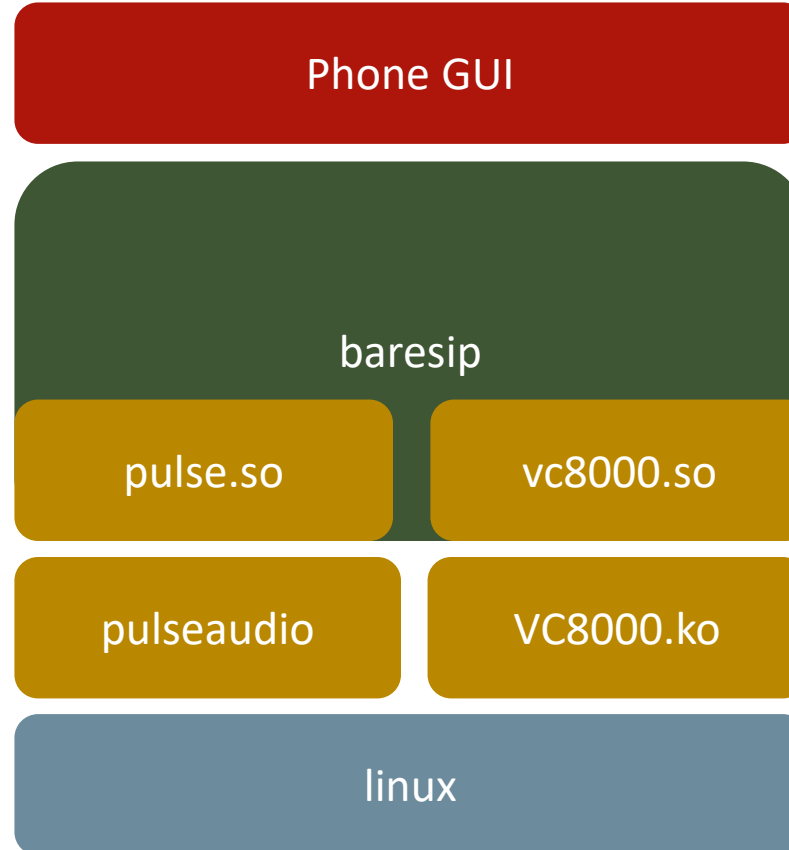
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| Outline

- baresip
- pulseaudio with WebRTC AEC3
- Phone GUI
- VC8000

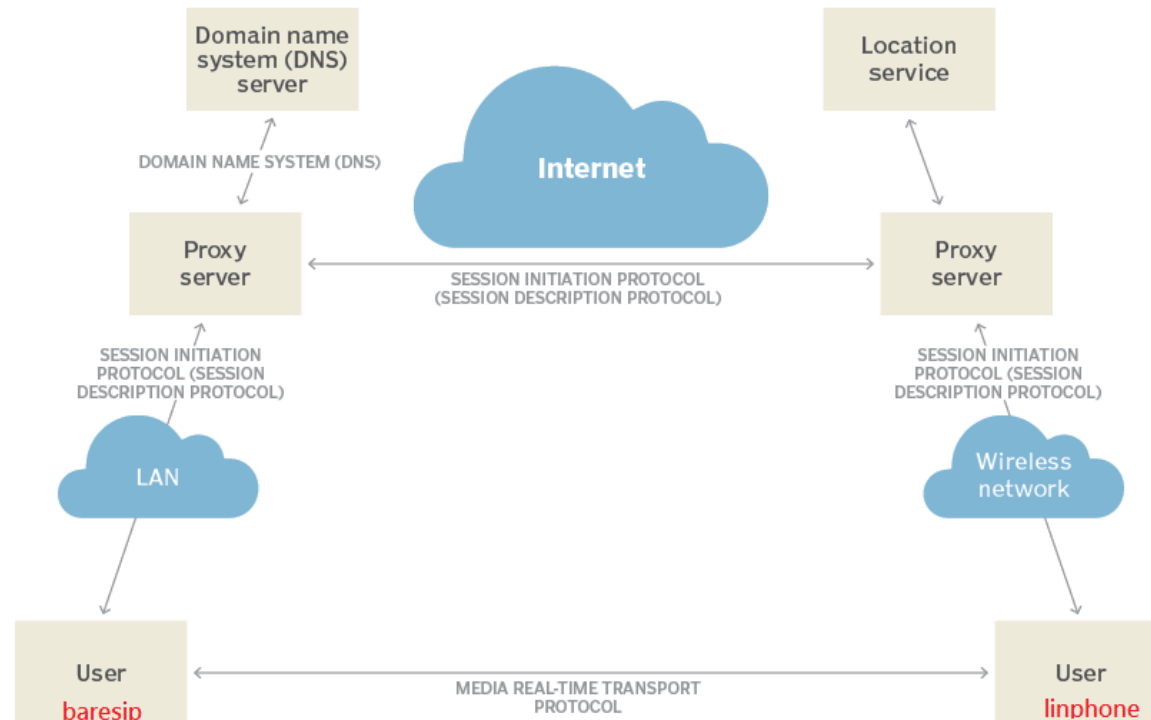
| SIP phone

- Architecture



| baresip

- A portable and modular SIP User-Agent with audio and video support
- Source: <https://github.com/baresip/baresip>



| baresip

- On MA35D1
 - VC8000 h264 decoder
 - 1080P: 30fps
 - 720P: 60fps
 - WebRTC AEC3 support (software AEC)
 - Multi calls support
- Configuration path
 - /home/root/.baresip/

| baresip

- Configuration (basic)

- Audio device

```
# Audio
audio_path          /usr/share/baresip
audio_player        alsa,default
audio_source        alsa,default
audio_alert         alsa,default
ausrc_rate          16000
auplay_rate         16000
ausrc_channels      2
auplay_channels     2
```

- Video device

```
# Video
#video_source       fakevideo
video_display       fb
video_size          1024x600
```

| baresip

- Audio driver

Audio driver Modules

module

#module

#module

alsa.so

pulse.so

jack.so

- Audio codec

Audio codec Modules (in order)

#module

#module

#module

module

mpa.so

codec2.so

ilbc.so

speex.so

| baresip

- Video display

Video display modules

module

fb.so

#module

x11.so

#module

sdl.so

- Video codec

Video codec Modules (in order)

#module

avcodec.so

#module

vp8.so

#module

vp9.so

module

vc8000.so

| baresip

- VC8000

#vc8000

vc8000_viddst_auto_size	yes
vc8000_viddst_size	1024x600
vc8000_viddst_offset_x	0
vc8000_viddst_offset_y	0
vc8000_panel_size	1024x600
vc8000_pp_enable	yes

- Call (Option for multi call)

Call

call_local_timeout	120
call_max_calls	4
call_hold_other_calls	no

| pulseaudio with WebRTC AEC3

- A sound server system
 - Middleware between applications and hardware devices, either using ALSA or OSS.
 - Per-application volume controls
 - Support for multiple audio sources and sinks
 - Built- in sample conversion and resampling
- Good for multi calls application
 - Mixer and echo cancel module support
- Download from OpenNuvoton

```
# git clone https://github.com/OpenNuvoton/pulseaudio_webrtc.git
```
- Configuration path
 - /home/root/.pulse/

| pulseaudio with WebRTC AEC3

- pulseaudio support on baresip
 - Modify the configuration of baresip

- Audio device

```
# Audio
audio_path          /usr/share/baresip
audio_player        pulse
audio_source        pulse
audio_alert         pulse
ausrc_srate         16000
auplay_srate        16000
ausrc_channels      2
auplay_channels     2
```

- Audio driver

```
# Audio driver Modules
#module             alsa.so
module              pulse.so
#module             jack.so
```

| pulseaudio with WebRTC AEC3

- Enable pulseaudio daemon

```
root@ma35d1-evb:~#pulseaudio -D
```

- Set WebRTC AEC3 to default audio source/sink device

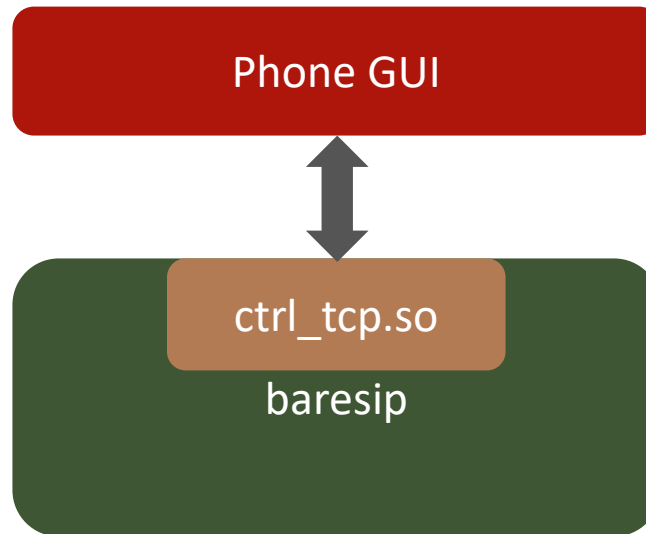
```
root@ma35d1-evb:~#pactl load-module module-echo-cancel use_master_format=1  
aec_method=webrtc source_name=echoCancel_source sink_name=echoCancel_sink
```

```
root@ma35d1-evb:~#pactl set-default-source echoCancel_source
```

```
root@ma35d1-evb:~#pactl set-default-sink echoCancel_sink
```

| Phone GUI

- A simple GUI demo for baresip front-end. Base on QT.
- Using TCP socket (localhost:4444) to communicate with baresip
- Message exchange by JSON data format



| Phone GUI

- Message format
 - len:{JSON body},
 - Command example

```
{  
  "command" : "dial",  
  "params" : "sip:alice@atlanta.com",  
  "token" : "qwerasdf"    ←Optional. Included in the response if present  
}
```

| Phone GUI

- Response example

```
{  
  "response" : true,  
  "ok"      : true,  
  "data"    : "",  
  "token"   : "qwertasdf"  
}
```

- Event example

```
{  
  "event"    : "true",  
  "class"    : "call",  
  "type"     : "CALL_CLOSED",  
  "param"    : "Connection reset by peer",  
  "accountaor" : "sip:alice@atlanta.com",  
  "direction" : "incoming",  
  "peeruri"   : "sip:bob@biloxi.com",  
  "id"        : "73a12546589651f8"  
}
```

| Phone GUI

- Phone GUI support on baresip
 - Modify the configuration of baresip

Application Modules

#module_app	syslog.so
#module_app	mqtt.so
module_app	ctrl_tcp.so
module_app	vidloop.so
module_app	ctrl_dbus.so
#module_app	httpreq.so
#module_app	multicast.so

| VC8000

- MA35D1 H264/JPEG hardware decoder
- Multi decode instance support (used by multi calls scenario)
- Post processing (scaling, rotation) support.
- Decode image to frame buffer 0(/dev/fb0) directly.

```
root@ma35d1-evb:/lib/modules/5.4.110#  
root@ma35d1-evb:/lib/modules/5.4.110# modinfo ma35d1-vc8000.ko  
filename:      /lib/modules/5.4.110/ma35d1-vc8000.ko  
description:   MA35D1 VC8000 H264/JPEG driver (V4L2 M2M)  
version:      0.4.1  
author:       Nuvoton Technology Corporation  
license:      GPL v2  
srcversion:   B821B2D6F370AAB906675F9  
alias:        of:N*T*Cnuvoton,ma35d1-vc8kC*  
alias:        of:N*T*Cnuvoton,ma35d1-vc8k  
depends:  
intree:      Y  
name:        ma35d1_vc8000  
vermagic:    5.4.110 SMP mod_unload aarch64  
parm:        debug:Debug level - higher value produces more verbose messages (int)  
root@ma35d1-evb:/lib/modules/5.4.110#
```

| VC8000

- VC8000 kernel configuration
 - https://github.com/OpenNuvoton/MA35D1_linux-5.4.y/blob/master/arch/arm64/boot/dts/nuvoton/ma35d1.dtsi

```
reserved-memory {  
    #address-cells = <2>;  
    #size-cells = <2>;  
    ranges;  
    display_buf: display_buf@0 {  
        reg = <0x0 0x8C800000 0x0 0x3000000>; /* 48MiB */  
        no-map;  
    };  
    vc8k_buf: vc8k_buf@0 {  
        reg = <0x0 0x8B000000 0x0 0x1800000>; /* 24MiB, used by H264 reference frame */  
        no-map;  
    };  
};
```

| VC8000

```
/* VC8000 engine */
vc8k:vc8k@40290000 {
    compatible = "nuvoton,ma35d1-vc8k";
    reg = <0x0 0x40290000 0x0 0x1000>;
    clocks = <&clk vc8k_gate>;
    nuvoton,sys = <&sys>;
    interrupts = <GIC_SPI 28 IRQ_TYPE_LEVEL_HIGH>;
    memory-region = <&vc8k_buf>;
    pp_out_enable = "yes"; /* enable post processing */
    fb_width = <1024>; /* frame buffer width */
    fb_height = <600>; /* frame buffer height */
    fb_fmt = "RGB888"; /* RGB888, RGB565, or YUV420P */
    vid_max_width = <1920>; /* video source maximum width */
    vid_max_height = <1080>; /* video source maximum height */
    vid_max_instance = <1>; /* video decode maximum instance */
    vid_refbuf_cnt = <6>; /* video P/B frame maximum reference number */
    status = "okay";
};
```

| VC8000

- vc8000 reserved memory size should be
 - $\text{vc8000_reserved-memory} \geq \text{vid_max_width} * \text{vid_max_height} * 2 * \text{vid_max_instance} * \text{vid_refbuf_cnt}$

| Demo - Standby

sip:root@192.168.50.40

1

2

3

4

5

6

7

8

9

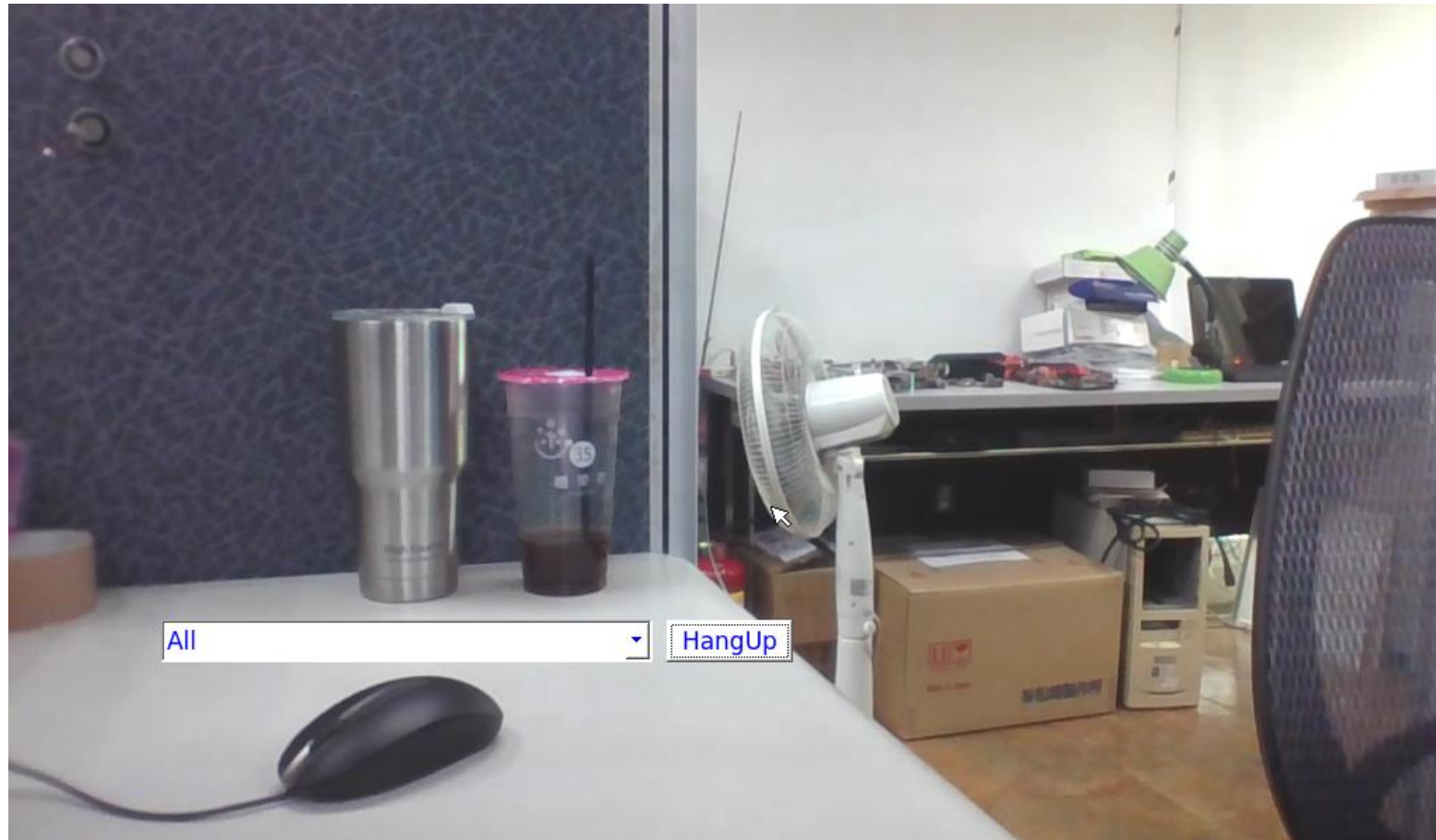
*

0

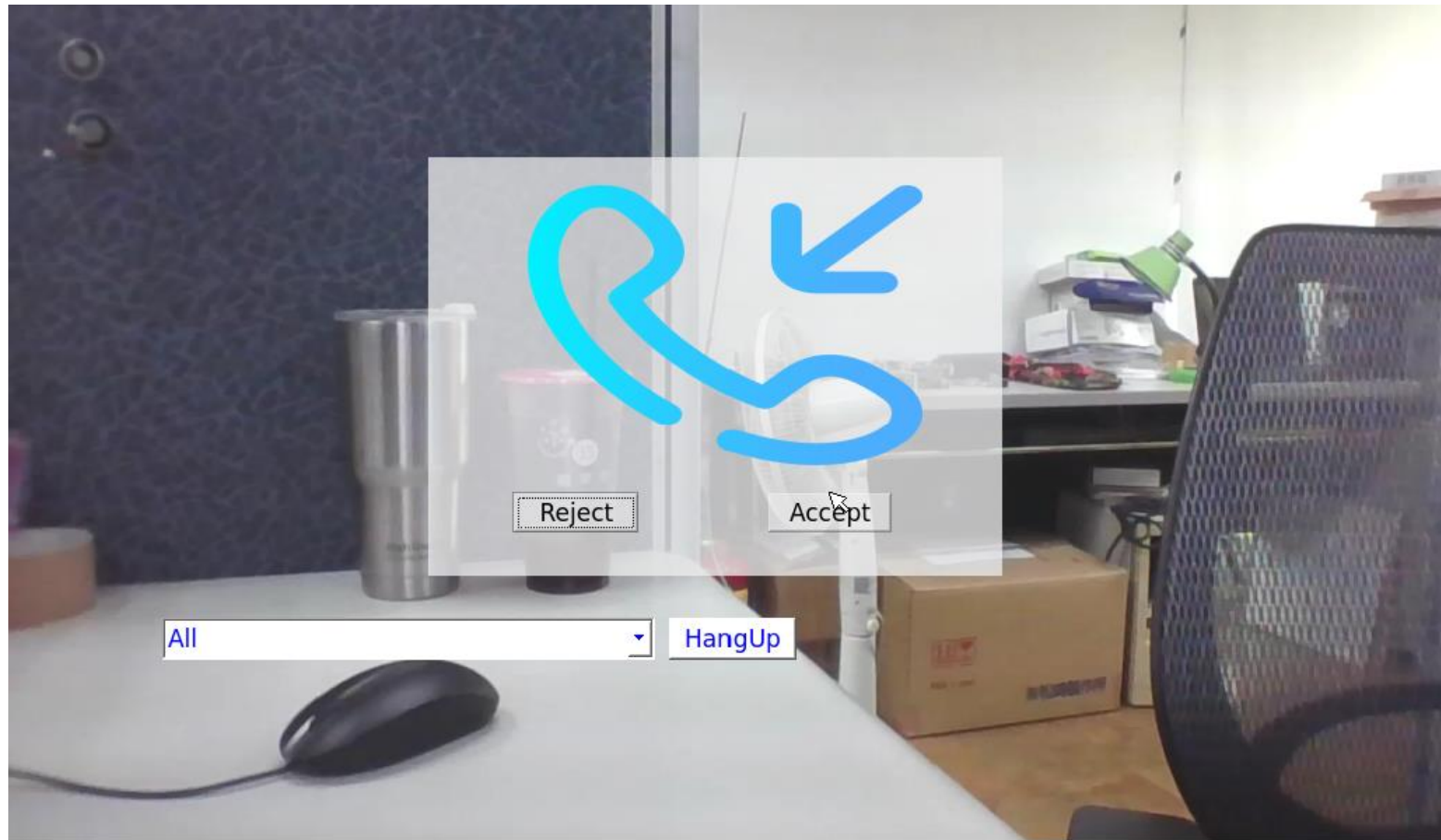
#

Dial

| Demo - Talking



| Demo – Incoming call during talking



| Demo – Multi calls



Demo – Multi calls



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Thank You

Danke

Merci

ありがとう

Gracias

Kiitos

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