# Recipes

Valuable programming, advanced use recipes and know how about C1 family cameras

- OpenCV (Python)
- GStreamer
- FFmpeg
- V4L2

# OpenCV (Python)

## Display live full resolution video from USB camera

OpenCV can grab video frames directly from USB camera. However it can be tricky to get full resolution and MJPEG compression. Example below unlocks full capabilities and captures 1080p@30fps from C1 family cameras.

More detailed bog post about OpenCV tricks to get full resolution from USB camera.

## Code #1

```
import cv2

camera = cv2.VideoCapture(0, cv2.CAP_DSHOW)

camera.set(cv2.CAP_PROP_FRAME_WIDTH, 1920)
camera.set(cv2.CAP_PROP_FRAME_HEIGHT, 1080)
camera.set(cv2.CAP_PROP_FPS, 30.0)
camera.set(cv2.CAP_PROP_FOURCC, cv2.VideoWriter.fourcc('m','j','p','g'))
camera.set(cv2.CAP_PROP_FOURCC, cv2.VideoWriter.fourcc('M','J','P','G'))

while (1):
    retval, im = camera.read()
    cv2.imshow("image", im)

    k = cv2.waitKey(1) & 0xff
    if k == 27:
        break

camera.release()
cv2.destroyAllWindows()
```

## Versions

| | |
|---|---|
| Python (Windows) | 3.8.4rc1 |
| OpenCV | 4.3.0 |

# Code #2

```
import cv2

print("Initializing camera")

camera = cv2.VideoCapture(0, cv2.CAP_DSHOW)

print("Setting camera mode")

camera.set(cv2.CAP_PROP_FPS, 30.0)
camera.set(cv2.CAP_PROP_FOURCC, cv2.VideoWriter.fourcc('m','j','p','g'))
camera.set(cv2.CAP_PROP_FOURCC, cv2.VideoWriter.fourcc('M','J','P','G'))
camera.set(cv2.CAP_PROP_FRAME_WIDTH, 1920)
camera.set(cv2.CAP_PROP_FRAME_HEIGHT, 1080)

print("Starting capture")
while(1):
    retval, im = camera.read()
    scale = 0.5
    im = cv2.resize(im, None, fx=scale, fy=scale, interpolation=cv2.INTER_CUBIC)
    cv2.imshow("image", im)

    camera.set(cv2.CAP_PROP_EXPOSURE, -10)
    camera.set(cv2.CAP_PROP_GAIN, 30)

    k = cv2.waitKey(1) & 0xff
    if k == 27:
        print("exit")
        break

camera.release()
cv2.destroyAllWindows()
```

# Versions

| | |
|---|---|
| Python (Windows) | 3.10.0 |

| | |
|---|---|
| OpenCV | 4.9.0 |

# GStreamer

GStreamer is a powerful tool which allows streaming complex video pipes over network. Simple pipelines to stream and receive video provided below.

## Stream h.264@30fps over network

### Show MJPEG stream on the LCD

```
gst-launch-1.0 -v v4l2src device=/dev/video0 ! image/jpeg, width=1920, height=1080,
framerate=30/1 ! jpegdec ! videoconvert ! queue ! autovideosink
```

### Stream h.264 compressed video over UDP socket

```
gst-launch-1.0 -v v4l2src device=/dev/video2 do-timestamp=true ! video/x-h264, width=1920, \
height=1080, framerate=30/1 ! h264parse ! queue ! \
rtph264pay config-interval=10 pt=96 ! udpsink \
host=192.168.0.111 port=5600 sync=false
```

### Receive stream and display on monitor

```
gst-launch-1.0 -e -v udpsrc port=5600 ! application/x-rtp, encoding-name=H264,payload=96 ! \
rtpjitterbuffer ! rtph264depay ! avdec_h264 ! autovideosink
```

## Some other helpful pipelines

### Receive, display and record video

```
gst-launch-1.0 -e -v udpsrc port=5600 ! tee name=STREAMOUT ! \
tee name=VIDEOWINDOW ! queue ! application/x-rtp, encoding-name=H264, payload=96 ! \
rtph264depay ! h264parse ! mp4mux ! filesink location=myvideo.mp4 STREAMOUT. ! \
queue ! udpsink port=5700 VIDEOWINDOW. ! queue ! application/x-rtp, \
payload=96 ! rtph264depay ! avdec_h264 ! autovideosink
```

### Display h.264 stream (Windows)

```
gst-launch-1.0.exe ksvideosrc ! \
video/x-raw,format=H264,width=1920 ! \
```

```
capssetter caps=video/x-h264,format=byte-stream join=false ! \
queue ! \
h264parse ! \
avdec_h264 ! \
autovideosink
```

> Not all firmware modifications are supported by gstreamer. If you experiencing streaming issues, feel free to contact us. Update procedure is detailed here.

## Inspect video device capabilities

Video device details can be inspected with video4linux command `v4l2-ctl --device /dev/video2 --all` Video device should support H.264 pixel format. Various firmware modifications can have different configuration parameters and

```
Driver Info:
        Driver name      : uvcvideo
        Card type        : KurokesuC1_536     : Kurokesu C
        Bus info         : usb-0000:01:00.0-1.3
        Driver version   : 5.10.11
        Capabilities     : 0x84a00001
                Video Capture
                Metadata Capture
                Streaming
                Extended Pix Format
                Device Capabilities
        Device Caps      : 0x04200001
                Video Capture
                Streaming
                Extended Pix Format
Media Driver Info:
        Driver name      : uvcvideo
        Model            : KurokesuC1_536     : Kurokesu C
        Serial           : SN000000
        Bus info         : usb-0000:01:00.0-1.3
        Media version    : 5.10.11
        Hardware revision: 0x00000100 (256)
        Driver version   : 5.10.11
Interface Info:
        ID               : 0x03000008
```

```
        Type            : V4L Video
Entity Info:
        ID              : 0x00000007 (7)
        Name            : KurokesuC1_536     : Kurokesu C
        Function        : V4L2 I/O
        Pad 0x01000011  : 0: Sink
          Link 0x0200001e: from remote pad 0x1000010 of entity 'Extension 4': Data, Enabled,
Immutable
Priority: 2
Video input : 0 (Camera 1: ok)
Format Video Capture:
        Width/Height     : 1920/1080
        Pixel Format     : 'H264' (H.264)
        Field            : None
        Bytes per Line   : 3840
        Size Image       : 2073600
        Colorspace       : sRGB
        Transfer Function : Rec. 709
        YCbCr/HSV Encoding: ITU-R 601
        Quantization     : Default (maps to Full Range)
        Flags            :
Crop Capability Video Capture:
        Bounds      : Left 0, Top 0, Width 1920, Height 1080
        Default     : Left 0, Top 0, Width 1920, Height 1080
        Pixel Aspect: 1/1
Selection: crop_default, Left 0, Top 0, Width 1920, Height 1080, Flags:
Selection: crop_bounds, Left 0, Top 0, Width 1920, Height 1080, Flags:
Streaming Parameters Video Capture:
        Capabilities     : timeperframe
        Frames per second: 30.000 (30/1)
        Read buffers     : 0
                     brightness 0x00980900 (int)    : min=-64 max=64 step=1 default=0
value=0
                       contrast 0x00980901 (int)    : min=0 max=64 step=1 default=32
value=32
                     saturation 0x00980902 (int)    : min=0 max=128 step=1 default=52
value=52
                            hue 0x00980903 (int)    : min=-40 max=40 step=1 default=0 value=0
 white_balance_temperature_auto 0x0098090c (bool)   : default=1
value=1
```

```
gamma 0x00980910 (int)    : min=72 max=500 step=1 default=100
value=100
                         gain 0x00980913 (int)    : min=0 max=100 step=1 default=0
value=0
           power_line_frequency 0x00980918 (menu)   : min=0 max=2 default=2 value=2
      white_balance_temperature 0x0098091a (int)    : min=2800 max=9300 step=1 default=4600
value=4600 flags=inactive
                     sharpness 0x0098091b (int)    : min=0 max=6 step=1 default=3
value=3
         backlight_compensation 0x0098091c (int)    : min=0 max=2 step=1 default=1
value=1
                 exposure_auto 0x009a0901 (menu)   : min=0 max=3 default=3
value=3
              exposure_absolute 0x009a0902 (int)    : min=1 max=5000 step=1 default=156
value=156 flags=inactive
         exposure_auto_priority 0x009a0903 (bool)   : default=0 value=0
```

# Debugging

Useful commands:

- `gst-launch-1.0 --gst-version` - read gstreamer version (tested with **GStreamer Core Library version 1.14.4**)

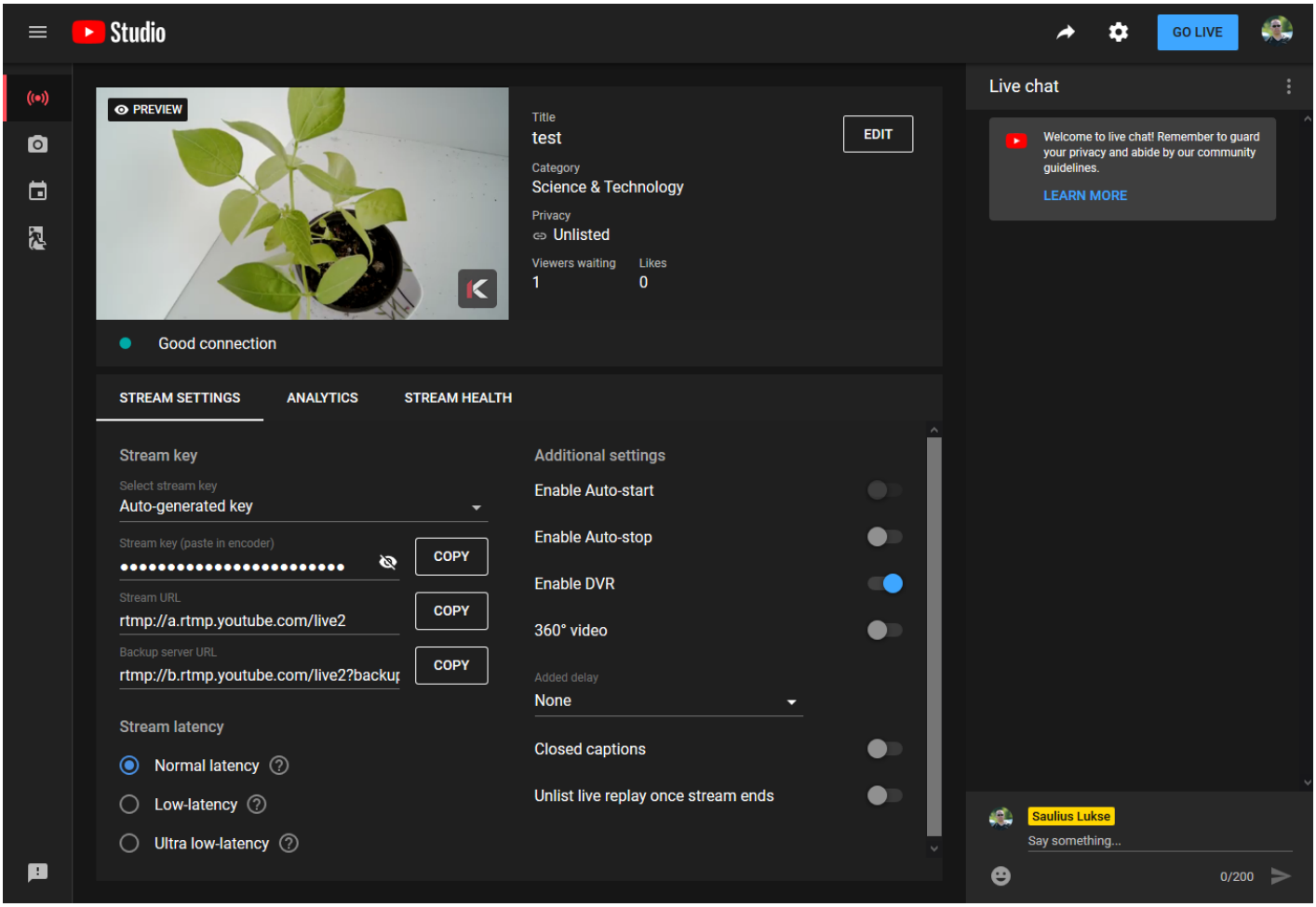
# FFmpeg

## Stream live 1080p @ 30fps video to YouTube

FFmpeg tool can be used to stream live video to youtube, recipe command is below. Also add silent audio with proper encoding.

```
ffmpeg -re \
-f v4l2 \
-framerate 30 \
-video_size 1920x1080 \
-i /dev/video1 \
-ar 44100 \
-ac 2 \
-acodec pcm_s16le \
-f s16le \
-ac 2 \
-i /dev/zero \
-codec:a aac \
-ab 64k \
-strict experimental \
-vcodec copy \
-pix_fmt yuv420p \
-f flv "rtmp://a.rtmp.youtube.com/live2/[STREAM_ID]"
```

YouTube studio preview




# Record h.264 stream in Windows

List connected devices `ffmpeg -hide_banner -list_devices true -f dshow -i dummy`

```
[dshow @ 03e80ee0] DirectShow video devices (some may be both video and audio devices)
[dshow @ 03e80ee0]  "C2 RVN-3Q4WH"
[dshow @ 03e80ee0]     Alternative name
"@device_pnp_\\?\usb#vid_16d0&pid_0ed4&mi_00#9&216b562&0&0000#{65e8773d-8f56-11d0-a3b9-
00a0c9223196}\global"
[dshow @ 03e80ee0] DirectShow audio devices
[dshow @ 03e80ee0]  "Input (M-Track)"
[dshow @ 03e80ee0]     Alternative name "@device_cm_{33D9A762-90C8-11D0-BD43-
00A0C911CE86}\wave_{B212B620-6CA9-46A0-ACB6-F7379A77ADCC}"
[dshow @ 03e80ee0]  "Microphone (C2)"
[dshow @ 03e80ee0]     Alternative name "@device_cm_{33D9A762-90C8-11D0-BD43-
00A0C911CE86}\wave_{65AA28A6-DECF-4DE1-9116-8D4F8B360AC2}"
dummy: Immediate exit requested
```

Check device compression options `ffmpeg -hide_banner -f dshow -list_options true -i video="C2 RVN-3Q4WH"`

> Do not forget to replace camera name.

```
[dshow @ 001a0f00] DirectShow video device options (from video devices)
[dshow @ 001a0f00]  Pin "Capture" (alternative pin name "0")
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1920x1080 fps=15 max s=1920x1080 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1920x1080 fps=15 max s=1920x1080 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1280x1024 fps=15 max s=1280x1024 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1280x1024 fps=15 max s=1280x1024 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1280x720 fps=15 max s=1280x720 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1280x720 fps=15 max s=1280x720 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=720x576 fps=5 max s=720x576 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=720x576 fps=5 max s=720x576 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=720x480 fps=5 max s=720x480 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=720x480 fps=5 max s=720x480 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=640x480 fps=15 max s=640x480 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=640x480 fps=15 max s=640x480 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1920x1080 fps=15 max s=1920x1080 fps=30
[dshow @ 001a0f00]   vcodec=mjpeg  min s=1920x1080 fps=15 max s=1920x1080 fps=30
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1920x1080 fps=5 max s=1920x1080 fps=5
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1920x1080 fps=5 max s=1920x1080 fps=5
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1280x1024 fps=5 max s=1280x1024 fps=5
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1280x1024 fps=5 max s=1280x1024 fps=5
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1280x720 fps=5 max s=1280x720 fps=10
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1280x720 fps=5 max s=1280x720 fps=10
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=800x600 fps=5 max s=800x600 fps=10
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=800x600 fps=5 max s=800x600 fps=10
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=720x576 fps=5 max s=720x576 fps=10
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=720x576 fps=5 max s=720x576 fps=10
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=720x480 fps=5 max s=720x480 fps=20
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=720x480 fps=5 max s=720x480 fps=20
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=640x480 fps=5 max s=640x480 fps=30
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=640x480 fps=5 max s=640x480 fps=30
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1920x1080 fps=5 max s=1920x1080 fps=5
[dshow @ 001a0f00]   pixel_format=yuyv422  min s=1920x1080 fps=5 max s=1920x1080 fps=5
[dshow @ 001a0f00]  Pin "Capture" (alternative pin name "1")
[dshow @ 001a0f00]   vcodec=h264  min s=1920x1080 fps=5 max s=1920x1080 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=1920x1080 fps=5 max s=1920x1080 fps=30
```

```
[dshow @ 001a0f00]   vcodec=h264  min s=1280x1024 fps=5 max s=1280x1024 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=1280x1024 fps=5 max s=1280x1024 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=1280x720 fps=5 max s=1280x720 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=1280x720 fps=5 max s=1280x720 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=720x576 fps=5 max s=720x576 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=720x576 fps=5 max s=720x576 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=720x480 fps=5 max s=720x480 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=720x480 fps=5 max s=720x480 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=640x480 fps=5 max s=640x480 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=640x480 fps=5 max s=640x480 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=1920x1080 fps=5 max s=1920x1080 fps=30
[dshow @ 001a0f00]   vcodec=h264  min s=1920x1080 fps=5 max s=1920x1080 fps=30
video=C2 RVN-3Q4WH: Immediate exit requested
```

Record h.264 compressed video directly from the camera `ffmpeg -hide_banner -f dshow -s 1920x1080 -r 30 -vcodec h264 -i video="C2 RVN-3Q4WH" output.mp4`

```
Input #0, dshow, from 'video=C2 RVN-3Q4WH':
  Duration: N/A, start: 3447069.727000, bitrate: N/A
    Stream #0:0: Video: h264 (Main) (H264 / 0x34363248), yuv420p, 1920x1080, 30 fps, 30 tbr,
10000k tbn, 20000k tbc
Stream mapping:
  Stream #0:0 -> #0:0 (h264 (native) -> h264 (libx264))
Press [q] to stop, [?] for help
[libx264 @ 06507020] using cpu capabilities: MMX2 SSE2Fast SSSE3 SSE4.2 AVX FMA3 BMI2 AVX2
[libx264 @ 06507020] profile High, level 4.0
[libx264 @ 06507020] 264 - core 152 r2851 ba24899 - H.264/MPEG-4 AVC codec - Copyleft 2003-
2017 - http://www.videolan.org/x264.html - options: cabac=1 ref=3 deblock=1:0:0
analyse=0x3:0x113 me=hex subme=7 psy=1 psy_rd=1.00:0.00 mixed_ref=1 me_range=16 chroma_me=1
trellis=1 8x8dct=1 cqm=0 deadzone=21,11 fast_pskip=1 chroma_qp_offset=-2 threads=34
lookahead_threads=5 sliced_threads=0 nr=0 decimate=1 interlaced=0 bluray_compat=0
constrained_intra=0 bframes=3 b_pyramid=2 b_adapt=1 b_bias=0 direct=1 weightb=1 open_gop=0
weightp=2 keyint=250 keyint_min=25 scenecut=40 intra_refresh=0 rc_lookahead=40 rc=crf
mbtree=1 crf=23.0 qcomp=0.60 qpmin=0 qpmax=69 qpstep=4 ip_ratio=1.40 aq=1:1.00
Output #0, mp4, to 'output.mp4':
  Metadata:
    encoder         : Lavf57.71.100
    Stream #0:0: Video: h264 (libx264) ([33][0][0][0] / 0x0021), yuv420p, 1920x1080, q=-1--1,
30 fps, 15360 tbn, 30 tbc
    Metadata:
```

```
      encoder         : Lavc57.89.100 libx264
    Side data:
      cpb: bitrate max/min/avg: 0/0/0 buffer size: 0 vbv_delay: -1
frame=  121 fps= 27 q=-1.0 Lsize=     973kB time=00:00:03.93 bitrate=2026.3kbits/s
speed=0.871x

### PRess CTRL + X to stop recording

video:971kB audio:0kB subtitle:0kB other streams:0kB global headers:0kB muxing overhead:
0.226249%
[libx264 @ 06507020] frame I:1     Avg QP:17.49  size: 43500
[libx264 @ 06507020] frame P:36    Avg QP:21.70  size: 15985
[libx264 @ 06507020] frame B:84    Avg QP:23.32  size:  4457
[libx264 @ 06507020] consecutive B-frames:  7.4%  0.0%  0.0% 92.6%
[libx264 @ 06507020] mb I  I16..4: 46.6% 47.6%  5.8%
[libx264 @ 06507020] mb P  I16..4:  3.3%  1.4%  0.0%  P16..4: 50.3%  3.0%  5.3%  0.0%
0.0%    skip:36.6%
[libx264 @ 06507020] mb B  I16..4:  0.1%  0.0%  0.0%  B16..8: 25.5%  0.1%  0.0%  direct:
5.3%  skip:68.9%  L0:42.0% L1:57.8% BI: 0.2%
[libx264 @ 06507020] 8x8 transform intra:34.9% inter:90.6%
[libx264 @ 06507020] coded y,uvDC,uvAC intra: 23.5% 56.0% 10.3% inter: 4.6% 27.7% 0.6%
[libx264 @ 06507020] i16 v,h,dc,p: 22% 19% 12% 47%
[libx264 @ 06507020] i8 v,h,dc,ddl,ddr,vr,hd,vl,hu: 22% 19% 42%  2%  3%  3%  3%  3%  3%
[libx264 @ 06507020] i4 v,h,dc,ddl,ddr,vr,hd,vl,hu: 27% 30% 18%  5%  4%  3%  5%  2%  6%
[libx264 @ 06507020] i8c dc,h,v,p: 55% 20% 19%  6%
[libx264 @ 06507020] Weighted P-Frames: Y:0.0% UV:0.0%
[libx264 @ 06507020] ref P L0: 59.4%  3.3% 25.4% 11.9%
[libx264 @ 06507020] ref B L0: 87.0%  9.8%  3.3%
[libx264 @ 06507020] ref B L1: 93.7%  6.3%
[libx264 @ 06507020] kb/s:1970.28
Exiting normally, received signal 2.
```

# V4L2

## Install

Install v4l utilities first.

```
sudo apt install v4l-utils
```

## Measure actual frame rate

Set video format, and start streaming to `/dev/null`

```
v4l2-ctl --device /dev/video1 -p 30
v4l2-ctl --device /dev/video1 --set-fmt-video=width=1920,height=1080,pixelformat=H264
```

Start capturing and calculating

```
v4l2-ctl --device /dev/video1 --stream-mmap=3 --stream-count=1000 --stream-to=/dev/null
```

Output from last command

```
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< 30.00 fps
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< 30.04 fps
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< 30.03 fps
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< 30.00 fps
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< 30.00 fps
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< 30.00 fps
```

## Get supported video formats

/dev/video1 supports h.264 video stream

```
v4l2-ctl --device /dev/video1 --list-formats
```

```
ioctl: VIDIOC_ENUM_FMT
        Index       : 0
        Type        : Video Capture
        Pixel Format: 'H264' (compressed)
```

```
        Name        : H.264
```

/dev/video0 support MJPG and YUYV streams

```
v4l2-ctl --device /dev/video0 --list-formats
```

```
ioctl: VIDIOC_ENUM_FMT
        Index       : 0
        Type        : Video Capture
        Pixel Format: 'MJPG' (compressed)
        Name        : Motion-JPEG

        Index       : 1
        Type        : Video Capture
        Pixel Format: 'YUYV'
        Name        : YUYV 4:2:2
```

# Get UVC control list

```
v4l2-ctl -d /dev/video0 --list-ctrls
```

```
                     brightness 0x00980900 (int)    : min=-64 max=64 step=1 default=0
value=0
                       contrast 0x00980901 (int)    : min=0 max=64 step=1 default=32
value=32
                     saturation 0x00980902 (int)    : min=0 max=128 step=1 default=64
value=64
                            hue 0x00980903 (int)    : min=-40 max=40 step=1 default=0 value=0
 white_balance_temperature_auto 0x0098090c (bool)   : default=1
value=1
                          gamma 0x00980910 (int)    : min=72 max=500 step=1 default=100
value=100
                           gain 0x00980913 (int)    : min=0 max=63 step=1 default=0
value=0
           power_line_frequency 0x00980918 (menu)   : min=0 max=2 default=1 value=1
      white_balance_temperature 0x0098091a (int)    : min=2800 max=10000 step=1 default=4600
value=4600 flags=inactive
                      sharpness 0x0098091b (int)    : min=0 max=6 step=1 default=3
value=3
         backlight_compensation 0x0098091c (int)    : min=0 max=2 step=1 default=1
```

```
value=1
                  exposure_auto 0x009a0901 (menu)   : min=0 max=3 default=3
value=3
               exposure_absolute 0x009a0902 (int)    : min=1 max=10000 step=1 default=156
value=156 flags=inactive
         exposure_auto_priority 0x009a0903 (bool)   : default=0 value=0
```

# Set white ballance

```
v4l2-ctl -d /dev/video0 -c white_balance_temperature_auto=0
v4l2-ctl -d /dev/video0 -c white_balance_temperature=3000
```

# Get supported video formats

```
v4l2-ctl -d /dev/video0 --list-formats-ext
```

```
ioctl: VIDIOC_ENUM_FMT
        Index       : 0
        Type        : Video Capture
        Pixel Format: 'MJPG' (compressed)
        Name        : Motion-JPEG
                Size: Discrete 1920x1080
                        Interval: Discrete 0.033s (30.000 fps)
                        Interval: Discrete 0.040s (25.000 fps)
                        Interval: Discrete 0.050s (20.000 fps)
                        Interval: Discrete 0.067s (15.000 fps)
                Size: Discrete 1280x1024
                        Interval: Discrete 0.033s (30.000 fps)
                        Interval: Discrete 0.040s (25.000 fps)
                        Interval: Discrete 0.050s (20.000 fps)
                        Interval: Discrete 0.067s (15.000 fps)
                Size: Discrete 1280x720
                        Interval: Discrete 0.033s (30.000 fps)
                        Interval: Discrete 0.040s (25.000 fps)
                        Interval: Discrete 0.050s (20.000 fps)
                        Interval: Discrete 0.067s (15.000 fps)
                Size: Discrete 720x576
                        Interval: Discrete 0.033s (30.000 fps)
                        Interval: Discrete 0.040s (25.000 fps)
                        Interval: Discrete 0.050s (20.000 fps)
```

```
                Interval: Discrete 0.067s (15.000 fps)
                Interval: Discrete 0.100s (10.000 fps)
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 720x480
                Interval: Discrete 0.033s (30.000 fps)
                Interval: Discrete 0.040s (25.000 fps)
                Interval: Discrete 0.050s (20.000 fps)
                Interval: Discrete 0.067s (15.000 fps)
                Interval: Discrete 0.100s (10.000 fps)
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 640x480
                Interval: Discrete 0.033s (30.000 fps)
                Interval: Discrete 0.040s (25.000 fps)
                Interval: Discrete 0.050s (20.000 fps)
                Interval: Discrete 0.067s (15.000 fps)
        Size: Discrete 1920x1080
                Interval: Discrete 0.033s (30.000 fps)
                Interval: Discrete 0.040s (25.000 fps)
                Interval: Discrete 0.050s (20.000 fps)
                Interval: Discrete 0.067s (15.000 fps)

Index       : 1
Type        : Video Capture
Pixel Format: 'YUYV'
Name        : YUYV 4:2:2
        Size: Discrete 1920x1080
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 1280x1024
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 1280x720
                Interval: Discrete 0.100s (10.000 fps)
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 800x600
                Interval: Discrete 0.100s (10.000 fps)
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 720x576
                Interval: Discrete 0.100s (10.000 fps)
                Interval: Discrete 0.200s (5.000 fps)
        Size: Discrete 720x480
                Interval: Discrete 0.050s (20.000 fps)
```

```
                        Interval: Discrete 0.067s (15.000 fps)
                        Interval: Discrete 0.100s (10.000 fps)
                        Interval: Discrete 0.200s (5.000 fps)
                Size: Discrete 640x480
                        Interval: Discrete 0.033s (30.000 fps)
                        Interval: Discrete 0.040s (25.000 fps)
                        Interval: Discrete 0.050s (20.000 fps)
                        Interval: Discrete 0.067s (15.000 fps)
                        Interval: Discrete 0.100s (10.000 fps)
                        Interval: Discrete 0.200s (5.000 fps)
                Size: Discrete 1920x1080
                        Interval: Discrete 0.200s (5.000 fps)
```

# Tell everything about camera

```
v4l2-ctl --all
```

```
Driver Info:
        Driver name      : uvcvideo
        Card type        : C2: C2 RVN-3Q4WH
        Bus info         : usb-0000:00:14.0-1.1.2
        Driver version   : 5.11.21
        Capabilities     : 0x84a00001
                Video Capture
                Metadata Capture
                Streaming
                Extended Pix Format
                Device Capabilities
        Device Caps      : 0x04200001
                Video Capture
                Streaming
                Extended Pix Format
Priority: 2
Video input : 0 (Camera 1: ok)
Format Video Capture:
        Width/Height      : 1920/1080
        Pixel Format      : 'MJPG' (Motion-JPEG)
        Field             : None
        Bytes per Line    : 0
        Size Image        : 4147789
```

```
        Colorspace       : Default
        Transfer Function : Default (maps to Rec. 709)
        YCbCr/HSV Encoding: Default (maps to ITU-R 601)
        Quantization     : Default (maps to Full Range)
        Flags            :
Crop Capability Video Capture:
        Bounds      : Left 0, Top 0, Width 1920, Height 1080
        Default     : Left 0, Top 0, Width 1920, Height 1080
        Pixel Aspect: 1/1
Selection Video Capture: crop_default, Left 0, Top 0, Width 1920, Height 1080, Flags:
Selection Video Capture: crop_bounds, Left 0, Top 0, Width 1920, Height 1080, Flags:
Streaming Parameters Video Capture:
        Capabilities     : timeperframe
        Frames per second: 10000000.000 (10000000/1)
        Read buffers     : 0
                     brightness 0x00980900 (int)    : min=-64 max=64 step=1 default=0
value=0
                       contrast 0x00980901 (int)    : min=0 max=64 step=1 default=32
value=32
                     saturation 0x00980902 (int)    : min=0 max=128 step=1 default=64
value=64
                            hue 0x00980903 (int)    : min=-40 max=40 step=1 default=0 value=0
 white_balance_temperature_auto 0x0098090c (bool)   : default=1
value=1
                          gamma 0x00980910 (int)    : min=72 max=500 step=1 default=100
value=100
                           gain 0x00980913 (int)    : min=0 max=48 step=1 default=0
value=0
           power_line_frequency 0x00980918 (menu)   : min=0 max=2 default=2
value=2
                                0: Disabled
                                1: 50 Hz
                                2: 60 Hz
      white_balance_temperature 0x0098091a (int)    : min=2800 max=9300 step=1 default=4600
value=4600 flags=inactive
                      sharpness 0x0098091b (int)    : min=0 max=6 step=1 default=3
value=3
         backlight_compensation 0x0098091c (int)    : min=0 max=2 step=1 default=1
value=1
                  exposure_auto 0x009a0901 (menu)   : min=0 max=3 default=3
value=3
```

```
                                1: Manual Mode
                                3: Aperture Priority Mode
             exposure_absolute 0x009a0902 (int)    : min=1 max=5000 step=1 default=156
value=156 flags=inactive
         exposure_auto_priority 0x009a0903 (bool)   : default=0 value=0
```