

视频编解码和摄像头应用案例

本文档涉及案例包括：

- 打开摄像头并编码存储摄像头视频，然后解码播放视频
 - 编码视频流并通过网络传输，接收端解码并播放
 - 同时解码并播放两路视频
 - 在视频播放窗口上叠加图标
1. 在动手实践本应用案例前先预定 i.MX8MP 开发板：
 - 1) 打开云实验室网页，点击右上角登陆按钮输入账号密码。

<https://aiotcloud.nxp.com.cn/>

登陆后依次点击硬件 -> i.MX 8 系列开发板



找到 i.MX 8M Plus “可立即使用” 状态的板子，点击“8MPLUSLPD4-PEVK”进入。



然后点击“立即预定”按钮：



选择立即使用，填写使用结束时间

请选择预定日期、开始和结束时间（北京时间） UTC+8

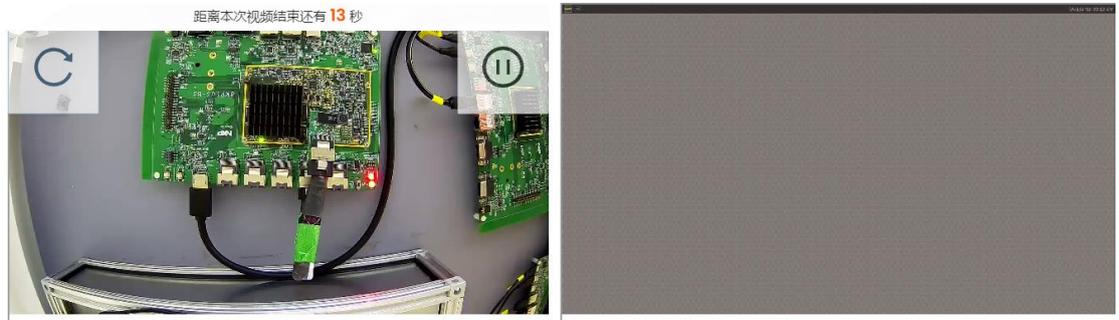
立即使用

15 45

然后点击进入我的预定，

ID	CPU	开发板名称	编号	开始时间	结束时间	时长	操作时间	状态	调试
3838	IMX 8M Plus	8MPLUSLPD4-PEVK	#1	2024-06-27 14:45	2024-06-27 15:40	0.917h	2024-06-27 14:56	正常	调试 取消

点击右侧蓝色“调试”按钮，之后就进入到板子的实物页面和系统启动 log 页面。到此为止，板子预定并且启动成功。



IMX 8 series EVKs 8MPLUSLPD4-PEVK-3 刷新显示器画面 (5分钟后再次点击刷新)

若调试对话框登录失败或卡顿，点击刷新对话框

本次调试结束时间: 18:30:00, 系统将在18:25:00回收资源

```

[ 23.763032] 8021q: adding VLAN 0 to HW filter on device eth1
[ OK ] Started Session c1 of User root.
[ OK ] Started Hostname Service.
[ OK ] Started Weston, a Wayland _positor, as a system service.
[ OK ] Reached target Graphical Interface.
[ OK ] Stopped ISP i.MX 8Mplus daemon.
[ OK ] Started ISP i.MX 8Mplus daemon.
Starting Record Runlevel Change in UTPM...
[ OK ] Finished Record Runlevel Change in UTPM.

NXP i.MX Release Distro 6.1-mickledore imx8mpevk ttyMX1
imx8mpevk login: [ 54.075025] kauditd_printk_skb: 12 callbacks suppressed
[ 54.075035] audit: type=1334 audit(1719998558.357:16): prog-id=14 op=UNLOAD
[ 54.087283] audit: type=1334 audit(1719998558.357:17): prog-id=13 op=UNLOAD

imx8mpevk login:
imx8mpevk login:
imx8mpevk login:

```

- 使用 gplay 播放，gplay 是 gstreamer 的前端，实现音视频的播放，它的底层会根据硬件选择合适的插件来做硬件加速。

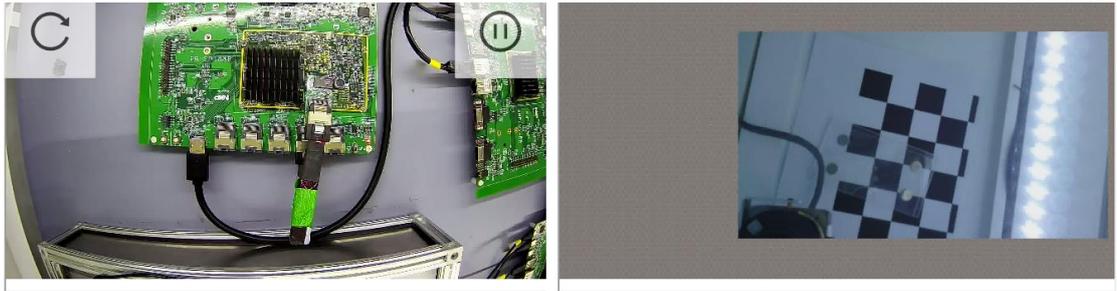
首先执行程序，利用板子摄像头拍摄一段视频并压缩存储到本地，作为实验用。

```

gst-launch-1.0 v4l2src device=/dev/video3 ! video/x-raw,format=NV12,width=1920,height=1080 ! tee name=t ! queue ! waylandsink window-width=1280 window-height=720 sync=false t. ! queue ! vpuenc_h264 ! mpegtsmux ! filesink location=test_1920_1080.h264

```

等待约 30s。



IMX 8 series EVKs 8MPLUSLPD4-PEVK-3 刷新显示器画面 (5分钟后再次点击刷新)

若调试对话框登录失败或卡顿, 点击刷新对话框

本次调试结束时间: 11:15:00, 系统将在11:10:00回收资源

```

root@imx8mpevk:~#
root@imx8mpevk:~#
root@imx8mpevk:~# ls
gstshark_2023-03-03_09:50:05 test_1920_1080.h264
cat /dev/null > /dev/null & queue ! vpucnc_h264 ! mpegtsmux ! filesink lo
Setting pipeline To PAUSED ...
=====
  vpucnc: 4.8.0 build on May 10 2023 01:50:04.
  wrapper: 3.0.0 (VPURAPPER_ARM64_LINUX Build on Jun  2 2023 01:00:38)
  vpulib: 1.1.1
  firmware: 1.1.1.43690
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GetSystemClock
[ 953.834792] bypass csc
[ 953.837169] input fmt YUV4
[ 953.839892] output fmt NM12
Redistribute latency...
Redistribute latency...
0:00:15.4 / 99:99:99.
  
```

PowerReset EVK

Upload File Download File

Reinstall system

TFTP error fix

Reconnection

这样本地就有了视频源文件 test_1920_1080.h264。板子执行 ls 命令即可看到:

```

root@imx8mpevk:~# ls
gstshark_2023-03-03_09:50:05 test_1920_1080.h264
  
```

然后使用 gplay 播放即可:

```

root@imx8mpevk:~# gplay-1.0 test_1920_1080.h264
  
```



IMX 8 series EVKs 8MPLUSLPD4-PEVK-3 刷新显示器画面 (5分钟后再次点击刷新)

若调试对话框登录失败或卡顿, 点击刷新对话框

本次调试结束时间: 11:15:00, 系统将在11:10:00回收资源

```

[e]Seek
[a]Pause when playing, play when paused
[v]Volume
[m]Switch to mute or not
[>]Play next file
[<]Play previous file
[r]Switch to repeated mode or not
[u]Select the video track
[d]Select the audio track
[b]Select the subtitle track
[n]Select adaptive playback track
[F]Set full screen
[S]resize the width and height
[r]Rotate
[c]Setting play rate
[i]Display the metadata
[x]eXit
State changed: buffering
State changed: playing
[Playing (No Repeated)] [Vol=1.0] [00:00:13/00:01:17]
  
```

PowerReset EVK

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- i.MX 板子编码本地摄像头视频流并通过网络传输, 远端 i.MX 板子接收网络视频流并解码, 以 i.MX8MP 为例, 使用到多个硬件模块, 有摄像头 MIPI CSI 接口, ISI, 网络,

VPU 编解码，显示控制器。

这里使用本地网络 loopback（从本地网口发送再回到本地网口接收）的方式来模拟网络发送接收。

重启板子，等板子启动后输入 root 登录，板子上执行：

```
~#gst-launch-1.0 v4l2src device=/dev/video3 io-mode=dmabuf ! video/x-raw,format=NV12,width=1280,height=720 ! v4l2h264enc output-io-mode=dmabuf-import ! rtph264pay ! udpsink host=127.0.0.1 port=6012 &
```

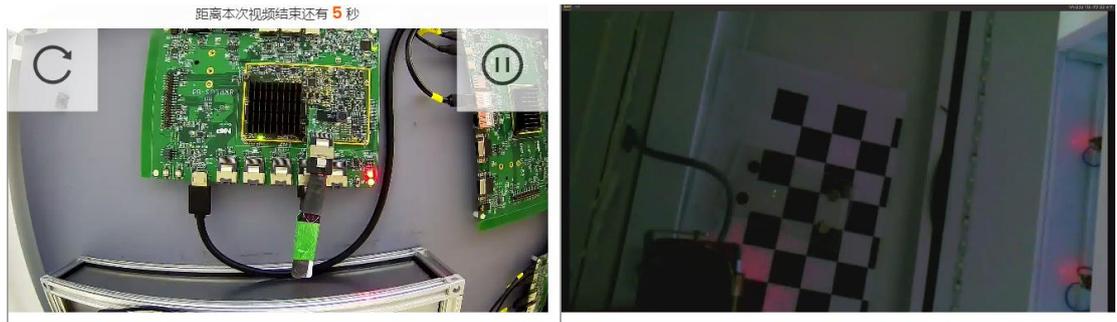
```
===== V4L2ENC: 1.22.5 build on Oct 19 2023 01:57:00. =====
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
[ 917.806194] 1500000001 fail to communicate with daemon, error=-512, cmd=3
[ 929.403727] bypass csc
[ 929.403734] input fmt YUV4
[ 929.403739] output fmt NM12
Redistribute latency...
0:00:08.7 / 99:99:99.
```

对端网络接收、解码并显示，因为是用同一个板子模拟网络发送，所以板子上执行：

```
~#gst-launch-1.0 udpsrc address=127.0.0.1 port=6012 ! application/x-rtp,encoding-name=H264 ! rtph264depay ! h264parse ! v4l2h264dec capture-io-mode=dmabuf ! queue ! waylandsink enable-tile=true sync=false
```

```
===== V4L2ENC: 1.22.5 build on Oct 19 2023 01:57:00. =====
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
[ 917.806194] 1500000001 fail to communicate with daemon, error=-512, cmd=3
[ 929.403727] bypass csc
[ 929.403734] input fmt YUV4
[ 929.403739] output fmt NM12
Redistribute latency...
0:00:08.7 / 99:99:99.
```

可以看到屏幕显示了网络发送的视频流：



LMX 8 series EVKs 8MPLUSLPD4-PEVK-3 刷新显示器画面 (5分钟后再次点击刷新)

若调试对话框登录失败或卡顿, 点击刷新对话框

本次调试结束时间: 18:30:00, 系统将在18:25:00回收资源

```

Redistribute latency...
0:00:08.4 / 99:99:99.
0:00:08.6 / 99:99:99.0:08.5 / 99:99:99.
0:00:08.8 / 99:99:99.0:08.7 / 99:99:99.
0:00:09.0 / 99:99:99.0:08.9 / 99:99:99.
0:00:09.2 / 99:99:99.0:09.1 / 99:99:99.
0:00:12.3 / 99:99:99.buf ! queue ! waylandsink enable-tile=true sync=false0:00:11.2 / 99:99:99.264depay ! h264parse ! v4l2h264dec
[ 707.077995] isi-m2m 32e00000.isi:m2m_device: ISI channel[0] is busy
Setting pipeline to PAUSED ...

===== V4L2DEC: 1.22.0 build on May 25 2023 06:16:47. =====
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
0:00:20.0 / 99:99:99.
  
```

PowerReset EVK

Upload File

Download File

Reinstall system

TFTP error fix

Reconnection

- 同时播放两个视频, 使用的硬件加速有硬件 VPU 解码和 GPU 进行窗口合成, 在测试这个功能前需要重启板子, 点击 log 窗口右上角的 PowerReset EVK 键,



等待重启完毕, 输入 root 命令登录板子。

然后执行:

```

gst-launch-1.0 imxcompositor_g2d background=0x00FFFFFF name=comp
sink_0::xpos=0 sink_0::ypos=0 sink_0::width=960 sink_0::height=540 sink_1::xpos=960
sink_1::ypos=0 sink_1::width=960 sink_1::height=540 ! waylandsink uridecodebin
uri=file:///home/root/BirdNoSound.mp4 ! queue ! comp.sink_0 uridecodebin
uri=file:///home/root/BirdNoSound.mp4 ! queue ! comp.sink_1
  
```

```

===== BEEP: 4.8.2 build on Oct 10 2023 02:31:27. =====
Core: DSP decoder Wrapper build on Jun 5 2023 05:45:53
file: /usr/lib/imx-mm/audio-codec/wrap/lib_dsp_wrap_arm_elnux.so

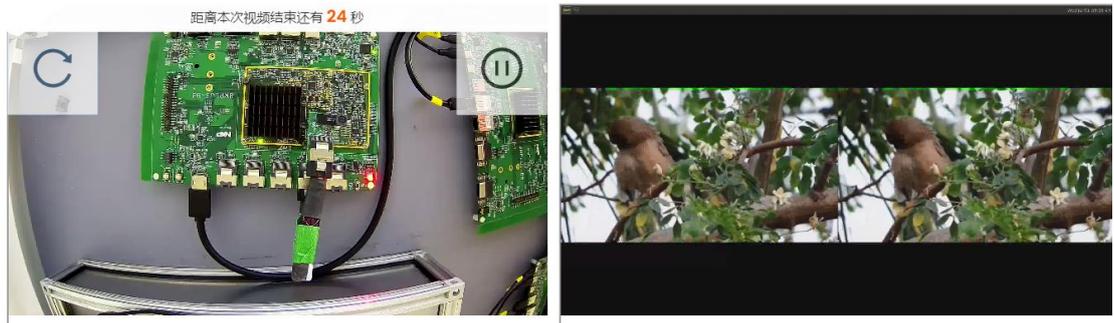
===== BEEP: 4.8.2 build on Oct 10 2023 02:31:27. =====
Core: DSP decoder Wrapper build on Jun 5 2023 05:45:53
file: /usr/lib/imx-mm/audio-codec/wrap/lib_dsp_wrap_arm_elnux.so
Audio Device Ready
Audio Device Ready
Redistribute latency...
Redistribute latency...

===== V4L2DEC: 1.22.5 build on Oct 19 2023 01:57:00. =====

===== V4L2DEC: 1.22.5 build on Oct 19 2023 01:57:00. =====
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:06.9 / 0:00:31.0 (22.3 %)

```

执行效果的画面如下:



IMX 8 series EVKs 8MPLUSLPD4-PEVK-3 刷新显示画面 (5分钟后再次点击刷新)

若调试对话框登录失败或卡顿, 点击刷新对话框

本次调试结束时间: 18:30:00, 系统将在18:25:00回收资源

```

[ 72.027471] remoteproc remoteproc0: remote processor imx-dsp-rproc is now up
[ 72.034624] virtio_rpmsg_bus virtio0: creating channel rpmsg-raw addr 0x1
[ 72.041616] virtio_rpmsg_bus virtio0: creating channel rpmsg-raw addr 0x2
Audio Device Ready
Audio Device Ready
Redistribute latency...
Redistribute latency...

===== V4L2DEC: 1.22.0 build on May 25 2023 06:16:47. =====

===== V4L2DEC: 1.22.0 build on May 25 2023 06:16:47. =====
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Redistribute latency...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
Redistribute latency...
New clock: GstSystemClock
0:00:15.9 / 0:00:31.0 (51.5 %)

```

等待视频播放完毕或者按 Ctrl+C 键停止程序

5. 在播放视频的窗口上叠加图标或者按钮等, 板上执行:

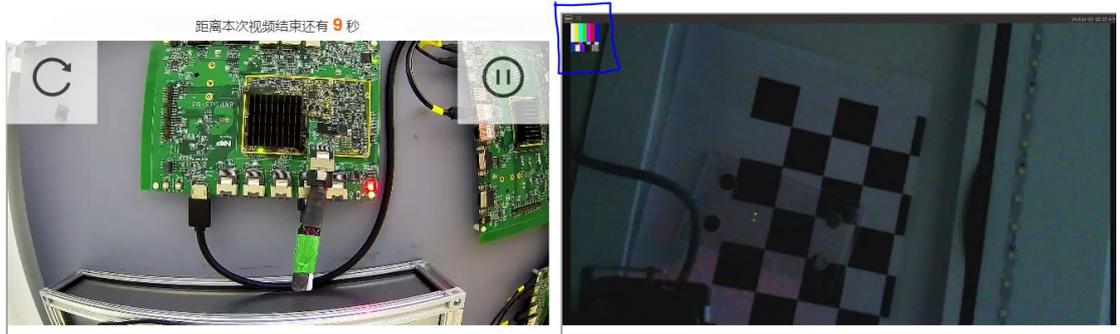
```

gst-launch-1.0 imxcompositor_g2d name=comp sink_0::width=1920
sink_0::height=1080 sink_1::xpos=0 sink_1::ypos=0 sink_1::width=100
sink_1::height=100 ! tee name=t ! queue ! waylandsink v4l2src

```

device=/dev/video3 ! video/x-raw,format=YUY2,width=1920,height=1080 ,
 framerate=30/1 ! comp.sink_0 videotestsrc ! video/x-
 raw,format=I420,width=1920,height=1080, framerate=30/1 ! comp.sink_1

执行效果如下:



IMX 8 series EVKs | BMPLUSPD4-PEVK-3 | 刷新显示器画面 (5分钟后再次点击刷新)

若调试对话框登录失败或卡顿, 点击刷新对话框

本次调试结束时间: 18:30:00, 系统将在18:25:00回收资源

```

Redistribute latency...
New clock: GstSystemClock
Got EOS from element "pipeline0".
Execution ended after 0:00:31.098837250
Setting pipeline to NULL ...
Total showed frames (933), playing for (0:00:31.098642875), fps (30.001).
Priming pipeline ...
root@imx8pevk:~# gst-launch-1.0 imxcompositor_g2d name=comp sink_0::width=1920 sink_0::height=1080 sink_1::xpos=0 sink_1::ypos=0 sink_1::width=1080 sink_1::height=1080 ! tee name=t ! queue ! waylandsink v4l2src device=/dev/video3 ! video/x-raw,format=YUY2,width=1920,height=1080,framerate=30/1 ! comp.sink_0 videotestsrc ! video/x-raw,format=I420,width=1920,height=1080,framerate=30/1 ! comp.sink_1
Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
[ 144.877138] bypass csc
[ 144.879517] input fmt YUV4
[ 144.882265] output fmt YUYV
0:00:10.5 / 99:99:99.
  
```

```

Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Pipeline is PREROLLED ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
Redistribute latency...
[ 2989.148004] bypass csc
[ 2989.148011] input fmt YUV4
[ 2989.148016] output fmt YUYV
0:00:05.8 / 99:99:99.
  
```

按 Ctrl + c 关闭程序的运行。