Differences between V4L and V4L2

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 2)

Unknown directive type "c:namespace".

```
.. c:namespace:: V4L
```

The Video For Linux API was first introduced in Linux 2.1 to unify and replace various TV and radio device related interfaces, developed independently by driver writers in prior years. Starting with Linux 2.5 the much improved V4L2 API replaces the V4L API. The support for the old V4L calls were removed from Kernel, but the library :ref:`libv4l` supports the conversion of a V4L API system call into a V4L2 one.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 10); *backlink*

Unknown interpreted text role "ref".

Opening and Closing Devices

For compatibility reasons the character device file names recommended for V4L2 video capture, overlay, radio and raw vbi capture devices did not change from those used by V4L. They are listed in :ref:`devices` and below in :ref:`v4l-dev`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 20); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 20); *backlink*

Unknown interpreted text role "ref".

The teletext devices (minor range 192-223) have been removed in V4L2 and no longer exist. There is no hardware available anymore for handling pure teletext. Instead raw or sliced VBI is used.

The V4L `videodev` module automatically assigns minor numbers to drivers in load order, depending on the registered device type. We recommend that V4L2 drivers by default register devices with the same numbers, but the system administrator can assign arbitrary minor numbers using driver module options. The major device number remains 81.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 37)

Unknown directive type "flat-table".

```
.. flat-table:: V4L Device Types, Names and Numbers
    :header-rows:  1
    :stub-columns: 0

    * - Device Type
      - File Name
      - Minor Numbers
    * - Video capture and overlay
      - ``/dev/video`` and ``/dev/bttv0``\  [#f1]_, ``/dev/video0`` to
        ``/dev/video63``
      - 0-63
    * - Radio receiver
      - ``/dev/radio``\  [#f2]_, ``/dev/radio0`` to ``/dev/radio63``
      - 64-127
    * - Raw VBI capture
      - ``/dev/vbi``, ``/dev/vbi0`` to ``/dev/vbi31``
```

```
        - 224-255
```

V4L prohibits (or used to prohibit) multiple opens of a device file. V4L2 drivers *may* support multiple opens, see :ref:`open` for details and consequences.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 55); *backlink*

Unknown interpreted text role "ref".

V4L drivers respond to V4L2 ioctls with an `EINVAL` error code.

Querying Capabilities

The V4L `VIDIOCGCAP` ioctl is equivalent to V4L2's :ref:`VIDIOC_QUERYCAP`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 64); *backlink*

Unknown interpreted text role "ref".

The `name` field in struct `video_capability` became `card` in struct :c:type:`v4l2_capability`, `type` was replaced by `capabilities`. Note V4L2 does not distinguish between device types like this, better think of basic video input, video output and radio devices supporting a set of related functions like video capturing, video overlay and VBI capturing. See :ref:`open` for an introduction.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 67); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 67); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 79)

Unknown directive type "tabularcolumns".

```
.. tabularcolumns:: |p{5.3cm}|p{6.7cm}|p{5.3cm}|
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 81)

Unknown directive type "cssclass".

```
.. cssclass:: longtable
```

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 83)

Unknown directive type "flat-table".

```
.. flat-table::
    :header-rows:  1
    :stub-columns: 0
```

```
    * - ``struct video_capability`` ``type``
      - struct :c:type:`v4l2_capability`
        ``capabilities`` flags
      - Purpose
    * - ``VID_TYPE_CAPTURE``
      - ``V4L2_CAP_VIDEO_CAPTURE``
      - The :ref:`video capture <capture>` interface is supported.
    * - ``VID_TYPE_TUNER``
      - ``V4L2_CAP_TUNER``
      - The device has a :ref:`tuner or modulator <tuner>`.
    * - ``VID_TYPE_TELETEXT``
      - ``V4L2_CAP_VBI_CAPTURE``
      - The :ref:`raw VBI capture <raw-vbi>` interface is supported.
    * - ``VID_TYPE_OVERLAY``
      - ``V4L2_CAP_VIDEO_OVERLAY``
      - The :ref:`video overlay <overlay>` interface is supported.
    * - ``VID_TYPE_CHROMAKEY``
      - ``V4L2_FBUF_CAP_CHROMAKEY`` in field ``capability`` of struct
        :c:type:`v4l2_framebuffer`
      - Whether chromakey overlay is supported. For more information on
        overlay see :ref:`overlay`.
    * - ``VID_TYPE_CLIPPING``
      - ``V4L2_FBUF_CAP_LIST_CLIPPING`` and
        ``V4L2_FBUF_CAP_BITMAP_CLIPPING`` in field ``capability`` of
        struct :c:type:`v4l2_framebuffer`
      - Whether clipping the overlaid image is supported, see
        :ref:`overlay`.
    * - ``VID_TYPE_FRAMERAM``
      - ``V4L2_FBUF_CAP_EXTERNOVERLAY`` *not set* in field ``capability``
        of struct :c:type:`v4l2_framebuffer`
      - Whether overlay overwrites frame buffer memory, see
        :ref:`overlay`.
    * - ``VID_TYPE_SCALES``
      - ``-``
      - This flag indicates if the hardware can scale images. The V4L2 API
        implies the scale factor by setting the cropping dimensions and
        image size with the :ref:`VIDIOC_S_CROP <VIDIOC_G_CROP>` and
        :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>` ioctl, respectively. The
        driver returns the closest sizes possible. For more information on
        cropping and scaling see :ref:`crop`.
    * - ``VID_TYPE_MONOCHROME``
      - ``-``
      - Applications can enumerate the supported image formats with the
        :ref:`VIDIOC_ENUM_FMT` ioctl to determine if
        the device supports grey scale capturing only. For more
        information on image formats see :ref:`pixfmt`.
    * - ``VID_TYPE_SUBCAPTURE``
      - ``-``
      - Applications can call the :ref:`VIDIOC_G_CROP <VIDIOC_G_CROP>`
        ioctl to determine if the device supports capturing a subsection
        of the full picture ("cropping" in V4L2). If not, the ioctl
        returns the ``EINVAL`` error code. For more information on cropping
        and scaling see :ref:`crop`.
    * - ``VID_TYPE_MPEG_DECODER``
      - ``-``
      - Applications can enumerate the supported image formats with the
        :ref:`VIDIOC_ENUM_FMT` ioctl to determine if
        the device supports MPEG streams.
    * - ``VID_TYPE_MPEG_ENCODER``
      - ``-``
      - See above.
    * - ``VID_TYPE_MJPEG_DECODER``
      - ``-``
      - See above.
    * - ``VID_TYPE_MJPEG_ENCODER``
      - ``-``
      - See above.
```

The `audios` field was replaced by `capabilities` flag `V4L2_CAP_AUDIO`, indicating *if* the device has any audio inputs or outputs. To determine their number applications can enumerate audio inputs with the :ref:`VIDIOC_G_AUDIO <VIDIOC_G_AUDIO>` ioctl. The audio ioctls are described in :ref:`audio`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 159); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 159); *backlink*

Unknown interpreted text role "ref".

The `maxwidth`, `maxheight`, `minwidth` and `minheight` fields were removed. Calling the :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>` or :ref:`VIDIOC_TRY_FMT <VIDIOC_G_FMT>` ioctl with the desired dimensions returns the closest size possible, taking into account the current video standard, cropping and scaling limitations.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 165); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 165); *backlink*

Unknown interpreted text role "ref".

Video Sources

V4L provides the `VIDIOCGCHAN` and `VIDIOCSCHAN` ioctl using struct `video_channel` to enumerate the video inputs of a V4L device. The equivalent V4L2 ioctls are :ref:`VIDIOC_ENUMINPUT`, :ref:`VIDIOC_G_INPUT <VIDIOC_G_INPUT>` and :ref:`VIDIOC_S_INPUT <VIDIOC_G_INPUT>` using struct :c:type:`v4l2_input` as discussed in :ref:`video`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 174); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 174); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 174); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 174); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 174); *backlink*

Unknown interpreted text role "ref".

The `channel` field counting inputs was renamed to `index`, the video input types were renamed as follows:

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 186)

Unknown directive type "flat-table".

```
    .. flat-table::
        :header-rows:  1
        :stub-columns: 0

        * - struct ``video_channel`` ``type``
          - struct :c:type:`v4l2_input` ``type``
        * - ``VIDEO_TYPE_TV``
          - ``V4L2_INPUT_TYPE_TUNER``
        * - ``VIDEO_TYPE_CAMERA``
          - ``V4L2_INPUT_TYPE_CAMERA``
```

Unlike the `tuners` field expressing the number of tuners of this input, V4L2 assumes each video input is connected to at most one tuner. However a tuner can have more than one input, i. e. RF connectors, and a device can have multiple tuners. The index number of the tuner associated with the input, if any, is stored in field `tuner` of struct :c:type:`v4l2_input`. Enumeration of tuners is discussed in :ref:`tuner`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 197); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 197); *backlink*

Unknown interpreted text role "ref".

The redundant `VIDEO_VC_TUNER` flag was dropped. Video inputs associated with a tuner are of type `V4L2_INPUT_TYPE_TUNER`. The `VIDEO_VC_AUDIO` flag was replaced by the `audioset` field. V4L2 considers devices with up to 32 audio inputs. Each set bit in the `audioset` field represents one audio input this video input combines with. For information about audio inputs and how to switch between them see :ref:`audio`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 205); *backlink*

Unknown interpreted text role "ref".

The `norm` field describing the supported video standards was replaced by `std`. The V4L specification mentions a flag `VIDEO_VC_NORM` indicating whether the standard can be changed. This flag was a later addition together with the `norm` field and has been removed in the meantime. V4L2 has a similar, albeit more comprehensive approach to video standards, see :ref:`standard` for more information.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 213); *backlink*

Unknown interpreted text role "ref".

Tuning

The V4L `VIDIOCGTUNER` and `VIDIOCSTUNER` ioctl and struct `video_tuner` can be used to enumerate the tuners of a V4L TV or radio device. The equivalent V4L2 ioctls are :ref:`VIDIOC_G_TUNER <VIDIOC_G_TUNER>` and :ref:`VIDIOC_S_TUNER <VIDIOC_G_TUNER>` using struct :c:type:`v4l2_tuner`. Tuners are covered in :ref:`tuner`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 223); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 223); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 223); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 223); *backlink*

Unknown interpreted text role "ref".

The `tuner` field counting tuners was renamed to `index`. The fields `name`, `rangelow` and `rangehigh` remained unchanged.

The `VIDEO_TUNER_PAL`, `VIDEO_TUNER_NTSC` and `VIDEO_TUNER_SECAM` flags indicating the supported video standards were dropped. This information is now contained in the associated struct :c:type:`v4l2_input`. No replacement exists for the `VIDEO_TUNER_NORM` flag indicating whether the video standard can be switched. The `mode` field to select a different video standard was replaced by a whole new set of ioctls and structures described in :ref:`standard`. Due to its ubiquity it should be mentioned the BTTV driver supports several standards in addition to the regular `VIDEO_MODE_PAL` (0), `VIDEO_MODE_NTSC`, `VIDEO_MODE_SECAM` and `VIDEO_MODE_AUTO` (3). Namely N/PAL Argentina, M/PAL, N/PAL, and NTSC Japan with numbers 3-6 (sic).

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 233); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 233); *backlink*

Unknown interpreted text role "ref".

The `VIDEO_TUNER_STEREO_ON` flag indicating stereo reception became `V4L2_TUNER_SUB_STEREO` in field `rxsubchans`. This field also permits the detection of monaural and bilingual audio, see the definition of struct :c:type:`v4l2_tuner` for details. Presently no replacement exists for the `VIDEO_TUNER_RDS_ON` and `VIDEO_TUNER_MBS_ON` flags.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 246); *backlink*

Unknown interpreted text role "c:type".

The `VIDEO_TUNER_LOW` flag was renamed to `V4L2_TUNER_CAP_LOW` in the struct :c:type:`v4l2_tuner` `capability` field.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 253); *backlink*

Unknown interpreted text role "c:type".

The `VIDIOCGFREQ` and `VIDIOCSFREQ` ioctl to change the tuner frequency where renamed to :ref:`VIDIOC_G_FREQUENCY <VIDIOC_G_FREQUENCY>` and :ref:`VIDIOC_S_FREQUENCY <VIDIOC_G_FREQUENCY>`. They take a pointer to a struct :c:type:`v4l2_frequency` instead of an unsigned long integer.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 256); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-

api] [media] [v4l]diff-v4l.rst, line 256); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master] [Documentation] [userspace-api] [media] [v4l]diff-v4l.rst, line 256); *backlink*

Unknown interpreted text role "c:type".

Image Properties

V4L2 has no equivalent of the `VIDIOCGPICT` and `VIDIOCSPICT` ioctl and struct `video_picture`. The following fields where replaced by V4L2 controls accessible with the :ref:`VIDIOC_QUERYCTRL`, :ref:`VIDIOC_G_CTRL <VIDIOC_G_CTRL>` and :ref:`VIDIOC_S_CTRL <VIDIOC_G_CTRL>` ioctls:

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master] [Documentation] [userspace-api] [media] [v4l]diff-v4l.rst, line 268); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master] [Documentation] [userspace-api] [media] [v4l]diff-v4l.rst, line 268); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master] [Documentation] [userspace-api] [media] [v4l]diff-v4l.rst, line 268); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master] [Documentation] [userspace-api] [media] [v4l]diff-v4l.rst, line 276)

Unknown directive type "flat-table".

```
.. flat-table::
    :header-rows:  1
    :stub-columns: 0

    * - struct ``video_picture``
      - V4L2 Control ID
    * - ``brightness``
      - ``V4L2_CID_BRIGHTNESS``
    * - ``hue``
      - ``V4L2_CID_HUE``
    * - ``colour``
      - ``V4L2_CID_SATURATION``
    * - ``contrast``
      - ``V4L2_CID_CONTRAST``
    * - ``whiteness``
      - ``V4L2_CID_WHITENESS``
```

The V4L picture controls are assumed to range from 0 to 65535 with no particular reset value. The V4L2 API permits arbitrary limits and defaults which can be queried with the :ref:`VIDIOC_QUERYCTRL` ioctl. For general information about controls see :ref:`control`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master] [Documentation] [userspace-api] [media] [v4l]diff-v4l.rst, line 293); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 293); *backlink*

Unknown interpreted text role "ref".

The `depth` (average number of bits per pixel) of a video image is implied by the selected image format. V4L2 does not explicitly provide such information assuming applications recognizing the format are aware of the image depth and others need not know. The `palette` field moved into the struct :c:type:`v4l2_pix_format`:

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 299); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 306)

Unknown directive type "flat-table".

```
.. flat-table::
    :header-rows:  1
    :stub-columns: 0

    * - struct ``video_picture`` ``palette``
      - struct :c:type:`v4l2_pix_format` ``pixfmt``
    * - ``VIDEO_PALETTE_GREY``
      - :ref:`V4L2_PIX_FMT_GREY <V4L2-PIX-FMT-GREY>`
    * - ``VIDEO_PALETTE_HI240``
      - :ref:`V4L2_PIX_FMT_HI240 <pixfmt-reserved>` [#f3]_
    * - ``VIDEO_PALETTE_RGB565``
      - :ref:`V4L2_PIX_FMT_RGB565 <pixfmt-rgb>`
    * - ``VIDEO_PALETTE_RGB555``
      - :ref:`V4L2_PIX_FMT_RGB555 <pixfmt-rgb>`
    * - ``VIDEO_PALETTE_RGB24``
      - :ref:`V4L2_PIX_FMT_BGR24 <pixfmt-rgb>`
    * - ``VIDEO_PALETTE_RGB32``
      - :ref:`V4L2_PIX_FMT_BGR32 <pixfmt-rgb>` [#f4]_
    * - ``VIDEO_PALETTE_YUV422``
      - :ref:`V4L2_PIX_FMT_YUYV <V4L2-PIX-FMT-YUYV>`
    * - ``VIDEO_PALETTE_YUYV``\  [#f5]_
      - :ref:`V4L2_PIX_FMT_YUYV <V4L2-PIX-FMT-YUYV>`
    * - ``VIDEO_PALETTE_UYVY``
      - :ref:`V4L2_PIX_FMT_UYVY <V4L2-PIX-FMT-UYVY>`
    * - ``VIDEO_PALETTE_YUV420``
      - None
    * - ``VIDEO_PALETTE_YUV411``
      - :ref:`V4L2_PIX_FMT_Y41P <V4L2-PIX-FMT-Y41P>` [#f6]_
    * - ``VIDEO_PALETTE_RAW``
      - None [#f7]_
    * - ``VIDEO_PALETTE_YUV422P``
      - :ref:`V4L2_PIX_FMT_YUV422P <V4L2-PIX-FMT-YUV422P>`
    * - ``VIDEO_PALETTE_YUV411P``
      - :ref:`V4L2_PIX_FMT_YUV411P <V4L2-PIX-FMT-YUV411P>` [#f8]_
    * - ``VIDEO_PALETTE_YUV420P``
      - :ref:`V4L2_PIX_FMT_YVU420 <V4L2-PIX-FMT-YVU420>`
    * - ``VIDEO_PALETTE_YUV410P``
      - :ref:`V4L2_PIX_FMT_YVU410 <V4L2-PIX-FMT-YVU410>`
```

V4L2 image formats are defined in :ref:`pixfmt`. The image format can be selected with the :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>` ioctl.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 345); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-

api][media][v4l]diff-v4l.rst, line 345); *backlink*

Unknown interpreted text role "ref".

Audio

The `VIDIOCGAUDIO` and `VIDIOCSAUDIO` ioctl and struct `video_audio` are used to enumerate the audio inputs of a V4L device. The equivalent V4L2 ioctls are :ref:`VIDIOC_G_AUDIO <VIDIOC_G_AUDIO>` and :ref:`VIDIOC_S_AUDIO <VIDIOC_G_AUDIO>` using struct :c:type:`v4l2_audio` as discussed in :ref:`audio`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 351); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 351); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 351); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 351); *backlink*

Unknown interpreted text role "ref".

The `audio` "channel number" field counting audio inputs was renamed to `index`.

On `VIDIOCSAUDIO` the `mode` field selects *one* of the `VIDEO_SOUND_MONO`, `VIDEO_SOUND_STEREO`, `VIDEO_SOUND_LANG1` or `VIDEO_SOUND_LANG2` audio demodulation modes. When the current audio standard is BTSC `VIDEO_SOUND_LANG2` refers to SAP and `VIDEO_SOUND_LANG1` is meaningless. Also undocumented in the V4L specification, there is no way to query the selected mode. On `VIDIOCGAUDIO` the driver returns the *actually received* audio programmes in this field. In the V4L2 API this information is stored in the struct :c:type:`v4l2_tuner` `rxsubchans` and `audmode` fields, respectively. See :ref:`tuner` for more information on tuners. Related to audio modes struct :c:type:`v4l2_audio` also reports if this is a mono or stereo input, regardless if the source is a tuner.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 361); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 361); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 361); *backlink*

Unknown interpreted text role "c:type".

The following fields where replaced by V4L2 controls accessible with the :ref:`VIDIOC_QUERYCTRL`, :ref:`VIDIOC_G_CTRL <VIDIOC_G_CTRL>` and :ref:`VIDIOC_S_CTRL <VIDIOC_G_CTRL>` ioctls:

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 375); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 375); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 375); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 381)

Unknown directive type "flat-table".

```
.. flat-table::
    :header-rows:  1
    :stub-columns: 0

    * - struct ``video_audio``
      - V4L2 Control ID
    * - ``volume``
      - ``V4L2_CID_AUDIO_VOLUME``
    * - ``bass``
      - ``V4L2_CID_AUDIO_BASS``
    * - ``treble``
      - ``V4L2_CID_AUDIO_TREBLE``
    * - ``balance``
      - ``V4L2_CID_AUDIO_BALANCE``
```

To determine which of these controls are supported by a driver V4L provides the `flags` `VIDEO_AUDIO_VOLUME`, `VIDEO_AUDIO_BASS`, `VIDEO_AUDIO_TREBLE` and `VIDEO_AUDIO_BALANCE`. In the V4L2 API the :ref:`VIDIOC_QUERYCTRL` ioctl reports if the respective control is supported. Accordingly the `VIDEO_AUDIO_MUTABLE` and `VIDEO_AUDIO_MUTE` flags where replaced by the boolean `V4L2_CID_AUDIO_MUTE` control.

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 396); *backlink*

Unknown interpreted text role "ref".

All V4L2 controls have a `step` attribute replacing the struct `video_audio` `step` field. The V4L audio controls are assumed to range from 0 to 65535 with no particular reset value. The V4L2 API permits arbitrary limits and defaults which can be queried with the :ref:`VIDIOC_QUERYCTRL` ioctl. For general information about controls see :ref:`control`.

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 404); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (`D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst`, line 404); *backlink*

Unknown interpreted text role "ref".

Frame Buffer Overlay

The V4L2 ioctls equivalent to `VIDIOCGFBUF` and `VIDIOCSFBUF` are :ref:`VIDIOC_G_FBUF <VIDIOC_G_FBUF>` and :ref:`VIDIOC_S_FBUF <VIDIOC_G_FBUF>`. The `base` field of struct `video_buffer` remained unchanged, except V4L2 defines a flag to indicate non-destructive overlays instead of a `NULL` pointer. All other fields moved into the struct :c:type:`v4l2_pix_format` `fmt` substructure of struct :c:type:`v4l2_framebuffer`. The `depth` field was replaced by `pixelformat`. See :ref:`pixfmt-rgb` for a list of RGB formats and their respective color depths.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 414); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 414); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 414); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 414); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 414); *backlink*

Unknown interpreted text role "ref".

Instead of the special ioctls `VIDIOCGWIN` and `VIDIOCSWIN` V4L2 uses the general-purpose data format negotiation ioctls :ref:`VIDIOC_G_FMT <VIDIOC_G_FMT>` and :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>`. They take a pointer to a struct :c:type:`v4l2_format` as argument. Here the `win` member of the `fmt` union is used, a struct :c:type:`v4l2_window`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 425); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 425); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 425); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 425); *backlink*

Unknown interpreted text role "c:type".

The `x`, `y`, `width` and `height` fields of struct `video_window` moved into struct :c:type:`v4l2_rect` substructure `w` of struct :c:type:`v4l2_window`. The `chromakey`, `clips`, and `clipcount` fields remained unchanged. Struct `video_clip` was renamed to struct :c:type:`v4l2_clip`, also containing a struct :c:type:`v4l2_rect`, but the semantics are still the same.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 433); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 433); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 433); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 433); *backlink*

Unknown interpreted text role "c:type".

The `VIDEO_WINDOW_INTERLACE` flag was dropped. Instead applications must set the `field` field to `V4L2_FIELD_ANY` or `V4L2_FIELD_INTERLACED`. The `VIDEO_WINDOW_CHROMAKEY` flag moved into struct :c:type:`v4l2_framebuffer`, under the new name `V4L2_FBUF_FLAG_CHROMAKEY`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 442); *backlink*

Unknown interpreted text role "c:type".

In V4L, storing a bitmap pointer in `clips` and setting `clipcount` to `VIDEO_CLIP_BITMAP` (-1) requests bitmap clipping, using a fixed size bitmap of 1024 Ã— 625 bits. Struct :c:type:`v4l2_window` has a separate `bitmap` pointer field for this purpose and the bitmap size is determined by `w.width` and `w.height`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 448); *backlink*

Unknown interpreted text role "c:type".

The `VIDIOCCAPTURE` ioctl to enable or disable overlay was renamed to :ref:`VIDIOC_OVERLAY`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 454); *backlink*

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Cropping

To capture only a subsection of the full picture V4L defines the `VIDIOCGCAPTURE` and `VIDIOCSCAPTURE` ioctls using struct `video_capture`. The equivalent V4L2 ioctls are :ref:`VIDIOC_G_CROP <VIDIOC_G_CROP>` and :ref:`VIDIOC_S_CROP <VIDIOC_G_CROP>` using struct :c:type:`v4l2_crop`, and the related :ref:`VIDIOC_CROPCAP` ioctl. This is a rather complex matter, see :ref:`crop` for details.

**System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-

api][media][v4l]diff-v4l.rst, line 460); backlink

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 460); backlink

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 460); backlink

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 460); backlink

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 460); backlink

Unknown interpreted text role "ref".

The `x`, `y`, `width` and `height` fields moved into struct :c:type:`v4l2_rect` substructure `c` of struct :c:type:`v4l2_crop`. The `decimation` field was dropped. In the V4L2 API the scaling factor is implied by the size of the cropping rectangle and the size of the captured or overlaid image.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 469); backlink

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 469); backlink

Unknown interpreted text role "c:type".

The `VIDEO_CAPTURE_ODD` and `VIDEO_CAPTURE_EVEN` flags to capture only the odd or even field, respectively, were replaced by `V4L2_FIELD_TOP` and `V4L2_FIELD_BOTTOM` in the field named `field` of struct :c:type:`v4l2_pix_format` and struct :c:type:`v4l2_window`. These structures are used to select a capture or overlay format with the :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>` ioctl.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 475); backlink

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 475); backlink

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 475); backlink

Unknown interpreted text role "ref".

Reading Images, Memory Mapping

Capturing using the read method

There is no essential difference between reading images from a V4L or V4L2 device using the :c:func:`read()` function, however V4L2 drivers are not required to support this I/O method. Applications can determine if the function is available with the :ref:`VIDIOC_QUERYCAP` ioctl. All V4L2 devices exchanging data with applications must support the :c:func:`select()` and :c:func:`poll()` functions.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 489); *backlink*

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 489); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 489); *backlink*

Unknown interpreted text role "c:func".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 489); *backlink*

Unknown interpreted text role "c:func".

To select an image format and size, V4L provides the `VIDIOCSPICT` and `VIDIOCSWIN` ioctls. V4L2 uses the general-purpose data format negotiation ioctls :ref:`VIDIOC_G_FMT <VIDIOC_G_FMT>` and :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>`. They take a pointer to a struct :c:type:`v4l2_format` as argument, here the struct :c:type:`v4l2_pix_format` named `pix` of its `fmt` union is used.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 498); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 498); *backlink*

Unknown interpreted text role "ref".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 498); *backlink*

Unknown interpreted text role "c:type".

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 498); *backlink*

Unknown interpreted text role "c:type".

For more information about the V4L2 read interface see :ref:`rw`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 506); *backlink*

Unknown interpreted text role "ref".

Capturing using memory mapping

Applications can read from V4L devices by mapping buffers in device memory, or more often just buffers allocated in DMA-able system memory, into their address space. This avoids the data copying overhead of the read method. V4L2 supports memory mapping as well, with a few differences.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 518)

Unknown directive type "flat-table".

```
.. flat-table::
    :header-rows:  1
    :stub-columns: 0

    * - V4L
      - V4L2
    * -
      - The image format must be selected before buffers are allocated,
        with the :ref:`VIDIOC_S_FMT <VIDIOC_G_FMT>` ioctl. When no
        format is selected the driver may use the last, possibly by
        another application requested format.
    * - Applications cannot change the number of buffers. The it is built
        into the driver, unless it has a module option to change the
        number when the driver module is loaded.
      - The :ref:`VIDIOC_REQBUFS` ioctl allocates the
        desired number of buffers, this is a required step in the
        initialization sequence.
    * - Drivers map all buffers as one contiguous range of memory. The
        ``VIDIOCGMBUF`` ioctl is available to query the number of buffers,
        the offset of each buffer from the start of the virtual file, and
        the overall amount of memory used, which can be used as arguments
        for the :c:func:`mmap()` function.
      - Buffers are individually mapped. The offset and size of each
        buffer can be determined with the
        :ref:`VIDIOC_QUERYBUF` ioctl.
    * - The ``VIDIOCMCAPTURE`` ioctl prepares a buffer for capturing. It
        also determines the image format for this buffer. The ioctl
        returns immediately, eventually with an ``EAGAIN`` error code if no
        video signal had been detected. When the driver supports more than
        one buffer applications can call the ioctl multiple times and thus
        have multiple outstanding capture requests.

        The ``VIDIOCSYNC`` ioctl suspends execution until a particular
        buffer has been filled.
      - Drivers maintain an incoming and outgoing queue.
        :ref:`VIDIOC_QBUF` enqueues any empty buffer into
        the incoming queue. Filled buffers are dequeued from the outgoing
        queue with the :ref:`VIDIOC_DQBUF <VIDIOC_QBUF>` ioctl. To wait
        until filled buffers become available this function,
        :c:func:`select()` or :c:func:`poll()` can
        be used. The :ref:`VIDIOC_STREAMON` ioctl
        must be called once after enqueuing one or more buffers to start
        capturing. Its counterpart
        :ref:`VIDIOC_STREAMOFF <VIDIOC_STREAMON>` stops capturing and
        dequeues all buffers from both queues. Applications can query the
        signal status, if known, with the
        :ref:`VIDIOC_ENUMINPUT` ioctl.
```

For a more in-depth discussion of memory mapping and examples, see :ref:`mmap`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 566); *backlink*

Unknown interpreted text role "ref".

Reading Raw VBI Data

Originally the V4L API did not specify a raw VBI capture interface, only the device file `/dev/vbi` was reserved for this purpose. The only driver supporting this interface was the BTTV driver, de-facto defining the V4L VBI interface. Reading from the device yields a raw VBI image with the following parameters:

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 579)

Unknown directive type "flat-table".

```
.. flat-table::
    :header-rows:  1
    :stub-columns: 0

    * - struct :c:type:`v4l2_vbi_format`
      - V4L, BTTV driver
    * - sampling_rate
      - 28636363 Hz NTSC (or any other 525-line standard); 35468950 Hz PAL
        and SECAM (625-line standards)
    * - offset
      - ?
    * - samples_per_line
      - 2048
    * - sample_format
      - V4L2_PIX_FMT_GREY. The last four bytes (a machine endianness
        integer) contain a frame counter.
    * - start[]
      - 10, 273 NTSC; 22, 335 PAL and SECAM
    * - count[]
      - 16, 16 [#f9]_
    * - flags
      - 0
```

Undocumented in the V4L specification, in Linux 2.3 the `VIDIOCGVBIFMT` and `VIDIOCSVBIFMT` ioctls using struct `vbi_format` were added to determine the VBI image parameters. These ioctls are only partially compatible with the V4L2 VBI interface specified in :ref:`raw-vbi`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 602); *backlink*

Unknown interpreted text role "ref".

An `offset` field does not exist, `sample_format` is supposed to be `VIDEO_PALETTE_RAW`, equivalent to `V4L2_PIX_FMT_GREY`. The remaining fields are probably equivalent to struct :c:type:`v4l2_vbi_format`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 608); *backlink*

Unknown interpreted text role "c:type".

Apparently only the Zoran (ZR 36120) driver implements these ioctls. The semantics differ from those specified for V4L2 in two ways. The parameters are reset on :c:func:`open()` and `VIDIOCSVBIFMT` always returns an `EINVAL` error code if the parameters are invalid.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 613); *backlink*

Unknown interpreted text role "c:func".

Miscellaneous

V4L2 has no equivalent of the `VIDIOCGUNIT` ioctl. Applications can find the VBI device associated with a video capture device (or vice versa) by reopening the device and requesting VBI data. For details see :ref:`open`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 622); *backlink*

Unknown interpreted text role "ref".

No replacement exists for VIDIOCKEY, and the V4L functions for microcode programming. A new interface for MPEG compression and playback devices is documented in :ref:`extended-controls`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 627); *backlink*

Unknown interpreted text role "ref".

[1] According to Documentation/admin-guide/devices.rst these should be symbolic links to /dev/video0. Note the original bttv interface is not compatible with V4L or V4L2.

[2] According to Documentation/admin-guide/devices.rst a symbolic link to /dev/radio0.

[3] This is a custom format used by the BTTV driver, not one of the V4L2 standard formats.

[4] Presumably all V4L RGB formats are little-endian, although some drivers might interpret them according to machine endianness. V4L2 defines little-endian, big-endian and red/blue swapped variants. For details see :ref:`pixfmt-rgb`.

System Message: ERROR/3 (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\[linux-master][Documentation][userspace-api][media][v4l]diff-v4l.rst, line 645); *backlink*

Unknown interpreted text role "ref".

[5] VIDEO_PALETTE_YUV422 and VIDEO_PALETTE_YUYV are the same formats. Some V4L drivers respond to one, some to the other.

[6] Not to be confused with V4L2_PIX_FMT_YUV411P, which is a planar format.

[7] V4L explains this as: "RAW capture (BT848)"

[8] Not to be confused with V4L2_PIX_FMT_Y41P, which is a packed format.

[9] Old driver versions used different values, eventually the custom BTTV_VBISIZE ioctl was added to query the correct values.