



VKMS: the new ConfigFS interface

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Corrections, suggestions, contributions and translations are welcome!





Current options





- ▶ `enable_cursor - true`
Add a cursor plane
- ▶ `enable_writeback - true`
Add a writeback connector
- ▶ `enable_overlay - false`
Add multiple planes



Minimal configuration

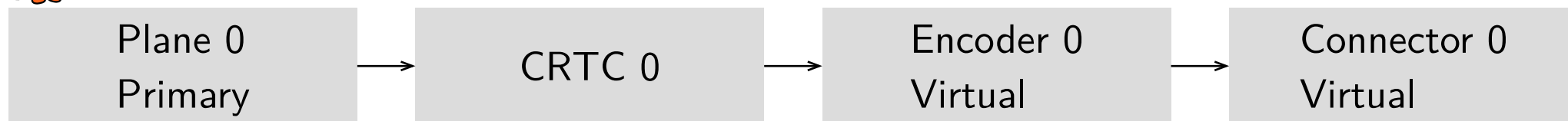


Figure 1: enable_cursor=false, enable_writeback=false, enable_overlay=false

```
Node: /dev/dri/card0
├──Driver: vkms (Virtual Kernel Mode
Setting) version 1.0.0
├──Device: platform vkms
├──Connectors
│   └──Connector 0
│       ├──Type: virtual
│       └──Encoders: {0}
├──Encoders
│   └──Encoder 0
│       ├──Type: virtual
│       ├──CRTCS: {0}
│       └──Clones: {0}
```

```
├──CRTCs
│   └──CRTC 0
└──Planes
    └──Plane 0
        ├──CRTCs: {0}
        └──Properties
            ├──"type" = Primary
```

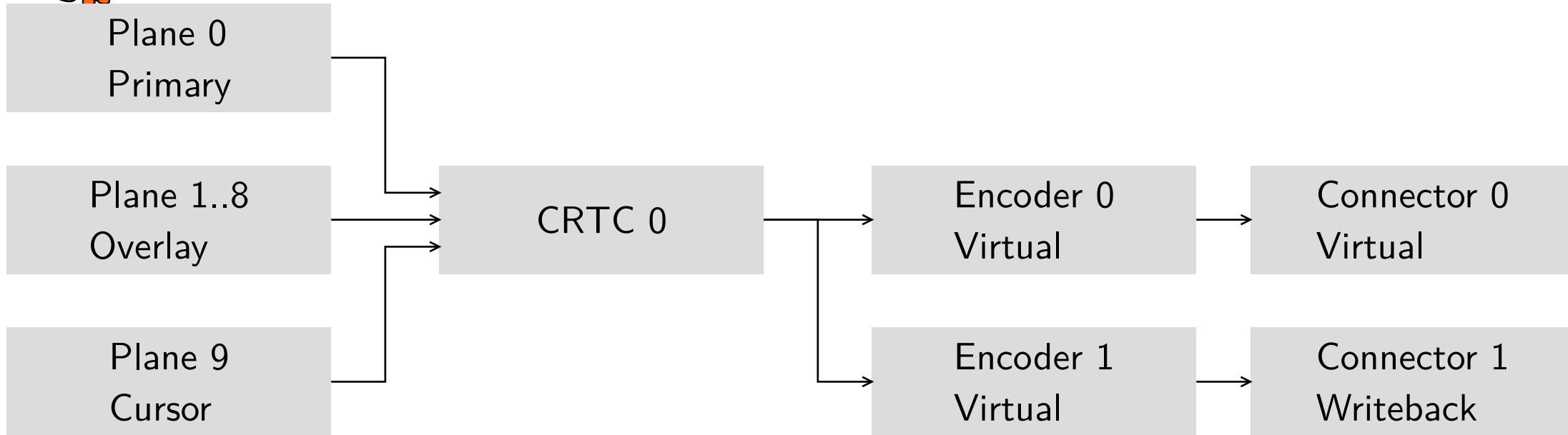


Figure 2: `enable_cursor=true`, `enable_writeback=true`, `enable_overlay=true`



Maximal configuration

Node: /dev/dri/card0

└─Driver: vkms (Virtual Kernel Mode Setting) version 1.0.0

└─Device: platform vkms

└─Connectors

└─└─Connector 0

└─└─└─Type: writeback

└─└─└─Encoders: {0}

└─└─Connector 1

└─└─└─Type: virtual

└─└─└─Encoders: {1}

└─Encoders

└─└─Encoder 0

└─└─└─Type: virtual

└─└─└─CRTCS: {0}

└─└─└─Clones: {0}

└─└─Encoder 1

└─└─└─Type: virtual

└─└─└─CRTCS: {0}

└─└─└─Clones: {0, 1}

└─CRTCs

└─└─CRTC 0

└─Planes

└─└─Plane 0

└─└─└─CRTCs: {0}

└─└─└─Properties

└─└─└─└─"type" = Primary

└─└─Plane 1..8

└─└─└─CRTCs: {0}

└─└─└─Properties

└─└─└─└─"type" = Overlay

└─└─Plane 9

└─└─└─CRTCs: {0}

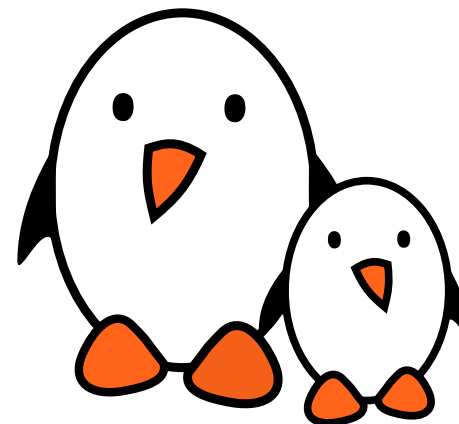
└─└─└─Properties

└─└─└─└─"type" = Cursor



ConfigFS interface

bootlin





- ▶ `enable_cursor - true`
Add a cursor plane
- ▶ `enable_writeback - true`
Add a writeback connector
- ▶ `enable_overlay - false`
Add multiple planes
- ▶ `create_default_dev - true`
Create the default device (backward compatibility)



```
$ mkdir /sys/kernel/config/vkms/MY_DEV
```

```
$ tree /sys/kernel/config/vkms/MY_DEV
```

```
/sys/kernel/config/vkms/DEV_1/
```

```
├─ connectors/
```

```
├─ crtcs/
```

```
├─ enabled
```

```
├─ encoders/
```

```
└─ planes/
```

1 = create device, 0 = destroy device



```
$ mkdir /sys/kernel/config/vkms/DEV_1/connectors/CON_1
```

```
$ tree /sys/kernel/config/vkms/DEV_1/
```

```
/sys/kernel/config/vkms/DEV_1/
```

```
| [ ... ]
```

```
| connectors/
```

```
|   | CON_1/
```

```
|       | dynamic
```

```
# 1 = dynamic connector (MST), 0 = static
```

```
|       | edid
```

```
# raw edid
```

```
|       | enabled
```

```
# 1 = create connector, 0 = destroy connector
```

```
|       | possible_encoders/
```

```
|       | status
```

```
# 1 = connected, 2 = disconnected, 2 = unknown
```

```
|       | type
```

```
# 15 = virtual, 10 = DP, ...
```



```
$ mkdir /sys/kernel/config/vkms/DEV_1/crtcs/CRTC_1
```

```
$ tree /sys/kernel/config/vkms/DEV_1/
```

```
/sys/kernel/config/vkms/DEV_1/
```

```
├─ [...]
```

```
└─ crtcs/
```

```
    └─ CRTC_1/
```

```
        └─ writeback
```

1 = create writeback connector for this CRTC



```
$ mkdir /sys/kernel/config/vkms/DEV_1/encoders/ENC_1
$ tree /sys/kernel/config/vkms/DEV_1/
/sys/kernel/config/vkms/DEV_1/
├── [...]
└── encoders/
    └── ENC_1/
        ├── possible_crtcs/
        └── type                # 5 = virtual, 3 = LVDS, ...
```



```
$ mkdir /sys/kernel/config/vkms/DEV_1/planes/PLA_1
```

```
$ tree /sys/kernel/config/vkms/DEV_1/
```

```
/sys/kernel/config/vkms/DEV_1/
```

```
├── [...]
```

```
└── planes/
```

```
    └── PLA_1/
```

```
        ├── default_color_encoding # default for color encoding
```

```
        ├── default_color_range # default for color range
```

```
        ├── default_rotation # default for rotation
```

```
        ├── possible_crtcs/
```

```
        ├── supported_color_encoding # color encoding bitmask
```

```
        ├── supported_color_range # color range bitmask
```

```
        ├── supported_formats # +RG24 to enable RGB888, -RG24 to disable
```

```
        ├── supported_rotations # rotation bitmask
```

```
        └── type # 0 = Overlay, 1 = Primary, 2 = Cursor
```



```
$ ln -s /sys/kernel/config/vkms/DEV_1/crtcs/CRTC_1/ /sys/kernel/config/vkms/  
DEV_1/planes/PLA_1/possible_crtcs/  
$ ln -s /sys/kernel/config/vkms/DEV_1/crtcs/CRTC_1/ /sys/kernel/config/vkms/  
DEV_1/encoders/ENC_1/possible_crtcs/  
$ ln -s /sys/kernel/config/vkms/DEV_1/encoders/ENC_1/ /sys/kernel/config/vkms/  
DEV_1/connectors/CON_1/possible_encoders/
```



```
$ tree /sys/kernel/config/vkms/DEV_1/  
/sys/kernel/config/vkms/DEV_1/  
├── connectors  
│   └── CON_1/  
│       └── possible_encoders/  
│           └── ENC_1 -> ../../../../../../vkms/DEV_1/encoders/ENC_1  
├── encoders  
│   └── ENC_1  
│       └── possible_crtcs  
│           └── CRTC_1 -> ../../../../../../vkms/DEV_1/crtcs/CRTC_1  
└── planes  
    └── PLA_1  
        └── possible_crtcs  
            └── CRTC_1 -> ../../../../../../vkms/DEV_1/crtcs/CRTC_1
```



```
$ echo 1 > enabled
```

```
$ drm_info
```

```
Node: /dev/dri/card0
```

```
|—Driver: vkms (Virtual Kernel Mode Setting) version 1.0.0
```

```
[...]
```



```
$ echo 0 > /sys/kernel/config/vkms/DEV_1/enabled
$ echo 1 > /sys/kernel/config/vkms/DEV_1/connectors/CON_1/dynamic
$ echo 0 > /sys/kernel/config/vkms/DEV_1/connectors/CON_1/enabled
$ echo 1 > /sys/kernel/config/vkms/DEV_1/enabled
```

```
$ modetest -c -M vkms
[empty]
```

```
$ echo 1 > /sys/kernel/config/vkms/DEV_1/connectors/CON_1/enabled
```

```
$ modetest -c -M vkms
[1 connector]
```



Other additions





▶ Planes:

- BGR565
- P010, P012, P016
- RGB888, BGR888
- XBGR16161616, ABGR16161616
- XBGR8888, RGBX8888, BGRX8888
- RGBA8888, BGRA8888

▶ Writeback:

- XRGB1555, XBGR1555, ARGB1555, ABGR1555
- RGBX5551, BGRX5551, RGBA5551, BGRA5551
- ARGB4444, ABGR4444, XRGB4444, XBGR4444
- RGBA4444, BGRA4444, RGBX4444, BGRX4444
- XRGB2101010

What is missing?

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<https://bootlin.com/pub/conferences>