



How to find Linux kernel driver
associated to a device



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Contents

1 Introduction	2
2 Find kernel driver for a device	2
2.1 Major and minor numbers for a Linux kernel device	2
2.2 List of available devices	2
2.3 Device entries in /dev	5
2.4 System device entries in /sys/dev	5
2.5 Driver associated to a platform device	6
3 References	7

1 Introduction

This article shows the user how to find the Linux[®] kernel driver associated to a kernel device.

This can, for example, be useful when debugging devices that the user does not know, or monitoring for correct system behavior.

2 Find kernel driver for a device

2.1 Major and minor numbers for a Linux kernel device

The device files in the Linux kernel are associated to a MAJOR and a MINOR number, giving each file a unitary identity. This abstraction of device handling is a basic features of the Linux kernel.

A list of MAJOR numbers, and rules for MINOR numbers are given in *Documentation/admin-guide/devices.txt* of the Linux kernel source^[1], or in kernel.org^[2].

2.2 List of available devices

A list of the available devices for the Linux kernel can be read from the procs file */proc/devices*:

```
Board $> cat /proc/devices
```



How to find Linux kernel driver associated to a device

This lists all of the available devices, according to their classification as a character or a block device.

The number preceding the device name corresponds to the MAJOR number of the device (for example, "4" is the MAJOR number for the "tty" device):

Character devices:

```
1 mem
2 pty
3 ttyp
4 /dev/vc/0
4 tty
5 /dev/tty
5 /dev/console
5 /dev/ptmx
5 ttyRPMSG
7 vcs
10 misc
13 input
21 sg
29 fb
81 video4linux
89 i2c
90 mtd
116 alsa
128 ptm
136 pts
153 spi
166 ttyACM
180 usb
189 usb_device
199 galcore
226 drm
245 cec
246 media
247 ttySTM
248 bsg
249 watchdog
250 iio
251 ptp
252 pps
253 rtc
254 gpiochip
```

Block devices:

```
1 ramdisk
7 loop
8 sd
11 sr
31 mtblock
65 sd
66 sd
67 sd
68 sd
69 sd
70 sd
71 sd
128 sd
129 sd
130 sd
131 sd
132 sd
```



How to find Linux kernel driver associated to a device

```
133 sd
134 sd
135 sd
179 mmc
254 virtblk
259 blkext
```

ST internal information

With Beta1 DV and earlier, UART are linked to TTYS*

Character devices:

```
1 mem
2 pty
3 tty
4 /dev/vc/0
4 tty
5 /dev/tty
5 /dev/console
5 /dev/ptmx
5 ttyRPMMSG
7 vcs
10 misc
13 input
21 sg
29 fb
81 video4linux
89 i2c
90 mtd
116 alsa
128 ptm
136 pts
153 spi
166 ttyACM
180 usb
189 usb_device
199 galcore
226 drm
245 cec
246 media
247 ttyS
248 bsg
249 watchdog
250 iio
251 ptp
252 pps
253 rtc
254 gpiochip
```

Block devices:

```
1 ramdisk
7 loop
8 sd
```

be.ST



```
11 sr
31 mtdblock
65 sd
66 sd
67 sd
68 sd
69 sd
70 sd
71 sd
128 sd
129 sd
130 sd
131 sd
132 sd
133 sd
134 sd
135 sd
179 mmc
254 virtblk
259 blkext
```

For further information about the major and minor numbers for a Linux kernel driver, refer to the Linux tutorial web page^[3].

Note: Misc devices have a specific setup; you can find the list of misc devices with the corresponding MINOR number in the `/proc/misc` file.

2.3 Device entries in /dev

Each device has a corresponding entry in the `/dev` directory of the Linux kernel pseudo filesystem.

```
Board $> ls -lR /dev
```

Be careful, /dev contains some sub-directories containing device entries, that is, *input*. That the reason why *-R* should be used.

This command lists all of the device entries, including the device type and the associated MAJOR and MINOR numbers

For example:

```
crw-rw---- 1 root video 81, 0 Dec 18 16:26 video0
```

This device `video0` is of type character (c), with MAJOR number of 81 and MINOR number of 0.

2.4 System device entries in /sys/dev

All devices, classified by type (char or block), and identified by their MAJOR/MINOR number can be found in the `dev` subdirectory of the `sysfs` file system entry (`/sys`).

A platform device is then linked to each MAJOR/MINOR number.



How to find Linux kernel driver associated to a device

For example:

```
Board $> ls -l /sys/dev/char/81\:0
lrwxrwxrwx 1 root root 0 Dec 18 17:00 81:0 -> ../../devices/platform/soc/4c006000.dcmi
/video4linux/video0
```

The device *video0* is linked to the platform device *4c006000.dcmi/video4linux/video0*.

2.5 Driver associated to a platform device

If the device is linked to a platform device, you can find the corresponding driver definition in the device tree with the compatible parameter.

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ST internal information

When the DT for DCMI is upstreamed, it is convenient to link to *stm32mp15c.dtsi* instead of the "(device tree file for STM32MP15 in arch/arm/boot/dts Linux kernel source path)"

For example: Look for device *4c006000.dcmi/video4linux/video0* in *stm32mp15c.dtsi* (the device tree file for the STM32MP15 in *arch/arm/boot/dts* Linux kernel source path)

```
...
dcmi: dcmi@4c006000 {
    compatible = "st,stm32-dcmi";
    reg = <0x4c006000 0x400>;
    interrupts = <GIC_SPI 78 IRQ_TYPE_NONE>;
    resets = <&rcc CAMITF_R>;
    clocks = <&rcc DCMI>;
    clock-names = "mclk";
    dmas = <&dmamux1 75 0x400 0x05>;
    dma-names = "tx";
    status = "disabled";
};
...
```

The driver associated to the *video0* device is *st,stm32-dcmi*.

If the driver belongs to your Linux kernel tree, you can search for the driver by declaring *st,stm32-dcmi* as a compatible device.

- In the previous example, when looking for the driver compatible with *st,stm32-dcmi*, you find *drivers/media/platform/stm32/stm32-dcmi.c* driver

```
PC $> cd <your_kernel_source_path>
PC $> grep -rs "st,stm32-dcmi" *
...
drivers/media/platform/stm32/stm32-dcmi.c:      { .compatible = "st,stm32-dcmi"},
...
```



How to find Linux kernel driver associated to a device

If the driver is not part of your Linux kernel source tree, it is present as a kernel object library file and you can check on the board:

```
Board $> cd /lib/modules/<kernel_version>  
Board $> grep <compatible_name> modules.alias
```

This gives you the name of the module driver.

For example, for the gcnano driver used for the GPU:

```
Board $> grep "st,gcnano" modules.alias  
alias of:N*T*Cst,gcnano galcore
```

This means that the module name is *galcore.ko*.

3 References

- Documentation/admin-guide/devices.txt
- <https://www.kernel.org/doc/Documentation/admin-guide/devices.txt>
- <http://www.linux-tutorial.info/modules.php?name=MContent&pageid=94>

Process File System (See <https://en.wikipedia.org/wiki/Procsfs> for more details)

Universal Asynchronous Receiver/Transmitter

System File System (See <https://en.wikipedia.org/wiki/Sysfs> for more details)

Device Tree

Digital Camera Memory Interface

Generic Interrupt Controller

Serial Peripheral Interface

Graphics Processing Units