Linux driver for FD722/FD722/FD720 boards

Linux support for Forward boards consist of kernel module (driver) implementing common Video4Linux2 (V4L2) and ALSA kernel interfaces. Thereby, board can be used by almost any third-party software supporting V4L2 and ALSA (most noticeable – Gstreamer, OBS Studio). Whole board configuration can be done using common Video4Linux2 tools (package called v4l-utils in most distributions) and sysfs/udev interfaces – no special tools required.

Kernel modules were developed to support Linux kernel version from 4.4. Only requirement for Linux distribution is support for dkms – driver will be built from sources by dkms during installation. So theoretically, driver should work at any Linux installation with appropriate kernel and dkms, however, we recommends to use one of following distribution:

- CentOS 8 (kernel 4.18)

- Debian 10 (kernel 4.19)

- Debian 11 (kernel 5.10)

- Ubuntu 16.04 LTS (kernel 4.10)

- Ubuntu 18.04 LTS (kernel 4.15)

- Ubuntu 20.04 LTS (kernel 5.4)

DEB and RPM packages provided, and common tarball for other distribution as well.

Board configuration

When loading driver creates following devices:

- `/dev/video`**X** – V4L2 device (video), one for each I/O pin

- `/dev/snd/pcmC`**Y**`D`**Z**`*` – ALSA playback and capture devices (known as hw:**Y.Z** in most of software)

By default device is setted to use 1080i50 video format (*DV timings* in V4L2 terminology). To switch video format, **v4l-ctl** or **qv4l2** tools should be used.

Some examples:

- List of all supported formats (timings):
  ```
  $ v4l2-ctl --list-dv-timings -d /dev/videoX
  ```

- Set format #13 (1080p50):
  ```
  $ v4l2-ctl --set-dv-bt-timings index=13 -d /dev/videoX
  ```

- Autodetect format on input and set it:
  ```
  $ v4l2-ctl --set-dv-bt-timings query -d /dev/videoX
  ```

FD788

FD788 board can switch their I/O pin to being either input or output (all pins are inputs by default). To change pin direction sysfs variables should be used:

```
$ echo IIIIOOOO > /sys/class/forward/fd788-n/io_config
```

Where `IIIIOOOO` means «first 4 pins are inputs (I), last 4 – outputs (O)», **n –** board serial number (sticker on board).

Udev rules can be used to set board I/O configuration during system startup (or driver loading). For example, following rule (add to `/etc/udev/rules.d/90-forward.rules`):

```
SUBSYSTEM=="forward", ATTR{software_id}=="80002",
ATTR{io_config}="IIIIIOOO"
```

will setup pins to 5 inputs/3 outputs for board #80002.

Another feature of FD788 – support for 1x1 Quad-SDI (inputs 1-4, outputs 5-8) and 2x2 Dual-SDI (inputs 1-2, 3-4, outputs 5-6, 7-8). To use this formats board I/O should be configured as 4 inputs + 4 outputs (`IIIIOOOO`) and correct video formats should be selected on correspondig video device (0, 4 for Quad-SDI 0, 2, 4, 6 for Dual-SDI).

GStreamer

To work with GStreamer it is enough to use common v4l2src/v4l2sink and alsasrc/alsasink plugins. For example, following pipeline will show test video and audio:

```
$ gst-launch-1.0 videotestsrc ! v4l2sink device=/dev/video2
audiotestsrc ! alsasink device=hw:1,2
```

capture and show input:

```
$ gst-launch-1.0 v4l2src device=/dev/video0 ! autovideosink
alsasrc device=hw:1,0 ! autoaudiosink
```

DVB-ASI

Warning: *For now FD722/FD788 board support only DVB-ASI capture.*

If ASI signal is detected at board input, regardless of format setted, V4L2 device starts MPEG-TS streaming. GStreamer support MPEG-TS capture in v4l2src – for example, dump stream to file:

```
$ gst-launch-1.0 v4l2src device=/dev/video0 ! "video/mpegts" !
filesink location=/tmp/test.ts
```

Utility for FD722/FD722/FD720 boards

>sudo forward-flash

Command show current firmware version and update it if new version is availabe.