libcamera: Making Complex Cameras Easy

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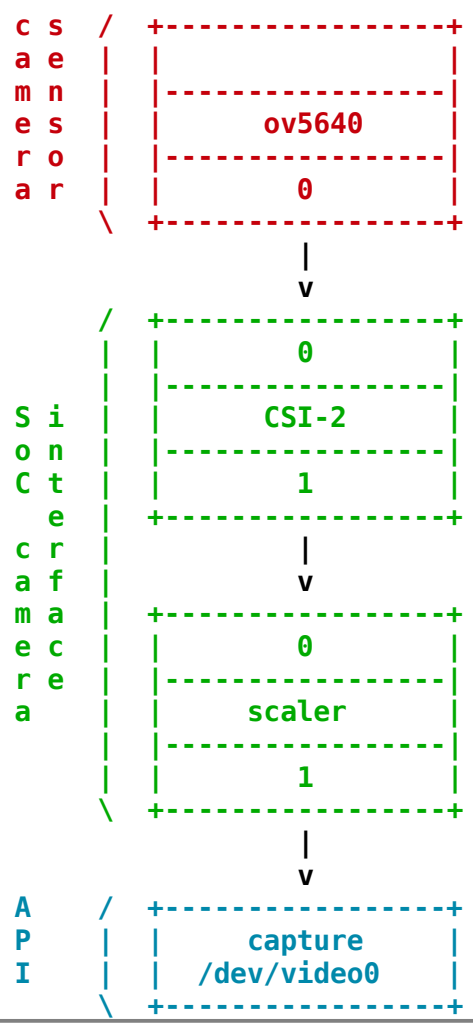
Cameras are complex devices that need heavy hardware image processing operations. Control of the processing is based on advanced algorithms that must run on a programmable processor. This has traditionally been implemented in a dedicated MCU in the camera, but in embedded devices algorithms have been moved to the main CPU to save cost. Blurring the boundary between camera devices and Linux often left the user with no other option than a vendor-specific closed-source solution.

!

To address this problem the **Linux media community** has very recently started collaboration with the industry to develop a camera stack that will be open-source-friendly while still protecting vendor core IP. libcamera was born out of that collaboration and will offer modern camera support to Linux-based systems, including traditional Linux distributions, ChromeOS and Android.

Libcamera V4L2


camera sensor
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SoC camera
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CSI-2
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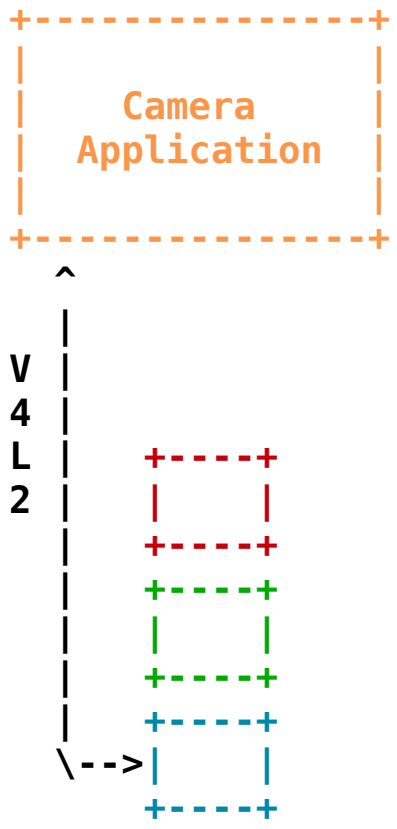
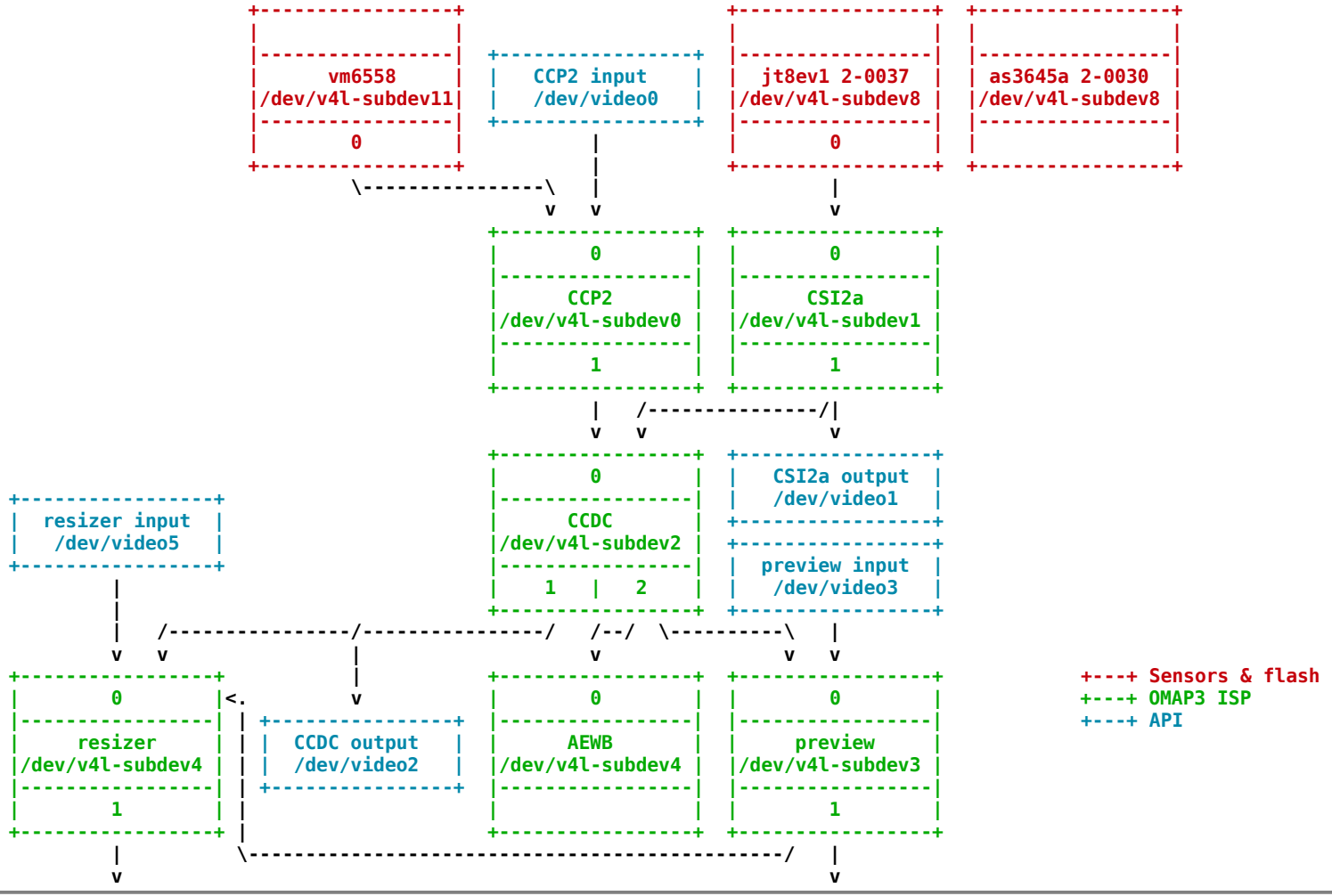
0
scaler
1
API
capture
/dev/video0

Why?



Why?


vm6558
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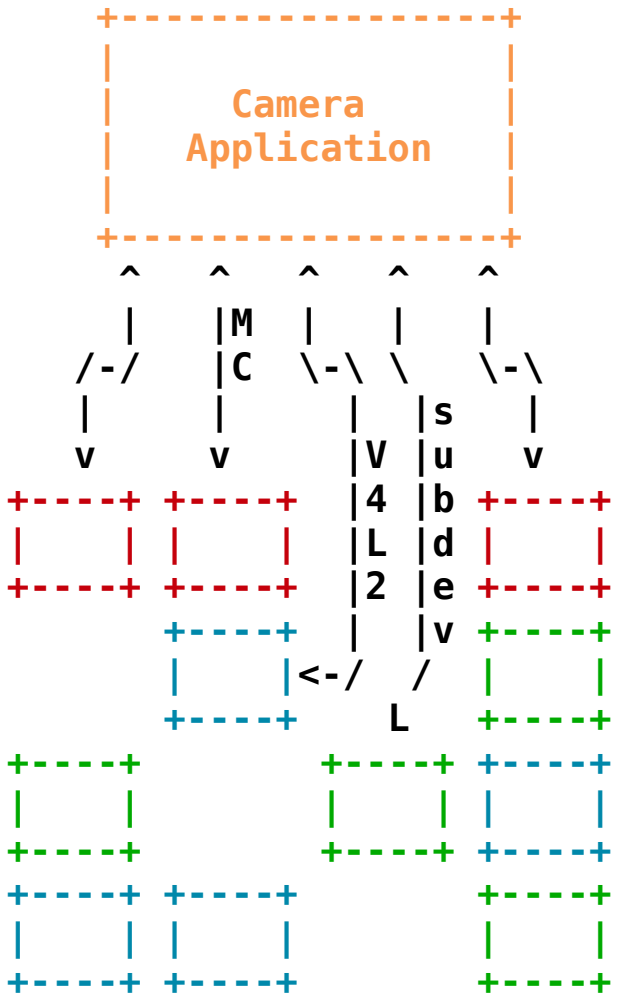
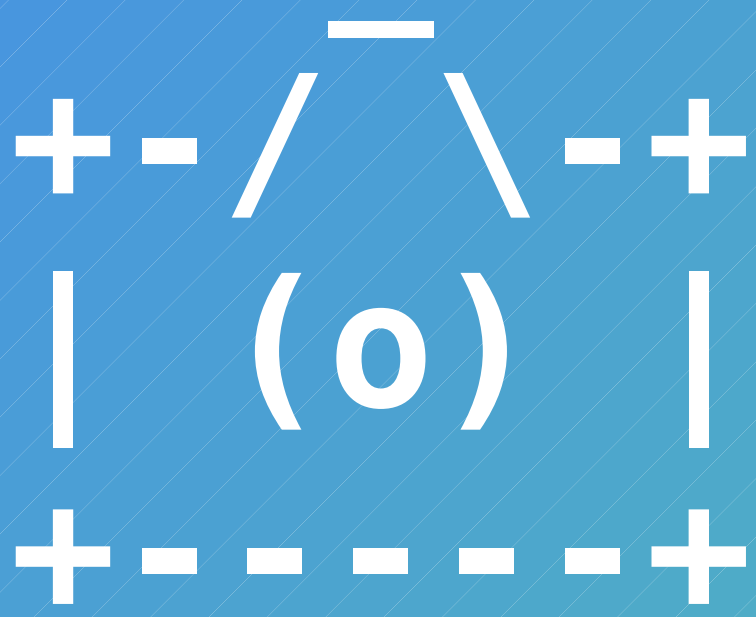
CCP2 input
/dev/video0
jt8ev1 2-0037
/dev/v4l-subdev8
0
as3645a 2-0030
/dev/v4l-subdev8
0
CCP2
/dev/v4l-subdev0
CSI2a
/dev/v4l-subdev1
CSI2a output
/dev/video1
CCDC
/dev/v4l-subdev2
preview input
/dev/video3
resizer input
/dev/video5
resizer
/dev/v4l-subdev4
CCDC output
/dev/video2
AEWB
/dev/v4l-subdev4
preview
/dev/v4l-subdev3
+---+ Sensors & flash
+---+ OMAP3 ISP
+---+ API


IDEAS
ON BOARD

Why?

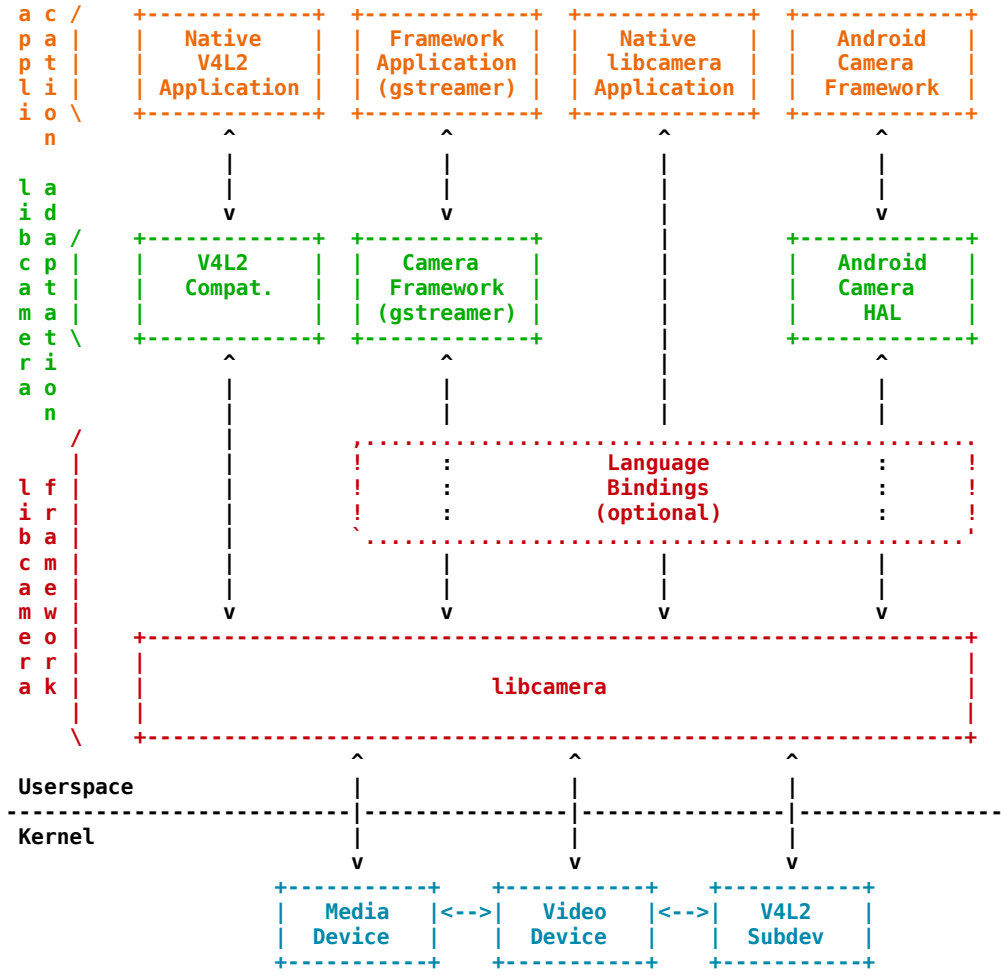


Why?

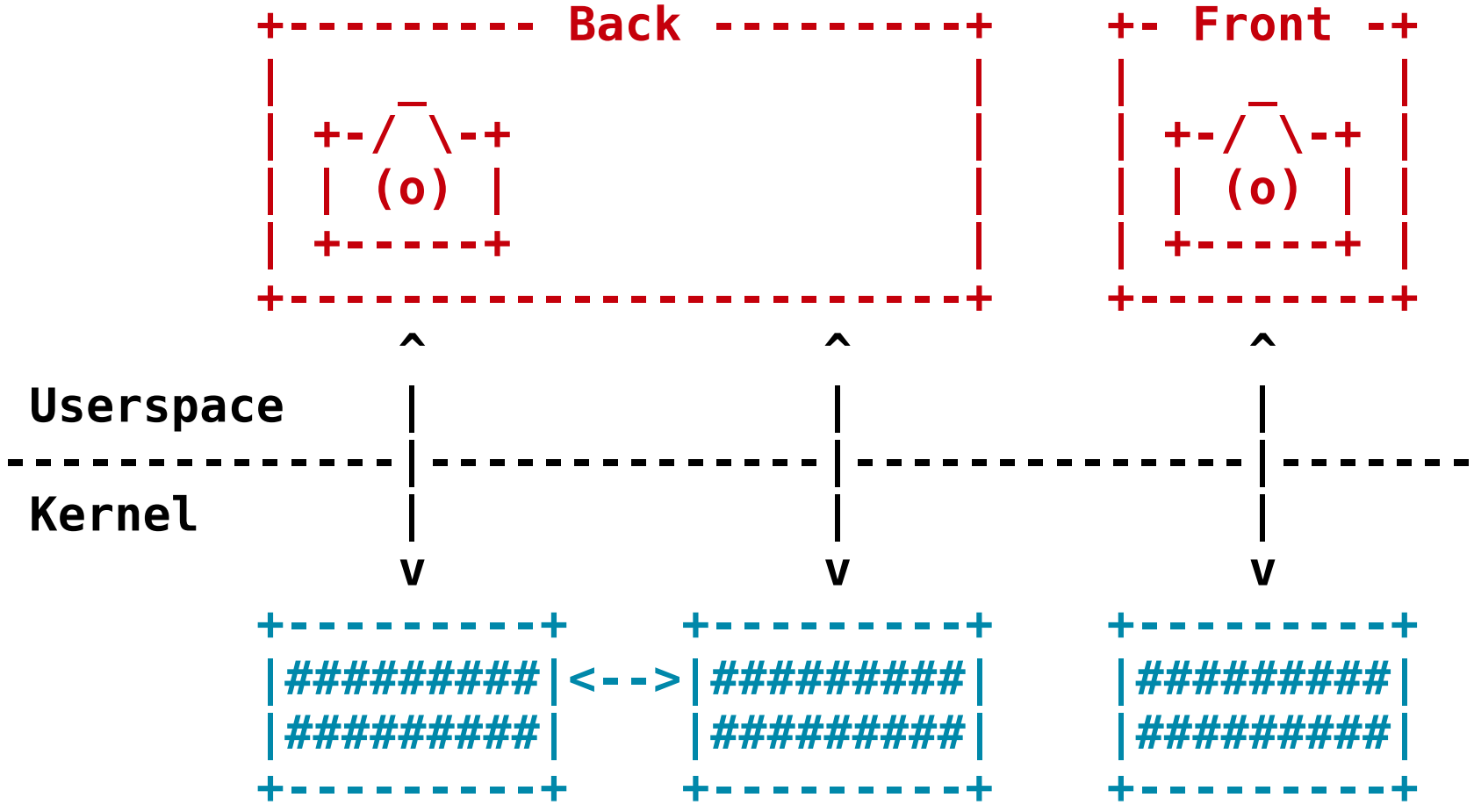


Libcamera Architecture

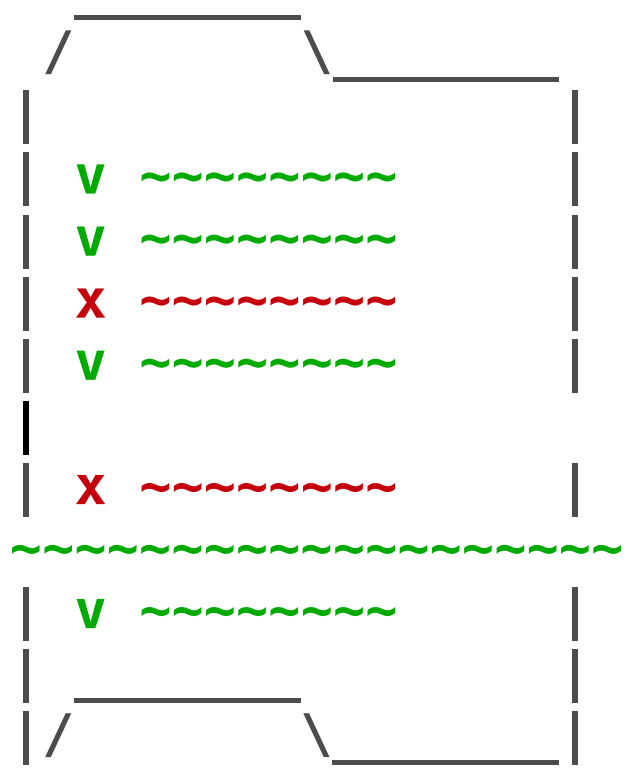
IDEAS ON BOARD

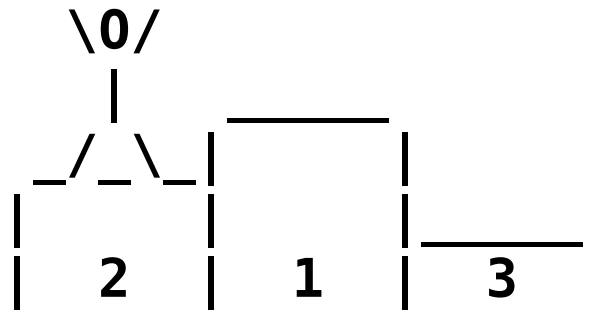


Camera Stack



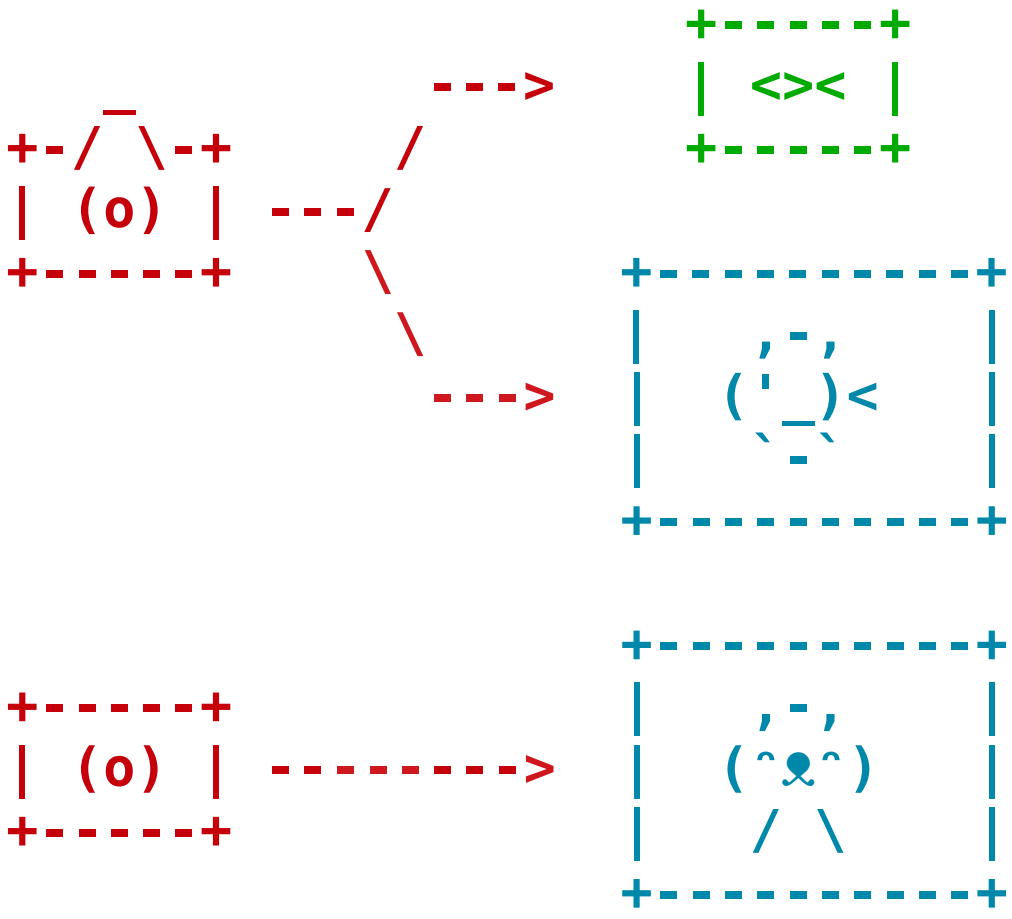
Camera Devices & Enumeration





Capabilities **Profiles**

Capabilities & Profiles



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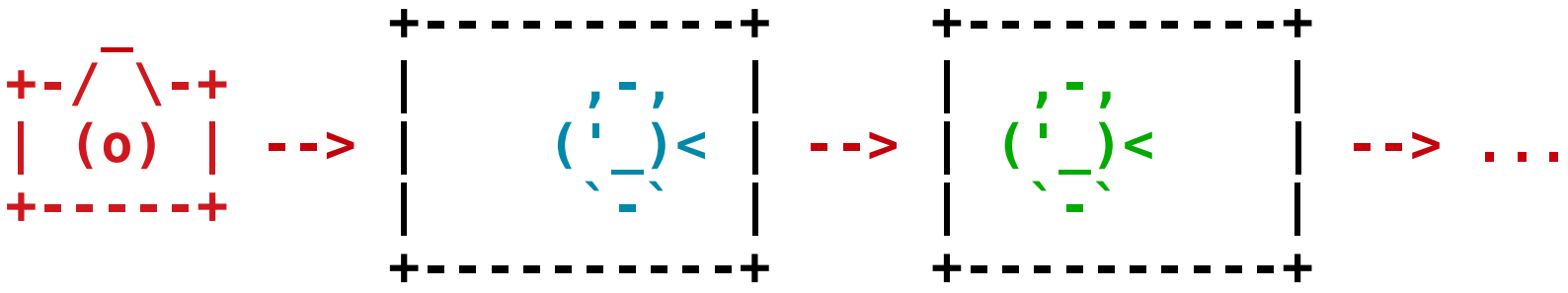
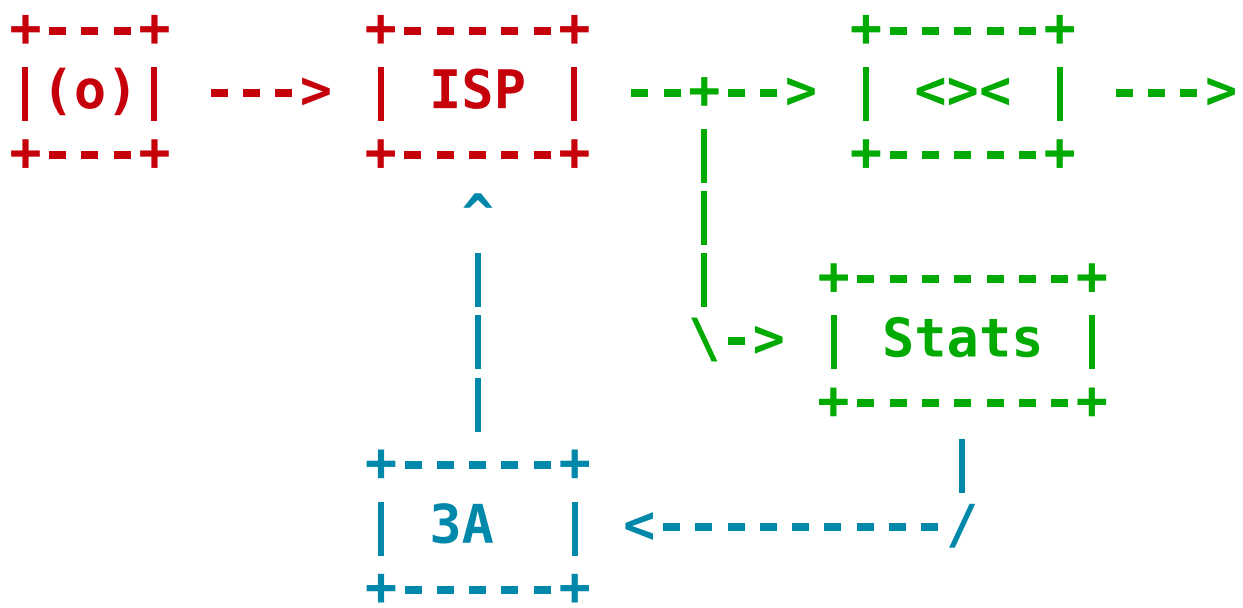
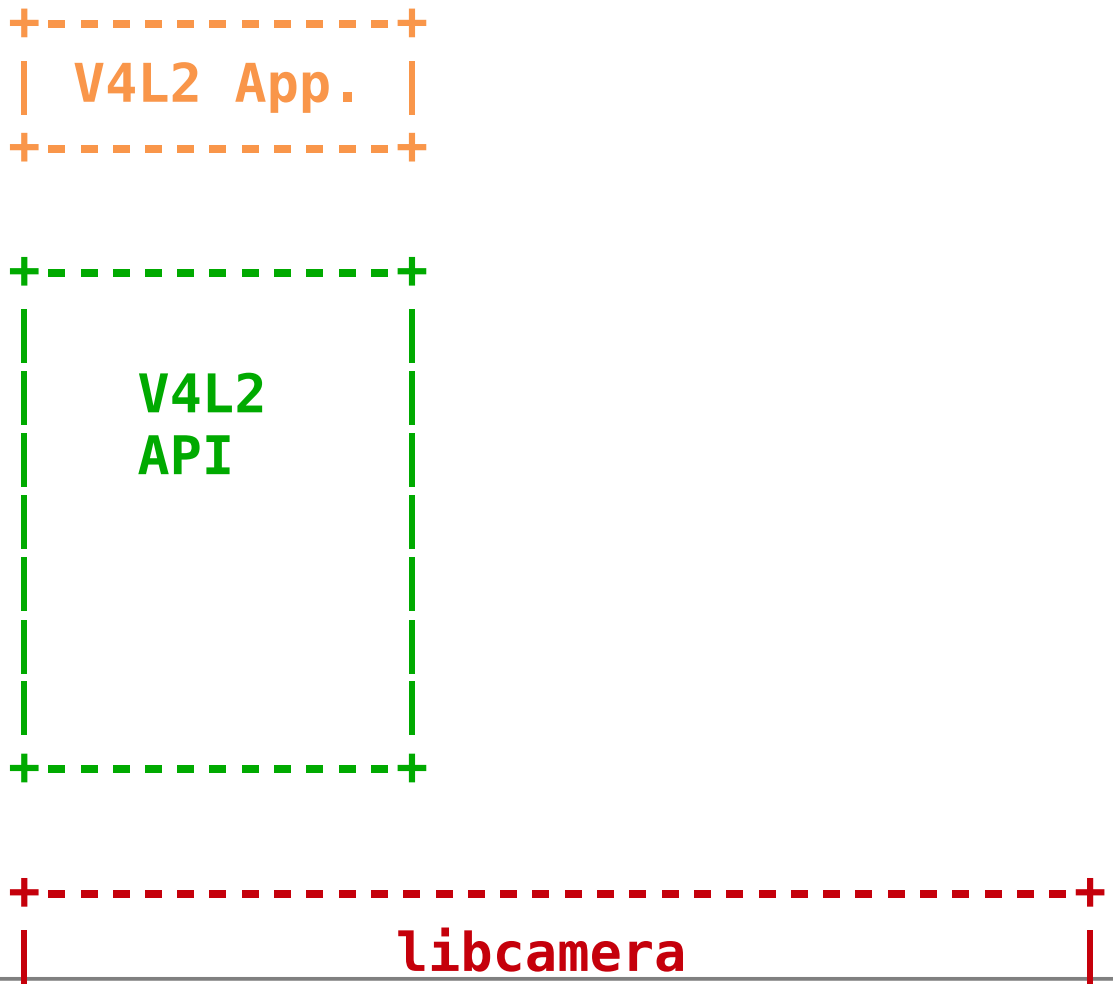
Streams



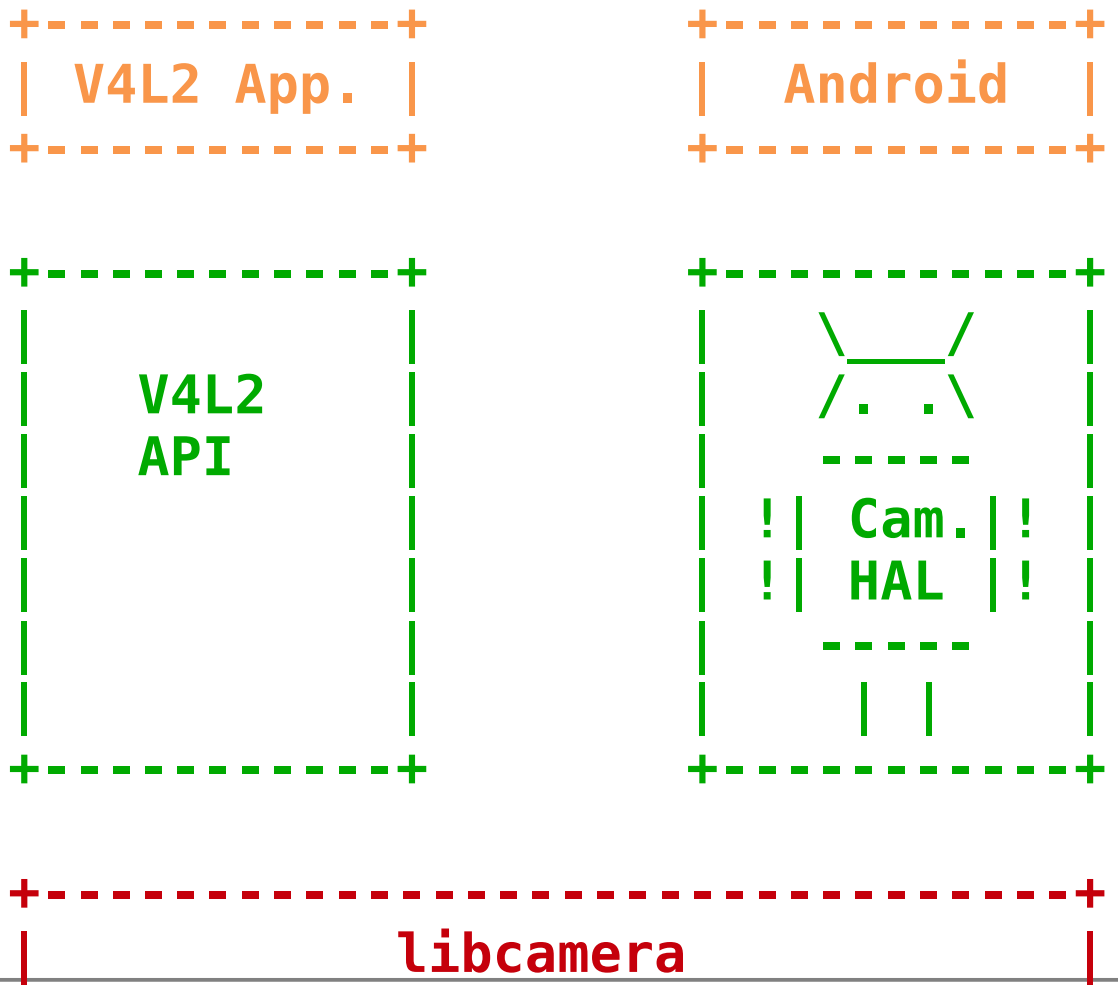
Per-Frame Controls



3A & Image Enhancement Algorithms

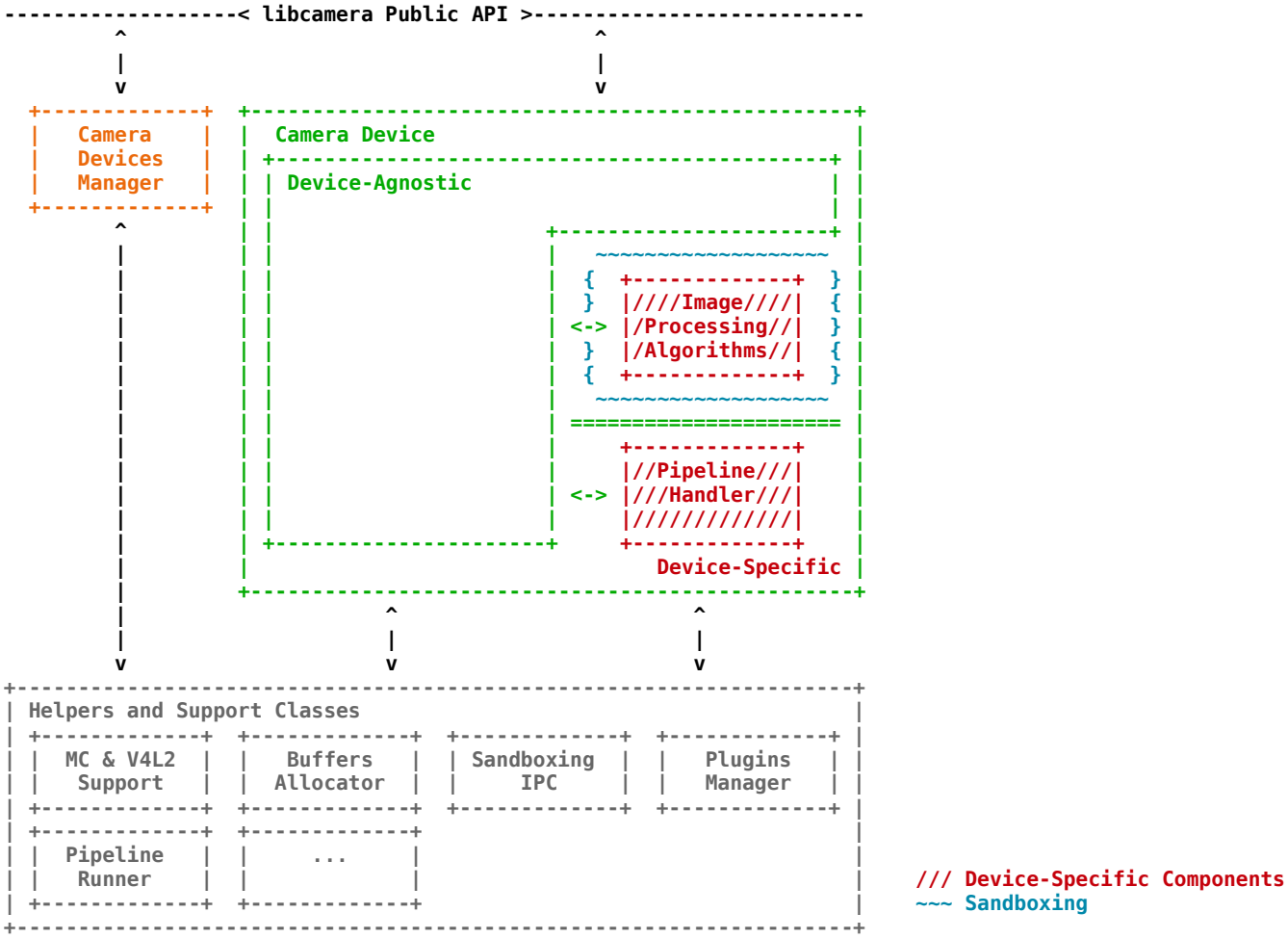


Adaptation

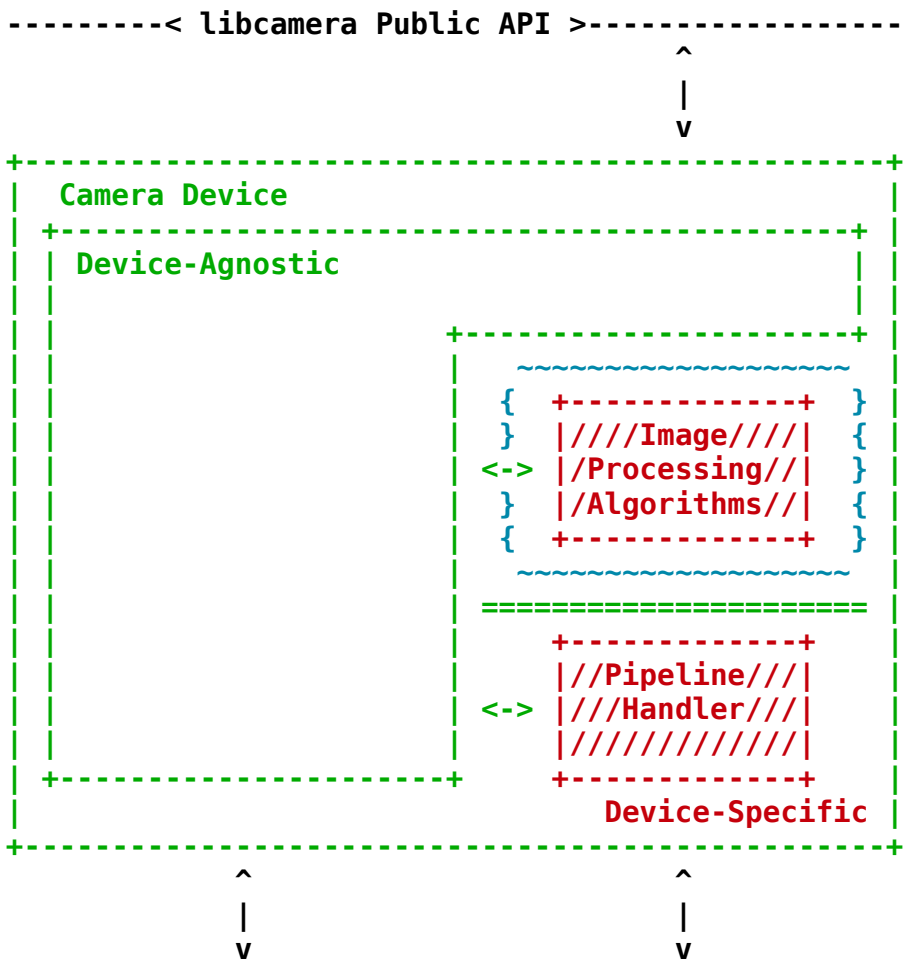


Adaptation

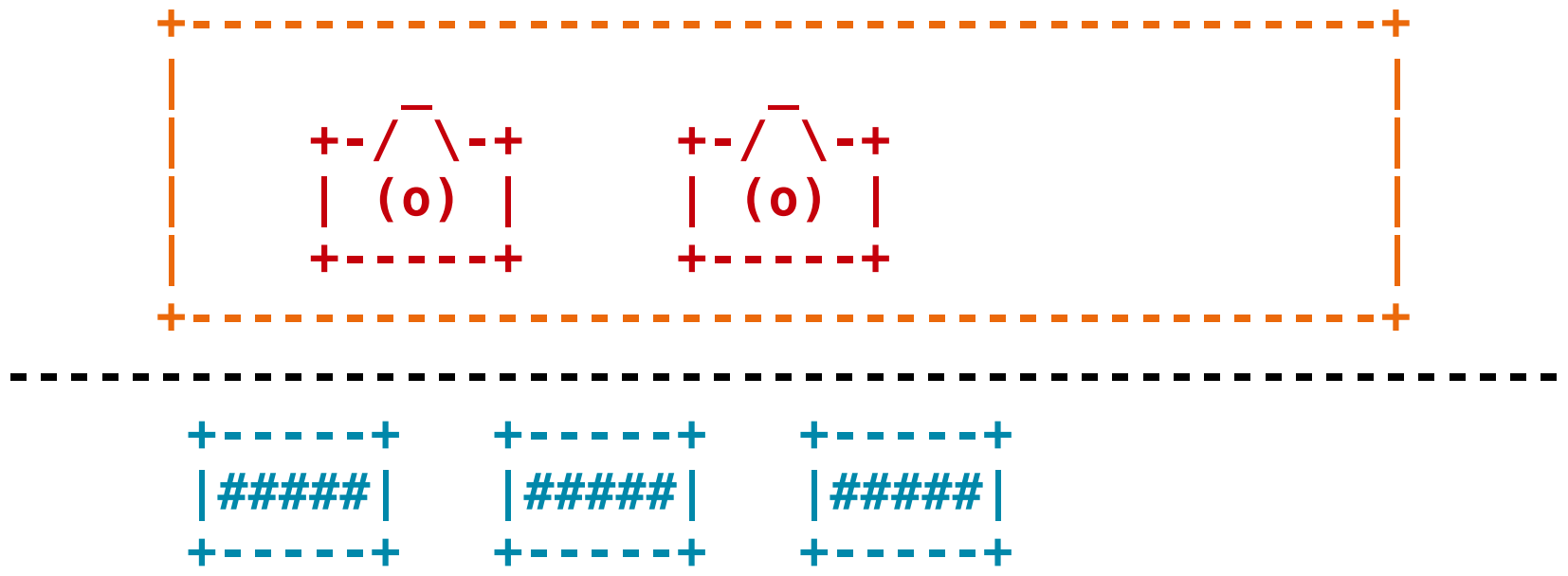
Libcamera Internals



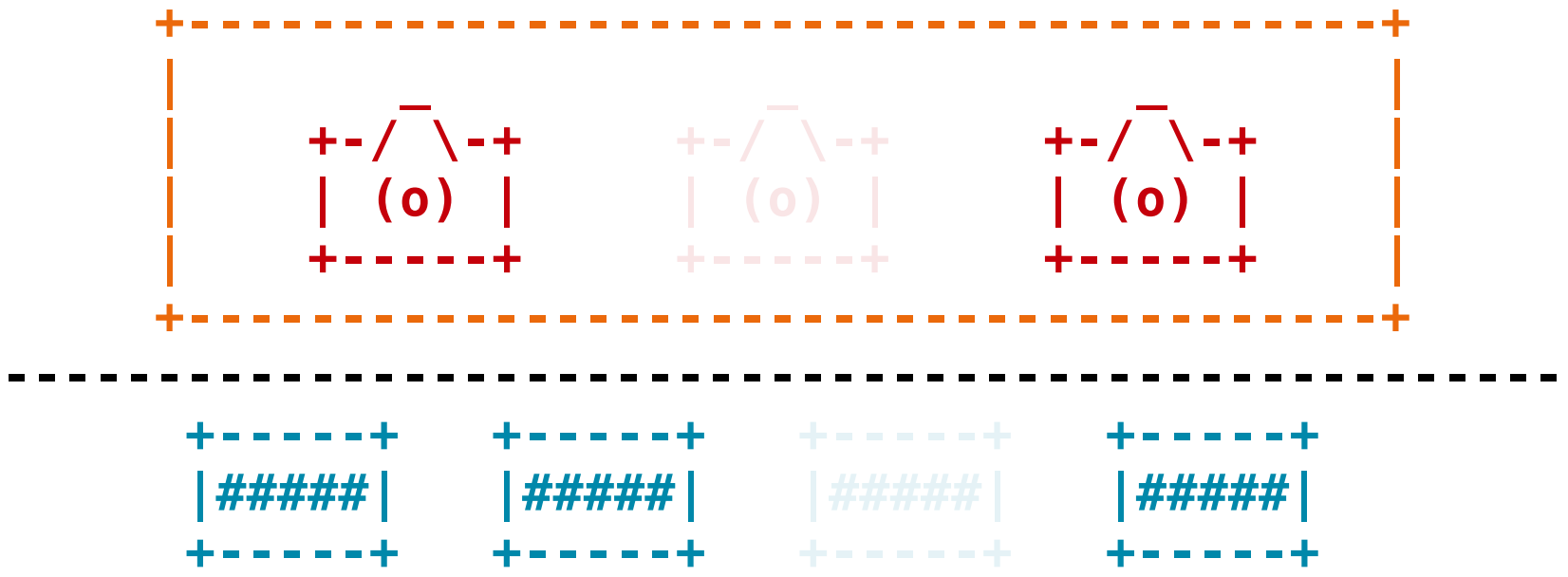
libcamera architecture



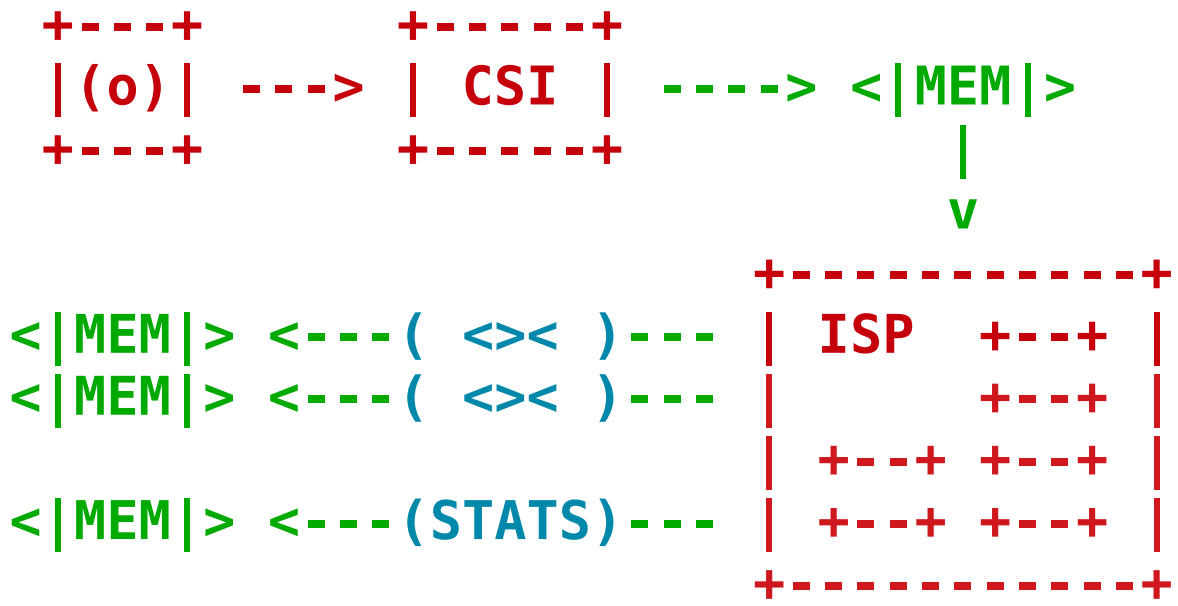
Camera Device



Camera Devices Manager



Camera Devices Manager



Pipeline Handler

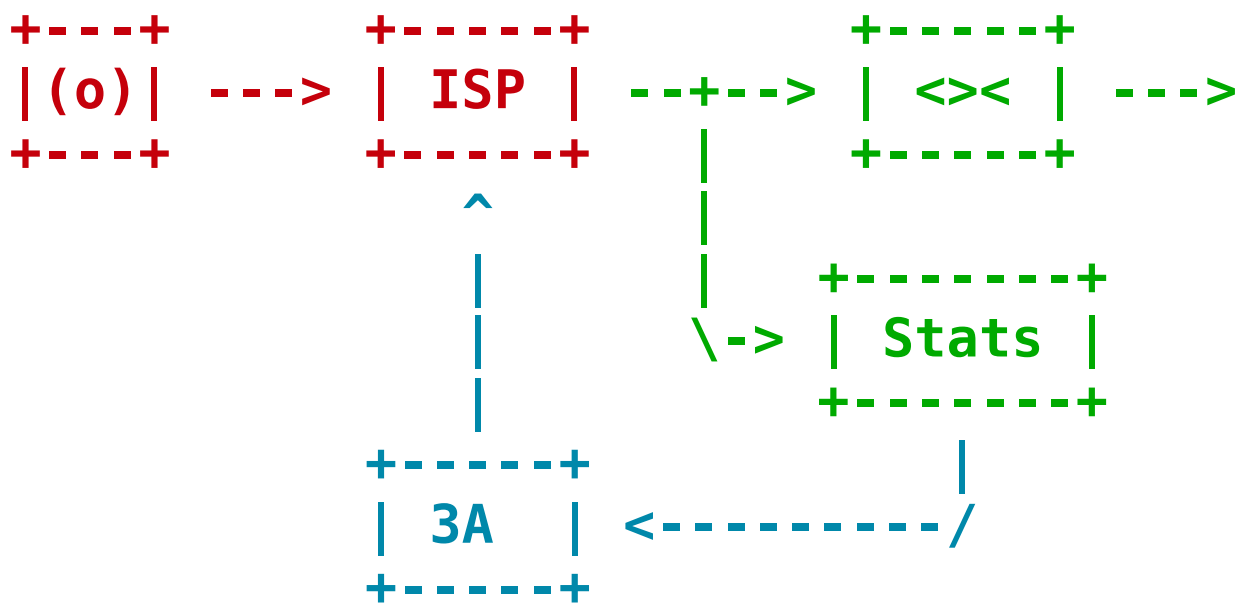


Image Processing Algorithms

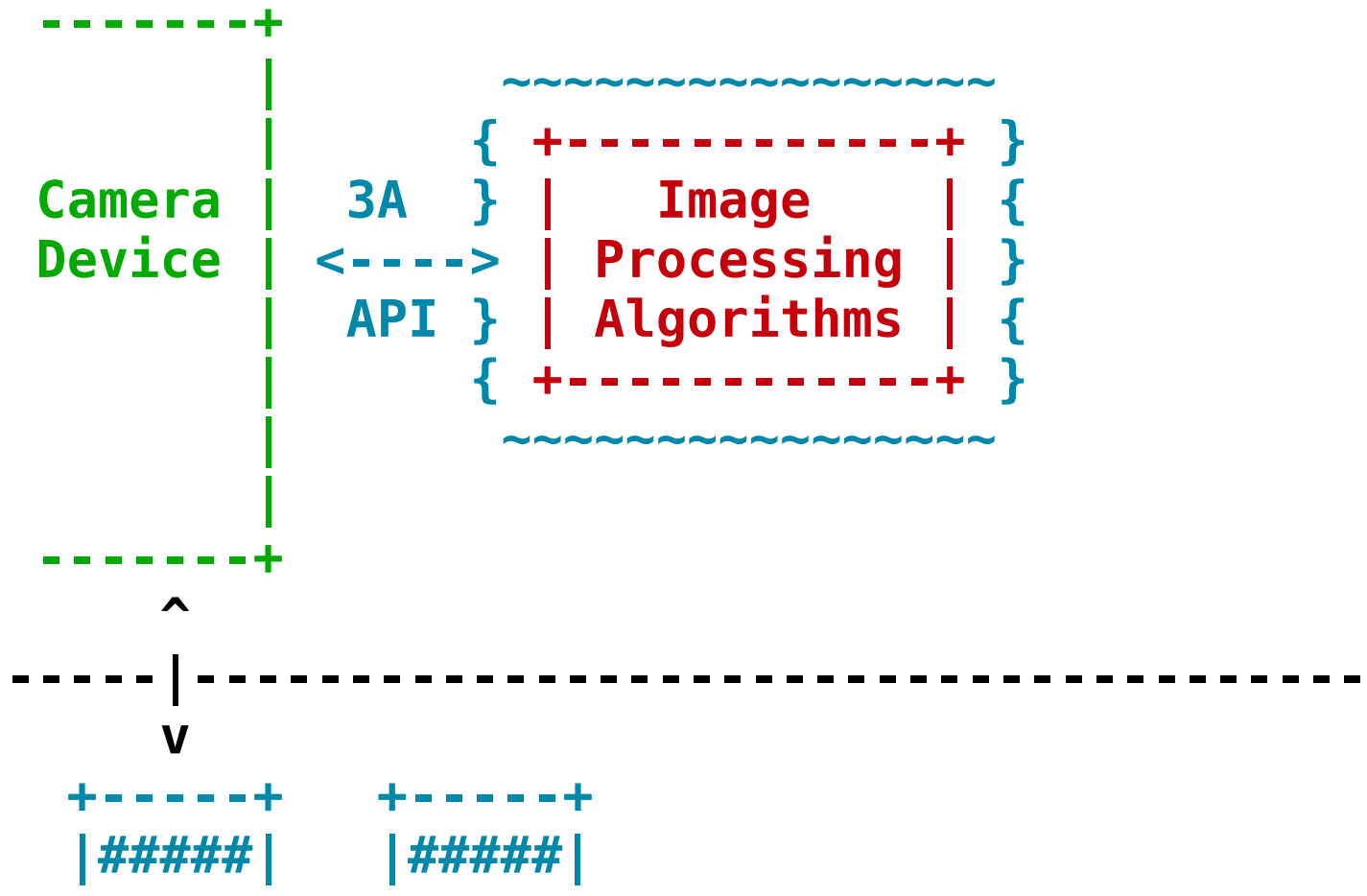
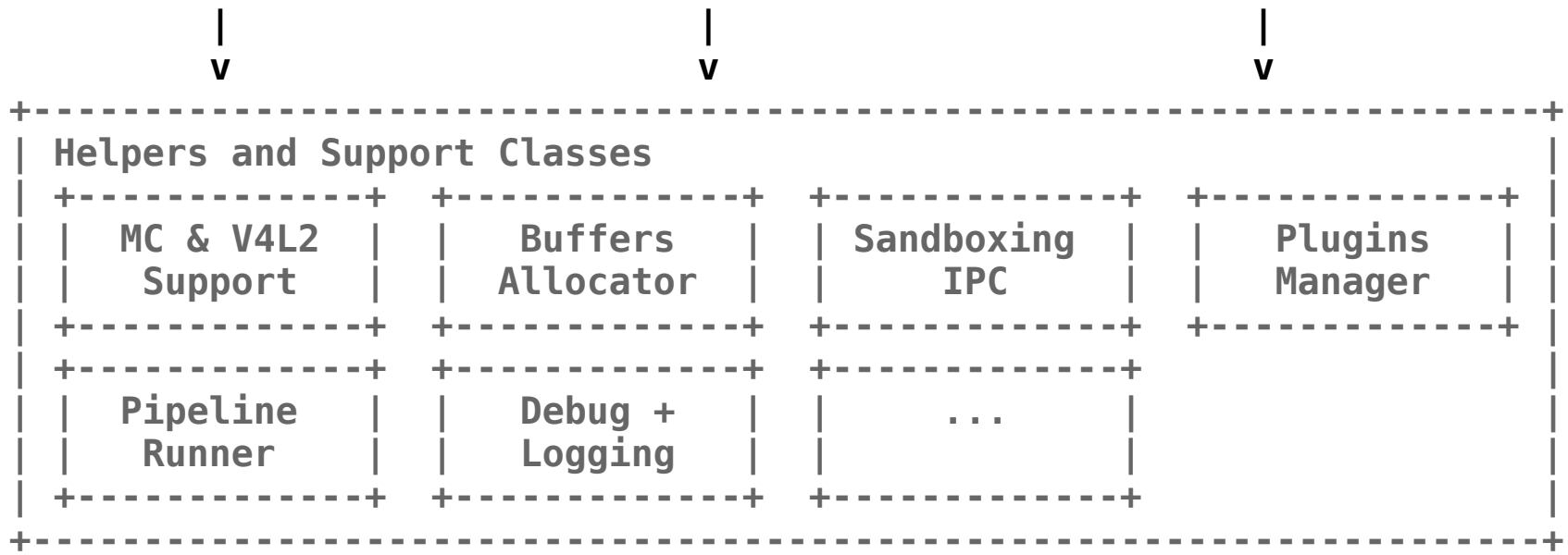
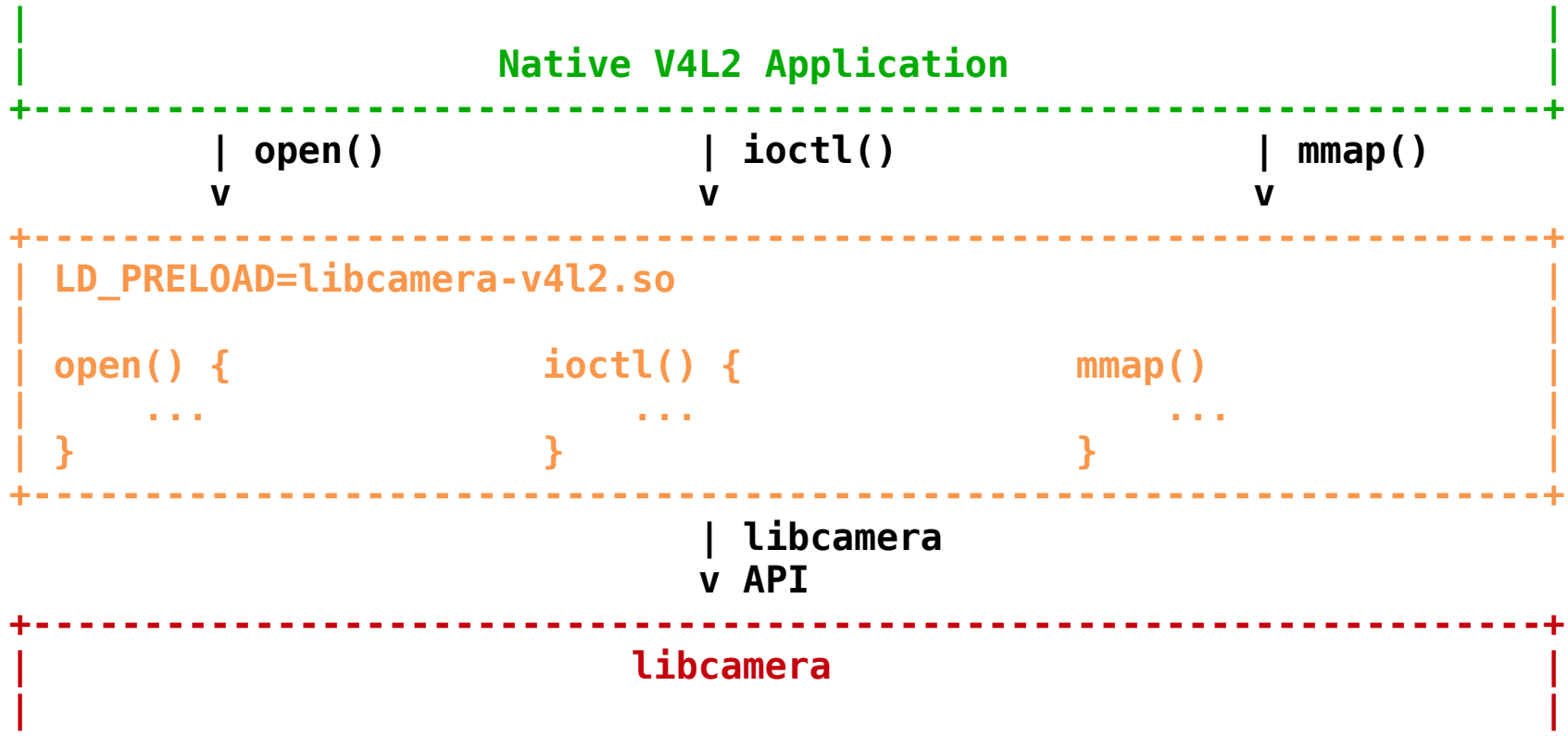


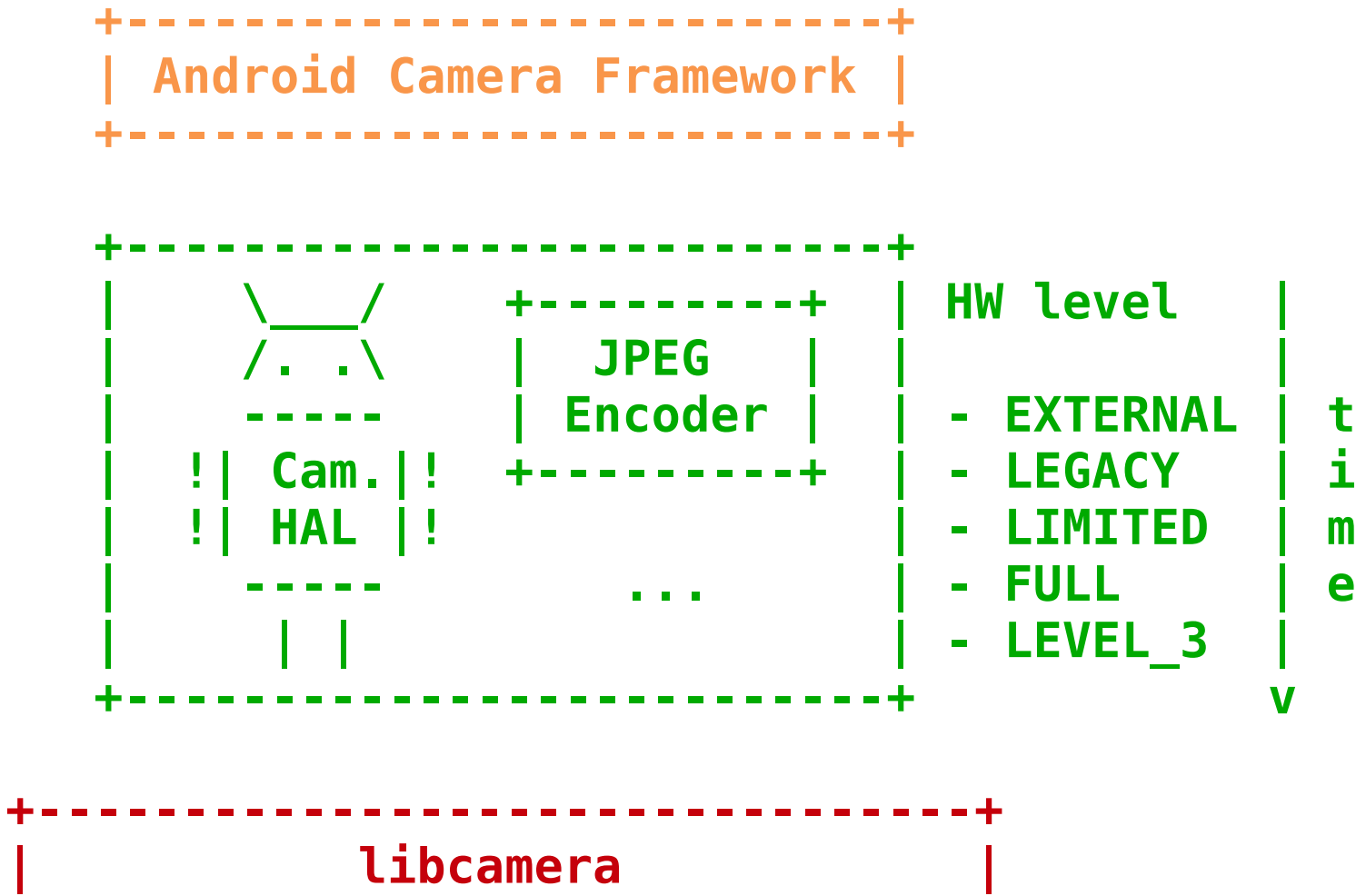
Image Processing Algorithms



Helpers and Support Classes

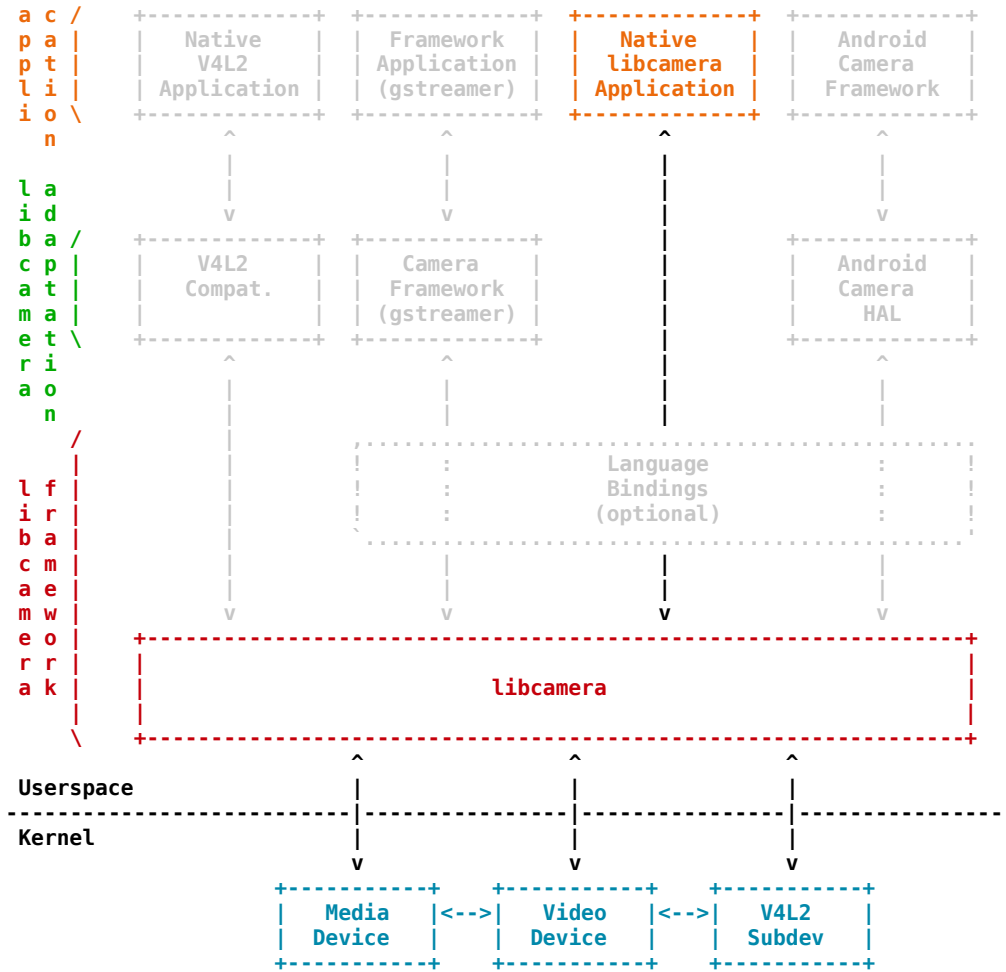


V4L2 Compatibility

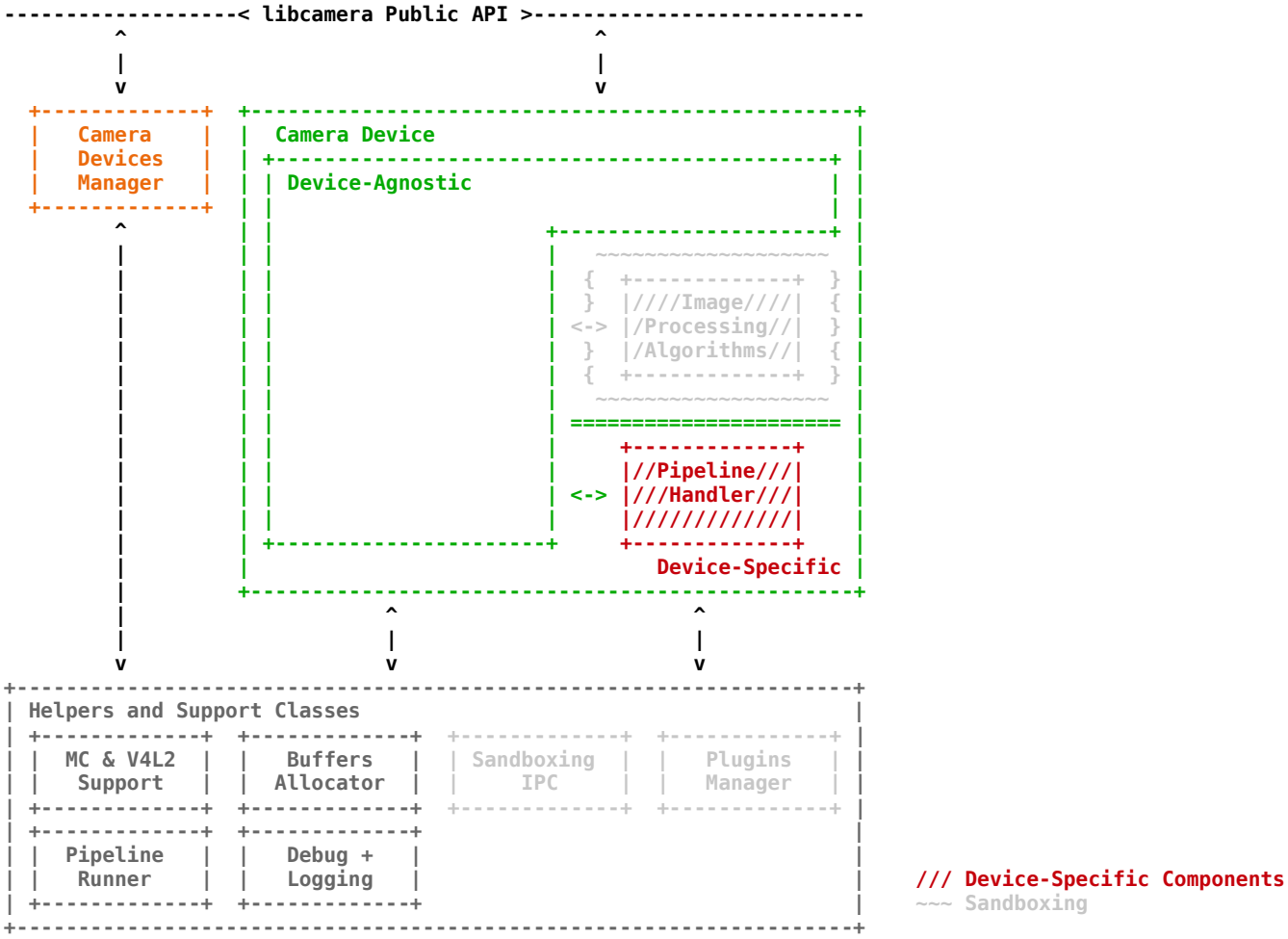


Android Camera HAL

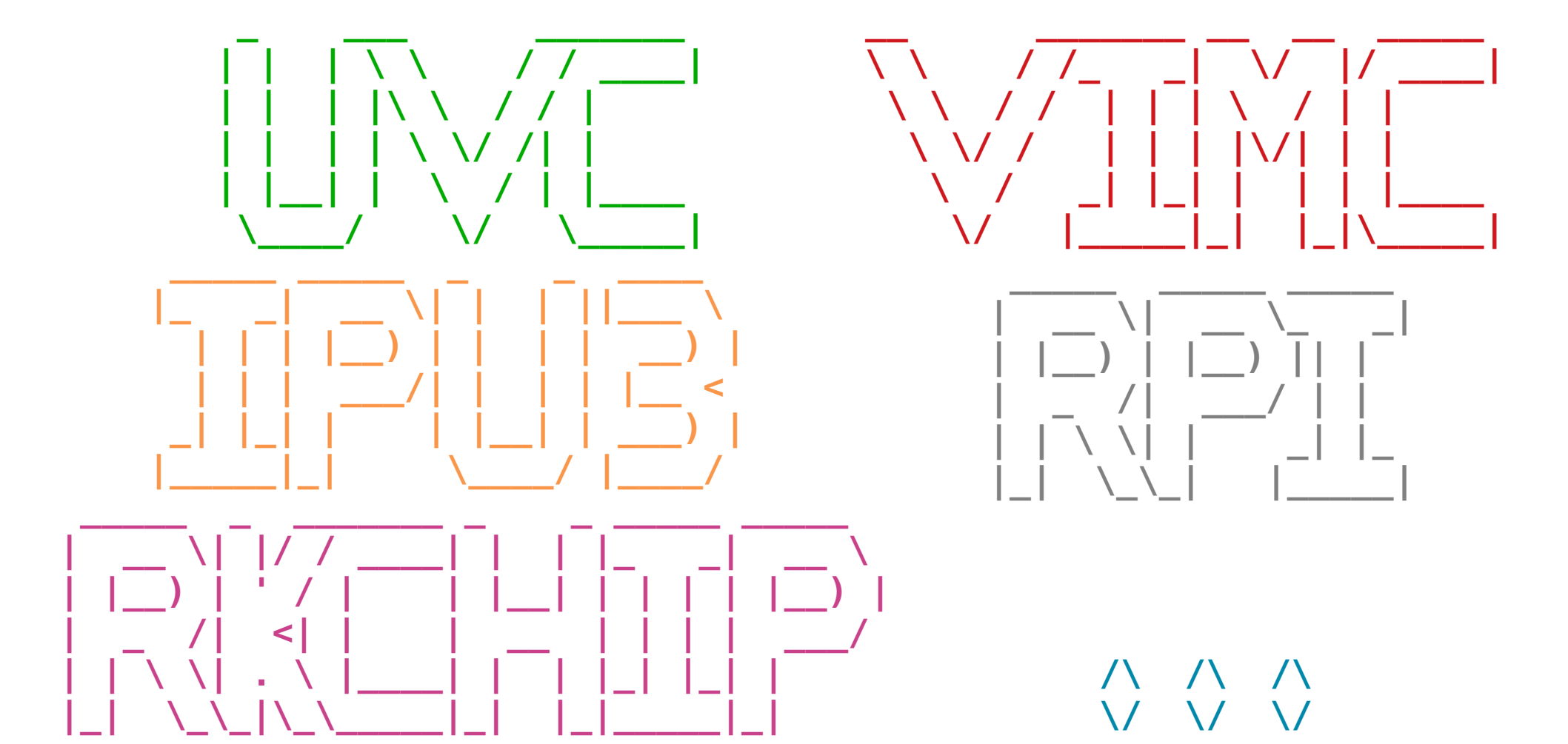
Libcamera Status



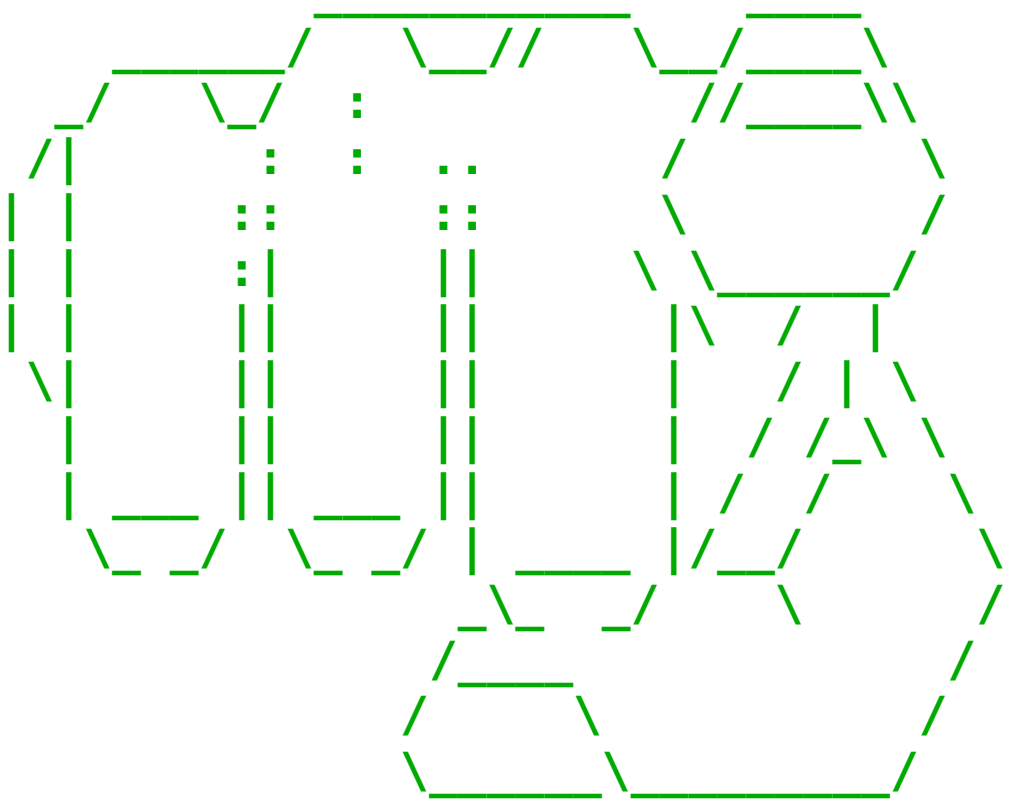
Camera Stack



libcamera architecture status



Status

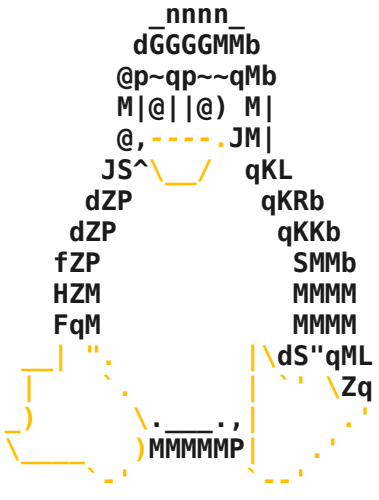


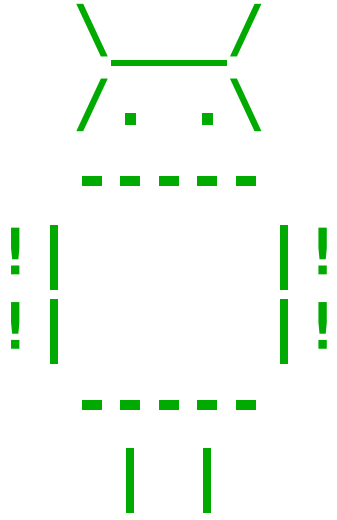
We need YOU

- Platforms
- Needs, Use cases
- Adoption

IDEAS ON BOARD

Status





Adoption

Contributing

libcamera is developed as a free software project and welcomes contributors. Whether you would like to help with coding, documentation, testing, proposing new features, or just discussing the project with the community, you can join our official public communication channels, or simply check out the code.

Mailing List

We use a public mailing list as our main means of communication. You can find subscription information and the messages archive on the **libcamera-devel** list information page.

IRC Channel

For informal and real time discussions, our IRC channel on Freenode is open to the public. Point your IRC client to #libcamera to say hello, or use the **WebChat**.

Source Code

libcamera is in early stages of development, and no releases are available yet. The source code is available from the project's **git tree**, hosted by **LinuxTV**.

```
$ git clone git://linuxtv.org/libcamera.git
```

Documentation

Project documentation is created using **Sphinx**. Source level documentation uses **Doxygen**. Please make sure to document all code during development.

Sphinx integration with Doxygen is planned, likely using **Breathe** and **Exhale**.

Submitting Patches

Patches submitted to the libcamera project must be certified as suitable for integration into an open source project. As such libcamera follows the same model as utilised by the Linux kernel, and requires the use of 'Signed-off-by:' tags in all patches.

By signing your contributions you are certifying your work in accordance with the **Developer's Certificate of Origin**

Contents

IDEAS ON BOARD

Contribute

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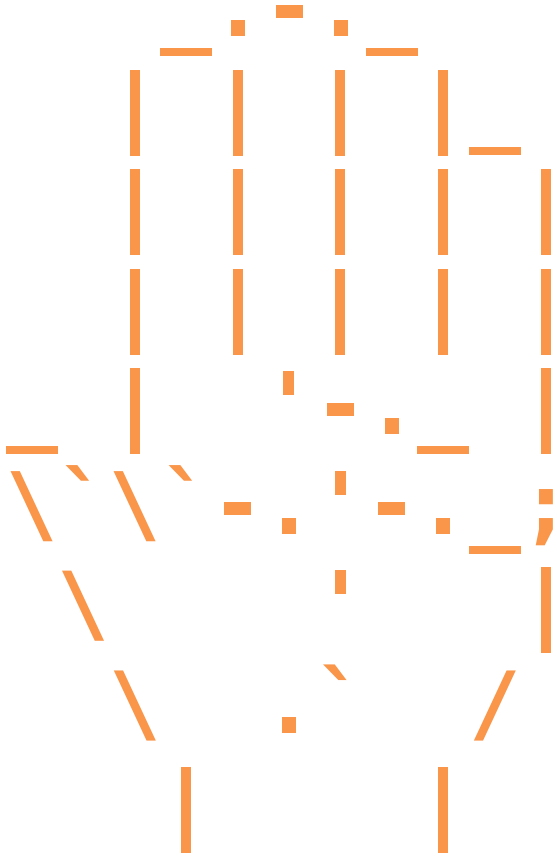

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irc://chat.freenode.net/#libcamera

kieran.bingham@ideasonboard.com

Contact

ขอบคุณ!