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| Phio Usage |
| A short introduction to phio options for vl53l3cx (vl53lx linux driver) |
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| **1/27/2021** |

1. Introduction

The VL53Lx Linux Driver delivery comes with a daemon (for IPP histograms’ related source code part which we don’t intend to disclose to our customers) and an example of user space application named “phio” (historically stands for photonic I/O) to call driver functions through ioctl or sysfs paths.

This phio application was not aiming to be a delivery itself but today it is currently used for tests and some FAE applications. That raises the need for a bit of documentation about it.

1. Parameters and settings

With the phio application, most of the time, the option used alone stands for “getting” the current value of the setting related to that option. For instance to get the current measurement timing budget you shall type

sudo ./phio –t

To change the timing budget value you have to add ‘=’ sign followed by the new value to set. For instance to set timing budget to 20 ms (i.e. 20 000µsec) you shall type

sudo ./phio –t=20000

Please note settings are actually applied to the device by the linux driver only when the ranging is started.

As a consequence, all setting parameters preceding the ‘-s’ will be applied before the actual start of measurements.

Typical example of a histogram based 10 values ranging measurement with a timing budget of 17 ms and a default ROI (full field of view):

sudo ./phio –t=17000 -s -Z=10 –S

note the –S stops the ranging

* 1. Linux device selection

By default, stmvl531lx linux driver’s installation creates the device called /dev/stmvl53lx\_ranging which is corresponding to the device number 0

In case of multiple devices connected to the host you can select the device to be used through phio with the –d option

[-d --dev dev\_no] dev\_no shall be set at first arg

sudo ./phio –d <number>

* 1. Tuning parameters

The tuning parameters can be displayed and modified thanks to phio   
Store the tuning params [key, value] tuplets in a text formatted file

sudo ./phio –g <destination\_file>

Modify the value for a specific tuning param

sudo ./phio -N "<key> <value>"

Update several tuning params [key, value] tuplets taken from a text formatted file

sudo ./phio –G <input\_params\_file>

Some keys can’t be actually modified by the user and driver may return device i/o error -4 in such case

When it occurs it ends up with the following message in phio:

[Eio] perform\_tuning\_ioctl -1 Input/output error [device i/o error is -4]

1. Calibration
   1. Reference Spad Management

Performs reference spad management calibration. See user manual for further explanations.

sudo ./phio -R

* 1. Crosstalk calibration

Xtalk calibration histogram based mode crosstalk calibration needs for a target location setting if there is not a field free of target up to 600mm from the sensor.

The actual distance of the target (here 580 mm) is passed through a dedicated tuning param index VL53LX\_TUNING\_SINGLE\_TARGET\_XTALK\_TARGET\_DISTANCE\_MM = 2

sudo ./phio -N "2 580" -X

Enable Xtalk compensation in driver:

sudo ./phio –E=1

Enable Live xtalk correction (aka smudge correction):

sudo ./phio –h=2

* 1. Offset calibration

Perform Offset calibration(arguments = OffsetCalibrationMode, Distance of target)

OffsetCalibrationMode :

4 OFFSET : normal offset calibration

5 OFFSET\_PER\_VCSEL : performs 3 offset calibration, one for each distance mode

6 OFFSET\_ZERO\_DISTANCE (distance arg is then ignored) : offset calibration for “repair stores” with a target touching the cover glass

sudo ./phio -F "4 150"

The choice of offset correction to apply is done by -T option, selecting between 1 (standard, apply offset calibrated by mode 4 or 6) and 3 (per vcsel) which applies the right offset calibrated by mode 5 according to the distance mode active while the ranging operates.

* 1. Dump or read calibration in file

Read current calibration values into a bin file :

sudo ./phio –c cal.bin

Load Xtalk values from a bin file(updated with fixed xtalk values for instance):

sudo ./phio –C cal.bin

Print the data in calibration bin file in human reading format

sudo ./phio -l "cal.bin out.txt"

cat out.txt

On the other hand you can modify some values in out.txt and recode it to apply to the driver

sudo ./phio -L "out.txt cal.bin "

sudo ./phio –C cal.bin

1. Ranging
   1. Ranging examples

Histogram ranging with 15 ms of timing budget

sudo ./phio -t=15000 -s -Z=10 -S

1. Options detailed
   1. Option -Z

Run a specific number of measurement.

–Z shall be followed by the number of measurements to perform, example for 10 rangings –Z =10.

* 1. Option –P

Set the device polling delay to time\_ms and run a pause of the same time

[-P --Pause time\_ms]

* 1. Option –O

Set ROI values, values are given as list.

The following will set ROI with the coordinates x0 y0 x1 y1:  
x0: top left x ROI rectangle’s corner coordinate

y0: top left y ROI rectangle’s corner coordinate

x1: bottom right x ROI rectangle’s corner coordinate

y1: bottom right y ROI rectangle’s corner coordinate

sudo ./phio -O="6 9 9 6"

Please refer to the user manual for further description about ROIs.

* 1. Option –o

Get currently ROI values

sudo ./phio -o

or

sudo ./phio --roi\_get

* 1. Option –s

Start ranging.

* 1. Option –S

Stop ranging.

* 1. Option –t

Set/Get timing budget.

-t [=time\_us]

* 1. Option –D

Set/Get distance mode.

-D [=distance\_mode] : set/get distance mode, values 1 = short, 2 = medium, 3 = long