Linux I2C in the 21st century

Wolfram Sang, Renesas / Consultant

29.10.2019, ELCE 2019
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Workflow
I2C: its simplicity is a problem

What could go wrong?

- specs didn’t change much since 1982
- definitely not rocket science\(^1\)
- drivers are (relatively) simple

So, do an IP core, dump the driver, move on…

\(^1\)yet, gory details are everywhere
I2C: its simplicity is a problem

What could go wrong?
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I2C is a good example
- a *Fly-by* subsystem
- mostly used by embedded
- largely maintained in spare time

\(^1\)yet, gory details are everywhere
Growth of I2C bus master drivers

number of files in drivers/i2c/busses


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Which group???
From: Wolfram Sang <wsa@the-dreams.de>
Subject: I2C delay due to maintainer illness

sadly, I have been tied to bed for a few days now, not in a condition to really work on I2C...

I think it is annoying, sure, but no catastrophe. However, it shows that I am the single-point-of-failure for I2C patches, what I don't like. Like I said before, I am open to group maintainership. If you think you are a reliable candidate, please get in touch with me.
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“Get well soon!”
Divide & conquer to the extreme

I2C SUBSYSTEM
M: Wolfram Sang <wsa@the-dreams.de>
L: linux-i2c@vger.kernel.org
...
S: Maintained

I2C SUBSYSTEM HOST DRIVERS
L: linux-i2c@vger.kernel.org
...
S: Odd Fixes
Divide & conquer to the extreme

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L: linux-i2c@vger.kernel.org
... 
S: Odd Fixes

66 drivers have dedicated maintainers now
I2C ACPI SUPPORT
M: Mika Westerberg <mika.westerberg@linux.intel.com>
S: Maintained

I2C MUXES
M: Peter Rosin <peda@axentia.se>
S: Maintained

I2C/SMBUS CONTROLLER DRIVERS FOR PC
M: Jean Delvare <jdelvare@suse.com>
S: Maintained
Modern complex setups
API changes
API changes: retval for i2c_new_*

- NULL
+ ERR_PTR
API changes: retval conversions

- i2c_new_dummy
+ i2c_new_dummy_device (done)

- i2c_new_secondary_device
+ i2c_new_ancillary_device (done)

- i2c_new_device
+ i2c_new_client_device (WIP)

- i2c_new_probed_device
+ ??? (TBD)
API changes: more devm__*

+ devm_i2c_new_client_device (TBD)
+ devm_i2c_new_dummy_device (done)
+ devm_i2c_new_ancillary_device (TBD)
API suggestion

- i2c_new_dummy_device
- (client->adapter, addr)

+ i2c_new_ancillary_device
+ (client, name, default_addr)
New atomic callbacks

+ int (*master_xfer_atomic)(...)
+ int (*smbus_xfer_atomic)(...)

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New fault injectors
Figure 1: Scoped with sigrok
Dangerous! The unintended write

Figure 2: Scoped with sigrok
much better!

Figure 3: Scoped with sigrok
from the docs\textsuperscript{2}:

“This fault injector will create a Kernel panic once the master under test started a transfer. This usually means that the state machine of the bus master driver will be ungracefully interrupted and the bus may end up in an unusual state. Use this to check if your shutdown/reboot/boot code can handle this scenario.”

Remember the atomic transfers?

\footnote{\texttt{Documentation/i2c/gpio-fault-injection.rst}}
Here, we want to simulate the condition where the master under test loses the bus arbitration against another master in a multi-master setup.

As simple as:

```
$ echo 200 > lose_arbitration &
$ i2cget -y <bus_to_test> 0x3f
```
Questions? Comments?

- Right here, right now...
- At the conference
- wsa@the-dreams.de
References

- Renesas Electronics Logo