VISION 2020「From Domestic No.1 to Global Top 10」

SiW Touch Driver
version 1.0

2016.03.15

R&D / Touch Team

History

Version	Date	Description
1.0	2016.03.15	1st release

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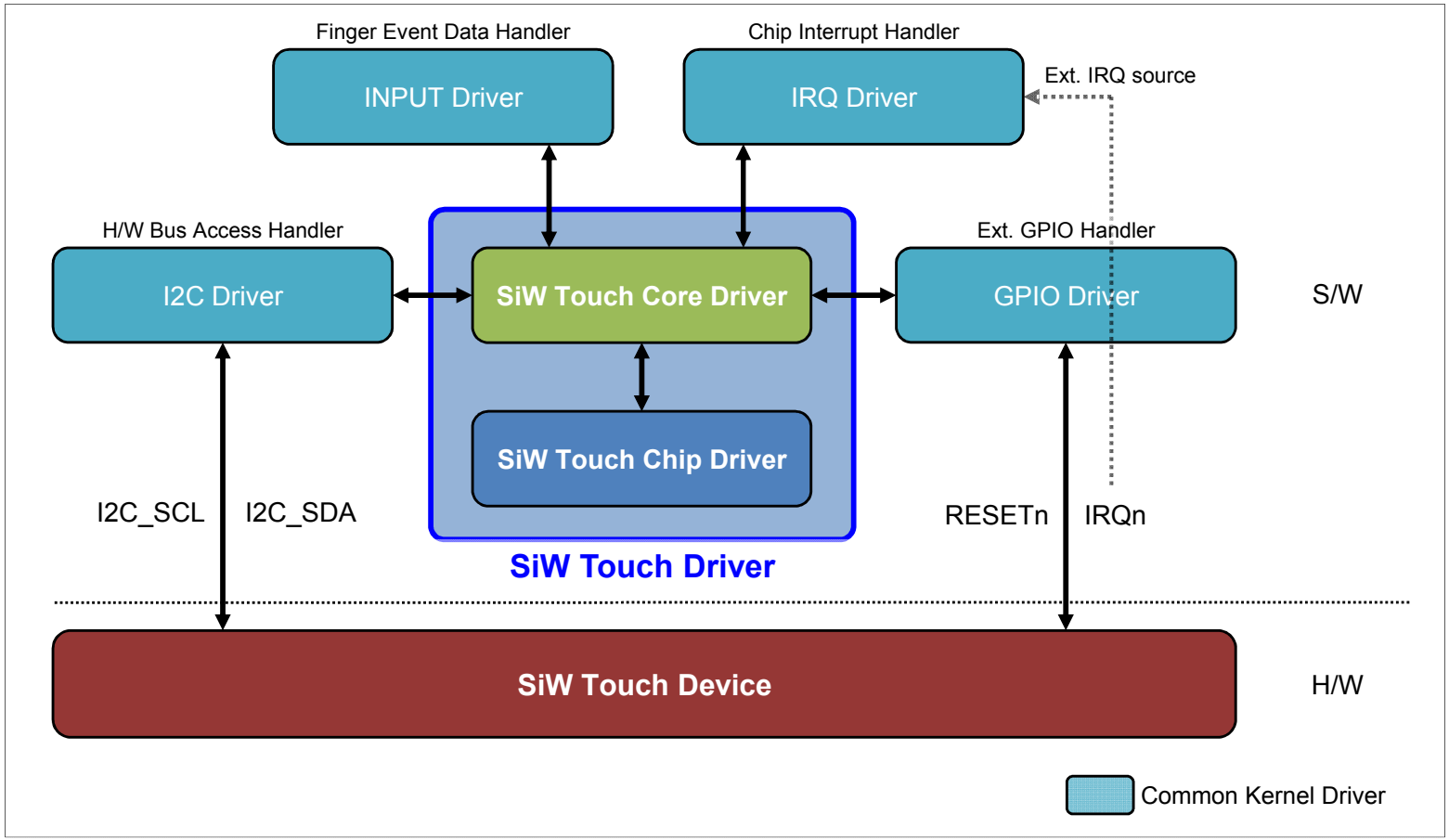
(1) Overview



[Fig. 1-1] Driver Relationship

1. Driver Operation

1.1 Driver Architecture

(2) SiW Touch Driver Files

Layer	Name	Description
Touch Core Layer	siw_touch.c/h	Touch Core main control
	siw_touch_bus.c/h	Touch Bus I/F main
	siw_touch_bus_i2c.c/h	Touch Bus I/F - I2C type
	siw_touch_bus_spi.c/h	Touch Bus I/F - SPI type
	siw_touch_bus_event.c/h	Touch Input & Event control
	siw_touch_gpio.c/h	Touch GPIO control
	siw_touch_irq.c/h	Touch Interrupt control
	siw_touch_notify.c/h	Touch Notifier Chain
	siw_touch_of.c/h	Touch Device Tree analysis
	siw_touch_sysfs.c/h	Touch Sysfs control
	siw_touch_sys.c/h	Helper for Touch & System Inter-connection
Touch Chip Layer	touch_lg4894.c/h	LG4894 main control
	touch_lg4894_sysfs.c/h	LG4894 Sysfs (additional)
Build Files	Kconfig / Makefile	

[Table. 1-1] Drivers Files and Role

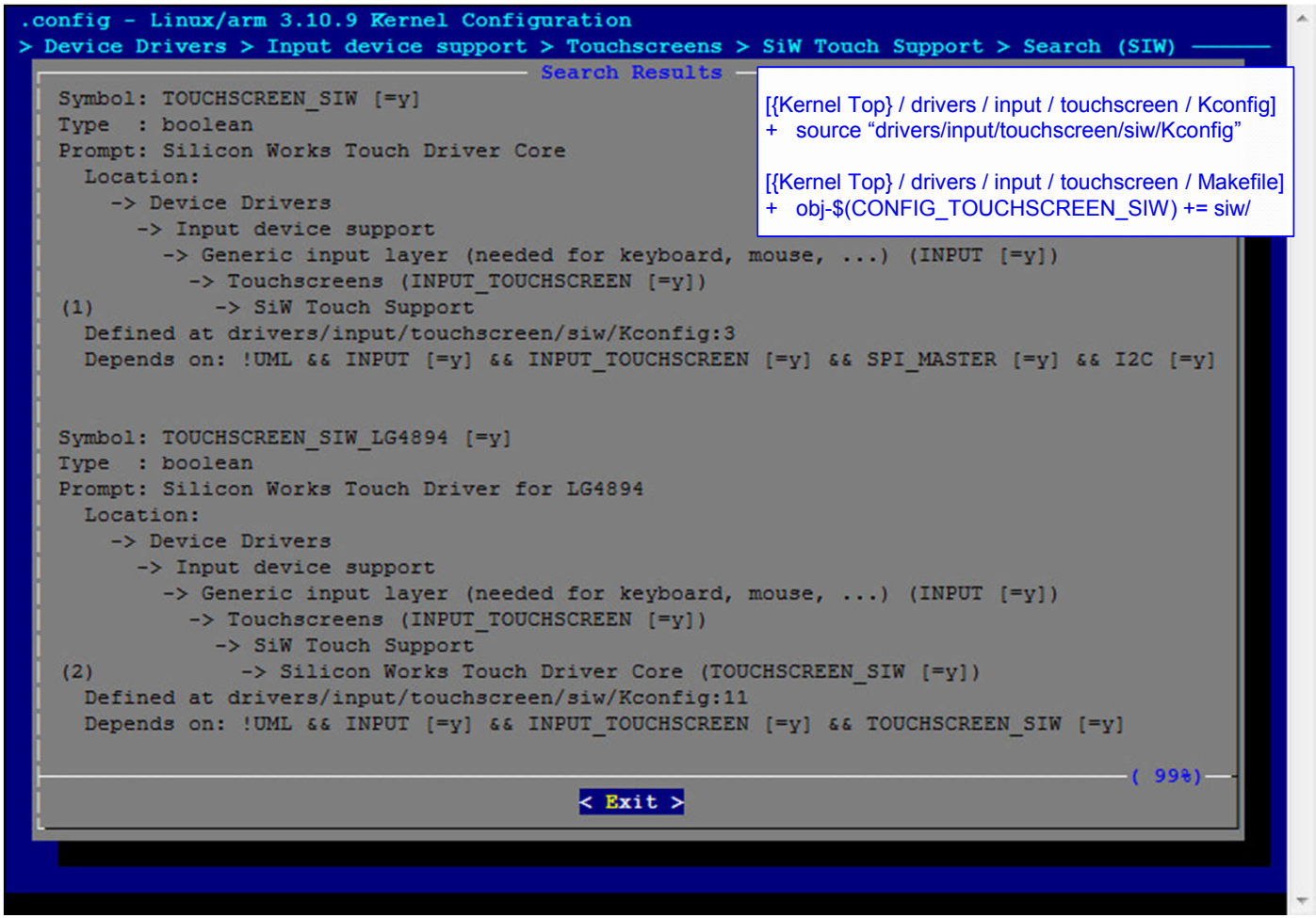
Test Environment		
H/W		Odroid-XU4(Exynos5422)
S/W	Platform Version	Android 4.4.4
		Kernel 3.10.9
	Driver Folder	{Kernel Top} / drivers / input / touchscreen / siw
		{Kernel Top} / include / linux / input : siw_touch_notify.h

[Table. 1-2] Test Environment

1. Driver Operation

1.1 Driver Architecture

(2) SiW Touch Driver Files - Kconfig

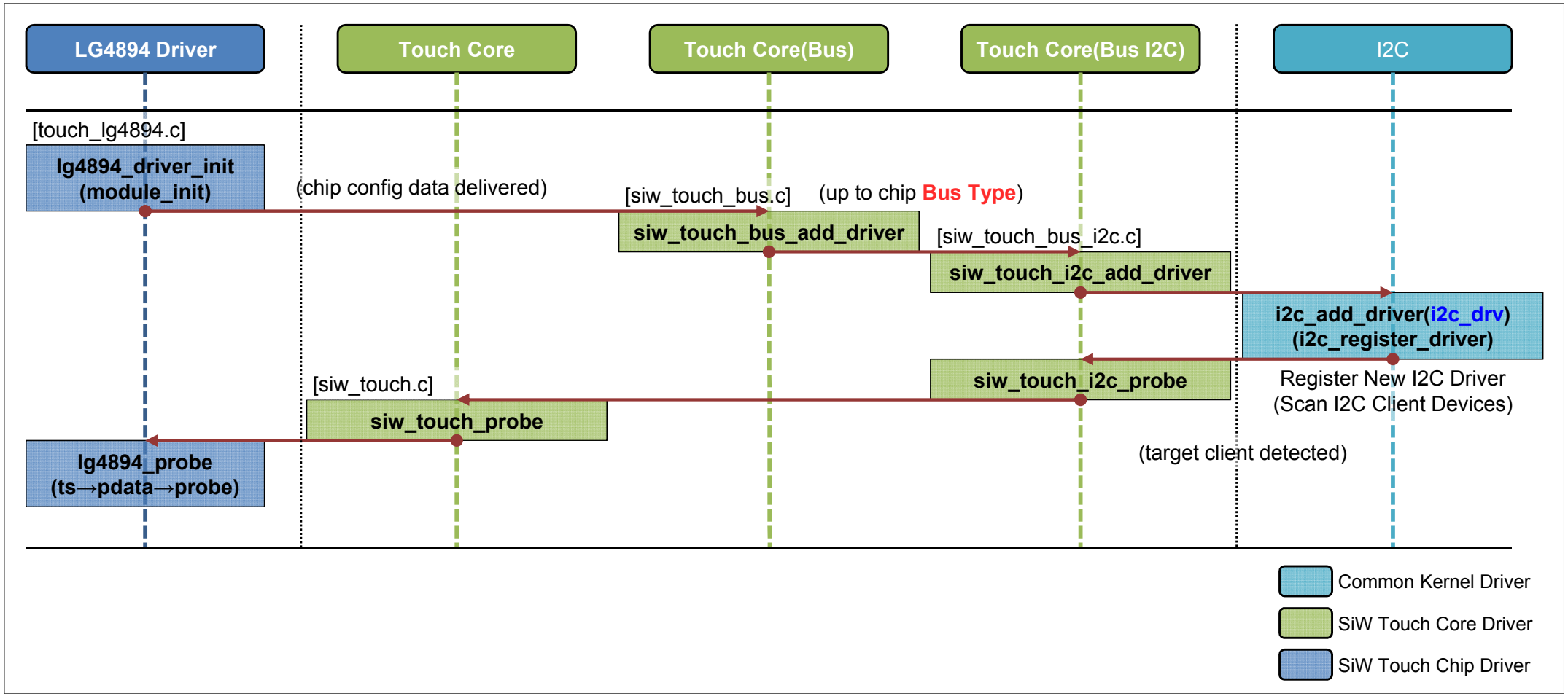


[Fig. 1-2] Kconfig (example)

1. Driver Operation

1.2 Initialization Flow

(1) Initial Probe Sequence

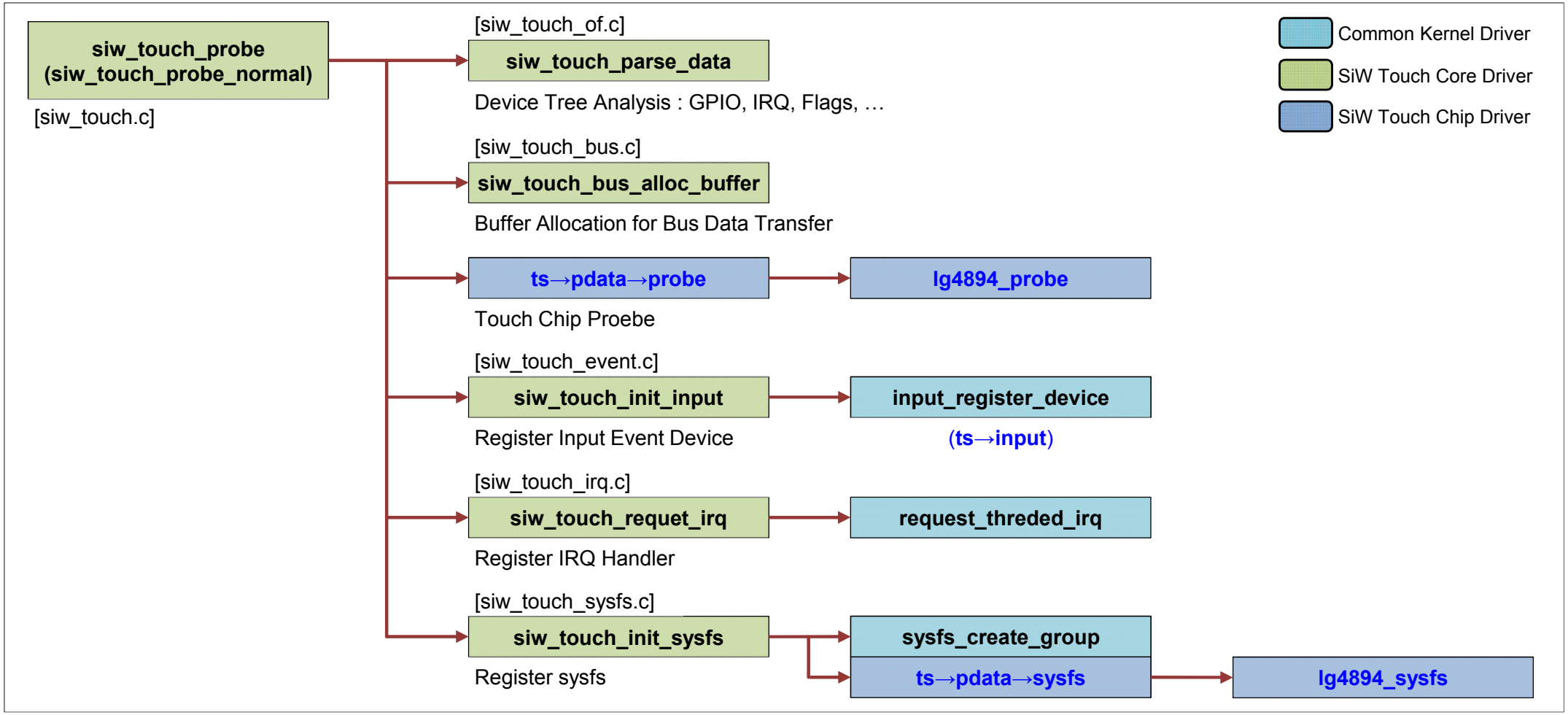


[Fig. 1-3] Driver Probe Sequence

1. Driver Operation

1.2 Initialization Flow

(2) Inside Core Probe

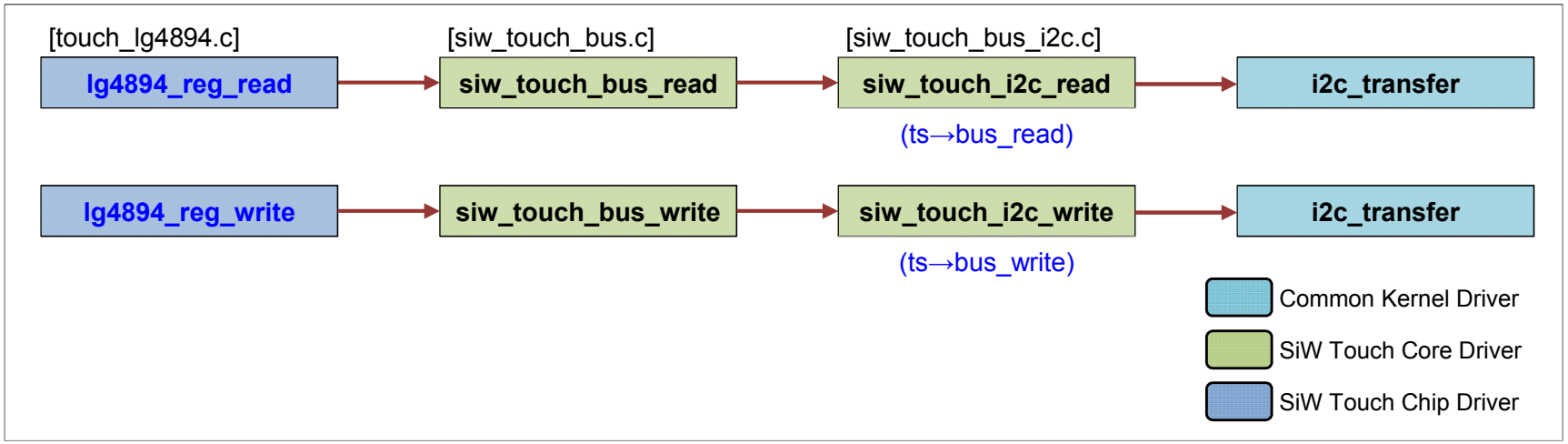


[Fig. 1-4] Operation Steps in Core Probe

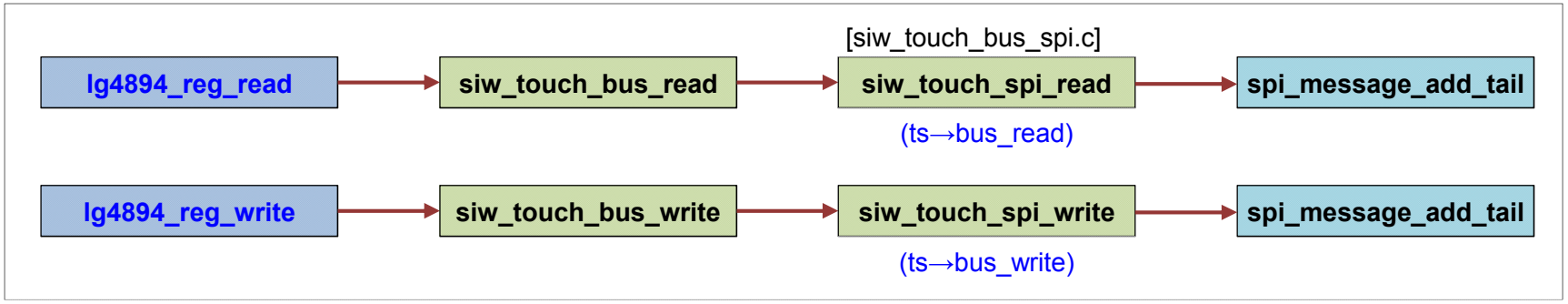
1. Driver Operation

1.3 Operation

(1) Bus Access



[Fig. 1-5] Bus Access Flow for I2C type

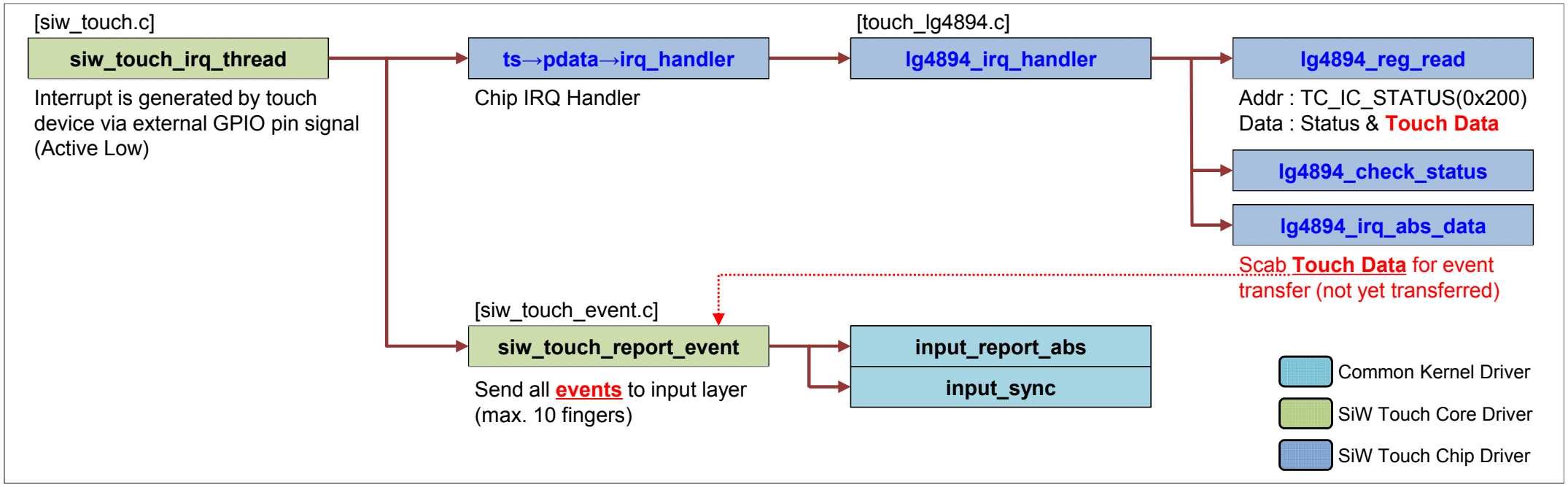


[Fig. 1-6] Bus Access Flow for SPI type

1. Driver Operation

1.3 Operation

(2) IRQ Handler (when touch event detected)



[Fig. 1-7] Interrupt Handling

- An appropriate external interrupt connection shall be guaranteed for the accuracy of this IRQ operation

1. Driver Operation

1.4 Kernel Log (example)

(1) Probe message

```
[    3.046610] mousedev: PS/2 mouse device common for all mice
[    3.051944] usbcore: registered new interface driver xpad
[    3.056764] usbcore: registered new interface driver dwav_usb_mt
[    3.062215] lg4894 driver init
[    3.065344] siw_touch 5-0028: dev bus probe : i2c-5/5-0028
[    3.070724] siw_touch 5-0028: touch probe
[    3.074708] siw_touch 5-0028: siw_touch_do_probe_normal
[    3.079921] siw_touch 5-0028: of gpio  : reset-gpio(0x1), 23
[    3.085555] siw_touch 5-0028: of gpio  : irq-gpio, 22
[    3.091552] input: siw_touch_input as /devices/12c70000.i2c/i2c-5/5-0028/input/input6
[    3.098817] input input0: input device registered (720, 1280, 255, 15, 15, 1, 10)
[    3.106111] siw_touch 5-0028: threaded irq request done(530, siw_touch, 0x2002)
[    3.113890] siw_touch 5-0028: hw_reset_delay : 210 ms
[    3.121584] s2m-rtc s2m-rtc: s2m_rtc_enable_wtsr: enable WTSR
[    3.126169] s2m-rtc s2m-rtc: s2m_rtc_enable_smpl: enable SMPL
```

- 5-0028 : I2C adaptor(0x12C70000) is registered as I2C-5 and the slave address of the client(LG4894) is 0x28.

1. Driver Operation

1.4 Kernel Log (example)

(2) System Information

```
root@odroidxu3:/sys/bus/i2c/devices/5-0028 # ll
lrwxrwxrwx root     root              2013-01-01 14:44 driver -> ../../../../bus/i2c/drivers/siw_touch
drwxr-xr-x root     root              2013-01-01 14:44 input
-r--r--r-- root     root         4096 2013-01-01 09:09 modalias         // = i2c:lg4894
-r--r--r-- root     root         4096 2013-01-01 09:09 name             // = lg4894
drwxr-xr-x root     root              2013-01-01 09:09 power
lrwxrwxrwx root     root              2013-01-01 09:09 subsystem -> ../../../../bus/i2c
-rw-r--r-- root     root         4096 2013-01-01 09:09 uevent

root@odroidxu3:/sys/bus/i2c/devices/5-0028/input # ll
drwxr-xr-x root     root              2013-01-01 14:46 input6           // input6/name = siw_touch_input
drwxr-xr-x root     root              2013-01-01 14:46 siw_touch_input



root@odroidxu3:/proc/bus/input # cat devices
…
I: Bus=0018 Vendor=abcd Product=9876 Version=1234
N: Name="siw_touch_input"
P: Phys=i2c-5/5-0028/siw_touch_input
S: Sysfs=/devices/12c70000.i2c/i2c-5/5-0028/input/input6
U: Uniq=
H: Handlers=event4
B: PROP=2
B: EV=9
B: ABS=67c8000 0
```

2. Device Tree (example)

- Definition of I2C client device for LG4894 (refer to DTS example files for more information)

```
…
&i2c_1 {                                    // indicates parent device : I2C_1 adapter block
    lg4894@28 {                             // define new client device(lg4894) and slave addr. is 0x28
        status = "okay";
        compatible = "siw,lg4894";          // compatible name (see lg4894.c)
        reg = <0x28>;                       // slave addr. : 0x28
        interrupt-parent = <&gpx1>;         // interrupt source : GPIO group gpx1
        interrupts = <6 0x02>;              // index 6(0~7) in gpx1 external interrupts
        irqflags = <0x2002>;                // IRQF_ONESHOT(0x2000) | IRQF_TRIGGER_FALLING(0x2)
        chip_flags = <0>;
        reset-gpio = <&gpx1 7 GPIO_ACTIVE_LOW>;          // index 7 in gpx1
        irq-gpio = <&gpx1 6 GPIO_ACTIVE_LOW>;            // index 6 in gpx1
        /* Caps */
        max_x = <720>;
        max_y = <1280>;
        max_pressure = <0xff>;
        max_width = <15>;
        max_orientation = <1>;
        max_id = <10>;
        /* role */
        hw_reset_delay = <210>;
        sw_reset_delay = <90>;
        use_lpwg = <1>;
        use_lpwg_test = <1>;
        /* firmware */
        use_fw_upgrade = <0>;
        use_firmware = <0>;
        fw_image = "/sdcard/siw/lg4894/ph1/L0W57PH1_0_02.img";
        panel_spec = "/sdcard/siw/lg4894/ph1/ph1_limit.txt";
        panel_spec_mfts = "/sdcard/siw/lg4894/ph1/ph1_limit_mfts.txt";
    };
};
```

(mandatory)

[gpx1 definition in exynos5422 pinctrl device tree]

```
…
    pinctrl@13400000 {
    …
        gpx1: gpx1 {
            …
                    interrupt-controller;
                    interrupt-parent = <&combiner>;
                    #interrupt-cells = <2>;
                    interrupts = <28 0>, <28 1>, <29 0>, <29 1>,
                                 <30 0>, <30 1>, <31 0>, <31 1>;
        };
        …
    };
…
```

- This example has been established based on odroidx-xu4(exynos5422) platform
- The detail configuration shall be modified up to main chipset.