

Regulator userspace consumer

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EXTERNAL USE



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Case Description

There is requirement need to control(enable/disable) regulator from user space.

Regulator userspace-consumer driver can help.

But it doesn't support device tree. A patch for handling device tree is needed.

`linux/drivers/regulator/userspace-consumer.c`

Demo environment

HW: i.MX8QXP

SW: rel_imx_5.4.47_2.2.0 + userspace consumer patch & changes

Software patch & changes

1. Add device tree support
userspace-consumer.c.DT.support.rel_imx_5.4.47_2.2.0.patch
2. Enable Linux regulator userspace consumer
CONFIG_REGULATOR_USERSPACE_CONSUMER
3. Device tree to use regulator userspace consumer
imx8qxp-mek-reg-userspace-consumer.dts

Userspace consumer binding

Userspace consumer regulators

Required properties:

Compatible : Must be "reg-userspace-consumer".

regulator-supplies: Supply names for this regulator.
This can be multiple strings.

Optional properties:

regulator-name: Name of the consumer line.

regulator-boot-on: Enable regulator on booting.

With all supply names,
there should be <supply-name>-supply to
pass regulators handle as defined in regulator.txt.

Example:

```
userspace-consumer {  
    compatible = "reg-userspace-consumer";  
  
    regulator-name = "user-consumer-1";  
    regulator-boot-on;  
    regulator-supplies = "vdd", "vcc", "vdd-3v3";  
        vdd-supply = <&reg1>;  
        vcc-supply = <&reg2>;  
        vdd-3v3-supply = <&reg3>;  
};
```

Software patch & changes(cont.)

imx8qxp-mek-reg-userspace-consumer.dts

```
/*
 * Copyright 2019-2020 NXP
 */
/dts-v1/;
#include "imx8qxp-mek.dts"

/ {
    userspace-consumer-SD1_SPWR {
        compatible = "reg-userspace-consumer";
        regulator-name = "reg-userspace-consumer-test-SD1_SPWR";
        regulator-supplies = "SD1_SPWR";
        SD1_SPWR-supply = <&reg_usdhc2_vmmc>;
        regulator-boot-on;
    };

    userspace-consumer-usb_otg1_vbus {
        compatible = "reg-userspace-consumer";
        regulator-name = "reg-userspace-consumer-test-usb_otg1_vbus";
        regulator-supplies = "usb_otg1_vbus";
        reg_usb_otg1_vbus-supply = <&reg_usb_otg1_vbus>;
    };
};
```

```
&iomuxc {
    pinctrl_reg_vmmc_gpio: regvmmcgpiogrp {
        fsl,pins = <
            IMX8QXP_USDHC1_RESET_B_LSIO_GPIO4_IO19
            0x00000021
            >;
    };

    &usdhc2 {
        /delete-property/ vmmc-supply;
        /delete-property/ pinctrl-0;
        /delete-property/ pinctrl-1;
        /delete-property/ pinctrl-2;
        /delete-property/ pinctrl-names;
    };

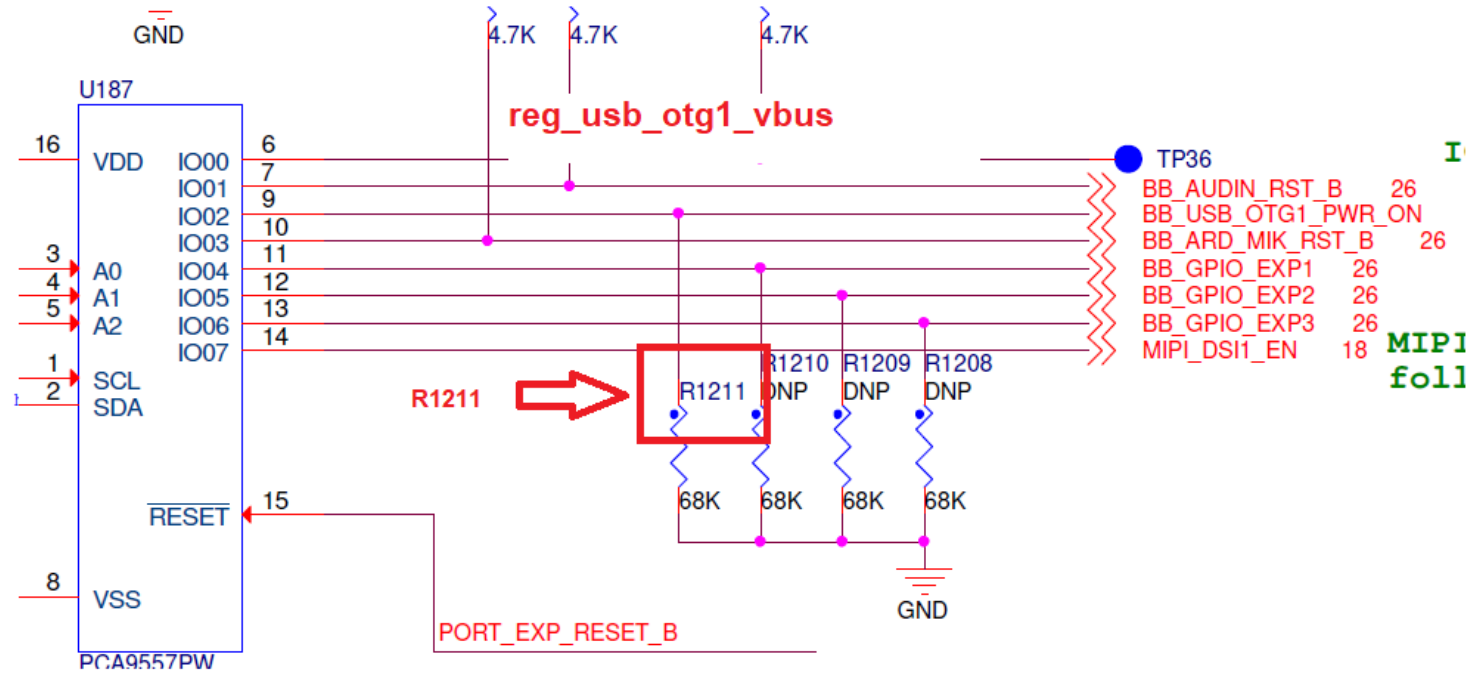
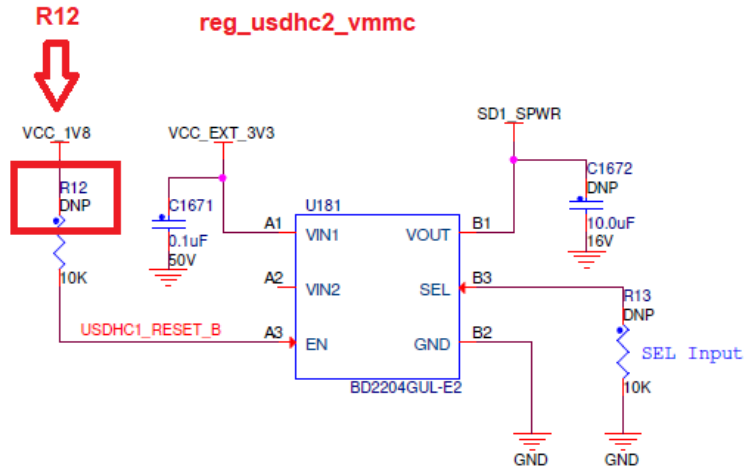
    &usbotg1 {
        /delete-property/ vbus-supply;
    };

    &reg_usdhc2_vmmc {
        pinctrl-names = "default";
        pinctrl-0 = <&pinctrl_reg_vmmc_gpio>;
    };
};
```



Demo

SDXC Power Control



Demo(cont.)

```
for i in /sys/devices/platform/userspace-consumer* ; do echo $i/name ;cat $i/name; echo $i/state ;cat $i/state; echo; done
```

```
/sys/devices/platform/userspace-consumer-SD1_SPWR/name  
reg-userspace-consumer-test-SD1_SPWR  
/sys/devices/platform/userspace-consumer-SD1_SPWR/state  
enabled (because use regulator-boot-on)
```

```
/sys/devices/platform/userspace-consumer-usb_otg1_vbus/name  
reg-userspace-consumer-test-usb_otg1_vbus  
/sys/devices/platform/userspace-consumer-usb_otg1_vbus/state  
disabled
```

```
cat /sys/kernel/debug/gpio
```

```
.....
```

```
.....
```

```
gpio-147 (          |usdhc2-vmmc          ) out hi  
gpio-450 (          |regulator-usb0tg1-vb) out lo
```


Demo(cont.)

```
echo disabled > /sys/devices/platform/userspace-consumer-SD1_SPWR/state  
echo enabled > /sys/devices/platform/userspace-consumer-usb_otg1_vbus/state
```

```
cat /sys/kernel/debug/gpio
```

```
gpio-147 (          |usdhc2-vmmc          ) out lo  
gpio-450 (          |regulator-usbotg1-vb) out hi
```

```
gpio-147 (          |usdhc2-vmmc          ) out hi → ← gpio-147 (          |usdhc2-vmmc          ) out lo  
gpio-450 (          |regulator-usbotg1-vb) out lo ← ← gpio-450 (          |regulator-usbotg1-vb) out hi
```

Demo(cont.)

/sys/class/regulator/regulator.2

imx8qxp-mek-reg-userspace-consumer.dtb

consumers	name	power	subsystem	suspend_mem_state	uevent	device	num_users
requested_microamps	suppliers	suspend_standby_state				userspace-consumer-SD1_SPWR-SD1_SPWR	
microvolts	of_node	state		suspend_disk_state	type		

imx8qxp-mek.dtb

consumers	name	power	subsystem	suspend_mem_state	uevent	device	num_users
requested_microamps	suppliers	suspend_standby_state				5b020000.mmc-vmmc	
microvolts	of_node	state		suspend_disk_state	type		

/sys/devices/platform/userspace-consumer-SD1_SPWR and
/sys/class/regulator/regulator.2/userspace-consumer-SD1_SPWR-SD1_SPWR are the same place.

/sys/class/regulator/regulator.2/userspace-consumer-SD1_SPWR-SD1_SPWR is symbol link



One user space consumer control multiple regulators

imx8qxp-mek-reg-userspace-consumer-multi.dts

```
userspace-consumer-SD1_SPWR {
```

```
    compatible = "reg-userspace-consumer";
```

```
    regulator-name = "reg-userspace-consumer-test-SD1_SPWR-USB_OTG1_VBUS";
```

```
    regulator-supplies = "SD1_SPWR", "USB_OTG1_VBUS";
```

```
    SD1_SPWR-supply = <&reg_usdhc2_vmmc>;
```

```
    USB_OTG1_VBUS-supply = <&reg_usb_otg1_vbus>;
```

```
    regulator-boot-on;
```

```
};
```

```
};
```

One user space consumer control multiple regulators(cont.)

```
COM5:115200baud - Tera Term VT
File Edit Setup Control Window Help
```

```
gpiochip2: GPIOs 64-95, parent: platform/5d0a0000.gpio, 5d0a0000.gpio:
gpiochip3: GPIOs 96-127, parent: platform/5d0b0000.gpio, 5d0b0000.gpio:
gpiochip4: GPIOs 128-159, parent: platform/5d0c0000.gpio, 5d0c0000.gpio:
  gpio-129 (          |enable          ) out hi ACTIVE LOW
  gpio-147 (          |usdhc2-vmmc       ) out hi
  gpio-149 (          |wp                ) in hi
  gpio-150 (          |cd                ) in hi IRQ ACTIVE L
  gpio-155 (          |enable           ) out hi ACTIVE LOW
gpiochip5: GPIOs 160-191, parent: platform/5d0d0000.gpio, 5d0d0000.gpio:
  gpio-169 (          |switch           ) out lo ACTIVE LOW
gpiochip6: GPIOs 192-223, parent: platform/5d0e0000.gpio, 5d0e0000.gpio:
gpiochip7: GPIOs 224-255, parent: platform/5d0f0000.gpio, 5d0f0000.gpio:
gpiochip10: GPIOs 464-471, parent: i2c/21-001d, 21-001d, can sleep:
  gpio-466 (          |regulator-usbotg1-vb) out hi
  gpio-471 (          |reset            ) out hi ACTIVE LOW
gpiochip9: GPIOs 472-479, parent: i2c/21-001a, 21-001a, can sleep:
  gpio-473 (          |?                ) out hi
  gpio-478 (          |reset            ) out hi ACTIVE LOW
  gpio-479 (          |reset            ) out hi
```

```
COM5:115200baud - Tera Term VI
File Edit Setup Control Window Help
```

```
/sys/devices/platform/userspace-consumer-SD1_SPWR/state
enabled
/ # echo 0 > /sys/devices/platform/userspace-consumer-SD1_SPWR/state
/ # cat /sys/kernel/debug/gpio
gpiochip0: GPIOs 0-31, parent: platform/5d080000.gpio, 5d080000.gpio:
  gpiochip1: GPIOs 32-63, parent: platform/5d090000.gpio, 5d090000.gpio:
    gpio-32 (          |headphone detect  ) in lo IRQ
    gpio-33 (          |reset              ) out hi ACTIVE LOW
    gpio-41 (          |sda                ) in lo
    gpio-42 (          |scl                ) out lo
  gpiochip2: GPIOs 64-95, parent: platform/5d0a0000.gpio, 5d0a0000.gpio:
  gpiochip3: GPIOs 96-127, parent: platform/5d0b0000.gpio, 5d0b0000.gpio:
  gpiochip4: GPIOs 128-159, parent: platform/5d0c0000.gpio, 5d0c0000.gpio:
    gpio-129 (          |enable          ) out hi ACTIVE LOW
    gpio-147 (          |usdhc2-vmmc       ) out lo
    gpio-149 (          |wp                ) in hi
    gpio-150 (          |cd                ) in hi IRQ ACTIVE LOW
    gpio-155 (          |enable           ) out hi ACTIVE LOW
  gpiochip5: GPIOs 160-191, parent: platform/5d0d0000.gpio, 5d0d0000.gpio:
    gpio-169 (          |switch           ) out lo ACTIVE LOW
  gpiochip6: GPIOs 192-223, parent: platform/5d0e0000.gpio, 5d0e0000.gpio:
  gpiochip7: GPIOs 224-255, parent: platform/5d0f0000.gpio, 5d0f0000.gpio:
  gpiochip10: GPIOs 464-471, parent: i2c/21-001d, 21-001d, can sleep:
    gpio-466 (          |regulator-usbotg1-vb) out lo
    gpio-471 (          |reset            ) out hi ACTIVE LOW
  gpiochip9: GPIOs 472-479, parent: i2c/21-001a, 21-001a, can sleep:
```





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