"Integration of RFID-RC522 Module with SPI Protocol on A5D2X Board"

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Required Hardware:

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- Rugged Board- a5d2x
- USB cable
- RFID RC522 module
- Patch Cards
- RFID Tags

Pin connections:

RC522 Module		RB-A5D2X (mikroBUS pinouts)	
VCC		PIN no: 7	VCC_3V3
RST		PIN no: 2	PB2_RST_mBUS1
GND		PIN no: 8	GND
MISO		PIN no: 5	PC29_MISO_mBUS1
MOSI		PIN no: 6	PC28_MOSI_mBUS1
SCK		PIN no: 4	PC30_SPCK_mBUS1
CS		PIN no: 3	PD0_NPCS1_mBUS

Step1: Create a directory to download the kernel source.

$ mkdir kernel_source

$ cd kernel_source

Step 2: Clone kernel with the proper branch.

$ git clone https://github.com/rugged-board/linux-rba5d2x.git

$ cd linux-rba5d2x

$ git checkout origin/linux-rba5d2x

Step 3: Copy the below patch files to the kernel source directory which you got with documents.

I) 0001-Rb-a5d2x.dtsi. patch

ii) 0002-rfid-rc522_driver. patch

Step 4: Apply the patch files in the kernel source

$ git am 0001-Rb-a5d2x.dtsi. patch

$ git am 0002-rfid-rc522_driver. patch

Step 5: Enable the toolchain.

$. /opt/poky-tiny/2.5.2/environment-setup-cortexa5hf-neon-poky-linux-musleabi

$ make distclean

$ make clean

$ make rb_a5d2x_defconfig

$ make menuconfig

Device Drivers --->
Misc devices --->
<*> rfid RC522 for RB-A5D2x

$ make

Step11: After compilation of the make command.

$ cp arch/arm/boot/zImage

Note: From this location copy the zImage to BOOT partition of the SD card

$ cp arch/arm/boot/dts/ a5d2x-rugged_board.dtb

Note: "imx6ul-phytec-ruggedboard-rdk.dtb" file from this location

to the BOOT partition of the SD card and rename it as "oftree".

Bootable SD card:

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Follow below steps to prepare Bootable SD card:

Note: Here we will use zImage = we have compiled

Here we will use oftree = we have compiled

u-boot.bin image & BOOT.BIN = Default images

Step2: Copy kernel image(zImage), oftree image(.dtb) into the boot partition of the sdcard.

$ cp zImage /media/<username>/BOOT

$ cp oftree /media/<username>/BOOT

Step3: extract 'tar -xvf armhf-rootfs-debian-bullseye.tar' it into rootfs partition of SD card.

$ sudo tar -xvf rb-sd-core-image-minimal-rugged-board-a5d2x-sd1.tar.gz -C /media/<username>/rootfs/

Testing the RFID-RC522 module in Host terminal:

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Step 1: Open the terminal and follow the given steps to boot the board.

$ Sudo minicom

: ~# root

$ ls /dev/rfid_rc522_dev

Step 2: Enable the toolchain and cross-compile the **rfid_rc522_dev.c** file. Then, copy the binary file (**rfid_rc522_dev**) to the board's terminal.

venkatesh@phytec:~$. /opt/poky-tiny/2.5.2/environment-setup-cortexa5hf-neon-poky-linux-musleabi

venkatesh@phytec:~$ ${CC} rfid_rc522_dev.c -o rfid_rc522_dev

venkatesh@phytec:~$ python3 -mhttp.server 8080

Serving HTTP on 0.0.0.0 port 8080 ...

192.168.1.20 - - [03/Apr/2024 10:43:11] "GET /rfid_rc522_dev HTTP/1.1" 200 -

root@rugged-board-a5d2x-sd1: ~# wget 192.168.1.30:8080/rfid_rc522_dev

Connecting to 192.168.1.30:8080 (192.168.1.30:8080)

rfid_rc522_dev 100% |**********| 9536 0:00:00 ETA

root@rugged-board-a5d2x-sd1: ~# chmod 777 rfid_rc522_dev

root@rugged-board-a5d2x-sd1: ~#./rfid_rc522_dev

**** **(Adding Driver in kernel in static way)** ****

Step 1: First, create a folder named `rfid_rc522`
at the following path: /drivers/misc/

Step 2: Copy the files rc522.c, rc522_api.c, and rc522_api.h to the directory /drivers/misc/rfid_rc522.

Step 3: vim drivers/misc/ rfid_rc522/Kconfig

```
config RFID_RC522
tristate "rfid RC522 for RB-A5D2x"
        default y
help
    This driver helps you to interface with RFID RC522 with RB-A5D2x.
```

Step 4: vim drivers/misc/ rfid_rc522/Makefile

```
obj-$(CONFIG_RFID_RC522) += rfid-rc522.o
rfid-rc522-objs            += rc522.o rc522_api. O
```

Step 5: vim drivers/misc/Kconfig

```
source "drivers/misc/rfid_rc522/Kconfig"
```

Step 6: vim drivers/misc/Makefile

```
obj-y                        += rfid_rc522/
```

Step 7: Describe Hardware in a5d2x_rugged_board_common.dtsi file

```
flx4: flexcom@fc018000 {
atmel,flexcom-mode = <ATMEL_FLEXCOM_MODE_SPI>;
status = "disabled";
status = "okay";
```

```
pinctrl-names = "default";
pinctrl-0 = <&pinctrl_mikrobus_spi &pinctrl_mikrobus1_spi_cs
&pinctrl_mikrobus1_rst>;
atmel,fifo-size = <16>;
status = "disabled";
status = "okay";
spidev@0 {
compatible = "rohm, dh2228fv";
reg = <0>;
spi-max-frequency = <500000>;
status = "disabled";
status = "okay";
};
rc522@1 {
compatible = "phytec, rfid_rc522";
reg = <1>;
spi-max-frequency = <13560000>;
status = "okay";
};
};
i2c3: i2c@600 {
compatible = "atmel, sama5d2-i2c";
```

$ Enable toolchain

$ make distclean

$ make clean

$ make rb_a5d2x_defconfig

$ make

After Compilation the Kernel:

==> zImage present in /arch/arm/boot/ copy into BOOT dir of SD Card for SD Card Flash and for NOR Flash copy into /var/lib/tftpboot/ and then copy to NOR flash

==> a5d2x_rugged_board.dtb present in /arch/arm/boot/dts/ copy into BOOT dir of SD Card for SD Card Flash and for NOR Flash copy into /var/lib/tftpboot/ and then copy to NOR flash

After booting the board :

$ cd /home/

$ insmod rfid_rc522.ko ===>to insert the driver

$ ./rfid_rc522