

Near Field Communication on Raspberry Pi

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Abstract - In today's world speed and efficiency is what needed to reduce the time of work and performance of an individual or a system. This paper gives a description on how to interface ITEAD-PN532[3] NFC on Raspberry pi model A,B,B+ and Raspberry pi 2 model B[1] and how to read an RFID tag using NFC reader.

Key Words: – RASPBERRYPI, NFC, RFID, ITEAD-PN532, Linux.

1. INTRODUCTION

RASPBERRY PI: The Raspberry Pi is a credit card sized computer. The initial idea behind it was to develop a small and cheap computer to be used by kids all over the world to learn programming. In the end it became very popular among developers all over the world. To get started quickly, the Raspberry Pi Foundation provides several preconfigured Linux distributions.

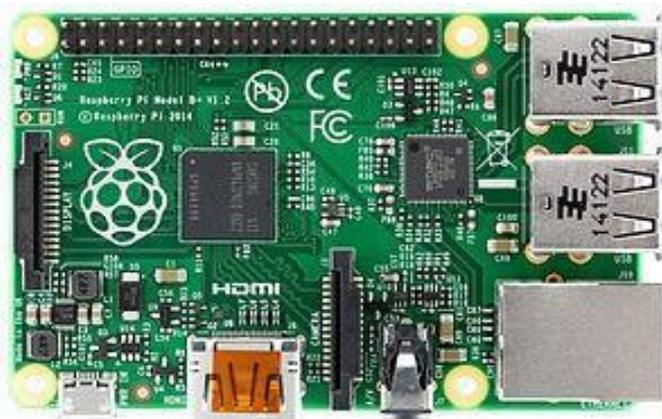


Fig 1: Raspberry pi 2 model B

The heart of the Raspberry pi is a SOC (system on chip). This contains an ARM11 running at 700MHz and a graphics processor that is capable of blue ray quality playback, using H.264 at 40Mbps. It has a fast 3D core accessed using the supplied open GLES2.0 and VG libraries. In addition model pi2 has 1GB RAM included in its SOC.[1]

RFID: Radio frequency identification (RFID) is becoming common place in everyday life these days. From tap-and-go payment cards and transit passes to E-Z Pass devices used

on toll roads to the tags stuck on and sewn into consumer goods to manage inventory and deter theft, most of us encounter RFID tags at least a few times a week and never think about what can be done with this technology. In the past few years, a new term has started to bubble up in connection with RFID.[2]

ITEAD-PN532: ITEAD-PN532 is a high performance fully NFC compliant expansion board for the Raspberry pi. Based on ITEAD-PN532 solution NFC [3] meets compliance with reader mode, peer to peer mode and card emulation standards.

2. SETTING-UP THE SOFTWARE

Required items:

1. Raspberry Pi Model B or B+ or Raspberry Pi
2. Compatible SD card with a size of at least 4GB.
3. Card reader.

Downloading the system image: Please download Win 32 Disk Imager and the Raspbian "Wheezy" image from the download page of the Raspberry Pi foundation.

Preparing the SD card:

1. Unzip the archive containing the system image.
2. Insert the SD card into a card reader connected to the PC.
3. Start Win32DiskImager.
4. Choose the unzipped *.img file.
5. Ensure that the correct device is chosen.
6. Click onto the Write button.

3. HARDWARE SET-UP

1. Requirements:

- a) Contact less reader board ITEAD-PN532 NFC[4]
- b) Micro USB power supply (5V / 1A)
- c) Keyboard
- d) Mouse
- e) HDMI cable to connect to a Monitor / TV. Please connect the hardware in the following order:
 1. Connect the ITEAD-PN532NFC board. The connection is shown in FIG4.1.
 2. Put the SD card into the card reader of the Raspberry Pi.
 3. Connect the Raspberry Pi to a Monitor.

4. Connect the Keyboard and the Mouse to the USB ports of the Raspberry Pi.

5. Connect the USB power adapter to the Raspberry Pi and plug it into a socket. Please wait until the Raspberry Pi is booted and the login screen appears.

4. Configuring NFC Reader on Raspberry-Pi

As Itead PN532 Module is customized for Raspberry Pi, it can be connected directly to Raspberry Pi via the adapter cable as shown in picture below



Fig 2: ITEAD-PN532 NFC with Raspberry pi

According to the connection in the picture above, Itead PN532 Module is connected via the SPI bus with raspberry pi, therefore, operating mode of PN532 Module should be set to SPI mode, as shown below:

SET0-->L

SET1-->H

If you want to use I2C mode of PN532 module, you should set the code as below:

SET0-->H

SET1-->L

Before install the needed software, please do the configuration first.

Raspberry Pi Software Configuration:

`sudo raspi-config`

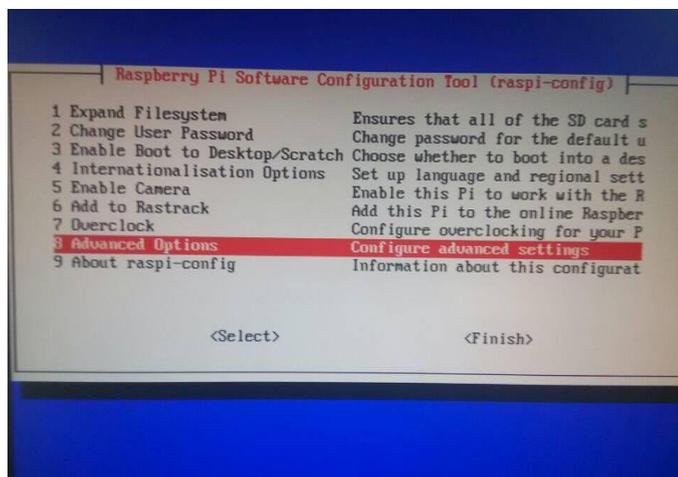


Fig 3: Configuration settings of Raspberry pi

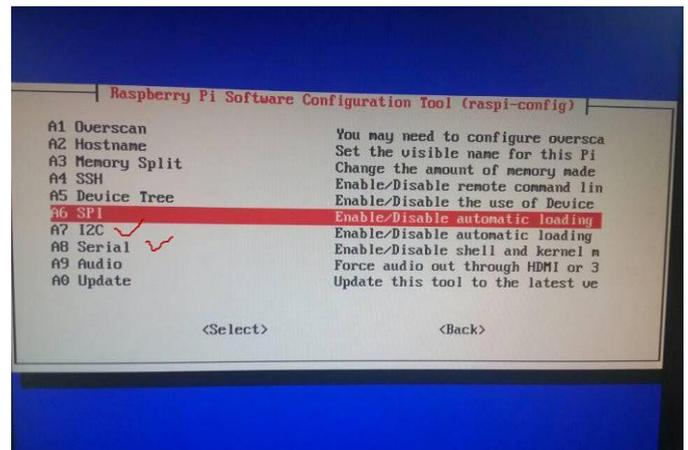


Fig 4: Configuration of SPI,I2C,Serial

1. Chose to configure SPI, I2C, and Serial.

2. Install the software pack needed

```
sudo apt-get update
```

```
sudo apt-get install libusb-dev libpcsclite-dev
```

3. Download and compress source code pack of libnfc

```
cd ~
```

```
wgethttp://dl.bintray.com/nfc-tools/sources/libnfc-
```

```
1.7.1.tar.bz2
```

```
tar -xf libnfc-1.7.1.tar.bz2
```

4. Compile and install

```
cd libnfc-1.7.1
```

```
./configure --prefix=/usr --sysconfdir=/etc
```

```
make
```

```
sudo make install
```

5. Modify configuration file

```
cd /etc
```

```
sudo mkdir nfc
```

```
sudo nano /etc/nfc/libnfc.conf
```

Copy and paste the following contents to file /etc/nfc/libnfc.conf:

```
# Allow device auto-detection (default: true)
```

```
# Note: if this auto-detection is disabled, user has to set manually a device
```

```
# configuration using file or environment variable
```

```
allow_autoscan = true
```

```
# Allow intrusive auto-detection (default: false)
```

```
# Warning: intrusive auto-detection can seriously disturb other devices
```

```
# This option is not recommended, user should prefer to add manually his device.
```

```
allow_intrusive_scan = false
```

```
# Set log level (default: error)
```

```
# Valid log levels are (in order of verbosity): 0 (none), 1 (error), 2 (info), 3 (debug)
```

```
# Note: if you compiled with --enable-debug option, the default log level is "debug"
```

```
log_level = 1
```

```
# Manually set default device (no default)
```

```
# To set a default device, you must set both name and connstring for your device
```

Note: if auto scan is enabled, default device will be the first device available in device list. device.name = "Itead_PN532_SPI" device.connstring = "pn532_spi:/dev/spidev0.0:500000"

6. As Raspberry Pi defaults to disable the driver for SPI module, we need to enable it sudo nano /etc/modprobe.d/raspi-blacklist.conf Add # in front of blacklist spi-bcm2708 and it will become #blacklist spi-bcm2708

As shown in the picture below:

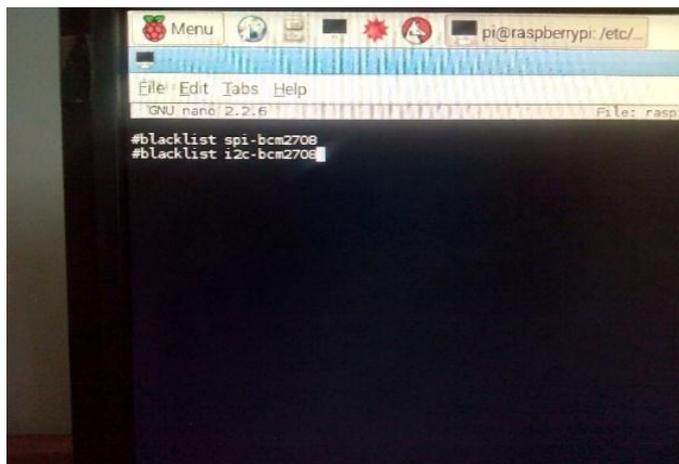


Fig 5: SPI configuration.

You can see two spi devices under /dev after rebooting.

7. Up to now, preparations are done. And then we can use command nfc-list to check if it is successfully installed.

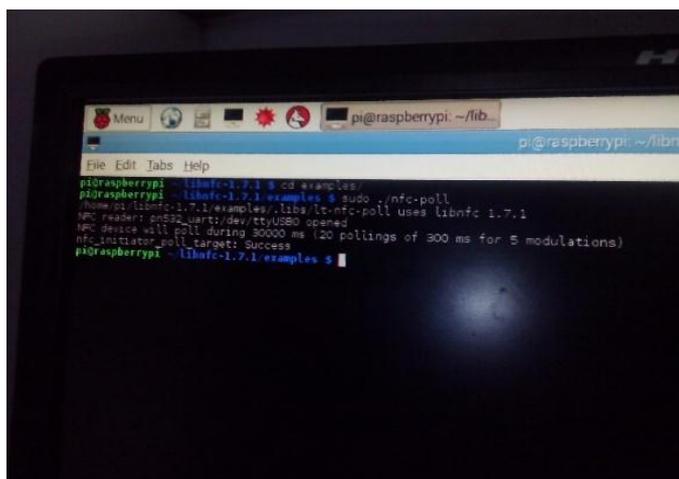


Fig 6: Opening NFC enabled devices.

Let's try swiping the card.

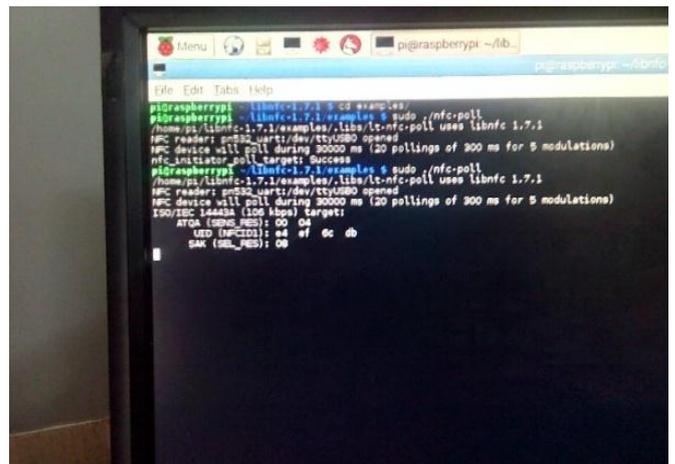


Fig 7: Reading RFID tag.

5. CONFIGURATIONS FOR CONNECTION VIA I2C BUS

Software configuration:

Enable I2C bus on Raspberry Pi, and change blacklist i2c-bcm2708 in /etc/modprobe.d/raspi-blacklist.conf to #blacklist i2c-bcm2708 .

Add i2c-dev at the end of /etc/modules

Modify last line of /etc/nfc/libnfc.conf to pn532_i2c:/dev/i2c-1 as shown in the picture below

Hardware connection:

Connection is as shown in the picture below:

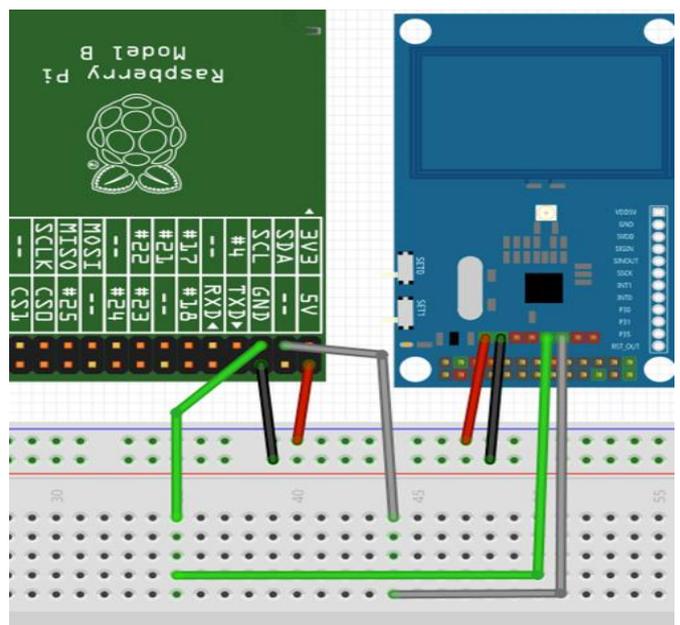


Fig 8: Hardware connection.

6. RESULT

Running result is as shown in the picture below:

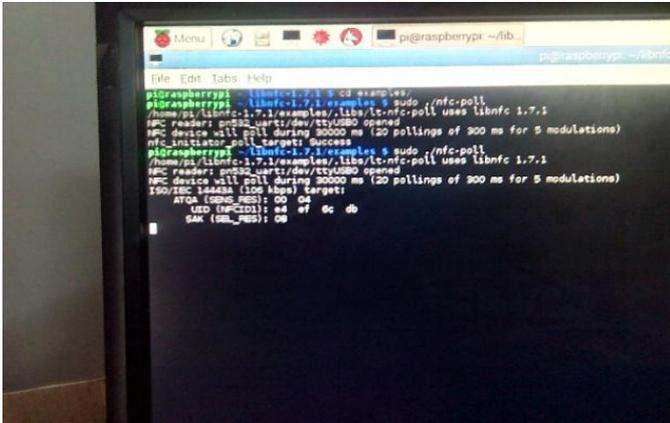


Fig 9: Polling the RFID tag.

Task	Description
Poll	To scan the NFC devices
Emulate	To select the type of connection between two NFC devices
List	To show the active NFC devices

Table 1: Various operations NFC tag reader

7. FUTURE SCOPE

1. Real time attendance is monitored without any wastage of time using NFC technology with Raspberry pi.
2. Door locking system using RFID tag can be built using NFC card reading technology.
3. Making payments through mobile phones



Fig 10: Payment using NFC technology.

7. CONCLUSION

NFC tag reading technology implemented on Raspberry pi is a cost effective method of reading RFID tags. It can be noted that it is highly secured authentication system. In future, this technology will play a crucial role in many NFC enabled product applications.

REFERENCES

- [1] J Dean Brock, Rebecca F. Bruce, Marietta E. Cameron Department of Computer Science University of North Carolina at Asheville, NC 28804 "CHANGING THE WORLD WITH A RASPBERRY PI".
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