

浙江大学

实验报告

课程名称：____ 嵌入式系统 _____ 实验类型：____ 综合 _____

实验项目名称：____ 任务 11：DHCP 服务器 _____

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实验地点：____ _____ 实验日期：____ 2015 年 ____ 3 月 ____ 27 日

实验目的和要求

- 掌握 DHCP 服务器的概念；
- 了解如何在 Raspberry Pi 搭建 DHCP 服务器。
- 把 Raspberry Pi 变成一个 DHCP 服务器。。

实验器材

硬件：

- Raspberry Pi 板一块；
- 5V/1A 电源一个；
- microUSB 线一根；

- USB-TTL 串口线一根（PL2303 芯片）。
- PC（Windows/Mac OS/Linux）一台；
- 以太网线一根（可能还需要路由器等）

软件：

- PC 上的 USB-TTL 串口线配套的驱动程序；
- PC 上的串口终端软件，如 minicom、picocom、PuTTY 等；
- PC 上的 SSH 软件，如 PuTTY, XShell 等

实验内容和原理

- 安装 DHCP 服务器软件；
- 对 DHCP 服务器软件进行配置；
- 验证 DHCP 服务器的功能。

实验过程和数据记录

1. 配置无线网卡

本实验选择使用无线网卡来完成。因此必须先配置无线网卡。网卡型号是 RealTek RTL8188CUS。

首先安装 hostapd 用于管理无线共享。

```
# sudo apt-get install hostapd
```

```

pi@raspberrypi ~ $ sudo apt-get install hostapd
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  hostapd
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 420 kB of archives.
After this operation, 908 kB of additional disk space will be used.
Get:1 http://mirrordirector.raspbian.org/raspbian/ wheezy/main hostapd armhf 1:1.0-3+deb7u1 [420 kB]
Fetched 420 kB in 21s (19.9 kB/s)
Selecting previously unselected package hostapd.
(Reading database ... 84729 files and directories currently installed.)
Unpacking hostapd (from .../hostapd_1%3a1.0-3+deb7u1_armhf.deb) ...
Processing triggers for man-db ...
Setting up hostapd (1:1.0-3+deb7u1) ...

```

但是官方的版本不支持我们手中的无线网卡，在网络上找到了可行的方法：有人专门编译了适用的版本。通过以下的指令来修改安装好的 hostapd。

```

#          wget          http://www.daveconroy.com/wp3/wp-
content/uploads/2013/07/hostapd.zip
# unzip hostapd.zip
# sudo mv /usr/sbin/hostapd /usr/sbin/hostapd.bak
# sudo mv hostapd /usr/sbin/hostapd.edimax
# sudo ln -sf /usr/sbin/hostapd.edimax /usr/sbin/hostapd
# sudo chown root.root /usr/sbin/hostapd
# sudo chmod 755 /usr/sbin/hostapd

```

```

pi@raspberrypi ~ $ wget http://www.daveconroy.com/wp3/wp-content/uploads/2013/07/hostapd.zip
--2015-03-27 18:52:10-- http://www.daveconroy.com/wp3/wp-content/uploads/2013/07/hostapd.zip
Resolving www.daveconroy.com (www.daveconroy.com)... 173.236.224.34
Connecting to www.daveconroy.com (www.daveconroy.com)|173.236.224.34|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 706800 (690K) [application/zip]
Saving to: `hostapd.zip'

100%[=====>] 706,800

2015-03-27 18:52:27 (42.5 KB/s) - `hostapd.zip' saved [706800/706800]

pi@raspberrypi ~ $ unzip hostapd.zip
Archive: hostapd.zip
  inflating: hostapd
pi@raspberrypi ~ $ sudo mv /usr/sbin/hostapd /usr/sbin/hostapd.bak
pi@raspberrypi ~ $ sudo mv hostapd /usr/sbin/hostapd.edimax
pi@raspberrypi ~ $ sudo ln -sf /usr/sbin/hostapd.edimax /usr/sbin/hostapd
pi@raspberrypi ~ $ sudo chown root.root /usr/sbin/hostapd
pi@raspberrypi ~ $ sudo chmod 755 /usr/sbin/hostapd

```

2. 安装 DHCP 服务器软件；

首先安装 udhcpd

```
# sudo apt-get install udhcpd
```

```

pi@raspberrypi ~ $ sudo apt-get install udhcpd
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  busybox
The following NEW packages will be installed:
  busybox udhcpd
0 upgraded, 2 newly installed, 0 to remove and 0 not upgraded.
Need to get 459 kB of archives.
After this operation, 843 kB of additional disk space will be used.
Do you want to continue [Y/n]? y
Get:1 http://mirrordirector.raspbian.org/raspbian/ wheezy/main busybox armhf 1:1.20.0-7 [438 kB]
Get:2 http://mirrordirector.raspbian.org/raspbian/ wheezy/main udhcpd armhf 1:1.20.0-7 [20.9 kB]
Fetched 459 kB in 14s (30.8 kB/s)
Selecting previously unselected package busybox.
(Reading database ... 84700 files and directories currently installed.)
Unpacking busybox (from .../busybox_1%3a1.20.0-7_armhf.deb) ...
Selecting previously unselected package udhcpd.
Unpacking udhcpd (from .../udhcpd_1%3a1.20.0-7_armhf.deb) ...
Processing triggers for man-db ...
Setting up busybox (1:1.20.0-7) ...
Setting up udhcpd (1:1.20.0-7) ...
udhcpd: Disabled. Edit /etc/default/udhcpd to enable it.

```

3. 对 DHCP 服务器软件进行配置；

编辑 udhcpd 的配置文件/etc/udhcpd.conf

sudo nano /etc/udhcpd.conf

主要修改的内容如下：

```

# The start and end of the IP lease block
start          192.168.0.20    #default: 192.168.0.20
end            192.168.0.254   #default: 192.168.0.254

# The interface that udhcpd will use
interface      wlan0          #default: eth0
# keyword 'opt' or 'option'. If an option can take
multiple items, such
# as the dns option, they can be listed on the same
line, or multiple
# lines. The only option with a default is 'lease'.

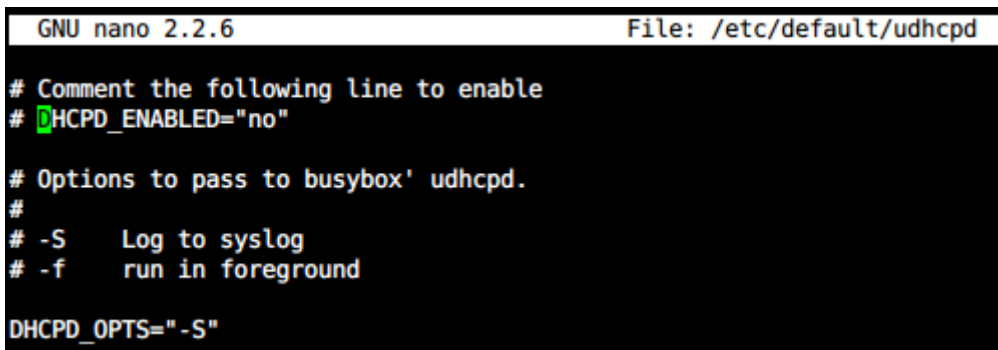
#Examples
opt    dns      114.114.114.114
option subnet  255.255.255.0
opt     router  192.168.10.2
opt     wins    192.168.10.10
option  dns     129.219.13.81
# appened to above DNS servers for a total of 3
option domain  local
option lease   864000          # 10 days of seconds

```

随后还需要修改 /etc/default/udhcpd，注释其中的

DHCPD_ENABLED="no" 这一行。

```
# sudo nano /etc/default/udhcpd
```



```
GNU nano 2.2.6 File: /etc/default/udhcpd

# Comment the following line to enable
# DHCPD_ENABLED="no"

# Options to pass to busybox' udhcpd.
#
# -S    Log to syslog
# -f    run in foreground

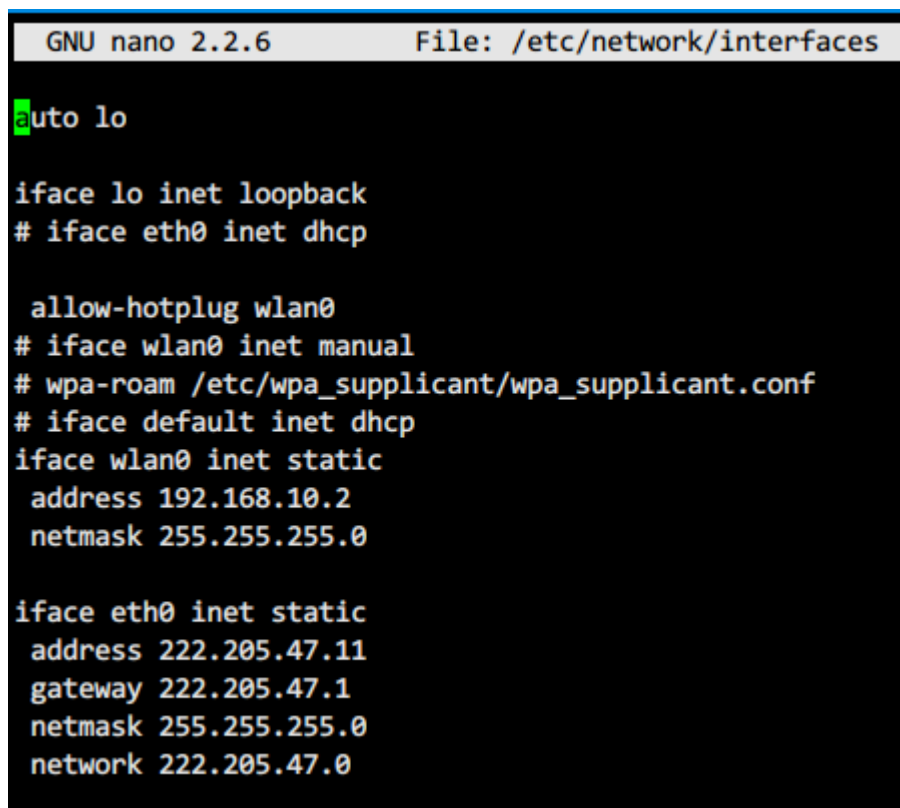
DHCPD_OPTS="-S"
```

还需要给我们的无线网卡一个 IP。

```
# sudo ifconfig wlan0 192.168.10.2
```

再编辑网卡配置文件/etc/network/interfaces 注释掉其中关于无线网卡的部分，最终得到下图的结果。

```
# sudo nano /etc/network/interfaces
```



```
GNU nano 2.2.6 File: /etc/network/interfaces

auto lo

iface lo inet loopback
# iface eth0 inet dhcp

    allow-hotplug wlan0
# iface wlan0 inet manual
# wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
# iface default inet dhcp
iface wlan0 inet static
    address 192.168.10.2
    netmask 255.255.255.0

iface eth0 inet static
    address 222.205.47.11
    gateway 222.205.47.1
    netmask 255.255.255.0
    network 222.205.47.0
```

接着，还需要配置我们之前安装好的 hostapd。设置 Wi-Fi 相关的内容。如下图

```
# sudo nano /etc/hostapd/hostapd.conf
```

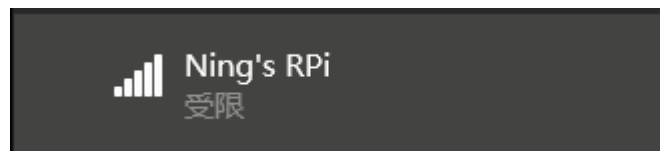
```
GNU nano 2.2.6      File: /etc/hostapd/hostapd.conf

interface=wlan0
driver=rtl871xdrv
ssid=Ning's RPi
hw_mode=g
channel=6
macaddr_acl=0
auth_algs=1
ignore_broadcast_ssid=0
wpa=2
wpa_passphrase=wangning
wpa_key_mgmt=WPA-PSK
wpa_pairwise=TKIP
rsn_pairwise=CCMP
```

配置完成后，重启系统，以使得 hostapd 正常工作。键入以下命令以验证 hostapd。

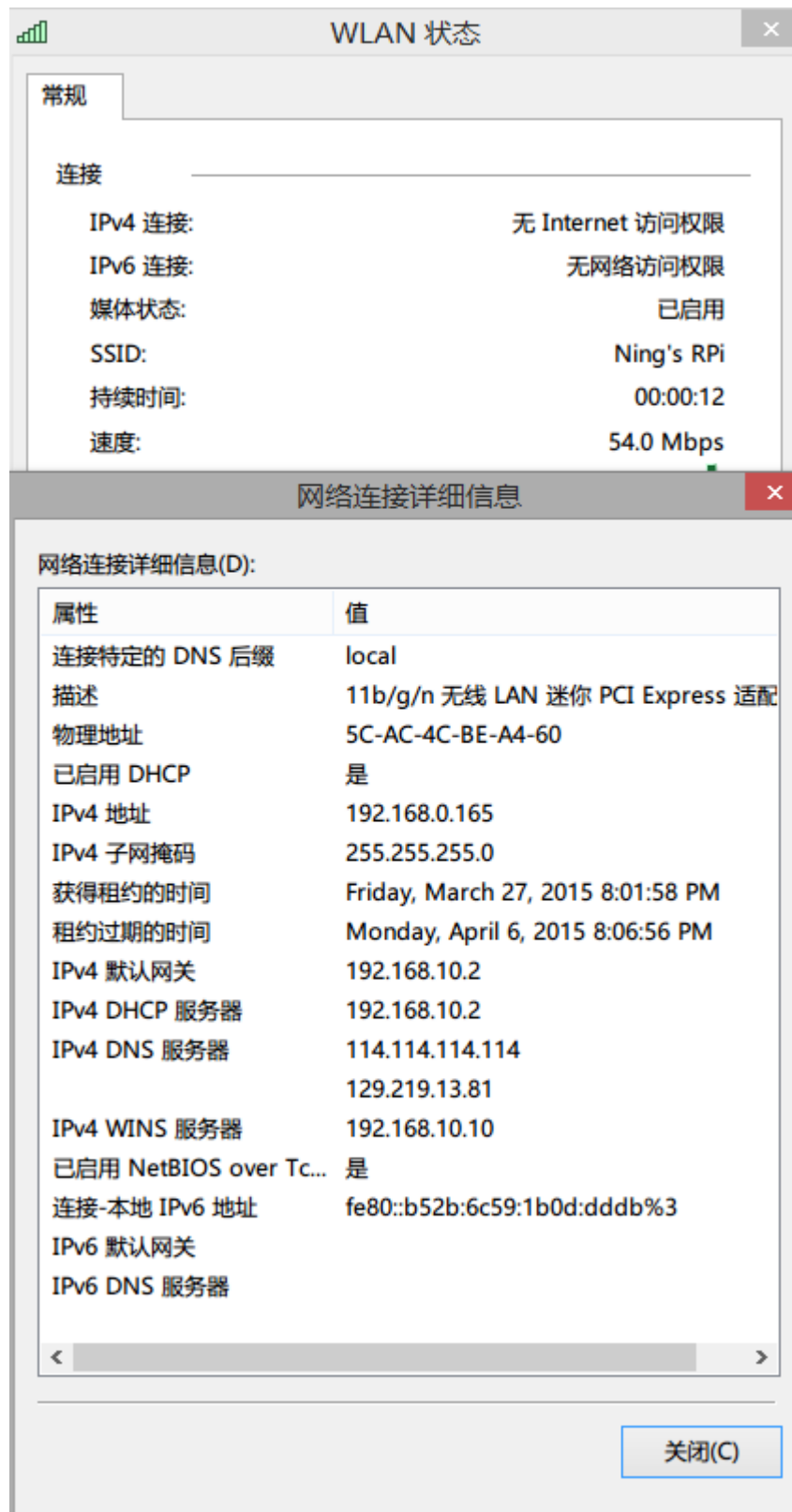
```
# sudo hostapd -dd /etc/hostapd/hostapd.conf
```

这时适用 PC 搜索 Wi-Fi 信号，能找到 SSID 为我们在配置文件里所预设的 AP。则说明 hostapd 配置正确。



4. 验证 DHCP 服务器的功能。

选择连接上述的 Wi-Fi，打开 Windows 的网络共享中心，可以看到以下。



看到分配的 IP 段在我们的预设 IP 段之内。这说明 DHCP 服务配置正确。

实验结果分析

DHCP 服务器搭建成功。