Wireless Home Network: Coverage & Security

Low cost implementation with Raspberry Pi

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Introduction

Wireless home networks are common place in today's world and Wi-Fi is a must to connect your devices. The purpose of this project was to find a low cost method of solving issues such as, **extending your home Wi-Fi coverage** and **improving your home network security**. Range may be an issue due to the size of one's house and security may be an issue when a large amount of people are asking for access to your network. The issue of range can be solved by configuring a Raspberry Pi to function as a wireless bridge and extend your existing network's coverage. Security can be increased by setting up a guest network and limiting who has access to your main home network. A Raspberry Pi can solve both of these problems and at a low cost.

Extend your home Wi-Fi coverage

By configuring a Raspberry Pi to act as an access point to the home router this extends its coverage. Which in turn allows the Pi to pass along any incoming internet traffic and pass it along through the Pi to the home router. The Pi becomes an extension of the current wi-fi router allowing for a larger coverage range. There is no noticeable drop in performance when using this method making it a viable choice for someone looking etend their coverage area. **Figure 1** illustrates how the Pi keeps the same SSID and IP address range of the main home router.

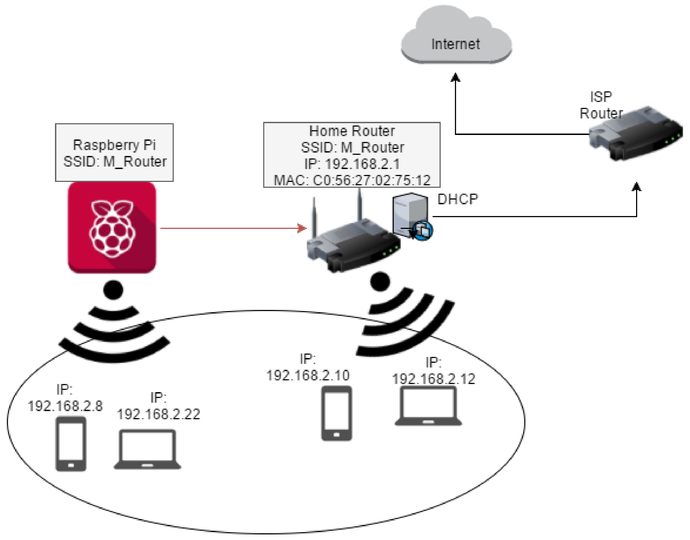

Figure 1: An example topology of a wireless bridge using a Pi

Implementation

Installing bridge utils and hostapd on Raspberry Pi

sudo apt-get install -y bridge-utils hostapd

Creation of the Bridge
/etc/network/interfaces

1
```
#auto br0
iface br0 inet static
    bridge_ports eth0
    address 192.168.2.13
    netmask 255.255.255.0
    network 192.168.2.0
    broadcast 192.168.2.255
```

3 Configuration of Bridge which will can be called using using the command: *sudo ifup br0*

Settings used to extend your current set-up
2 */etc/hostapd/hostapd.conf*

```
ssid=wifi_ssid
wpa_passphrase=wifi_password
bridge=br0
```

Having the same SSID and security as your current router will extend your coverage under the same SSID

Adding bridge to the configuration

Begin broadcast using command:
4 *sudo /usr/sbin/hostapd /etc/hostapd/hostapd.conf*

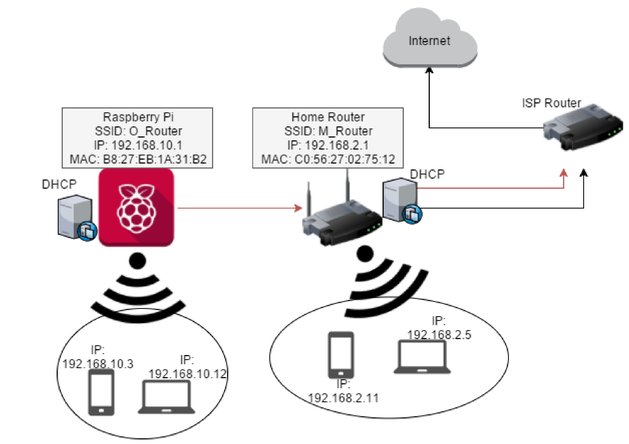

Figure 2. An example topology of a guest network using a Pi

Rasperry Pi 3 Specs

System on chip: Broadcom BCM2837
CPU: 1.2GHz 64-bit quad-core ARMv8 CPU
GPU: Broadcom VideoCore IV @ 400 MHz
Memory: 1 GB LPDDR2-900 SDRAM
USB ports: 4
Network: 10/100 MBPS Ethernet, 802.11n Wireless LAN, Bluetooth 4.0
Cost: $35

Improve home network security

Configuring the Raspberry Pi to act as a guest network that is seperate from your home network improves security. This would allow for greater control over who has access to your network and the devices or files stores on it. Both of these things would be safely out of reach from those you don't want having access to.At $35 a Raspberry Pi will act as another router and at a lower cost. Keeping access to your things under your control while still allowing guests access to the internet. Figure 2 illustrats how the Raspberry Pi acts independent of your main home router.

Implementation

Installing hostapd, dhcp-server and iptables on Raspberry Pi
sudo apt-get install hostapd isc-dhcp-server iptables-persistent

1
```
subnet 192.168.10.0 netmask 255.255.255.0 {
range 192.168.10.10 192.168.10.50;
option broadcast-address 192.168.10.255;
option routers 192.168.10.1;
default-lease-time 600;
max-lease-time 7200;
option domain-name "local";
option domain-name-servers 8.8.8.8, 8.8.4.4;}
```

Configuring the DHCP settings of the Raspberry Pi

/etc/dhcp/dhcpd.conf

Raspberry Pi Access Point settings

2
```
interface=wlan0
ssid=rpi-wifi
country_code=US
hw_mode=g
channel=9
macaddr_acl=0
auth_algs=1
ignore_broadcast_ssid=0
wpa=2
wpa_passphrase=aco-rpi-wifi
wpa_key_mgmt=WPA-PSK
wpa_pairwise=CCMP
wpa_group_rekey=86400
ieee80211n=1
wme_enabled=1
```

/etc/hostapd/hostapd.conf

Commands to save and launch configuration upon reboot

3
```
sudo iptables -t nat -A
POSTROUTING -o eth0 –j
MASQUERADE

sudo iptables -A FORWARD -i eth0 -
o wlan0 -m state –

state RELATED,ESTABLISHED -j
ACCEPT

sudo iptables -A FORWARD -i wlan0
-o eth0 -j ACCEPT

sudo sh -c "iptables-save >
/etc/iptables/rules.v4"
```

Conclusion

A raspberry Pi is small and at a low cost allows for a wide range of things to be done. The wireless bridge allows someone to extend the Wi-Fi coverage of their home at a low cost. The guest network allows for a home to have another network for other both for guests and keeping people out of things on your main network. The Pi allows this network to be set up easily and taken down just as easily. The Pi's small size and cost allows both of these things to be done at a low cost and without having to set up anything very obstructive in your home. Most importantly it does not compromise your networks performance to such a degree that this would become a hassle allowing this to solve and not create problems. This small board solves your home netowrk needs.