

How to enable Realtek Repeater Self-Organization Network

2017/07/20	Aries Lee	Ver 0.2
------------	-----------	---------

1. Introduction

Realtek Repeater Self-Organization Network is a private software protocol which allows all devices to construct and maintain the network topology automatically. All devices which's with the same identity (we call RSON ID) will connect each other in the form of tree structure. If any node is deleted or added, all nodes can automatically reconstruct a new network topology to adapt any change.

Since the network will form a hierarchical tree structure. The top of the tree is called "Root", which only operates hostapd function to allow to be associated by other devices. The STA interface of Root is **NOT** necessary to be active.

On the other hand, the rest parts of the tree are called "Nodes", which be required to operated not only hostapd but also wpa_supplicant at the same time, the STA interface of "Node" **MUST** connect to tree and the AP interface of "Node" **MUST** allow to be connected by other node as well. We also define a term -- "Hop count", which means the number of edges from the Root to the Nodes, it also represent the hierarchical level for a node in the tree

Following figures show the process of each stage during RSON working.

Attention!! A linking was **UNABLE** to be established between a peer and a peer unless both of them have **the same RSON ID**.

- All devices are just power on, RSON function is preparing.

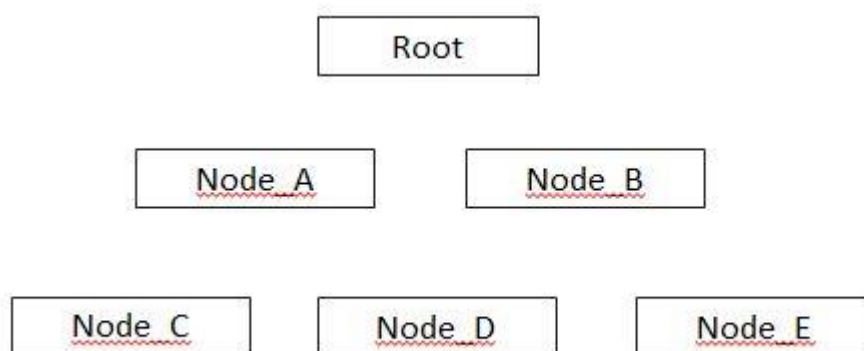


Figure 1

- All devices have constructed a tree structure networking by RSON function.

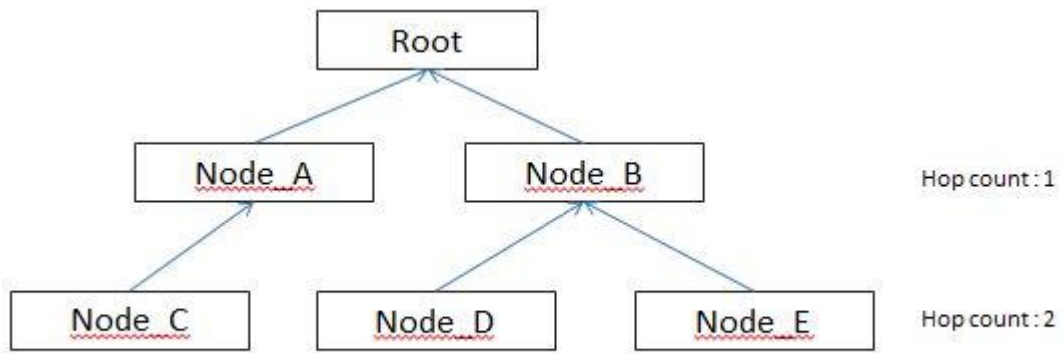


Figure 2

- If a node is disconnect for some reason, RSON function will recovery the connection of whole networking.

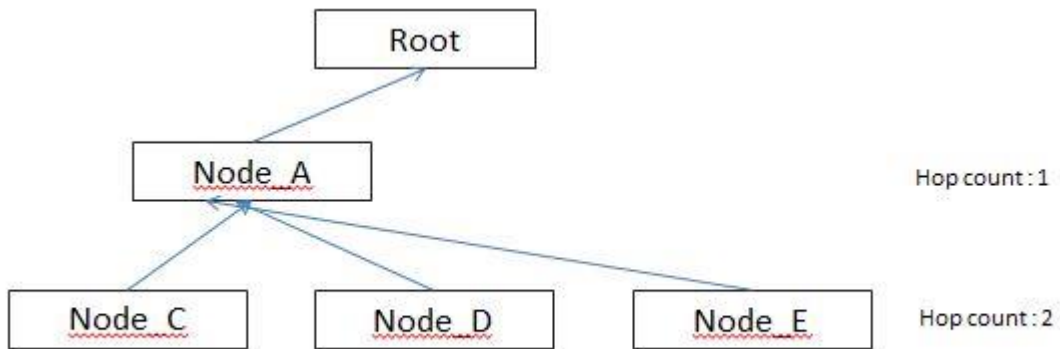


Figure 3

2. Driver configuration

2.1 Please **make sure that all devices can perform repeater mode well**, you have to run hostapd and wpa_supplicant at the same time, if you have no idea about how to enable repeater mode function, please reference the documents -- “Quick_Start_Guide_for_Bridge.pdf” and “Realtek_WiFi_concurrent_mode_Introduction.pdf”.

2.2 Set **CONFIG_RTW_REPEATER_SON** as y in Makefile

2.3 Edit include/autoconfig.h, put following string in file.

```
#define CONFIG_RTW_REPEATER_SON_ID 0XXXXXXXXX
```

Where “0XXXXXXXXX” is an 4byte hexadecimal number which’s used as an identity of network. The devices with the same CONFIG_RTW_REPEATER_SON_ID value will consist of the same network. On the other hand, the devices with different ID would **NOT** try to connect each other even they have the same SSID and password.

2.4 If this device is a root (ex:NVR), please put following string in include/autoconfig.h.

```
#define CONFIG_RTW_REPEATER_SON_ROOT
```

If this device is a node (ex:IPCAM), do NOT define this flag.

2.5 All device which’s in the same network should use the same channel, SSID, password, encryption way. In other words, the content of hostapd.conf and wpa_supplicant.conf should be the same.

3. Technical detail

This table shows the parameters of “Realtek Repeater Self-Organization Network” mechanism.

Name	Explanation
Version	Version
ID	Different network should own a different ID.
HopCount	Hop count
Connectible	Whether the AP allow to be connected or not 1 : allow 0 : deny
Loading	The traffic loading
Reserve	Reserve

The file “/proc/net/<wifi_chip>/wlanx/rson_data” allows the developers to get/set those parameters.

- How to get parameter?

cat /proc/net/<wifi_chip>/wlanx/rson_data

```
root@realtek-BM5242-BM5342-BM5642:~# cat /proc/net/rtl8188fu/wlan1/rson_data
version :      1
id :           02040608
hop count :    255
connectible :  1
loading :      0
reserve :      aa aa aa aa aa aa aa aa aa aa aa aa aa aa aa
```

- How to set parameter?

echo <field> <val> > /proc/net/<wifi_chip>/wlanx/rson_data

where <field> is the parameter name and <val> is the value you want to assign.

Ex :

```

echo ver 1 > /proc/net/rtl8188eu/wlan0/rson_data
echo id 0x01020304 > /proc/net/rtl8188eu/wlan0/rson_data
echo hc 1 > /proc/net/rtl8188eu/wlan0/rson_data
echo cnt 1 > /proc/net/rtl8188eu/wlan0/rson_data
echo loading 1 > /proc/net/rtl8188eu/wlan0/rson_data
echo res 11223344556677889900aabbcc > /proc/net/rtl8188eu/wlan0/rson_data

```

For debugging purpose, developer can observe the content of /proc/net/<wifi_chip>/wlanx/survey_info, it shows a list of all detected nodes and their information in the air.

```

root@realtek-BM5242-BM5342-BM5642:~# cat /proc/net/rtl8188eu/wlan59/survey_info
index  bssid          ch   id             hop_cnt  loading  RSSI  score          ssid
1  44:d9:e7:fa:12:b6  1  0x00000000    0         0     -47    0              RealEZ-2.4G
2  00:e0:4c:97:2b:a4  1  0x00000000    0         0     -63    0              sd4_open
3  96:10:3e:7a:7e:d8  1  0x00000000    0         0     -43    0              test_fail_2g.guests
4  02:1a:11:f0:34:10  1  0x00000000    0         0     -67    0              HTC
5  46:d9:e7:fa:12:9e  1  0x00000000    0         0     -73    0              RealKungFu-2.4G
6  28:2c:b2:f6:dd:66  1  0x00000000    0         0     -43    0              zzz_test_24g
7  00:40:5a:ae:ab:c8  3  0x00000000    0         0     -57    0
8  84:1b:5e:e2:d2:42  1  0x00000000    0         0     -69    0              2gxxx
9  94:10:3e:7a:7e:d8  1  0x00000000    0         0     -39    0              test_fail_2g
10 f8:d1:11:a1:bd:20  4  0x00000000    0         0     -36    0              TP-LINK_Martin
11 24:0a:64:36:51:f4  3  0x00000000    0         0     -53    0              aigale-James
12 64:09:80:52:b5:5a  4  0x00000000    0         0     -52    0              A_Xiaomi_B559

```

4. Note

- 4.1 All nodes will detect whole system and automatically roam to better choice (if it exist) every 2 seconds.
- 4.2 The node will detect the linking status of parent node, it would not report disconnection immediately. Instead, device will try to roam to the second choice and report disconnection if it is still unable to connect with any peer in next 6 seconds.
- 4.3 “Realtek Repeater Self-Organization Network” function **only focus on constructing a layer 2 wifi networking topology**, this function DOESN'T take care IP, TCP/UDP, HTTP or any other upper network protocol/application.
- 4.4 The criteria of choosing parent node is implemented in `core/rtw_rson.c::rtw_cal_so_score()` function. It is based on 2 factor ---
 - A. The hop count from the root.
 - B. RSSI.The developer can customize this function by their user scenario.