



# 2STON™ SPN Box

## based on Turris Omnia

: Let's make the SPNBox-AP(a.k.a SPNBox-1000) !

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**2IP R & D Center**

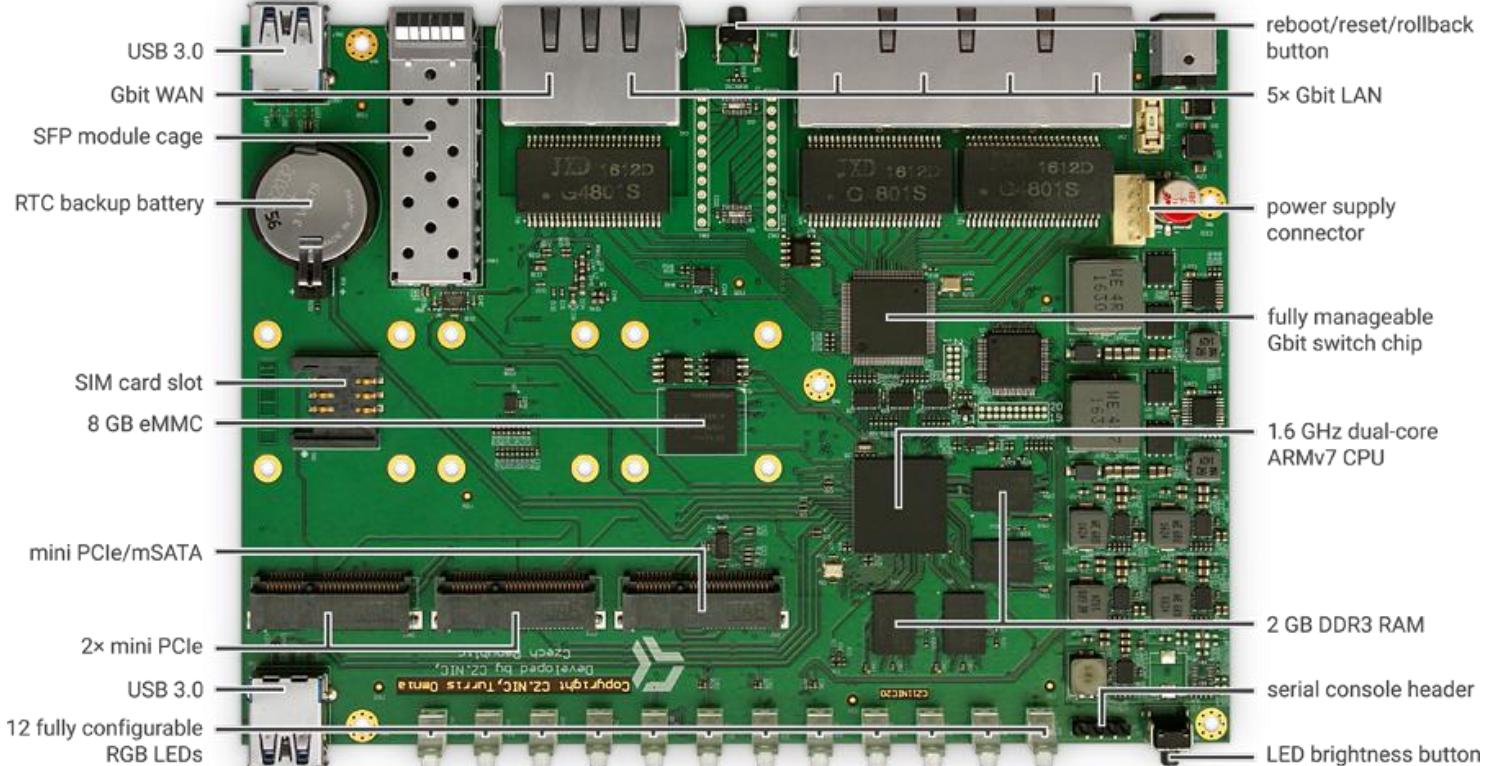
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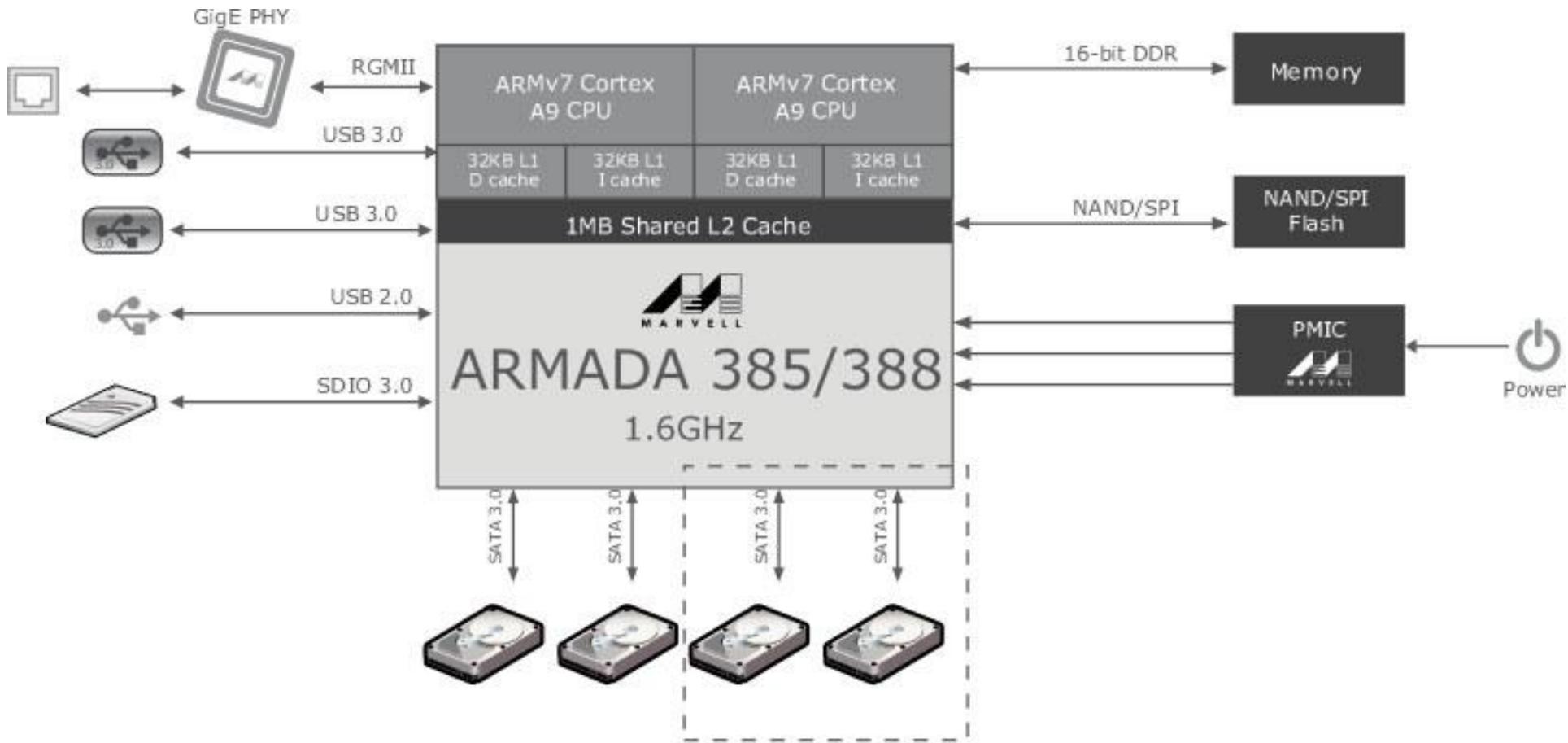
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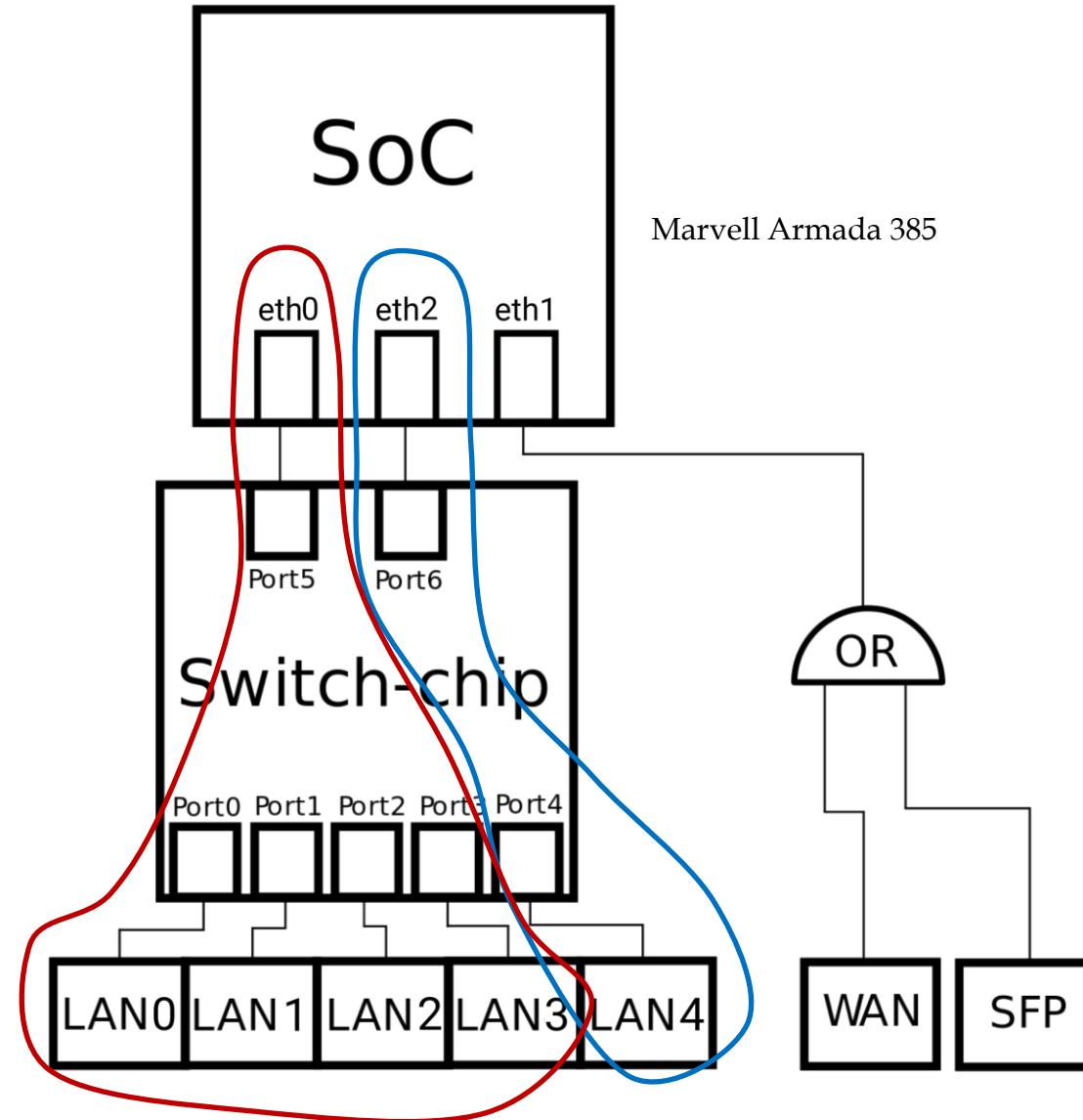
# 1. Turris Omnia(1) - Target Board



# 1. Turris Omnia(2) - ARMADA 385 SoC



# 1. Turris Omnia(3) - Switching Chip



# 1. Turris Omnia(4) - 3 miniPCIe

- mSATA
- 802.11ac Wi-Fi
- 802.11b/g/n Wi-Fi
- LTE



# 1. Turris Omnia(5) – Specification(1)

Hardware Specification	
CPU	Marvell Armada 385, dual-core 1.6 GHz
Memory	1 GB DDR3
Storage	8 GB eMMC
Antenna Type	2x2 MIMO Omni-directional high-gain dipole (2.4 GHz) 3x3 MIMO Omni-directional high-gain dipole (5 GHz)
Antenna Gain	3x 2.4 GHz 3.5 dBi, 5 GHz 4.6 dBi
LAN Port	5x 10/100/1000 Mbps (RJ-45)
WAN Port	1x 10/100/1000 Mbps (RJ-45) + SFP up to 2.5 Gb
External Ports	2x USB 3.0 (5 V, 1.5 A power output)
Internal Interfaces	1x UART (4 pins header)
	1x miniPCIe/msATA
	1x miniPCIe (without USB and SIM Lock)
	1x miniPCIe (with USB and SIM Lock)
	1x JTAG 20 pin (CPU)
	1x Programming connector 10 pin (MCU)
	1x 5 pin Power connector (3V, 5V, 12V) for SATA drives 2x 10 pin GPIO connector (GPIO, SPI, I2C, UART)
Button and Switch	Reset, LED intensity
Appearance	
Size (Width x Depth x Height)	190 x 135 x 40 mm (without antenna)
Weight	1180 g (no Wi-Fi 1130 g)
Power Supply	
AC Input	100–240 V / 1.0 A
Power Frequency	50/60 Hz, Single Phase
DC Output	12 V / 3.33 A
Power Consumption	5–40 W max (depends on connected peripheries)

Wireless Specification	
Standard (IEEE 802.11a/b/g/n/ac)	IEEE 802.11a/b/g/n/ac Simultaneous dual band Wi-Fi (2 Wi-Fi interfaces installed) Compex WLE200N2: 2.4 GHz, 300 Mbps Compex WLE900VX: 5 GHz, 1.3 Gbps or 2.4 GHz, 450 Mbps
Transmitting Power	23 dBm max.
Secured Transmission	64/128 bit WEP, WPA/WPA2, WPA-PSK/WPA2-PSK
Standard (IEEE 802.11b/g/n)	IEEE 802.11b/g/n 2.4 GHz: 300 Mbps
Transmitting Power	16 dBm max.
Secured Transmission	WEP, WPA, WPA2
HW Extensibility	NAS box with SATA connectivity, TV tuners via USB, security cameras, printers, LTE modem (miniPCIe or USB), USB soundcards, smart sensors via GPIO pins...
Network	
Internet Connection	By default: Dynamic IP; Static IP; PPPoE; other by Linux packages
Port Forwarding	Setup via web UI or via SSH
Maximum Port Forwarding Rules	Unlimited*
Maximum UPnP Rules	Unlimited*
Port Triggering	
Maximum Port Triggering Rules	Unlimited*
Minimum Port Triggering Timeouts	Unlimited*
DMZ	Yes
Network Standards	IPv4, IPv6 (DHCPv6 client, server and RA) by default, OSPF, BGP, NAT64 and DN64 by packages
DHCP	Server/client mode, client list, MAC address reservation
Maximum DHCP Reservations	Unlimited
LAN/WLAN IGMP Snooping	

\*UPnP server/client / OpenVPN/DNS by default, others by packages

# 1. Turris Omnia(5) - Specification(2)

Policy Route, Static Route, Network Address Translation (NAT), PPPoE Relay	
Maximum IPv4 Static Routes	Unlimited*
Maximum IPv6 Static Routes	Unlimited*
Diagnosis Tools	Any Linux package
Management	
Operating System	Turris OS, open source, based on OpenWrt, endless SW extensibility by Linux packages
Free OS Upgrade	Frequent automatic security and feature updates
Remote Access	VPN, SSH
Operation Modes	Wireless Router, Wireless AP, Wireless Client
Wake on LAN (WOL)	Yes
Maximum Connected Devices	Unlimited*
Notification	Email, push notifications in mobile application in plan
SSH	Yes
SNMP	By third party packages
Configuration, Backup & Restore	Yes, simple Foris UI, advanced LuCI or SSH, UART serial bus accessible, easy reflash from USB drive
User Account Management	Yes
Printer Server	2x USB 3.0 ports, possible extension by USB hub
Parental Control	
Customized Internet Schedule, DNS-based Web-filter with Built-in Database, Customized Allow/Block List	Setup by single/multiple devices

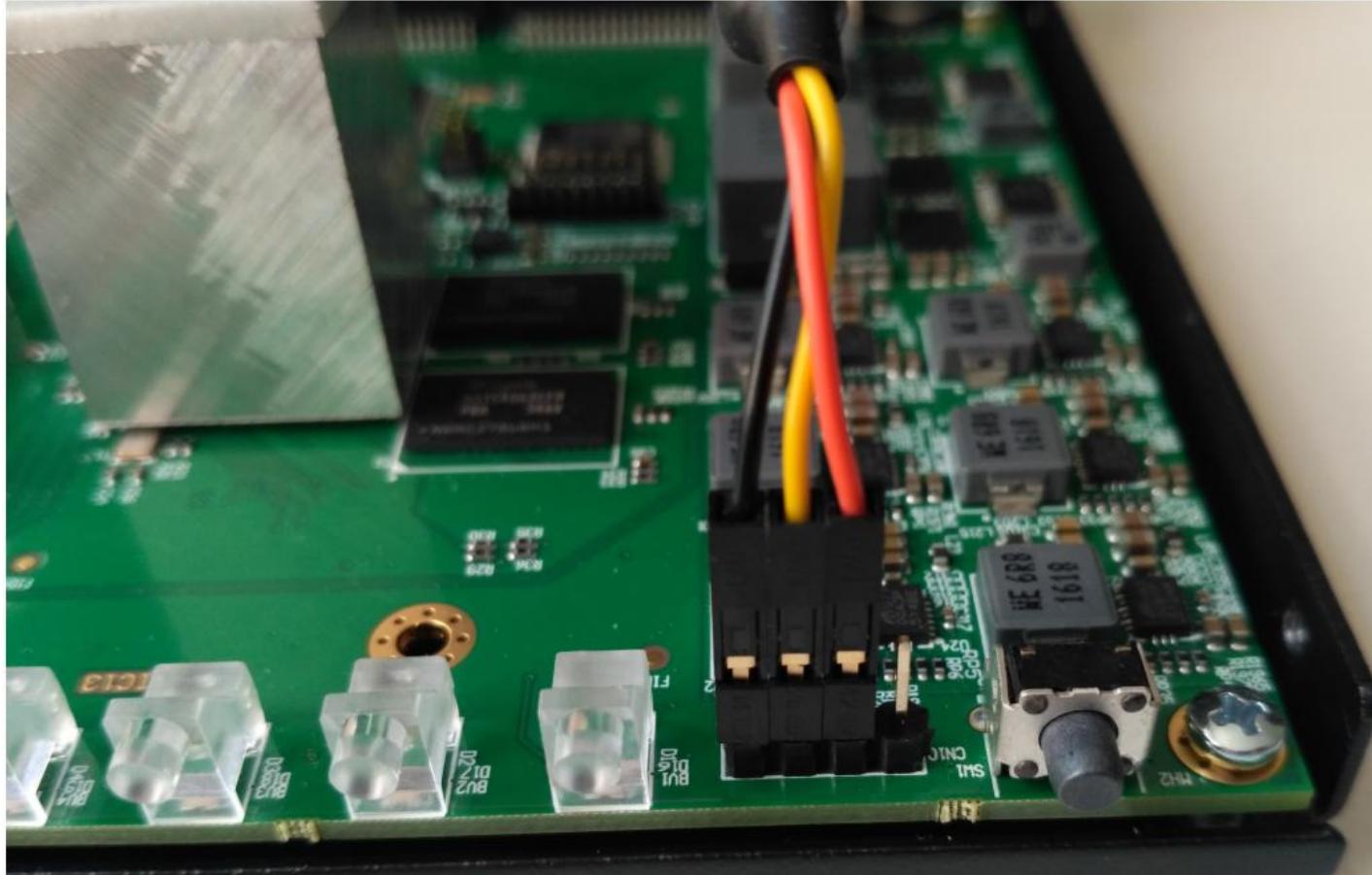
Maximum Devices	Unlimited*
Maximum Blocked URLs	Unlimited*
Maximum Allowed URLs	Unlimited*
Traffic Control	
Internet Ban, Device Speed & Priority	Yes
Application Layer (L7) Quality of Service (QoS)	
Maximum Device Rules	Unlimited*
Maximum Application Rules per Device	Unlimited*
Traffic Monitor for Graphical Live /History Statistics	Yes, in Majordomo package for now, in advanced parental control in 2017
Security	
Wi-Fi Encryption	WEP, WPA/WPA2-Personal, WPA/WPA2-Enterprise
Wi-Fi MAC Address Filter	Yes
Firewall/SPI Firewall	Yes, with unlimited settings*
DoS Protection	Yes, by optional central-maintained, shared firewall
Special Security Features	Honeypots and minipots that are getting informations about attacker and share them with other Turris routers.
Mobile App	In development
File Service	
File System	EXT2/3/4, Btrfs, FAT, NTFS, HFS+, exFAT (depending on installed packages)
Access Support	Web browser, SSH, mobile app (in development)
Protocol Support	SMB, AFP, DLNA, FTP/FTPS, WebDAV
Apple Time Machine	User installable by package
Shared Folder Privileges	Manageable by Linux permissions

# 1. Turris Omnia(6) - Serial Console

- [https://doc.turris.cz/doc/en/troubleshooting/serial\\_link](https://doc.turris.cz/doc/en/troubleshooting/serial_link)

black (GND), yellow (RX), orange (TX)

```
screen /dev/ttyUSB0 115200
```



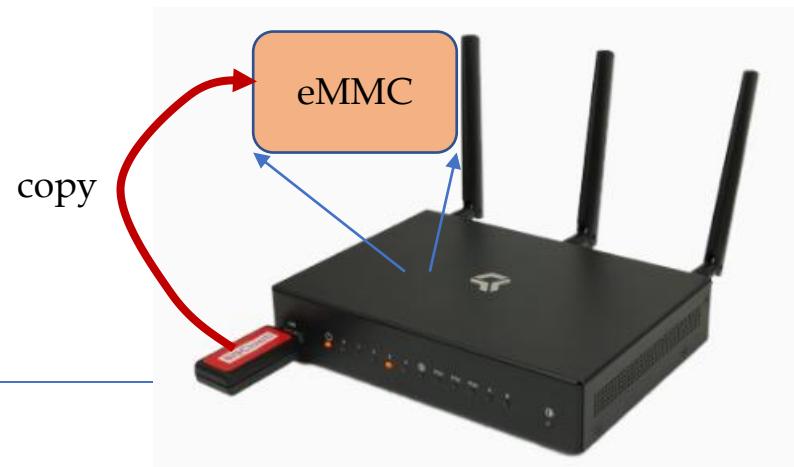
# 1. Turris Omnia(7) - ps

Foris UI가 제거된 모습

```
1239 root      0 SW< [kafsd]
1244 root      0 SW< [cifsiod]
1259 root      0 SW< [rpciod]
1265 root      0 SW< [nfsiod]
1380 root      0 SW< [cryptodev_queue]
1400 root      0 SW< [cfg80211]
1405 root      0 SW< [ath10k_wq]
1406 root      0 SW< [ath10k_aux_wq]
1762 root      1280 S /sbin/rpcd
1795 root      1564 S /usr/sbin/haveged -w 1024 -d 32 -i 32 -v 1
1845 root      4780 S {sfpswitch.py} /usr/bin/python /usr/sbin/sfpswitch.py --nodaemon
1870 root      1552 S /sbin/netifd
2008 root      1128 S /usr/sbin/odhcpd
2049 nobody    792 S /usr/sbin/atd -f
2087 root      2792 S /usr/sbin/sshd -f /var/etc/ssh/sshd_config
2094 root      8208 S /usr/sbin/syslog-ng -F
2353 root      2080 S /usr/sbin/hostapd -P /var/run/wifi-phy1.pid -B /var/run/hostapd-phy1.conf
2377 root      4976 S /usr/sbin/lighttpd -D -f /etc/lighttpd/lighttpd.conf
2383 root      936 S /sbin/mountd -f
2408 root      764 S /usr/sbin/cron -n
2421 root      1756 S /usr/sbin/smardd -q never
2662 root      2080 S /usr/sbin/hostapd -P /var/run/wifi-phy0.pid -B /var/run/hostapd-phy0.conf
2681 root      1108 S udhcpc -p /var/run/udhcpc-eth1.pid -s /lib/netifd/dhcp.script -f -t 0 -i eth1
2710 root      0 SW< [wg-crypt-spn0]
2715 root      852 S odhcp6c -s /lib/netifd/dhcpv6.script -P0 -U -t120 eth1
2799 nobody    1168 S /usr/sbin/dnsmasq -C /var/etc/dnsmasq.conf -k -x /var/run/dnsmasq/dnsmasq.pid
2867 root      34620 S /usr/bin/kresd -c /tmp/kresd.config -f 1 /tmp/kresd -a 0.0.0.0 53 -a :: 53
3041 root      1108 S< /sbin/ntp -n -N -S /usr/sbin/ntp-hotplug -p 217.31.202.100 -p 195.113.144.20
3566 root      2812 S sshd: root@pts/0
3594 root      1120 S -ash
8809 root      0 SW [kworker/0:0]
11466 root     2812 S sshd: root@pts/1
11671 root     1112 S -ash
14672 root      0 SW< [kworker/u5:1]
14777 root      0 SW [kworker/u4:0]
17371 root      0 SW [kworker/0:2]
18242 root      716 S nethist
18669 root      0 SW [kworker/u4:1]
19099 root     1112 R ps
```

## 2. How to flash firmware image(1)

- [https://doc.turris.cz/doc/en/howto/omnia\\_factory\\_reset](https://doc.turris.cz/doc/en/howto/omnia_factory_reset)
  - 0| site 내용 참조
- <http://api.turris.cz/openwrt-repo/omnia/medkit/>
  - [omnia-medkit-201811301131.tar.gz](#) (or latest 파일을 download 받음)
  - **이 파일을 USB stick(/ 파티션)에 복사(압축을 풀지 않고, 그대로 복사)한 후, 장비 전면의 USB slot에 삽입**
  - 참고: 이 파일을 풀면, usr/lib/python3.6/site-packages/foris 아래에 foris webUI(python code)가 있을 것임.
- 장비 후면의 reset button을 누른 상태에서 아래 LED(4번)가 켜지면 떼면 됨. 이후 Serial console을 통해 flashing 진행 상태 확인하면 됨.
  - 1 LED: Standard (re)boot
  - 2 LEDs: Rollback to latest snapshot
  - 3 LEDs: Rollback to factory reset
  - **4 LEDs: Re-flash router from flash drive**
  - 5 LEDs or more: Boot to rescue shell



## 2. How to flash firmware image(2)

- 1) USB memory stick 준비
  - <Ubuntu 16.04>
  - \$ sudo umount /dev/sdc1
    - ✓ /dev/sdc1 은 자신의 환경에 맞는 값을 입력해 주면 됨.
  - \$ sudo fdisk /dev/sdc
  - \$ sudo mkfs.ext4 /dev/sdc1
  - \$ sudo cp ./omnia-medkit-latest.tar.gz /media/chyi/michael
    - ✓ / 파티션에 medkit 파일을 복사해 주면 됨.
    - ✓ **주의: omnia-medkit-latest.tar.gz 파일은 build\_spnbox.sh를 통해 새로 생성한 것을 사용해야 함.**
- 2) Serial Console 연결 [꼭 필요한 사항은 아님]
- 3) USB stick을 Turris Omnia 전면 USB slot에 삽입
- 4) 장비 후면의 reset 버튼을 누른 상태에서 LED4가 켜지면 땡.
  - 전원 cable을 연결한 상태에서 진행해도 됨.
- 5) Serial console을 통해 flashing(to EMMC)이 진행되는 것을 확인. 설치가 완료되면 system 자동 reboot 됨.

### 3. Turris WebUI(Foris) Wizard 설정(1)

Firmware 설치 후, 192.168.1.1로 접속

The screenshot shows a web browser window titled "Password | Turris router". The URL is "192.168.1.1/foris/config/main/password/". A yellow header bar at the top says "Firmware 설치 후, 192.168.1.1로 접속". The main content area has a blue header with the text "your password. Note the security of your home network is in your hands, so try not to use weak passwords." and two buttons: "Reset Guided Mode" and "Leave Guided Mode".

**Password**

**for Foris web interface**  
Set your password for this administration interface. The password must be at least 6 characters long.

**Password**  .....  
**Password (repeat)**  .....

**for Advanced administration**  
In order to access the advanced configuration options which are not available here, you must set the root user's password. The advanced configuration options can be managed either through the [LuCI web interface](#) or via SSH.

**Advanced administration**  ?

**Discard changes** **Save changes**

### 3. Turris WebUI(Foris) Wizard 설정(2)

The screenshot shows the Turris WebUI interface for WAN configuration. On the left, a sidebar lists options: PASSWORD, WAN (which is selected and highlighted in blue), REGION AND TIME, DNS, UPDATER, and GUIDE FINISHED. At the bottom of the sidebar are language settings (ENGLISH) and a LOG OUT button. The main content area has a header 'FORIS GUIDE' with the sub-instruction: 'In order to access the internet you need to configure your WAN interface.' Below this are two buttons: 'Reset Guided Mode' and 'Leave Guided Mode'. The main section is titled 'WAN' and contains instructions: 'Here you specify your WAN port settings. Usually, you can leave this options untouched unless instructed otherwise by your internet service provider. Also, in case there is a cable or DSL modem connecting your router to the network, it is usually not necessary to change this setting.' It includes three configuration fields: 'IPv4 protocol' set to 'DHCP (automatic configuration)', 'IPv6 protocol' set to 'Disable IPv6', and a 'Custom MAC address' field with a checkbox and a help icon. At the bottom are 'Discard changes' and 'Save changes' buttons. A 'Connection test' section at the bottom is described with the note: 'Here you can test your connection settings. Remember to click on the **Save** button before running the test. Note that sometimes it takes a while before the connection is fully initialized. So it might be useful to wait for'.

### 3. Turris WebUI(Foris) Wizard 설정(3)

The screenshot shows the 'Region and time' configuration page of the Turris WebUI. At the top, there are 'Reset Guided Mode' and 'Leave Guided Mode' buttons. The main title is 'Region and time'. A note states: 'It is important for your device to have the correct time set. If your device's time is delayed, the procedure of SSL certificate verification might not work correctly.' Below this, under 'Region settings', it says: 'Please select the timezone the router is being operated in. Correct setting is required to display the right time and for related functions.' There are dropdown menus for 'Continent or ocean' (set to Asia), 'Country' (set to South Korea), and 'Timezone' (set to Seoul). Under 'Time settings', it says: 'Time should be up-to-date otherwise DNS and other services might not work properly.' A dropdown menu for 'How to set time' is set to 'via ntp'.

PASSWORD

WAN

REGION AND TIME

DNS

UPDATER

GUIDE FINISHED

ENGLISH

LOG OUT

Region and time

Reset Guided Mode

Leave Guided Mode

Region settings

Please select the timezone the router is being operated in. Correct setting is required to display the right time and for related functions.

Continent or ocean: Asia

Country: South Korea

Timezone: Seoul

Time settings

Time should be up-to-date otherwise DNS and other services might not work properly.

How to set time: via ntp

### 3. Turris WebUI(Foris) Wizard 설정(4)

The screenshot shows the Turris WebUI DNS configuration page. The URL is [192.168.1.1/foris/config/main/dns/](http://192.168.1.1/foris/config/main/dns/). The left sidebar has tabs for 'DNS', 'UPDATER' (disabled), and 'GUIDE FINISHED'. The main content area has a green success message: 'Configuration was successfully saved.' Below it, a note states: 'Router Turris uses its own DNS resolver with DNSSEC support. It is capable of working independently or it can forward your DNS queries to your internet service provider's DNS resolver.' A detailed note explains that ISP resolvers might interfere with DNSSEC validation, so temporarily disabling it can help identify problems, but it warns against doing so. It also recommends keeping DNSSEC turned on. At the bottom, there are settings for 'Use forwarding' (checked), 'DNS Forwarder' (set to 'Use provider's DNS resolver'), 'Disable DNSSEC' (checked), and 'Enable DHCP clients in DNS' (unchecked). A yellow warning box at the bottom right says: '주의: 이걸 선택하지 않으면, 인터넷 연결이 안될 수 있음.' (Warning: If you don't select this, the internet connection may not work). Buttons at the bottom are 'Discard changes' and 'Save changes'.

DNS

Configuration was successfully saved.

Router Turris uses its own DNS resolver with DNSSEC support. It is capable of working independently or it can forward your DNS queries to your internet service provider's DNS resolver.

The following setting determines the behavior of the DNS resolver. Usually, it is better to use the ISP's resolver in networks where it works properly. If it does not work for some reason, it is necessary to use direct resolving without forwarding.

In rare cases ISP's have improperly configured network which interferes with DNSSEC validation. If you experience problems with DNS, you can **temporarily** disable DNSSEC validation to determine the source of the problem. However, keep in mind that without DNSSEC validation, you are vulnerable to DNS spoofing attacks! Therefore we **recommend keeping DNSSEC turned on** and resolving the situation with your ISP as this is a serious flaw on their side.

Use forwarding

DNS Forwarder

Disable DNSSEC

Enable DHCP clients in DNS  ?

주의: 이걸 선택하지 않으면, 인터넷 연결이 안될 수 있음.

Discard changes Save changes

### 3. Turris WebUI(Foris) Wizard 설정(5)

The screenshot shows the Turris WebUI Updater interface. On the left sidebar, there are sections for **PASSWORD**, **WAN**, **REGION AND TIME**, **DNS**, and **UPDATER**. The **UPDATER** section is highlighted with a blue background and contains a circular arrow icon. Below the sidebar, it says **GUIDE FINISHED**. At the bottom, there are language options (**ENGLISH**) and a **LOG OUT** button.

**FORIS GUIDE**

Now you need to configure automatic updates on your device.

**Reset Guided Mode** | **Leave Guided Mode**

## Updater

Updater is a service that keeps all TurrisOS software up to date. Apart from the standard installation, you can optionally select bundles of additional software that'd be installed on the router. This software can be selected from the following list. Please note that only software that is part of TurrisOS or that has been installed from a package list is maintained by Updater. Software that has been installed manually or using opkg is not affected.

One of the most important features of router Turris are automatic system updates. Thanks to this function your router's software stays up to date and offers better protection against attacks from the Internet.

It is **highly recommended** to have this feature **turned on**. If you decide to disable it, be warned that this might weaken the security of your router and network in case flaws in the software are found.

By turning the automatic updates on, you agree to this feature's license agreement. More information is available [here](#).

Use automatic updates (recommended)  
 Turn automatic updates off

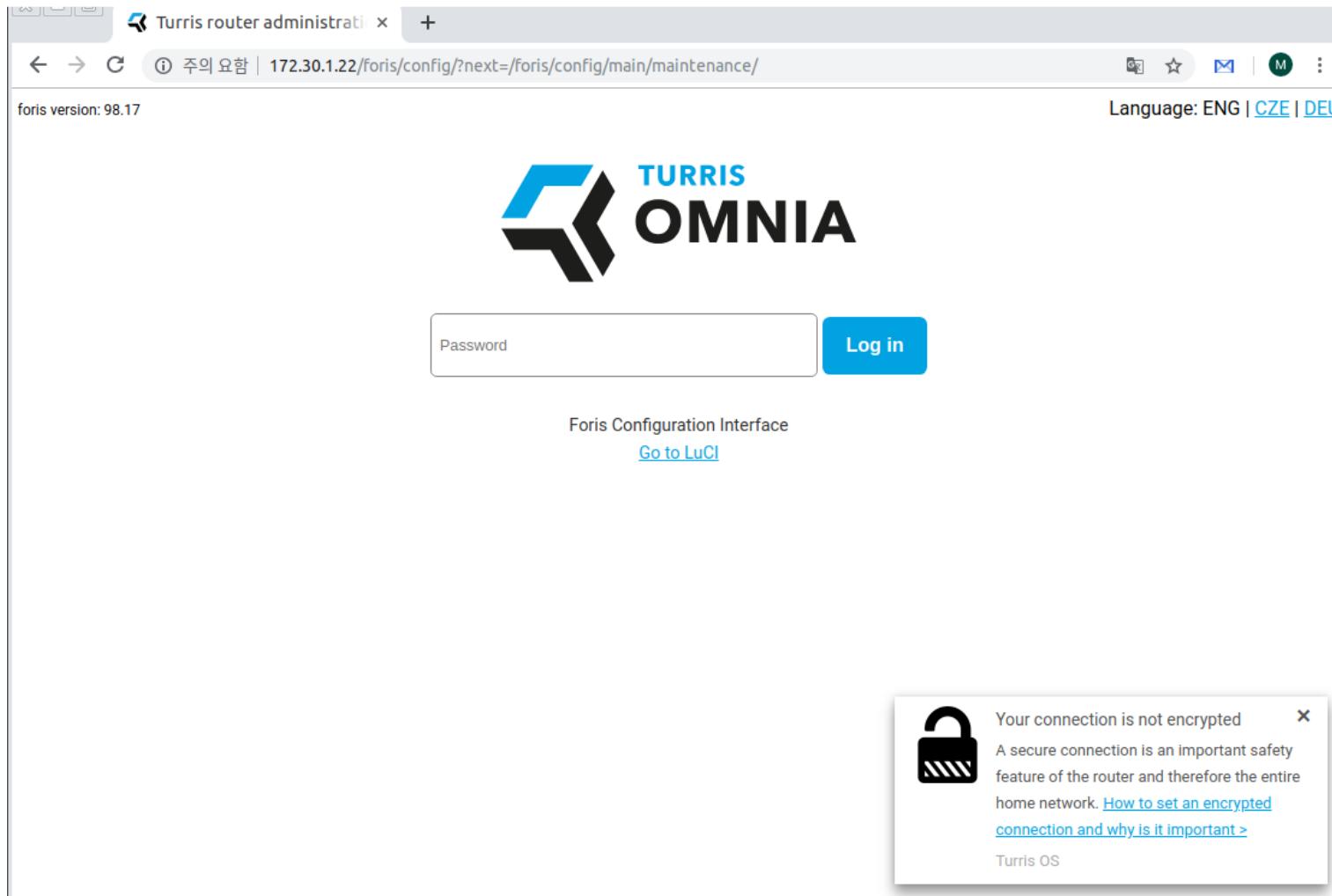
### Update approvals

### 3. Turris WebUI(Foris) Wizard 설정(6)

The screenshot shows the Turris WebUI Maintenance page at the URL [192.168.1.1/foris/config/main/maintenance/](http://192.168.1.1/foris/config/main/maintenance/). The left sidebar includes links for MAINTENANCE, UPDATER, STORAGE, DIAGNOSTICS, and ABOUT, with ENGLISH selected. The main content area has three main sections:

- Configuration backup:** A section for saving the current configuration as an unencrypted compressed archive (.tar.bz2). It includes a "Save" button and a "Download configuration backup" button.
- Configuration restore:** A section for restoring configuration from a backup file. It includes a "Backup file" input field (set to "선택된 파일 없음") and a "Restore from backup" button.
- Device reboot:** A section for rebooting the device. It includes a "Reboot" button and a note: "If you need to reboot the device, click on the following button. The reboot process takes approximately 30 seconds, you will be required to log in again after the reboot." A red dashed box highlights the "Reboot" button, which is also highlighted by a blue arrow pointing to a yellow callout box containing the Korean text "Wizard setup 후에는 반드시 Reboot을 해주어야 한다."

### 3. Turris WebUI(Foris) Wizard 설정(7)



# 4. SPNBox(1) - Build and Install SPNBox S/W

```
=====
** 2STON SPNBox/Cloud Image Generator **
=====

Would you like to:
 1. generate an image for ARM64 ESPRESSObin board
 2. generate an image for ARM64 GrapeBoard
 3. generate an image for ARM64 MACCHIATObin board
 4. generate an image for ARM64 Raspberry Pi 3 B+ board
 5. generate an image for X86_64 C1037 board(10 ports)
 6. generate an image for X86_64 J1900 board(4 ports)
 7. generate an image for X86_64 D525 board(6 ports)
 8. generate an image for X86_64 XD1518 board(8 ports)
 9. generate an image for X86_64 H310 board(KIP12 Box)
10. generate an image for X86_64 Fitlet2 board(NextCloud)
11. generate an image for SPN OS(based on VyOS)
12. generate an image for Amazon Web Service EC2
13. generate an image for Amazon Web Service NAT instance
14. generate an image for ARM32 RP7 R3 board(Access Point)
15. generate an image for ARM32 Turris Omnia board(Access Point)
16. generate an image for MIPS32 GL.iNet AR7505 board(Access Point)
17. generate an image for MIPS32 GL.iNet USB150 board(Access Point)
18. generate an image for ARM32 GL.iNet B1300 board(Access Point)
19. generate an image for MIPS32 GL.iNet AR150 board(Access Point)
20. generate an image for MIPS32 GL.iNet X750 board(Access Point/LTE)
21. generate an image for MIPS32 GL.iNet MiFi board(Access Point/LTE)
22. login to AWS EC2
i. Information
q. Quit this program

Please select one of the above (1-22 or i or q): 15
```

<Ubuntu 16.04 Desktop>

omnia-medkit-latest.tar.gz 파일 설치 시, /root/workspace 아래에  
자동으로 spnbox\_install.tar.gz이 복사되게 됨.

수동 설치

root@turris:~/workspace/spnbox\_install# ./Install.sh

```
*****
*                                     2IP 2STON SPNBox 1.00
*                                     (C)opyright 2018, All rights reserved.
*****
```

Installing 2ston spnbox package for Turris\_Omnia ...
OK, done.

>>> Do you want to restart the system now?(y/n)

```
root@turris:~/workspace/spnbox_install# Connection to 172.30.1.49 closed by remote host.
Connection to 172.30.1.49 closed.
```

SPNBox-AP(Target Board)

## 4. SPNBox(2) - SPN Tunnel 설정 예(1)

```
chy@jupiter:~/2IP/spn/Turris/turris-os$ ssh root@172.30.1.49  
root@172.30.1.49's password:
```

```
BusyBox v1.29.3 () built-in shell (ash)
```



```
Build On Dec 18 2018 11:25:38  
turris> en  
turris# configure terminal  
turris(config)# show running-config  
#Writed on Tue Dec 18 14:30:36 2018  
ip address spn0 10.1.1.99 255.255.255.0  
ip route 172.31.0.0 255.255.0.0 10.1.1.99  
spn link-up  
spn listenport 59760  
spn peer gXlNPPhrIpboSr4rMD9tF614mVFvF/GqyONJo4kmNB3I= allowed-ips 172.31.0.0/16,10.1.1.0/24 endpoint 1  
3.125.60.224:59760 persistent-keepalive 25  
!  
turris(config)#
```

주의 !

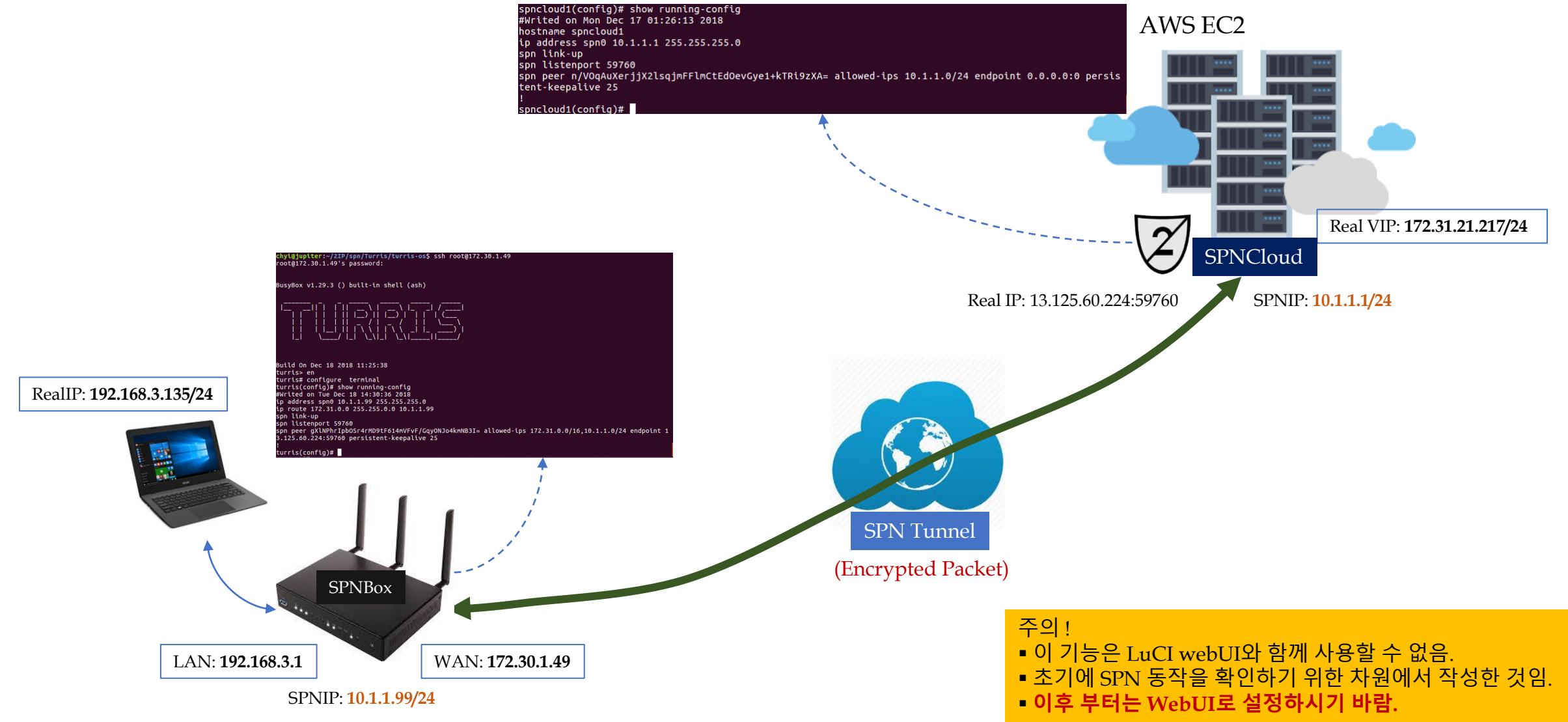
- 이 기능은 LuCI webUI와 함께 사용할 수 없음.
- 초기에 SPN 동작을 확인하기 위한 차원에서 작성한 것임.
- 이후 부터는 WebUI로 설정하시기 바랍니다.

```
turris(config)# show spn  
interface: spn0  
public key: YHcfMMMZjfOM7RlQyhG+T/wgtSkUXEUJJ+4khqSM3o=  
private key: (hidden)  
listening port: 59760
```

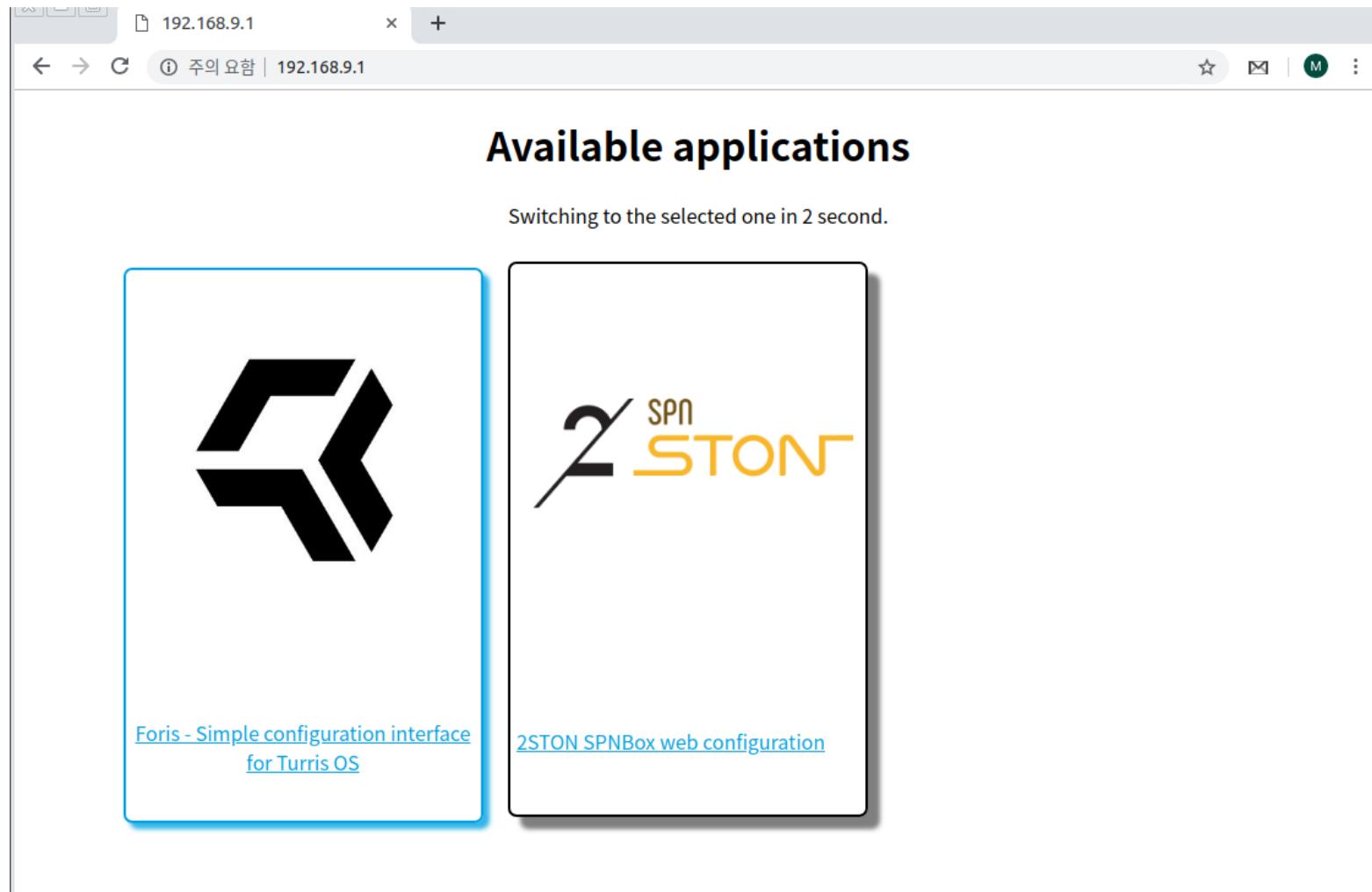
```
peer: gXlNPPhrIpboSr4rMD9tF614mVFvF/GqyONJo4kmNB3I=  
endpoint: 13.125.60.224:59760  
allowed ips: 172.31.0.0/16, 10.1.1.0/24  
latest handshake: 1 minute, 25 seconds ago  
transfer: 228.48 KiB received, 230.25 KiB sent  
persistent keepalive: every 25 seconds
```

```
interface: spn1  
turris(config)#
```

## 4. SPNBox(2) - SPN Tunnel 설정 예(2)



# 5. LuCI WebUI(1) - Login



# 5. LuCI WebUI(2) - Status Page(1)

The screenshot shows the LuCI Status Page for the device spnbox-ap. The page is divided into sections: System, Memory, and Network. The System section displays various system parameters. The Model field, which contains "SPNBox-1000", is highlighted with a red rectangle. The Memory section shows memory usage statistics. The Network section is partially visible at the bottom.

## Status

### System

Hostname	spnbox-ap
Model	SPNBox-1000
Firmware Version	OpenWrt omnia 15.05 r47055 / LuCI 96366054565006474c39e02dca00c9d45dcb9e15 branch (git-18.328.59464-9636605)
Kernel Version	4.4.167-4a7a81f8db0ad743e54c68e1845c60b6-1
Local Time	Wed Jan 9 18:16:42 2019
Uptime	0h 29m 34s
Load Average	2.85, 0.82, 0.35

### Memory

Total Available	1945200 kB / 2070072 kB (93%)
Free	1942776 kB / 2070072 kB (93%)
Buffered	2424 kB / 2070072 kB (0%)

### Network

# 5. LuCI WebUI(2) - Status Page(2)

The screenshot shows the LuCI Status Page for the device 'spnbox-ap'. The top navigation bar includes links for Overview, Status, System, Services, Network, Statistics, and Logout. A green button labeled 'AUTO REFRESH ON' is visible. The main content area displays three sections: 'DHCP Leases', 'DHCPv6 Leases', and 'Wireless'.

**DHCP Leases**

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
DESKTOP-T8IE46N	192.168.9.135	30:52:cb:20:57:1f	11h 38m 7s

**DHCPv6 Leases**

Host	IPv6-Address	DUID	Leasetime remaining
DESKTOP-T8IE46N	fda1:b4de:45c8::22a/128	000100011d889a9e988389160341	11h 38m 5s

**Wireless**

Generic 802.11ac Wireless Controller (radio0)

81%	SSID: SPNBOX_OMNIA_5G Mode: Master Channel: 36 (5.180 GHz) Bitrate: 6 Mbit/s BSSID: 04:F0:21:32:43:82 Encryption: WPA2 PSK (CCMP)
0%	SSID: OpenWrt Mode: Master Channel: 36 (5.180 GHz) Bitrate: ? Mbit/s BSSID: 06:F0:21:32:43:82 Encryption: None

# 5. LuCI WebUI(3) – SPN Interface Up/Down

The screenshot shows the LuCI WebUI interface for managing network interfaces. The top navigation bar includes links for spnbox-ap, Status, System, Services, Network, Statistics, and Logout. A green button labeled "AUTO REFRESH ON" is visible in the top right.

The main content area is titled "Interfaces" and displays an "Interface Overview". It lists five interfaces:

- WAN**: Status: Uptime: 1h 29m 15s, MAC-Address: D8:58:D7:00:97:00, RX: 7.63 MB (27976 Pkts.), TX: 4.57 MB (22019 Pkts.), IPv4: 172.30.1.30/24. Actions: Connect, Stop, Edit, Delete.
- LAN**: Status: Uptime: 1h 29m 34s, MAC-Address: D8:58:D7:00:96:FF, RX: 1.72 MB (12551 Pkts.), TX: 6.30 MB (11244 Pkts.). Actions: Connect, Stop, Edit, Delete.
- SPN0**: Status: Uptime: 1h 29m 15s, MAC-Address: 00:00:00:00:00:00, RX: 971.05 KB (8332 Pkts.), TX: 1.10 MB (9248 Pkts.), IPv4: 10.1.1.75/32. Actions: Connect, Stop, Edit, Delete. This row is highlighted with a red rounded rectangle and has a blue arrow pointing from the yellow annotation to the "Edit" button.
- WAN6**: Status: RX: 0 B (0 Pkts.), TX: 0 B (0 Pkts.). Actions: Connect, Stop, Edit, Delete.

At the bottom left, there is a button labeled "Add new interface...".

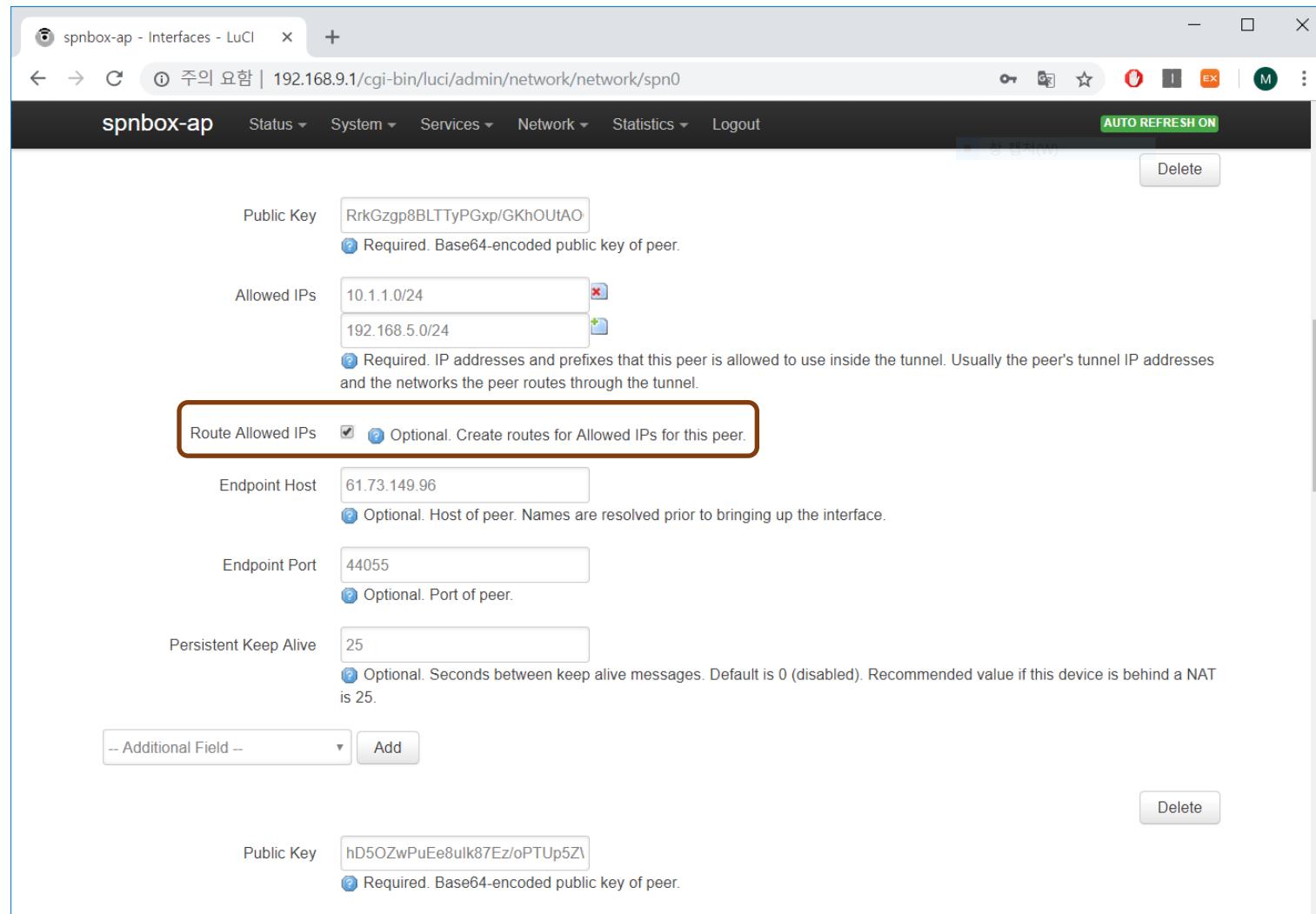
A yellow callout box with the Korean text "Edit 선택하여 SPN rule 입력" (Select Edit to enter SPN rule input) points to the "Edit" button for the SPN0 interface.

# 5. LuCI WebUI(4) - SPN Local 설정

The screenshot shows the LuCI WebUI interface for configuring network interfaces. The current page is 'Interfaces - SPN0'. The 'Advanced Settings' tab is active. The 'Protocol' dropdown is set to '2ston-spn'. The 'Private Key' field contains a placeholder '.....' and has a note: 'Required. Base64-encoded private key for this interface.' The 'Public Key' field contains a placeholder 'vclGaH6tOqnM6u7gmxW2UReaH...' and has a note: 'Required. Base64-encoded public key for this interface.' The 'Listen Port' field is set to '59761' with a note: 'Optional. UDP port used for outgoing and incoming packets.'

Public/Private key는 부팅하면서 자동 생성됨.  
▪ /config/privatekey  
▪ /config/publickey  
  
▪ 위 키를 새로 생성하려면 위 두개의 파일을 제거하고  
부팅하면 됨.

# 5. LuCI WebUI(5) - Peer 추가하기



# 5. LuCI WebUI(6) - Firewall Zone 설정하기

spnbox-ap - Interfaces - LuCI

주의 요약 | 192.168.9.1/cgi-bin/luci/admin/network/network/spn0

spnbox-ap Status Services Network Statistics Logout AUTO REFRESH ON

WAN WAN6 SPN0 LAN

### Interfaces - SPN0

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and enter the names of several network interfaces separated by spaces. You can also use VLAN notation INTERFACE.VLANNR (e.g.: eth0.1).

#### Common Configuration

General Setup Advanced Settings Firewall Settings

Create / Assign firewall-zone

lan:

root: (empty)

spn:

wan:

unspecified -or- create:

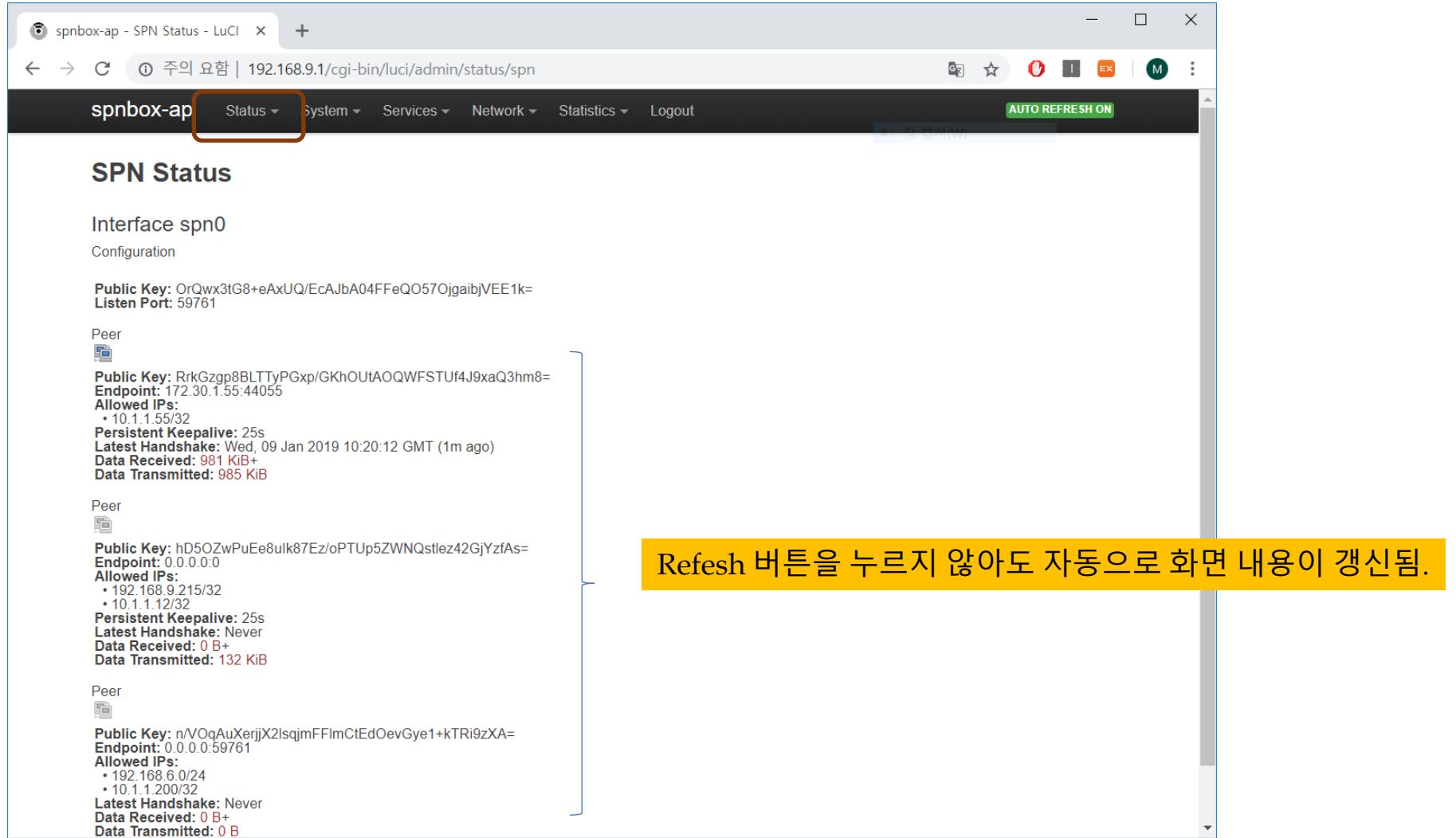
Choose the firewall zone you want to assign to this interface. Select *unspecified* to remove the interface from the associated zone or fill out the *create* field to define a new zone and attach the interface to it.

#### Peers

Further information about SPN interfaces and peers at [2STON SPNBox](#).

실제로 이 부분은 꼭 이렇게 설정해야 하는 것은 아님.

# 5. LuCI WebUI(7) - SPN 연결 상태 보기



spnbox-ap - SPN Status - LuCI

주의 요함 | 192.168.9.1/cgi-bin/luci/admin/status/spn

spnbox-ap Status System Services Network Statistics Logout AUTO REFRESH ON

## SPN Status

Interface spn0

Configuration

Public Key: OrQwx3tG8+eAxUQ/EcAJbA04FFeQO57OjgaibjVEE1k=  
Listen Port: 59761

Peer

Public Key: RrkGzgp8BLTTyPGxp/GKhOUTAOQWFSTUf4J9xaQ3hm8=  
Endpoint: 172.30.1.55:44055  
Allowed IPs:

- 10.1.1.55/32

Persistent Keepalive: 25s  
Latest Handshake: Wed, 09 Jan 2019 10:20:12 GMT (1m ago)  
Data Received: 981 KiB+  
Data Transmitted: 985 KiB

Peer

Public Key: hD5OZwPuEe8ulk87Ez/oPTUp5ZWNQstlez42GjYzfAs=  
Endpoint: 0.0.0.0:0  
Allowed IPs:

- 192.168.9.215/32
- 10.1.1.12/32

Persistent Keepalive: 25s  
Latest Handshake: Never  
Data Received: 0 B+  
Data Transmitted: 132 KiB

Peer

Public Key: nVOqAuXerjJX2lsqjmFFImCtEdOevGye1+kTRi9zXA=  
Endpoint: 0.0.0.0:59761  
Allowed IPs:

- 192.168.6.0/24
- 10.1.1.200/32

Latest Handshake: Never  
Data Received: 0 B+  
Data Transmitted: 0 B

Refesh 버튼을 누르지 않아도 자동으로 화면 내용이 갱신됨.

# 5. LuCI WebUI(8) - Firewall SPN Zone 추가(1)

The screenshot shows the LuCI WebUI interface for the 'spnbox-ap' device, specifically the 'firewall' section. The top part of the screen displays general settings for the firewall, including options for SYN-flood protection and dropping invalid packets. Below this, the 'Zones' section lists existing zones and their configurations. A new zone, 'spn', is being added, as indicated by the 'Add' button at the bottom. A yellow callout box on the right side of the 'Zones' table points to the 'Edit' button for the 'spn' zone, with the text 'Edit 버튼 선택하여 상세 설정' (Select the Edit button to set detailed configurations). Another yellow callout box on the left side of the same table points to the 'Edit' button for the 'root' zone, with the text 'SPN port가 Firewall에 의해 차단되므로 SPN port를 허용해 주어야 함.' (The SPN port is blocked by the Firewall, so it must be allowed). The 'spn' zone configuration is highlighted with a brown border.

Zone	Forwardings	Input	Output	Forward	Masquerading	MSS clamping
lan: lan:  ⇒ wan spn	accept	accept	accept	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
wan: wan6:  ⇒ REJECT	reject	accept	reject	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
root: (empty) ⇒ REJECT	accept	accept	reject	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
spn: spn0:  ⇒ wan	accept	accept	accept	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

# 5. LuCI WebUI(8) - Firewall SPN Zone 추가(2)

The screenshot shows the LuCI WebUI interface for managing firewall zones. The URL in the address bar is `192.168.9.1/cgi-bin/luci/admin/network/firewall/zones/cfg25dc81`. The page title is "Firewall - Zone Settings - Zone \"spn\"". The "General settings" tab is selected. The "Zone \"spn\"" section describes the common properties of the zone, mentioning input, output, forward policies, and covered networks. The "Advanced Settings" tab is also visible. Below these are fields for Name (spn), Input (accept), Output (accept), and Forward (accept). A red box highlights the "Masquerading" and "MSS clamping" checkboxes, both of which are checked. A yellow box contains a note in Korean: "SPN packet의 경우도 NAT를 태우겠다는 의미임. ■ 내부 local 망에서 peer의 local 망으로 진입시 반드시 필요함." (The meaning is that NAT will be applied even for SPN packets. ■ It is necessary for traffic entering from the internal local network to the peer's local network.)

SPN packet의 경우도 NAT를 태우겠다는 의미임.  
■ 내부 local 망에서 peer의 local 망으로 진입시 반드시 필요함.

# 5. LuCI WebUI(8) - Firewall SPN Zone 추가(3)

The screenshot shows the LuCI WebUI interface for managing firewall zones. The top navigation bar includes tabs for General settings, Status, System, Services, Network, Statistics, and Logout. The main content area is titled "Inter-Zone Forwarding". It contains two sections: "Allow forward to destination zones" and "Allow forward from source zones". Both sections list three zones: "lan", "root", and "wan". In the "Allow forward to destination zones" section, the "wan" checkbox is checked. In the "Allow forward from source zones" section, the "lan" checkbox is checked. A yellow callout box on the right side of the screen contains the Korean text: "내부 local 망에서 peer의 local 망으로 진입시 반드시 필요함." (It is mandatory when entering from the internal local network to the peer's local network). At the bottom of the page are buttons for "Back to Overview", "Save & Apply", "Save", and "Reset".

내부 local 망에서 peer의 local 망으로 진입시 반드시 필요함.

# 5. LuCI WebUI(9) - 외부망에서 SPNBox 접근 허용 예

**Firewall - Traffic Rules**

The screenshot shows the LuCI WebUI interface for managing traffic rules. The main title is "spnbox-ap - Traffic Rules - LuCI". The URL in the address bar is "192.168.9.1/cgi-bin/luci/admin/network/firewall/rules". The page title is "spnbox-ap". The navigation menu includes Status, System, Services, Network, Statistics, and Logout.

The "advertisement" section contains the following rule:

Allow-ICMPv6-Forward	IPv6-icmp with types <i>echo-request, echo-reply, destination-unreachable, packet-too-big, time-exceeded, bad-header, unknown-header-type</i>	From <i>any host</i> in <i>wan</i> To <i>any router IP</i> on <i>this device</i>	<i>Accept forward</i> and limit to <i>1000 pkts. per second</i>	<input checked="" type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
----------------------	---	---	---	-------------------------------------	-------------------------------------	---------------------------------------

Below this are three more rules, each with a red box around it:

-	Any esp	From <i>any host</i> in <i>wan</i> To <i>any host</i> in <i>lan</i>	<i>Accept forward</i>	<input checked="" type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
---	---------	--	-----------------------	-------------------------------------	-------------------------------------	---------------------------------------

-	Any udp	From <i>any host</i> in <i>wan</i> To <i>any host</i> , port <i>300</i> in <i>lan</i>	<i>Accept forward</i>	<input checked="" type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
---	---------	--	-----------------------	-------------------------------------	-------------------------------------	---------------------------------------

ssh	IPv4-tcp	From <i>any host</i> in <i>any zone</i> To IP <i>172.30.1.30</i> at port <i>22</i> on <i>this device</i>	<i>Accept input</i>	<input checked="" type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
-----	----------	---	---------------------	-------------------------------------	-------------------------------------	---------------------------------------

web	IPv4-tcp	From IP <i>172.30.1.23</i> in <i>wan</i> To IP <i>172.30.1.30</i> at port <i>80</i> on <i>this device</i>	<i>Accept input</i>	<input checked="" type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
-----	----------	--	---------------------	-------------------------------------	-------------------------------------	---------------------------------------

A yellow box at the bottom right contains the text: "일반적으로는 이런 설정을 해서는 안됨."

At the bottom left, there is a section titled "Open ports on router:" with a table:

Name	Protocol	External port
New input rule	TCP+UDP	<input type="text"/>
<input type="button" value="Add"/>		

# 5. LuCI WebUI(10) - Wireless 설정(1)

The screenshot shows the LuCI WebUI interface for a device named 'spnbox-ap'. The top navigation bar includes links for Status, System, Services, Network, Statistics, and Logout, with 'AUTO REFRESH ON' enabled. Below the header, four network interfaces are listed: radio0 (Master "OpenWrt"), radio0 (Master "SPNBOX\_OMNIA\_5G"), radio1 (Master "radio1.network2"), and radio1 (Master "SPNBOX\_OMNIA\_2.4G").

### Wireless Overview

**Qualcomm Atheros QCA9880 802.11bgnac (radio0)**  
Channel: 36 (5.180 GHz) | Bitrate: ? Mbit/s

	94%	SSID: SPNBOX_OMNIA_5G   Mode: Master BSSID: 04:F0:21:32:43:82   Encryption: WPA2 PSK (CCMP)	<input type="button" value="Disable"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/>
	0%	SSID: OpenWrt   Mode: Master BSSID: 06:F0:21:32:43:82   Encryption: None	<input type="button" value="Disable"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/>

**Generic MAC80211 802.11bgn (radio1)**

	0%	SSID: SPNBOX_OMNIA_2.4G   Mode: Master BSSID: 04:F0:21:31:84:D8   Encryption: WPA2 PSK (CCMP)	<input type="button" value="Disable"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/>
	0%	SSID: ?   Mode: Master Wireless is disabled or not associated	<input type="button" value="Enable"/> <input type="button" value="Edit"/> <input type="button" value="Remove"/>

### Associated Stations

SSID	MAC-Address	Host	Signal / Noise	RX Rate / TX Rate
wlan0	SPNBOX_OMNIA_5G	30:52:CB:20:57:1F DESKTOP-T8IE46N (192.168.9.135)	-44 / -101 dBm	351.0 Mbit/s, 80MHz, VHT-MCS 4, VHT-NSS 2 6.0 Mbit/s, 20MHz

# 5. LuCI WebUI(10) - Wireless 설정(2)

The screenshot shows the LuCI WebUI interface for a device named 'spnbox-ap'. The main page displays a summary of network connections and a detailed view of the 'radio0' interface, which is the Master for the SSID 'SPNBOX\_OMNIA\_5G' (wlan0). A yellow callout box highlights the 'Status' section under 'Device Configuration', showing wireless parameters like Mode: Master, SSID: SPNBOX\_OMNIA\_5G, Channel: 36 (5.180 GHz), and Tx-Power: 23 dBm. Another yellow callout box on the right indicates '802.11ac 설정' (802.11ac configuration). A third yellow callout box at the bottom left states '비정상적으로 채널 설정을 할 경우, network 성능이 제대로 안나옴.' (If channel settings are set abnormally, network performance will not be proper).

spnbox-ap - Wireless - LuCI

주요 요함 | 192.168.9.1/cgi-bin/luci/admin/network/wireless/radio0.network1

spnbox-ap Status System Services Network Statistics Logout AUTO REFRESH ON

radio0: Master "OpenWrt" radio0: Master "SPNBOX\_OMNIA\_5G" radio1: Master "radio1.network2" radio1: Master "SPNBOX\_OMNIA\_2.4G"

Wi-Fi 상태

일반

연결

IPv4 연결: 인터넷  
IPv6 연결: 네트워크에 연결되어 있지 않음  
미디어 상태: 사용함  
SSID: SPNBOX\_OMNIA\_5G  
시간: 00:00:34  
속도: 866.7 Mbps

신호 품질:

자세히(E)... 무선 속성(W)

작업

보냄 ————— [PC] ————— 받음  
바이트: 33,617 218,542

속성(P) 사용 안 함(D) 진단(G)

닫기(C)

Wireless Network: Master "SPNBOX\_OMNIA\_5G" (wlan0)

The Device Configuration section covers physical settings of the radio hardware such as channel, transmit power or antenna selection which are shared among all defined wireless networks (if the radio hardware is multi-SSID capable). Per network settings like encryption or operation mode are grouped in the Interface Configuration.

Device Configuration

General Setup Advanced Settings

Status

Mode: Master | SSID: SPNBOX\_OMNIA\_5G  
92% BSSID: 04:F0:21:32:43:82 | Encryption: WPA2 PSK (CCMP)  
Channel: 36 (5.180 GHz) | Tx-Power: 23 dBm  
Signal: -45 dBm | Noise: -101 dBm  
Bitrate: 6.0 Mbit/s | Country: CZ

Wireless network is enabled

Disable

Operating frequency

Mode: AC | Channel: 36 (5180 MHz) | Width: 80 MHz

Transmit Power

auto

dBm

802.11ac 설정

비정상적으로 채널 설정을 할 경우, network 성능이 제대로 안나옴.

# 5. LuCI WebUI(10) - Wireless 설정(3)

spnbox-ap - Wireless - LuCI

← → C ⓘ 주의 요약 | 192.168.9.1/cgi-bin/luci/admin/network/wireless/radio1.network1

spnbox-ap Status Services Network Statistics Logout AUTO REFRESH ON

radio0: Master "OpenWrt" radio0: Master "SPNBOX\_OMNIA\_5G" radio1: Master "radio1.network2" radio1: Master "SPNBOX\_OMNIA\_2.4G"

### Wireless Network: Master "SPNBOX\_OMNIA\_2.4G" (wlan1)

The *Device Configuration* section covers physical settings of the radio hardware such as channel, transmit power or antenna selection which are shared among all defined wireless networks (if the radio hardware is multi-SSID capable). Per network settings like encryption or operation mode are grouped in the *Interface Configuration*.

#### Device Configuration

General Setup Advanced Settings

Status

Mode: Master | SSID: SPNBOX\_OMNIA\_2.4G  
0% BSSID: 04:F0:21:31:84:D8 | Encryption: WPA2 PSK (CCMP)  
Channel: 11 (2.462 GHz) | Tx-Power: 19 dBm  
Signal: 0 dBm | Noise: -95 dBm  
Bitrate: 0.0 Mbit/s | Country: CZ

Wireless network is enabled  Disable

Operating frequency Mode N Channel 11 (2462 MHz) Width 20 MHz

Transmit Power auto  dBm

802.11n 설정

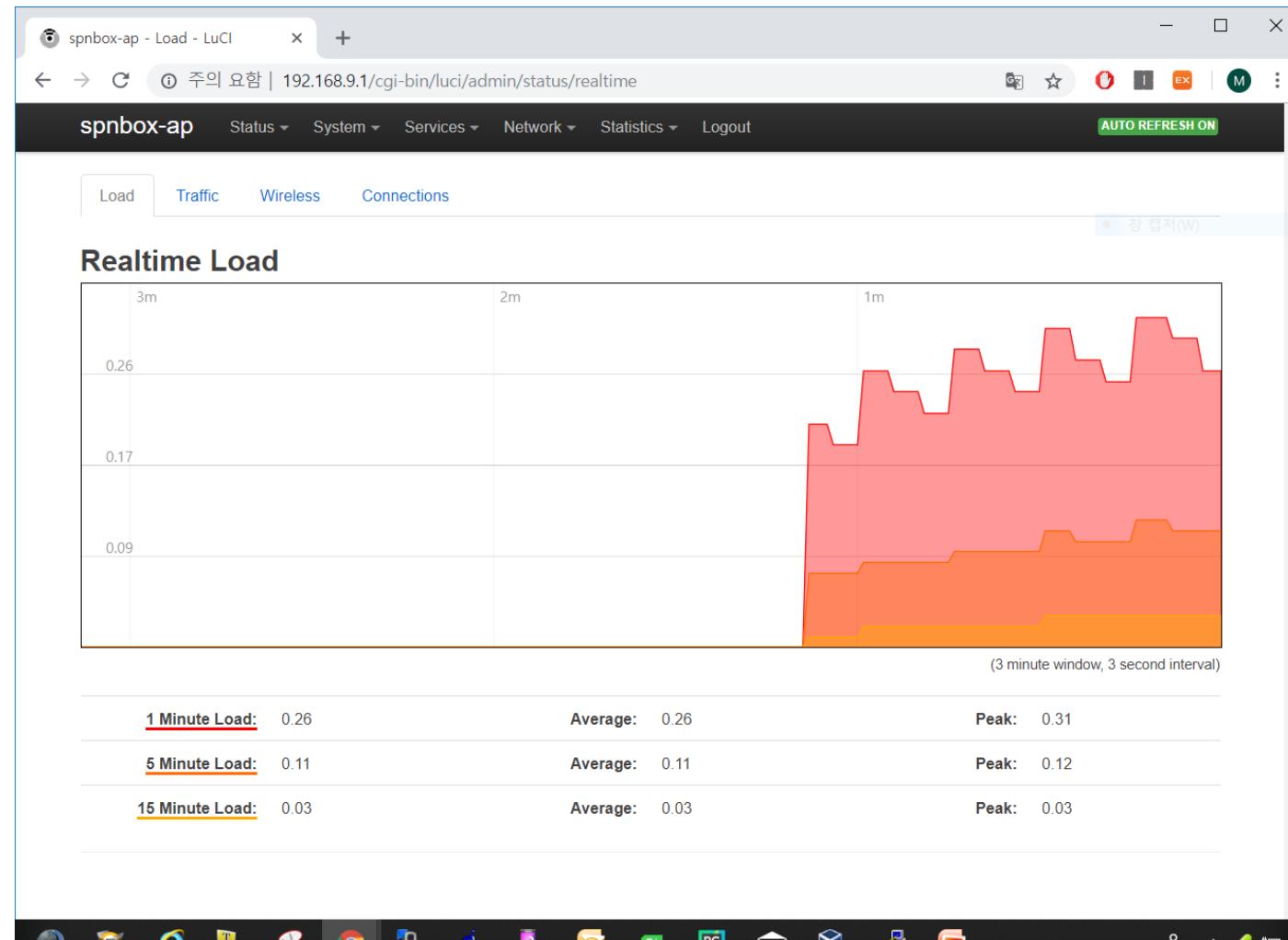
Interface Configuration

## 5. LuCI WebUI(10) – Wireless 설정(4)

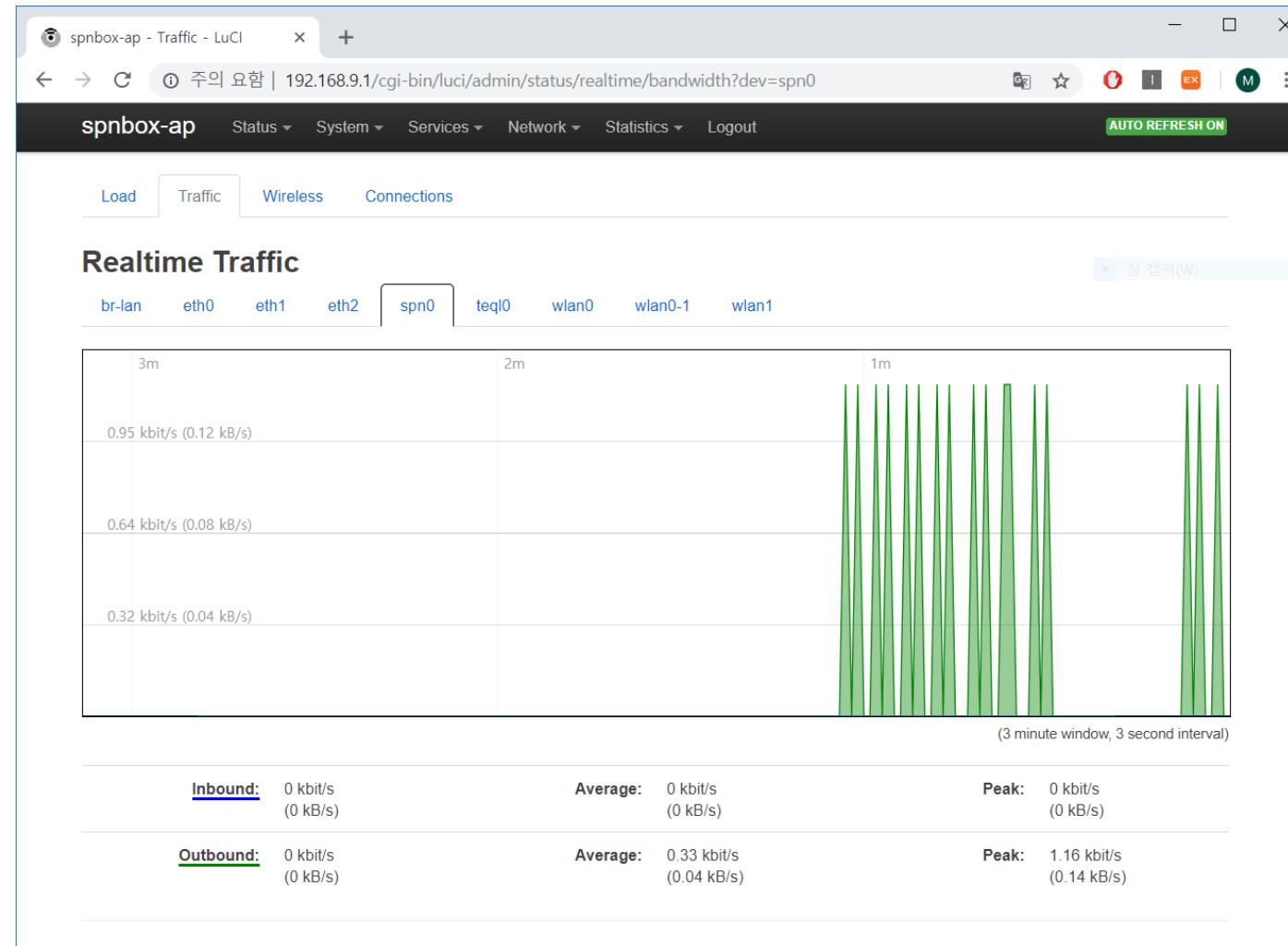
기능	상세 정보
1. 지원 모드	Access Point, Client, Ad-Hoc 802.11s(mesh), WDS(AP or Client)
2. AP Security	WPA-PSK, WPA2-PSK, WPA-PSK/WPA2-PSK Mixed mode, WPA-EAP, WPA2-EAP
3. Cipher	Force CCMP(AES), Force TKIP, Force TKIP and CCMP(AES)
4. Fast Roaming	802.11r Fast Transition
5. 802.11w Management Frame Protection	지원(실제 data가 아니라 wifi 연결을 위한 frame이 암호화 되는 기능)
6. MAC Filter	Supported

(\*) 너무 많아서 일일이 화면 capture를 할 수는 없으나, 고사양 wireless LAN에서 언급하는 거의 대부분의 기능을 제공함.

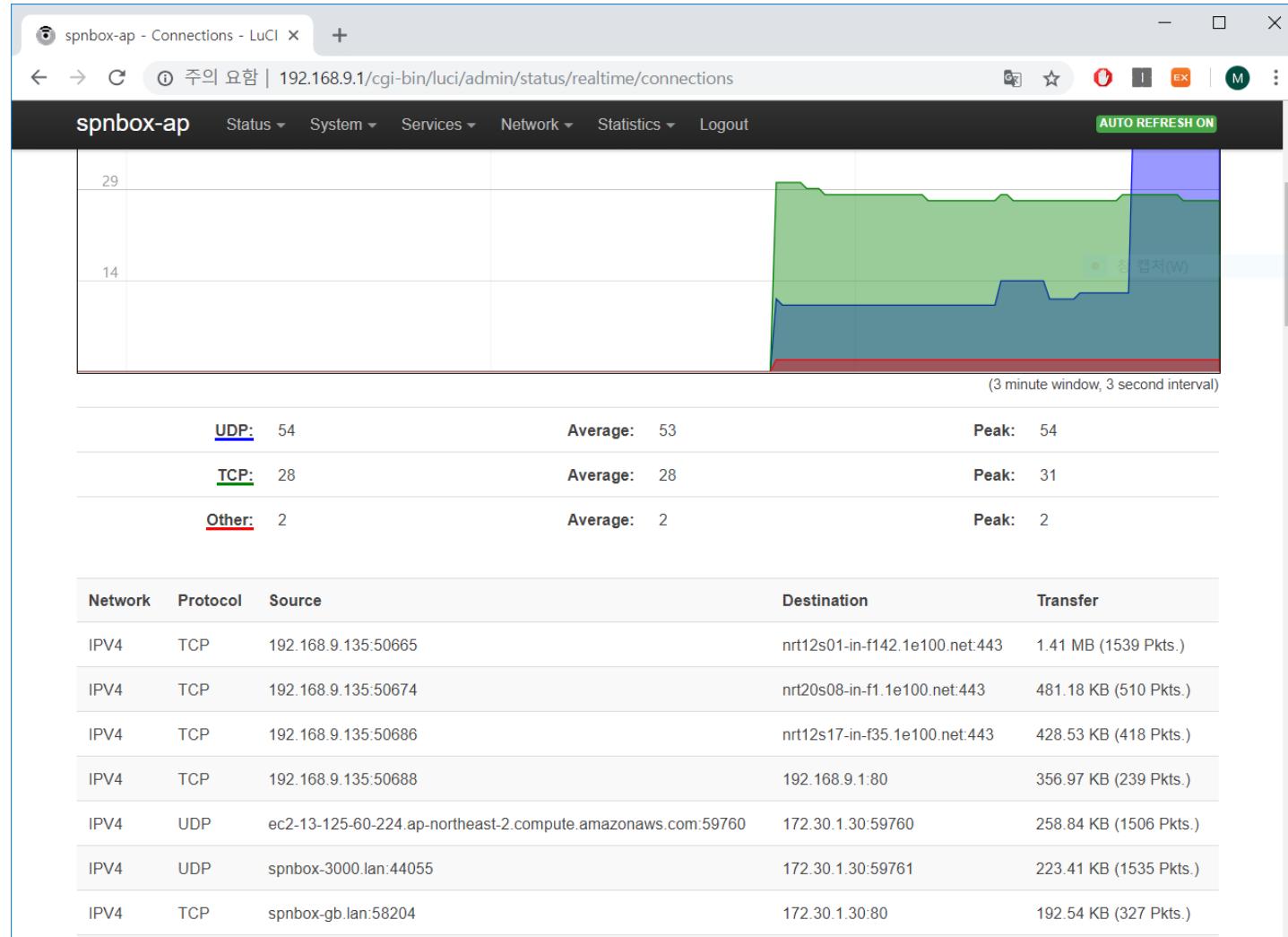
# 5. LuCI WebUI(11) - RealTime Graph(1)



# 5. LuCI WebUI(11) - RealTime Graph(2)



# 5. LuCI WebUI(11) - 세션 정보 확인



# 6. Foris WebUI 분석(1) - Foris 화면 진입 차단하기

- <foris & luci UI 화면이 구동되는 순서>

/etc/lighttpd/lighttpd.conf (=> lighttpd의 configuration file)



include "/etc/lighttpd/conf.d/\*.conf"



/etc/lighttpd/conf.d/turris-root.conf



/usr/share/turris-webapps/turris-root-cgi



여기서 foris와 luci 화면으로 분기하는군 ... 아래와 같이 00\_foris.conf 파일을 삭제하면, 자동으로 foris 화면으로 넘어가는 것을 막을 수 있다.

```
root@turris:/usr/share/turris-webapps# ls -la
drwxr-xr-x  1 root  root      130 Dec 27 15:00 .
drwxr-xr-x  1 root  root      398 Dec 26 11:02 ..
-rw-r--r--  1 root  root     144 Dec 18 21:02 00_foris.conf.ORIG ← 00_foris.conf 파일을 제거하자.
-rw-r--r--  1 root  root      84 Nov 30 19:32 05_luci.conf
-rwxr-xr-x  1 root  root    3730 Dec 27 14:51 turris-root-cgi
-rwxr-xr-x  1 root  root    3730 Dec 27 14:51 turris-root-cgi.ORIG
```

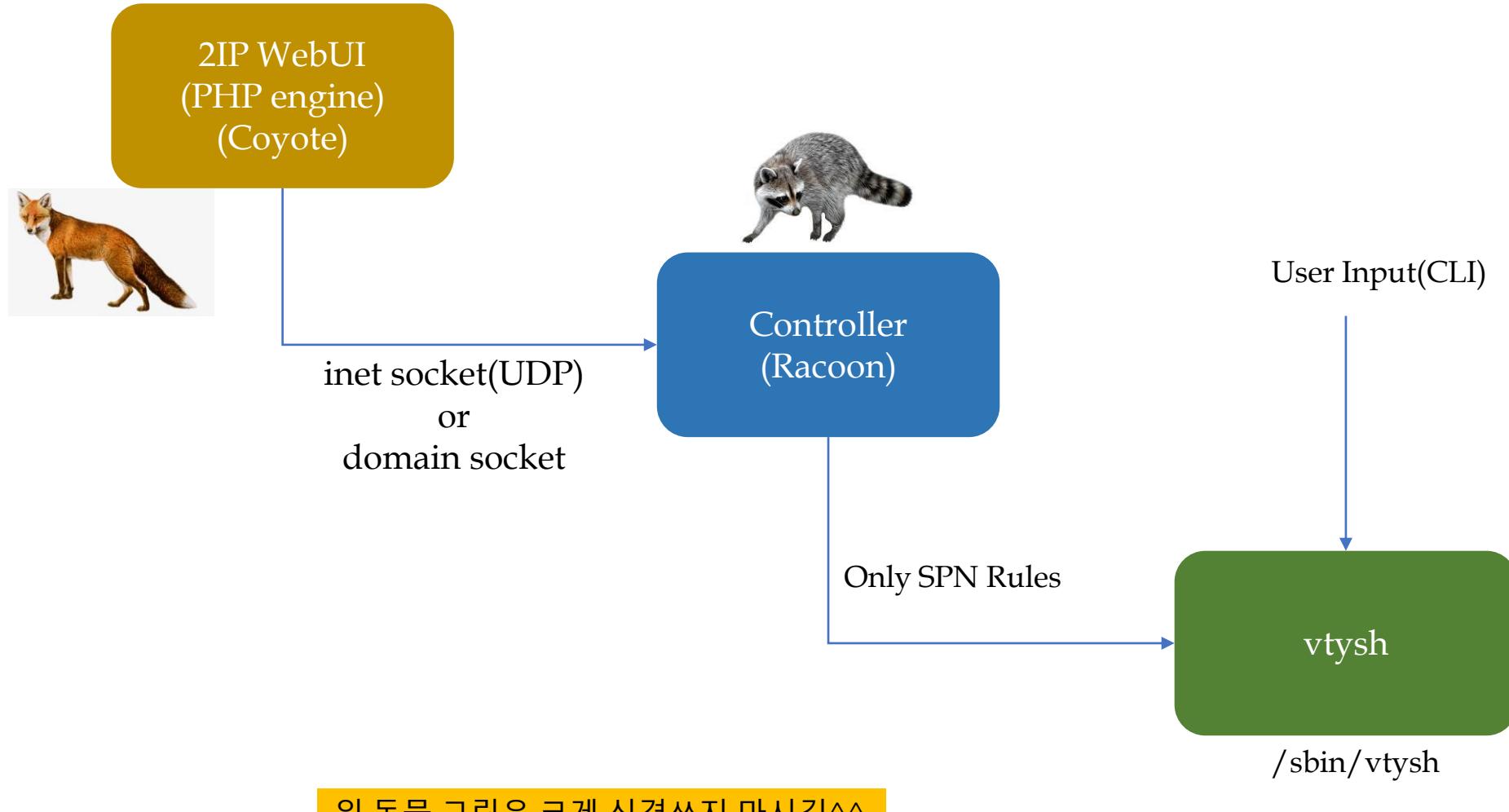
# 6. Foris WebUI 분석(2) - Foris daemon 중지하기

## <foris daemon 제거하기>

- ✓ /etc/rc.d/ 아래의 아래 link를 제거(삭제)
- ✓ foris-controller, foris-ws(web socket) daemon의 구동을 막을 수 있음.

- lrwxrwxrwx 1 root root 18 Dec 26 11:02 K1foris-ws -> ../init.d/foris-ws
- lrwxrwxrwx 1 root root 18 Dec 26 11:48 S69foris-ws -> ../init.d/foris-ws
- lrwxrwxrwx 1 root root 26 Dec 26 11:49 S70foris-controller -> ../init.d/foris-controller

## 7. SPNBox-AP 2IP WebUI(1)



위 동물 그림은 크게 신경쓰지 마시길^^

# 7. SPNBox-AP 2IP WebUI(2)

Turris main UI

The diagram illustrates the integration between the Turris main UI and the SPNBox-AP 2IP WebUI. A blue arrow points from the Turris main UI interface on the left to the SPN RULES section of the SPNBox-AP 2IP WebUI on the right.

**SPN RULES**

**SPNBox Rules & List**

Num	Public Key	Public IP / Port	Allowed IPs	Keepalive	Delete
1	0BQ2YGRLts9jkXBUE5+xONZNXaf+jKJK40R+3Ru+xw=	0.0.0.0	10.1.1.80/32	25	X
2	3L0OJqUTWesqxXBAAaT5V4WWoR48MXxw+JBeRV/h32A=	0.0.0.0	10.1.12/32	25	X
3	3z59OnDn9j32sXWD87upLrHtwIMETIrhzphETCo4Ag=	0.0.0.0	10.1.1.101/32	25	X
4	5P9w79j4rNe4gJG7hixDyWh2IW9f71bXXUN8bSz5S0=	0.0.0.0	10.1.1.77/32	25	X
5	8e/D1DgW+vCxXBtby7zXjyoFAfoT5oyOn0Yhqob85k0=	0.0.0.0	10.1.1.211/32	25	X
6	B/TyeoAv+3hitR54P9/OezEjq80MJIS4OFFG5O6vUh8=	0.0.0.0	10.1.1.27/32	25	X
7	E0DPF5v/3gy6JOSqJv1H1LP9bHYnPl2aaAcgqQfvuDs=	0.0.0.0	10.1.1.35/32	25	X
8	NHbfpyMKe/yXIP0PCKTUP3lwz1kFxnfpxSX3roZ92A=	0.0.0.0	10.1.1.102/32	25	X
9	OrQwx3tG8+eAxUQ/EcAJbA04FFeQO57OjgaibjVEE1k=	0.0.0.0	10.1.1.75/32	25	X
10	YKZRWPpHm8b7sC2fovYx2uCxKMipBawxc7gTWd9w6xQ=	0.0.0.0	10.1.1.80/32	25	X

(\*) 사실상, Sfirewall 기능도 불필요해 보임(Turris main UI 내용과 겹침)  
■ 빼자~

# 8. LTE Module 연결(1) - Quectel EC25-E LTE Module

요 아래에 USIM이 꽂혀 있음.

✓/모서리 각인 부분이 아래로 위치함.



[주의 사항]

LTE 모뎀을 볼 때에는 USIM을 꽂은 상태에서 반드시 장비를 2~3번 정도 재 부팅해 주어야 한다 => USIM 문제

# 8. LTE Module 연결(2) - 참고 Site(1)

✓ 아래 site에 관련 내용이 잘 설명되어 있음.

[https://doc.turris.cz/doc/en/howto/lte\\_modem\\_install](https://doc.turris.cz/doc/en/howto/lte_modem_install)

The screenshot shows a web browser window with the URL [https://doc.turris.cz/doc/en/howto/lte\\_modem\\_install](https://doc.turris.cz/doc/en/howto/lte_modem_install). The page title is "Installation of LTE modem into Turris Omnia router". The content area starts with "Assembly" instructions: "You need a cross-point screwdriver for the assembly." Below this is a "Step 1" section featuring a photograph of a dark brown Turris Omnia router. The router has a small logo on its top surface and ventilation holes along its sides. To the right of the main content area is a "Table of Contents" sidebar with the following structure:

- Installation of LTE modem into Turris Omnia router
  - Assembly
  - Settings

At the bottom left of the page is a link: [https://doc.turris.cz/doc/en/howto/lte\\_modem\\_install?do=register](https://doc.turris.cz/doc/en/howto/lte_modem_install?do=register).

# 8. LTE Module 연결(3) - 참고 Site(2)

## Step 2

Now we should be redirected to the settings page. You can see that the protocol is set to UMTS/GPRS/EV-D0.

Put `/dev/ttyUSB2` into the Modem device field.

If `/dev/ttyUSB2` is not in the menu it could mean that it is necessary to install the `kmod-usb-serial-qualcomm` package.



If you have automatic updates allowed on your router make sure that you have the `netutils` userlist enabled. You can do it in the foris web interface (LuCI password was set there). Just click on the `UPDATER` tab and enable the `Extensions of network protocols` option. Don't forget to store the settings using `Save Changes` button. The package will be automatically installed a bit later.

If you don't have automatic updates allowed you need to install the package manually.

Choose UMTS/GPRS for the Service Type.



Don't be confused by the name of the option. The card could use LTE network even though the LTE option is not mentioned. To see which network is currently used by your card you could connect to your router using SSH and insert a command:

```
uqmi -d /dev/cdc-wdm0 -get-signal-info
```

Then set the APN field. Your provider should instruct you what to put there (usually it is something like "internet").

Lastly set the PIN for your SIM card. If you don't have it set for your card just leave the field empty.



Make sure that you insert the correct pin code. Usually the pin code is blocked after 3 failed attempts and it is necessary to unblock it afterwards.

LTE module이 정상 동작하려면 Linux와 USB interface가 정상적으로 올라와 져야 한다.

```
root@SPNBox-1000:~# opkg install kmod-usb-serial-qualcomm
Package kmod-usb-serial-qualcomm (4.4.169+2-1-7bc33afbb1b35f5830b2b1b42c9cd8a0-2) installed in root is up to date.
root@SPNBox-1000:~#
root@SPNBox-1000:~#
root@SPNBox-1000:~# ls -l /dev/ttyUSB*
crw-r--r-- 1 root root 188, 0 Mar 22 13:04 /dev/ttyUSB0
crw-r--r-- 1 root root 188, 1 Mar 22 13:04 /dev/ttyUSB1
crw-r--r-- 1 root root 188, 2 Mar 22 13:04 /dev/ttyUSB2
crw-r--r-- 1 root root 188, 3 Mar 22 13:04 /dev/ttyUSB3
```

# 8. LTE Module 연결(4) - LuCI 설정



## Interfaces - LTE

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and enter the names of several network interfaces separated by spaces. You can also use VLAN notation INTERFACE.VLANNR (e.g.: eth0.1).

### Common Configuration



Status

3g-LTE

**Uptime:** 0h 1m 22s  
**MAC-Address:** 00:00:00:00:00:00  
**RX:** 17.65 KB (137 Pkts.)  
**TX:** 16.80 KB (135 Pkts.)  
**IPv4:** 197.223.20/32

---

Protocol: UMTS/GPRS/EV-DO

Modem device: /dev/ttyUSB3

Service Type: UMTS/GPRS

APN: lte.ktfwing.com

PIN:

PAP/CHAP username:

PAP/CHAP password:

Dial number: \*99\*\*\*1#

## Interfaces - LTE

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and enter the names of several network interfaces separated by spaces. You can also use VLAN notation INTERFACE.VLANNR (e.g.: eth0.1).

### Common Configuration



Create / Assign firewall-zone

lan:

wan:  wan6:

unspecified -or- create:

Choose the firewall zone you want to assign to this interface. Select *unspecified* to remove the interface from the associated zone or fill out the *create* field to define a new zone and attach the interface to it.

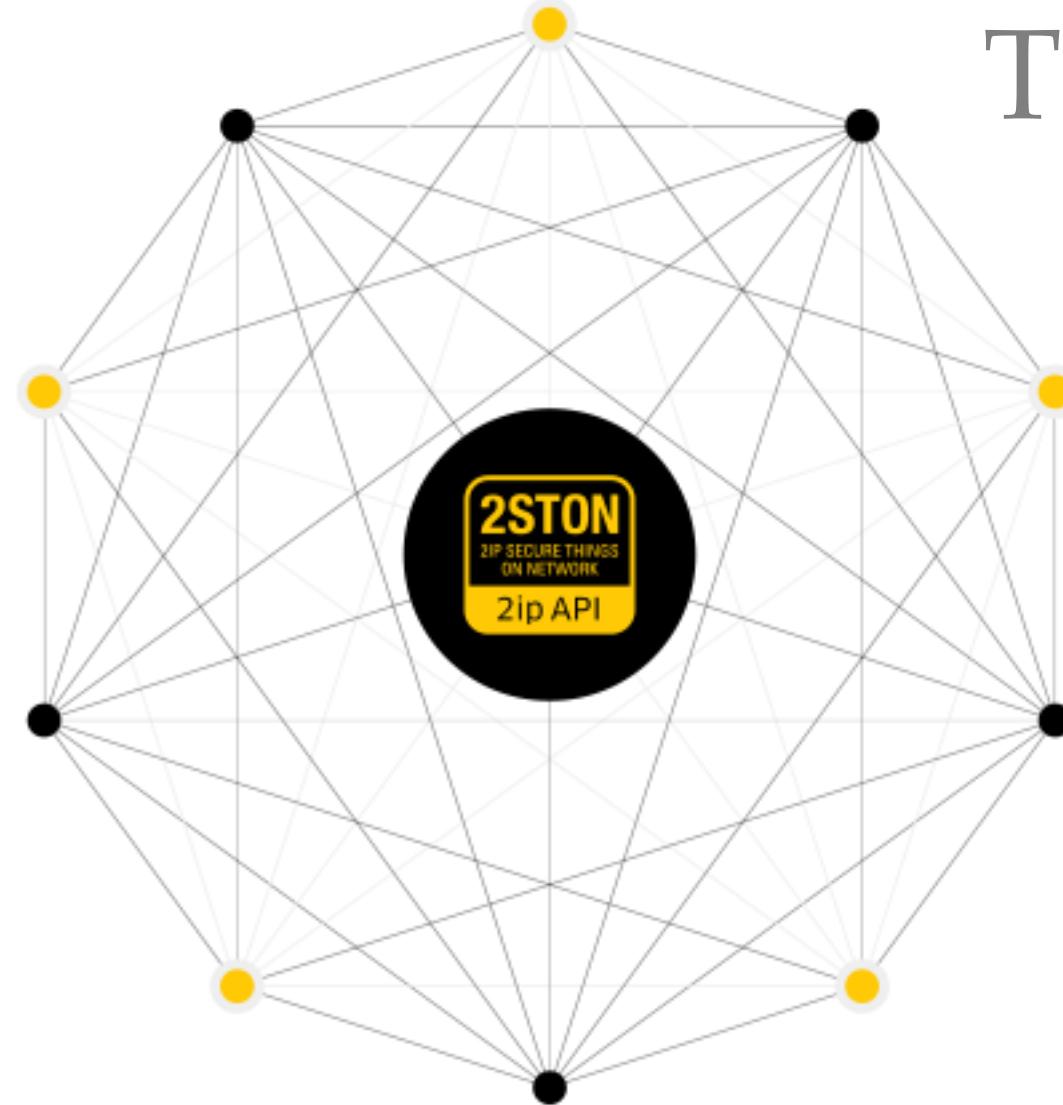
# 8. LTE Module 연결(5) - ps & netstat -nr

```
2761 root    20900 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2764 root    21124 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2766 root    20900 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2767 root    20900 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2768 root    20952 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2775 root    20952 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2778 root    20900 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2782 root    20900 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2786 root    20900 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2787 root    21028 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2793 root    21004 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
2794 root    21108 S  [foris-contolle] /usr/bin/python3.6 /usr/bin/foris-controller -b openwrt -C
3784 root    2812 R   sshd: root@pts/0
3810 root    1112 S   -ash
5831 root    0 SW    [kworker/0:1]
5924 root    0 SW    [kworker/u4:0]
5925 root    0 SW<  [kworker/u5:0]
5994 root    0 SW    [kworker/u4:3]
6066 root    1272 S  /bin/sh /etc/rc.common /etc/init.d/kresd reload
6067 root    1108 S  sleep 60
6111 root    1552 S  /sbin/netifd
6400 root    2080 S  /usr/sbin/hostapd -P /var/run/wifi-phy1.pid -B /var/run/hostapd-phy1.conf
6470 root    0 SW    [kworker/1:0]
6486 root    2084 S  /usr/sbin/hostapd -P /var/run/wifi-phy0.pid -B /var/run/hostapd-phy0.conf
6570 root    1108 S  udhcpc -p /var/run/udhcpc-eth1.pid -s /lib/netifd/dhcp.script -f -t 0 -i eth1
6683 nobody  1168 S  /usr/sbin/dnsmasq -C /var/etc/dnsmasq.conf -k -x /var/run/dnsmasq/dnsmasq.pid
6744 root    1272 S  /bin/sh /etc/rc.common /etc/init.d/kresd reload
6745 root    1108 S  sleep 60
7173 root    984 S  /usr/sbin/pppd nodetach ipparam LTE ifname 3g-LTE +ipv6 set AUTOIPV6=1 nodefa
7196 root    1152 S  /bin/sh /sbin/hotplug-call iface
7214 root    852 S  odhcpoc -s /lib/netifd/dhcpv6.script -P0 -t120 3g-LTE
7375 root    1272 S  /bin/sh /etc/rc.common /etc/init.d/kresd reload
7376 root    1108 S  sleep 60
7382 root    31776 S /usr/bin/kresd -c /tmp/kresd.config -f 1 /tmp/kresd -a 0.0.0.0 53 -a :: 53
7406 root    1152 S  /bin/sh /sbin/hotplug-call iface
7407 root    1156 S  /bin/sh /usr/bin/foris-notify-wrapper -n -m networks -a network_change {"netw
7409 root    5536 R  [foris-notify] /usr/bin/python3.6 /usr/bin/foris-notify -n -m networks -a net
7410 root    1112 R  ps
root@SPNBox-1000:~#
```

붙었다 😊

```
root@SPNBox-1000:~# netstat -nr
Kernel IP routing table
Destination      Gateway        Genmask        Flags  MSS Window irtt Iface
0.0.0.0          10.64.64.64  0.0.0.0        UG     0 0          0 3g-LTE
10.1.1.0         0.0.0.0      255.255.255.0  U      0 0          0 spn0
10.64.64.64      0.0.0.0      255.255.255.255 UH    0 0          0 3g-LTE
10.111.222.0     0.0.0.0      255.255.255.0  U      0 0          0 br-guest_turris
172.30.1.0       0.0.0.0      255.255.255.0  U      0 0          0 eth1
172.30.1.254     0.0.0.0      255.255.255.255 UH   0 0          0 eth1
192.168.1.0      0.0.0.0      255.255.255.0  U      0 0          0 br-lan
```

# Thank You



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