

OpenWRT User Guide

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Table Of Contents

1	Clone the repository	3
2	Update and install feeds	3
3	Change dts.....	3
4	Menuconfig	3
5	Compile	3
6	Firmware Upgrade	4
7	Configuration.....	7
8	Configuration in the browser.....	8
9	SFP Support	14

This document describes how to download, compile and upgrade the OpenWRT 23.05 onto M7981U0 EVK, which is a MTK MT7981 SOM based platform

1 Clone the repository

Cloning the Openwrt v23.05 repository to the local computer

```
git clone -b openwrt-23.05 https://github.com/openwrt/openwrt.git
```

2 Update and install feeds

After the repository is downloaded, go to openwrt directory to update and install feeds

```
cd openwrt-23.05  
./scripts/feeds update -a && ./scripts/install -a
```

3 Change dts

Modify [target/linux/mediatek/dts/mt7981a-ubnt-unifi-6-plus.dts](#)

For more details, please refer to the document: mt7981a-ubnt-unifi-6-plus.dts, in the folder \dts

4 Menuconfig

Use [make menuconfig](#) to configure the compile options

Target:

- Target System -> 'MediaTek Ralink ARM'
- Subtarget -> 'Filologic 8x0 (MT798x)'
- Target Profile -> 'Ubiquiti UniFi 6 Plus'

Kernel

- Kernel modules -> Other modules -> kmod-gpio-pca953x

Web configuration UI

- LuCI -> 1. Collections -> luci

After selected, goes to "Exit ->:", select "Yes", to save the configuration and exit

5 Compile

Use the command:

```
Make V=s
```

When the compile is completed, the file "[openwrt-mediatek-filologic-ubnt_unifi-6-plus-squashfs-sysupgrade.bin](#)" is created and will be saved in the folder: bin/targets/mediatek/filologic/

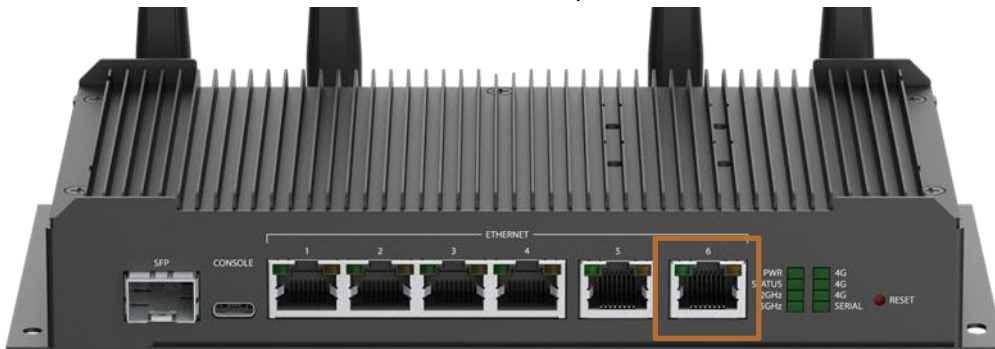
For example:

```
-rw-r--r-- 1 willzhang willzhang 889 Jan 6 17:10 config.buildinfo
-rw-r--r-- 1 willzhang willzhang 263 Jan 6 17:10 feeds.buildinfo
-rw-r--r-- 1 willzhang willzhang 8751352 Jan 6 17:19 openwrt-mediatek-filogic-ubnt_unifi-6-plus-
initramfs-kernel.bin
-rw-r--r-- 1 willzhang willzhang 9216813 Jan 6 17:19 openwrt-mediatek-filogic-ubnt_unifi-6-plus-
squashfs-sysupgrade.bin
-rw-r--r-- 1 willzhang willzhang 4954 Jan 6 17:19 openwrt-mediatek-filogic-ubnt_unifi-6-
plus.manifest
drwxr-xr-x 2 willzhang willzhang 4096 Jan 6 17:19 packages
-rw-r--r-- 1 willzhang willzhang 1518 Jan 6 17:19 profiles.json
-rw-r--r-- 1 willzhang willzhang 710 Jan 6 17:19 sha256sums
-rw-r--r-- 1 willzhang willzhang 18 Jan 6 17:10 version.buildinfo
```

6 Firmware Upgrade

Preparation:

- Insert the Ethernet cable to the Port6, as below
- Connect the other side of the Ethernet cable to the PC/notebook



- Install a TFTP server on the PC, and save the compiled firmware “[openwrt-mediatek-filogic-ubnt_unifi-6-plus-squashfs-sysupgrade.bin](#)” in the TFTP server folder.
- Power on the EVK, and go to U-Boot Menu, as below. Select 2 to upgrade firmware in the emmc

*** U-Boot Boot Menu ***

```
1. Startup system (Default)
2. Upgrade firmware (emmc)
3. Upgrade eMMC partition table (emmc)
4. Upgrade single image (emmc)
5. Load image
0. U-Boot console
```

Press UP/DOWN to move, ENTER to select, ESC/CTRL+C to quit

- Select 0 to upgrade via TFTP

```
*** Upgrading Firmware (emmc) ***
```

```
Available load methods:
```

- 0 - TFTP client (Default)
- 1 - Xmodem
- 2 - Ymodem
- 3 - Kermit
- 4 - S-Record
- 5 - RAM

```
Select (enter for default):
```

- Input U-Boot's IP address, which is the EVK IP address

```
*** Upgrading Firmware (emmc) ***
```

```
Available load methods:
```

- 0 - TFTP client (Default)
- 1 - Xmodem
- 2 - Ymodem
- 3 - Kermit
- 4 - S-Record
- 5 - RAM

```
Select (enter for default):
```

```
Input U-Boot's IP address: 192.168.8.3
```

- Input TFTP server IP address, which is the PC Lan port address

```
*** Upgrading Firmware (emmc) ***
```

```
Available load methods:
```

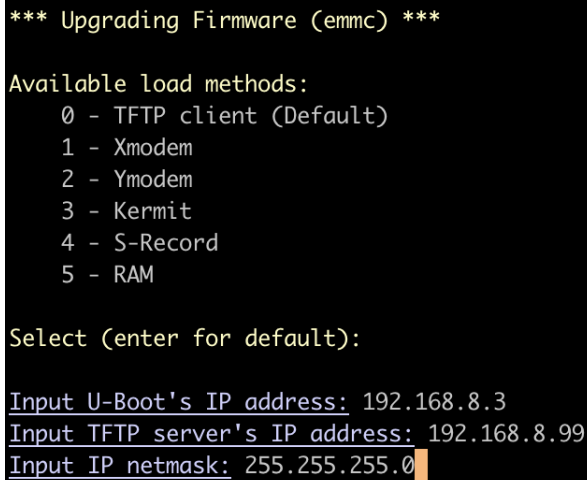
- 0 - TFTP client (Default)
- 1 - Xmodem
- 2 - Ymodem
- 3 - Kermit
- 4 - S-Record
- 5 - RAM

```
Select (enter for default):
```

```
Input U-Boot's IP address: 192.168.8.3
```

```
Input TFTP server's IP address: 192.168.8.99
```

- Input TFTP server IP address and Subnet Mask



```
*** Upgrading Firmware (emmc) ***

Available load methods:
0 - TFTP client (Default)
1 - Xmodem
2 - Ymodem
3 - Kermit
4 - S-Record
5 - RAM

Select (enter for default):

Input U-Boot's IP address: 192.168.8.3
Input TFTP server's IP address: 192.168.8.99
Input IP netmask: 255.255.255.0
Input file name: openwrt-mediatek-filogic-ubnt_unifi-6-plus-squashfs-sysupgrade.bin
```

[illegible]

- As completion, reset the EVK and restart the device

7 Configuration

- As the EVK restarted, enter, and it will go to the shell, as below:

```
[ 4.148890] loop0: detected capacity change from 0 to 4111360
[ 4.193455] loop0: detected capacity change from 4111360 to 4100864
[ 4.200662] mount_root: overlay filesystem in /dev/loop0 has not been formatted yet
[ 4.214759] random: proc: uninitialized urandom read (4 bytes read)
[ 6.691177] F2FS-fs (loop0): Found nat_bits in checkpoint
[ 6.721612] F2FS-fs (loop0): Mounted with checkpoint version = 5ccce271
[ 6.728662] mount_root: overlay filesystem has not been fully initialized yet
[ 6.736132] mount_root: switching to f2fs overlay
[ 6.742714] overlayfs: null uuid detected in lower fs '/', falling back to xino=off,index=off,nfs_export=off.
[ 6.753932] urandom-seed: Seed file not found (/etc/urandom.seed)
[ 6.794538] proc: - early -
[ 6.797491] proc: - watchdog -
[ 7.334724] proc: - watchdog -
[ 7.338124] proc: - ubus -
[ 7.361895] random: ubusd: uninitialized urandom read (4 bytes read)
[ 7.390804] random: ubusd: uninitialized urandom read (4 bytes read)
[ 7.399084] random: ubusd: uninitialized urandom read (4 bytes read)
[ 7.406727] proc: - init -
Please press Enter to activate this console.
[ 7.604692] kmodloader: loading kernel modules from /etc/modules.d/*
[ 7.619973] crypto-safexcel 10320000.crypto: EIP97:230(0,1,4,4)-HIA:270(0,5,5),PE:150/433(alg:7fcdcf00)/0/0/0
[ 7.636482] Loading modules backported from Linux version v6.1.24-0-g0102425ac76b
[ 7.644007] Backport generated by backports.git v5.15.92-1-44-gd6ea70fafd36
[ 7.809780] urngd: v1.0.2 started.
[ 7.970157] random: crng init done
[ 7.973572] random: 23 urandom warning(s) missed due to ratelimiting
[ 8.017753] mt798x-wmac 18000000.wifi: HW/SW Version: 0x8a108a10, Build Time: 20221208201745a
[ 8.017753]
[ 8.175453] mt798x-wmac 18000000.wifi: WM Firmware Version: ____000000, Build Time: 20221208201806
[ 8.265276] mt798x-wmac 18000000.wifi: WA Firmware Version: DEV_000000, Build Time: 20221208202048
[ 8.385513] PPP generic driver version 2.4.2
[ 8.391103] NET: Registered PF_PPPOX protocol family
[ 8.400458] kmodloader: done loading kernel modules from /etc/modules.d/*
[ 14.662297] mtk_soc_eth 15100000.ethernet eth0: Link is Down
[ 14.677857] mtk_soc_eth 15100000.ethernet eth0: configuring for fixed/2500base-x link mode
[ 14.687237] mtk_soc_eth 15100000.ethernet eth0: Link is Up - 2.5Gbps/Full - flow control rx/tx
[ 14.696569] br-lan: port 1(eth0) entered blocking state
[ 14.701804] br-lan: port 1(eth0) entered disabled state
[ 14.707283] device eth0 entered promiscuous mode
[ 14.714613] br-lan: port 1(eth0) entered blocking state
[ 14.719849] br-lan: port 1(eth0) entered forwarding state
```

```
BusyBox v1.36.1 (2023-12-19 02:55:03 UTC) built-in shell (ash)
```

```
|_____| |_____| _____| ____| | | | | | | |
|   | |___| |___| |___| |___| |___|  
| - | | _ | -__| |___| |___| |___|  
|_____| | |___| |___| |___| |___| |___|  
          |__| WIRELESS FREEDOM
```

OpenWrt 23.05-SNAPSHOT, r23673-59fd8f08cf

```
==== WARNING! =====
There is no root password defined on this device!
Use the "passwd" command to set up a new password
in order to prevent unauthorized SSH logins.
```

```
root@OpenWrt:/#
```

- The Interface for Ethernet port6 is “eth1”, so it can be configured as below.

```
ifconfig eth1 192.168.2.55  
/etc/init.d/firewall stop
```

Remark:

Since the eth1 is default configured as lan or wan zone, so the firewall should be closed temporary. If the EVK can ping from the PC, the browser can be opened for further configuration

Assign GPIO for power (optional)

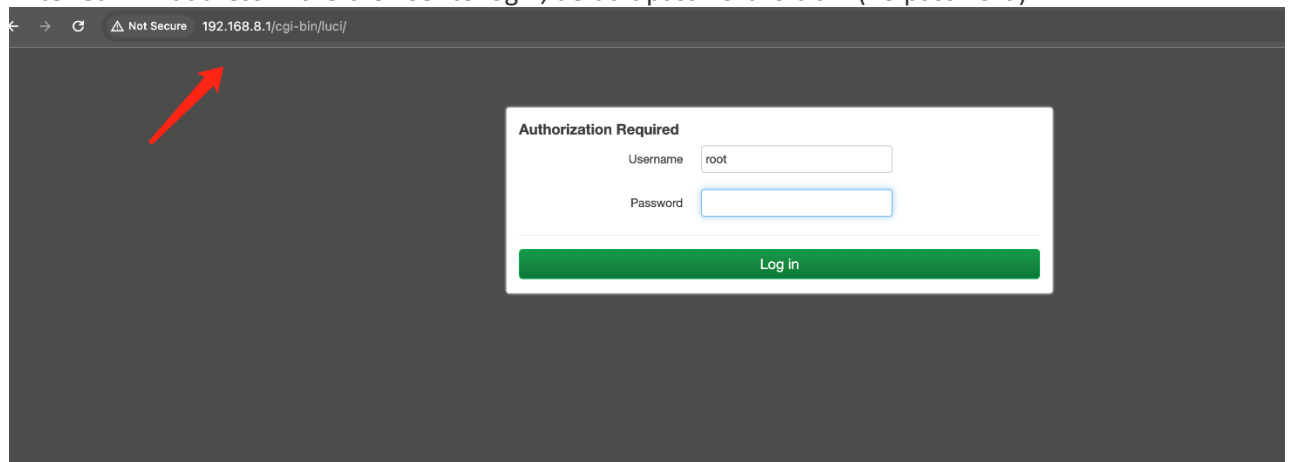
Please enter the CLI below:

```
local power_pin=467  
echo ${power_pin} > /sys/class/gpio/export  
echo out > /sys/class/gpio/gpio${power_pin}/direction  
echo 0 > /sys/class/gpio/gpio${power_pin}/value  
sleep 1  
echo 1 > /sys/class/gpio/gpio${power_pin}/value
```

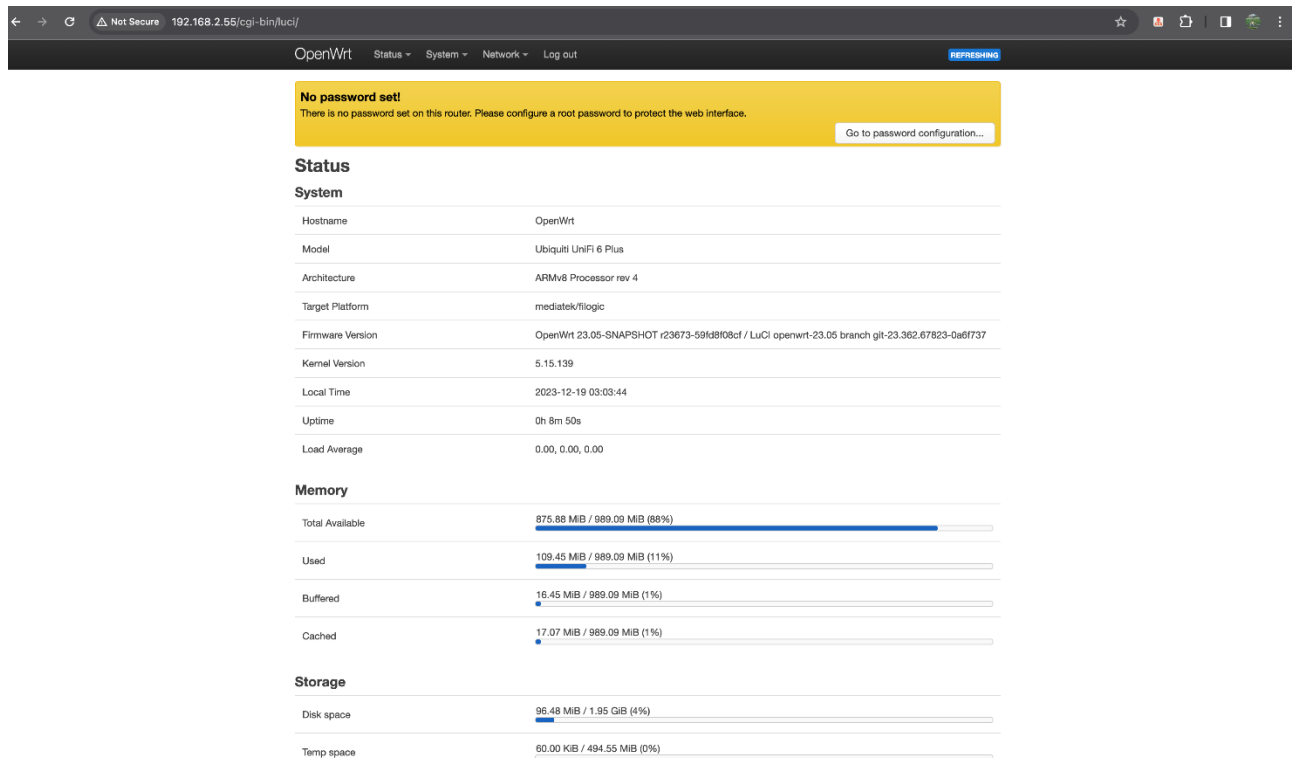
8 Configuration in the browser

- Login

Enter eth1 IP address in the browser to login, default password is blank(no password)



The OpenWRT web interface is shown up



No password set!
There is no password set on this router. Please configure a root password to protect the web interface.
[Go to password configuration...](#)

Status

System

Hostname	OpenWrt
Model	Ubiquiti UniFi 6 Plus
Architecture	ARMv8 Processor rev 4
Target Platform	mediatek/filogic
Firmware Version	OpenWrt 23.05-SNAPSHOT r23673-59fd8f08cf / LuCI openwrt-23.05 branch git-23.362.67823-0a6f737
Kernel Version	5.15.139
Local Time	2023-12-19 03:03:44
Uptime	0h 8m 50s
Load Average	0.00, 0.00, 0.00

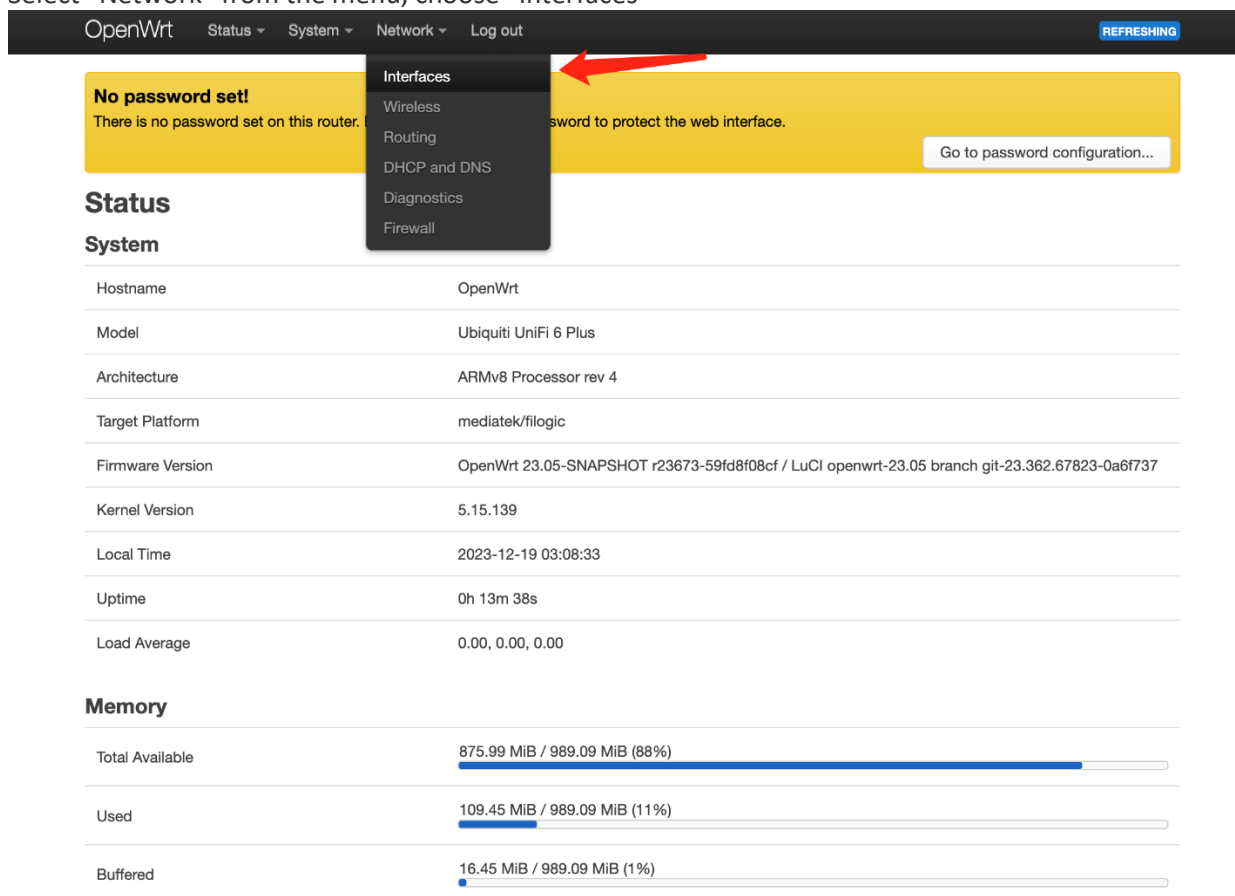
Memory

Total Available	875.88 MiB / 989.09 MiB (88%)
Used	109.45 MiB / 989.09 MiB (11%)
Buffered	16.45 MiB / 989.09 MiB (1%)
Cached	17.07 MiB / 989.09 MiB (1%)

Storage

Disk space	96.48 MiB / 1.95 GiB (4%)
Temp space	60.00 KiB / 494.55 MiB (0%)

- Modify br-lan
- Select “Network” from the menu, choose “Interfaces



No password set!
There is no password set on this router. Please configure a root password to protect the web interface.
[Go to password configuration...](#)

Status

System

Hostname	OpenWrt
Model	Ubiquiti UniFi 6 Plus
Architecture	ARMv8 Processor rev 4
Target Platform	mediatek/filogic
Firmware Version	OpenWrt 23.05-SNAPSHOT r23673-59fd8f08cf / LuCI openwrt-23.05 branch git-23.362.67823-0a6f737
Kernel Version	5.15.139
Local Time	2023-12-19 03:08:33
Uptime	0h 13m 38s
Load Average	0.00, 0.00, 0.00

Memory

Total Available	875.99 MiB / 989.09 MiB (88%)
Used	109.45 MiB / 989.09 MiB (11%)
Buffered	16.45 MiB / 989.09 MiB (1%)

Select “Devices” tab, and click the “br-lan” label

OpenWrt
Status
System
Network
Log out
REFRESHING
UNSAVED CHANGES: 7

No password set!
There is no password set on this router. Please configure a root password to protect the web interface.
Go to password configuration...

Interfaces
Devices
Global network options

Devices

Device	Type	MAC Address	MTU		
 br-lan	Bridge device	00:0C:43:26:60:B1	1504	Configure...	Unconfigure
 eth0	Network device	00:0C:43:26:60:B1	1504	Configure...	Unconfigure
 eth1	Network device	00:0C:43:26:60:B2	1500	Configure...	Unconfigure
 lan0	Network device	00:0C:43:26:60:B1	1500	Configure...	Unconfigure
 lan1	Network device	00:0C:43:26:60:B1	1500	Configure...	Unconfigure
 lan2	Network device	00:0C:43:26:60:B1	1500	Configure...	Unconfigure
 lan3	Network device	00:0C:43:26:60:B1	1500	Configure...	Unconfigure
 lan4	Network device	00:0C:43:26:60:B1	1500	Configure...	Unconfigure
 sfp2	Network device	00:0C:43:26:60:B1	1500	Configure...	Unconfigure

Add device configuration...

Save & Apply
Save
Reset

Set up “br-lan” as “eth0”

OpenWrt Status System Network Log out REFRESHING

Bridge device: br-lan

General device options Advanced device options Bridge VLAN filtering

Device type Bridge device

Device name br-lan

Bridge ports  eth0 

 Specifies the wired ports to attach to this bridge. In order to attach wireless networks, choose the associated interface as network in the wireless settings.

Bring up empty bridge ☐

 Bring up the bridge interface even if no ports are attached

MTU 1504

MAC address 00:0C:43:26:60:B1

TX queue length 1000

Enable IPv6 automatic (enabled)

IPv6 MTU 1504

DAD transmits 1

 Amount of Duplicate Address Detection probes to send

Dismiss Save

Save & Apply Save Reset

Modify “Bridge ports” as below, and click “save”

OpenWrt
Status
System
Network
Log out
REFRESHING

Bridge device: br-lan

General device options
Advanced device options
Bridge VLAN filtering

Device type: Bridge device
Device name: br-lan
Bridge ports:

lan0
lan1
lan2
lan3
lan4
sfp2

☐ Ethernet Switch: "eth0"
☐ Ethernet Adapter: "eth1"
☒ Switch port: "lan0"
☒ Switch port: "lan1"
☒ Switch port: "lan2"
☒ Switch port: "lan3"
☒ Switch port: "lan4"
☒ Switch port: "sfp2"
☐ -- custom --

Bring up empty bridge:
MTU:
MAC address:
TX queue length: 1000
Enable IPv6: automatic (enabled)
IPv6 MTU: 1504
DAD transmits: 1
Amount of Duplicate Address Detection probes to send

Dismiss
Save

Save & Apply
Save
Reset

Go to “Interfaces” tab, and click “Edit”

OpenWrt
Status
System
Network
Log out
REFRESHING
UNSAVED CHANGES: 7

No password set!

There is no password set on this router. Please configure a root password to protect the web interface.

[Go to password configuration...](#)

Interfaces
Devices
Global network options

Interfaces

lan
br-lan

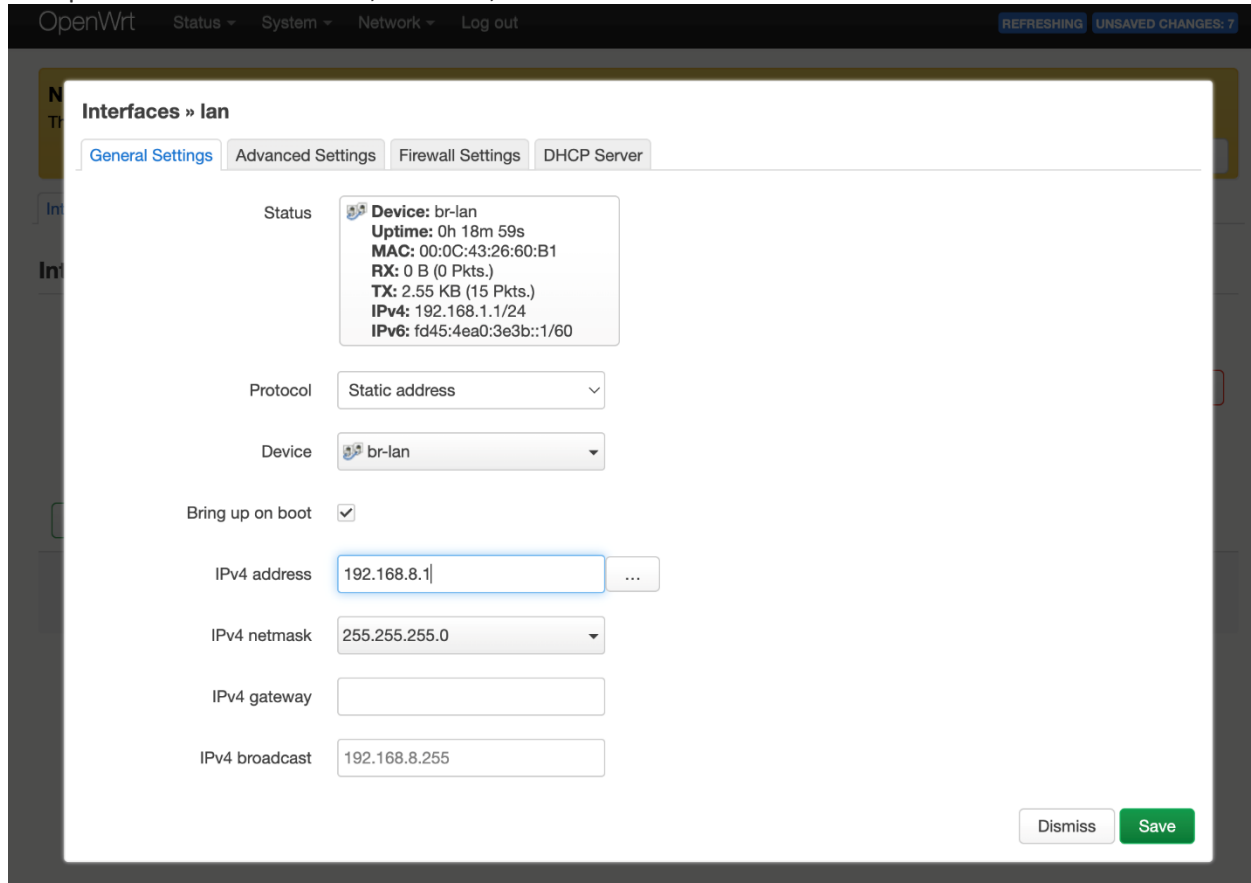
Protocol: Static address
Uptime: 0h 16m 54s
MAC: 00:0C:43:26:60:B1
RX: 0 B (0 Pkts.)
TX: 2.38 KB (14 Pkts.)
IPv4: 192.168.1.1/24
IPv6: fd45:4ea0:3e3b::1/60

Restart
Stop
Edit
Delete

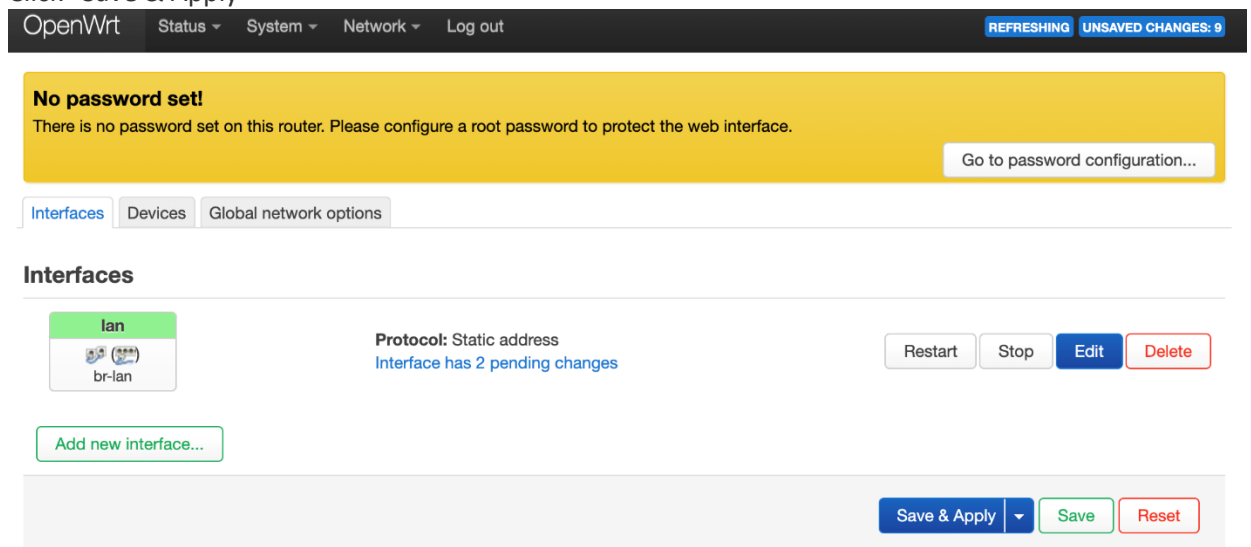
Add new interface...

Save & Apply
Save
Reset

Set up IPv4 address for the lan, as below, and Save



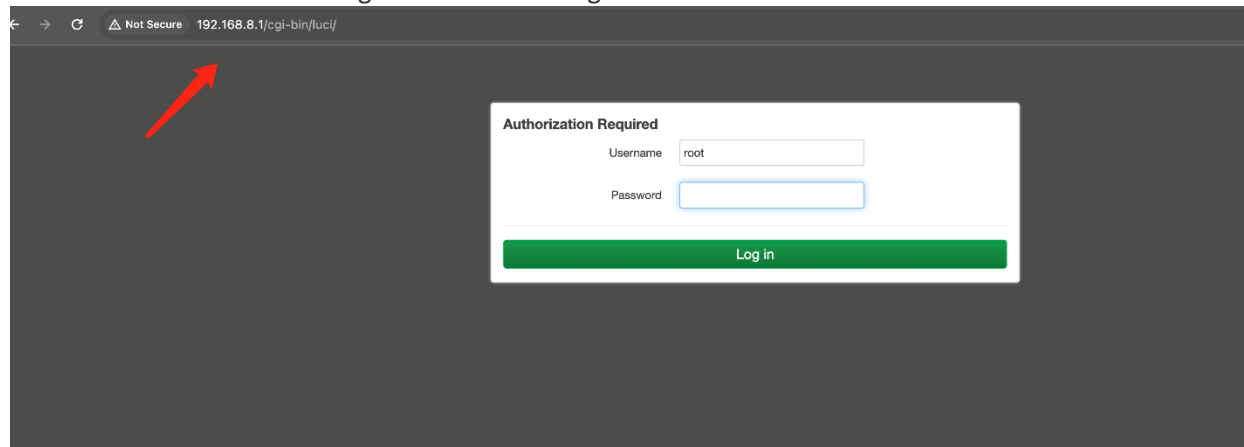
Click "Save & Apply"



- Restart the EVK
Insert the Ethernet cable to Port1~Port4:

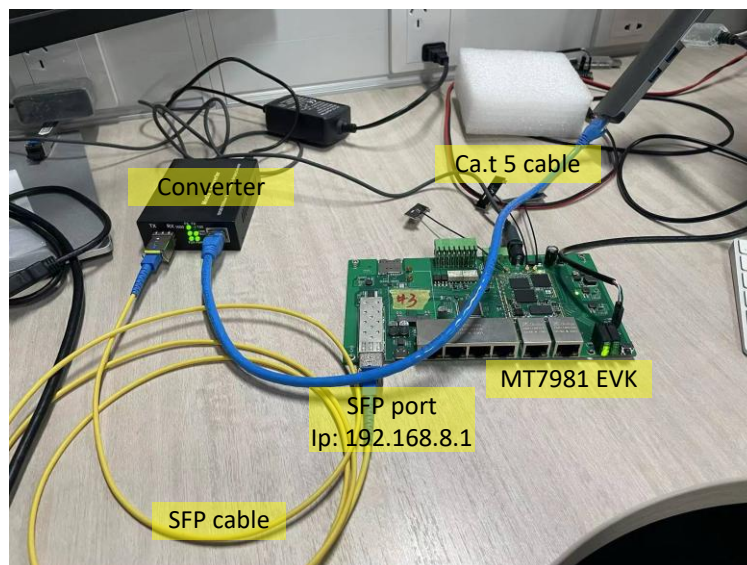


Enter the lan IP address configured above and log in



9 SFP Support

- Equipment
 - MT7981 board x 1
 - - SFP cable x 1
 - - SFP module x 2
 - - Fiber converter x 1
 - - Notebook x 1
- Test setup



To notebook
Ip: 192.168.8.99

- Firmware

- OpenWRT 23.05
- Add kmod-sfp module from Kernel modules > Network Devices, as below



- Enable the OpenWRT kernel, and the SFP should be identified if the following messages are printed:

```
[ 10.581393] pca953x 0-0020: supply vcc not found, using dummy regulator
[ 10.588247] pca953x 0-0020: using no AI
[ 10.594898] gpio-439 (lan_sfp_fault): hogged as input
[ 10.602020] gpio-440 (lan_sfp_dis): hogged as output/low
[ 10.607945] gpio-441 (lan_sfp_mod_def): hogged as input
[ 10.613763] gpio-442 (lan_sfp_los): hogged as input
[ 10.619660] i2c-gpio i2c-gpio-1: using lines 457 (SDA) and 455 (SCL)
[ 10.638379] crypto-safexcel 10320000.crypto: EIP97:230(0,1,4,4)-HIA:270(0,5,5),PE:150/433(alg:7fcd4c00)/0/0/0
[ 10.662425] Bridge firewalling registered
[ 10.667523] usbcore: registered new interface driver cdc_wdm
[ 10.673704] Loading modules backported from Linux version v6.1.24-0-g0102425ac76b
[ 10.681252] Backport generated by backports.git v5.15.92-1-44-gd6ea70fafd36
[ 10.720272] sfp sfp-2: Host maximum power 1.0W
[ 10.724814] sfp sfp-2: No tx_disable pin: SFP modules will always be emitting.
[ 10.737935] usbcore: registered new interface driver usbserial_generic
[ 10.744575] usbserial: USB Serial support registered for generic
[ 10.762847] xt_time: kernel timezone is -0000
[ 10.768316] usbcore: registered new interface driver cdc_ether
[ 10.775725] usbcore: registered new interface driver cdc_ncm
[ 10.789413] usbcore: registered new interface driver huawei_cdc_ncm
[ 11.053687] sfp sfp-2: module OEM SFP-SM1310 rev 30 sn 20230619366 dc 230619
[ 11.063186] mt7530-mdio mdio-bus:1f sfp2: switched to inband/1000base-x link mode
[ 11.093187] hwmmon hwmmon1: temp1_input not attached to any thermal zone
[ 11.125843] mt798x-wmac 18000000.wifi: HW/SW Version: 0x8a108a10, Build Time: 20221208201745a
[ 11.125843]
[ 11.284426] mt798x-wmac 18000000.wifi: WM Firmware Version: ____000000, Build Time: 20221208201806
[ 11.373256] mt798x-wmac 18000000.wifi: WA Firmware Version: DEV_000000, Build Time: 20221208202048
```

● Configuration

- After booting up, the sfp2 interface will be created. If sfp2 is not bridged to br-lan, config as below:
 - ◆ ifconfig sfp2 up
 - ◆ ifconfig sfp2 192.168.8.1
 - ◆ ping 192.168.8.99 (notebook ip)

```
root@OpenWrt:/# ifconfig sfp2 up
[ 150.426466] mt7530-mdio mdio-bus:1f sfp2: configuring for inband/1000base-x link mode
root@OpenWrt:/# [ 150.494419] mt7530-mdio mdio-bus:1f sfp2: Link is Up - 1Gbps/Full - flow control rx/tx
[ 150.502525] IPv6: ADDRCONF(NETDEV_CHANGE): sfp2: link becomes ready
root@OpenWrt:/# ifconfig sfp2 192.168.8.1
root@OpenWrt:/# ping 192.168.8.99
PING 192.168.8.99 (192.168.8.99): 56 data bytes
64 bytes from 192.168.8.99: seq=0 ttl=64 time=1.549 ms
64 bytes from 192.168.8.99: seq=1 ttl=64 time=1.033 ms
^C
--- 192.168.8.99 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 1.033/1.291/1.549 ms
```

- if sfp2 is bridged to br-lan, the ip of the br-lan can be configured:
 - ◆ ifconfig br-lan up
 - ◆ ifconfig br-lan 192.168.8.1
 - ◆ ping 192.168.8.99