

## 1. Hardware

MTK7628 580MHz  
 FLASH 16MB  
 RAM 64MB DDR2  
 Storage 16GB  
 2 LAN Ports  
 2 Serial Ports

**Note:** the panel on the right is the MT7628 model, labeled with WAN/LAN Ethernet



### 1) Ethernet Ports

Old: 1x WAN, 2x LAN

New: 1x WAN/LAN, 2x LAN

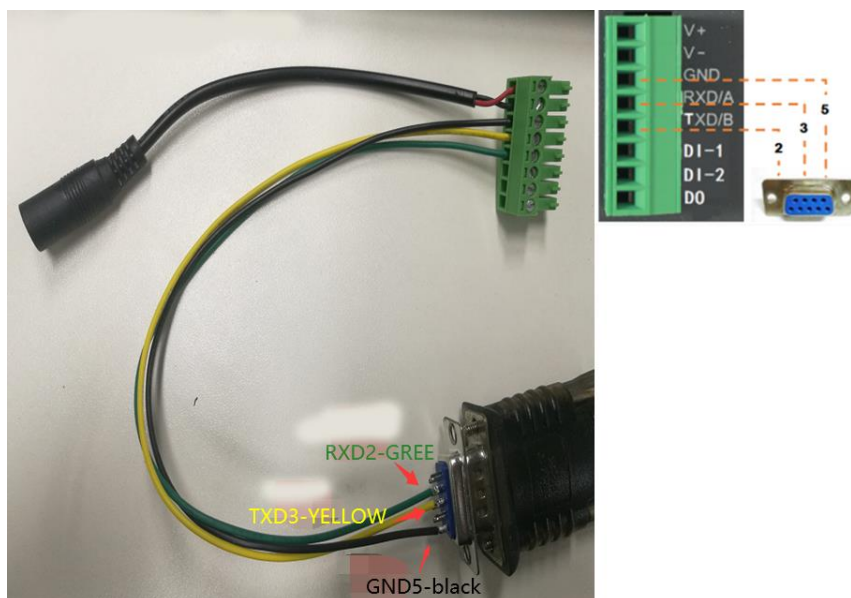
➤ both Ethernet ports can be configured in VLAN in the GUI, refer to the product manual for details

### 2) Serial Ports

Old: 1x RS232(pin terminal)

New: 1x RS232(pin terminal), 1x RS232 (Console)

➤ the new model has the RX&RX wire line sequence reversed from the old one, only the serial port on the terminal block is used for printing device information



## 2. Download OpenWRT source codes

2.1 git clone <https://github.com/openwrt/openwrt.git>

2.2 cd openwrt; git bracr -a

2.3 git checkout -b openwrt-23.05 origin/openwrt-23.05

### 3. feeds.conf.default to add modem management tool

```
src-git mobile_broadband https://gitlab.freedesktop.org/mobile-broadband/mobile-broadband-
openwrt.git
src-git luci_proto_modemmanager https://github.com/nickberry17/luci-proto-modemmanager.git
```

**NOTE:** if 23.05 version, it support modem dial manager, no feed download required

### 4. make menuconfig to choose ZBT-WE3526 version

- 1) Target System (MediaTek Ralink MIPS) --->
- 2) Subtarget (MT76x8 based boards) --->
- 3) Target Profile (MediaTek MT7628 EVB) --->

### 5. make menuconfig to choose modem management tool and mi/mbim driver

#### 2) LUCI

Protocols --->

- <\*> luci-proto-modemmanager. Support for ModemManager
- <\*> luci-proto-qmi. Support for QMI

#### 3) Network --->

WWAN --->

- <\*> comgt. Option/Vodafone 3G/GPRS control tool
- <\*> umbim. Control utility for mobile broadband modems
- <\*> uqmi. Control utility for mobile broadband modems
- \*- modemmanager..... Control utility for any kind of mobile broadband modem

## 6. Kernel Custom

### 6.1 Modify firmware volume and partition size

1) <openwrt>/target/linux/ramips/image/mt76x8.mk

```
--- a/target/linux/ramips/image/mt76x8.mk
+++ b/target/linux/ramips/image/mt76x8.mk
@@ -84,7 +84,7 @@ TARGET_DEVICES += miwifi-nano
define Device/mt7628
    DTS := MT7628
    BLOCKSIZE := 64k
-   IMAGE_SIZE := $(ralink_default_fw_size_4M)
+   IMAGE_SIZE := 16064k
    DEVICE_TITLE := MediaTek MT7628 EVB
    DEVICE_PACKAGES := kmod-usb2 kmod-usb-ohci kmod-usb-ledtrig-usbport
_endif
```

2) <openwrt>/target/linux/ramips/dts/MT7628.dts

```
@@ -56,7 +116,7 @@
        partition@50000 {
            label = "firmware";
            reg = <0x50000 0x7b0000>;
            reg = <0x50000 0xfb0000>;
        };
    };
```

3) <openwrt>/target/linux/ramips/dts/MT7628.dts

```
--- a/target/linux/ramips/dts/MT7628.dts
+++ b/target/linux/ramips/dts/MT7628.dts
@@ -1,5 +1,7 @@
 /dts-v1/;

#include <dt-bindings/input/input.h>
#include <dt-bindings/gpio/gpio.h>
#include "mt7628an.dtsi"

/ {
@@ -8,14 +10,72 @@
        memory@0 {
            device_type = "memory";
            reg = <0x0 0x2000000>;
            reg = <0x0 0x4000000>;
        };
```

6.2 Modify debugging serial port baudrate <openwrt>/target/linux/ramips/dts/mt7628an.dtsi

```
--- a/target/linux/ramips/dts/mt7628an.dtsi
+++ b/target/linux/ramips/dts/mt7628an.dtsi
@@ -10,7 +10,7 @@
    };

    chosen {
        bootargs = "console=ttyS0,57600";
        bootargs = "console=ttyS0,115200";
    };

    aliases {
```

### 6.3 GPIO Control

Define GPIO and remove GPIO multiplex:

<openwrt>/target/linux/ramips/dts/MT7628.dts

```

--- a/target/linux/ramips/dts/MT7628.dts
+++ b/target/linux/ramips/dts/MT7628.dts
@@ -1,5 +1,7 @@
 /dts-v1/;

+#include <dt-bindings/input/input.h>
+#include <dt-bindings/gpio/gpio.h>
+#include "mt7628an.dtsi"

/ {
@@ -10,12 +12,70 @@
     device_type = "memory";
     reg = <0x0 0x2000000>;
};
+   gpio-keys-polled {
+       compatible = "gpio-keys-polled";
+       #address-cells = <1>;
+       #size-cells = <0>;
+       poll-interval = <20>;
+
+       reset {
+           label = "reset";
+           gpios = <&gpio1 38 GPIO_ACTIVE_LOW>;
+           linux,code = <KEY_RESTART>;
+       };
+   };
+   gpio_export {
+       compatible = "gpio-export";
+       #size-cells = <0>;
+       sim {
+           gpio-export,name = "sim";
+           gpio-export,output = <1>;
+           gpios = <&gpio0 3 GPIO_ACTIVE_HIGH>;
+       };
+       usb0 {
+           gpio-export,name = "usb0";
+           gpio-export,output = <1>; // GPIOF_OUT_INIT_HIGH
+           gpios = <&gpio0 2 GPIO_ACTIVE_HIGH>;
+       };
+   };
+   gpio-leds {
+       compatible = "gpio-leds";
+
+       signal1 {
+           label = "mt7628an-eval-board:green:signal1";
+           gpios = <&gpio0 4 GPIO_ACTIVE_HIGH>;
+       };
+
+       signal2 {
+           label = "mt7628an-eval-board:green:signal2";
+           gpios = <&gpio0 5 GPIO_ACTIVE_HIGH>;
+       };
+
+       signal3 {
+           label = "mt7628an-eval-board:green:signal3";
+           gpios = <&gpio1 13 GPIO_ACTIVE_HIGH>;
+       };
+
+       err {
+           label = "mt7628an-eval-board:green:err";
+           gpios = <&gpio1 14 GPIO_ACTIVE_LOW>;
+       };
+
+       wlan {
+           label = "mt7628an-eval-board:green:wlan";
+           gpios = <&gpio1 42 GPIO_ACTIVE_LOW>;
+       };
+   };
};

```

## 6.4 PL2303 serial port HXD GPIOs DI/DO



pl2303-gpio-sysf  
 s.patch

- 1) Kernel patch file
- 2) Modify driver module Makefile

```

--- a/package/kernel/linux/modules/usb.mk
+++ b/package/kernel/linux/modules/usb.mk
@@ -712,7 +712,8 @@ $(eval $(call KernelPackage,usb-serial-mos7720))

define KernelPackage/usb-serial-pl2303
    TITLE:=Support for Prolific PL2303 devices
    - KCONFIG:=CONFIG_USB_SERIAL_PL2303
    + KCONFIG:=CONFIG_USB_SERIAL_PL2303 \
      CONFIG_USB_SERIAL_PL2303_GPIO
    FILES:=$(LINUX_DIR)/drivers/usb/serial/pl2303.ko
    AUTOLOAD:=$(call AutoProbe,pl2303)
    $(call AddDepends,usb-serial)
    
```

## 7. Enable 4G module

### 7.1 Mobile Data Connection

The screenshot shows the OpenWrt web interface. At the top, there is a navigation menu on the left with options like Status, System, Services, Network, Interfaces, Wireless, Switch, Routing, DHCP and DNS, Diagnostics, Firewall, MultiWAN Manager, VPN, and Logout. The main content area shows a warning: "No password set!" with a button to "Go to password configuration...". Below this, there are tabs for "Interfaces", "Devices", and "Global network options". The "Interfaces" tab is active, displaying a list of network interfaces:

Interface	Protocol	Uptime	MAC	RX	TX	IPV4	IPV6	Actions
lan br-lan	Static address	0h 3m 20s	1C:59:74:82:A9:3A	234.53 KB (1971 Pkts.)	1.00 MB (1773 Pkts.)	192.168.1/24	fd0d:4bcc:9d37::1/60	Restart Stop Edit Delete
mobile wwan0	Modem Manager	0h 2m 10s		2773 KB (90 Pkts.)	11.47 KB (109 Pkts.)	10.39.24.18/30		Restart Stop Edit Delete
wan eth0.1	DHCP client		1C:59:74:82:A9:3A	38.80 KB (203 Pkts.)	23.91 KB (91 Pkts.)			Restart Stop Edit Delete
wan6 eth0.1	DHCPv6 client		1C:59:74:82:A9:3A	38.80 KB (203 Pkts.)	23.91 KB (91 Pkts.)			Restart Stop Edit Delete

At the bottom of the interface list, there is a button labeled "Add new interface..." which is circled in red. A red arrow also points to the "Edit" button of the "mobile" interface.

## 7.2 QMI Cellular Connection

### Interfaces » mobile

General Settings Advanced Settings Firewall Settings DHCP Server

Status	<div style="border: 1px solid #ccc; padding: 5px; width: fit-content;">                 Device: wwan0                  Uptime: 0h 2m 45s                  RX: 29.79 KB (101 Pkts.)                  TX: 12.43 KB (121 Pkts.)                  IPv4: 10.39.24.18/30             </div>
Protocol	ModemManager <input type="text"/>
Bring up on boot	<input checked="" type="checkbox"/>
Modem device	QUALCOMM INCORPORATED - QUECTEL Mobile Broadband Module <input type="text"/>
APN	<input type="text"/>
PIN	<input type="text"/>
Authentication Type	None <input type="text"/>
IP Type	IPv4/IPv6 (both - defaults to IPv4) <input type="text"/>
Signal Refresh Rate	<input type="text"/> In seconds

Dismiss Save

OpenWrt
23.05.0-rc2 r23228-cd17d8df2a Refreshing

- Status
- Overview
- Routing
- Firewall
- System Log
- Processes
- Channel Analysis
- Realtime Graphs
- Mobile Service**
- MultiWAN Manager
- System
- Services
- Network
- VPN
- Logout

**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...](#)

### Mobile Service

/sys/devices/platform/101c0000.ehci/usb1/1-1/1-1

#### Modem Info

Manufacturer	QUALCOMM INCORPORATED
Model	QUECTEL Mobile Broadband Module
Revision	EC25EUXGAR08A14M1G
IMEI	865847055242851
Device Identifier	956862b5fe35918180c605e3deb97d9b588f4f2b
Power State	on
State	connected

#### Network Registration

Own Numbers	
Access Technologies	lte
Operator	CMCC
Operator Code	46000
Registration State	home
Packet Service State	attached
Signal Quality	<div style="background-color: #0072bc; width: 100%; height: 10px; margin: 0;"></div> 100%

#### Cell Location

CID	033BFE88
LAC	0000
MCC	460
MNC	00
TAC	002866

#### SIMs

##### SIM 1

Active	yes
Operator Name	CMCC
ICCID	898604B6032270009113
IMSI	460083638109113

Powered by LuCI openwrt-23.05 branch (git-23.186.24953-08bb74)

## 8. GPIO Control

GPIO List		
<b>GPIO45</b> ND-D0	Signal_1 Net1_Green	Signal LED1, light at high level
<b>GPIO5</b> ND-D1	Signal_2 Net1_Green	Signal LED2, light at high level
<b>GPIO4</b> ND-D2	Signal_3 Net2_Green	Signal LED3, light at high level
<b>GPIO46</b> ND-D3	Error Net2_Green	Error LED. light at low level No 5G module or network for Red
<b>GPIO2</b>	Module_PWR	4G Module power control High level for power on Low level for power off
<b>GPIO3</b> JTRST	SIM_Choose	Control SIM card High level for SIM2 Low level for SIM1 Power OFF 4G module at first, then control GPIO to switch SIM card. Then power on 4G module in 8sec.
GPIO38	Default Factory	
GPIO44	WLAN	

### 8.1 GPIO2

GPIO2 for 4G module power control

- `cd /sys/class/gpio/usb0` (GPIO2 is exported from dts file)
- `echo 1 > value` (Power on)
- `echo 0 > value` (Power off)

### 8.2 GPIO 3

GPIO3 for SIM choose

- `cd /sys/class/gpio/sim` (GPIO3 is exported from dts file)
- `echo 1 > value` (High level for SIM2)
- `echo 0 > value` (Low level for SIM1)

Power OFF 4G module at first, then control GPIO to switch SIM card. Then power on 4G module in 8sec.

### 8.3 LED Control

- `cd /sys/class/gpio`
- `echo N > export` (N for GPIO value. Signal LED indicators for 4,5,45. Error LED indicator for 46. WLAN LED indicator for 44)
- `echo out > gpioN/direction` (N for GPIO value. Signal LED indicators for 4,5,45. Error LED indicator for 46. WLAN LED indicator for 44. Direction for output)

- echo 1 > gpioN/value (N for GPIO value. Signal LED indicators for 4,5,45. Error LED indicator for 46. WLAN LED indicator for 44. value 1 for WLAN LED Light on)
- echo 0 > gpioN/value (N for GPIO value. Signal LED indicators for 4,5,45. Error LED indicator for 46. WLAN LED indicator for 44. value 0 for WLAN LED Light off)

#### 8.4 Extend GPIO to Control DI/DO

- cd /sys/class/gpio (PL2303 driver file patch exports gpiochip508)
- echo 508 > export (508 for DI 1. gpio508/value for input signal. 1 for low level. 0 for high level)
- echo 509 > export (509 for DI 2. gpio509/value for input signal. 1 for low level. 0 for high level)
- echo 510 > export (510 for DO. gpio510/value for output signal. 1 for low level. 0 for high level)

## 9. Storage

### 9.1 Load Driver

- `-*` kmod-usb-storage..... USB Storage support
- `<*>` kmod-usb-storage-extras..... Extra drivers for usb-storage
- `-*` kmod-scsi-core..... SCSI device support
- `<*>` kmod-fs-ext4..... EXT4 filesystem support
- `<*>` kmod-fs-ntfs..... NTFS filesystem support
- `<*>` kmod-fs-vfat..... VFAT filesystem support

```
[ 6.902845] usb-storage 1-1.3:1.0: USB Mass Storage device detected
[ 6.910234] scsi host0: usb-storage 1-1.3:1.0
[ 7.949421] scsi 0:0:0:0: Direct-Access Kingston DataTraveler 2.0 1.00 PQ: 0 ANSI: 4
[ 7.963374] sd 0:0:0:0: [sda] 15131636 512-byte logical blocks: (7.75 GB/7.21 GiB)
[ 7.972245] sd 0:0:0:0: [sda] write Protect is off
[ 7.977120] sd 0:0:0:0: [sda] Mode Sense: 45 00 00 00
[ 7.977914] sd 0:0:0:0: [sda] write cache: disabled, read cache: enabled, doesn't support DPO or FUA
[ 7.996408] sd 0:0:0:0: [sda] Attached SCSI removable disk
```

### 9.2 mount -t vfat /dev/sda/mnt

### 9.3 Configure the auto loading

192.168.1.1/cgi-bin/luci/admin/system/mounts

**Mount Points**

**Global Settings**

Generate Config Generate Config  
 Find all currently attached filesystems and swap and replace configuration with defaults based on what was detected

Mount attached devices Mount attached devices  
 Attempt to enable configured mount points for attached devices

Anonymous Swap  Mount swap not specifically configured

Anonymous Mount  Mount filesystems not specifically configured

Automount Swap  Automatically mount swap on hotplug

Automount Filesystem  Automatically mount filesystems on hotplug

Check filesystems before mount  Automatically check filesystem for errors before mounting

**Mounted file systems**

Filesystem	Mount Point	Available	Used	Unmount
/dev/root	/rom	0 B / 8.00 MiB	100.00% (8.00 MiB)	-
tmpfs	/tmp	27.68 MiB / 27.95 MiB	0.95% (272.00 KiB)	-
/dev/mtdblock6	/overlay	5.39 MiB / 5.69 MiB	5.29% (308.00 KiB)	-
overlayfs:overlay	/	5.39 MiB / 5.69 MiB	5.29% (308.00 KiB)	-
tmpfs	/dev	512.00 KiB / 512.00 KiB	0.00% (0 B)	-

**Mount Points**

Mount Points define at which point a memory device will be attached to the filesystem

Enabled	Device	Mount point	Filesystem	Mount options	Run filesystem check
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## 10. VLAN Configuration

### 10.1 2 LAN Port As default

The screenshot shows the OpenWrt web interface for VLAN configuration. At the top, there is a notification: "No password set! There is no password set on this router. Please configure a root password to protect the web interface." Below this, the "Switch" section is active, showing "Switch 'switch0' (rt305x-esw), ports: 7 (cpu @ 6)". The "Enable VLAN functionality" checkbox is checked. Underneath, the "VLANs on 'switch0' (rt305x-esw), ports: 7 (cpu @ 6)" section contains a table with columns for VLAN ID, Description, CPU (eth0), LAN 1, LAN 2, LAN 3, LAN 4, and WAN. Two VLANs are listed: VLAN 1 (tagged) and VLAN 2 (tagged). Buttons for "Add VLAN", "Save & Apply", "Save", and "Reset" are visible at the bottom.

10.2 If configure WAN, it will be customized by customer.

## 11. Enable Wi-Fi

The screenshot shows the OpenWrt web interface for the "Wireless Overview" section. At the top, there is a notification: "No password set! There is no password set on this router. Please configure a root password to protect the web interface." Below this, the "Wireless Overview" section shows two radio devices: "radio0" (MediaTek MT7628 802.11b/g/n, Device is not active) and "radio1" (SSID: OpenWrt | Mode: Master, Wireless is disabled). Buttons for "Restart", "Scan", "Add", "Enable", "Edit", and "Remove" are present. The "Associated Stations" section below is empty, showing "No information available". Buttons for "Save & Apply", "Save", and "Reset" are at the bottom.

## 12. Status GUI

OpenWrt
23.05.0-rc2 r23228-cd17d8df2a
Refreshing

**Status**

- Overview
- Routing
- Firewall
- System Log
- Processes
- Channel Analysis
- Realtime Graphs
- Mobile Service
- MultiWAN Manager

**System**

- Services
- Network
- VPN
- Logout

**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	Mediatek MT7628AN evaluation board
Architecture	MediaTek MT7628AN ver:1 eco:2
Target Platform	ramips/mt76x8
Firmware Version	OpenWrt 23.05.0-rc2 r23228-cd17d8df2a / LuCI openwrt-23.05 branch git-23.186.24953-088bb74
Kernel Version	5.15.118
Local Time	2024-01-04 06:58:50
Uptime	0h 10m 26s
Load Average	1.63, 1.62, 1.11

**Memory**

Total Available	8.90 MiB / 55.89 MiB (15%)
Used	42.95 MiB / 55.89 MiB (76%)
Buffered	52.00 KiB / 55.89 MiB (0%)
Cached	14.71 MiB / 55.89 MiB (26%)

**Storage**

Disk space	308.00 KiB / 5.69 MiB (5%)
------------	----------------------------

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**Status**

- Overview
- Routing
- Firewall
- System Log
- Processes
- Channel Analysis
- Realtime Graphs
- Mobile Service
- MultiWAN Manager

**System**

- Services
- Network
- VPN
- Logout

**Storage**

Disk space	308.00 KiB / 5.69 MiB (5%)
Temp space	272.00 KiB / 27.95 MiB (0%)

**Network**

IPv4 Upstream

Protocol: ModemManager  
 Address: 10.39.24.18/30  
 Gateway: 10.39.24.17  
 DNS 1: 120.196.165.7  
 DNS 2: 221.179.38.7  
 Connected: 0h 8m 18s

Device: Ethernet Adapter: "wwan0"

Active Connections 51 / 7168 (0%)

**Active DHCP Leases**

Hostname	IPv4 address	MAC address	Lease time remaining	Static Lease
<i>There are no active leases</i>				

**Active DHCPv6 Leases**

Host	IPv6 address	DUID	Lease time remaining	Static Lease
WLINK-Support	fd0d:4bcc:9d37::b85/128	000100012a1242bee4a8dfc4f23f	expired	<a href="#" style="background-color: #007bff; color: white; padding: 2px 5px; font-size: 0.6em;">Set Static</a>

**Wireless**

radio0

Type: MediaTek MT7628 802.11b/g/n  
 Channel: 1 (0.000 GHz)  
 Bitrate: -