

# UG10118

## MCUXpresso SDK USB Host RNDIS and lwIP

Rev. 1.0 — 22 April 2024

User guide

COMPANY PUBLIC

### Document information

Information	Content
Keywords	LWIP, RNDIS, Remote Network Driver Interface, Lightweight TCP/IP, UG10118, USB
Abstract	This document describes how to use the USB Host Remote Network Driver Interface Specification (RNDIS) and Lightweight TCP/IP (lwIP) example in the MCUXpresso SDK to access the internet via a cellphone.



## 1 Introduction

The USB tethering feature on the cell phone enables full access to the Internet. This document describes how to use the USB Host Remote Network Driver Interface Specification (RNDIS) and Lightweight Transmission Control Protocol/Internet Protocol (lwIP) example provided in the MCUXpresso SDK. This example enables you to access the Internet via a cell phone, which turns on the USB tethering function.

## 2 Software

The document mentions the MCUXpresso SDK2.4 evkbimxrt1050 package as an example. The folders on the other boards are similar.

### 2.1 Folder structure

[Figure 1](#) and [Figure 2](#) illustrate the folder structure of the MCUXpresso SDK2.4 evkbimxrt1050 package.

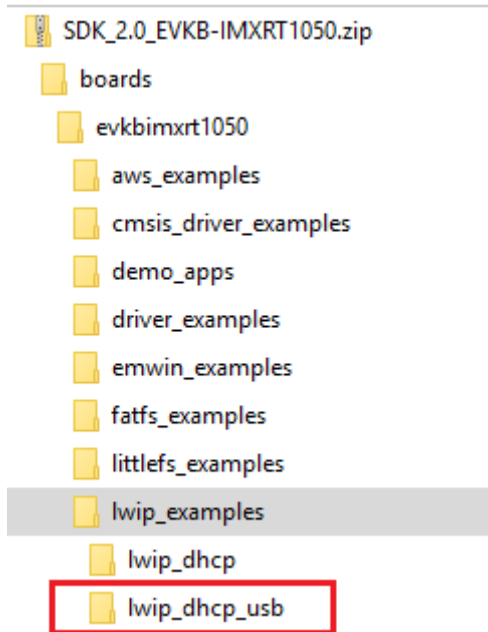


Figure 1. Contents of the lwip\_examples folder

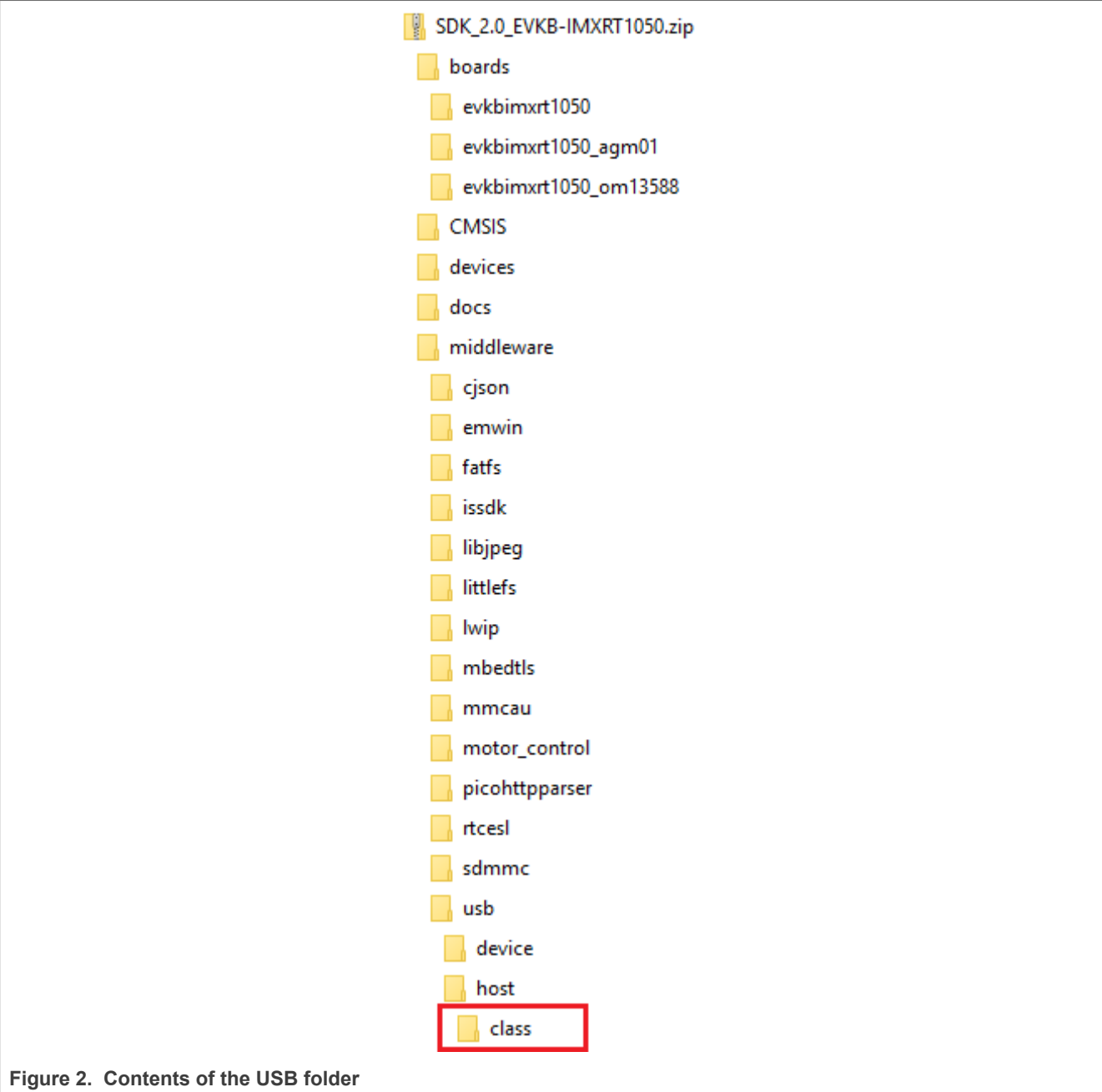


Figure 2. Contents of the USB folder  
Table 1 describes the content of the folders.

Table 1. Contents of the folders

Folder	Description
boards/ CMSIS/ devices/ docs/ middleware/ rtos/	MCUXpresso SDK2.x evkbimxrt1050 package directory

Table 1. Contents of the folders...continued

Folder	Description
boards/evkbimxrt1050/lwip_examples/lwip_dhcp_usb	USB RNDIS & lwip example directory
middleware/usb/host/class	USB RNDIS class driver
middleware/lwip/port	USB ethernet interface driver

2.2 Features

The software provides `lwip_dhcp_usb` as an example, which is a simple demonstration. This example integrates the USB Host RNDIS and lwIP TCP/IP stack.

- The example performs the following steps.
  - Connects to a cell phone, which turns on the USB tethering feature.
  - Gets the ip address via DHCP.
  - Pings the URL [www.nxp.com](http://www.nxp.com).
- Supports BareMetal (BM) and Free Real-Time Operating System (FreeRTOS).

2.3 Building the demo

The demo projects are available in the below path.

`<root>/boards/board_name/lwip_examples/lwip_dhcp_usb/<rtos>/<toolchain>`.

**Note:** The `<rtos>` is `bm` for BareMetal or `freertos` for FreeRTOS OS. For more information on how to build the demo/download the binary to the board, see `root/docs/Getting Started with MCUXpresso SDK for xxxx(board name).pdf`.

3 Hardware

- Micro AB to standard A USB converter
- USB A to micro AB cable
- Personal Computer(PC)
- Cell phone with Android OS
  - MEIZU Note 3 – OS is Flyme 6.1.0.1M
  - Moto G – Android 8.1.0
  - Honor 10 of Huawei – EMUI 8.1.0
  - Huawei Mate 40 Pro – HarmonyOS 4.0.0
  - Redmi K40 – MIUI 14.0.8 Android 13
  - Redmi K60 – HyperOS 1.0.4.0.UMNCNXM Android 14

4 Run demo

This section lists the steps to [Section 4.1, Section "Begin to run"](#), and [Section "Insert the USB device"](#). The section also provides [Section "Turn on the USB tethering feature on the cell phone"](#).


4.1 Set up the board

The following are the steps to set up the board.

1. Set the hardware jumpers to the default settings.
2. Make sure that the USB port has power. For details, refer to the `readme.txt` file.
3. Make sure to build and download the `lwip_dhcp_usb` demo to the board as described in [Section 2.3 "Building the demo"](#).
4. Connect Universal Asynchronous Receiver Transmitter (UART) to PC.
5. Configure the COM port of the PC and get the debug information.
6. Open the COM port in the PC device manager with the serial tool, such as TeraTerm.

## 4.2 Begin to run

To begin, power on the board. The following information appears in the terminal.



```
host init.
```

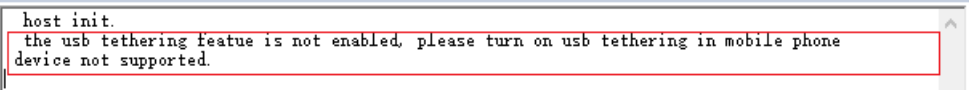
Figure 3. Terminal information

## 4.3 Insert the USB device

To insert the USB device, perform the following steps.

1. Connect the cell phone to the usb port on the board.

The example prints the following log in the terminal.

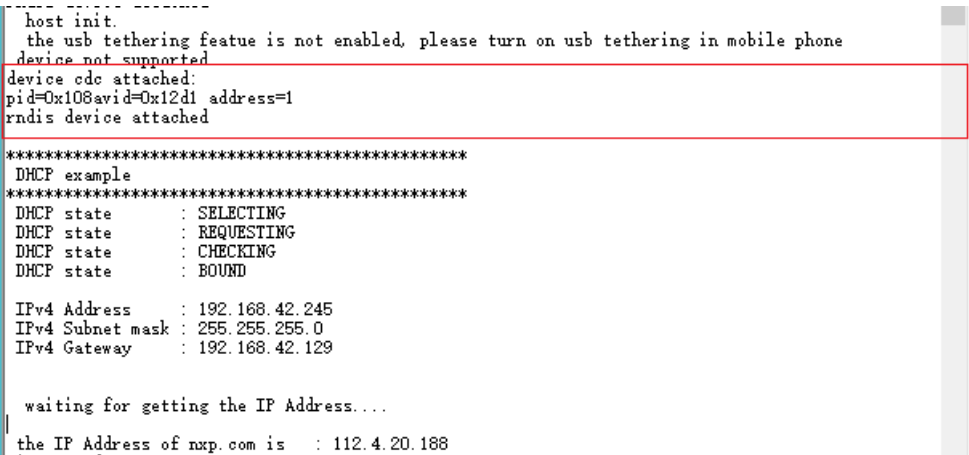


```
host init.  
the usb tethering feature is not enabled, please turn on usb tethering in mobile phone  
device not supported.
```

Figure 4. Terminal log

For the steps to turn on the usb tethering feature, see [Section 4.4 "Turn on the USB tethering feature on the cell phone"](#).

2. After enabling the feature, the `lwip` example enumerates the cell phone as cdc device and prints the following log in the terminal.



```
host init.  
the usb tethering feature is not enabled, please turn on usb tethering in mobile phone  
device not supported  
device cdc attached:  
pid=0x108avid=0x12d1 address=1  
rndis device attached  
  
*****  
DHCP example  
*****  
DHCP state : SELECTING  
DHCP state : REQUESTING  
DHCP state : CHECKING  
DHCP state : BOUND  
  
IPv4 Address : 192.168.42.245  
IPv4 Subnet mask : 255.255.255.0  
IPv4 Gateway : 192.168.42.129  
  
waiting for getting the IP Address...  
the IP Address of nxp.com is : 112.4.20.188
```

Figure 5. Terminal log when the example enumerates the cell phone

3. After the enumeration of the cell phone, the example gets the IP address and pings repeatedly. The following log appears in the terminal.

**Note:** The IP information and IP address of the NXP website is different in different scenarios.

```
host init.
the usb tethering featue is not enabled, please turn on usb tethering in mobile phone
device not supported.
device cdc attached:
pid=0x108avid=0x12d1 address=1
rndis device attached

*****
DHCP example
*****
DHCP state      : SELECTING
DHCP state      : REQUESTING
DHCP state      : CHECKING
DHCP state      : BOUND

IPv4 Address     : 192.168.42.245
IPv4 Subnet mask : 255.255.255.0
IPv4 Gateway     : 192.168.42.129

waiting for getting the IP Address...

the IP Address of nxp.com is : 112.4.20.188
ping: send
112.4.20.188

ping: rcv
112.4.20.188
55 ms
ping: send
112.4.20.188
```

Figure 6. Terminal log when the example pings the NXP website

#### 4.4 Turn on the USB tethering feature on the cell phone

**Note:** The following steps are valid for the Redmi K60 cell phone on Android 14. For other cell phone or other Android version, the steps can differ.

1. Find the system setting on your cell phone.
2. Check the **Portable hotspot** option.

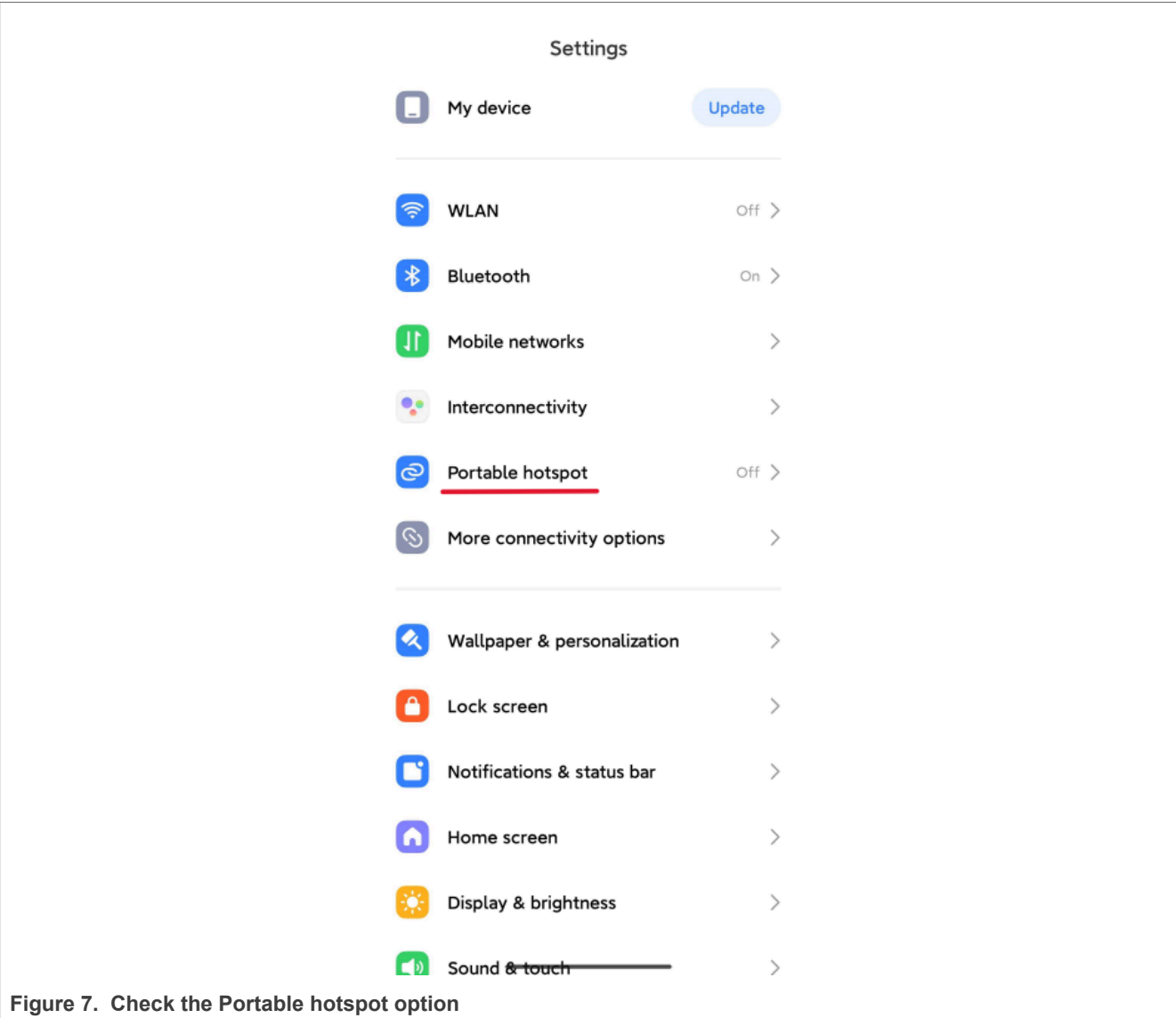


Figure 7. Check the Portable hotspot option

**Note:** It is not possible to enable USB tethering until the cell phone connects to a USB RNDIS Host.

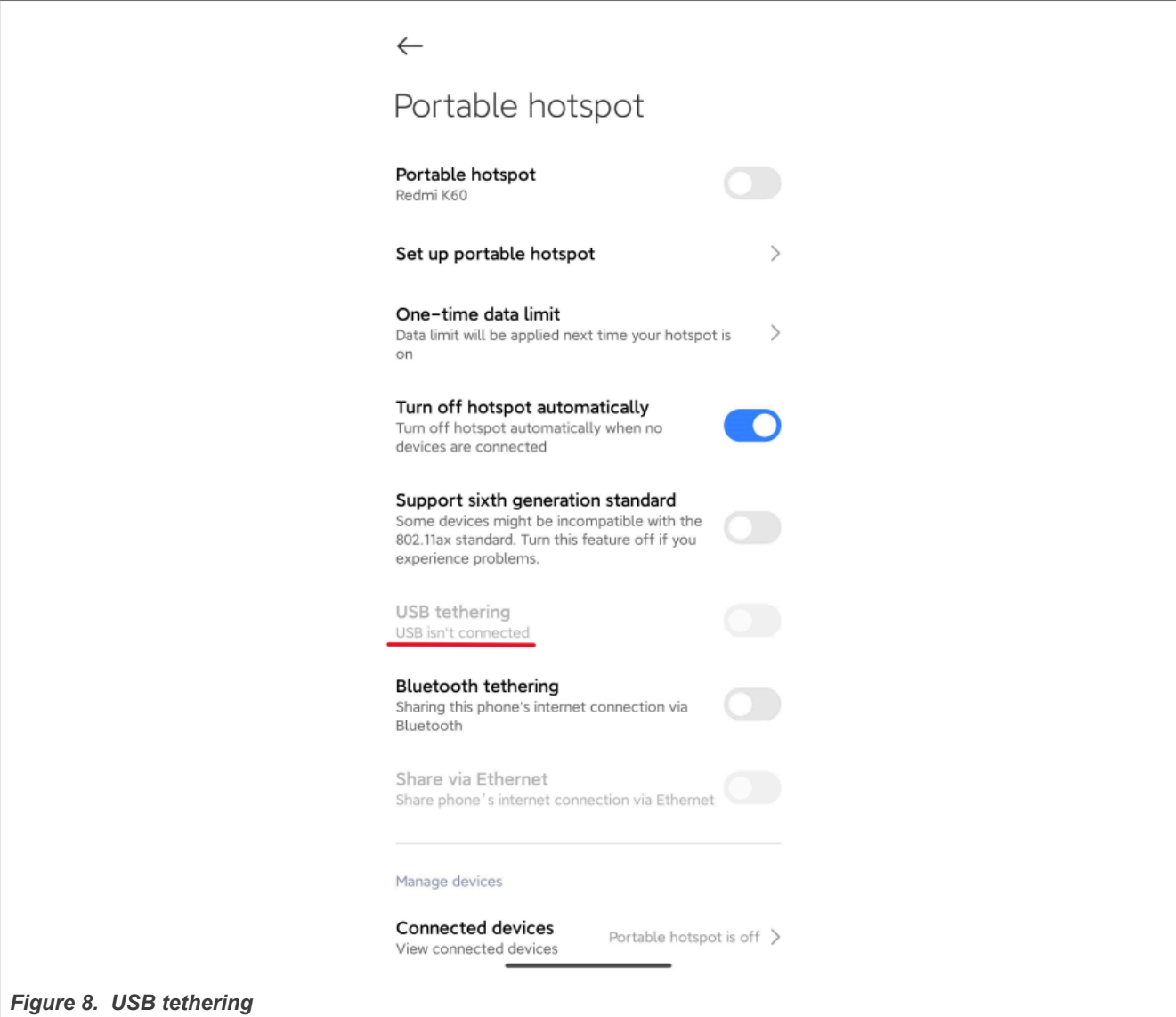
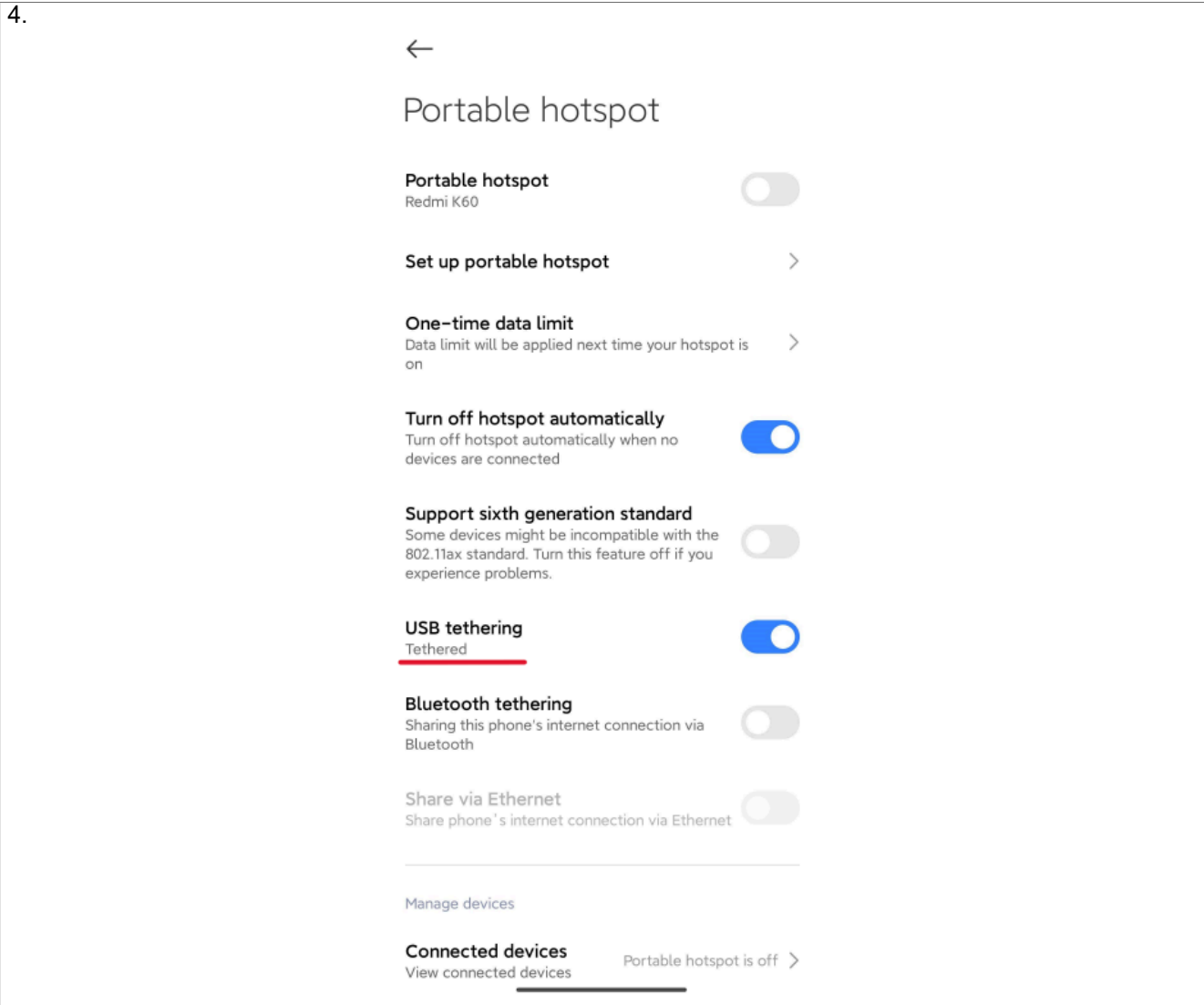


Figure 8. USB tethering

3. The USB tethering is available only when the cell phone connects to a USB RNDIS Host. Tap the switch to enable the USB tethering feature.





## 5 Known issue

If the mobile phone is unplugged and then plugged in again during the `lwip` example ping, the ping command does not receive feedback. This issue only occurs on the MEIZU Note 3.

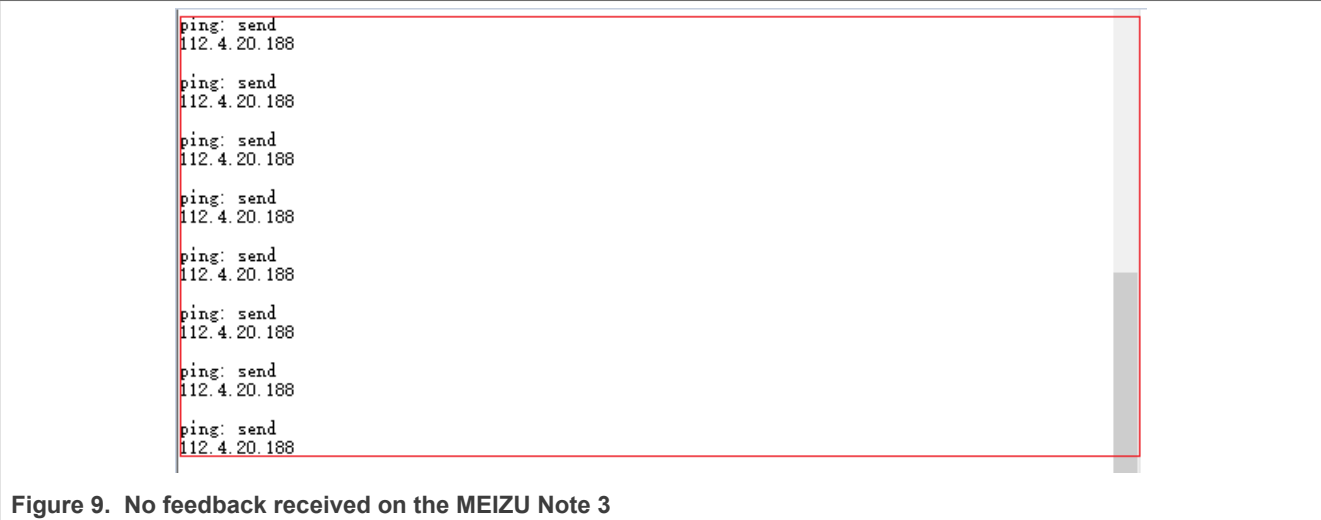


Figure 9. No feedback received on the MEIZU Note 3

## 6 Revision history

Table 2. Revision history

Document ID	Release date	Description
UG10118 v.1.0	22 April 2024	• Initial version

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