USB Gadget Mode - Mac to Pi Connection Guide

This guide explains how to connect your Mac to the Raspberry Pi via USB cable using USB gadget mode.

Overview

USB gadget mode allows the Raspberry Pi to act as a USB Ethernet device when connected to your Mac via USB cable. This is useful when:
• You don't have network access (no WiFi/Ethernet)
• You want a direct connection without a router
• You need to configure the Pi for the first time

How It Works

• **Pi acts as:** USB Ethernet device (usb0 interface)
• **Mac sees:** USB Ethernet adapter
• **Pi IP:** 192.168.10.2
• **Mac IP:** 192.168.10.1

Prerequisites

• Raspberry Pi 5 (or Pi 4)
• USB-C to USB-C cable (or USB-A to USB-C)
• Mac computer
• SD card with moOde image

Setup Process

Step 1: Configure Pi (Before Booting)

Run the setup script to configure USB gadget mode in the build:

```
cd ~/moodeaudio-cursor
./SETUP_USB_GADGET_MODE.sh
```

This script:
• Adds `dtoverlay=dwc2` to `config.txt`
• Adds `modules-load=dwc2,g_ether` to `cmdline.txt`
• Creates `usb-gadget-network.service` systemd service
• Configures Pi IP address (192.168.10.2)

Step 2: Build and Flash Image

Build your custom image with USB gadget mode enabled:

```
cd ~/moodeaudio-cursor
./tools/build.sh --deploy
```

Or if using a pre-built image, apply the configuration to the SD card:

1. Mount SD card (bootfs and rootfs)
2. Run: `./SETUP_USB_GADGET_MODE.sh`
3. Eject SD card

Step 3: Boot Pi with USB Cable

1. **Connect USB cable:**
• Use USB-C to USB-C cable
• Connect to USB port on Pi (not power-only port)
• Connect to Mac USB port

2. **Boot Pi:**
• Insert SD card
• Power on Pi
• Wait 30-60 seconds for boot

Step 4: Configure Mac

Once Pi is booted, run the Mac configuration script:

```
cd ~/moodeaudio-cursor
./SETUP_USB_GADGET_MAC.sh
```

This script:
• Detects USB Ethernet interface
• Configures Mac IP address (192.168.10.1)
• Tests connection to Pi

Step 5: Connect

After configuration, you can connect via SSH:

```
ssh andre@192.168.10.2
```

Or access moOde web interface:

```
http://192.168.10.2
```

Troubleshooting

Mac doesn't detect USB Ethernet

1. **Check cable:** Use data-capable USB cable (not power-only)
2. **Check port:** Use USB port on Pi (not power-only port)
3. **Wait:** Pi needs 30-60 seconds to boot and initialize USB gadget
4. **Check System Preferences:** Look for new network interface

Pi not responding

1. **Check Pi boot:** Look for activity LED or display
2. **Wait longer:** USB gadget initialization can take time
3. **Check Mac IP:** Verify Mac has IP 192.168.10.1
4. **Ping test:** `ping 192.168.10.2`

Connection works but SSH fails

1. **Check SSH service:** `systemctl status ssh` on Pi
2. **Check user:** Make sure `andre` user exists
3. **Check password:** Default password is `0815`
4. **Try serial console:** Use serial connection to debug

Manual Configuration

Mac Side (Manual)

1. Open **System Preferences > Network**
2. Find USB Ethernet interface
3. Configure manually:
• IP Address: 192.168.10.1
• Subnet Mask: 255.255.255.0
• Router: (leave empty)

Pi Side (Manual)

If USB gadget interface exists but no IP:

```
sudo ip link set usb0 up
sudo ip addr add 192.168.10.2/24 dev usb0
```

Technical Details

Files Modified

• `config.txt`: Added `dtoverlay=dwc2`
• `cmdline.txt`: Added `modules-load=dwc2,g_ether`
• `usb-gadget-network.service`: Systemd service for network configuration

Network Configuration

• **Pi:** 192.168.10.2/24 on usb0 interface
• **Mac:** 192.168.10.1/24 on USB Ethernet interface
• **Subnet:** 192.168.10.0/24

Service Details

The `usb-gadget-network.service`:
• Starts after network-pre.target
• Waits 2 seconds for usb0 interface
• Configures IP address automatically
• Runs on boot

Notes

• USB gadget mode works alongside WiFi/Ethernet
• You can use USB connection and network simultaneously
• USB connection is useful for initial setup
• After network is configured, USB connection is optional

Related Scripts

• `SETUP_USB_GADGET_MODE.sh` - Configure Pi for USB gadget mode
• `SETUP_USB_GADGET_MAC.sh` - Configure Mac for USB connection
• `CONFIGURE_MAC_ETHERNET_FOR_PI.sh` - Configure Mac for Ethernet connection