MUNTS-0019 Raspberry Pi Tutorial Kit User Guide
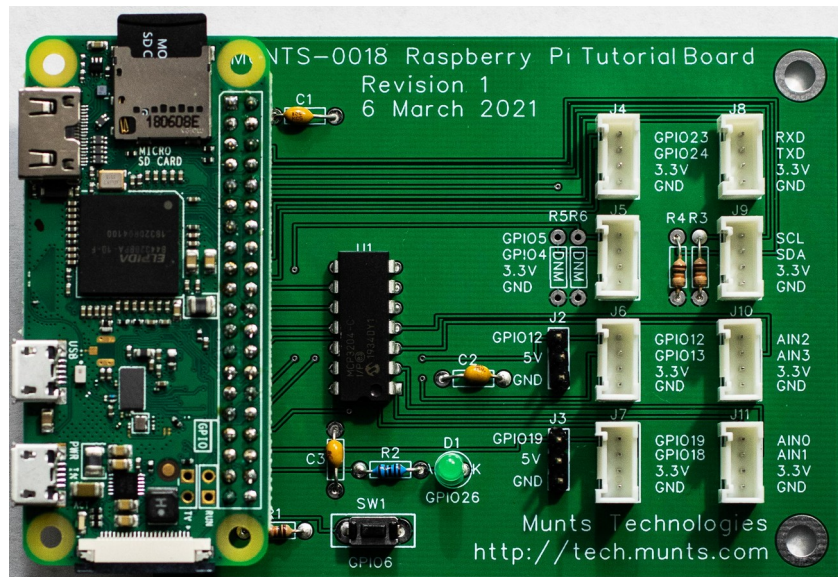
Revision 3
11 January 2023

by Philip Munts
Munts Technologies

http://tech.munts.com

Introduction

The **MUNTS-0019 Raspberry Pi Tutorial Kit** consists of a **Raspberry Pi Zero W** or **Raspberry Pi Zero 2 W** microcomputer mated to a **MUNTS-0018 Raspberry Pi Tutorial I/O Board**, along with some **Grove System** compatible I/O devices.

The Raspberry Pi supplied in the tutorial kit comes with **MuntsOS Embedded Linux** firmware already installed. **MuntsOS Embedded Linux** is a very small Linux distribution for resource constrained microcomputers like the Raspberry Pi. It boots from a micro-SD card, but thereafter runs entirely from RAM.

MUNTS-0019 Raspberry Pi Tutorial Kits always come with firmware (including a special Linux kernel) that enables the Raspberry Pi to act as a **USB Ethernet Gadget**. The Raspberry Pi USB interface hardware is placed into slave device mode. When plugged into a host computer, from which it receives power, the Raspberry Pi enumerates as a USB Ethernet device. This works on Chromebook, Linux, MacOS and Windows host computers.

The firmware even runs a DHCP server that causes the host operating system to configure its USB Ethernet interface such that the Raspberry Pi is accessible at the IPv4 address `10.254.254.252` or the domain name `usbgadget.munts.net.`

Depending on the particular tutorial a particular kit is configured for, the Raspberry Pi firmware may also include extensions such as the **.Net Runtime** or a **Remote I/O Protocol** server.

Raspberry Pi Network Setup

Plug the USB micro cable supplied with the tutorial kit into a USB socket on your host computer. The other end of the USB micro cable must be plugged into the middle socket (labeled `USB`) on the left edge of the Raspberry Pi Zero printed circuit board.

After a few seconds, your host computer should automatically create and configure a new Ethernet network interface, probably named `usb0` on a Linux host computer and something like `USB Ethernet/RNDIS Gadget #1` on a Windows host computer. That interface will eventually be configured with the IP address `10.254.254.253`. You will have to wait until the new network interface has finished its auto-configuration before you can proceed.

*Note: If you are using a virtual machine or container environment, such as **Linux on Chrome OS** on a Chromebook or **Windows Subsystem for Linux** on a Windows computer, the Ethernet interface for the target computer may not be visible. It should still be network accessible from the virtual machine environment (try `ping usbgadget.munts.net`). If `usbgadget.munts.net` can be pinged from the host computer, but not from the virtual machine, you will need to adjust the virtual machine network settings. Make sure one of the virtual machine's network interfaces is configured for NAT (Network Address Translation).*

When you communicate from your host computer to the Raspberry Pi Zero, from now on you can use the host name `usbgadget.munts.net`, which resolves to the IP address `10.254.254.252`.

If you do not already have SSH private and public keys on your host computer, you must create them with the following command:

```
ssh-keygen -C "Your Name"
```

Next you must transfer your SSH public key to the Raspberry Pi Zero using the following command:

```
ssh-copy-id root@usbgadget.munts.net
```

The default superuser password for the Raspberry Pi Zero is `default`. You will need to enter that password only one time for this tutorial, at this step.

Now you must log into the Raspberry Pi Zero:

```
ssh root@usbgadget.munts.net
```

Now you must configure **MuntsOS Embedded Linux** on the Raspberry Pi Zero using the `sysconfig` program, exactly as follows (substituting your WiFi SSID and password):

```
tutorial1# sysconfig

MuntsOS System Configurator

Change hostname from tutorial1                          [y,N]
Edit static network configuration                       [y,N]
Add a wireless network                                  [y,N] y
Add open wireless network                               [y,N]
Add WPA/PSK wireless network                            [y,N] y
  Enter SSID:     MYNETWORK
  Enter password: MYPASSWORD
Add WEP wireless network                                [y,N]
Add another wireless network                            [y,N]
Remove redundant 00-wlan-init                           [y,N] y
Regenerate SSH server keys                              [y,N]
Change superuser password                               [y,N]
Generate superuser id_rsa                               [y,N]
Add public key to superuser authorized_keys             [y,N]
Disable SSH password authentication                     [y,N] y
Manage extensions                                       [y,N]
Register wlan0 for Dynamic DNS at noip.com              [y,N]
Edit cmdline.txt                                        [y,N]
Edit config.txt                                         [y,N]
Reboot system (recommended)                             [y,N] y
Connection to usbgadget closed by remote host.
```

After all this the Raspberry Pi Zero will restart and join your wireless network, as well as creating the `usb0` Ethernet interface on your host computer again.

Depending on your host computer, the Raspberry Pi Zero might now be accessible as *both* `usbgadget.munts.net` (over the `usb0` USB Ethernet Gadget interface) *and* `tutorial1.local` (over WiFi).