

# MiniZed Getting Started Guide

Version 1.2

## Document Control

**Document Version:** 1.2

**Document Date:** 21 May 2018

### Prior Version History

Version	Date	Comment
1.0	12 Jun 2017	Initial MiniZed Hardware User Guide
1.1	22 Jun 2017	Fixed a formatting problem with Appendix A
1.2	21 May 2018	Fixed an error about the USB stick on page 10

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# 1 Getting Started with MiniZed

The Avnet MiniZed enables hardware and software developers to explore the capabilities of the Zynq™-7000 All Programmable SoC Single-Core. Designers can create or evaluate designs for both the Zynq Processor Subsystem (PS) and the Programmable Logic (PL) fabric.

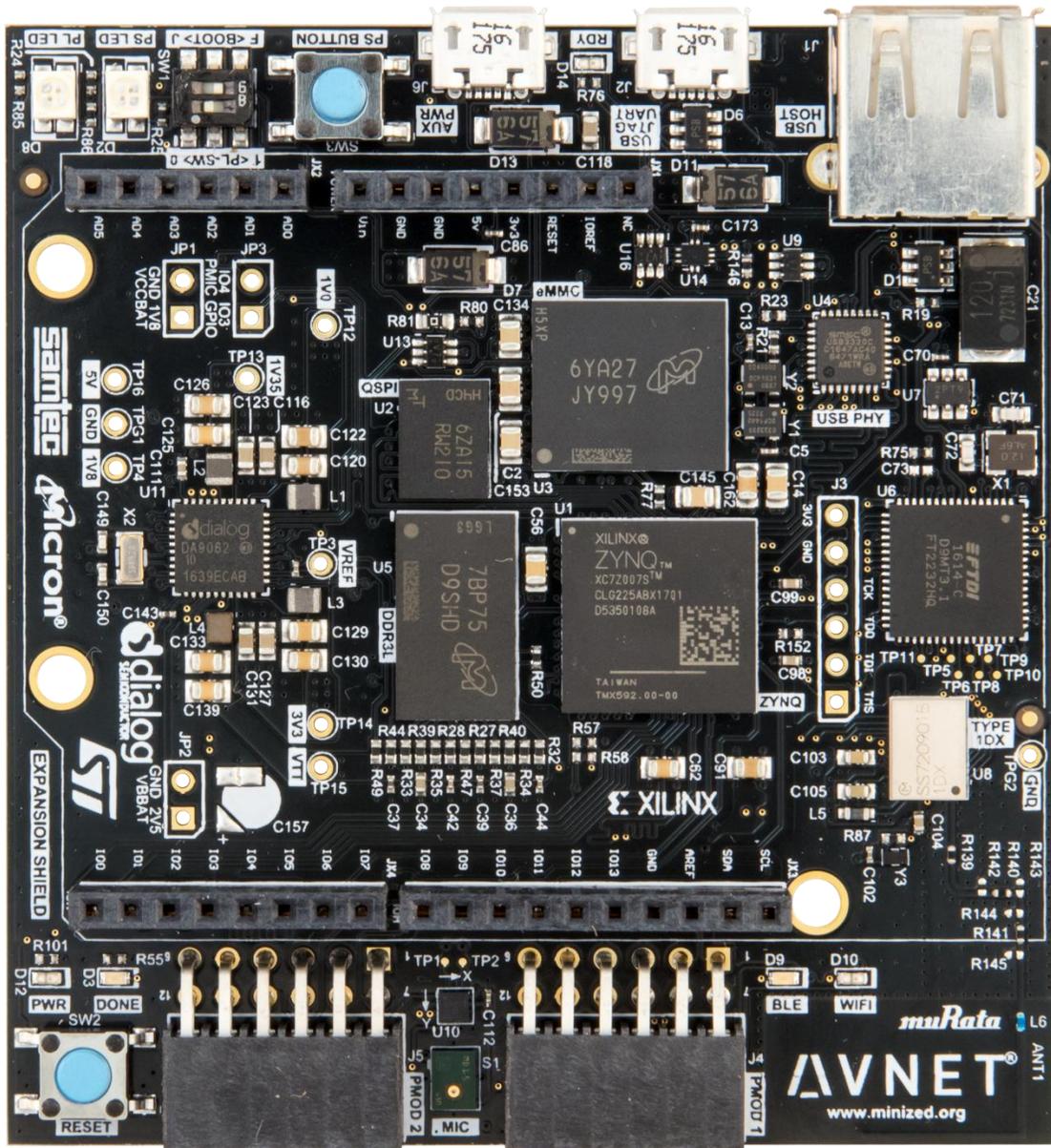


Figure 1 – MiniZed

This Getting Started Guide will outline the steps to setup the MiniZed hardware. It documents the procedure to run a PetaLinux design running on the ARM® Cortex™-A9 MPCore™ Processing System (PS).

## 2 What's Inside the Box?

- MiniZed development board
- Voucher for SDSoC license from Xilinx
- Micro USB cable
- Quick Start Instruction card
- Safety Instructions pamphlet

### 2.1 Optional add-on items:

- External 2A @ 5V power supply with micro USB cable (AES-ACC-MINIZ-PWR)
- Digilent SD Card Pmod with SD Card (410-123)
- ST Micro Motion MEMS and environmental sensor expansion board (X-NUCLEO-IKS01A1)

## 3 What's on the Web?

MiniZed is a community-oriented kit, with all materials being made available through the [MiniZed.org](http://MiniZed.org) community website.

### 3.1 Official Documentation:

- Getting started guide
- Hardware user guide
- Schematics
- Bill of materials
- Layout
- PCB net lengths
- Mechanical drawing
- 3D Model
- Board definition files for Vivado integration
- Programmable logic (PL) master user constraints

### 3.2 Tutorials and Reference Designs:

- Introduction to Zynq Design Tutorials
- PetaLinux BSP
- Booting MiniZed using QSPI and eMMC

### 3.3 Trainings and Videos:

- Introduction to MiniZed

### 3.4 Available through Avnet FAE:

- Altium source database for schematic and layout

## 4 MiniZed Key Features

- Xilinx Zynq XC7Z007S SoC
- Memory
  - Micron 512 MB DDR3L
  - Micron 128 MB QSPI flash
  - Micron 8GB eMMC mass storage
- Configuration and Debug
  - On-board USB to JTAG and debug UART circuit
- Communications
  - On-board USB to JTAG and debug UART circuit
  - Murata "Type 1DX" wireless module with 802.11b/g/n Wi-Fi and Bluetooth 4.1 plus EDR and BLE (Bluetooth Low Energy)
  - USB 2.0 host interface
- Power
  - Dialog Semiconductor DA9062 PMIC (Power Management IC)
- Expansion connectors
  - Arduino-compatible shield interface
  - 2 x Pmod-compatible interfaces
- Sensors
  - ST Micro LIS2DS12 Accelerometer and Temperature sensor
  - ST Micro MP34DT05 digital MEMS microphone
- General Purpose I/O
  - Reset button
  - User button
  - User switch
  - Two user bi-element LEDs

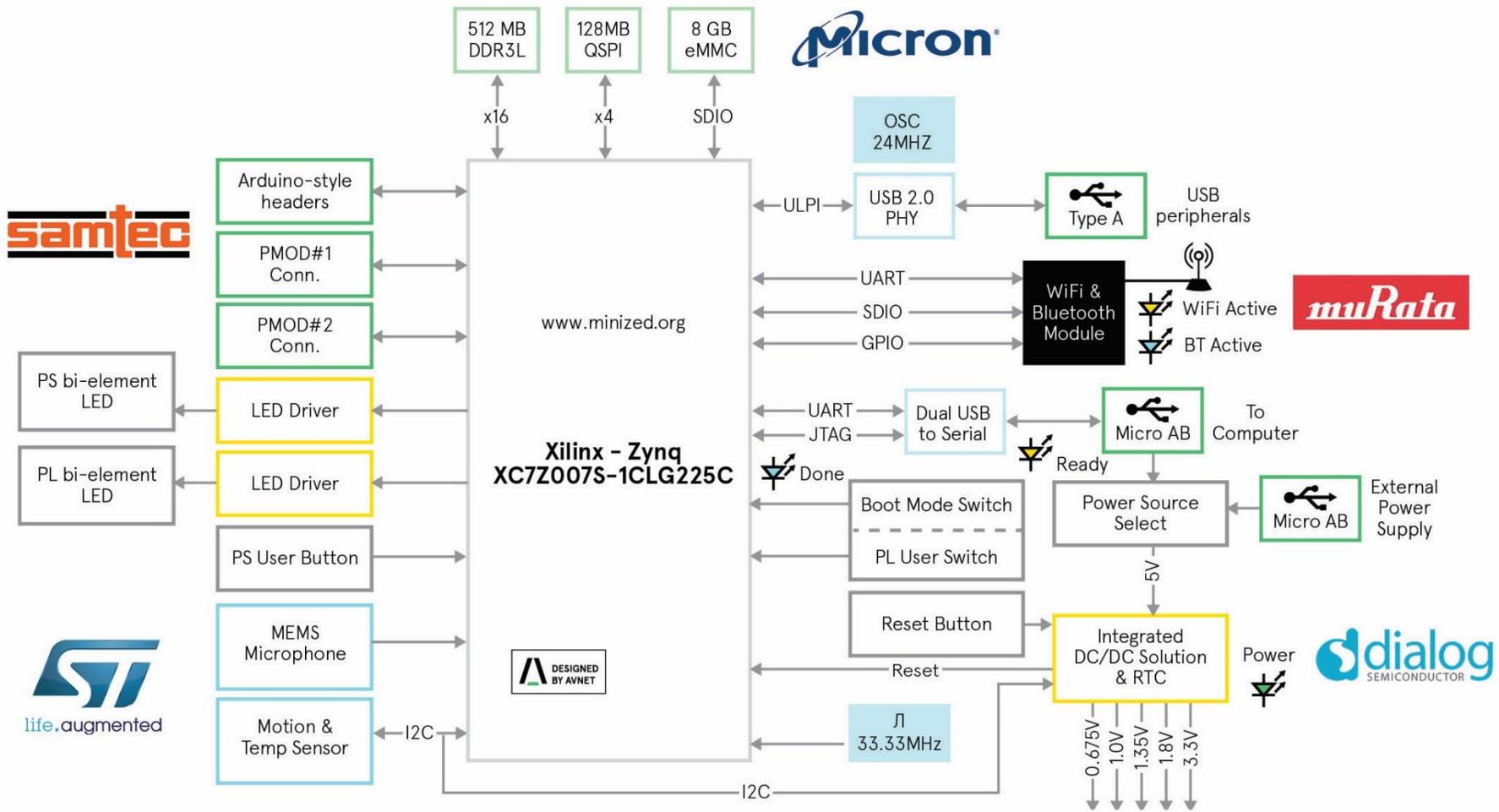


Figure 2 – MiniZed Block Diagram

## 5 MiniZed Basic Setup and Operation

The functionality of the MiniZed is determined by the application booted from the non-volatile memory – by default that is the QSPI and eMMC. This *Getting Started Guide* allows system developers to exercise and demonstrate multiple circuits through PetaLinux, including:

- USB 2.0
- eMMC
- Wi-Fi
- Bluetooth
- I2C Sensor
- Microphone

In addition to the items included in the kit, you will also need the following to complete the exercises in this tutorial.

- **Wi-Fi connection**
- **2<sup>nd</sup> micro-USB cable**
- **USB thumb drive formatted as FAT or FAT32**

A MiniZed image in its expected out-of-box configuration is shown below along with the locations of several key components.

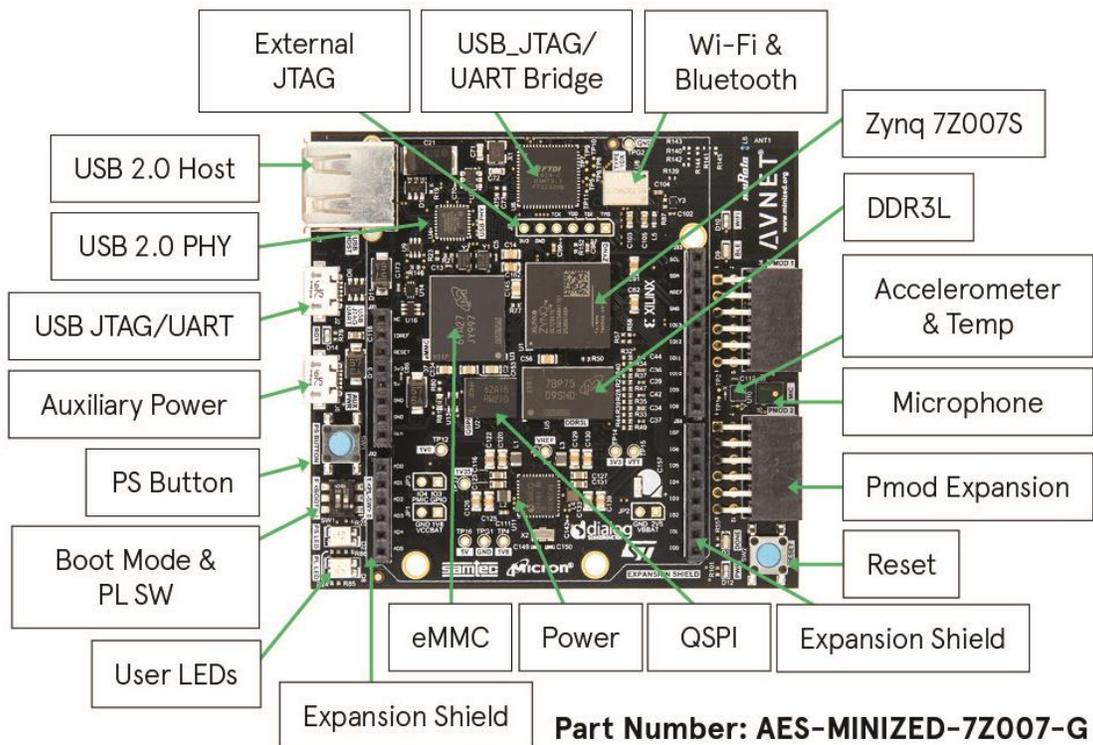


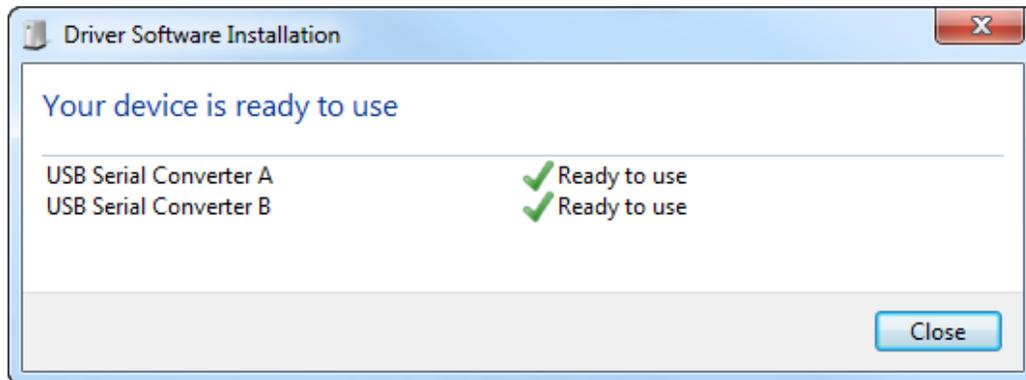
Figure 3 – MiniZed Topology

## 5.1 Example Design

The MiniZed ships with an example PetaLinux design stored in the QSPI and eMMC. If the QSPI has been erased or reprogrammed, then use the *Restore QSPI and eMMC Factory Images* tutorial available at [www.MinizEd.org](http://www.MinizEd.org) to restore both the QSPI and eMMC to the original factory images.

## 5.2 Hardware Setup

1. The USB thumb drive must be formatted as FAT32. If this has not been previously done, please do that now.
2. A terminal program is required. Tera Term was used in this example which can be downloaded from the Tera Term project on the SourceForge Japan page: [tssh2.sourceforge.jp](http://tssh2.sourceforge.jp) Install Tera Term or another terminal program of your choice.
3. Connect the MiniZed USB-JTAG/UART port J2 to your Windows PC. It should automatically install the proper drivers, giving you a confirmation as shown below. If installed correctly, skip to Step 7.



**Figure 4 – MiniZed USB-JTAG/UART Installed Correctly**

4. In the rare circumstance that the drivers are not auto-installed, then you must manually install the driver for the FTDI FT2232H device. Visit the FTDI website and download the appropriate driver for your operating system.

<http://www.ftdichip.com/Drivers/VCP.htm>

5. Make sure the MiniZed is unplugged from the PC. Unzip and install the driver.
6. Reboot your PC then plug in the MiniZed.

7. Set the MiniZed boot mode switch SW1 to QSPI mode ('F' for Flash) as shown below.

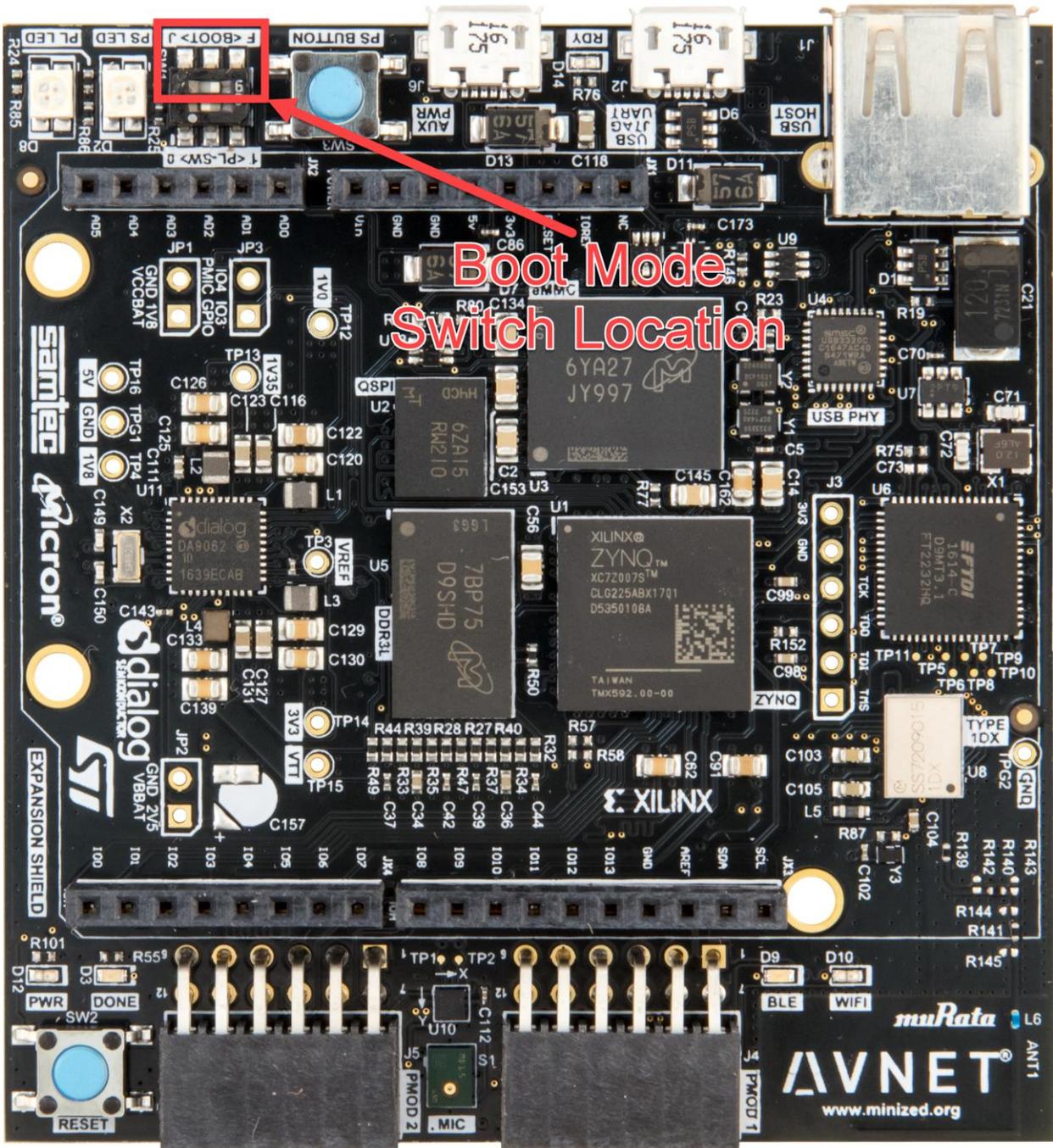


Figure 5 – MiniZed Switch Location

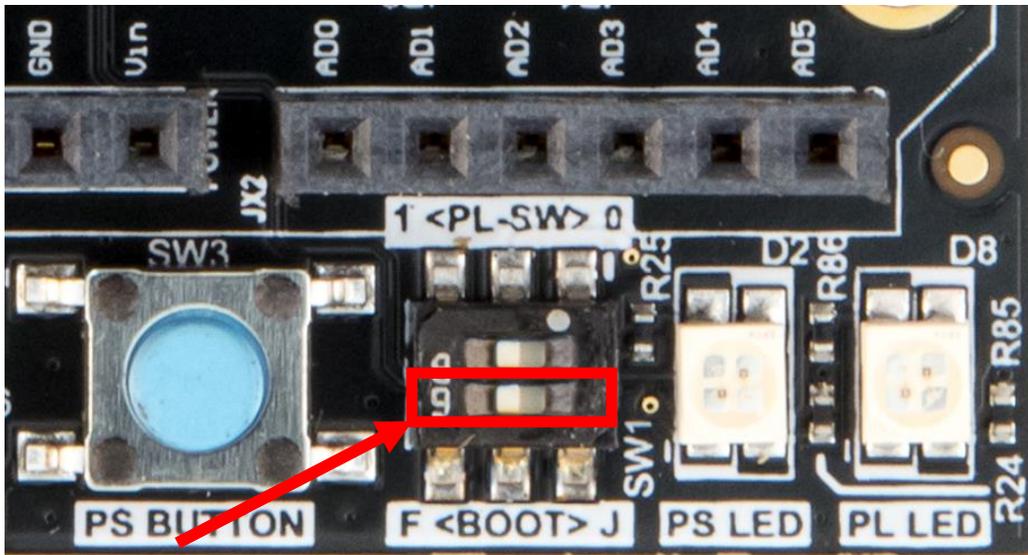


Figure 6 – QSPI/Flash Boot Mode

## 6 Boot Linux

8. If previously disconnected, plug in the micro-USB cable to the USB-JTAG/UART port.
9. Plug in the 2<sup>nd</sup> micro-USB cable to the auxiliary power port. This is necessary for the USB thumb drive to get power.
10. Launch and connect Tera Term using the settings shown below. Press the **RESET** button (SW2) to reset the board so you can see the boot sequence.

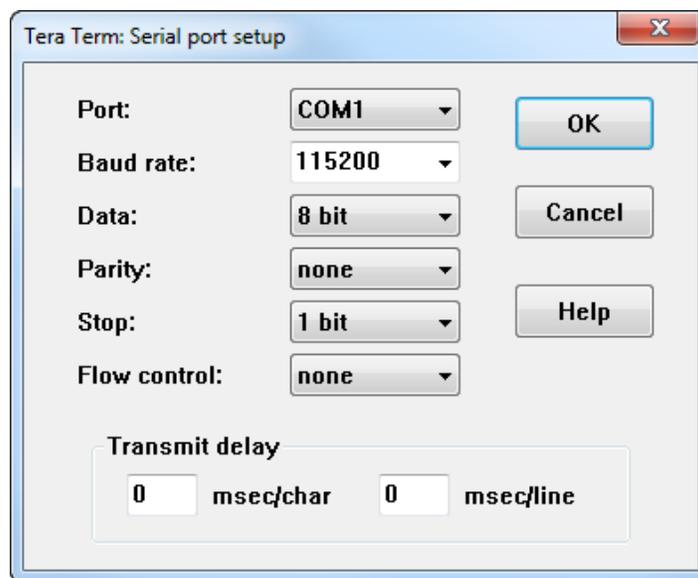


Figure 7 – COM Port Settings for USB-UART Terminal

```

COM40:115200baud - Tera Term VT
File Edit Setup Control Window Help
NET: Registered protocol family 10
sit: IPv6 over IPv4 tunneling driver
NET: Registered protocol family 17
Bluetooth: RFCOMM TTY layer initialized
Bluetooth: RFCOMM socket layer initialized
Bluetooth: RFCOMM ver 1.11
Bluetooth: BNEP (Ethernet Emulation) ver 1.3
Bluetooth: BNEP socket layer initialized
Bluetooth: HIDP (Human Interface Emulation) ver 1.2
Bluetooth: HIDP socket layer initialized
Registering SWP/SWPB emulation handler
mmc1: new high speed MMC card at address 0001
hctosys: unable to open rtc device (rtc0)
wlrreg_on: disabling
ALSA device list:
  No soundcards found.
Freeing unused kernel memory: 1024K (c0a00000 - c0b00000)
usb 1-1: new high-speed USB device number 2 using ci_hcd
mmcblk1: mmc1:0001 Q2J55L 7.09 GiB
INIT: mmcblk1boot0: mmc1:0001 Q2J55L partition 1 16.0 MiB
      version 2.88 bootingmmcblk1boot1: mmc1:0001 Q2J55L partition 2 16.0 MiB
mmcblk1rpnb: mmc1:0001 Q2J55L partition 3 4.00 MiB
mmcblk1: p1
usb-storage 1-1:1.0: USB Mass Storage device detected
scsi host0: usb-storage 1-1:1.0
EXT4-fs (mmcblk1rpnb): unable to read superblock
EXT4-fs (mmcblk1rpnb): unable to read superblock
EXT2-fs (mmcblk1rpnb): error: unable to read superblock
FAT-fs (mmcblk1rpnb): unable to read boot sector
EXT4-fs (mmcblk1rpnb): unable to read superblock
EXT4-fs (mmcblk1rpnb): unable to read superblock
EXT2-fs (mmcblk1rpnb): error: unable to read superblock
FAT-fs (mmcblk1rpnb): unable to read boot sector
FAT-fs (mmcblk1rpnb): unable to read boot sector
mount: mounting /dev/mmcblk1rpnb on /run/media/mmcblk1rpnb failed: Input/output
error
mount: mounting /dev/mmcblk1boot0 on /run/media/mmcblk1boot0 failed: Invalid arg
ument
mount: mounting /dev/mmcblk1boot1 on /run/media/mmcblk1boot1 failed: Invalid arg
ument
/etc/mdev/mdev-mount.sh: line 28: [: /sys/block/mmcblk1/mmcblk1boot1: binary ope
rator expected
mount: mounting /dev/mmcblk1 on /run/media/mmcblk1 failed: Device or resource bu
sy
scsi 0:0:0:0: Direct-Access    Generic Mass-Storage    1.11 PQ: 0 ANSI: 2
sd 0:0:0:0: Attached scsi generic sg0 type 0
sd 0:0:0:0:  [sdal 1947648 512-byte logical blocks: (997 MB/951 MiB)
sd 0:0:0:0:  [sdal Write Protect is off
sd 0:0:0:0:  [sdal No Caching mode page found
sd 0:0:0:0:  [sdal Assuming drive cache: write through
sda: sda1
sd 0:0:0:0:  [sdal Attached SCSI removable disk
random: dd urandom read with 19 bits of entropy available
Fri Apr 14 07:11:47 UTC 2017
Starting internet superserver: inetd.
INIT: Entering runlevel: 5
Configuring network interfaces... ifconfig: SIOCGIFFLAGS: No such device
Starting system message bus: dbus.
Starting Dropbear SSH server: Generating key, this may take a while...
Public key portion is:
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQBAQ0rcYm7EhKggEa4KzBAJlThZJFuvkC6tp9G9hwFp0Y
kz22hj2sbqkDCFUtdS1kgl1kjuBq3fcJ41LHg4YJXJg9UGwZF00dD1aU6/Ac7SfzucvA21ExI l pnt
EwrC8BmoTSUqn7LvnIqkntGleGDYgJAqt767mIDEx0uJtI/uKhp/cIB8oLPK+f90qI6aNBIPy1+UYMu
OpYwtzDZWEp1NExCN/Gc12F3RPPYPYcHtdzEI GUYG*0itUMfXOFZsWc+1/ouUUF1Q80wypUSwFud9hhH
611Pxcg+suA4PYWEhfn56frHRygiGSXwM8FkpYQ1RbQKCaavz+R/unoGe15j root@plnx_arm
Fingerprint: md5 56:91:e8:59:44:4a:c4:f1:9d:6b:2d:81:69:3c:e6:e6
dropbear.
Starting bluetooth
bluetoothd
Starting syslogd/klogd: done
Starting tcf-agent: OK

PetaLinux 2016.4 plnx_arm /dev/ttyPS0
plnx_arm login:

```

Figure 8 – PetaLinux Boot on MiniZed

11. Login into the system with the following credentials (note that these credentials are set up under the PetaLinux build environment, and we purposely chose very simple username and password for this example).

- Username: root
- Password: root

This Linux image creates a “ramdisk” file system in the DDR3 on MiniZed. Basic Linux commands are available as you might expect on any Linux system.

## 7 Reading from USB

12. Plug the USB thumb drive into MiniZed. Linux should recognize the drive and report status to the terminal. Notice the USB device is labeled sda1.

```
root@plnx_arm:/bin# usb 1-1: new high-speed USB device number 2 using ci_hdrc
usb-storage 1-1:1.0: USB Mass Storage device detected
scsi host0: usb-storage 1-1:1.0
scsi 0:0:0:0: Direct-Access    SanDisk  Cruzer           1.20 PQ: 0 ANSI: 5
sd 0:0:0:0: Attached scsi generic sg0 type 0
sd 0:0:0:0: [sda] 62530624 512-byte logical blocks: <32.0 GB/29.8 GiB>
sd 0:0:0:0: [sda] Write Protect is off
sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DPO or FUA
sda: sda1
sd 0:0:0:0: [sda] Attached SCSI removable disk
random: nonblocking pool is initialized
```

Figure 9 – USB Drive Recognized

13. PetaLinux will also automatically mount the USB drive. Issue the 'df' command to see where the USB drive was mounted. Use 'ls' to see if you recognize the contents.

```
root@plnx_arm:~# df
root@plnx_arm:~# ls /run/media/sda1
```

```
root@plnx_arm:/bin# df
Filesystem            1K-blocks      Used Available Use% Mounted on
devtmpfs              64            4         60    6% /dev
tmpfs                 254940        28      254912    0% /run
tmpfs                 254940        44      254896    0% /var/volatile
tmpfs                 64            4         60    6% /dev
/dev/mmcblk1p1       123089       16282    106807   13% /run/media/mmcblk1p1
/dev/sda1            31250016    18784   31231232    0% /run/media/sda1
root@plnx_arm:/bin# ls /run/media/sda1
boot_eMMC.bin      image.ub          wpa_supplicant.conf
root@plnx_arm:/bin#
```

Figure 10 – USB Drive Mounted

The eMMC was previously partitioned and formatted when your board was tested. In fact, you can see this in the 'df' command in Figure 10. The eMMC shows up as already mounted on /run/media/mmcblk1p1. In the interest of time, we will use this existing formatted partition as is. If you have time, you are welcome to learn about partitioning and formatting the eMMC in [Appendix A – Partition and Format eMMC](#) at the end of this document.

14. You may copy images from the USB stick to the eMMC.

```
root@plnx_arm:~# cd /run/media/sda1
root@plnx_arm:~# ls
root@plnx_arm:~# cp file1 ../mmcblk1p1
root@plnx_arm:~# cp file2 ../mmcblk1p1
```

## 8 Wi-Fi

15. Prior to testing the Wi-Fi, you must edit the configuration file to match your wireless settings. The config file is **wpa\_supplicant.conf** and is located on the eMMC. You must edit this file so that SSID and passcode (psk) match your wireless connection. You can use the built-in editor vi to do this.

For a list of vi commands, refer to <http://www.linfo.org/vi/summary.html>

You may also copy **wpa\_supplicant.conf** to the USB stick, then edit on your PC, then copy back to the eMMC.

```
root@plnx_arm:~# vi /run/media/mmcblk1p1/wpa_supplicant.conf
```

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
update_config=1
network={
    key_mgmt=WPA-PSK
    ssid="HotelStef"
    psk="74248483"
}
```

**Figure 11 – Edit these 2 fields in wpa\_supplicant.conf**

16. To test your Wi-Fi connection, several setup steps are required. To ease the burden of typing, a script has been provided in the **/usr/local/bin** directory, which is in the default search path. To view the script, use the **cat** command. View the comments in the script to understand what the script is doing.

```
root@plnx_arm:~# cat /usr/local/bin/wifi.sh
```

17. Run the script to setup the Wi-Fi as shown below

```
root@plnx_arm:~# wifi.sh
```

When MiniZed connects with the network it will obtain an IP address and report it in the Tera Term window as below.

```
wl_bss_connect_done succeeded with 30:b5:c2:36:a7:0e
wl_bss_connect_done succeeded with 30:b5:c2:36:a7:0e
Sending discover...
Sending select for 192.168.0.104...
Lease of 192.168.0.104 obtained, lease time 7200
/etc/udhcp.d/50default: Adding DNS 192.168.0.1
```

18. Now run iperf in Server mode on the MiniZed side:

```
root@plnx_arm:~# iperf -s
```

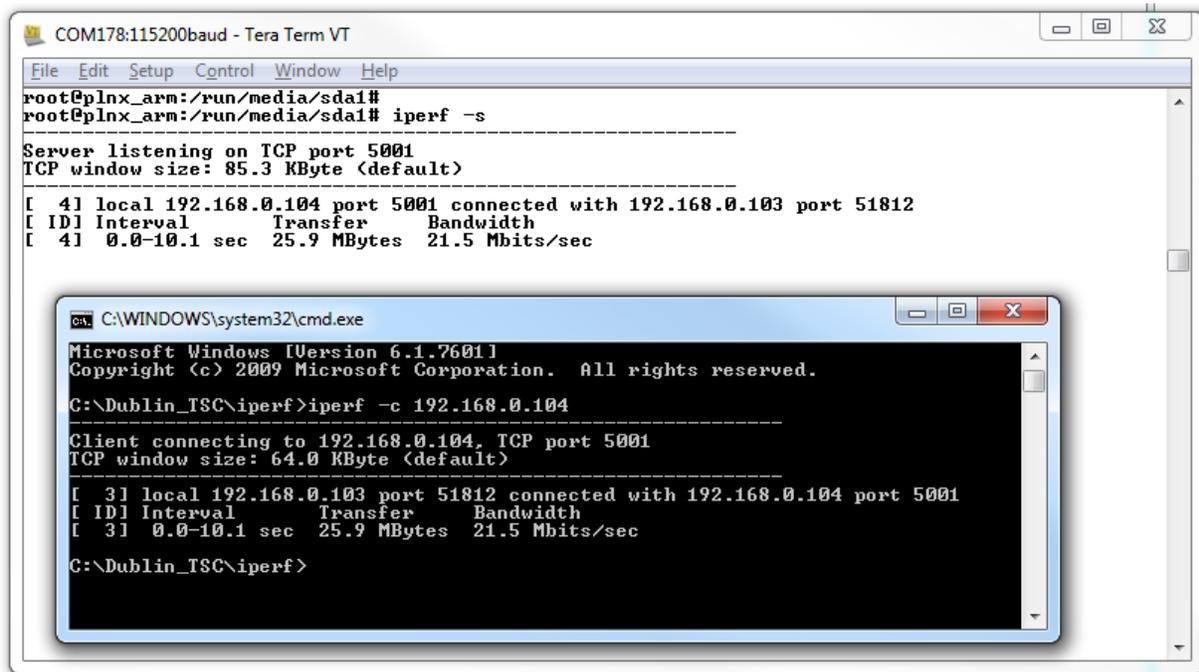
19. To complete the test, you must also run the iperf Client side on your PC, connecting to the displayed IP address. You can get iperf from the following site:

<https://iperf.fr/iperf-download.php>

20. **First, make sure your PC is on the same Wi-Fi network as MiniZed.** Also, turn off any VPN or firewall that may prevent communication across the network. Open a CMD window. Change directory to the location where you copied iperf. Then enter command below, using the IP you discovered for MiniZed in the previous step.

```
iperf -c <IP_of_MiniZed>
```

Results are then displayed in Tera Term as well as in the CMD window, as shown below.



The screenshot shows two overlapping windows. The top window is 'COM178:115200baud - Tera Term VT'. It displays the output of the 'iperf -s' command on a Linux device. The output shows the server listening on TCP port 5001 and receiving a connection from 192.168.0.103 on port 51812. The test results show a transfer of 25.9 MBytes over a 10-second interval, resulting in a bandwidth of 21.5 Mbits/sec. The bottom window is a Windows Command Prompt titled 'C:\WINDOWS\system32\cmd.exe'. It shows the execution of 'iperf -c 192.168.0.104' from the directory 'C:\Dublin\_TSC\iperf'. The output shows the client connecting to 192.168.0.104 on port 5001 and receiving the same test results as the server: 25.9 MBytes transfer and 21.5 Mbits/sec bandwidth.

Figure 12 – iperf results on MiniZed

21. Use <Ctrl-C> to cancel iperf in Linux.

22. **Note that this step will only work if the Wi-Fi access point is connected to the internet.**

Now try using ping to see if you can reach various internet sites using the DHCP server to resolve the IP addresses.

```
root@plnx_arm:~# ping -c 3 <URL>
```

```
--- www.avnet.com  
--- www.xilinx.com  
--- www.google.com  
--- www.amazon.com, etc.
```

```
root@plnx_arm:~# ping -c 3 www.avnet.com  
PING www.avnet.com (12.9.136.144): 56 data bytes  
64 bytes from 12.9.136.144: seq=0 ttl=244 time=48.441 ms  
64 bytes from 12.9.136.144: seq=1 ttl=244 time=191.165 ms  
64 bytes from 12.9.136.144: seq=2 ttl=244 time=61.691 ms  
--- www.avnet.com ping statistics ---  
3 packets transmitted, 3 packets received, 0% packet loss  
round-trip min/avg/max = 48.441/100.432/191.165 ms  
root@plnx_arm:~# ping -c 3 www.xilinx.com  
PING www.xilinx.com (23.35.226.17): 56 data bytes  
64 bytes from 23.35.226.17: seq=0 ttl=55 time=51.135 ms  
64 bytes from 23.35.226.17: seq=1 ttl=55 time=61.501 ms  
64 bytes from 23.35.226.17: seq=2 ttl=55 time=61.738 ms  
--- www.xilinx.com ping statistics ---  
3 packets transmitted, 3 packets received, 0% packet loss  
round-trip min/avg/max = 51.135/58.124/61.738 ms  
root@plnx_arm:~# ping -c 3 www.google.com  
PING www.google.com (172.217.5.100): 56 data bytes  
64 bytes from 172.217.5.100: seq=0 ttl=52 time=27.388 ms  
64 bytes from 172.217.5.100: seq=1 ttl=52 time=37.895 ms  
64 bytes from 172.217.5.100: seq=2 ttl=52 time=37.901 ms  
--- www.google.com ping statistics ---  
3 packets transmitted, 3 packets received, 0% packet loss  
round-trip min/avg/max = 27.388/34.394/37.901 ms  
root@plnx_arm:~# █
```

Figure 13 – ping results

23. **Note that this step will only work if the Wi-Fi access point is connected to the internet.**

Get a file from a host website and display it.

```
root@plnx_arm:~# wget http://www.textfiles.com/food/brdpudd.des
root@plnx_arm:~# cat brdpudd.des
```

```
root@plnx_arm:~# wget http://www.textfiles.com/food/brdpudd.des
Connecting to www.textfiles.com (208.86.224.90:80)
brdpudd.des 100% !*****! 762 0:00:00 ETA
root@plnx_arm:~# cat brdpudd.des
Louisberg Cafe Bread Pudding
Taken form Taste Of Home Magazine
Category: Desserts: Cake, cookies, mousse, puddings, etc..
Posted by: Pop
Quantity: 24 servings

Ingredients:
6 eggs, beaten          6 cups milk
3/4 cup sugar          1 cup raisins
10 to 12 cups broken bread
or rolls or doughnuts

Instructions:
Combine first four ingredients in a large bowl. Blend in
pieces of bread, rolls or doughnuts. Pour mixture into a 13-
in X 9-in baking pan. Bake at 350 deg. for 45 minutes or
until set.

Comments:
Locals Agree that the Louisberg Cafe in Louisberg Minnesota
serves up the best bread pudding there is! Taste of Home
editors convinced the cafe's owner, Emily Hansen, to share
her recipe with our readers.
root@plnx_arm:~#
```

Figure 14 – Download and View Text File

24. Use ifconfig to get information about the connection.

```
root@plnx_arm:~# ifconfig
```

```
root@plnx_arm:/run/media/sda1# ifconfig
lo          Link encap:Local Loopback
            inet addr:127.0.0.1  Mask:255.0.0.0
            inet6 addr: ::1:768144/128 Scope:Host
            UP LOOPBACK RUNNING  MTU:65536  Metric:1
            RX packets:0 errors:0 dropped:0 overruns:0 frame:0
            TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1
            RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

wlan0      Link encap:Ethernet  HWaddr B8:72:BF:A6:50:A5
            inet addr:192.168.0.104  Bcast:192.168.0.255  Mask:255.255.255.0
            UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
            RX packets:41174 errors:0 dropped:0 overruns:0 frame:0
            TX packets:22448 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:1000
            RX bytes:58351505 (55.6 MiB)  TX bytes:1452643 (1.3 MiB)

root@plnx_arm:/run/media/sda1# █
```

Figure 15 -- ifconfig

25. Open a Windows Command Prompt.

26. Connect an FTP session to the remote host with the command  
`ftp <MiniZed IP>`

27. Use the login **root**. You can use the ftp session to transfer files back and forth across the network to MiniZed. Commands such as `'cd'` , `'ls'` , `'pwd'` , `'put'` , and `'get'` are all useful commands.

28. Close the ftp session using the `quit` command.

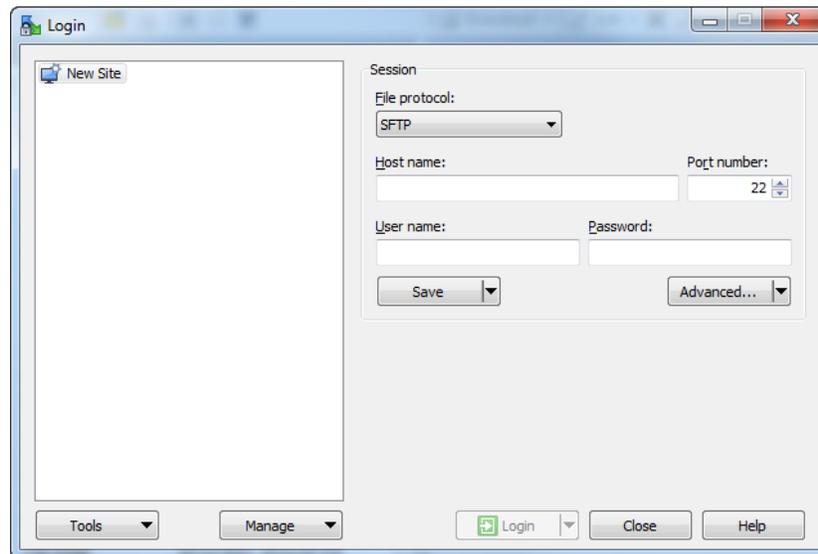
```
C:\WINDOWS\system32\cmd.exe
mnt
proc
root
run
sbin
sys
tmp
usr
var
226 Operation successful
ftp: 101 bytes received in 0.27Seconds 0.37Kbytes/sec.
ftp> cd run
250 Operation successful
ftp> cd media
250 Operation successful
ftp> ls
200 Operation successful
150 Directory listing
mmchlk1
mmchlk1boot0
mmchlk1boot1
mmchlk1p1
mmchlk1p2
mmchlk1rpb
sdal
226 Operation successful
ftp: 78 bytes received in 0.00Seconds 78.00Kbytes/sec.
ftp> cd mmchlk1p1
250 Operation successful
ftp> ls
200 Operation successful
150 Directory listing
image.ub
wpa_suppllicant.conf
226 Operation successful
ftp: 31 bytes received in 0.00Seconds 31000.00Kbytes/sec.
ftp> get image.ub
200 Operation successful
150 Opening BINARY connection for image.ub (16671276 bytes)
226 Operation successful
ftp: 16671276 bytes received in 11.12Seconds 1499.22Kbytes/sec.
ftp> quit
221 Operation successful

C:\Temp>
```

Figure 16 – MiniZed FTP Session

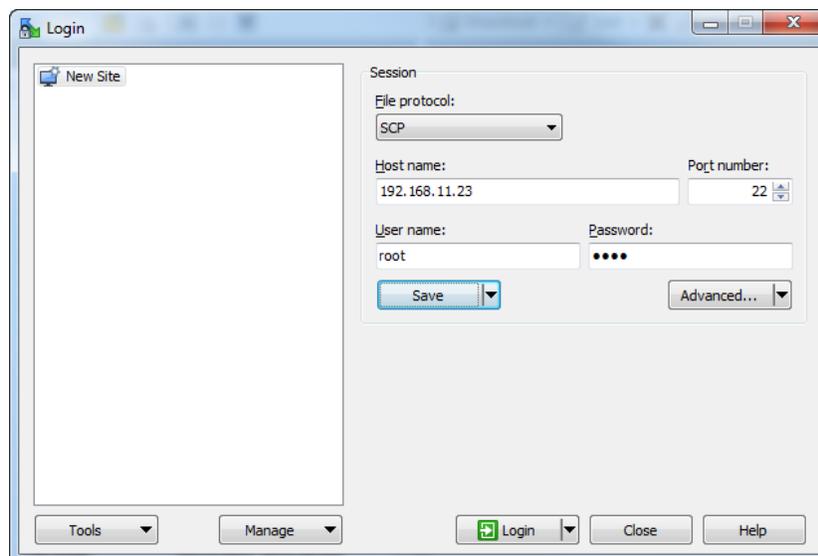
29. So far we have seen how files can be copied to and from MiniZed using a USB memory stick or over Wi-Fi via FTP. Lastly, we will look at a secure copy mechanism that can also be used with a graphical interface. WinSCP can be downloaded from <http://winscp.net>. It can be run command line under Windows or Linux.

In Windows, browse to the **WinSCP** directory and double-click on WinSCP.exe.



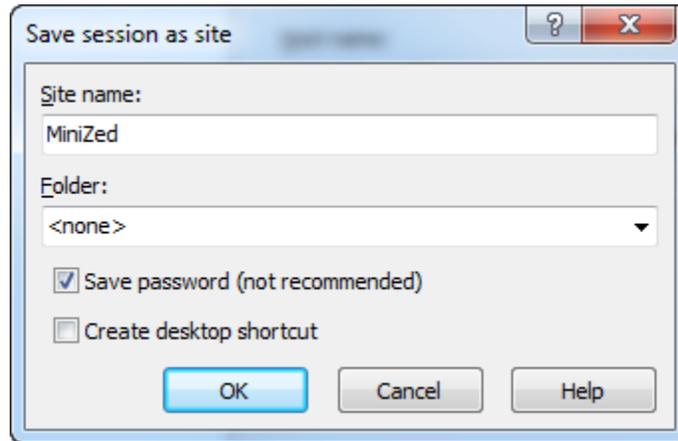
**Figure 17 – WinSCP Launched**

30. Change the *File protocol* to **SCP**. Edit the *Host name* to match the IP address of MiniZed. Use “root” for both the *User name* and *Password*.



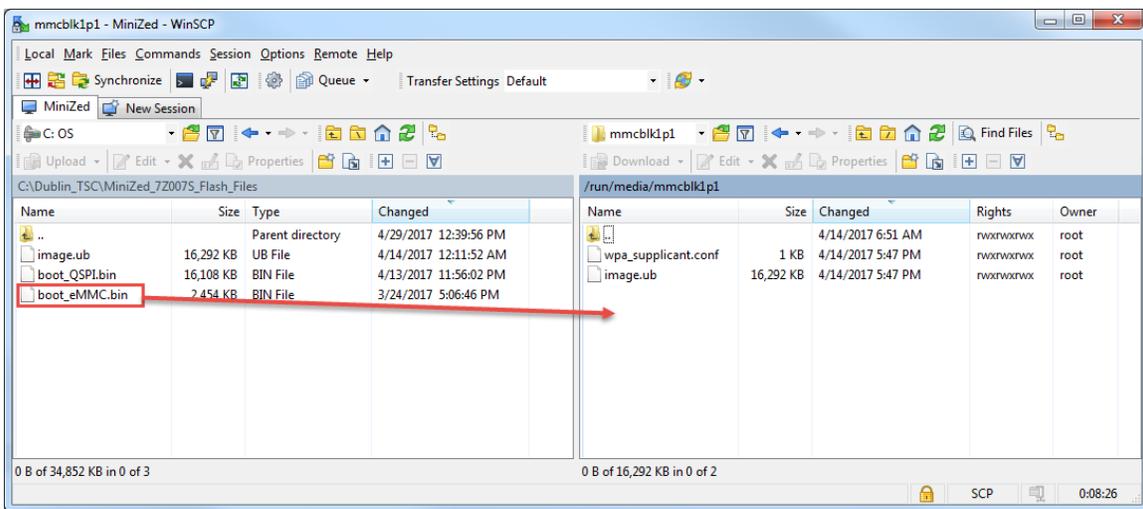
**Figure 18 – WinSCP Parameters Entered**

31. Click Save. You can set the *Site name* to “MiniZed” if you would like. You can also choose to *Save password*. Then click **OK**.



**Figure 19 – WinSCP Save Session**

32. Click Login. If you get a prompt about connecting to an **unknown server**, click **Yes**.



33. On the left side pane of the WinSCP, which is the host, browse a directory containing a file that you would like to transfer (for example, a new image.ub or .bin file for the QSPI). On the MiniZed side, browse to **/run/media/mmcblk1p1**, which is the eMMC. Drag the file to the eMMC side (or click F5) and click OK if prompted for permission.

## 9 Bluetooth

34. To test your bluetooth connection, several setup steps are required. To ease the burden of typing, a script has been provided in the `/usr/local/bin` directory. To view the script, use the `cat` command. View the comments in the script to understand what the script is doing.

```
root@plnx_arm:~# cat /usr/local/bin/bt.sh
```

35. Turn on your phone's Bluetooth and make it discoverable.

36. Enter the following to launch the Bluetooth setup script:

```
root@plnx_arm:~# bt.sh
```

```
root@plnx_arm:~# /custom/./bt.sh
#To turn on BT_REG_ON, which is on EMIO GPIO #0
echo 960 > /sys/class/gpio/export
echo out > /sys/class/gpio/gpio960/direction
echo 1 > /sys/class/gpio/gpio960/value
#Set uart0 = serial1 = ttyPS1 baudrate:
stty -F /dev/ttyPS1 115200
sleep 1s
#For the flow control.
#It seems you have to send a character before RTS from the 1DX module will be set in the correct state.
echo "M" > /dev/ttyPS1
sleep 1s
#Initialize the device:
hciattach /dev/ttyPS1 bcm43xx 921600 flow -t 10
bcm43xx_init
Set Controller UART speed to 921600 bit/s
Flash firmware /etc/firmware/BCM43430A1.1DX.hcd
Set Controller UART speed to 921600 bit/s
Device setup complete
sleep 2s
#Configure the right BT device:
hciconfig hci0 up
sleep 1s
#Scan for BT devices:
hcitool scan
Scanning ..:
        D0:13:FD:72:6D:CC          U20
set +v
root@plnx_arm:~# █
```

**Figure 20 – MiniZed Bluetooth Discovers V20 Android**

If you would like to scan again, do NOT rerun the script or it will hang your system.

37. To rescan the system, you can rerun the `hcitool` command:

```
root@plnx_arm:~# hcitool scan
```

or, for Bluetooth Low Energy only devices:

```
root@plnx_arm:~# hcitool lscan
```

Use <Ctrl-C> to cancel a low-energy scan.

# 10 I2C Sensor and GPIO

To ease testing of several peripheral devices on your board, a user application, `i2csensor`, has been built into `image.ub`.

38. To test the LEDs, button, switch, and I2C sensor on the board, enter

```
root@plnx_arm:~# i2csensor
```

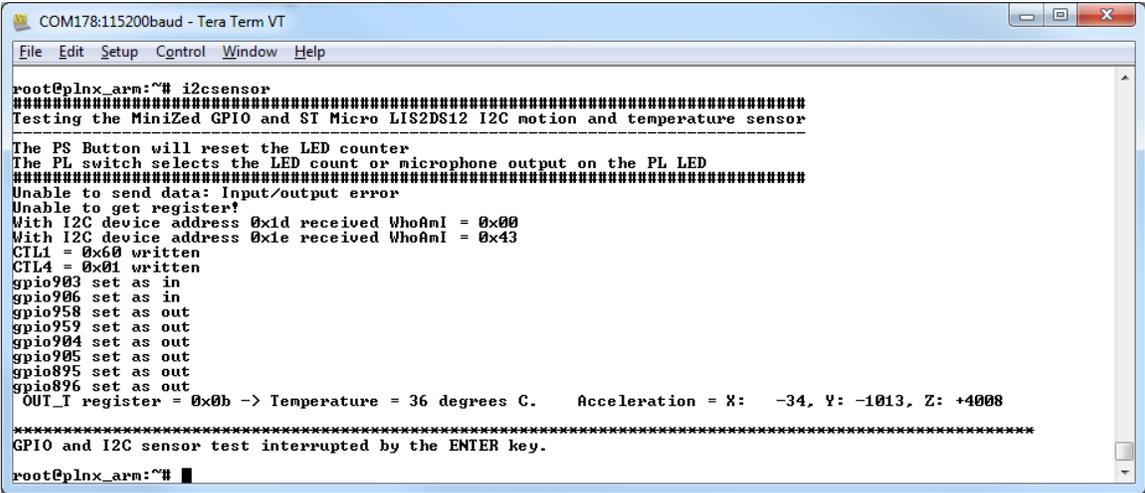


Figure 21 – Testing LEDs, Button, Switch, and Sensor

- 39. Set the 2<sup>nd</sup> dip switch nearest the Arduino connector towards the LED. This puts both LEDs into counting mode.
- 40. Press the PS push button (SW3) to blank the LEDs and restart the counter.
- 41. Set the 2<sup>nd</sup> dip switch towards the push button. This puts the outside LED into microphone mode. Speak near the microphone, and the LED brightness will reflect the intensity of the sound.

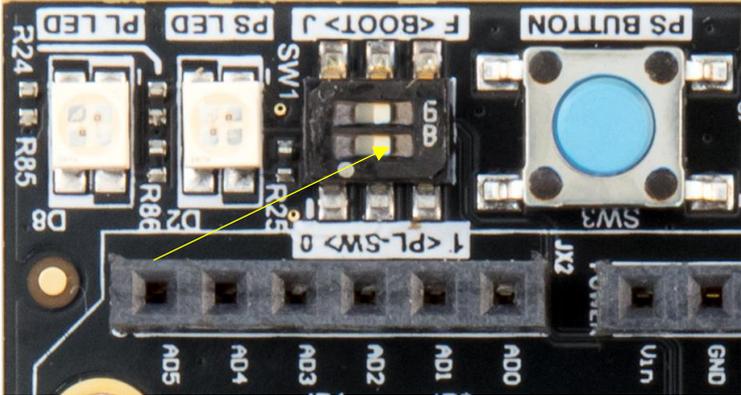


Figure 22 – USER DIP set towards Push Button

42. You may have to widen your Tera Term window to see the full output. Pick up and twist the MiniZed (preferably without giving it an ESD zap). See the changes in the XYZ measurements in the terminal.
43. The relative temperature is also reported. For this sensor the temperature delta is actually tracked, and the absolute displayed value is not necessarily accurate.
44. Press any key to exit the user test application.

# 11 Linux File System

45. CD into the /bin directory.

```
root@plnx_arm:~# cd /bin/
```

46. Check the current directory by typing the command below

```
root@plnx_arm:~# pwd
```

```
root@plnx_arm:~# cd /bin/  
root@plnx_arm:/bin# pwd  
/bin  
root@plnx_arm:/bin# █
```

Figure 23 – Print Working Directory

47. List the contents of /bin by typing the command below

```
root@plnx_arm:~# ls
```

```
root@plnx_arm:/bin# ls  
ash                gunzip             rm  
bash              gzip              rmdir  
busybox           hostname          run-parts  
busybox.nosuid   kill              sed  
busybox.suid     ln                sh  
cat               login             sleep  
chattr           login.shadow     start_getty  
chgrp            ls                stat  
chmod            mkdir             stty  
chown            mknod            su  
cp               mktemp           su.shadow  
cpio             more              sync  
date             mount             tar  
dd               mountpoint        touch  
df               mountpoint.sysvinit true  
dmesg            mv                umount  
dnsdomainname   netstat           uname  
dumpkmap         nice              usleep  
echo             pidof             vi  
egrep            pidof.sysvinit   watch  
false            ping              wl  
fgrep            ping6             zcat  
getopt           ps  
grep             pwd  
root@plnx_arm:/bin#
```

Figure 24 – List Contents

48. To see full details, use the command below

```
root@plnx_arm:~# ls -l
```

```
total 3336
lrwxrwxrwx 1 root root      19 Mar  7 00:21 ash -> /bin/busybox.nosuid
-rwxr-xr-x 1 root root 822440 Dec  9 23:51 bash
lrwxrwxrwx 1 root root      14 Mar  7 00:20 busybox -> busybox.nosuid
-rwxr-xr-x 1 root root 627252 Feb 22 02:40 busybox.nosuid
-rwsr-xr-x 1 root root  73208 Feb 22 02:40 busybox.suid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 cat -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 chattr -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 chgrp -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 chmod -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 chown -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 cp -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:20 cpio -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:20 date -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 dd -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 df -> /bin/busybox.nosuid
lrwxrwxrwx 1 root root      19 Mar  7 00:21 dmesg -> /bin/busybox.nosuid
```

Figure 25 – Detailed List Contents

49. To see how much free disk space is available, use the command `df`. This will also show you what mass storage is already mounted. In our case, the eMMC (SDIO 1) partition #1 is `/dev/mmcbk1p1` and is mounted at `/run/media/mmcbk1p1`.

```
root@plnx_arm:~# df
```

```
Filesystem          1K-blocks      Used Available Use% Mounted on
devtmpfs             64            4         60      6% /dev
tmpfs                254940         28    254912      0% /run
tmpfs                254940         40    254900      0% /var/volatile
tmpfs                 64            4         60      6% /dev
/dev/mmcbk1p1       123089        16282    106807     13% /run/media/mmcbk1p1
```

Figure 26 – Disk Free

50. To find a file in the file system, use the command 'find'. The command below searches from the root directory looking for a file called "flashcp".

```
root@plnx_arm:~# find / -name "flashcp"
```

```
root@plnx_arm:/bin# find / -name flashcp
/usr/sbin/flashcp
root@plnx_arm:/bin# █
```

### Figure 27 – Find a File

51. In the case with two executables with the same name, it might be useful to know which one is found without explicitly spelling out the path. Command 'which' will tell you the path of the executable to be run. For example, see how many copies of command 'echo' are on the system and then which one is executed.

```
root@plnx_arm:~# find / -name "echo"
```

```
root@plnx_arm:~# which echo
```

```
root@plnx_arm:/bin# find / -name "echo"
/bin/echo
/usr/lib/opkg/alternatives/echo
root@plnx_arm:/bin# which echo
/bin/echo
root@plnx_arm:/bin# █
```

### Figure 28 – Which

A short list of several more useful file- and directory-oriented commands are listed below. For an explanation of these commands, see:

[https://en.wikibooks.org/wiki/Guide\\_to\\_Unix/Commands/File\\_System\\_Uilities](https://en.wikibooks.org/wiki/Guide_to_Unix/Commands/File_System_Uilities).

- mkdir
- rmdir
- rm
- chmod
- cp
- mv
- less <file>

## 12 Poweroff

When you are finished experimenting with PetaLinux on MiniZed, you should shut PetaLinux down gracefully to prevent corruption of your eMMC.

52. Enter either of the following commands to shut down the MiniZed properly. Both accomplish the same thing.

```
root@plnx_arm:~# shutdown -h now
```

or

```
root@plnx_arm:~# poweroff
```

If you want to issue a restart to the system, use the following command:

```
root@plnx_arm:~# reboot
```

## 13 Getting Help and Support

### 13.1 Avnet Support

The MiniZed is a versatile development kit that allows evaluation of the Zynq SoC, which can help you adopt Zynq into your next design. All technical support is offered through [www.minized.org](http://www.minized.org) website support forums. MiniZed users are encouraged to participate in the forums and offer help to others when possible.

<http://minized.org/forums/>

For questions regarding the MiniZed community website, please direct any questions to:

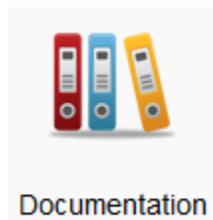
MiniZed.org Web Master – [webmaster@MiniZed.org](mailto:webmaster@MiniZed.org)

To access the most current collateral for MiniZed please visit the community support page at:

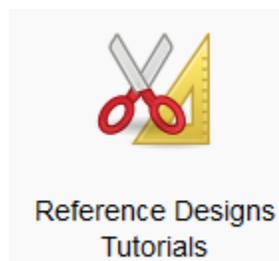
[www.MiniZed.org/content/support](http://www.MiniZed.org/content/support)

Once on the [MiniZed.org](http://MiniZed.org) support page:

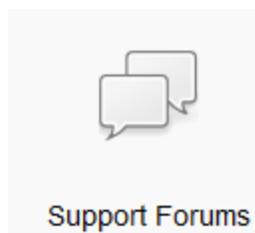
To access the latest MiniZed documentation, click on the Documentation link:



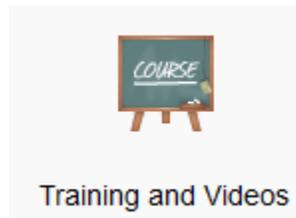
To access the latest reference designs for MiniZed, click on the following link:



To access the MiniZed technical forums, click on the following link:



To view online training and videos, click on the following link:



## 13.2 Xilinx Support

For questions regarding products within the Product Entitlement Account, send an e-mail message to the Customer Service Representative in your region:

Canada, USA and South America - [isscs\\_cases@xilinx.com](mailto:isscs_cases@xilinx.com)

Europe, Middle East, and Africa - [eucases@xilinx.com](mailto:eucases@xilinx.com)

Asia Pacific including Japan - [apaccase@xilinx.com](mailto:apaccase@xilinx.com)

For technical support including the installation and use of the product license file, contact Xilinx Online Technical Support at [www.xilinx.com/support](http://www.xilinx.com/support). The following assistance resources are also available on the website:

- Software, IP and documentation updates
- Access to technical support web tools
- Searchable answer database with over 4,000 solutions
- User forums

## 14 Installing and Licensing Xilinx Software

### 14.1 Install Vivado Design Suite, WebPack Edition

The Zynq device on the MiniZed is supported in Vivado Design Suite, WebPack Edition. Version 2017.1 or later is required for the on-board USB-JTAG/UART circuit to work. See

[www.xilinx.com/products/design-tools/vivado/vivado-webpack.html](http://www.xilinx.com/products/design-tools/vivado/vivado-webpack.html)

This software can be downloaded online at:

[www.xilinx.com/support/download/index.htm](http://www.xilinx.com/support/download/index.htm)

Although free, WebPack still must be licensed. To obtain your free license, visit the following website and insert the voucher code from the certificate included in your kit:

<http://www.xilinx.com/getlicense>

If a full seat of Vivado System or Design Edition has already been installed, then no further software will be needed. Please check online for any updates at:

[www.xilinx.com/support/download/index.htm](http://www.xilinx.com/support/download/index.htm)

For detailed instructions on installing and licensing the Xilinx tools, please refer to the latest version of **Vivado Design Suite User Guide Release Notes, Installation, and Licensing (UG973)**. The 2017.1 version is available on the Xilinx website at:

[https://www.xilinx.com/support/documentation/sw\\_manuals/xilinx2017\\_1/ug973-vivado-release-notes-install-license.pdf](https://www.xilinx.com/support/documentation/sw_manuals/xilinx2017_1/ug973-vivado-release-notes-install-license.pdf)

## 15 Certification Disclaimer

Both CE and FCC certifications are necessary for system level products in those countries governed by these regulatory bodies.

Because Avnet boards are intended for evaluation kits only and destined for professionals (you) to be used solely at research and development facilities for such purposes, they are considered exempt from the EU product directives and normally are not tested for CE or FCC compliance.

If you choose to use your board to transmit using an antenna, it is your responsibility to make sure that you are in compliance with all laws for the country, frequency, and power levels in which the device is used. Additionally, some countries regulate reception in certain frequency bands. Again, it is the responsibility of the user to maintain compliance with all local laws and regulations.

## 16 Regulatory Compliance Information

### EU Compliance Statement:

Hereby, Avnet declares that this device is in compliance with the essential requirements and other relevant provisions of the Radio Equipment Directive 2014/53/EU. A full copy of the Declaration of Conformity can be found at <http://minized.org/policies>.

### US Compliance Statement:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

### Canada Compliance Statement:

#### English

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

#### French

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

- 1) l'appareil ne doit pas produire de brouillage;
- 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### WEEE statement:



Correct Disposal of this product. This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

## 17 Safety Warnings

This product shall only be connected to an external power supply rated at 5V DC that provides a minimum current of 500mA. Any external power supply used with MiniZed shall comply with relevant regulations and standards applicable in the country of intended use.

Only compatible plug-in modules shall be connected to MiniZed. The connection of incompatible devices may affect compliance or result in damage to the unit and void the warranty.

This product shall be operated in a well-ventilated environment. If a case is used, it shall have adequate ventilation.

## 18 RF Certification

The frequency range is 2.4 to 2.4835GHz.

The max power complies with 802.11b, which is 17dBm (typ).

## 19 Appendix A – Partition and Format eMMC

Although the eMMC was previously formatted and partitioned, you can repeat the steps to learn the process.

1. First, unmount the eMMC.

```
root@plnx_arm:~# umount /run/media/mmcblk1p1
```

2. The Linux fdisk utility is used to create a partition on the storage media for use with a file system. Enter the commands as shown below:
  - a. Start the fdisk utility for the eMMC controller. ( fdisk <device name> )

```
root@plnx_arm:~# fdisk /dev/mmcblk1
```

```
/dev/mmcblk1p1 /dev/mmcblk1p1
root@plnx_arm:/bin# fdisk /dev/mmcblk1

The number of cylinders for this disk is set to 232448.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): █
```

Figure 29 – fdisk started

- b. List the existing partition information by typing command 'p'. If the storage media has never been used, there should be no partitions shown. In our case, there is one partition which is 3907 units large, 32768 bytes per unit, for a total of 128MB. The formatting is Linux.

```
Command (m for help): p

Disk /dev/mmcblk1: 7616 MB, 7616856064 bytes
4 heads, 16 sectors/track, 232448 cylinders
Units = cylinders of 64 * 512 = 32768 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/mmcblk1p1            1         3907     125016   83  Linux

Command (m for help): █
```

Figure 30 – View Partitions

- c. Delete this partition with command 'd'

```
Command <m for help>: d
Selected partition 1
```

Figure 31 – Partition 1 Deleted

- d. Create a new primary partition #1 starting at the first cylinder and extending for 128 MB using commands 'n', 'p', '1', '1', '+128M'

```
Command <m for help>: n
Command action
  e  extended
  p  primary partition <1-4>
p
Partition number <1-4>: 1
First cylinder <1-232448, default 1>: 1
Last cylinder or +size or +sizeM or +sizeK <1-232448, default 232448>: +128M
Command <m for help>: █
```

Figure 32 – 128 MB Primary Partition Created

- e. Create another partition that spans the remainder of the eMMC, using commands 'n', 'p', '2', '3908', '232448'

```
Command <m for help>: n
Command action
  e  extended
  p  primary partition <1-4>
p
Partition number <1-4>: 2
First cylinder <3908-232448, default 3908>: 3908
Last cylinder or +size or +sizeM or +sizeK <3908-232448, default 232448>: 232448
Command <m for help>: █
```

Figure 33 – Partition #2

- f. Type command 'p' to print the new partition table

```
Command <m for help>: p
Disk /dev/mmcbk1: 7616 MB, 7616856064 bytes
4 heads, 16 sectors/track, 232448 cylinders
Units = cylinders of 64 * 512 = 32768 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/mmcbk1p1            1         3907     125016    83  Linux
/dev/mmcbk1p2        3908       232448     7313312    83  Linux
Command <m for help>: █
```

Figure 34 – New Partitions

- g. Change the Type for Partition 1 to be FAT32 using commands 't', '1', 'L', 'b' and then reprint the table with 'p'

```
Command (m for help): t
Partition number (1-4): 1
Hex code (type L to list codes): L

 0 Empty                1b Hidden Win95 FAT32      9f BSD/OS
 1 FAT12                1c Hidden W95 FAT32 (LBA) a0 Thinkpad hibernation
 4 FAT16 <32M          1e Hidden W95 FAT16 (LBA) a5 FreeBSD
 5 Extended            3c Part.Magic recovery    a6 OpenBSD
 6 FAT16               41 PPC PReP Boot          a8 Darwin UFS
 7 HPFS/NTFS          42 SFS                     a9 NetBSD
 a OS/2 Boot Manager  63 GNU HURD or SysU       ab Darwin boot
 b Win95 FAT32        80 Old Minix              b7 BSDI fs
 c Win95 FAT32 (LBA)  81 Minix / old Linux      b8 BSDI swap
 e Win95 FAT16 (LBA)  82 Linux swap             be Solaris boot
 f Win95 Ext'd (LBA)  83 Linux                  eb BeOS fs
11 Hidden FAT12       84 OS/2 hidden C: drive   ee EFI GPT
12 Compaq diagnostics 85 Linux extended         ef EFI (FAT-12/16/32)
14 Hidden FAT16 <32M  86 NTFS volume set       f0 Linux/PA-RISC boot
16 Hidden FAT16       87 NTFS volume set       f2 DOS secondary
17 Hidden HPFS/NTFS   8e Linux LUM              fd Linux raid autodetect

Hex code (type L to list codes): b
Changed system type of partition 1 to b (Win95 FAT32)

Command (m for help): p

Disk /dev/mmcblk1: 7616 MB, 7616856064 bytes
4 heads, 16 sectors/track, 232448 cylinders
Units = cylinders of 64 * 512 = 32768 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/mmcblk1p1    1           3907     125016    b   Win95 FAT32
/dev/mmcblk1p2    3908        232448    7313312   83   Linux
```

Figure 35 – Partition Type Set to FAT32

- h. Write the partition table and exit fdisk using command 'w'

```
Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table
mmcblk1: p1 p2
root@plnx_arm:/bin#
```

Figure 36 – Partition Table Written

3. Before the new partitions can be used, they must be formatted. Format the first one with a FAT32 file system. Use the Linux mkdosfs utility to perform this action. ( mkdosfs -F 32 <device name> )

```
root@plnx_arm:~# mkdosfs -F 32 /dev/mmcblk1p1
```

4. Format the 2<sup>nd</sup> partition using mkfs.vfat as follows:

```
root@plnx_arm:~# mkfs.vfat /dev/mmcblk1p2
```

5. The first partition will be automatically mounted. The second one must be mounted manually.

```
root@plnx_arm:~# mount /dev/mmcblk1p2 /run/media/mmcblk1p2
```

6. Use df to see what is available now.

```
root@plnx_arm:/run/media# df
Filesystem            1K-blocks      Used Available Use% Mounted on
devtmpfs                64           4         60     6% /dev
tmpfs                  254940        28      254912     0% /run
tmpfs                  254940        44      254896     0% /var/volatile
tmpfs                   64           4         60     6% /dev
/dev/sda1              31250016     18784    31231232     0% /run/media/sda1
/dev/mmcblk1p1         123089        1      123089     0% /run/media/mmcblk1p1
/dev/mmcblk1p2         7299052        4      7299048     0% /run/media/mmcblk1p2
```

Figure 37 – eMMC Partitions Mounted