Networking over USB

Prerequisites

- A DaVinci DM355 EVM (USB peripheral device)
- A computer running Linux (USB Host)
- TI DaVinci LSP kernel source
- A USB A to mini-B cable

Configuring the EVM Hardware

This section will cover how to configure the DaVinci hardware as a USB peripheral device.

DM355

- J9 jumpered
- J10 un-jumpered

Host PC

Connect the USB cable to a standard *USB A* socket. Connect the *USB Mini-B* end of the cable to the DM355 EVM (J5).

Kernel Config

USB Support:

```
< > Support for Host-side USB
<M> Inventra USB Highspeed Dual Role Controller Support
---   DaVinci 644x USB support
      Driver Mode (USB Peripheral (gadget stack))  --->
[*]   Disable DMA (always use PIO)
(0)   Logging Level (0 - none / 3 - annoying / ... )
--- NOTE: USB_STORAGE enables SCSI, and 'SCSI disk support' may also be needed; see USB_STORAGE Help for more information
    USB Gadget Support  --->
```

USB Gedget Support:

```
<M> Support for USB Gadgets
[*]   Debugging information files
      USB Peripheral Controller (Inventra (M)HDRC USB Peripheral)  --->
      USB Gadget Drivers
< >     Gadget Zero (DEVELOPMENT)
<M>     Ethernet Gadget
[*]       RNDIS support (EXPERIMENTAL)
< >     Gadget Filesystem (EXPERIMENTAL)
< >     File-backed Storage Gadget
< >     Serial Gadget
```

Network Operation

Connect the DM355 EVM to the Host PC via the USB cable.

Set the DM355 up as a Network Gadget:

```
modprobe musb_hdrc use_dma=n
modprobe g_ether
ifconfig usb0 10.0.0.2 up
```

Output from dmesg on the DM355 EVM:

```
musb_hdrc: version 2.2a/db-0.4.8 [cppi-dma] [peripheral] [debug=0]
Registering platform device 'musb_hdrc'. Parent at platform
musb_hdrc: ConfigData=0x06 (UTMI-8, dyn FIFOs, SoftConn)
musb_hdrc: MHDRC RTL version 1.300
musb_hdrc: setup fifo_mode 4
musb_hdrc: hw_ep 0shared, max 64
musb_hdrc: hw_ep 1tx, max 512
musb_hdrc: hw_ep 1rx, max 512
musb_hdrc: hw_ep 2tx, max 512
musb_hdrc: hw_ep 2rx, max 512
musb_hdrc: hw_ep 3tx, max 512
musb_hdrc: hw_ep 3rx, max 512
musb_hdrc: hw_ep 4tx, max 512
musb_hdrc: hw_ep 4rx, max 256
musb_hdrc: USB Peripheral mode controller at c886e000 using PIO, IRQ 12
usb0: Ethernet Gadget, version: Equinox 2004
usb0: using musb_hdrc, OUT ep1out IN ep1in STATUS ep2in
usb0: MAC de:b8:d7:c3:54:27
usb0: HOST MAC 66:ae:d1:47:3a:32
usb0: RNDIS ready
usb0: high speed config #3: 100 mA, Ethernet Gadget, using CDC Ethernet
```

The Host PC (running Linux) should have automatically loaded the necessary drivers for the USB CDC class: *cdc_ether* and *usbnet*.

Bring the network up and ping the USB device:

```
ifconfig usb0 10.0.0.1 up
ping 10.0.0.2

PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=7.49 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.390 ms
```

Output from dmesg on the Host PC:

```
usb 7-4: new high speed USB device using ehci_hcd and address 14
usb 7-4: configuration #3 chosen from 2 choices
usb0: register 'cdc_ether' at usb-0000:00:1a.7-4, CDC Ethernet Device, 66:ae:d1:47:3a:32
```

Throughput Testing

Netcat is a very useful tool for sending and receiving data over the network.

Setup the DM355 EVM to receive data from the Host PC:

```
nc -l -p 3000 > /dev/null
```

Create a test file on the Host PC and send this over the network to the USB device:

```
dd if=/dev/urandom of=100M-random.data bs=1M count=100
time ( cat 100M-random.data | nc -q 0 10.0.0.2 3000 )

real    1m8.690s
user    0m0.012s
sys     0m0.404s
```

Therefore the throughput = (100MB * 8 / 68 sec) = **11.76 Mbps**

Conclusion

- The *g_ether* driver does not seem to work when *musb_hdrc* is using DMA, and tests using the *g_file_storage* driver show that PIO is 5 times slower. Perhaps patches have been submitted to fix this.
- The above result is very close to 12Mbps, which is the maximum for full-speed USB. Is this a coincidence, or is something preventing high-speed USB rates ?

I expected the throughput to be much higher...

Article Sources and Contributors

Networking over USB *Source*: http://processors.wiki.ti.com/index.php?oldid=20164 *Contributors*: Alexander.stohr, Bill.farrow