

H1 hcRTOS USB gadget NCM 驱动说明

H2 概述

设定为usb device模式, 虚拟为两张本地网卡. 此时分别在Linux PC和板端 上通过ifconfig 看到本地网卡.
(备注: Windows并不支持USB NCM网卡)

目前hcRTOS USB NCM Gadget所虚拟出来的网卡的MAC地址是固定的,

Important

Linux PC: PC端看到的虚拟网卡, MAC地址固定为 **8e:6b:ee:e6:b8:54**

```
1 $ ifconfig
2 enx8e6beee6b854: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
3     inet6 fe80::b49e:539d:2c20:aa3a prefixlen 64 scopeid 0x20<link>
4     ether 8e:6b:ee:e6:b8:54 txqueuelen 1000 (Ethernet)
5     RX packets 6 bytes 384 (384.0 B)
6     RX errors 0 dropped 0 overruns 0 frame 0
7     TX packets 17 bytes 2684 (2.6 KB)
8     TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

HcRTOS: 板端看到的虚拟网卡, MC地址固定为 **02:c5:a3:e8:fd:b7**

```
1 hc1600a@dbA3100v10# net ifconfig
2 usb0      ip:192.168.100.10 netmask:255.255.255.0 gateway:192.168.100.1
3          ip6: FE80::200:FF:FE00:0/64
4          ip6: 2000::2/64
5          ip6: FE80::C5:A3FF:FEE8:FDB7/64
6          HWaddr 02:c5:a3:e8:fd:b7 MTU:1500 Running Default Link UP
7 lo        ip:127.0.0.1 netmask:255.0.0.0 gateway:127.0.0.1
8          ip6: ::1/64
9          HWaddr 00 MTU:0 Running Link UP
```

H2 环境搭建

以下以A3100开发板为例子进行说明

```
1 make O=output_a3100_bl  
   hichip_hc16xx_db_a3100_v10_projector_cast_bl_defconfig  
2 make O=output_a3100_bl all  
3  
4 make O=output_a3100 hichip_hc16xx_db_a3100_v10_projector_cast_defconfig  
5 make O=output_a3100 all
```

其中需要 `make O=output_a3100 menuconfig` 中确保以下宏开关有打开

- CONFIG_NET
- BR2_PACKAGE_PREBUILTS_USBGADGETDRIVER
- BR2_PACKAGE_PREBUILTS_USBGADGETDRIVER_NCM
- CONFIG_NET_LWIP_IPV6 // 如果需要支持IPV6的话

以下宏为测试cmd开关

- CONFIG_CMDS_USB
- CONFIG_CMDS_USB_GADGET_NCM

确认过以上都成功配置后, 执行 `make O=output_a3100 kernel-rebuild cmds-rebuild all` 来进行编译

H2 测试演示(基于IPV4)

H3 hichip开发板端操作

hichip 板子上通过串口终端执行以下命令

```
1  ## 如果想要指定具体某个usb端口, 可以用-p 来指定, 例如
2  ## usb g_ncm -p 0  ## 指定usb#0
3  ## usb g_ncm -p 1  ## 指定usb#1
4  ## usb g_ncm      ## 如果不指定usb口的话, 默认使用usb#0
5  usb g_ncm
6
7  ## 设置掩码
8  net ifconfig usb0 netmask 255.255.255.0
9
10 ## 设置MAC地址, 具体请见串口打印
11 net ifconfig usb0 hw ether 02:c5:a3:e8:fd:b7
12
13 ## 配置IP地址和网关地址, 并使能网卡
14 net ifconfig usb0 192.168.100.10 gateway 192.168.100.1
15
16 ## ifconfig查看网络设备配置情况
17 net ifconfig
```

以下为输入对应命令的例子:

```
hc1600a@dbA3100v10# usb g_ncm
usb port#0 : 2 (1:host, 2:peripheral, 3:otg)
---->usb int vbus err
hc16xx_musb_interrupt 386: VBUS error workaround (delay coming)
l/usbd-ether [01-01 08:00:03.454 t:01,0] (geth_register_netdev:907)HOST MAC AE:44:B5:6B:52:16
l/usbd-ether [01-01 08:00:03.464 t:01,0] (geth_register_netdev:926)MAC 5A:35:AA:EE:FB:28
l/usbd-ncm [01-01 08:00:03.475 t:01,0] (gncm_bind:182)NCM Gadget
hc1600a@dbA3100v10#
hc1600a@dbA3100v10#
hc1600a@dbA3100v10# net ifconfig usb0 netmask 255.255.255.0
hc1600a@dbA3100v10#
hc1600a@dbA3100v10# net ifconfig usb0 hw ether 02:c5:a3:e8:fd:b7
hc1600a@dbA3100v10# net ifconfig usb0 192.168.100.10 gateway 192.168.100.1
hc1600a@dbA3100v10# net ifconfig
usb0 ip:192.168.100.10 netmask:255.255.255.0 gateway:192.168.100.1
ip6: FE80::200:FF:FE00:0/64
ip6: 2000::2/64
```

```
ip6: FE80::C5:A3FF:FEE8:FDB7/64
HWaddr 02:c5:a3:e8:fd:b7 MTU:1500 Running Default Link UP
lo ip:127.0.0.1 netmask:255.0.0.0 gateway:127.0.0.1
ip6: ::1/64
HWaddr 00 MTU:0 Running Link UP
```

H3 PC ubuntu 操作

完成板端的命令输入后, 只要此时 **USB#0** 有连接到PC端, 即可通过 `ifconfig` 查看到网卡设备. 也能通过 `lsusb` 看到这个usb虚拟网卡设备

```
1 $ lsusb    ## 查看所接入的usb设备
2 $ ifconfig ## 查看网卡
3
4 ## 指定网卡的ipv4地址, 并使能
5 $ sudo ifconfig enx8e6beee6b854 192.168.100.6 up
```

以下为输入对应命令的例子:

\$ lsusb

Bus 001 Device 002: ID 0525:a4a1 Netchip Technology, Inc. Linux-USB Ethernet Gadget

\$ ifconfig

```
enx8e6beee6b854: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
  inet 192.168.100.6 netmask 255.255.255.0 broadcast 192.168.100.255
  inet6 fe80::b49e:539d:2c20:aa3a prefixlen 64 scopeid 0x20
  ether 8e:6b:ee:e6:b8:54 txqueuelen 1000 (Ethernet)
  RX packets 13 bytes 1016 (1.0 KB)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 263 bytes 45663 (45.6 KB)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

完成上述操作, 那么

- 板端的网络设备IP 为 192.168.100.10
- PC端则为 192.168.10.6 , 显示的网卡名字为 enx8e6beee6b854

H3 ping测试

hichip开发板端命令

```
1 net ping 192.168.100.6    ## 使用ping进行测试
```

示例如下:

```
hc1600a@dbA3100v10# net ping 192.168.100.6
```

```
[0]Reply from 192.168.100.5: time=3ms TTL=64
```

```
[1]Reply from 192.168.100.5: time=3ms TTL=64
```

```
[2]Reply from 192.168.100.5: time=4ms TTL=64
```

```
[3]Reply from 192.168.100.5: time=4ms TTL=64
```

PC ubuntu端命令

```
1 ping 192.168.100.10
```

示例如下:

```
$ ping 192.168.100.10
```

```
PING 192.168.100.10 (192.168.100.10) 56(84) bytes of data.
```

```
64 bytes from 192.168.100.10: icmp_seq=1 ttl=255 time=27.0 ms
```

```
64 bytes from 192.168.100.10: icmp_seq=2 ttl=255 time=3.40 ms
```

H3 iperf 测试

hichip开发板端命令

使用命令 `net iperf -c {ip_addr}`

```
1 net iperf -c 192.168.100.5
```

PC ubuntu端命令

作为iperf server端, 每个两秒打印出结果

```
1 $ iperf -s -i 2
```

示例如下:

```
1 $ iperf -s -i 2
2 -----
3 Server listening on TCP port 5001
4 TCP window size: 128 KByte (default)
5 -----
6 [ 1] local 192.168.100.5 port 5001 connected with 192.168.100.10 port
  52498
7 [ ID] Interval      Transfer    Bandwidth
8 [ 1] 0.0000-2.0000 sec 23.9 MBytes 100 Mbits/sec
9 [ 1] 2.0000-4.0000 sec 31.6 MBytes 133 Mbits/sec
10 [ 1] 4.0000-6.0000 sec 28.8 MBytes 121 Mbits/sec
11 [ 1] 6.0000-8.0000 sec 31.2 MBytes 131 Mbits/sec
12 [ 1] 8.0000-10.0000 sec 27.4 MBytes 115 Mbits/sec
13 [ 1] 10.0000-12.0000 sec 30.8 MBytes 129 Mbits/sec
14 [ 1] 12.0000-14.0000 sec 31.0 MBytes 130 Mbits/sec
15
```

H2 测试演示(基于IPV6)

H3 hichip开发板端操作

```
1  ## 如果想要指定具体某个usb端口，可以用-p 来指定， 例如
2  ## usb g_ncm -p 0  ## 指定usb#0
3  ## usb g_ncm -p 1  ## 指定usb#1
4  ## usb g_ncm      ## 如果不指定usb口的话，默认使用usb#0
5  usb g_ncm
6
7  ## 设置掩码
8  net ifconfig usb0 netmask 255.255.255.0
9
10 ## 设置MAC地址,具体请见串口打印
11 net ifconfig usb0 hw ether 02:c5:a3:e8:fd:b7
12
13 ## 配置IP地址和网关地址，并使能网卡
14 net ifconfig usb0 192.168.100.10 gateway 192.168.100.1
15
16 ## 配置IPV6 地址
17 net ifconfig usb0 inet6 add fe80::c5:a3ff:fee8:fdb7
```

H3 ping 测试

Warning

目前由于hcRTOS ping6 功能不完善, 仅支持 Linux PC端对板端进行ping

PC ubuntu 端命令

```
1 $ ping6 -I enx8e6beee6b854 FE80::C5:A3FF:FEE8:FDB7
```

示例如下:

```
$ ping6 -I enx8e6beee6b854 FE80::C5:A3FF:FEE8:FDB7
```

```
ping6: Warning: source address might be selected on device other than: enx8e6beee6b854
PING FE80::C5:A3FF:FEE8:FDB7(fe80::c5:a3ff:fee8:fdb7) from :: enx8e6beee6b854: 56 data bytes
64 bytes from fe80::c5:a3ff:fee8:fdb7%enx8e6beee6b854: icmp_seq=1 ttl=255 time=528 ms
64 bytes from fe80::c5:a3ff:fee8:fdb7%enx8e6beee6b854: icmp_seq=2 ttl=255 time=3.08 ms
64 bytes from fe80::c5:a3ff:fee8:fdb7%enx8e6beee6b854: icmp_seq=3 ttl=255 time=4.08 ms
64 bytes from fe80::c5:a3ff:fee8:fdb7%enx8e6beee6b854: icmp_seq=4 ttl=255 time=3.07 ms
```

H2 源码接口执行

配置 usb 为NCM模式的源码, 可以参考 `components\cmds\source\usb\usb_gadget_cmd_ncm.c`

```
1  #include <kernel/drivers/hcusb.h>
2
3
4  // 配置或者查看usb HOST或GADGET 模式
5  int hcusb_set_mode(uint8_t usb_port, enum musb_mode mode);
6  enum musb_mode hcusb_get_mode(uint8_t usb_port);
7
8
9  int setup_usbd_ncm(int argc, char **argv)
10 {
11     int usb_port = 0; //使用 usb#0
12     hcusb_set_mode(usb_port, MUSB_PERIPHERAL);
13     hcusb_gadget_ncm_specified_init(get_udc_name(usb_port));
14 }
15
16
17 int deinit_usbd_ncm(int argc, char **argv)
18 {
19     int usb_port = 0; //使用 usb#0
20     hcusb_set_mode(usb_port, MUSB_HOST);
21     hcusb_gadget_ncm_deinit();
22 }
```