

LTE

to test the EM7455 Card (+ NGFF Key-B Adapter) on the BPI-R3 (mPCIe Slot)

<https://www.bipom.com/documents/sierra/4117727%20AirPrime%20EM-MC74xx%20AT%20Command%20Reference%20r4.pdf>

Kernel-Options:

```
CONFIG_USB_USBNET=m
CONFIG_USB_SERIAL_OPTION=m
CONFIG_USB_SERIAL_QUALCOMM=m
CONFIG_USB_NET_CDC_MBIM=m
CONFIG_USB_NET_QMI_WWAN=m
```

MBIM-Mode (over wwan0)

<https://gist.github.com/Juul/e42c5b6ec71ce11923526b36d3f1cb2c#connecting-using-mbim>

i'm using a Congstar-SIM

APN-settings:

<https://forum.congstar.de/thread/46325-mobil-surfen-mit-congstar-manuelle-einstellungen-zum-mobil-en-internet-apn/>

Step-by-step guide with qmicli:

<https://techship.com/faq/how-to-step-by-step-set-up-a-data-connection-over-qmi-interface-using-qmicli-and-in-kernel-driver-qmi-wwan-in-linux/>

first Test

```
root@bpi-r3:~# modprobe cdc_mbim

/etc/mbim-network.conf:
APN=internet.v6.telekom
PROXY=yes

root@bpi-r3:~# mbimcli --device=/dev/cdc-wdm0 --query-device-caps
[/dev/cdc-wdm0] Device capabilities retrieved:
    Device type: 'remote'
    Cellular class: 'gsm'
    Voice class: 'no-voice'
    SIM class: 'removable'
    Data class: 'umts, hsdpa, hsupa, lte'
    SMS caps: 'pdu-receive, pdu-send'
    Ctrl caps: 'reg-manual'
    Max sessions: '8'
```

```
Custom data class: 'unknown'
Device ID: '352733105743066'
Firmware info: 'SWI9X30C_02.24.03.00'
Hardware info: 'EM7455'
root@bpi-r3:~# mbim-network /dev/cdc-wdm0 start
Loading profile at /etc/mbim-network.conf...
APN: internet.v6.telekom
APN auth protocol: unset
APN user: unset
APN password: unset
mbim-proxy: yes
Querying subscriber ready status 'mbimcli -d /dev/cdc-wdm0 --query-
subscriber-ready-status --no-close --device-open-proxy'...
[/dev/cdc-wdm0] Subscriber ready status retrieved: Ready state: 'device-
locked'
Subscriber ID: 'unknown' SIM ICCID: '89490200001355851497' Ready info:
'none' Telephone numbers: (0) 'unknown' [/dev/cdc-wdm0] Session not closed:
TRID: '4'
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 4)
Querying registration state 'mbimcli -d /dev/cdc-wdm0 --query-registration-
state --no-open=4 --no-close --device-open-proxy'...
[/dev/cdc-wdm0] Registration status: Network error: 'unknown' Register
state: 'deregistered' Register mode: 'automatic' Available data classes:
'unknown' Curren
t cellular class: 'gsm' Provider ID: 'unknown' Provider name: 'unknown'
Roaming text: 'unknown' Registration flags: 'packet-service-automatic-
attach' [/dev/cdc-wdm0] Session not closed: TRID: '6'
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 6)
Attaching to packet service with 'mbimcli -d /dev/cdc-wdm0 --attach-packet-
service --no-open=6 --no-close --device-open-proxy'...
error: operation failed: PinRequired
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 8)
Starting network with 'mbimcli -d /dev/cdc-wdm0 --
connect=apn='internet.v6.telekom' --no-open=8 --no-close --device-open-
proxy'...
error: operation failed: PinRequired
Network start failed
[/dev/cdc-wdm0] Session not closed: TRID: '10'
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 10)
root@bpi-r3:~#
```

so it looks like pin-problem and i tried this:

```
root@bpi-r3:~# mbimcli --device=/dev/cdc-wdm0 -p --enter-pin=1234
[/dev/cdc-wdm0] PIN operation successful
[/dev/cdc-wdm0] PIN info:
PIN state: 'locked'
PIN type: 'pin2'
Remaining attempts: '3'
root@bpi-r3:~# mbim-network /dev/cdc-wdm0 start
Loading profile at /etc/mbim-network.conf...
```

```
APN: internet.v6.telekom
APN auth protocol: unset
APN user: unset
APN password: unset
mbim-proxy: yes
Loading previous state from /tmp/mbim-network-state-cdc-wdm0...
Previous Transaction ID: 10
error: no actions specified
Clearing state at /tmp/mbim-network-state-cdc-wdm0...
Querying subscriber ready status 'mbimcli -d /dev/cdc-wdm0 --query-
subscriber-ready-status --no-close --device-open-proxy'...
[/dev/cdc-wdm0] Subscriber ready status retrieved: Ready state:
'initialized' Subscriber ID: '26201704168zzzz' SIM ICCID:
'8949020000135585yyyy' Ready info: 'none' Telephone numbers: (1)
'+491512025xxxx' [/dev/cdc-wdm0] Session not closed:
TRID: '4'
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 4)
Querying registration state 'mbimcli -d /dev/cdc-wdm0 --query-registration-
state
--no-open=4 --no-close --device-open-proxy'...
[/dev/cdc-wdm0] Registration status: Network error: 'unknown' Register
state: 'deregistered' Register mode: 'automatic' Available data classes:
'unknown' Current cellular class: 'gsm' Provider ID: 'unknown' Provider
name: 'unknown' Roaming
text: 'unknown' Registration flags: 'packet-service-automatic-attach'
[/dev/cdc-wdm0] Session not closed: TRID: '6'
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 6)
Attaching to packet service with 'mbimcli -d /dev/cdc-wdm0 --attach-packet-
service --no-open=6 --no-close --device-open-proxy'...
error: operation failed: RadioPowerOff
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 8)
Starting network with 'mbimcli -d /dev/cdc-wdm0 --
connect=apn='internet.v6.telekom' --no-open=8 --no-close --device-open-
proxy'...
error: operation failed: RadioPowerOff
Network start failed
[/dev/cdc-wdm0] Session not closed: TRID: '10'
Saving state at /tmp/mbim-network-state-cdc-wdm0... (TRID: 10)
root@bpi-r3:~#
```

change Mode

Caution this may break functionality!

```
root@bpi-r3:~# qmicli -d /dev/cdc-wdm0 --device-open-mbim --dms-swi-get-usb-
composition
[/dev/cdc-wdm0] Successfully retrieved USB compositions:
        USB composition 6: DM, NMEA, AT, QMI
        [*] USB composition 8: DM, NMEA, AT, MBIM
```

USB composition 9: MBIM

```
root@bpi-r3:~# qmicli -d /dev/cdc-wdm0 --device-open-mbim --dms-swi-set-usb-composition 6
```

now no device is recognized by driver (no serial ttyUSBx too) and i saw in dmesg only this (also after cold-reset):

```
[ 3.592655] usb 1-1.1: new high-speed USB device number 4 using xhci-mtk
[ 3.823392] usb 1-1.1: config 1 has an invalid interface number: 8 but
max is 3
[ 3.830719] usb 1-1.1: config 1 has no interface number 1
```

i loaded all known modules:

```
root@bpi-r3:~# modprobe qmi_wwan
root@bpi-r3:~# modprobe qcserial
root@bpi-r3:~# modprobe cdc_mbim
```

with this i have got access to the AT-Interface:

lsusb:

```
Bus 001 Device 004: ID 413c:81c2 Dell Computer Corp. DW5811e Snapdragon™ X7
LTE
```

unlock ttyUSBx with option-module:

```
root@bpi-r3:~# modprobe option
[ 229.747728] usbcore: registered new interface driver option
[ 229.753429] usbserial: USB Serial support registered for GSM modem (1-port)

root@bpi-r3:~# echo 413c 81c2 >/sys/bus/usb-serial/drivers/option1/new_id
[ 300.293186] option 1-1.1:1.0: GSM modem (1-port) converter detected
[ 300.299755] usb 1-1.1: GSM modem (1-port) converter now attached to
ttyUSB0
[ 300.307011] option 1-1.1:1.2: GSM modem (1-port) converter detected
[ 300.313657] usb 1-1.1: GSM modem (1-port) converter now attached to
ttyUSB1
[ 300.320968] option 1-1.1:1.3: GSM modem (1-port) converter detected
[ 300.327741] usb 1-1.1: GSM modem (1-port) converter now attached to
ttyUSB2
[ 300.336533] option 1-1.1:1.8: GSM modem (1-port) converter detected
[ 300.343262] usb 1-1.1: GSM modem (1-port) converter now attached to
ttyUSB3
```

now only with "minicom -D /dev/ttyUSB2". (commandmode with Ctrl+AA, because already via Minicom on the R3)

ATE1

OK

AT!ENTERCND="A710"

OK

AT!CUSTOM?

!CUSTOM:

GPSENABLE	0x04
GPSSEL	0x01
IPV6ENABLE	0x01
SIMLPM	0x01
USBSERIALENABLE	0x01
SINGLEAPNSWITCH	0x01

OK

AT!USBCOMP?

Config Index: 1

Config Type: 1 (Generic)

Interface bitmask: 0020010D (diag,nmea,modem,rmnet0,ubist)

OK

AT!USBCOMP=?

!USBCOMP:

AT!USBCOMP=<Config Index>,<Config Type>,<Interface bitmask>

<Config Index> - configuration index to which the composition applies, s

<Config Type> - 1:Generic, 2:USBIF-MBIM, 3:RNDIS

config type 2/3 should only be used for specific

Sierra

customized VID/PID should use config type 1

```
<Interface bitmask> - DIAG      - 0x00000001,  
                      NMEA       - 0x00000004,  
                      MODEM      - 0x00000008,  
                      RMNET0     - 0x00000100,  
                      RMNET1     - 0x00000400,  
                      MBIM       - 0x00001000,
```

e.g.

10D - diag, nmea, modem, rmnet interfaces enabled

1009 - diag, modem, mbim interfaces enabled

The default configuration is:

```
at!usbcomp=1,1,10F
```

OK

can't set default-mode, but the following fixes it and go back to mbim-mode after a cold-boot (ttyUSB accessible via options-module too)

```
AT!USBCOMP=1,1,100D
```

OK

```
AT!RESET
```

OK

From:

<https://wiki.fw-web.de/> - **FW-WEB Wiki**

Permanent link:

<https://wiki.fw-web.de/doku.php?id=en:bpi-r3:lte&rev=1664292908>

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