

# APR 2021: DataHub Vodafone LTE & SIM7100A Issue

## Summary

We are seeing that there are some US DataHubs that fail to connect to the Vodafone network via LTE. When they connect to the network via LTE, they are connected for a few seconds and are then disconnected. The modem gives a `NO CARRIER` error when this happens which leads to `pppd` disconnecting the connection via the Point to Point Protocol.

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## Findings

To debug this issue, we have tested different ways to set up the connection. This way we can step by step rule out what is and what isn't working.

### Using ModemManager and gsm.sh script

To get more useful output from ModemManager, we set the log level to `DEBUG` in runtime to see the secret sauce. This is done by:

```
mmcli -G DEBUG
```

*Output from ModemManager:*

```
Apr 07 16:19:13 vc-f14us31723 ModemManager[25490]: <info> [modem0]
state changed (connecting ->
connected)

Apr 07 16:19:13 vc-f14us31723 ModemManager[25490]: <info> [modem0]
simple connect state (8/8): all
done

Apr 07 16:19:13 vc-f14us31723 ModemManager[25490]: <debug> [modem0
/ttyUSB2/at] device open count is 2
(close)

Apr 07 16:19:13 vc-f14us31723 ModemManager[25490]: <debug> [base-
manager] adding port ppp0 at sysfs path: /sys/devices/virtual/net
/ppp0

Apr 07 16:19:13 vc-f14us31723 ModemManager[25490]: <debug> [filter] (net
/ppp0) port filtered: forbidden port
type

Apr 07 16:19:14 vc-f14us31723 ModemManager[25490]: <debug> [modem0
/ttyUSB3/at] <-- '<CR><LF>NO
CARRIER<CR><LF>'

Apr 07 16:19:14 vc-f14us31723 ModemManager[25490]: <debug> [modem0
/ttyUSB3/at] operation failure: 1 (No
carrier)

Apr 07 16:19:14 vc-f14us31723 ModemManager[25490]: <debug> [modem0
/ttyUSB3/at] <-- '<CR><LF>+PPPD:
DISCONNECTED<CR><LF>'

Apr 07 16:19:14 vc-f14us31723 ModemManager[25490]: <debug> [modem0]
user request to disconnect modem (all bearers)
Apr 07 16:19:14 vc-f14us31723 ModemManager[25490]: <debug> [modem0
/bearer0] disconnecting...
```

We set up the connection with NetworkManager via the following command

```
nmcli c add type gsm ifname ttyUSB2 apn vf-viriciti gsm.number *99***1
ipv6.method "ignore"
```

If we just let ModemManager, NetworkManager and the gsm script do their thing, the modem is being registered to the network, but it never obtains an active data connection.

```
vc-f14us31767:~$ mmcli -m 0
-----
General |          dbus path: /org/freedesktop/ModemManager1/Modem/0
         |          device id: 26307902e01001f3ec1080f52f48a25008fa7ec3
-----
Hardware |          manufacturer: SIMCOM INCORPORATED
         |          model: SIMCOM_SIM7100A
         |          firmware revision: 4534B03SIM7100A
         |          supported: gsm-umts, lte
         |          current: gsm-umts, lte
         |          equipment id: 014339000429148
-----
System   |          device: /sys/devices/soc0/soc/2100000.aips-bus/2184200.usb/ci_hdrc.1/usb2/2-1/2-1.1
         |          drivers: option1
         |          plugin: simtech
         |          primary port: ttyUSB2
         |          ports: ttyUSB0 (qcdm), ttyUSB2 (at), ttyUSB3 (at)
-----
Status   |          unlock retries: sim-pin (3), sim-pin2 (3), sim-puk (10), sim-puk2 (10)
         |          state: registered
         |          power state: on
         |          access tech: lte
         |          signal quality: 77% (cached)
-----
Modes    |          supported: allowed: 2g; preferred: none
         |                   allowed: 3g; preferred: none
         |                   allowed: 2g, 3g; preferred: none
         |                   allowed: 2g, 3g; preferred: 2g
         |                   allowed: 2g, 3g; preferred: 3g
         |                   allowed: 2g, 3g, 4g; preferred: none
         |          current: allowed: any; preferred: none
-----
IP       |          supported: ipv4, ipv6, ipv4v6
-----
3GPP     |          imei: 014339000429148
         |          operator id: 310260
         |          operator name: T-Mobile DATA ONLY
         |          registration: roaming
-----
3GPP EPS |          ue mode of operation: csps-1
-----
SIM      |          dbus path: /org/freedesktop/ModemManager1/SIM/0
-----
Bearer   |          dbus path: /org/freedesktop/ModemManager1/Bearer/0
vc-f14us31767:~$
```

After multiple retries to connect to the network, ModemManager suddenly loses connection via the AT interface and marks the modem as **invalid**. Only after ModemManager is restarted and the modem is reinitialized, it will retry to connect via the modem.

```
password:
vc-f14us31765:~$ mmcli -G DEBUG
Successfully set logging level
vc-f14us31765:~$ journalctl -fu ModemManager
-- Logs begin at Fri 2018-12-21 18:53:34 UTC. --
Apr 08 14:48:05 vc-f14us31765 ModemManager[370]: <info> [modem0] simple connect state (4/8): wait to get fully enabled
Apr 08 14:48:05 vc-f14us31765 ModemManager[370]: <info> [modem0] simple connect state (5/8): register
Apr 08 14:48:08 vc-f14us31765 ModemManager[370]: <warn> [modem0] port ttyUSB2 timed out 9 consecutive times
Apr 08 14:48:08 vc-f14us31765 ModemManager[370]: <info> [modem0] 3GPP registration state changed (searching -> idle)
Apr 08 14:48:08 vc-f14us31765 ModemManager[370]: <info> [modem0] state changed (searching -> enabled)
Apr 08 14:48:09 vc-f14us31765 ModemManager[370]: <info> [modem0] simple connect started...
Apr 08 14:48:09 vc-f14us31765 ModemManager[370]: <info> [modem0] simple connect state (4/8): wait to get fully enabled
Apr 08 14:48:09 vc-f14us31765 ModemManager[370]: <info> [modem0] simple connect state (5/8): register
Apr 08 14:48:13 vc-f14us31765 ModemManager[370]: <error> [modem0] port ttyUSB2 timed out 10 consecutive times, marking modem as invalid
Apr 08 14:54:03 vc-f14us31765 ModemManager[370]: <info> [base-manager] logging: level 'DEBUG'
```

After manually switching the operator to T-Mobile and AT&T on **vc-f14us31765**, the modem magically stayed connected via LTE.

### Using pppd script

To check if this is not an issue with the **pppd** plugin of NetworkManager, we tried to set up the connection with the use of the **pppd** script:

▼ [The pppd script](#)

```
#!/bin/bash
echo "creating directories"
mkdir -p /data/ppp/chatscripts
```

```
mkdir -p /data/ppp/peers
mkdir -p /etc/ppp/chatscripts
mkdir -p /etc/ppp/peers
echo "creating script file : /data/ppp/chatscripts/quectel-chat-
connect"
echo "
ABORT \"BUSY\"
ABORT \"NO CARRIER\"
ABORT \"NO DIALTONE\"
ABORT \"ERROR\"
ABORT \"NO ANSWER\"
TIMEOUT 30
\" \" AT
OK ATE0
OK ATI;+CSUB;+CSQ;+COPS?;+CGREG?;&D2
# Insert the APN provided by your network operator, default apn is $1
OK AT+CGDCONT=1,\"IP\",,\"T\",,0,0
OK ATDT*99***1#
CONNECT" > /data/ppp/chatscripts/quectel-chat-connect
cp /data/ppp/chatscripts/quectel-chat-connect /etc/ppp/chatscripts
/quectel-chat-connect
echo "creating script file : /data/ppp/chatscripts/quectel-chat-
disconnect"
echo "
ABORT \"ERROR\"
ABORT \"NO DIALTONE\"
SAY \"\nSending break to the modem\n\"
\" +++
\" +++
\" +++
SAY \"\nGoodbay\n\"" > /data/ppp/chatscripts/quectel-chat-disconnect
cp /data/ppp/chatscripts/quectel-chat-disconnect /etc/ppp/chatscripts
/quectel-chat-disconnect
echo "creating script file : /data/ppp/peers/gprs"
echo "
/dev/$2 115200
# The chat script, customize your APN in this file
connect 'chat -s -v -f /data/ppp/chatscripts/quectel-chat-connect -T
$1'
# The close script
disconnect 'chat -s -v -f /data/ppp/chatscripts/quectel-chat-
disconnect'
" > /data/ppp/peers/gprs
cp /data/ppp/peers/gprs /etc/ppp/peers/gprs
echo "creating script file : /data/ppp/options"
echo "
# Hide password in debug messages
hide-password
# The phone is not required to authenticate
noauth
```

```
# Debug info from pppd
debug
# If you want to use the HSDPA link as your gateway
defaultroute
# pppd must not propose any IP address to the peer
noipdefault
# No ppp compression
novj
novjccomp
noccip
ipcp-accept-local
ipcp-accept-remote
local
# For sanity, keep a lock on the serial line
lock
modem
dump
nodetach
# Hardware flow control
nocrtscts
remotename 3gppp
ipparam 3gppp
ipcp-max-failure 30
# Ask the peer for up to 2 DNS server addresses
usepeerdns" > /data/ppp/options
cp /data/ppp/options /etc/ppp/options
```

Before we can use the **pppd** script, we need to compile it

```
./pppd-script <APN> <ttyUSB interface>
```

The pppd script is started with the following command:

```
pppd debug call gprs
```

Output from pppd script:

✓ Before modem reset

```
vc-f14us31767:/data$ pppd debug call gprs
pppd options in effect:
debug debug          # (from /etc/ppp/peers/gprs)
nodetach             # (from /etc/ppp/peers/gprs)
dump                # (from /etc/ppp/peers/gprs)
noauth              # (from /etc/ppp/peers/gprs)
remotename 3gppp    # (from /etc/ppp/peers/gprs)
```

```
/dev/ttyUSB3          # (from /etc/ppp/peers/gprs)
115200                # (from /etc/ppp/peers/gprs)
lock                  # (from /etc/ppp/peers/gprs)
connect chat -s -v -f /data/ppp/chatscripts/quectel-chat-connect -T
vf-viriciti          # (from /etc/ppp/peers/gprs)
disconnect chat -s -v -f /data/ppp/chatscripts/quectel-chat-
disconnect           # (from /etc/ppp/peers/gprs)
nocrtscts            # (from /etc/ppp/peers/gprs)
modem                 # (from /etc/ppp/peers/gprs)
hide-password        # (from /etc/ppp/peers/gprs)
novj                  # (from /etc/ppp/peers/gprs)
novjccomp            # (from /etc/ppp/peers/gprs)
ipcp-accept-local    # (from /etc/ppp/peers/gprs)
ipcp-accept-remote   # (from /etc/ppp/peers/gprs)
ipparam 3gppp        # (from /etc/ppp/peers/gprs)
noipdefault          # (from /etc/ppp/peers/gprs)
ipcp-max-failure 30  # (from /etc/ppp/peers/gprs)
defaultroute         # (from /etc/ppp/peers/gprs)
usepeerdns           # (from /etc/ppp/peers/gprs)
noccp                # (from /etc/ppp/peers/gprs)
abort on (BUSY)
abort on (NO CARRIER)
abort on (NO DIALTONE)
abort on (ERROR)
abort on (NO ANSWER)
timeout set to 30 seconds
send (AT^M)
expect (OK)
^M
OK
-- got it

send (ATE0^M)
expect (OK)
^M
^M
OK
-- got it

send (ATI;+CSUB;+CSQ;+COPS?;+CGREG?;&D2^M)
expect (OK)
^M
^M
Manufacturer: SIMCOM INCORPORATED^M
Model: SIMCOM_SIM7100A^M
Revision: SIM7100A_V4.5^M
IMEISV: 014339000429148/05^M
+GCAP: +CGSM^M
^M
+CSUB: B03V03^M
```

```
+CSUB: MDM9x15_AP_S_V1.63_161010^M
^M
+CSQ: 23,99^M
^M
+COPS: 0,0,"T-Mobile DATA ONLY",7^M
^M
+CGREG: 0,5^M
^M
OK
-- got it
```

```
send (AT+COPS=1,2,310260^M)
expect (OK)
^M
^M
OK
-- got it
```

```
send (AT+CGDCONT=1,"IP","vf-viriciti",,0,0^M)
expect (OK)
^M
^M
OK
-- got it
```

```
send (ATDT*99***1#^M)
expect (CONNECT)
^M
^M
CONNECT
-- got it
```

```
Script chat -s -v -f /data/ppp/chatscripts/quectel-chat-connect -T vf-
viriciti finished (pid 7758), status = 0x0
Serial connection established.
using channel 23
Using interface ppp0
Connect: ppp0 <--> /dev/ttyUSB3
sent [LCP ConfReq id=0x1 <asynctest 0x0> <magic 0x8e804837> <pcomp>
<accomp>]
rcvd [LCP ConfReq id=0x3f <asynctest 0x0> <auth chap MD5> <magic
0x88528a77> <pcomp> <accomp>]
No auth is possible
sent [LCP ConfRej id=0x3f <auth chap MD5>]
rcvd [LCP ConfAck id=0x1 <asynctest 0x0> <magic 0x8e804837> <pcomp>
<accomp>]
rcvd [LCP ConfReq id=0x40 <asynctest 0x0> <magic 0x88528a77> <pcomp>
<accomp>]
sent [LCP ConfAck id=0x40 <asynctest 0x0> <magic 0x88528a77> <pcomp>
<accomp>]
```

```
sent [IPCP ConfReq id=0x1 <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2
0.0.0.0>]
sent [IPV6CP ConfReq id=0x1 <addr fe80::9095:1777:829f:47a0>]
rcvd [LCP DiscReq id=0x41 magic=0x88528a77]
Modem hangup
Connection terminated.
```

After a modem reset using `echo -ne "AT+CFUN=1,1\r\n" > /dev/ttyUSB3`, we tried the `pppd` script again and this time the modem connected without a problem while using an LTE connection.

▼ [After modem reset](#)

```
vc-f14us31767:/data$ pppd debug call gprs
pppd options in effect:
debug debug          # (from /etc/ppp/peers/gprs)
nodetach             # (from /etc/ppp/peers/gprs)
dump                # (from /etc/ppp/peers/gprs)
noauth              # (from /etc/ppp/peers/gprs)
remotename 3gppp    # (from /etc/ppp/peers/gprs)
/dev/ttyUSB3       # (from /etc/ppp/peers/gprs)
115200             # (from /etc/ppp/peers/gprs)
lock               # (from /etc/ppp/peers/gprs)
connect chat -s -v -f /data/ppp/chatscripts/quectel-chat-connect -T
vf-viriciti        # (from /etc/ppp/peers/gprs)
disconnect chat -s -v -f /data/ppp/chatscripts/quectel-chat-
disconnect         # (from /etc/ppp/peers/gprs)
nocrtscts          # (from /etc/ppp/peers/gprs)
modem              # (from /etc/ppp/peers/gprs)
hide-password      # (from /etc/ppp/peers/gprs)
novj               # (from /etc/ppp/peers/gprs)
novjccomp          # (from /etc/ppp/peers/gprs)
ipcp-accept-local  # (from /etc/ppp/peers/gprs)
ipcp-accept-remote # (from /etc/ppp/peers/gprs)
ipparam 3gppp     # (from /etc/ppp/peers/gprs)
noipdefault        # (from /etc/ppp/peers/gprs)
ipcp-max-failure 30 # (from /etc/ppp/peers/gprs)
defaultroute       # (from /etc/ppp/peers/gprs)
usepeerdns         # (from /etc/ppp/peers/gprs)
noccps             # (from /etc/ppp/peers/gprs)
abort on (BUSY)
abort on (NO CARRIER)
abort on (NO DIALTONE)
abort on (ERROR)
abort on (NO ANSWER)
timeout set to 30 seconds
send (AT^M)
expect (OK)
AT^M^M
OK
-- got it
```



```
send (ATE0^M)
expect (OK)
^M
ATE0^M^M
OK
-- got it

send (ATI;+CSUB;+CSQ;+COPS?;+CGREG?;&D2^M)
expect (OK)
^M
^M
Manufacturer: SIMCOM INCORPORATED^M
Model: SIMCOM_SIM7100A^M
Revision: SIM7100A_V4.5^M
IMEISV: 014339000429148/05^M
+GCAP: +CGSM^M
^M
+CSUB: B03V03^M
+CSUB: MDM9x15_AP_S_V1.63_161010^M
^M
+CSQ: 26,99^M
^M
+COPS: 1,0,"T-Mobile DATA ONLY",7^M
^M
+CGREG: 0,5^M
^M
OK
-- got it

send (AT+COPS=1,2,310260^M)
expect (OK)
^M
^M
OK
-- got it

send (AT+CGDCONT=1,"IP","vf-viriciti",,0,0^M)
expect (OK)
^M
^M
OK
-- got it

send (ATDT*99***1#^M)
expect (CONNECT)
^M
^M
CONNECT
-- got it
```

```
Script chat -s -v -f /data/ppp/chatscripts/quectel-chat-connect -T vf-  
viriciti finished (pid 11933), status = 0x0  
Serial connection established.  
using channel 25  
Using interface ppp0  
Connect: ppp0 <--> /dev/ttyUSB3  
sent [LCP ConfReq id=0x1 <asynmap 0x0> <magic 0xfb7fbc11> <pcomp>  
<accomp>]  
rcvd [LCP ConfReq id=0x0 <asynmap 0x0> <auth chap MD5> <magic  
0x8856fba8> <pcomp> <accomp>]  
No auth is possible  
sent [LCP ConfRej id=0x0 <auth chap MD5>]  
rcvd [LCP ConfAck id=0x1 <asynmap 0x0> <magic 0xfb7fbc11> <pcomp>  
<accomp>]  
rcvd [LCP ConfReq id=0x1 <asynmap 0x0> <magic 0x8856fba8> <pcomp>  
<accomp>]  
sent [LCP ConfAck id=0x1 <asynmap 0x0> <magic 0x8856fba8> <pcomp>  
<accomp>]  
sent [IPCP ConfReq id=0x1 <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2  
0.0.0.0>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
rcvd [LCP DiscReq id=0x2 magic=0x8856fba8]  
rcvd [IPCP ConfReq id=0x0]  
sent [IPCP ConfNak id=0x0 <addr 0.0.0.0>]  
rcvd [IPCP ConfNak id=0x1 <addr 10.141.107.204> <ms-dns1 10.1.2.199>  
<ms-dns2 10.1.2.200>]  
sent [IPCP ConfReq id=0x2 <addr 10.141.107.204> <ms-dns1 10.1.2.199>  
<ms-dns2 10.1.2.200>]  
rcvd [IPCP ConfReq id=0x1]  
sent [IPCP ConfAck id=0x1]  
rcvd [IPCP ConfAck id=0x2 <addr 10.141.107.204> <ms-dns1 10.1.2.199>  
<ms-dns2 10.1.2.200>]  
Could not determine remote IP address: defaulting to 10.64.64.64  
not replacing default route to eth0 [192.168.1.254]  
local IP address 10.141.107.204  
remote IP address 10.64.64.64  
primary DNS address 10.1.2.199  
secondary DNS address 10.1.2.200  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
sent [IPV6CP ConfReq id=0x1 <addr fe80::64c5:e93a:eca7:5409>]  
IPV6CP: timeout sending Config-Requests
```

## Comparing pppd-script with NetworkManager nm-ppp-plugin

Because we are able to get a stable connection when using the pppd-script after some retries, we want to know the differences between the two. So we need to know which commands are used by the NetworkManager's **nm-ppp-plugin**.

ppp options comparison (pppd script left, nm-ppp-plugin on the right) :

1 debug	1 debug
2 defaultroute	2 idle 0
3 dump	3 ipparam /org/freedesktop/NetworkManager/PPP/10
4 hide-password	4 lcp-echo-failure 0
5 ipcp-accept-local	5 lcp-echo-interval 0
6 ipcp-accept-remote	
7 ipcp-max-failure 30	
8 ipparam 3gppp	
9 local	
10 lock	6 lock
11 modem	
12 noauth	7 noauth
13 noccp	8 nodefaultroute
14 nocrtscts	
15 nodetach	9 nodetach
16 noipdefault	10 noipdefault
17 novj	11 noipv6
18 novjccomp	12 plugin /usr/lib/pppd/2.4.9/nm-pppd-plugin.so
19 remotename 3gppp	13 ttyUSB2
20 usepeerdns	14 usepeerdns

pppd-script:

```
debug
defaultroute
dump
hide-password
ipcp-accept-local
ipcp-accept-remote
ipcp-max-failure 30
ipparam 3gppp
local
lock
modem
noauth
noccp
nocrtscts
nodetach
noipdefault
novj
novjccomp
remotename 3gppp
usepeerdns
```

nm-ppp-plugin:

```
debug
idle 0
ipparam /org/freedesktop/NetworkManager/PPP/10
lcp-echo-failure 0
lcp-echo-interval 0
lock
noauth
nodefaultroute
nodetach
noipdefault
noipv6
plugin /usr/lib/pppd/2.4.9/nm-pppd-plugin.so
ttyUSB2
usepeerdns
```

### PPPD Options Explained

As seen above there are some differences between the pppd-script and the NetworkManager plugin. Below are the deviating options explained.

- **nocc** - Disable CCP (Compression Control Protocol) negotiation. This option should only be required if the peer is buggy and gets confused by requests from pppd for CCP negotiation.
- **nocrtscts** - Disable hardware flow control (i.e. RTS/CTS) on the serial port. If neither the **crtscts** nor the **nocrtscts** nor the **cdtrcts** nor the **nocdtrcts** option is given, the hardware flow control setting for the serial port is left unchanged.
- **novj** - Disable Van Jacobson style TCP/IP header compression in both the transmit and the receive direction.
- **novjccomp** - Disable the connection-ID compression option in Van Jacobson style TCP/IP header compression. With this option, pppd will not omit the connection-ID byte from Van Jacobson compressed TCP/IP headers, nor ask the peer to do so.
- **ipcp-accept-local** - With this option, pppd will accept the peer's idea of our local IP address, even if the local IP address was specified in an option.
- **ipcp-accept-remote** - With this option, pppd will accept the peer's idea of its (remote) IP address, even if the remote IP address was specified in an option.
- **ipcp-max-failure** - Set the maximum number of IPCP configure-NAKs returned before starting to send configure-Rejects instead to *n* (default 10).
- **lcp-echo-failure** - If this option is given, pppd will presume the peer to be dead if *n* LCP echo-requests are sent without receiving a valid LCP echo-reply. If this happens, pppd will terminate the connection. Use of this option requires a non-zero value for the **lcp-echo-interval** parameter. This option can be used to enable pppd to terminate after the physical connection has been broken (e.g., the modem has hung up) in situations where no hardware modem control lines are available.
- **lcp-echo-interval** - If this option is given, pppd will send an LCP echo-request frame to the peer every *n* seconds. Normally the peer should respond to the echo-request by sending an echo-reply. This option can be used with the **lcp-echo-failure** option to detect that the peer is no longer connected.

### Interesting PPPD options

The following options are

- **nocc** - worth to try - Disable CCP (Compression Control Protocol) negotiation. This option should only be required if the peer is buggy and gets confused by requests from pppd for CCP negotiation.
- **nocrtscts** - worth to try - Disable hardware flow control (i.e. RTS/CTS) on the serial port. If neither the **crtscts** nor the **nocrtscts** nor the **cdtrcts** nor the **nocdtrcts** option is given, the hardware flow control setting for the serial port is left unchanged.
- **novj** and **novjccomp** - seems to be handy to keep - Disable Van Jacobson style TCP/IP header compression in both the transmit and the receive direction.
- **ipcp-accept-local** - seems to not be super influencing - With this option, pppd will accept the peer's idea of our local IP address, even if the local IP address was specified in an option.
- **ipcp-accept-remote** - seems to not be super influencing - With this option, pppd will accept the peer's idea of its (remote) IP address, even if the remote IP address was specified in an option.

- **ipcp-max-failure 30** - worth a try - Set the maximum number of IPCP configure-NAKs returned before starting to send configure-Rejects instead to n (default 10).

To translate the pppd protocol codes:

<http://www.iana.org/assignments/ppp-numbers/ppp-numbers.xhtml>

## Data Flow Control

When initializing the modem, ModemManager will set the data flow control to have the most optimal serial connection.


```
Apr 20 12:23:42 vc-f14us31769 ModemManager[9150]: <debug>
[1618921422.435749] [modem0/ttyUSB2/at] <-- '<CR><LF>+IFC: (0,2),(0,2)
<CR><LF><CR><LF>OK<CR><LF>'
Apr 20 12:23:42 vc-f14us31769 ModemManager[9150]: <debug>
[1618921422.441153] [modem0] TE supports no flow control
Apr 20 12:23:42 vc-f14us31769 ModemManager[9150]: <debug>
[1618921422.441341] [modem0] TE supports RTS/CTS flow control
Apr 20 12:23:42 vc-f14us31769 ModemManager[9150]: <debug>
[1618921422.441459] [modem0] TA supports no flow control
Apr 20 12:23:42 vc-f14us31769 ModemManager[9150]: <debug>
[1618921422.441540] [modem0] TA supports RTS/CTS flow control
Apr 20 12:23:42 vc-f14us31769 ModemManager[9150]: <debug>
[1618921422.441644] [modem0] flow control settings automatically
selected: rts-cts
```

So ModemManager will automatically set the flow control to the hardware flow control (RTS/CTS) as this is the preferred way as this will give the most stable connection. Below the preferred order is shown:

```
/* If flow control is not set explicitly by udev tags,
 * we prefer the methods in this order:
 *   RTS/CTS
 *   XON/XOFF
 *   None.
 */
```

We can however overwrite this automatic decision by using the following udev tag to set the flow control for the modem interfaces.

```
ID_MM_TTY_FLOW_CONTROL=none
```

 However, this should not have any effect as we are using the USB interfaces, so the flow control is handled internally in the USB core. So we should not be able to interfere with that.

## PPP Server-side Issue

It looks more and more like a server-side issue as we are able to register to the network, we are able to connect to the APN. It goes wrong when we are trying to request the static IP address and the DNS info for the PPP server that the modem hangs up.

So maybe it is time to get Vodafone into the loop.

---

**Solution**

No clue yet.