

Manual:Interface/LTE

see: /interface lte apn add name=Tigo apn=tigoWeb

Connecting Koye FECHÉ - 1Nov2019

From MikroTik Wiki
< Manual:Interface

Contents

- 1 Summary
- 2 LTE Client
 - 2.1 Properties
 - 2.2 APN profiles
 - 2.3 Scanner
 - 2.4 User Info command
 - 2.4.1 Properties (Up to 6.40)
 - 2.5 User at-chat command
- 3 Quick setup example
- 4 Passthrough Example
- 5 Dual SIM Example
- 6 Tips and Tricks
 - 6.1 Find device location using Cell information
 - 6.2 Using Cell lock
 - 6.3 Cell Monitor
- 7 Troubleshooting
 - 7.1 Locking band on Huawei and other modems
 - 7.2 mPCIe modems with RB9xx series devices
 - 7.3 Modem firmware upgrade
 - 7.4 Avoiding tethering speed throttling

RouterOS:
v6+,v5.12+

wine = winbox.exe

neighbourhood

192.168.50.1 (LTE) - admin, no passwd

/interface lte apn add name=ETC apn=etc.com

/interface lte set network-mode=3g,lte lte1

% in user interface, set modus to 3G,LTE

%

inbetween

/interface lte info lte1 => EGPRS :-(

Test if devices can see. 10.5.50.x (connection to Mikrotik LNCC)

Summary

Package: system

Support for Direct-IP mode type cards only. (QMI Support may be possible in future)

To enable access via a PPP interface instead of a LTE Interface, change direct IP mode with `/port firmware set ignore-directip-modem=yes` command and a reboot. Note that using PPP emulation mode you may not get the same throughput speeds as using the native lte interface.

LTE Client

Sub-menu: /interface lte

Properties

/interface lte set network-mode=3g,lte lte1 % worked for us

/interface lte apn-profiles=1 % wrong syntax

| Property | Description |
|--|---|
| allow-roaming (yes / no; Default: no) | Enable data roaming for connecting to other countries data-providers. Note all LTE modems support this feature |
| apn-profiles (string; Default: default) | Which APN profile to use for this interface |
| band (integer list; Default: "") | Frequency band used in communication LTE Bands and bandwidths (https://en.wikipedia.org/wiki/LTE_frequency_bands#Frequency_bands_and_channel_bandwidths) |
| comment (string; Default: "") | Descriptive name of an item |

| | |
|--|--|
| disabled (<i>yes / no</i> ; Default: yes) | Whether interface is disabled or not. By default it is disabled. |
| mac-address (<i>MAC</i> ; Default: "") | Media Access Control number of an interface. |
| modem-init (<i>string</i> ; Default: "") | Modem init string (AT command that will be executed at modem startup) |
| mtu (<i>integer</i> ; Default: 1500) | Maximum Transmission Unit. Max packet size that LTE interface will be able to send without packet fragmentation. |
| name (<i>string</i> ; Default: "") | Descriptive name of the interface. |
| network-mode (<i>3g / gsm / lte</i> ; Default: 3g,gsm,lte) | Select/force mode for LTE interface to operate with |
| operator (<i>integer</i> ; Default: "") | used to lock device to specific operator full PLMN number is used for lock consisting from MCC+MNC. PLMN codes (https://en.wikipedia.org/wiki/Public_land_mobile_network) |
| pin (<i>integer</i> ; Default: "") | SIM Card's PIN code. |

APN profiles

All network related settings are moved under profiles, starting from RouterOS 6.41

Sub-menu: `/interface lte apn`

| Property | Description |
|---|---|
| add-default-route (<i>yes / no</i>) | Whether to add default route to forward all traffic over the LTE interface. |
| apn (<i>string</i>) | Service Provider's Access Point Name |
| authentication (<i>pap / chap / none</i> ; Default: none) | Allowed protocol to use for authentication |
| default-route-distance (<i>integer</i> ; Default: 1) | Sets distance value applied to auto created default route, if add-default-route is also selected |
| ip-type (<i>ipv4 / ipv4-ipv6 / ipv6</i> ; Default:) | Requested PDN type |
| ipv6-interface (; Default:) | Interface on which to advertise IPv6 prefix |
| name (<i>string</i> ; Default:) | APN profile name |
| number (<i>integer</i> ; Default:) | APN profile number |
| passthrough-interface (; Default:) | Interface to passthrough IP configuration (activates passthrough) |
| passthrough-mac (<i>MAC</i> ; Default: auto) | If set to auto, then will learn MAC from first packet |
| password (<i>string</i> ; Default:) | Password used if any of the authentication protocols are active |
| use-peer-dns (<i>yes / no</i> ; Default: yes) | If set to yes, uses DNS received from LTE interface |
| user (<i>integer</i>) | Username used if any of the authentication protocols are active |

Scanner

It is possible to scan LTE interfaces with `/interface lte scan` command

Available read only properties:

| Property | Description |
|------------------------------------|-----------------------------|
| duration (<i>integer</i>) | Duration of scan in seconds |

freeze-frame-interval (*integer*)

time between data printout

number (*integer*)

Interface number or name

User Info command

It is possible to send special "info" command to LTE interface with `/interface lte info` command.

Properties (Up to 6.40)

| Property | Description |
|---|---|
| user-command (<i>string</i> ; Default: "") | send a command to LTE card to extract useful information, e.g. with AT commands |
| user-command-only (<i>yes / no</i> ; Default:) | |

User at-chat command

It is possible to send user defined "at-chat" command to LTE interface with `/interface lte at-chat` command.

```
[admin@MikroTik] > /interface lte at-chat lte1 input="AT*mrd_imei?"
output: *MRD_IMEI:356159060388208
OK
```

You can also use "at-chat" function in scripts and assign command output to variable.

```
[admin@MikroTik] > :global "lte_command" [/interface lte at-chat lte1 input="AT*mrd_imei\" as-value ]
[admin@MikroTik] > :put "$lte_command"
output=*MRD_IMEI:356159060388208
OK
```

Quick setup example

Start with network settings -



Warning: This guide is for RouterOS versions starting from 6.41

Start with network settings - Add new connection parameters under LTE apn profile (provided by network provider):

```
/interface lte apn
add name=profile1 apn=phoneprovider.net authentication=chap password=web user=web
```

Select newly created profile for LTE connection:

```
/interface lte set [find] apn-profiles=profile1
```

LTE interface should appear with running (R) flag:

```
[admin@MikroTik] > /interface lte print
Flags: X - disabled, R - running
0 R name="lte1" mtu=1500 mac-address=AA:AA:AA:AA:AA:AA
```

From RouterOS=>6.41 DHCP client is added automatically. If it's not added - add a DHCP Client to LTE Interface manually:

```
/ip dhcp-client
add default-route-distance=1 disabled=no interface=lte1
```

If required, add NAT Masquerade for LTE Interface to get internet to the local network:

```
/ip firewall nat
add action=masquerade chain=srcnat out-interface=lte1
```

After interface is added, you can use "info" command to see what parameters client acquired (parameters returned depends on LTE hardware device):

```
[admin@MikroTik] > /interface lte info lte1 once
status: call in progress
pin-status: no password required
functionality: full
manufacturer: Huawei Technologies Co., Ltd.
model: ME909u-521
revision: 12.631.07.01.00
current-operator: vodafone ES
current-cellid: 44436007
access-technology: Evolved 3G (LTE)
signal-strength: -79 dBm
frame-error-rate: n/a
earfcn: n/a
imei: 860461024123456
imsi: 234012555034981
uicc: n/a
rssi: -79dBm
rsrp: -109dBm
rsrq: -13dB
sinr: -1dB
[admin@MikroTik] >
```

Passthrough Example

Starting from RouterOS v6.41 some LTE interfaces support LTE Passthrough feature where the IP configuration is applied directly to the client device. In this case modem firmware is responsible for the IP configuration and router is used only to configure modem settings - APN, Network Technologies and IP-Type. In this configuration the router will not get IP configuration from the modem. The LTE Passthrough modem can pass both IPv4 and IPv6 addresses if that is supported by modem. Some modems support multiple APN where you can pass the traffic from each APN to a specific router interface.

Passthrough will only work for one host. Router will automatically detect MAC address of the first received packet and use it for the Passthrough. If there are multiple hosts on the network it is possible to lock the Passthrough to a specific MAC. On the host on the network where the Passthrough is providing the IP a DHCP-Client should be enabled on that interface to. Note, that it will not be possible to connect to the LTE router via public lte ip address or from the host which is used by the passthrough. It is suggested to create additional connection from the LTE router to the host for configuration purposes. For example vlan interface between the LTE router and host.

To enable the Passthrough a new entry is required or the default entry should be changed in the '/interface lte apn' menu Examples.

To configure the Passthrough on ether1:

```
[admin@MikroTik] > /interface lte apn add apn=apn1 passthrough-interface=ether1
[admin@MikroTik] > /interface lte set lte1 apn-profiles=apn1
```

To configure the Passthrough on ether1 host 00:0C:42:03:06:AB:

```
[admin@MikroTik] > /interface lte apn add apn=apn1 passthrough-interface=ether1 passthrough-mac=00:0C:42:03:06:00
[admin@MikroTik] > /interface lte set lte1 apn-profiles=apn1
```

To configure multiple APNs on ether1 and ether2:

```
[admin@MikroTik] > /interface lte apn add apn=apn1 passthrough-interface=ether1
[admin@MikroTik] > /interface lte apn add apn=apn2 passthrough-interface=ether2
[admin@MikroTik] > /interface lte set lte1 apn-profiles=apn1,apn2
```

To configure multiple APNs with the same APN for different interfaces:

```
[admin@MikroTik] > /interface lte apn add name=interface1 apn=apn1
[admin@MikroTik] > /interface lte apn add name=interface2 apn=apn1 passthrough-interface=ether1
[admin@MikroTik] > /interface lte set lte1 apn-profiles=interface1
[admin@MikroTik] > /interface lte set lte2 apn-profiles=interface2
```

Dual SIM Example

For some boards with dual SIM slots (like LtAP mini) it is possible to alternate between cellular providers. Follow this link - Dual SIM Application, to see an example how to change SIM slot based on roaming status with help of RouterOS scripts and scheduler.

Tips and Tricks

This paragraph contains information for additional features and usage cases.

Find device location using Cell information

On devices using R11e-LTE International version card (wAP LTE kit) some extra information is provided under info command (from 6.41rc61)

```
current-operator: 24701
lac: 40
current-cellid: 2514442
```

| Property | Description |
|---|--|
| current-operator (<i>integer</i> ; Default:) | Contains MCC and MNC. For example: current-operator: 24701 breaks to: MCC=247 MNC=01 |
| lac (<i>integer</i> ; Default:) | location area code (LAC) |
| current-cellid (<i>integer</i> ; Default:) | Station identification number |

Values can be used to find location in databases: Cell Id Finder (<http://cellidfinder.com/cells/findcell>)

Using Cell lock

It is possible to lock R11e-LTE International version modem and R11e-4G equipped devices to exact LTE tower. LTE info command provides currently used cellular tower information:

```
phy-cellid: 384
earfcn: 1300 (band 3, bandwidth 20Mhz, cqi 8)
```

| Property | Description |
|---|--|
| phy-cellid (<i>integer</i> ; Default:) | Physical Cell Identification (PCI) of currently used cell tower. |
| earfcn (<i>integer</i> ; Default:) | Absolute Radio Frequency Channel Number |

Exact tower location as well as available bands and other information can be acquired from mobile carrier or by using online services:

CellMapper (<https://www.cellmapper.net/map>)

By using those acquired variables it's possible to send AT command to modem for locking to tower in current format:

for R11e-LTE

```
AT*Cell=<mode>,<NetworkMode>,<band>,<EARFCN>,<PCI>

where

<mode> :
0 - Cell/Frequency disabled
1 - Frequency lock enabled
2 - Cell lock enabled

<NetworkMode>
0 - GSM
1 - UMTS_TD
2 - UMTS_WB
3 - LTE

<band>
Not in use, leave this blank

<EARFCN>
earfcn from lte info

<PCI>
phy-cellid from lte info
```

To lock modem at previously used tower at-chat can be used:

```
/interface lte at-chat ltel input="AT*Cell=2,3,,1300,384"
```

After reboot or modem reset, all set on locks are lost. Cell data can be also gathered from "cell-monitor".

for R11e-4G

```
AT%CLCMD=<mode>,<mode2>,<EARFCN>,<PCI>,<PLMN>
AT%CLCMD=1,1,3250,244,\"24705\"

where

<mode> :
0 - Cell/Frequency disabled
1 - Cell lock enabled

<mode2> :
0 - Save lock for first scan
1 - Always use lock
(after each reset modem will clear out previous settings no matter what is used here)

<EARFCN>
earfcn from lte info

<PCI>
phy-cellid from lte info

<PLMN>
Mobile operator code
```

All PLMN codes available here (https://en.wikipedia.org/wiki/Mobile_country_code) this variable can be also left blank

To lock modem to the cell - modem needs to be in non operating state, easiest way for **R11e-4G** modem is to add CellLock line to "modem-init" string:

```
/interface lte set ltel modem-init=AT%CLCMD=1,1,3250,244,\"24705\"
```

Multiple cells can also be added by providing list instead of one tower informatin in following format:

```
AT%CLCMD=<mode>,<mode2>,<EARFCN_1>,<PCI_1>,<PLMN_1>,<EARFCN_2>,<PCI_2>,<PLMN_2>
```

For example to lock to two different PCIs within same band and operator:

```
/interface lte set lte1 modem-init="AT%CLCMD=1,1,6300,384,\"24701\",6300,385,\"24701\""
```

Cell Monitor

Cell monitor allows to scan available nearby mobile network cells:

```
[admin@MikroTik] > interface lte cell-monitor lte1
```

| PHY-CELLID | BAND | EARFCN | RSRP | R |
|------------|------|--------|---------|-----|
| 11 | B3 | 1300 | -107dBm | -17 |
| 306 | B1 | 150 | -115dBm | -19 |
| 373 | B3 | 1300 | -111dBm | -19 |
| 374 | B3 | 1300 | -111dBm | -19 |
| 384 | B1 | 150 | -106dBm | -12 |
| 384 | B7 | 2850 | -115dBm | -17 |
| 384 | B20 | 6300 | -97dBm | -19 |

Gathered data can be used for more precise location detection or for Cell lock.

Troubleshooting

Enable LTE logging:

```
[admin@MikroTik] > /system logging add topics=lte
```

Check for errors in log:

```
[admin@MikroTik] > /log print
```

```
11:08:59 lte,async lte1: sent AT+CPIN?
11:08:59 lte,async lte1: rcvd +CME ERROR: 10
```

search for CME error description online,

in this case: CME error 10 - SIM not inserted

Locking band on Huawei and other modems

To lock band for Huawei modems `/interface lte set lte1 band=""` option can't be used.

It is possible to use AT commands to lock to desired band manually.

To check all supported bands run at-chat command:

```
[admin@MikroTik] /interface lte at-chat lte1 input="AT^SYSCFGEX=\\?"
```

```
output: ^SYSCFGEX: ("00","03","02","01","99"),((2000004e80380,"GSM850/GSM900/GSM1800/GSM1900/WCDMA BCI/WCDMA BC
(3fffffff,"All Bands")), (0-2), (0-4), ((800d7,"LTE BC1/LTE BC2/LTE
BC3/LTE BC5/LTE BC7/LTE BC8/LTE BC20"), (7fffffffffffffff,"All Bands"))
OK
```

Example to lock to LTE band 7,

```
[admin@MikroTik] /interface lte set lte1 modem-init="AT^SYSCFGEX=\\\"03\\\",3FFFFFFF,2,4,40,,,"
```

Change last part **40** to desired band specified hexadecimal value where:

```
4 LTE BC3
40 LTE BC7
80000 LTE BC20
7FFFFFFFFFFFFFFF All bands
etc
```

All band HEX values and AT commands can be found in Huawei AT Command Interface Specification guide (<http://download-c.huawei.com/download/downloadCenter?downloadId=29741&version=72288&siteCode=>)

Check if band is locked:

```
[admin@MikroTik] /interface lte at-chat lte1 input="AT^SYSCFGEX\?"

output: ^SYSCFGEX: "03",3FFFFFFF,0,2,40
OK
```

For more information check modem manufacturers AT command reference manuals.

mPCIe modems with RB9xx series devices

For mPCIe modems to work in RB9xx series devices it is required to set the USB type to mPCIe, this can be done using the following command:

```
/system routerboard usb set type=mini-PCIe
```

In case your modem is not being recognized after a soft reboot, then you might need to add a delay before the USB port is being initialized. This can be done using the following command:

```
/system routerboard settings set init-delay=5s
```

Modem firmware upgrade

Starting from RouterOS version 6.44beta20 it is possible to upgrade modems firmware.

Firmware update is only available for R11e-LTE and R11e-4G modems.

Firmware upgrade can only be done through working mobile connection - it will download approx 5.5MB firmware file. Firmware upgrades usually includes small improvements in stability or small bug fixes that can't be included into RouterOS.

Check currently used firmware version by running:

```
[admin@MikroTik] > /interface lte info lte1 once

-----
revision: "MikroTik_CP_2.160.000_v008"
-----
```

Check if new firmware is available:

```
[admin@MikroTik] > /interface lte firmware-upgrade lte1
installed: MikroTik_CP_2.160.000_v008
latest: MikroTik_CP_2.160.000_v010
```

Upgrade firmware:

```
[admin@MikroTik] > interface lte firmware-upgrade lte1 upgrade=yes
status: downloading via LTE connection (>1min)
```


Whole upgrade process may take up to 10 minutes, depending on mobile connection speed.

After successful upgrade issue USB power-reset, reboot device or run AT+reset command, to update modem version readout under info command:

```
[admin@MikroTik] > /interface lte at-chat ltel input="AT+reset"
```

Avoiding tethering speed throttling

Some operators (TMobile, YOTA etc.) allows unlimited data only for device SIM card is used on, all other data coming from mobile hotspots or tethering is highly limited by volume or by throughput speed. Some sources (https://www.reddit.com/r/hacking/comments/54a7dd/bypassing_tmobiles_tethering_data_capthrottling/) have found out that this limitation is done by monitoring TTL (Time To Live) values from packets to determinate if limitations need to be applied (TTL is decreased by 1 for each "hop" made). RouterOS allows changing the TTL parameter for packets going from the router to allow hiding sub networks. Keep in mind that this may conflict with fair use policy.

```
/ip firewall mangle  
add action=change-ttl chain=postrouting new-ttl=set:65 out-interface=ltel passthrough=yes
```

More information: YOTA (<https://m.habr.com/en/post/238351/>), TMobile (https://www.reddit.com/r/mikrotik/comments/acq4kz/anyone_familiar_with_configuring_the_ltap_us_with/)

[Top | Back to Content]

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Categories: Manual | VPN | Interface

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