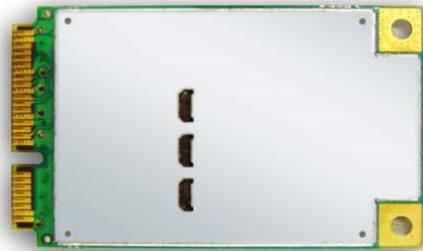


3G Applications on RouterOS

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Overview of this Presentation

- Why 3G / 4G?
- M2M and why it's going to be BIG!
- New Features in RouterOS V5 for 3G
- Interface Types
- Real World Applications
- SMS Configuration
- PPP Configuration
- Troubleshooting
- Live Demonstration

Why 3G / 4G?

- Need mobile internet access
- Backup link, if the main link fails
- Out-of-band management of router systems
- Sending SMS from the router
- Receiving SMS and executing scripts
- 3G becomes faster and Internet access is more affordable

3G Applications

- Public Safety
- Rural Areas
- Mobile / Fixed Hotspots
- Bandwidth Backup / Redundancy
- Digital Signage
- Kiosks
- Remote Monitoring / Security
- Transportation
- M2M Applications



M2M (Machine to Machine)

- M2M is the concept of a device sending data to another device
- Extreme competition in voice services is driving down revenue, carriers looking at data.
- Carriers starting to embrace having “embedded devices” on their network besides mobile phones.
- Meters, Appliances, Remote Access, Lighting, Medical, Retail Inventory, etc. --- Reducing Costs and saving energy.
- Wireless M2M reached 81.4 Millions Units at end of 2010 – Predicted to be 430 Million by 2013 (Berg Insight)

Cost's are coming down!

- We sell 5MB data plans for \$4.50 on the Sprint M2M network – No Contract.
- LTE/3G Modems are very cheap
- Routerboard hardware gets better/cheaper as time goes on!
- By 2012 - \$100 RouterOS 3G Router complete!

New 3G RouterOS 4.0 Features

- Added the ability to talk to multiple channels within a USB connection at same time
- Added PIN ability (so you can SIM Unlock within winbox)
- Added APN (Access Point Name)

Port: usb2

Data Channel: 0

Info Channel: 0

Modem Init: AT+CFUN=1

Null Modem

APN: wap.cingular

PIN:

Torch

Scan...

Info...

Simple Mode

disabled running slave Status: connected

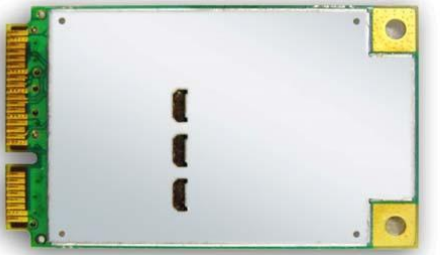
New 3G RouterOS 5.0 Features

- Additional Modem Support (Over 100 Supported)
- Added GOBI 2000 firmware download support
- LTE (4G) Currently being looked at
- Minor Winbox Tweaks
- Webfig Support added

RouterBOARD Interface Types

- RB/411u - mPCIe & USB
- RB/411UAHR – mPCIe & USB (No Power)
- RB/711UA-2HnD – USB w/802.11b/g/n
- RB/711UA-5HnD – USB w/802.11a/n
- RB/433UAH – USB x2
- RB/435G – USB x2
- RB/493G – USB
- RB/SXT - USB
- RB/800 has mPCIe but no USB support
- Some Models Support USB

mPCI-e Cards



- Harder to obtain – contact MFG
- Designed for dedicated applications
- Harsh environments – transportation
- Most used in M2M applications
- Require device certification in the USA by each carrier (Free to \$50,000)
- Require external 3G antenna's
- Cost more – but price coming down
- 4G modules currently sell for \$125



USB Type Modems

- Easy to find on the open market
- FREE with most carrier contracts
- Protrude out of the RouterBOARD
- Greater Selection
- Include built-in antennas

USB Dongle Type Modems



mPCIe Modules w/RB411U

- Some cards that have been tested:
 - OPTION GTM378
 - Gobi 2000
 - Sierra Wireless
MC8775,8780
8781,8790



See wiki.mikrotik.com

For additional supported

mPCIe Module Types

- Quadband GSM 850/900/1900/2100Mhz
- EVDO Rev A CDMA (3.1 Down / 1.8 Up)
- UMTS/HSDPA (7.2 Down / 2.0 Up)
- HSDPA+ 3.5G (28 Down / 5.8 Up)
- LTE (Long Term Evolution) (100 Down / 50 Up)
- LTE With 4x4 MIMO can Achieve 300Mbps!

SMS Applications

- RouterOS Supports sending SMS messages by script to any mobile device.
- RouterOS can accept SMS messages and trigger scripts to run
- Applications Include:
 - Remote Router Reboot
 - Check Voltage or Signal Strength and SMS Back

Sending SMS from the Router

- Command line example to send an SMS:
 - `/tool sms send usb2 "29111222" channel=0 message="Help!"`
- In RouterOS V4+, SMS can be sent while the port is used by other service (PPP or terminal)

Receiving SMS

- Turn on receiving the SMS
 - specify “port” and “channel”
 - set “secret” (required)
 - set “allowed-number” (optional)
- Received SMSs are stored in /tool sms inbox
- SMS message format
 - :cmd SECRET script NAME [[VAR[=VAL]] ...]

```

[admin@MikroTik] /tool sms>
[admin@MikroTik] /tool sms> print
  receive-enabled: yes
      port: usb2
  channel: 2
  secret: "111"
  allowed-number: ""
  keep-max-sms: 10
[admin@MikroTik] /tool sms> █

```

```

[admin@MikroTik] /tool sms> inbox
[admin@MikroTik] /tool sms inbox> pr
# SRC                TIMESTAMP                TEXT
0 16308540580        Nov/20/2009 01:23:21 GMT +26  :cmd 111 script log
[admin@MikroTik] /tool sms inbox>
[admin@MikroTik] /tool sms inbox>

```

Jan/02/1970 01:59:06	gsm read debug	+CMGL: 0,0,0
Jan/02/1970 01:59:06	gsm read debug	07913121139426F0040B816103580485F0000090 11021071704A13BA719B0C8AC562A0F9589E86 D341ECF719
Jan/02/1970 01:59:06	gsm read debug	OK
Jan/02/1970 01:59:06	gsm debug	running script: log
Jan/02/1970 01:59:06	script info	Hello This Works!
Jan/02/1970 01:59:06	gsm debug	keepMax exceeded, removing some messages.
Jan/02/1970 01:59:06	gsm write debug	AT+CMGD=0
Jan/02/1970 01:59:06	gsm write debug	
Jan/02/1970 01:59:06	gsm read debug	AT+CMGD=0
Jan/02/1970 01:59:06	gsm read debug	OK
Jan/02/1970 01:59:11	gsm write debug	AT+CMGL=0

PPP Config: Part 1 – Info Channel

```
[admin@MikroTik] /system> serial-terminal usb2 channel=2
```

```
[Ctrl-A is the prefix key]
```

```
ATi5
```

```
Manufacturer: Sierra Wireless, Inc.
```

```
Model: MC8781
```

```
Revision: F1_2_3_15AP C:/WS/FW/F1_2_3_15AP/MSM7200R3/SRC/AMSS 2008/07/09 13:02:11
```

```
IMEI: 356685011813019
```

```
IMEI SV: 13
```

```
FSN: D350558387911
```

```
3GPP Release 6
```

```
+GCAP: +CGSM,+DS,+ES
```

```
OK
```

```
[admin@MikroTik] /system> serial-terminal usb2 channel=0
```

```
[Ctrl-A is the prefix key]
```

```
Sierra Wireless, Inc.
```

```
MC8781
```

```
APP1
```

```
OK
```

PPP Config: Part 2 – General Settings

The screenshot shows a configuration window titled "Interface <ppp-out1>". It has four tabs: "General", "PPP", "Status", and "Traffic". The "General" tab is selected. The settings are as follows:

- Name: ppp-out1
- Type: PPP Client
- L2 MTU: 1500
- Max MTU: 1500
- Max MRU: 1500
- MRRU: (empty)
- Port: usb2
- Data Channel: 0
- Info Channel: 2
- Modem Init: AT+CFUN=1
- Null Modem
- APN: wap.cingular
- PIN: (empty)

On the right side, there is a vertical stack of buttons: OK, Cancel, Apply, Enable, Comment, Copy, Remove, Torch, Scan..., Info, and Simple Mode. The "Simple Mode" button is circled in orange. At the bottom, there are status indicators: "disabled", "running", "slave", and "Status: disabled".

PPP Config Part 3 – PPP Settings

Interface <ppp-out1>

General PPP Status Traffic

Phone: *99#

Dial Command: ATDT

User:

Password:

Remote Address:

Profile: default

Dial On Demand

Add Default Route

Use Peer DNS

- Allow -

pap chap

mschap1 mschap2

disabled running slave Status: disabled

OK Cancel Apply Enable Comment Copy Remove Torch Scan... Info... Simple Mode

PPP Config Part 4 - Info

The screenshot displays two windows from a network configuration application. The top window, titled "Interface <ppp-out1>", has tabs for "General", "PPP", "Status", and "Traffic". The "PPP" tab is active, showing fields for Name (ppp-out1), Type (PPP Client), L2 MTU (1500), and Max MTU (1500). The bottom window, titled "PPP Info <ppp-out1>", provides detailed information about the PPP connection. The "Info..." button in the right-hand toolbar of the top window is circled in orange.

Field	Value
Name	ppp-out1
Type	PPP Client
L2 MTU	1500
Max MTU	1500

Field	Value
Status	ready
PIN Status	no password required
Functionality	minimum
GPRS Class	A - GPRS & GSM simultaneous
Manufacturer	Sierra Wireless, Inc.
Model	MC8781
Revision	F1_2_3_15AP C:/WS/FW/F1_2_3_15AP/MSM7200R3/SRC/AMSS 2008/07/09 13:02:...
Serial Number	356685011813019
Current Operator	'AT&T'@
Access Technology	3G
Signal Strength	-97 dBm

3G Configuration Reminders

- Don't forget to add a SRC-NAT rule to Masquerade your ppp-out1 interface
- If your carrier charges for connect time, select that you want to dial on demand vs. always on
- Some carriers will give you private address space, depends on APN you connect to.
- Make sure you are using the default profile and not trying to do encryption

Troubleshooting

- **Can you talk to the modem at all?** Try using serial terminal to talk to the modem!
- **Is the SIM card requiring the PIN?** Disable PIN request, or, enter your PIN in winbox!
- **Consult MikroTik Wiki** and any 3G/GPRS AT Command Reference!

References / Live Demonstration

- http://wiki.mikrotik.com/wiki/Supported_Hardware#3G_cards
- <http://wiki.mikrotik.com/wiki/Manual:Tools/Sms>
- <http://www.sierrawireless.com/>
- <http://forum.mikrotik.com>
- <http://www.mikrotik.com>
- <http://www.balticnetworks.com>
- <http://www.maxxwave.com>

Thank You!