Timothy Symonds
Scoop Distribution

presents

Mobile WiFi with GPS Tracking using MikroTik's LtAP

MUM SOUTH AFRICA 2020

Timothy Symonds

- CTO at Scoop Distribution
- First exposure to MikroTik 2008
- Attended my first MUM in Zagreb in 2013 then later in Johannesburg that same year.
- MikroTik Certified Trainer since 2015

Scoop Distribution

- MikroTik distributor since 2003
- National presence with branches in JHB, CPT and DBN
- International supply to SADC regions in Africa
- Online ordering, payment and shipping
- Certified training

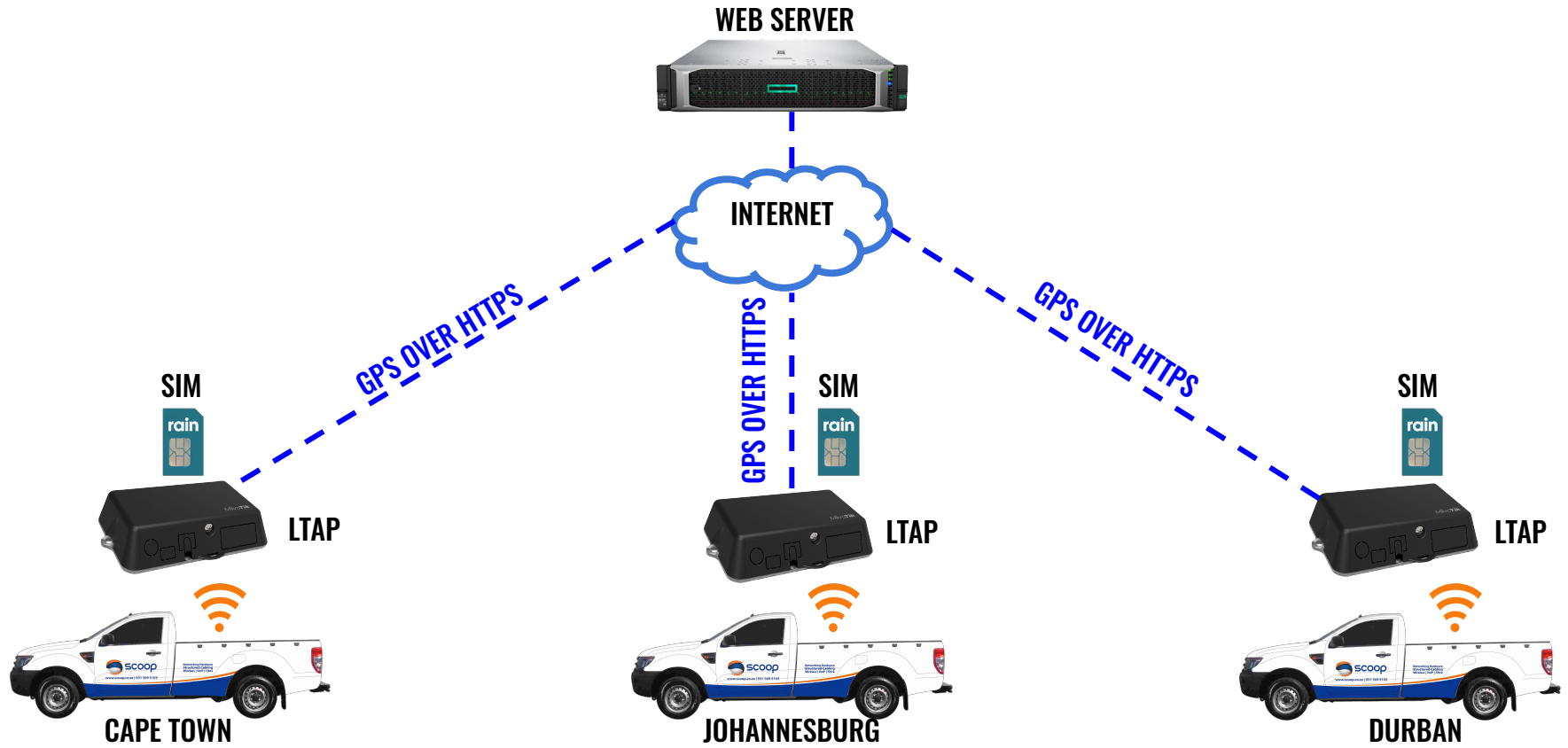
Project Objectives

- GPS tracking of company vehicles with simple web interface for use by our managers
- WiFi connectivity for our driver to have access to basic services like maps and voice calls
- Notifications during after hours
- A low maintenance solution

Why use MikroTik's LtAP?

- Inexpensive (No recurring hardware costs)
- Integrated WiFi and GPS
- Durability
- Flexible power input options
- Size - Easy to install and conceal
- Functionality - It's MikroTik 😎

Topology



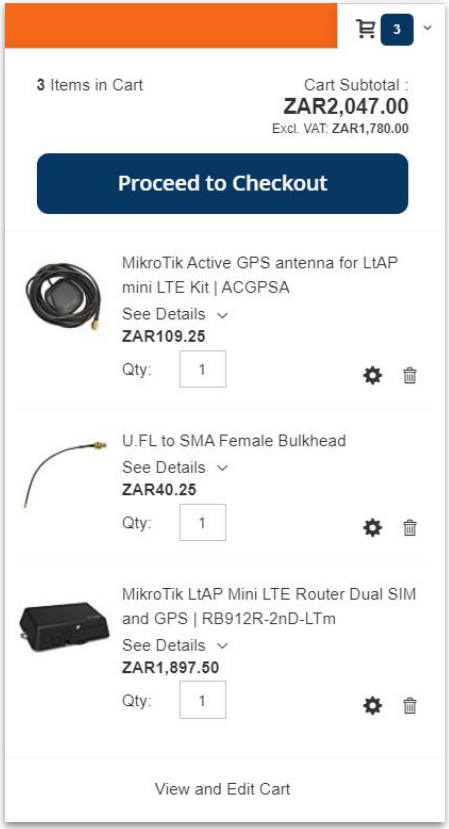
MikroTik ZA MUM 2020

scoop Your Network | Our Passion

LtAP-Mini vs LtAP-HD

2x SIM slots (Mini)	3x SIM slots (Mini)
1x Mini-PCIe	2x Mini-PCIe
1x R11e-LTE Modem	1x R11e-LTE Modem
3di LTE Antenna	4di LTE Antenna
2.4GHz-N WiFi Radio	2.4GHz-N WiFi Radio
1.5 dBi WiFi Antenna	2.5 dBi WiFi Antenna
Fast Ethernet	Gigabit
Internal GPS Antenna Connection	External GPS Antenna Connection

Project Requirements



- LtAP or LtAP-HD
- UFL-SMA-Female (LtAP-Mini only)
- GPS Antenna
- Web Server
- A few spare hours

MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Hardware Preparation

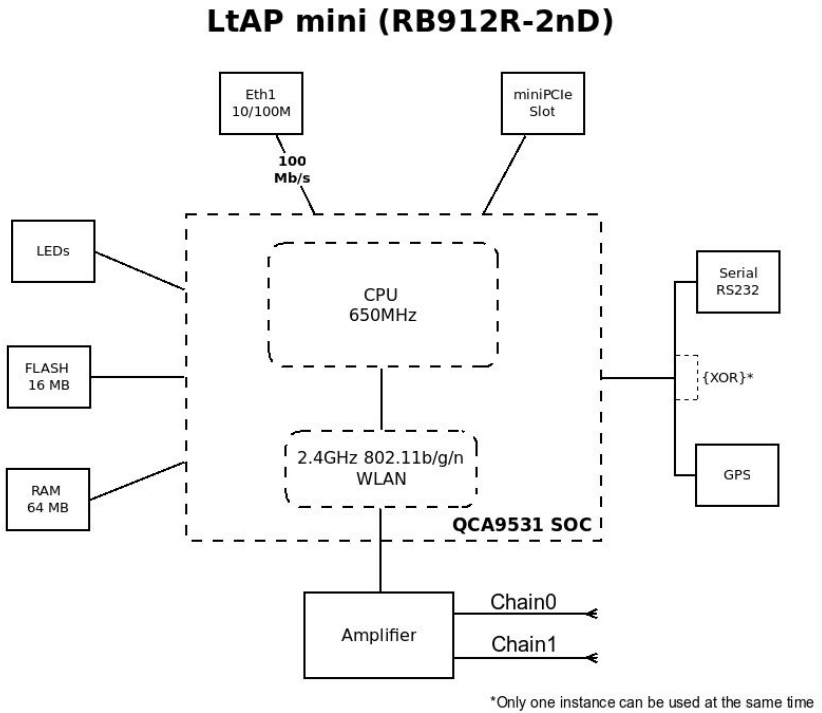
- When using the LtAP-Mini, the internal GPS antenna is compromised when the LTE modem is enabled so you will need to attach an external antenna.

- The GPS uses an active 3.3v antenna and the connector is sensitive to damage if touched while powered on.

- Power off the LtAP prior to installation!

Hardware Preparation

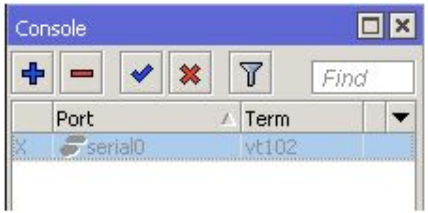
GPS Configuration - LtAP-Mini



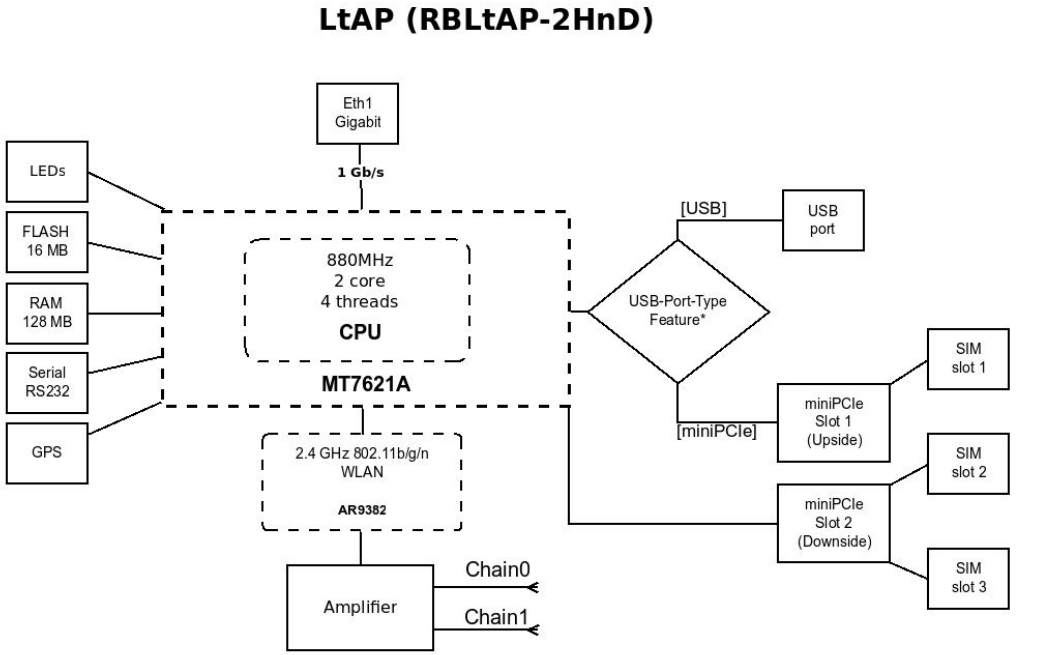
When using the LtAP-Mini, the serial port and GPS cannot be used concurrently.

RS232 is enabled by default in RouterOS

```
/system console
set [ find ] disabled=yes
```



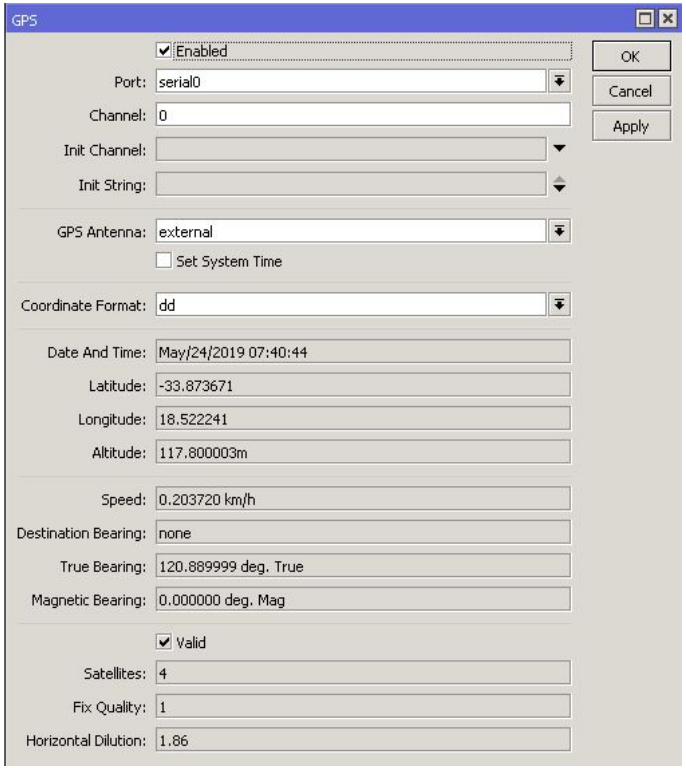
GPS Configuration - LtAP-HD



*https://wiki.mikrotik.com/wiki/Manual:USB_Features#USB_port_type

When using the LtAP-HD, it is not necessary to disable the default serial port as they do not share the same hardware path.

GPS Configuration



Decimal degrees (DD) express latitude and longitude geographic coordinates as decimal fractions and are used in web mapping applications such as OpenStreetMap

```
/system gps
set coordinate-format=dd
enabled=yes
gps-antenna-select=external
port=serial0
```

Web Server Requirements

- Web server of your choice - We used Digital Ocean, 1Gb Memory, 25Gb Storage, Ubuntu 16.04.6 x64 = $5p/m
- Apache
- PHP
- SQLite
- SSL Certificates

Check out our walk-through guide on Github HERE

Posting GPS Coordinates

WEB SERVER

PHP Script on Web server inserts coordinates into SQLite Database

HTTPS

HTTPS

RouterOS sends POST HTTP request to Apache web server over SSL in a JSON format

Front end libraries - Bootstrap Data tables and Nominatim OSM reverse geo-coding API

LTAP

OPEN STREET MAP

USER

MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Posting GPS Coordinates

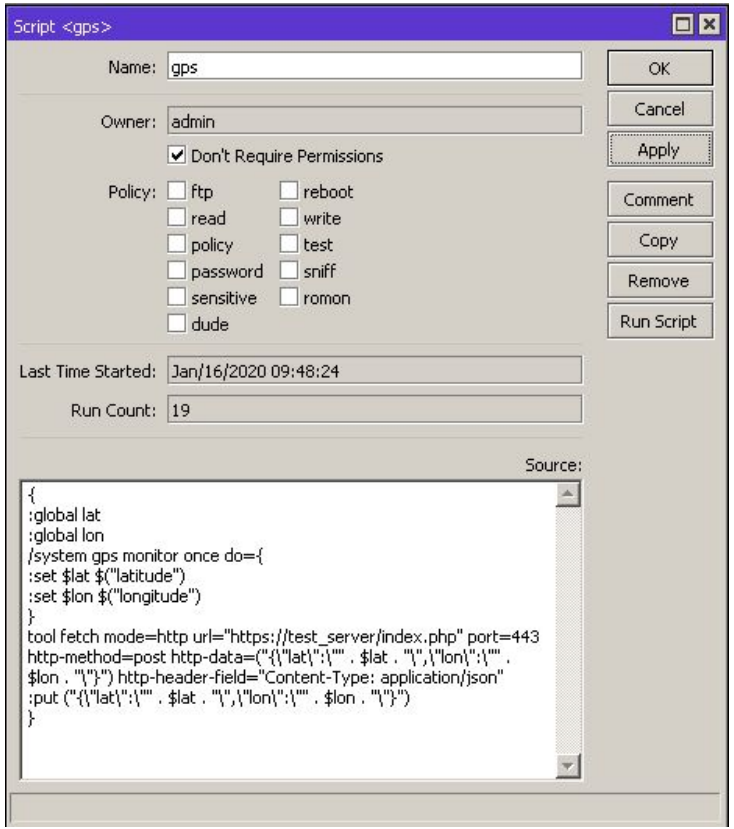
- RouterOS 6.40rc30 or above - Required for getting the the coordinates from the router to the server.
- Set GPS coordinates to ‘dd’ format
- Uses ‘/tool fetch’ parameter (CLI only)

Example:

```
/tool fetch http-method=post
http-content-type="application/json"
http-data="{\"lat\":\"56.12\",\"lon\":\"25.12\"}"
url="https://test_server/index.php"
```

Posting GPS Coordinates

```
{
:global lat
:global lon
/system gps monitor once do={
:set $lat $("latitude")
:set $lon $("longitude")
}
tool fetch mode=http
url="https://test_server/index.php"
port=443 http-method=post
http-data=("{\"lat\":\"" . $lat .
"\",\"lon\":\"" . $lon . "\"}")
http-header-field="Content-Type:
application/json"
:put ("{\"lat\":\"" . $lat .
"\",\"lon\":\"" . $lon . "\"}")
}
```



Posting GPS Coordinates

```
/system scheduler
add interval=1m name=gps on-event=gps
```

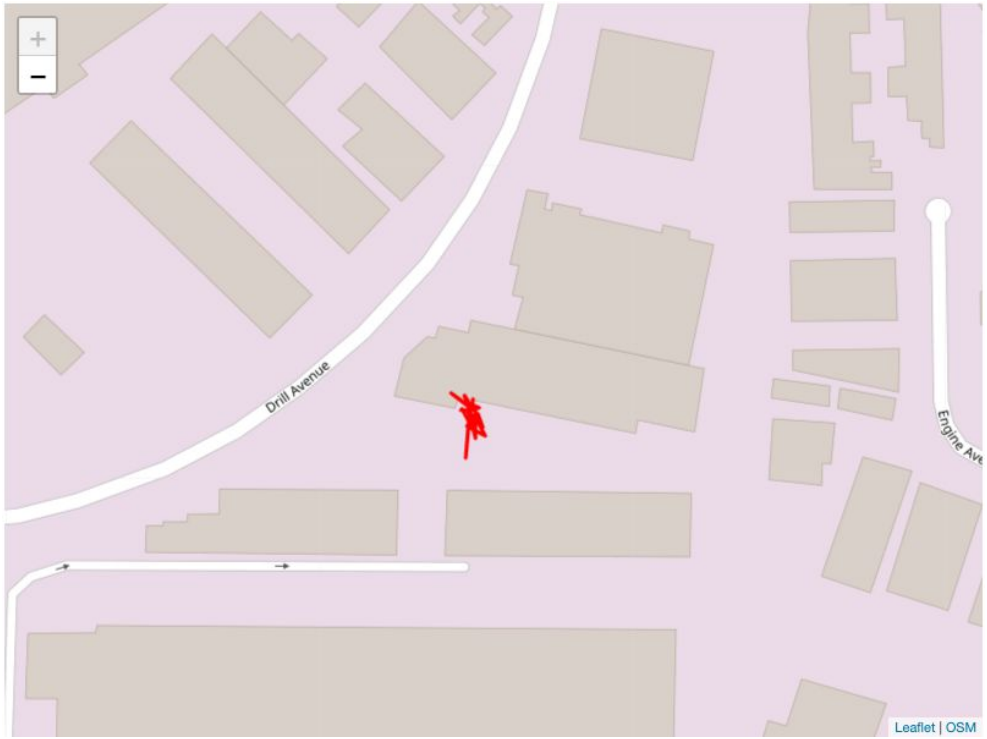
Check the HTTP access logs on the server to confirm everything is working

```
- - [16/Jan/2020:07:30:44 +0000] "POST /cpt.php HTTP/1.1" 200 3491 "-" "Mikrotik/6.x Fetch"
- - [16/Jan/2020:07:31:25 +0000] "POST /cpt.php HTTP/1.1" 200 3491 "-" "Mikrotik/6.x Fetch"
- - [16/Jan/2020:07:32:25 +0000] "POST /cpt.php HTTP/1.1" 200 3491 "-" "Mikrotik/6.x Fetch"
- - [16/Jan/2020:07:33:25 +0000] "POST /cpt.php HTTP/1.1" 200 3491 "-" "Mikrotik/6.x Fetch"
- - [16/Jan/2020:07:34:25 +0000] "POST /cpt.php HTTP/1.1" 200 3491 "-" "Mikrotik/6.x Fetch"
- - [16/Jan/2020:07:35:25 +0000] "POST /cpt.php HTTP/1.1" 200 3491 "-" "Mikrotik/6.x Fetch"
```

Web server address https://test_server/index.php

A map with plotted coordinates should appear on the web server address

Double check the ‘gps’ script if coordinates are incorrect on the map

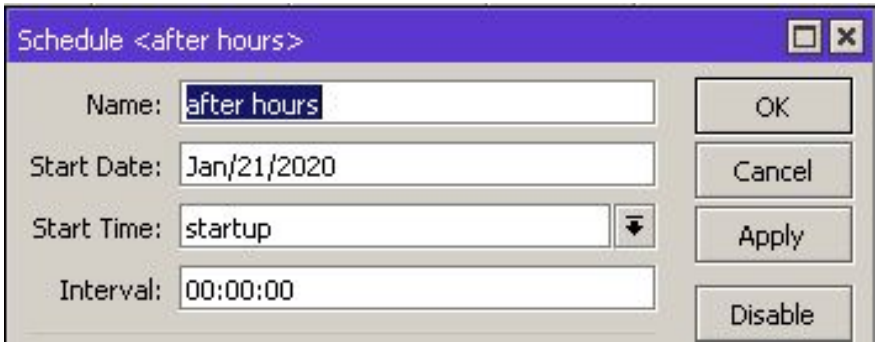


After Hours Notification

E-mail notifications when the vehicle is started after hours and on weekends

MikroTik's scheduler is limited to 'Start Time' and 'Interval'. This is an issue as the LtAP could be off at any given time.

Additional scripting is required when making use of the e-mail feature to achieve 'after hours'

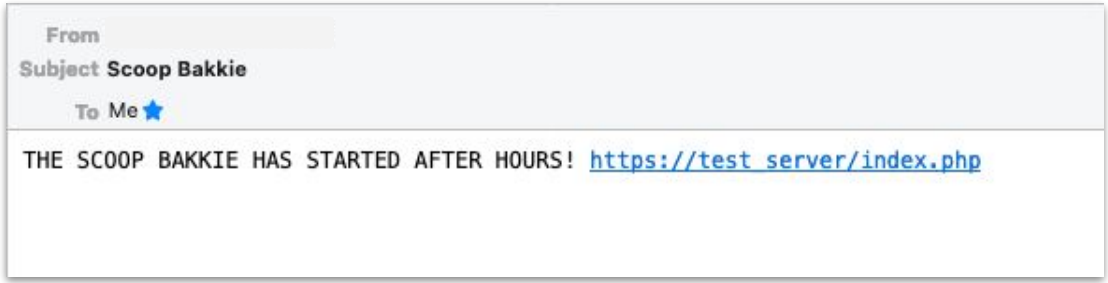


Notification Script

Checks what day of the week it is and sends an email based in these two variables

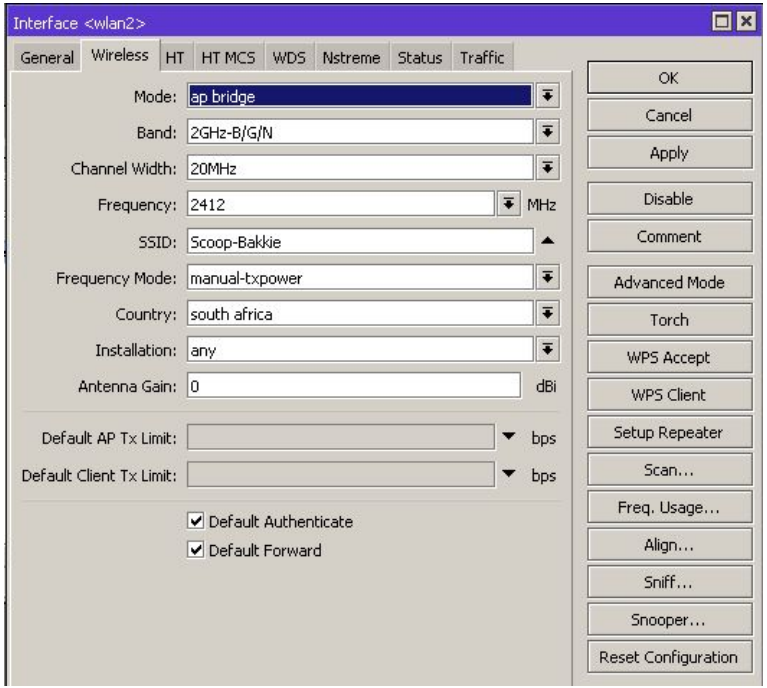
- If it's not Sat or Sun between 18:00 and 07:00
- If it is Sat or Sun

Get a copy of the script HERE




```
/system scheduler
name="after hours" on-event=after-hours start-time=startup
```

WiFi Configuration



Basic AP with PSK for our implementation.

Adjust your TX power once installed in the vehicle to reduce cell size if necessary.

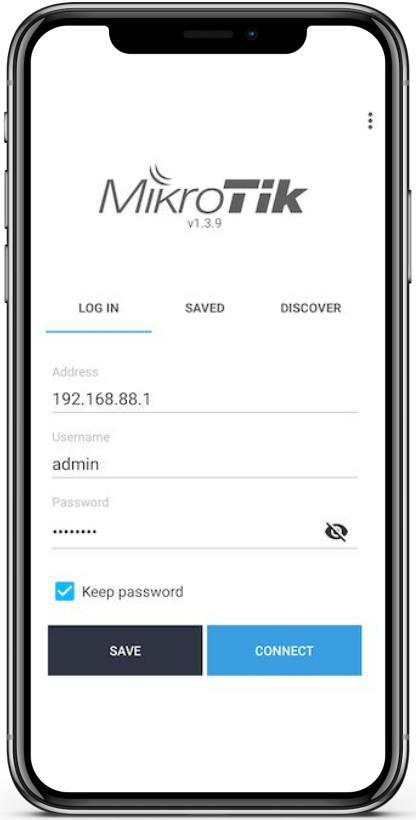
Mobile hotspots will require the ‘Hotspot’ package to be installed separately.

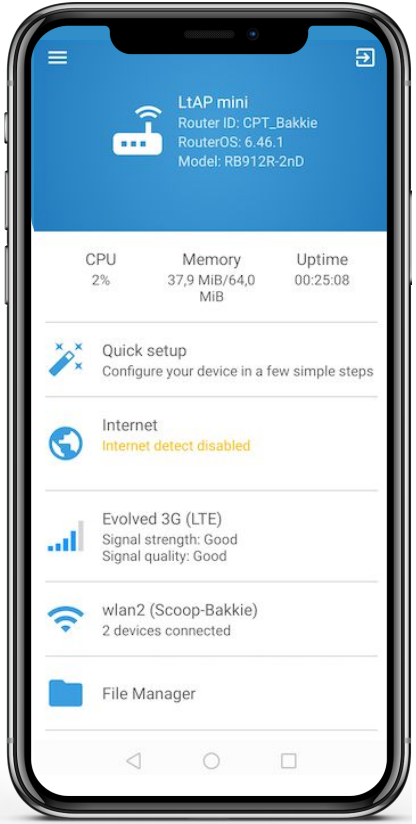
```
/interface wireless
set [ find default-name=wlan1 ]
antenna-gain=0 band=2ghz-b/g/n
country="south africa" disabled=no \
    frequency-mode=manual-txpower
mode=ap-bridge name=wlan2
security-profile=Profile1
ssid=Scoop-Bakkie
```

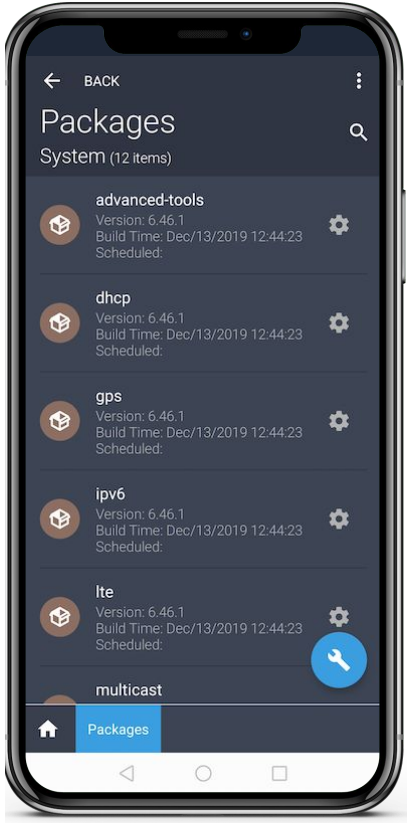
MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Management using MikroTik's App







We manage our routers via WiFi (mainly for ROS updates) as our fleet is small

For larger fleets and remote management you could use tunnelling and RoMON

MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Vehicle Installation

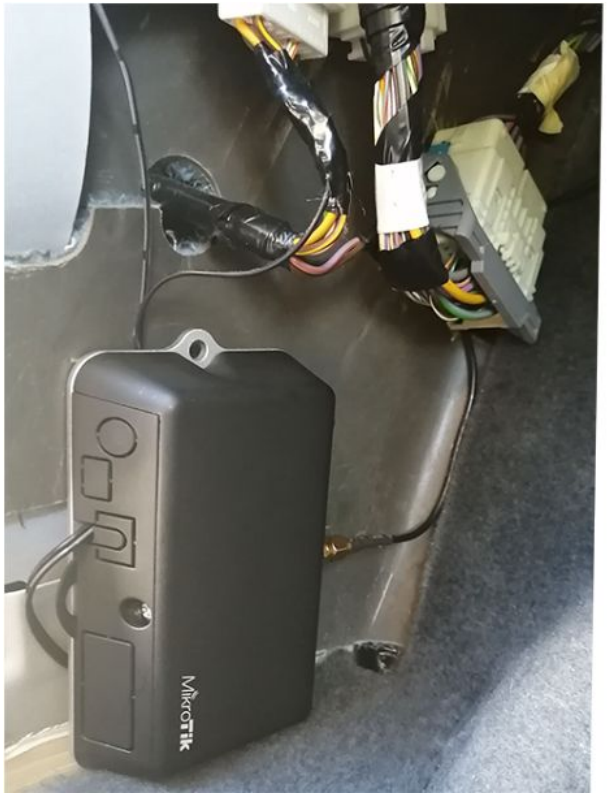
- Option 1 - 5v USB for Plug & Play (Awesome for testing)
- Option 2 - 12v connection to ignition switch. Requires tapping into your vehicle's PSU. Your vehicle warranty could be affected
- LtAP-HD - 12v connection via the automobile connector

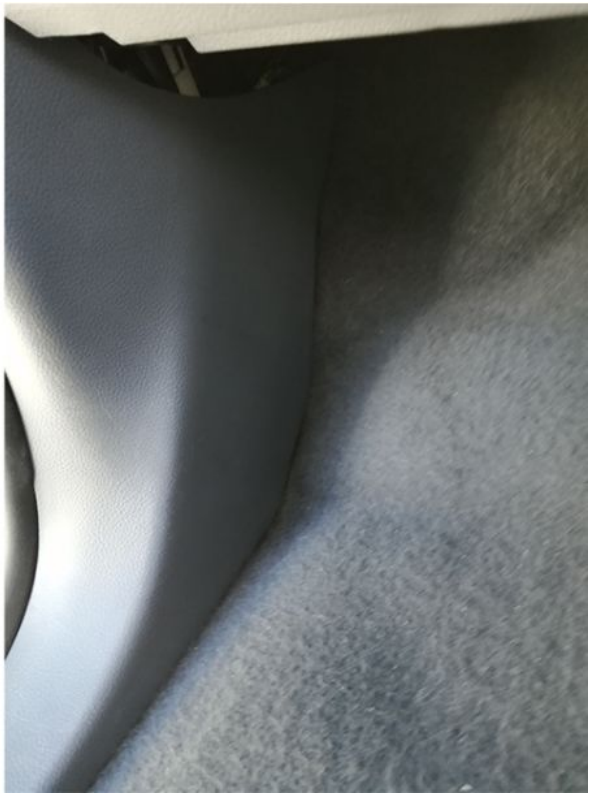
Vehicle Installation

MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Vehicle Installation

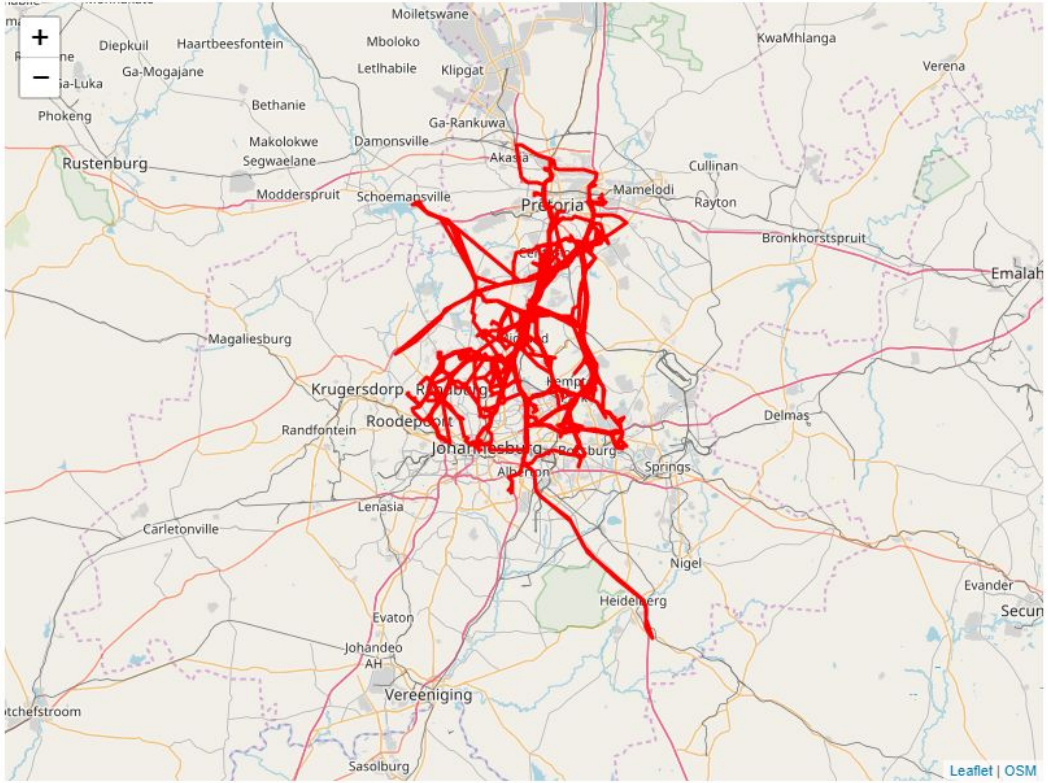




Vehicle Installation

- Install the GPS antenna in a fixed location where it has access to the satellites
- We chose to install on the dashboard to reduce the risk of tampering
- MikroTik's antenna is magnetic for easy fitting to the body of the vehicle

Pre Customisation



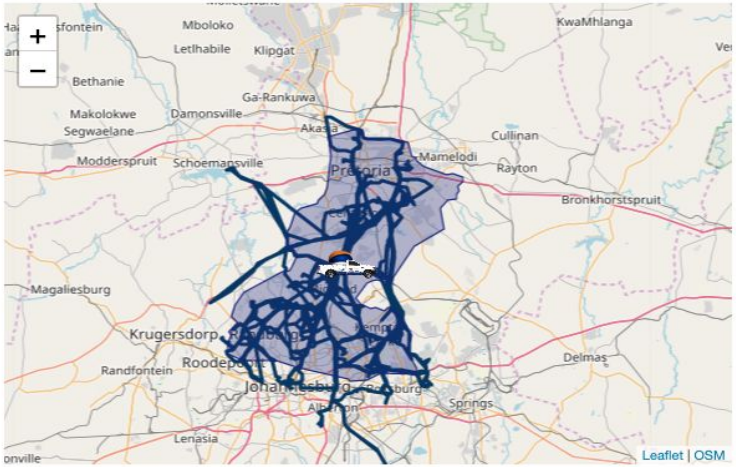
MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Post Customisation

scoop
Your Network | Our Passion

JHB CPT DBN



Show 10 entries Search:

Latitude	Longitude	Time Added	Details
-25.940558	28.144784	2020-01-09 17:06:36	View
-25.940566	28.144814	2020-01-09 17:05:37	View
-25.940193	28.144308	2020-01-08 12:54:39	View
-25.934141	28.147369	2020-01-08 12:51:36	View
-25.921512	28.153541	2020-01-08 12:49:37	View
-25.911608	28.159333	2020-01-08 12:48:37	View
-25.908471	28.159176	2020-01-08 12:47:37	View
-25.897256	28.159545	2020-01-08 12:46:37	View
-25.892528	28.160138	2020-01-08 12:45:37	View
-25.884671	28.161245	2020-01-08 12:44:37	View

Showing 1 to 10 of 15,924 entries

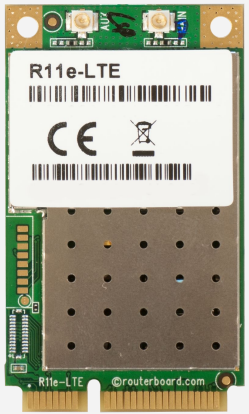
Previous 1 2 3 4 5 ... 1593 Next

Old Pretoria Johannesburg Road, Johannesburg Ward 92, City of Johannesburg Metropolitan Municipality, Gauteng, 1683, South Africa

MikroTik ZA MUM 2020

scoop
Your Network | Our Passion

Data Usage



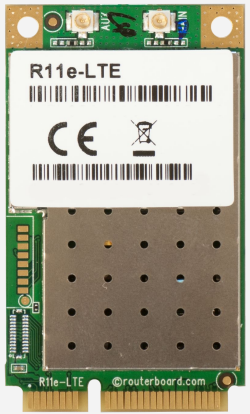
Scoop DBN

Active

data plan:
pay as you use

gig limit balance:
10.00GB left of 10GB

view



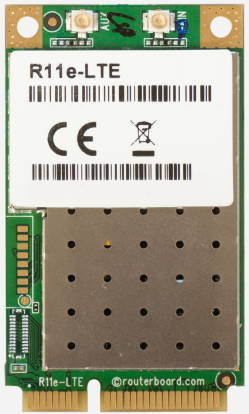
Scoop JHB

Active

data plan:
pay as you use

gig limit balance:
9.80GB left of 10GB

view



Scoop CPT

Active

data plan:
pay as you use

gig limit balance:
9.73GB left of 10GB

view

MikroTik ZA MUM 2020

scoop Your Network | Our Passion

Objectives

- GPS Tracking with simple user interface for our management team
- WiFi connectivity for our drivers for VoIP, IM and Maps
- Alerts when our vehicles are started at irregular times
- Low maintenance solution

Further Possibilities

- Content filtering
- Mobile hotspot
- SIM redundancy and/or roaming
- SMS and/or IM alerts
- Tunnelling for remote management

Links

scoop.co.za

Blogs

Scoop Distribution LinkedIn

Github Walk-Through Guide

Timothy Symonds

Chief Technical Officer | Technical Trainer | UBWA, UBWS, UEWA, MT...

Visit our stand in the exhibition area we would love to chat about all things MikroTik with you!

Thank You!

MikroTik ZA MUM 2020

scoop Your Network | Our Passion