

# Accel-ppp on OpenWrt with MESHdesk

## Background

- One of the main goals of MESHdesk is to enable fast WiFi deployment with commercial off-the-shelf (COTS) hardware and open source firmware.
- Another goal is the ability to manage network usage.
- For **bandwidth** and **data usage** management we include a captive portal.
- An alternative to a captive portal is PPPoE.
- In 2021 we introduced PPPoE client support in MESHdesk and APdesk.
- PPPoE is used by most WISPs.
  - In South Africa (and probably in most other countries) the PPPoE server of choice is provided by Mikrotik's RouterOS.
  - This is combined with the CPE of choice (usually Ubiquiti).
- There is already a solid and feature-rich open source PPPoE server called **Accel-ppp** for Linux.
- As we strongly believe in open source we want to offer a completely open source system for Internet providers.
- The biggest hurdle was compiling Accel-ppp and getting it to run under OpenWrt.
- Then we had to integrate it with MESHdesk and APdesk.
- This was no easy task but thanks to the work that others have done in the past we were able to draw on this knowledge and develop this last missing piece of the puzzle.
- Now that this part is complete we can offer Internet providers a managed alternative that could serve as a drop-in replacement for their current vendor-specific PPPoE servers.

## POC using a \$15 AP

- When fishing, it is much more fun to catch a big fish with a light line.
- For this Proof Of Concept (POC), we decided to go light on the hardware too.
- The Xiaomi 4C was on special offer, so we grabbed a couple of them.
- The price of the special offer was equivalent to ~15USD per device.

Home / Xiaomi Mi Wireless Router 4C

SAVE R 120



### Xiaomi Mi Wireless Router 4C

Product Code: 00000000010174128 ★★★★★ (20)

- Wireless speeds of up to 300Mbps
- 4 omnidirectional external antennas
- 64MB memory
- Smart unauthorized access prevention
- Wi-Fi optimization
- Smart control via app
- 1 Year warranty

Sale ends Thursday, 30 November 2023

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No interest, no fees, 4x instalments over 6 weeks



- MESHdesk and APdesk support WiFi 6 and hardware with up to three radios.
- We have deliberately chosen entry-level hardware for this POC to prove a point.

• Here are the technical details of the AP:

Model	SoC	CPU MHz	Flash MB	RAM MB	WLAN Hardware	WLAN2.4	WLAN5.0	100M ports
Mi Router 4C	MediaTek MT7628AN	580	16	64	MT7628AN	b/g/n	-	3

## POC networks

### Jhb-South (Main Mesh)

- We used the Wizard in RADIUSdesk to create a cloud called **Jhb-South**.
- We edit the **Jhb-South** mesh Exit Points:
  - Remove the bridge exit point
  - Add a PPPoE server exit point.
  - This connects then with the **Jhb-South Wireless SSID**

- Jhb-South will be our main mesh network to which various APs will connect via WiFi and PPPoE.

## Client Mesh Networks

- We create two client mesh networks named **Jhb-South-Unit1** and **Jhb-South-Unit2**.
- These can typically be a unit in a gated community.

Name ↑	Last Seen	Nodes	Actions
Jhb-South	1 minute ago	ALL 2 ONLINE	
Jhb-South-Unit1	17 seconds ago	ONLINE	
Jhb-South-Unit2	5 minutes ago	ONLINE	

## PPPoE RADIUS users

- We create permanent users that are used by the gateway AP of the client mesh networks.
- Since Accel-ppp can serve as replacement for Mikrotik, we can use the old Mikrotik attributes as they are.
- Accel-ppp will interpret them and apply the desired shaping.



- Accel-ppp also supports the advanced shaping functions that the Mikrotik PPPoE server do such as bursting.
- Again, there is no need to change any of the current Mikrotik reply attributes from RADIUS. It will interpret and apply even the advanced Mikrotik reply values.

The screenshot shows a window titled "RADIUS client" with a close button in the top right. The window is divided into two main sections: "Request" on the left and "Reply" on the right. The "Request" section contains three dropdown menus: "Request type" set to "Authentication", "User type" set to "Permanent user", and "Username" set to "unit2@jhb-south". At the bottom of the "Request" section is a blue button with a checkmark and the text "OK". The "Reply" section contains two boxes. The top box, titled "Request Attributes", has a light blue background and lists four attributes: "Calling-Station-Id = 'AA-AA-AA-AA-AA-AA'", "User-Name = 'unit2@jhb-south'", "Called-Station-Id = 'BB-BB-BB-BB-BB-BB'", and "Cleartext-Password = 'testing123'". The bottom box, titled "Reply Attributes", has a light green background and lists three attributes: "Mikrotik-Rate-Limit = '2M/2M'", "WISPr-Bandwidth-Max-Down = 2048", and "WISPr-Bandwidth-Max-Up = 2048".

## Add gateway nodes to client networks

- We add gateway nodes to our client networks.
- We specify their Internet Connection as **WiFi Client - PPPoE** and provide the required information.

The screenshot shows the configuration page for a mesh node in RADIUSdesk. The top navigation bar includes 'Meshes', 'Mesh Nodes', 'AP Profiles', 'APs', and 'New Arrivals - Hardware'. A dropdown menu is open for 'Unit1-Gw'. The configuration form includes the following fields:

- Mesh:** Jhb-South-Unit1
- Name:** Unit1-Gw
- Description:** (empty)
- Hardware model:** Xiaomi 4C 300M
- MAC Address:** 9C-9D-7E-83-45-87
- Static entry points:** Select Static Entry Points
- Internet Connect:** WIFI Client - PPPoE
- SSID:** Jhb-South Wireless
- Encryption:** WPA2 Personal
- Passphrase:** 12345678
- Username:** unit1@jhb-south
- Password:** (masked with dots)
- DNS Primary:** (empty)
- DNS Secondary:** (empty)

### Up and running overview

- Now that the client gateway nodes have been added, we can display everything in a grid.

The screenshot shows the 'Meshes' overview page in RADIUSdesk. The top navigation bar includes 'Meshes', 'Mesh Nodes', 'AP Profiles', 'APs', and 'New Arrivals - Hardware'. A 'Cloud' dropdown is set to 'Jhb-South'. Below the navigation bar is a toolbar with icons for refresh, add, delete, edit, and power. The main content is a table of mesh nodes:

Mesh ↓	Name	MAC Address	Hardware	Last 24 Hours	Avail	Config Fetched	Heartbeat Re...	IP Address	Internet Connection	Actions
Jhb-South	Node-2	64-64-4A-39-9...	Xiaomi 4C 300M			2 hours ago	1 minute ago	10.5.5.5	MESH	
Jhb-South	PPPoE-GW	9C-9D-7E-83-4...	Xiaomi 4C 300M			2 hours ago	54 seconds ago	10.5.5.4	LAN	
Jhb-South-Unit1	Unit1-Gw	9C-9D-7E-83-4...	Xiaomi 4C 300M			2 hours ago	42 seconds ago	10.5.5.2	-28 dBm	
Jhb-South-Unit2	Unit2-Gw	80-3F-5D-B9-8...	Wavlink HALO ...			2 hours ago	41 seconds ago	10.5.5.1	-18 dBm	

- A few important points about the screenshot above.
- The Jhb-South mesh has two nodes: PPPoE-GW and Node-2.
- The Internet connection for PPPoE-GW is via Ethernet (LAN).

- The Internet connection for Node-2 is the mesh.
- The nodes in the client networks use WiFi for the Internet (WiFi with PPPoE)
- Although not shown here, one client AP is connected to the WiFi of the PPPoE-GW. The other client AP is connected to the WiFi of Node-2.

The screenshot shows the RADIUSdesk NETWORK interface. At the top, there's a navigation bar with 'RADIUSdesk | NETWORK' and a 'Cloud' dropdown set to 'Jhb-South'. Below this are tabs for 'Meshes', 'Mesh Nodes', 'AP Profiles', 'APs', and 'New Arrivals - Hardware'. The 'Meshes' tab is active, showing a summary of 'Meshes 3 (3 ONLINE)' and 'Mesh Nodes 4 (4 ONLINE)'. A table below lists the meshes:

Name ↑	Last Seen	Nodes	Actions
Jhb-South	1 minute ago	ALL 2 ONLINE	
Jhb-South-Unit1	17 seconds ago	ONLINE	
Jhb-South-Unit2	5 minutes ago	ONLINE	

If it is necessary to extend the coverage of the client networks (Unit1 and Unit2), you can simply add more mesh nodes to the client networks.

## RADIUS Activity

- Finally we show the active sessions of Unit1 and Unit2 in RADIUS

The screenshot shows the RADIUSdesk USERS interface. At the top, there's a navigation bar with 'RADIUSdesk | USERS' and tabs for 'Permanent Users', 'Vouchers', 'Activity Monitor', and 'Top-Ups'. The 'Activity Monitor' tab is active, showing 'Accounting data' and 'Authentication data'. A 'Timezone' dropdown is set to 'Africa/Johannesburg'. Below this is a table of active sessions:

Username	Realm	NAS Identifier	Start time	Stop time ↓	Session time	Data in	Data out
unit1@jhb-south	Jhb-South	mpppoe_64_132	2023-11-19 16:38:27	1 hour Online	00:01:44:03	2.2 Mb	29.0 Mb
unit2@jhb-south	Jhb-South	mpppoe_64_132	2023-11-19 16:07:27	2 hours Online	00:02:16:04	907.7 Kb	7.7 Mb

- Since this is a replacement for Mikrotik, the extended RADIUSdesk functions such as FUP also work on the Accel-ppp PPPoE server.
- <http://radiusdesk.com/wiki/radiusdesk/profiles/fup>

## Load on PPPoE server

- We deliberately chose low-end hardware, and although we did not perform any stress tests, the memory and CPU utilization of the node running Accel-ppp looks very good, even when the two client APs are streaming Youtube.

- Our PPPoE clients are limited to 2Mbps up and down.

Username	IP Address	Calling SID	Called SID	Last Seen	Uptime	Rate Limit (kbps)	Rx-Bytes	Tx-Bytes	Actions
unit2@jhb-south	192.168.0.4	86:3f:5d:b9:88:f8	22:65:ec:b8:dd:3c	19 seconds ago	00:53:55	2000/2000	1.9 Mb	47.0 Mb	[Icons]
unit1@jhb-south	192.168.0.2	9a:9d:7e:83:45:88	22:65:ec:b8:dd:3c	19 seconds ago	00:54:40	2000/2000	69.1 Kb	53.0 Kb	[Icons]

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