

The background features a dark, almost black, space filled with intricate, glowing orange and yellow lines. These lines form a complex, three-dimensional grid of rectangular planes that appear to be receding into the distance, creating a sense of depth and perspective. The lines are sharp and bright, contrasting sharply with the dark background.

**How to make \$100 Mikrotik
work as an enterprise
network solution.**

Speaker



Pongpipat Thunyawiraphap

Mikrotik Certified Trainer

<https://mikrotiktutorial.com/>



Supadej Suthiphongkanasai

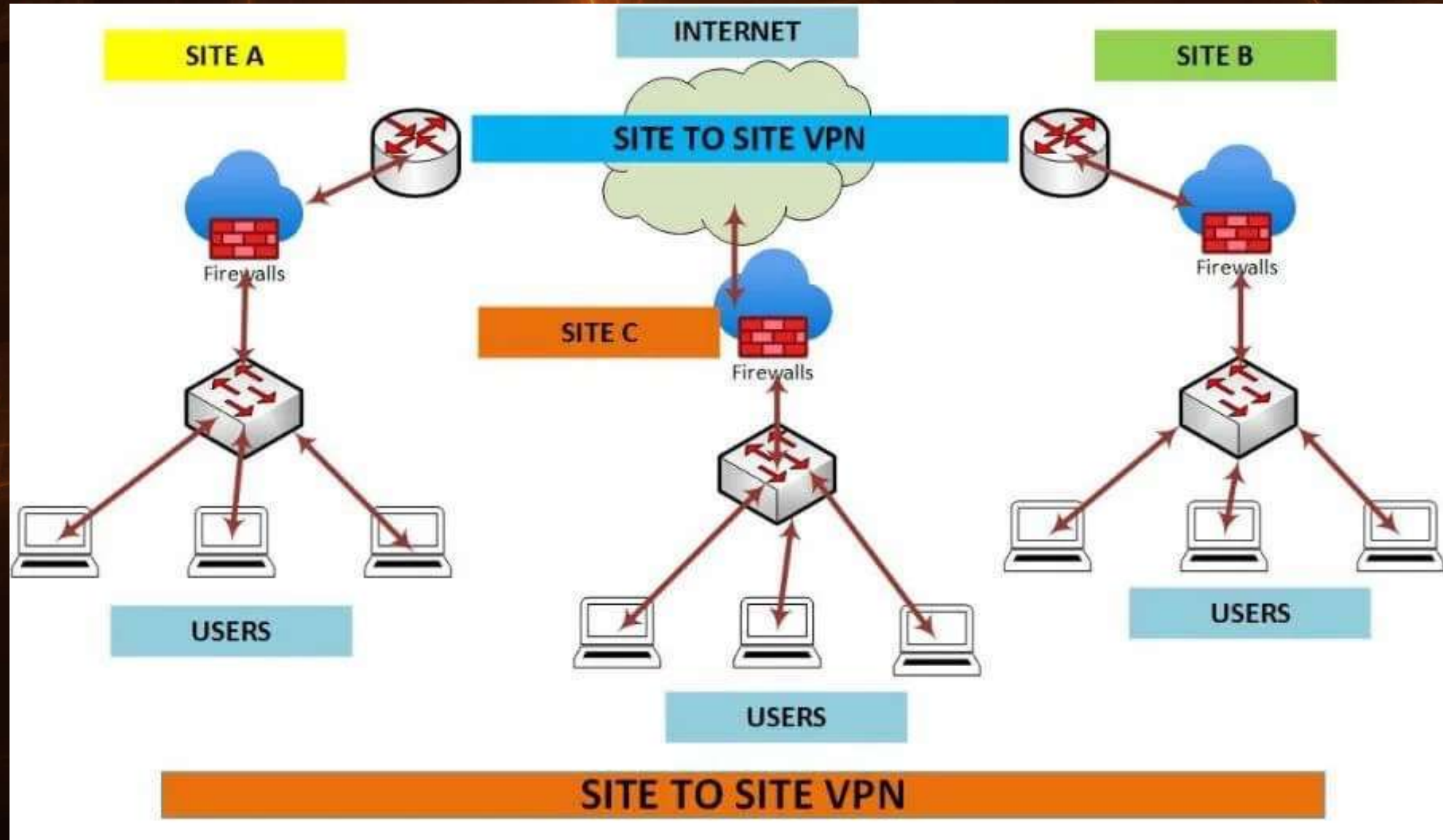
Mikrotik Certified Trainer

<https://packethunter.net/>

Disclaimer

- This demonstration is about how to use open source and Docker to show how the capabilities of Mikrotik can improve network services. It doesn't necessarily mean that Mikrotik is better than any other network device..

Network Diagram



hAP ax3

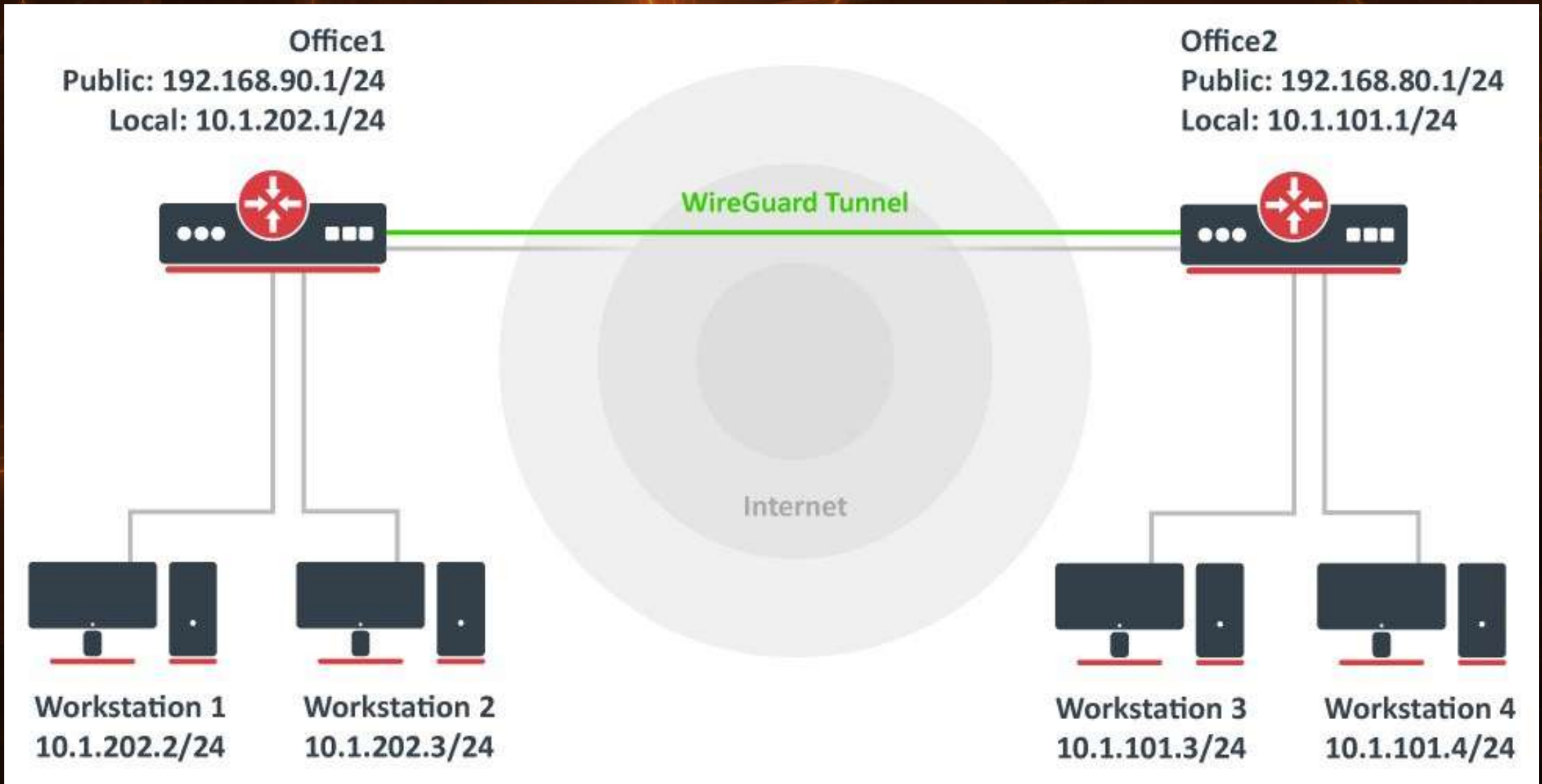


- RAM 1GB
- Ethernet
- USB 3.0
- 2.5Gbps

RouterOS 7.9

- Container
- WireGuard
- ZeroTier
- ROSE-Storage
- Let's Encrypt
 - `/certificate enable-ssl-certificate dns-name=⟨⟨FQDN⟩⟩`
- User-Manager with EAP Authentication and 802.1x

WireGuard



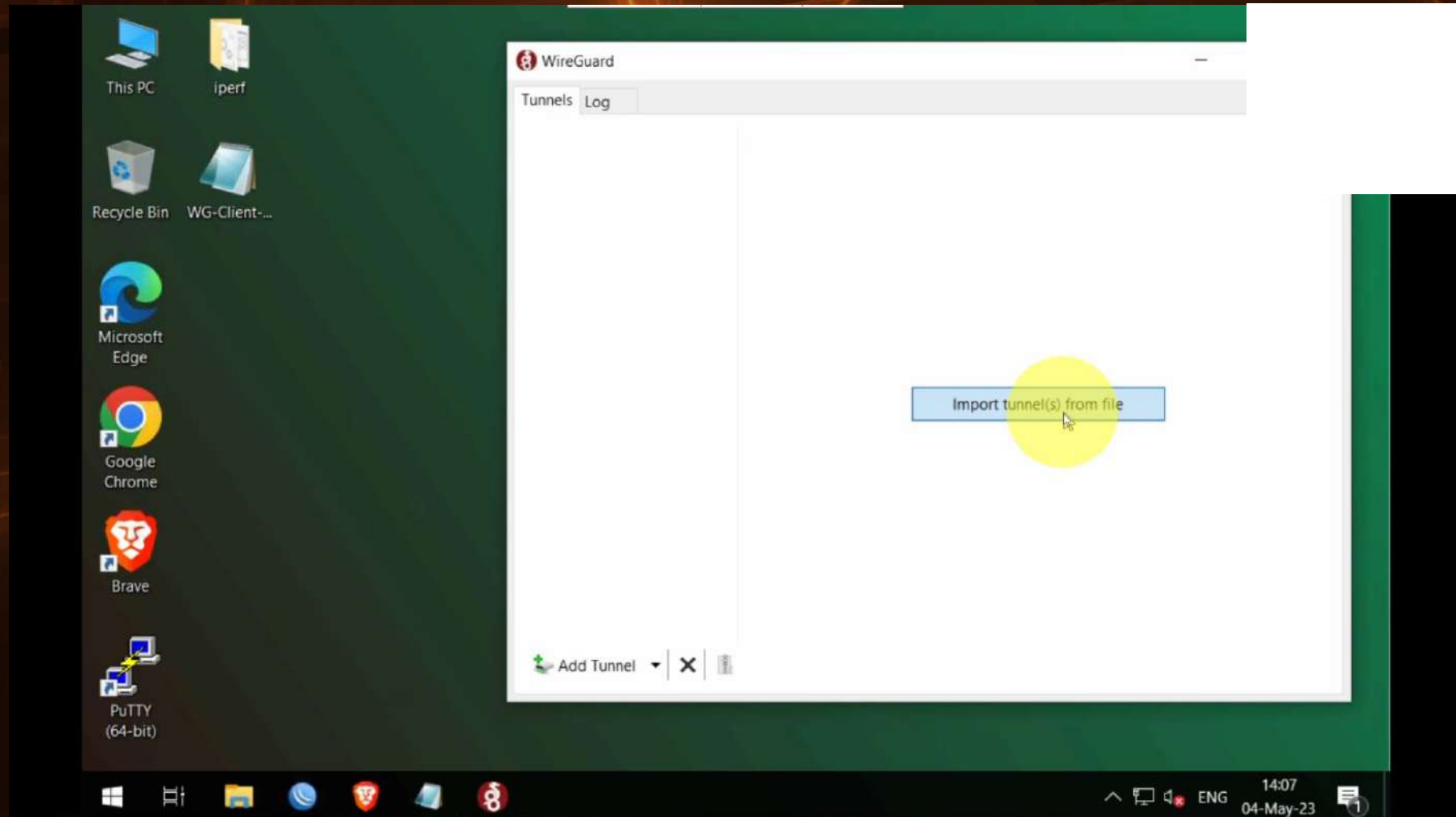
ความเร็ว VPN WireGuard UU hAP ax3

```
[ 34] 0.00-10.00 sec 88.1 MBytes 73.9 Mbits/sec sender
[ 34] 0.00-10.00 sec 87.9 MBytes 73.7 Mbits/sec receiver
[ 36] 0.00-10.00 sec 18.1 MBytes 15.2 Mbits/sec sender
[ 36] 0.00-10.00 sec 17.9 MBytes 15.0 Mbits/sec receiver
[ 38] 0.00-10.00 sec 11.0 MBytes 9.23 Mbits/sec sender
[ 38] 0.00-10.00 sec 10.8 MBytes 9.05 Mbits/sec receiver
[ 40] 0.00-10.00 sec 94.9 MBytes 79.6 Mbits/sec sender
[ 40] 0.00-10.00 sec 94.7 MBytes 79.5 Mbits/sec receiver
[ 42] 0.00-10.00 sec 12.4 MBytes 10.4 Mbits/sec sender
[ 42] 0.00-10.00 sec 12.2 MBytes 10.2 Mbits/sec receiver
[SUM] 0.00-10.00 sec 598 MBytes 502 Mbits/sec sender
[SUM] 0.00-10.00 sec 595 MBytes 499 Mbits/sec receiver
```

iperf Done.

```
C:\Users\nicha\Downloads\iperf-3.1.3-win64\iperf-3.1.3-win64>
```

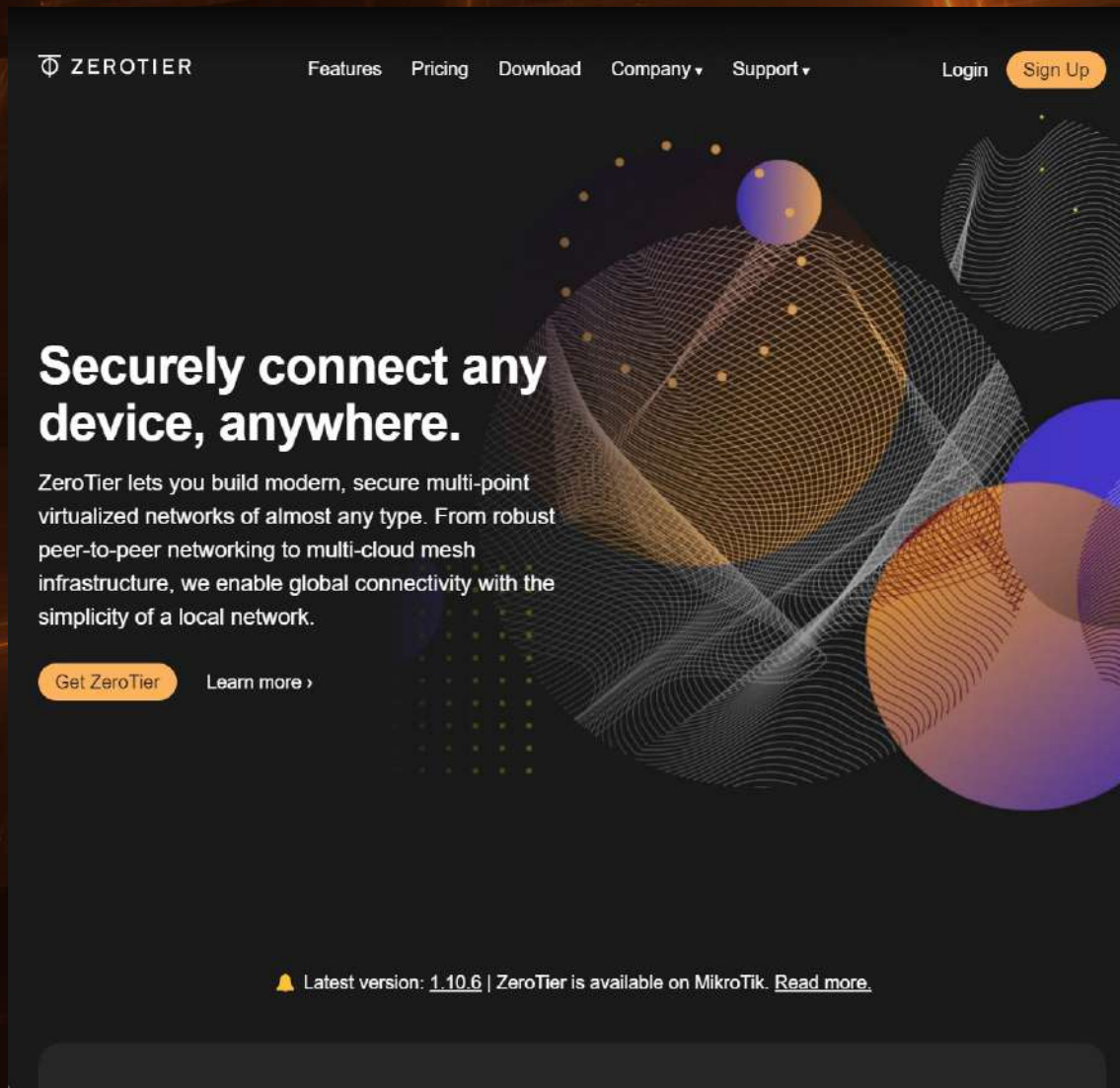

WireGuard ในฝั่ง Remote Access



WireGuard Pros and Cons

- **Agility.** WireGuard connects and reconnects fast, even when you're roaming across networks. It stays connected in situations where other VPN protocols would falter. Other VPN protocols sometimes feel brittle or clunky by comparison.
- **Security.** Compared to other VPN software, WireGuard chooses smart, modern cryptographic primitives with secure defaults. Plus, it's very small and simple in relation to older protocols, meaning that security researchers can audit it much more easily.
- **Speed.** WireGuard uses fast cryptography code. Plus, its low-level component lives within the Linux kernel (on servers and Linux desktops), making it faster than user space VPNs.
- **Ease of deployment.** Both the client and server parts of WireGuard are really easy to install. You can download ready-to-go client apps for desktops and mobile devices from the platform app store. On the server side, setting up WireGuard is not much harder than configuring SSH, a task that nearly every IT professional is familiar with.

ZeroTier



ZEROTIER

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Securely connect any device, anywhere.

ZeroTier lets you build modern, secure multi-point virtualized networks of almost any type. From robust peer-to-peer networking to multi-cloud mesh infrastructure, we enable global connectivity with the simplicity of a local network.

Get ZeroTier Learn more >

Latest version: [1.10.6](#) | ZeroTier is available on MikroTik. [Read more.](#)



Build your network and grow your business

ZeroTier automatically handles the complexities of networking across physical network boundaries, freeing you to spend your time on things that matter most.

Build Your Network

Next generation network virtualization

With ZeroTier you can treat the entire planet like one data center. Our network virtualization technology delivers the power of enterprise software-defined networking to every device, service, and application whether it's located on premise, at the edge, or in the cloud.

We solve hard networking problems for the world's most admired companies and organizations -- while millions use ZT for simple connectivity, from playing games online to connecting to their home networks from their mobile device.

Sign Up



Built by and for Developers

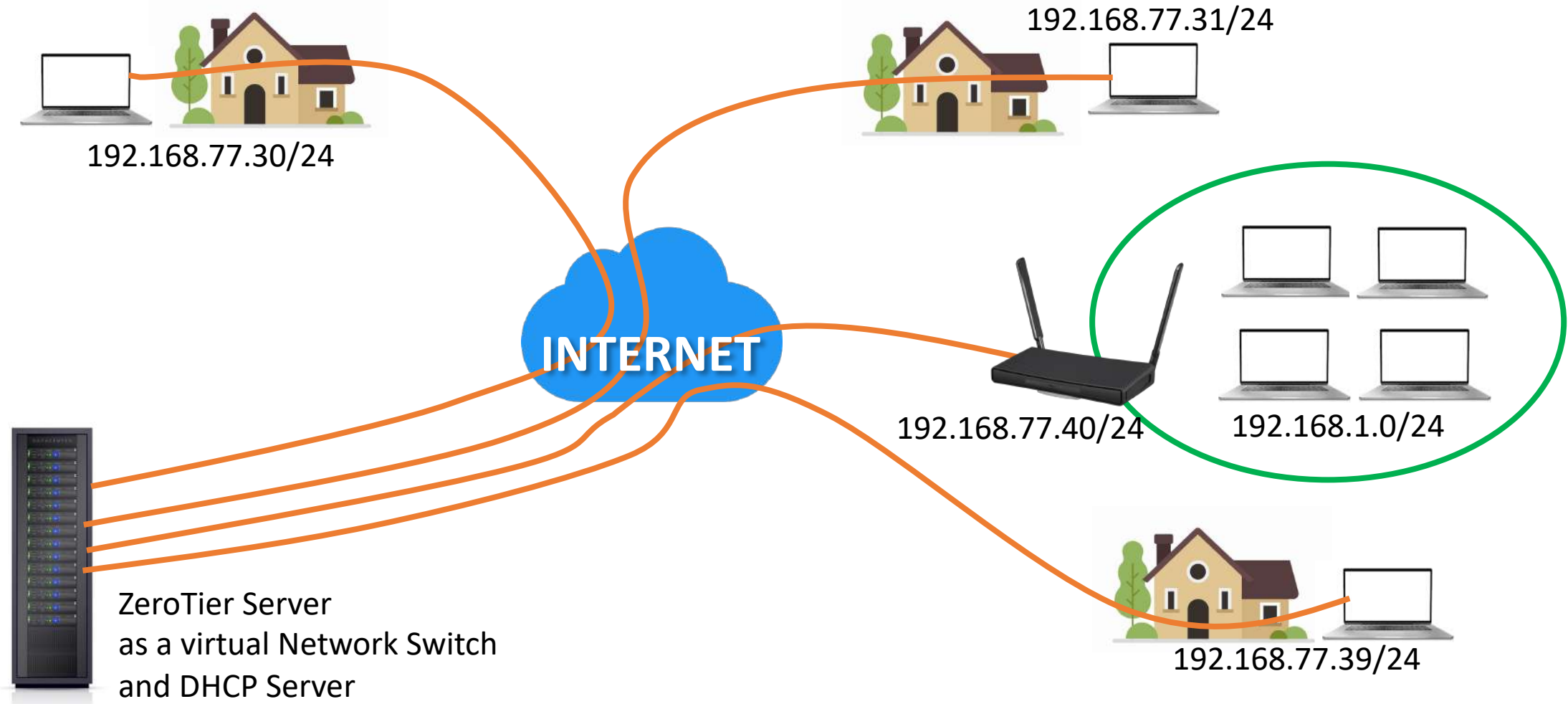
The ZeroTier SDK enables developers to seamlessly embed high-performance networking into modern applications that are both easier to create and pleasurable to use.

You now can build and deliver connected products and services faster with ZeroTier while avoiding the management cost, liability, and security impact of a large, highly-involved networking cloud presence.

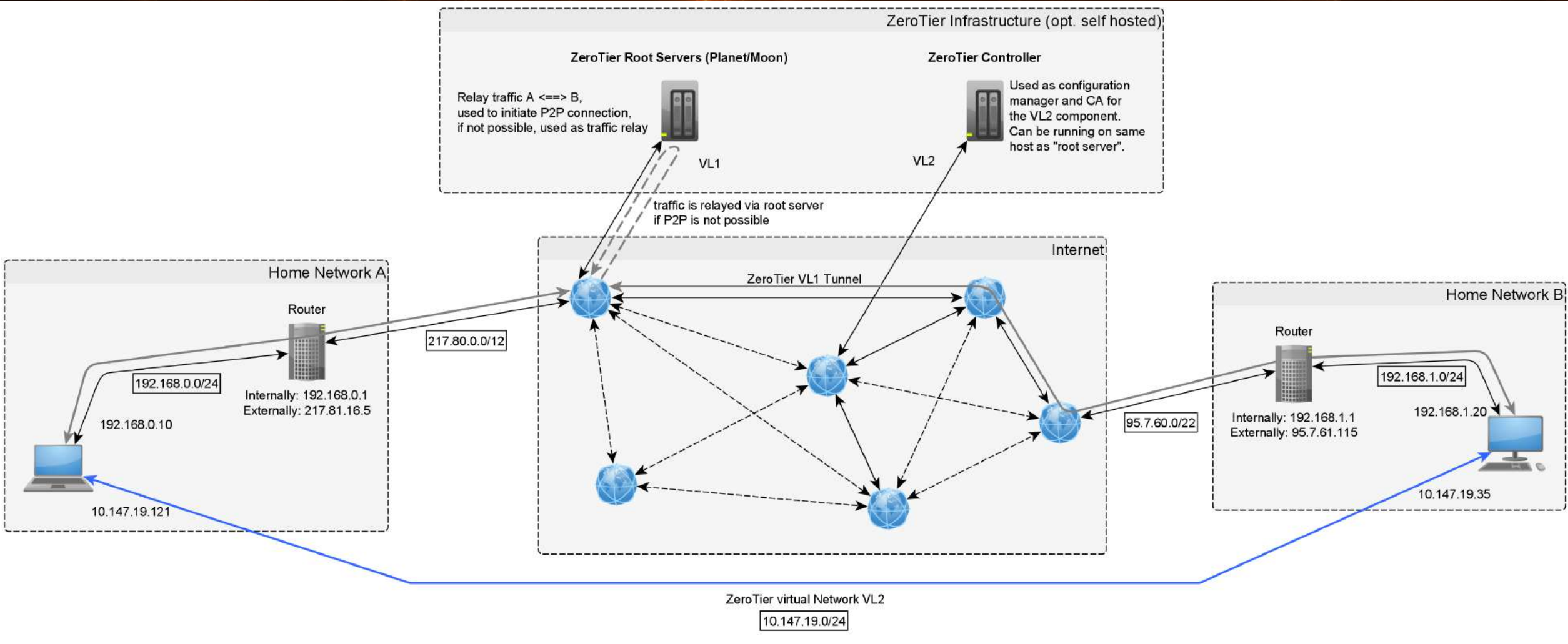
ZeroTier GitHub



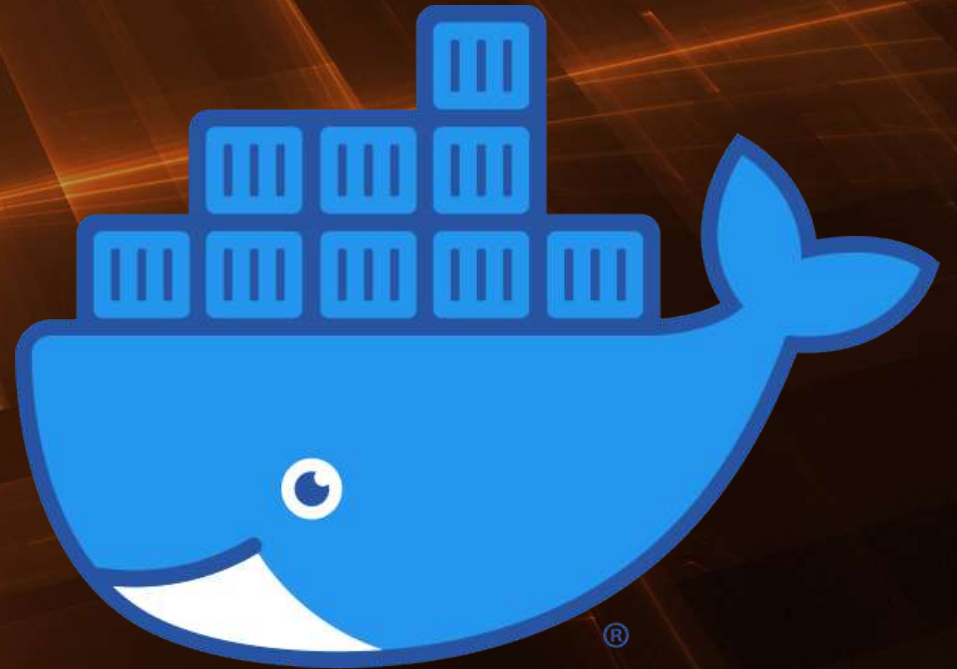
ZeroTier



ZeroTier



Mikrotik Container



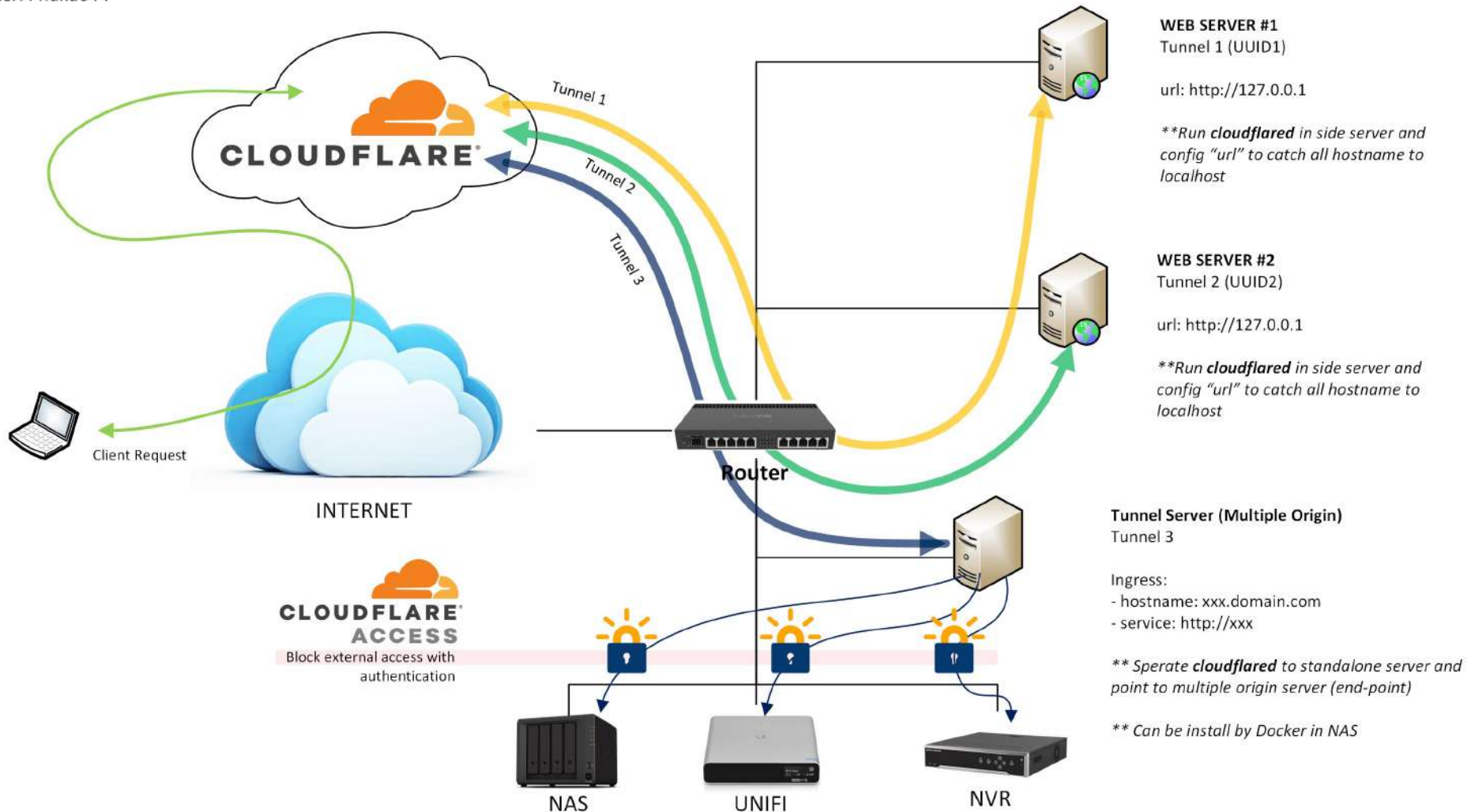
Container

- Some interesting containers
 - CloudFlare Tunnel
 - AdGuard
 - RustDesk

Cloudflare Tunnel and Cloudflare Access

Example design for multiple purpose

Designer: Phukao P.



Single Domain (Eg. www) on multiple webserver (none reverse-proxy / non Load-balance)

Method 1. Config DNS CNAME to round-robin method

- Record: WWW in CNAME to **tunnel-UUID1-.cfagrotunnel.com**

- Record: WWW in CNAME to **tunnel-UUID2-.cfagrotunnel.com**

Method 2. Use Cloudflare **Cloudflare Load Balancing** service

- The first 500,000 queries, shared across all Load Balancers, are FREE (per account).

- Ref: <https://developers.cloudflare.com/load-balancing/>


Cloudflare Tunnel

- <https://branch01.vrtunnel.net>
- <https://adguard-branch01.vrtunnel.net>

Cloudflare Tunnel

branch01.vrtunnel.net

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RouterOS v7.9

You have connected to a router. Administrative access only. If this device is not in your possession, please contact your local network administrator.

WebFig Login:

Login: Login

Password:

 Winbox  Graphs  License  Help

© [mikrotik](#)

Cloudflare Tunnel – Access Application



VRONLINE
adguard-branch01

Access to VROnline Asset

Get a login code emailed to you

Email



Send me a code

Login code for adguard-branch01.vrtunne



Cloudflare <noreply@notify.cloudflare.com>

to me ▾

Hello,

Click the link below to finish your login to adguard-branch01.vrtunnel.net
<https://vrontline.cloudflareaccess.com/cdn-cgi/access/callback?nonce=Y>

You can also copy and paste the code below into the Cloudflare Access

164517

This code will expire after 10 minutes or if you request a new code.

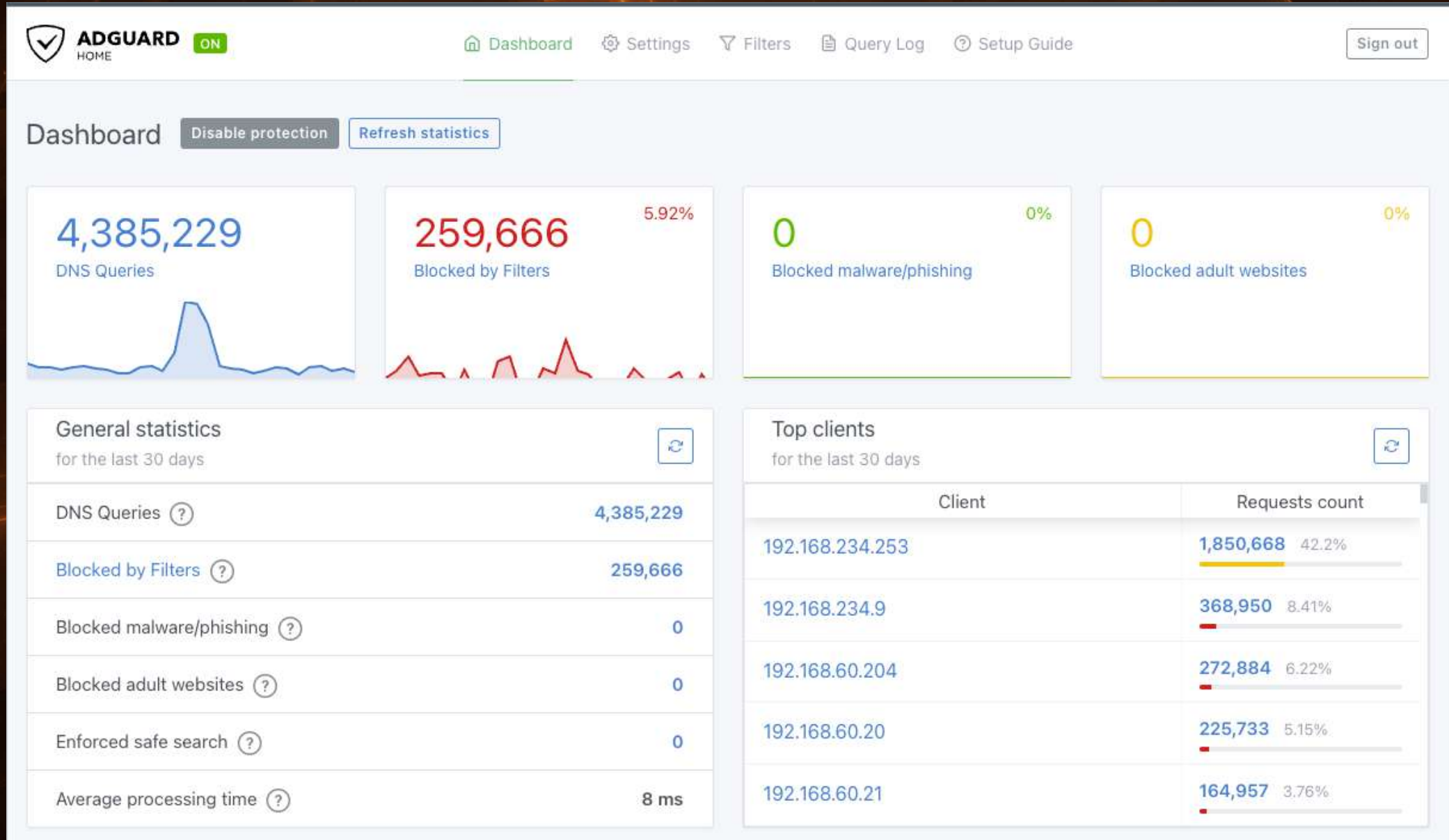
Thanks,

The Cloudflare Team

← Reply

→ Forward

AdGuard



AdGuard – Multiple Upstream DoH Server

DNS settings

Upstream DNS servers

Enter one server address per line. [Learn more](#) about configuring upstream DNS servers. Here is a [list of known DNS providers](#) to choose from.

```
https://dns.google/dns-query  
https://doh.opendns.com/dns-query  
https://dns10.quad9.net/dns-query  
https://security.cloudflare-dns.com/dns-query
```

Load-balancing

Query one upstream server at a time. AdGuard Home uses its weighted random algorithm to pick the server so that the fastest server is used more often.

Parallel requests

Use parallel queries to speed up resolving by querying all upstream servers simultaneously.

Fastest IP address

Query all DNS servers and return the fastest IP address among all responses. This slows down DNS queries as AdGuard Home has to wait for responses from all DNS servers, but improves the overall connectivity.

AdGuard – DNS Filtering List

DNS blocklists

AdGuard Home will block domains matching the blocklists.

AdGuard Home understands basic adblock rules and hosts files syntax.

Enabled	Name	List URL	Rules count	Last time updated	Actions
<input checked="" type="checkbox"/>	AdGuard DNS filter	https://adguardteam.github.io/Ad...	52,106	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	AdAway Default Blocklist	https://adaway.org/hosts.txt	6,542	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	Peter Lowe's List	https://pgl.yoyo.org/adserver/se...	3,738	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	Dan Pollock's List	https://someonewhocares.org/ho...	11,425	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	WindowsSpyBlocker - Hosts spy ...	https://raw.githubusercontent.co...	347	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	Scam Blocklist by DurableNapkin	https://raw.githubusercontent.co...	921	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	Dandelion Sprout's Anti-Malware...	https://raw.githubusercontent.co...	13,538	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	Game Console Adblock List	https://raw.githubusercontent.co...	11	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	OISD Blocklist Basic	https://abp.oisd.nl/basic/	51,389	May 15, 2023 at 10:55	✎ 🗑️
<input checked="" type="checkbox"/>	NoCoin Filter List	https://raw.githubusercontent.co...	409	May 15, 2023 at 10:55	✎ 🗑️

Previous

Page / 2

10 rows

Next

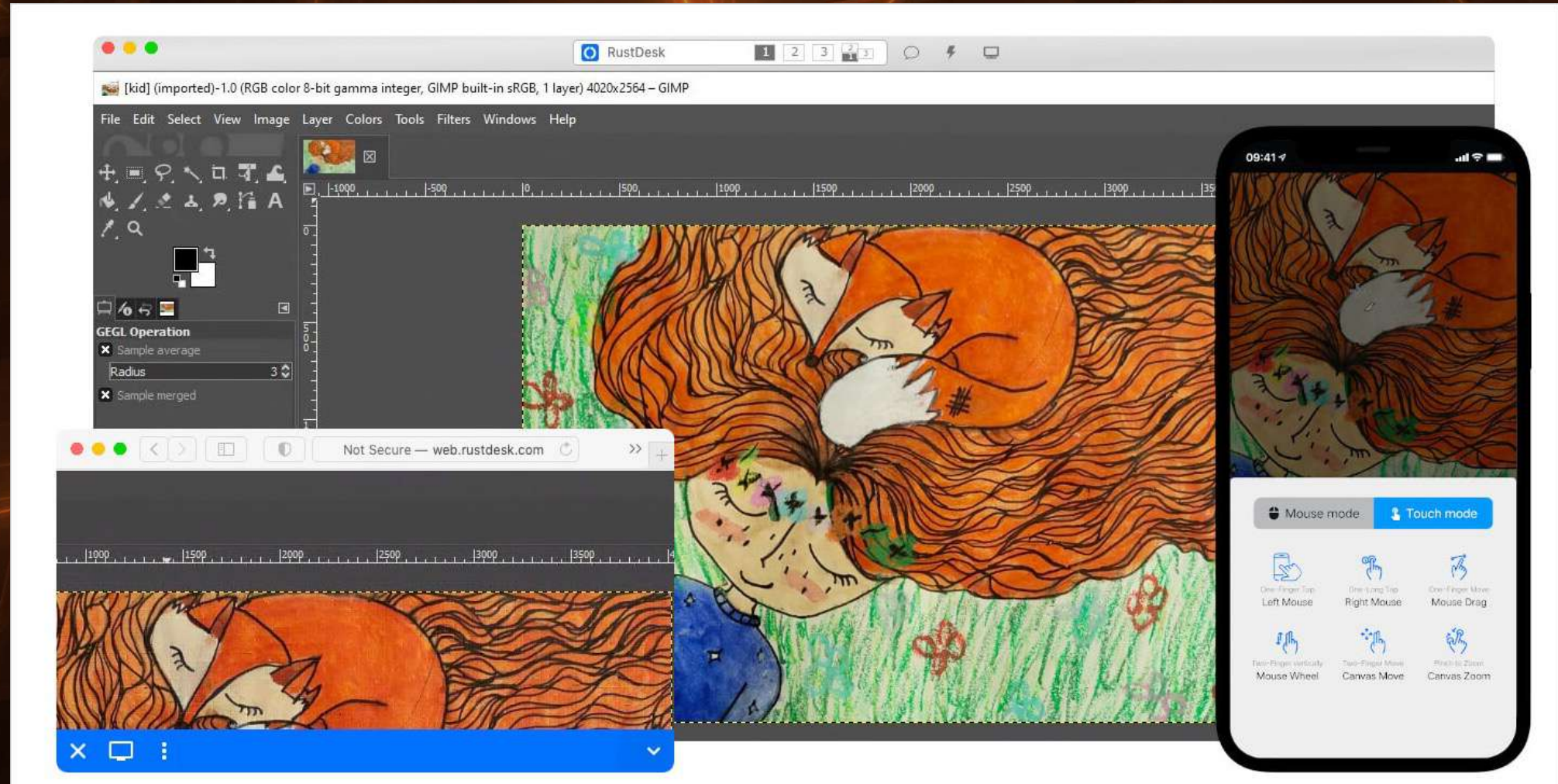
AdGuard – Service Block

The screenshot shows the AdGuard Home interface with the following elements:

- Header:** ADGUARD HOME logo, navigation menu (Home, Settings, Dashboard, Whitelist, Setup Guide), and a 'Logout' button.
- Section:** ปิดกั้นบริการ (Service Block) with a subtitle: อนุญาตให้บล็อกเว็บไซต์และบริการยอดนิยมได้อย่างรวดเร็ว (Allow blocking popular websites and services quickly).
- Filters:** Two tabs: ปิดกั้นทั้งหมด (Block All) and ปลดล็อคทั้งหมด (Unblock All).
- Service List:** A grid of 30 services, each with a toggle switch. The 'OnlyFans' service is highlighted with a red box.

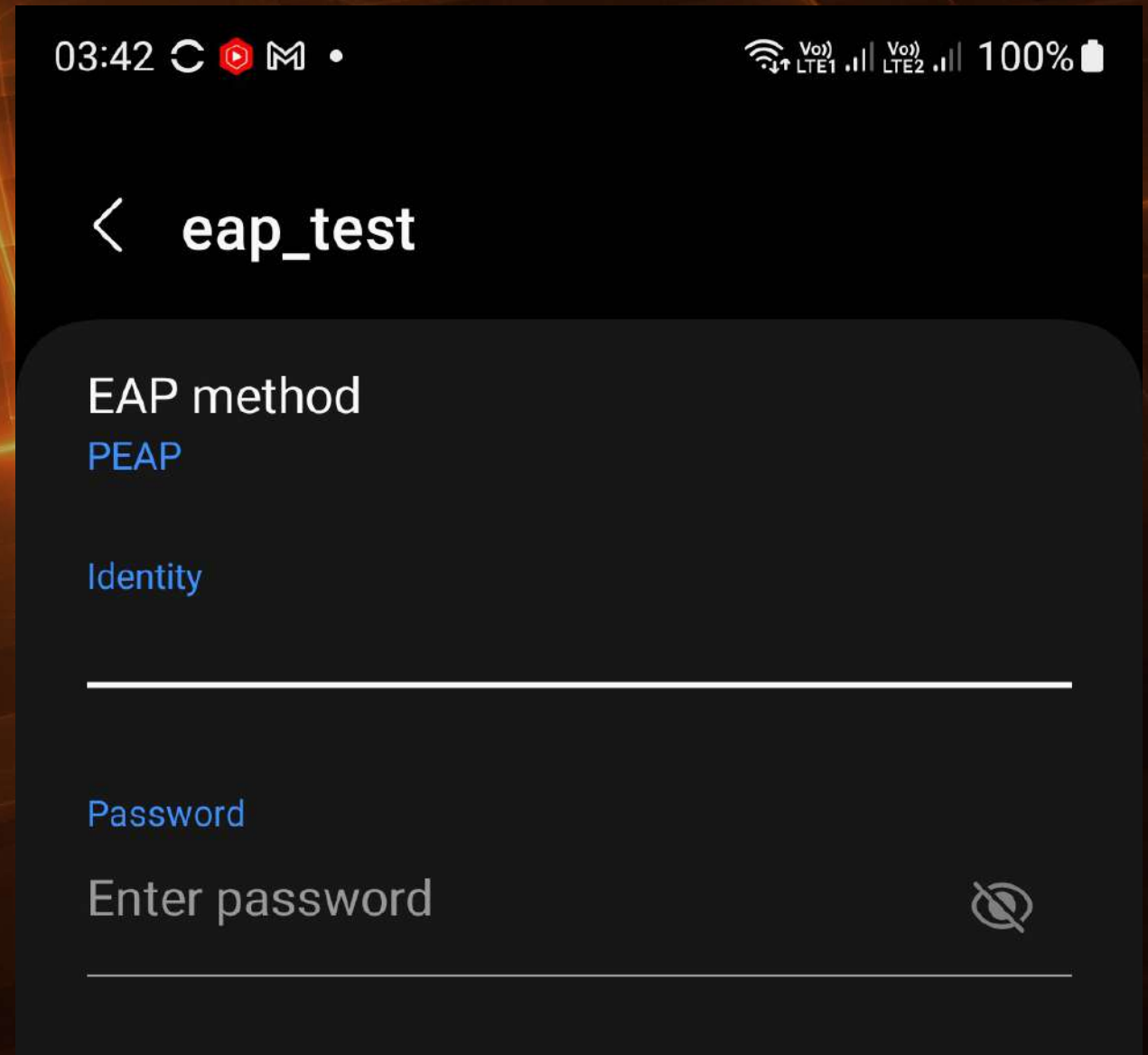
ปิดกั้นทั้งหมด	ปลดล็อคทั้งหมด
<input type="checkbox"/> 9GAG	<input type="checkbox"/> Bilibili
<input type="checkbox"/> CloudFlare	<input type="checkbox"/> Dailymotion
<input type="checkbox"/> Deezer	<input type="checkbox"/> Disney+
<input type="checkbox"/> Douban	<input type="checkbox"/> Epic Games
<input type="checkbox"/> Facebook	<input type="checkbox"/> HBO Max
<input type="checkbox"/> Hulu	<input type="checkbox"/> Imgur
<input type="checkbox"/> Instagram	<input type="checkbox"/> KakaoTalk
<input type="checkbox"/> Lazada	<input type="checkbox"/> LINE
<input type="checkbox"/> Mail.ru	<input type="checkbox"/> Minecraft
<input type="checkbox"/> Netflix	<input type="checkbox"/> OnlyFans
<input type="checkbox"/> Origin	<input type="checkbox"/> PlayStation
<input type="checkbox"/> Amazon	
<input type="checkbox"/> Crunchyroll	
<input type="checkbox"/> Discord	
<input type="checkbox"/> eBay	
<input type="checkbox"/> GOG	
<input type="checkbox"/> iCloud Private Relay	
<input type="checkbox"/> iQIYI	
<input type="checkbox"/> League of Legends	
<input type="checkbox"/> Mastodon	
<input type="checkbox"/> OK.ru	
<input type="checkbox"/> Pinterest	

RustDesk – Open source virtual / remote desktop infrastructure

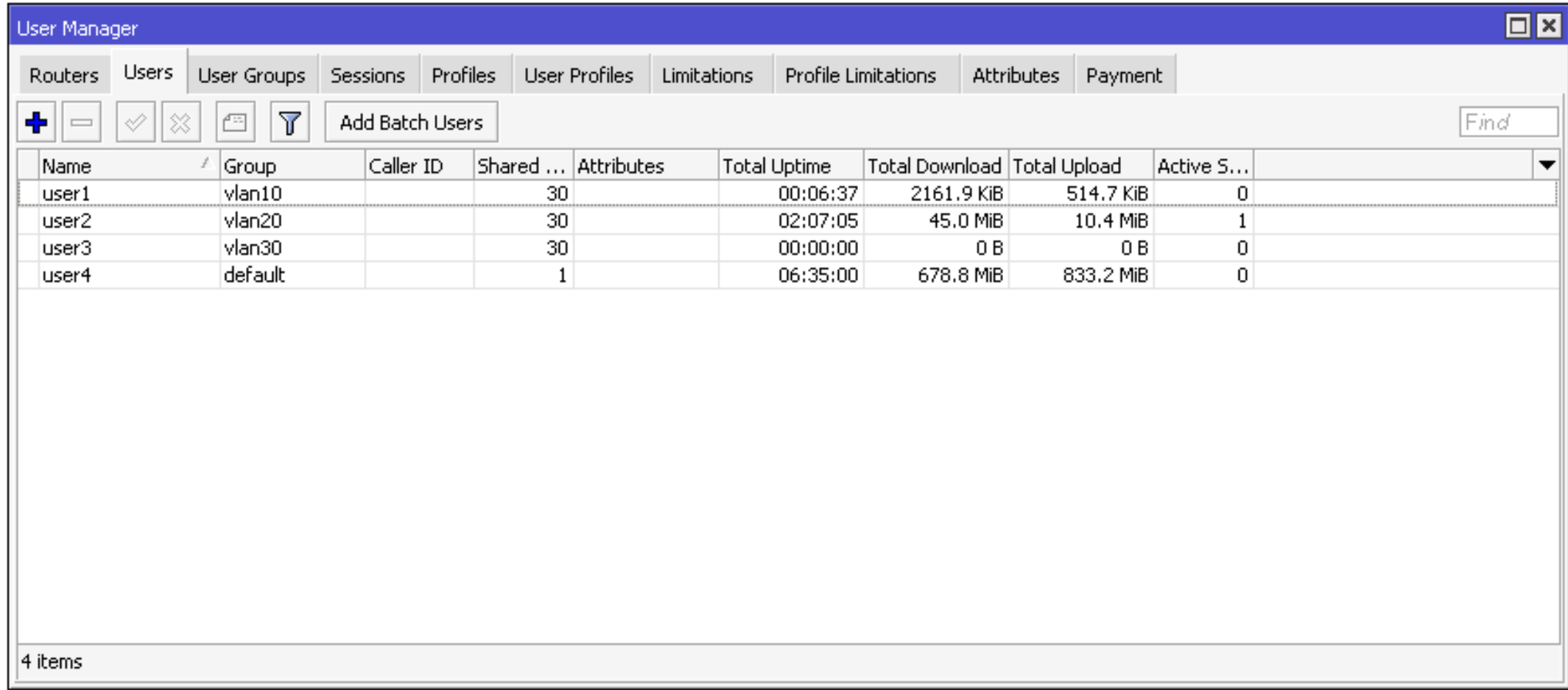


Mikrotik User manager (RADIUS Server)

- WiFi Extensible Authentication Protocol (EAP)
- 802.1X (dot1x)



Mikrotik User Manager (RADIUS Server)



The screenshot shows the Mikrotik User Manager web interface. The window title is "User Manager". The navigation tabs include "Routers", "Users", "User Groups", "Sessions", "Profiles", "User Profiles", "Limitations", "Profile Limitations", "Attributes", and "Payment". The "Users" tab is selected. Below the tabs is a toolbar with icons for adding, deleting, and filtering users, along with a search box labeled "Find". The main content area displays a table with the following data:

Name	Group	Caller ID	Shared ...	Attributes	Total Uptime	Total Download	Total Upload	Active S...
user1	vlan10		30		00:06:37	2161.9 KiB	514.7 KiB	0
user2	vlan20		30		02:07:05	45.0 MiB	10.4 MiB	1
user3	vlan30		30		00:00:00	0 B	0 B	0
user4	default		1		06:35:00	678.8 MiB	833.2 MiB	0

At the bottom left of the interface, it indicates "4 items".

Mikrotik User Manager (RADIUS Server)

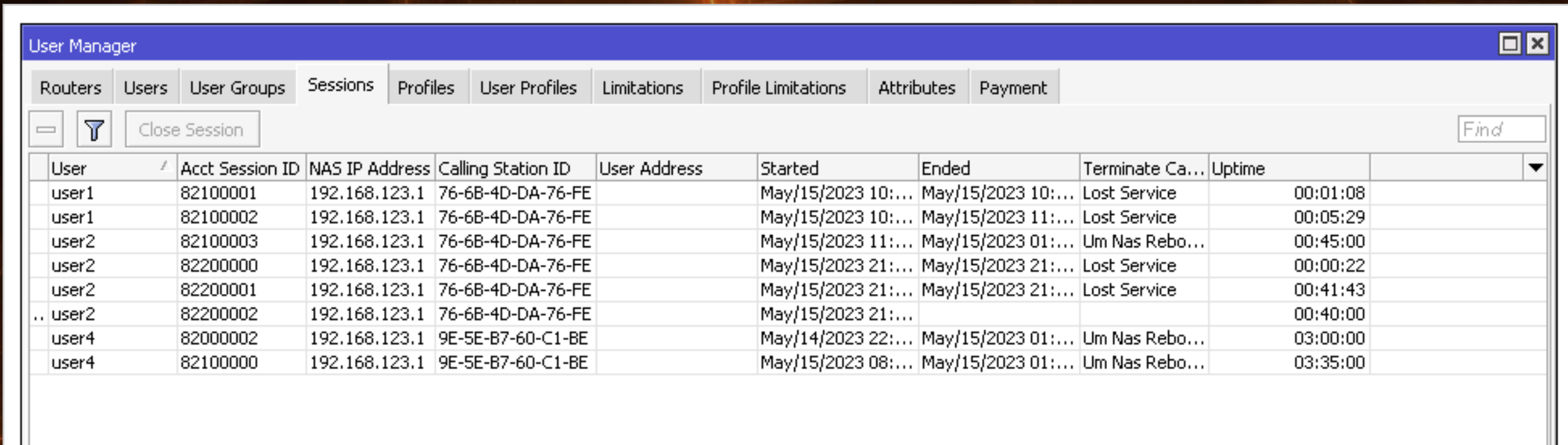
User Manager

Routers Users User Groups Sessions Profiles User Profiles Limitations Profile Limitations Attributes

+ - Filter

Name	Vendor ID	Type ID	Value Type	Packet Types	Standard Name
Acct-Interim-Interval	0 (standa..	85	uint32	access accept	Acct-Interim-...
Delegated-IPv6-Prefix	0 (standa..	123	ip6 prefix	access accept	Delegated-IP...
Framed-IP-Address	0 (standa..	8	ip address	access accept	Framed-IP-A...
Framed-IP-Netmask	0 (standa..	9	ip address	access accept	Framed-IP-N...
Framed-IPv6-Address	0 (standa..	168	ip address	access accept	Framed-IPv6-..
Framed-IPv6-Pool	0 (standa..	100	string	access accept	Framed-IPv6-..
Framed-IPv6-Prefix	0 (standa..	97	ip6 prefix	access accept	Framed-IPv6-..
Framed-Pool	0 (standa..	88	string	access accept	Framed-Pool
Idle-Timeout	0 (standa..	28	uint32	access accept	Idle-Timeout
Mikrotik-Address-List	14988 (M...	19	string	access accept	MT-Address-L..
Mikrotik-Advertise-Interval	14988 (M...	13	uint32	access accept	MT-Advertise...
Mikrotik-Advertise-URL	14988 (M...	12	string	access accept	MT-Advertise...
Mikrotik-DHCP-Option-Param-STR1	14988 (M...	24	string	access accept	MT-DHCP-Op...
Mikrotik-DHCP-Option-Param-STR2	14988 (M...	25	string	access accept	MT-DHCP-Op...
Mikrotik-DHCP-Option-Set	14988 (M...	23	string	access accept	MT-DHCP-Op...
Mikrotik-Delegated-IPv6-Pool	14988 (M...	22	string	access accept	MT-Delegate...
Mikrotik-Group	14988 (M...	3	string	access accept	MT-Group

Mikrotik User Manager (RADIUS Server)



The screenshot displays the Mikrotik User Manager web interface. The 'Sessions' tab is selected, showing a table of active sessions. The table columns include User, Acct Session ID, NAS IP Address, Calling Station ID, User Address, Started, Ended, Terminate Cause, and Uptime. The interface also features navigation tabs for Routers, Users, User Groups, Profiles, User Profiles, Limitations, Profile Limitations, Attributes, and Payment. A 'Close Session' button and a search field are visible above the table.

User	Acct Session ID	NAS IP Address	Calling Station ID	User Address	Started	Ended	Terminate Ca...	Uptime	
user1	82100001	192.168.123.1	76-6B-4D-DA-76-FE		May/15/2023 10:...	May/15/2023 10:...	Lost Service	00:01:08	
user1	82100002	192.168.123.1	76-6B-4D-DA-76-FE		May/15/2023 10:...	May/15/2023 11:...	Lost Service	00:05:29	
user2	82100003	192.168.123.1	76-6B-4D-DA-76-FE		May/15/2023 11:...	May/15/2023 01:...	Um Nas Rebo...	00:45:00	
user2	82200000	192.168.123.1	76-6B-4D-DA-76-FE		May/15/2023 21:...	May/15/2023 21:...	Lost Service	00:00:22	
user2	82200001	192.168.123.1	76-6B-4D-DA-76-FE		May/15/2023 21:...	May/15/2023 21:...	Lost Service	00:41:43	
.. user2	82200002	192.168.123.1	76-6B-4D-DA-76-FE		May/15/2023 21:...			00:40:00	
user4	82000002	192.168.123.1	9E-5E-B7-60-C1-BE		May/14/2023 22:...	May/15/2023 01:...	Um Nas Rebo...	03:00:00	
user4	82100000	192.168.123.1	9E-5E-B7-60-C1-BE		May/15/2023 08:...	May/15/2023 01:...	Um Nas Rebo...	03:35:00	

Dynamic VLAN Assignment

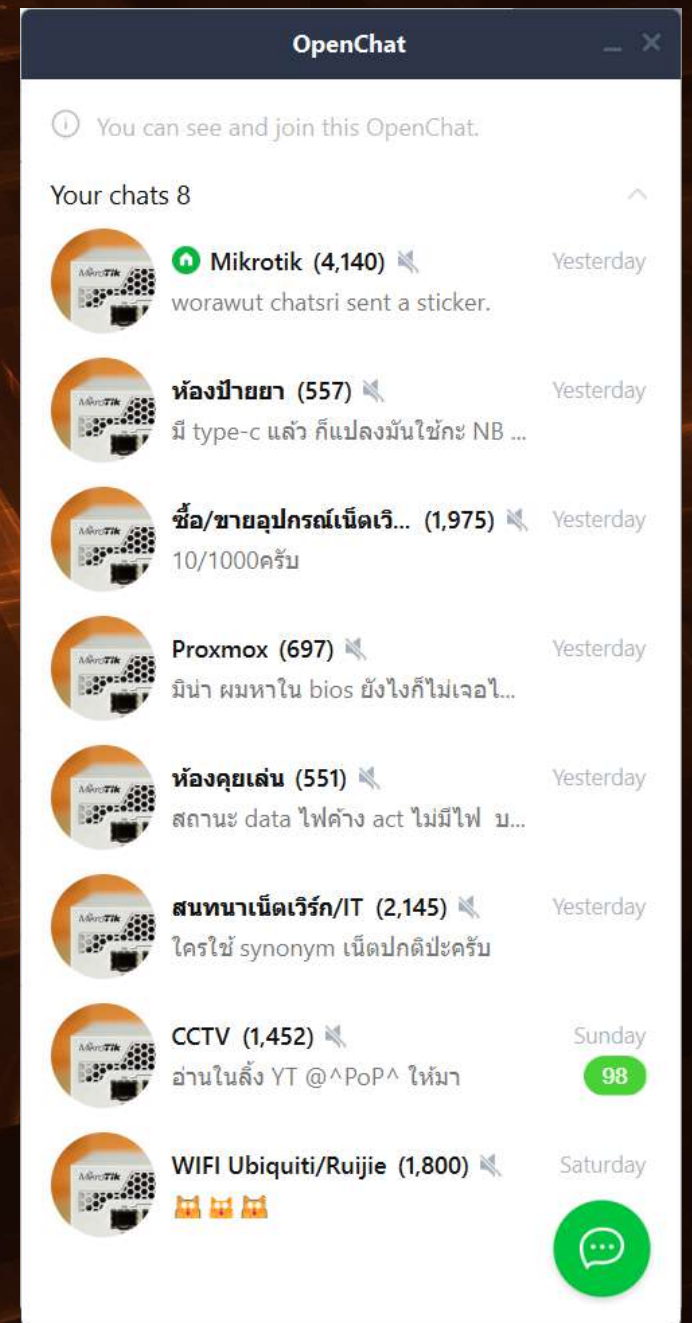
	Username	Password
vlan10	user1	user1
vlan20	user2	user2
vlan30	user3	user3

SSID : THAINOG-DEMO

Question?

 Mikrotik (4,140)

<https://bit.ly/MikrotikOpenCHAT>



YouTube Channel



@MikrotikTutorial

<https://mikrotiktutorial.com/>



@packethunter6673

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