

# Mikrotik in Network Operations in NZ - Learnings and Tricks

Or How I Stopped Worrying and Learned to Love Tricks

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# General Warnings

Tricks are still tricks

# General Warnings

- The tricks have limits to be aware of (noted with the tricks)
- Every effort should be made to avoid relying on tricks too much\*
- Always consider the side effects of any tricks implemented

# Network Tricks

Or lets get this show on the road

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# Triple NAT Trick

- Many network devices, to try be more secure, only accept requests from the local subnet (at least by default).
- These requests can be easily handled by a use of pinhole NAT to remotely access through a router (DST NAT followed by SRC NAT)
- However some devices are a little more tricky, these devices check the host header field in the http request and may return a 403 on mismatch

# Host Header

The Host Header field is a part of HTTP requests which is used to select which website hosted on the web server is displayed and which certificate to present (in HTTPS). Normally it will be the 'hostname' (or IP Address) put between the http:// and the first / at the end (including a specified port)

The screenshot shows a Wireshark capture of network traffic. The top pane displays a list of packets. Packet 4 is highlighted, showing an HTTP GET request from 10.250.0.56 to 50.116.106.7. The bottom pane shows the details of this packet, including the Hypertext Transfer Protocol section. The Host header is expanded, showing the value 'www.ufone.co.nz'. An orange arrow points from the Host header in the details pane to the Host header in the packet list pane.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.250.0.56	50.116.106.7	TCP	78	54634 → 80 [SYN, ECN, CWR] Seq=0 Win=65535 Len=0
2	0.190607	50.116.106.7	10.250.0.56	TCP	74	80 → 54634 [SYN, ACK, ECN] Seq=0 Ack=1 Win=14480
3	0.190994	10.250.0.56	50.116.106.7	TCP	66	54634 → 80 [ACK] Seq=1 Ack=1 Win=131200 Len=0 TS
4	0.191422	10.250.0.56	50.116.106.7	HTTP	562	GET / HTTP/1.1
5	0.387015	50.116.106.7	10.250.0.56	TCP	66	80 → 54634 [ACK] Seq=1 Ack=497 Win=15616 Len=0 T
6	2.960713	50.116.106.7	10.250.0.56	TCP	615	80 → 54634 [PSH, ACK] Seq=1 Ack=497 Win=15616 Le
7	2.960837	10.250.0.56	50.116.106.7	TCP	66	54634 → 80 [ACK] Seq=497 Ack=550 Win=130656 Len=
8	2.962325	50.116.106.7	10.250.0.56	TCP	1508	80 → 54634 [ACK] Seq=550 Ack=497 Win=15616 Len=1
9	2.963290	50.116.106.7	10.250.0.56	TCP	1508	80 → 54634 [ACK] Seq=1992 Ack=497 Win=15616 Len=
10	2.963375	10.250.0.56	50.116.106.7	TCP	66	54634 → 80 [ACK] Seq=497 Ack=3434 Win=128160 Len=
11	2.963705	50.116.106.7	10.250.0.56	TCP	1508	80 → 54634 [ACK] Seq=3434 Ack=497 Win=15616 Len=
12	2.967583	50.116.106.7	10.250.0.56	TCP	1508	80 → 54634 [ACK] Seq=4876 Ack=497 Win=15616 Len=

```
▶ Frame 4: 562 bytes on wire (4496 bits), 562 bytes captured (4496 bits) on interface 0
▶ Ethernet II, Src: Apple_19:eb:a2 (b8:e8:56:19:eb:a2), Dst: Routerbo_7a:f9:08 (e4:8d:8c:7a:f9:08)
▶ Internet Protocol Version 4, Src: 10.250.0.56, Dst: 50.116.106.7
▶ Transmission Control Protocol, Src Port: 54634, Dst Port: 80, Seq: 1, Ack: 1, Len: 496
▼ Hypertext Transfer Protocol
  ▶ GET / HTTP/1.1\r\n
    Host: www.ufone.co.nz\r\n
    Connection: keep-alive\r\n
    Upgrade-Insecure-Requests: 1\r\n
    User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_13_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/68...
    Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8\r\n
    ...
    request URI: http://www.ufone.co.nz/]
    P request 1/8]
    onse in frame: 27]
    t request in frame: 31]
```

▼ Hypertext Transfer Protocol  
▶ GET / HTTP/1.1\r\n  
Host: www.ufone.co.nz\r\n  
Connection: keep-alive\r\n  
Upgrade-Insecure-Requests: 1\r\n

# So what's the issue?

- The device being accessed compares the Host Header to the IP address and Port configured for management (or internal management in routers)
- If this Header doesn't match the address for management then the device will reply with an error response (using a 403 forbidden – or sometimes a 401 unauthorized)
- This means you will normally be unable to manage this device unless you can directly route to the network (often requiring a VPN) or use this trick



# Rough Diagram



# The Trick

1. DSTNAT the IP Address for the management interface of the target router in your local router to the public address of the target
2. DSTNAT the IP Address from the public address of the target to the internal IP Address of the web interface you want to reach
3. SRCNAT the IP Address from your source router to the inside IP Address of the router you pass through

# The Code

1. 

```
/ip firewall nat  
add action=dst-nat chain=dstnat dst-address=<device management  
IP> dst-port=<web management port> protocol=tcp to-  
addresses=<remote public IP> to-ports=<remote public Port>
```
2. 

```
/ip firewall nat  
add action=dst-nat chain=dstnat dst-port=<remote public Port> in-  
interface=<incoming interface> protocol=tcp to-addresses=<device  
management IP> to-ports=<web management port>
```
3. 

```
/ip firewall nat  
add action=masquerade chain=srcnat dst-address=<device  
management IP> src-address=<public IP you come from>
```

# Multiple Interface PPPoE Trick

- Handling the various "standard" circuit delivery standards in play can be somewhat of a mission
- Even when consistent / planned provisioning errors still abound
- And finally, even when delivered and working a speed change or firmware upgrade either in the exchange or locally can trigger an accidental change

# Multiple Interface PPPoE Trick Cont.

- BUBA / EUBA PPPoA (Untagged)
  - EUBA / WVS PPPoE / IPoE (Tagged – VLAN 10)
  - UFB BS2(a) (Selectable – Untagged / VLAN 10)
  - UFB BS3(a) 4 (Selectable – VLAN Transparent)
- 
- Common Issues
  - EUBA > VDSL Upgrades
  - BS2(a) Provisioning Errors

- /interface vlan  
add interface=ether1 name=VLAN-10 vlan-id=10
- /interface pppoe-client  
add add-default-route=yes disabled=no interface=ether1,VLAN-10  
name=PPPoE-Internet password=secretpassword  
user=user@provider.tld

- The Mikrotik will automatically rotate through the various interfaces provided when it doesn't have an active PPPoE session
- Very useful to use to avoid truck rolls to restore service or to limit the impact of provisioning errors by circuit providers
- However RADIUS replies need to be very timely
- Slow RADIUS replies cause the router to give up and move on before the reply is properly processed

# Network Service Reliability

Lets take care of NAT



# 3CX SBC Audio (First Call of the Day)

- 3CX made some significant improvements to the SBC they provide to their phone system
- These improvements were focused on improving peak performance and audio quality
- Previously all traffic was tunneled through the SBC in a single TCP tunnel
- V15 continued to carry Signalling in TCP but defaults to trying to send audio in a UDP tunnel

# 3CX SBC Audio

- Unfortunately a side effect of how calls are setup can cause an issue with NAT rules
- The server may start to send the audio traffic first causing the router to mark the port being in use
- So when the outbound audio stream begins the router makes a mapping to a different port breaking audio for the call

# 3CX – Why First Call?

- So if it's the mapping of the port, why does it only affect the first call of the day?
- Actually if the call continues for 35 seconds audio will resume working
- After ~30 seconds of no audio 3CX automatically switches to the old TCP tunnel.
- Surely we can fix this!

# The Fix

- /ip firewall nat  
add action=dst-nat chain=dstnat in-interface=<Internet Connection>  
protocol=udp src-address=<3CX Server Public IP> src-port=<Server  
Tunnel Port> to-addresses=<SBC Private IP>
- The fix matches the initial UDP packet inbound and establishes a NAT mapping from the server
- Using the Tunnel port on the public server catches the UDP tunnel stream and maintains the audio path

# Warnings / Limitations

- This rule solves the UDP tunnel audio for only one tunnel endpoint
- Provided all other users only do CTI with their softphone this is a full solution
- If other softphone clients are being used for calls then they can be affected by the same issue

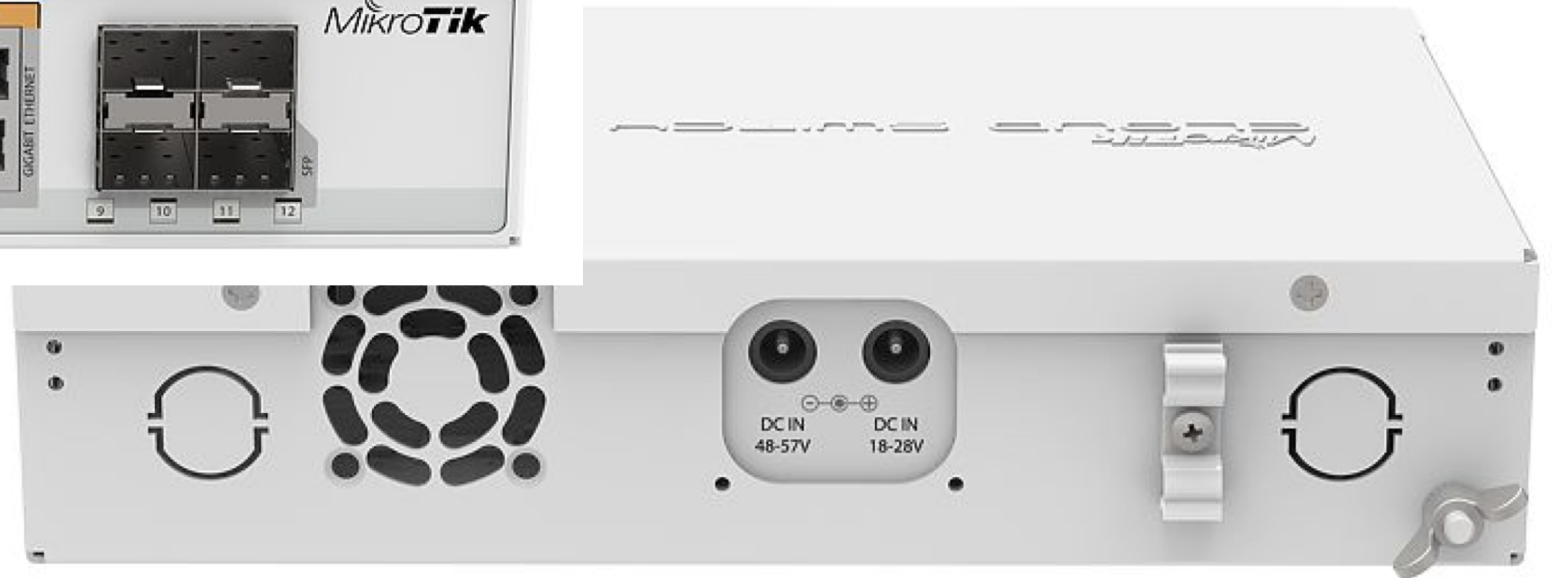
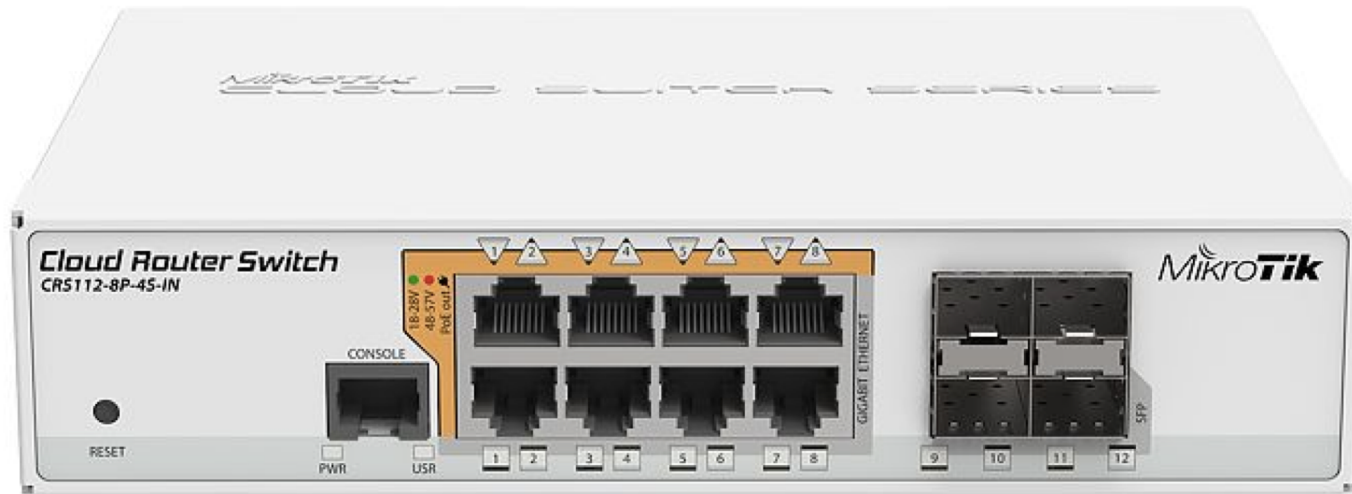
# Careful NAT Construction

- If customer / site IP Addresses are static using SRC NAT as the action rather than Masquerade
- Guidance from Mikrotik on SRC NAT  
[https://mum.mikrotik.com/presentations/US17/presentation\\_4241\\_1496042977.pdf](https://mum.mikrotik.com/presentations/US17/presentation_4241_1496042977.pdf)
- Order rules in firewall / NAT tables in the order of most frequent matches where possible
- Create jump rules for categories of firewall / NAT rules

# Mikrotik PoE Switch

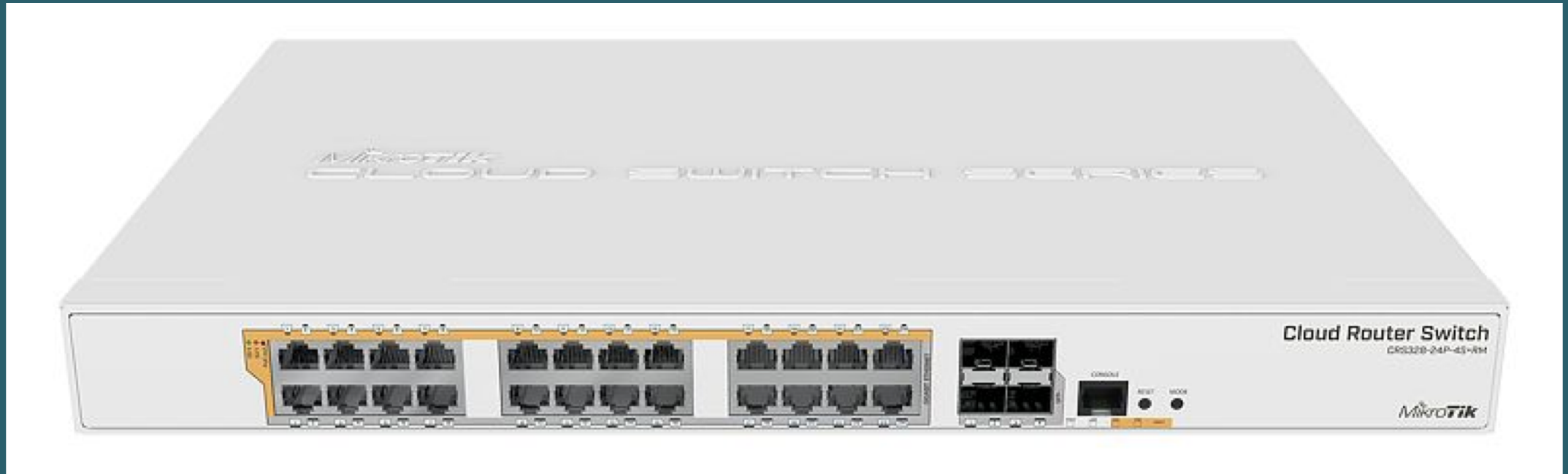
Initial Test Results

# I Have The Power





# More PoE



# Questions?

How Can I Help?

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## Thank You

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