L2TPv3 Tunnel Configuration on Donyx Routers

L2TPv3 (Layer 2 Tunneling Protocol version 3) is a tunneling protocol that encapsulates **Data Link Layer (L2)** traffic for transmission over **IP networks**.

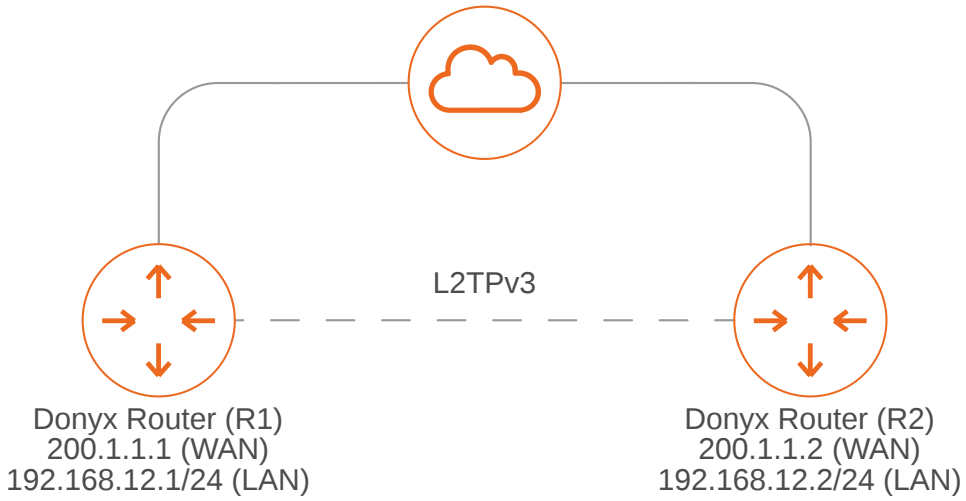
Operating on a point-to-point basis, it supports two primary modes:

- **IP Protocol mode:** Operates directly as IP protocol number *115*. This mode is recommended when no **NAT** exists between the tunnel endpoints.
- **UDP mode:** Operates over the **UDP** protocol, enabling the tunnel to traverse **NAT** boundaries.

As with many other tunneling protocols, **L2TPv3** does not include built-in encryption. Consequently, it should be implemented within private networks or secured using additional encryption, such as **IPsec**.

L2-over-L3 tunneling should be utilized only when necessary, specifically in scenarios where requirements cannot be met through standard routing within **L3** tunnels.

Integration of equipment into a single L2 segment via an L2TPv3 tunnel:



In this example, both routers are assigned public IP addresses, over which the tunnel is established. The local networks on both routers reside within the same subnet. These networks are integrated into a single **L2** segment using the **L2TPv3** tunnel. To prevent IP address conflicts, the **DHCP** server must be disabled on the local network interfaces designated for integration.

To establish the tunnel, the following steps are performed in the */tunnel/l2tpv3* section of the web interface or CLI:

1. Click the **Add** button.
2. Assign a name to the new tunnel.
3. Complete the configuration fields.

L2TPv3 Tunnel Configuration with UDP Encapsulation (without IPsec)

In this example, the tunnel interfaces are named *L2TPv3*, and the WAN interfaces are named *WAN*.

Configuration on Router R1

Table 1. Parameters for Router R1

Field	Value
Local IP	*WAN* (selected from the list).
Remote IP	*200.1.1.2* (specified by the user).
L2 Spec	Default (selected from the list).
Tunnel ID	1000 (specified by the user).
Peer Tunnel ID	2000 (specified by the user).
Session ID	3000 (specified by the user).
Peer Session ID	4000 (specified by the user).
Encapsulation	UDP (selected from the list).
Peer UDP Port	9001 (specified by the user).
UDP Port	9000 (specified by the user).

CLI Configuration (without IPsec Encryption)

To configure the tunnel via the CLI, establish an SSH session using administrator credentials and execute the following commands:

```
/tunnel l2tp-v3 add name=L2TPv3
    disabled false
    encap udp
    encryption none
    local-ip WAN
    l2spec-type default
    macaddr auto
    mtu 1458
    peer-session-id 4000
    peer-tunnel-id 2000
    remote-ip 200.1.1.2
    session-id 3000
    tunnel-id 1000
    tunnel-ip -
    udp-dport 9001
    udp-sport 9000
    apply
```

Configuration on Router R2

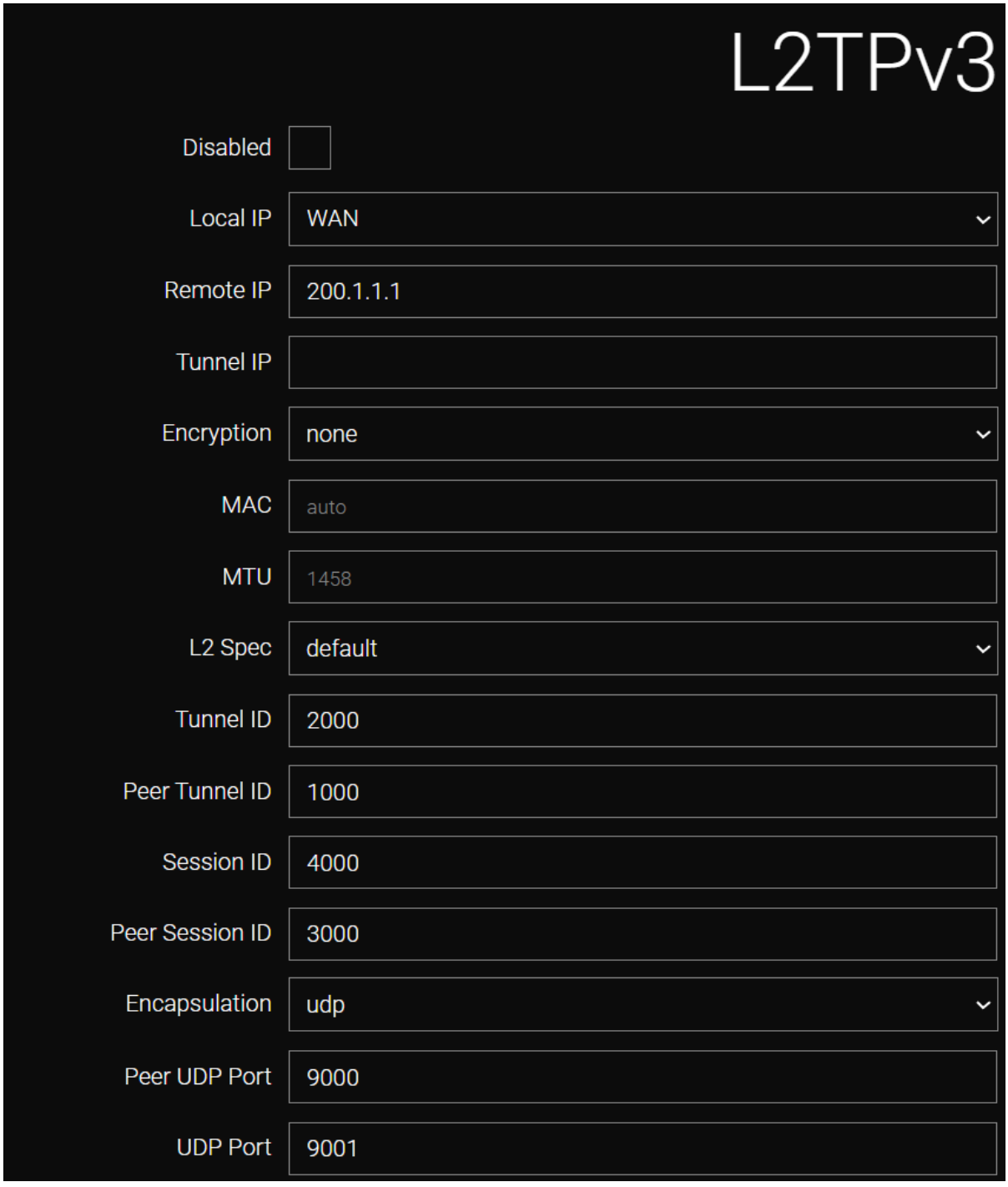


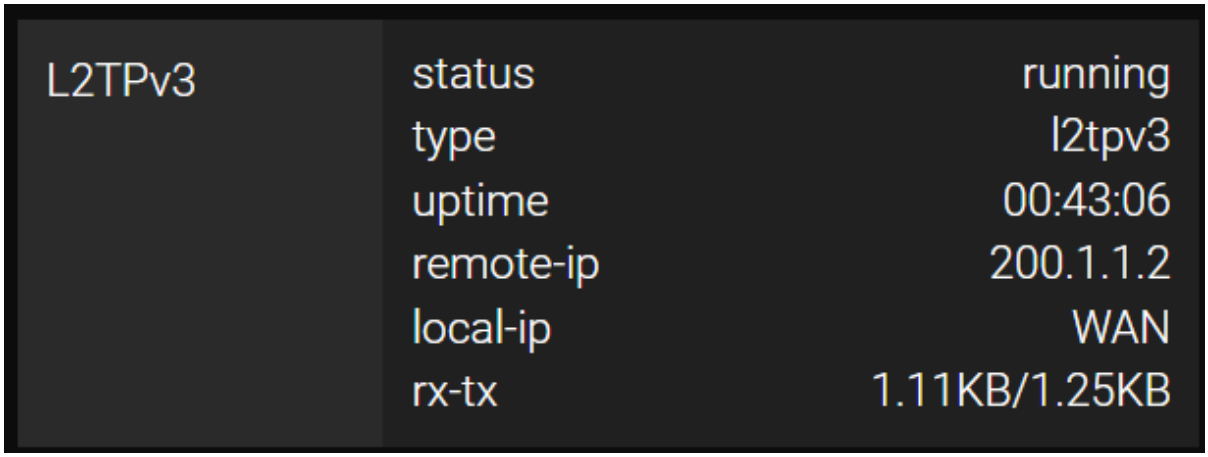
Table 2. Parameters for Router R2

Field	Value
Local IP	*WAN* (selected from the list).
Remote IP	*200.1.1.1* (specified by the user).
L2 Spec	Default (selected from the list).
Tunnel ID	2000 (specified by the user).
Peer Tunnel ID	1000 (specified by the user).
Session ID	4000 (specified by the user).
Peer Session ID	3000 (specified by the user).
Encapsulation	UDP (selected from the list).
Peer UDP Port	9000 (specified by the user).
UDP Port	9001 (specified by the user).

CLI Configuration (without IPsec Encryption)

```
/tunnel l2tp-v3 add name=L2TPv3
    disabled false
    encap udp
    encryption none
    local-ip WAN
    l2spec-type default
    macaddr auto
    mtu 1458
    peer-session-id 3000
    peer-tunnel-id 1000
    remote-ip 200.1.1.1
    session-id 4000
    tunnel-id 2000
    tunnel-ip -
    udp-dport 9000
    udp-sport 9001
    apply
```

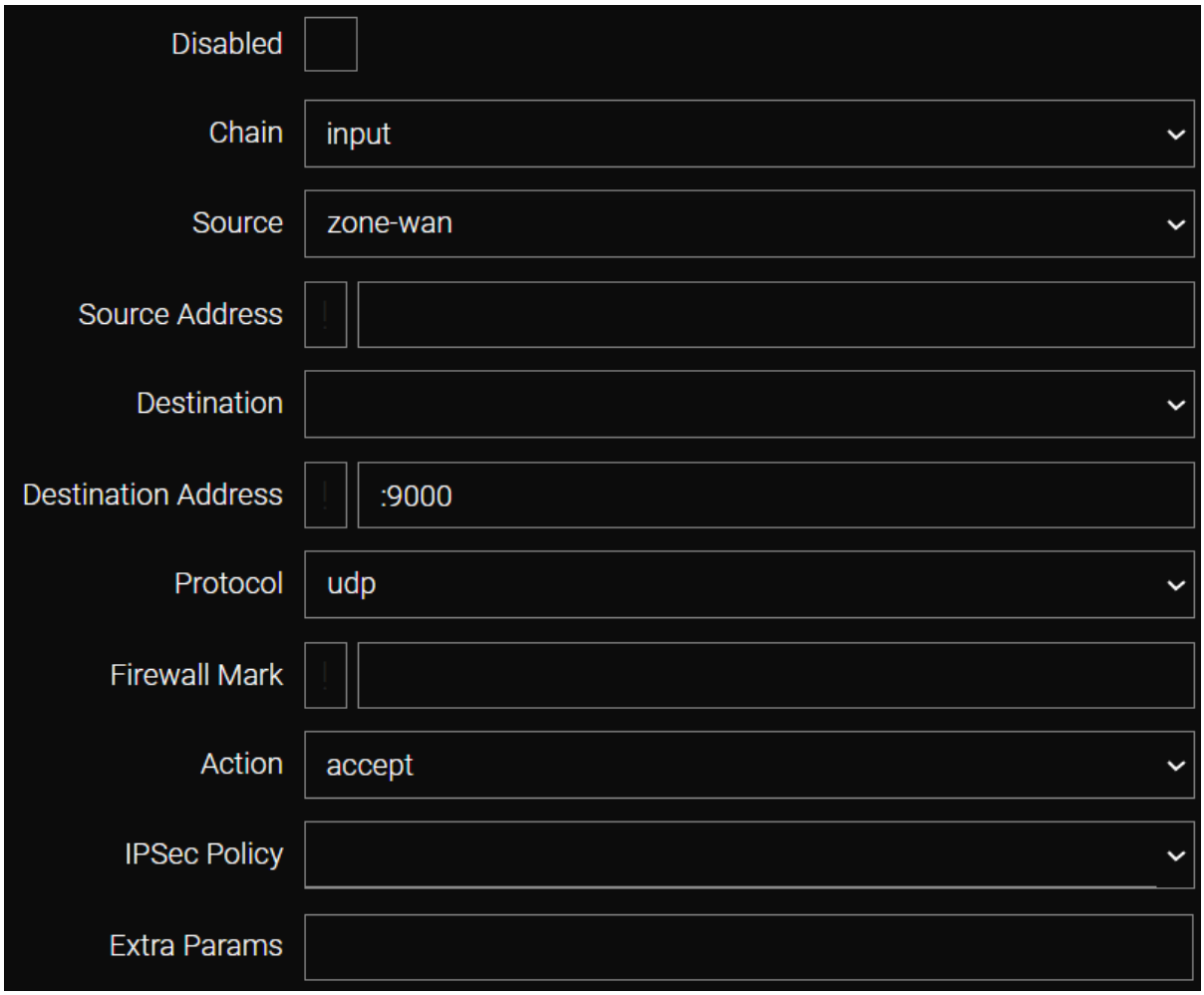
Tunnel statuses are displayed on the router's dashboard



Firewall Configuration

The firewall must be configured to permit incoming packets; this configuration is performed in the */firewall/filter* section.

R1



The port number must match the **UDP Port** value previously specified in the tunnel configuration.

CLI Configuration

```
/firewall filter add chain=input
    action accept
    dst-addr :9000
    protocol udp
    src zone-wan
    reorder position=-1
    apply
/firewall filter status
```

R2

CLI Configuration

```
/firewall filter add chain=input
    action accept
    dst-addr :9001
    protocol udp
    src zone-wan
    reorder position=-1
    apply
/firewall filter status
```

L2TPv3 Tunnel Configuration with UDP Encapsulation (with IPsec)

Configuration on Router R1

Table 3. Parameters for Router R1

Field	Value
Local IP	*WAN* (selected from the list).
Remote IP	*200.1.1.2* (specified by the user).
Encryption	ipsec
Pre-Shared Key	Password
L2 Spec	Default (selected from the list).
Tunnel ID	1000 (specified by the user).
Peer Tunnel ID	2000 (specified by the user).
Session ID	3000 (specified by the user).
Peer Session ID	4000 (specified by the user).
Encapsulation	UDP (selected from the list).
Peer UDP Port	9001 (specified by the user).
UDP Port	9000 (specified by the user).

CLI Configuration (with IPsec Encryption)

```
/tunnel l2tp-v3 add name=L2TPv3
    encap udp
    encryption ipsec
    local-ip bridge1
    l2spec-type default
    macaddr auto
    mtu 1458
    peer-session-id 4000
    peer-tunnel-id 2000
    psk password
    remote-ip 200.1.1.2
    session-id 3000
    tunnel-id 1000
    udp-dport 9001
    udp-sport 9000

  /tunnel l2tp-v3 apply
```

Configuration on Router R2

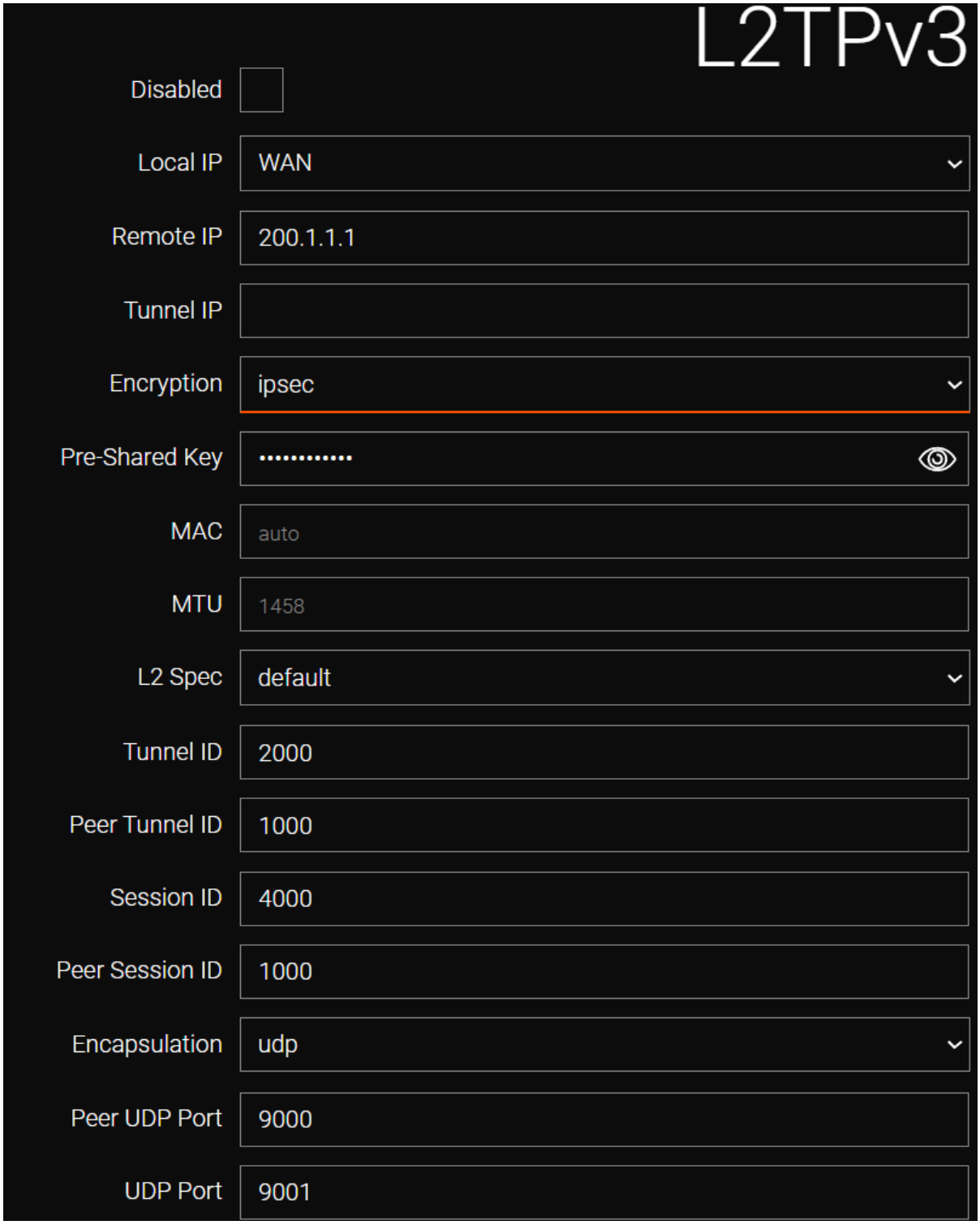


Table 4. Parameters for Router R1

Field	Value
Local IP	*WAN* (selected from the list).
Remote IP	*200.1.1.1* (specified by the user).
Encryption	ipsec
Pre-Shared Key	Password
L2 Spec	Default (selected from the list).
Tunnel ID	2000 (specified by the user).
Peer Tunnel ID	1000 (specified by the user).
Session ID	4000 (specified by the user).
Peer Session ID	3000 (specified by the user).
Encapsulation	UDP (selected from the list).
Peer UDP Port	9000 (specified by the user).
UDP Port	9001 (specified by the user).

CLI Configuration (with IPsec Encryption)

```
/tunnel l2tp-v3 add name=L2TPv3
    encap udp
    encryption ipsec
    local-ip bridge1
    l2spec-type default
    macaddr auto
    mtu 1458
    peer-session-id 3000
    peer-tunnel-id 1000
    psk password
    remote-ip 200.1.1.1
    session-id 4000
    tunnel-id 2000
    udp-dport 9000
    udp-sport 9001
/tunnel l2tp-v3 apply
```

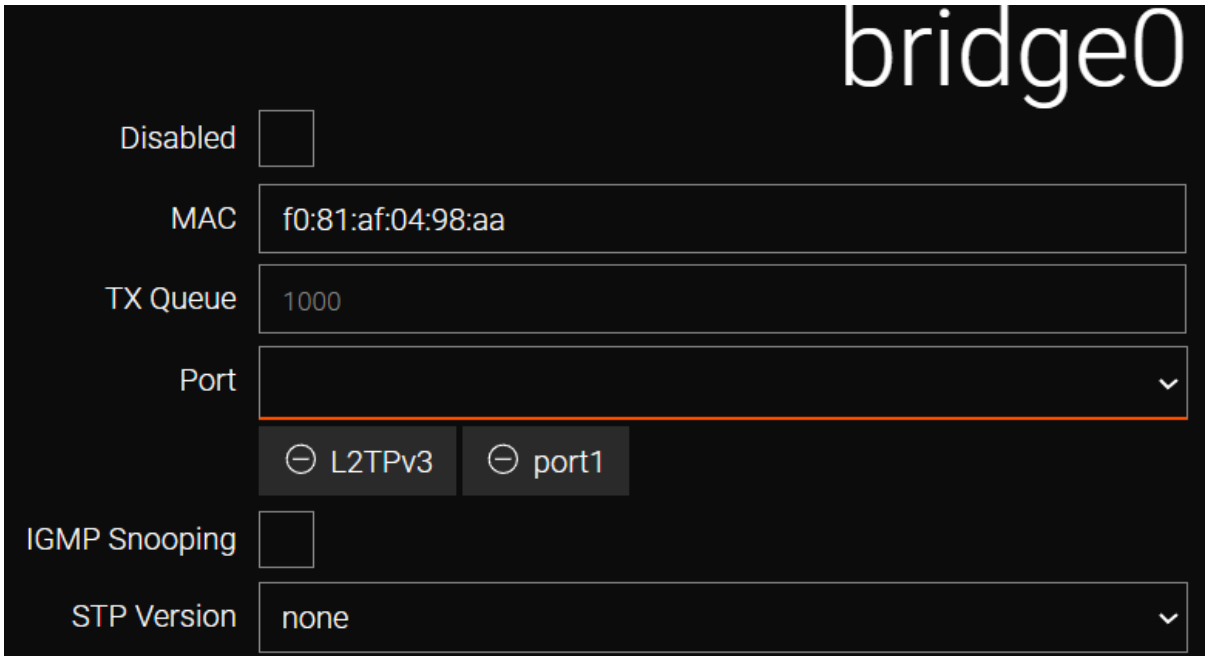
If the tunnel is configured with **IPsec** encryption, additional firewall configuration is **not required**.

Local Network Connectivity

To facilitate communication between local networks, the virtual tunnel interfaces must be added to the corresponding bridges.

The following procedure is performed in the *network/bridge* section:

1. Select the bridge interface responsible for the local network segment (e.g., *bridge0*).
2. Add the tunnel interface (e.g., *L2TPv3*) to the *Untagged* ports list.
3. Click **Apply**.



CLI Configuration

1. Use the */ip interface status* command to display the list of existing bridges and their parameters.
2. Identify the bridge interface assigned the required IP address and subnet (e.g., *192.168.12.1/24*). In this example, the target is *bridge0*.

```
/ip interface status
```

3. Navigate to the bridge configuration section */network bridge bridge0*
4. View the current ports within the bridge using the *port* command.
5. Add the tunnel interface to the port list. To maintain existing connectivity, the tunnel interface is added to the current list (e.g., *port port1,L2TPv3*, where *L2TPv3* is the name assigned to the tunnel).
6. Execute the *apply* command to confirm the bridge settings.

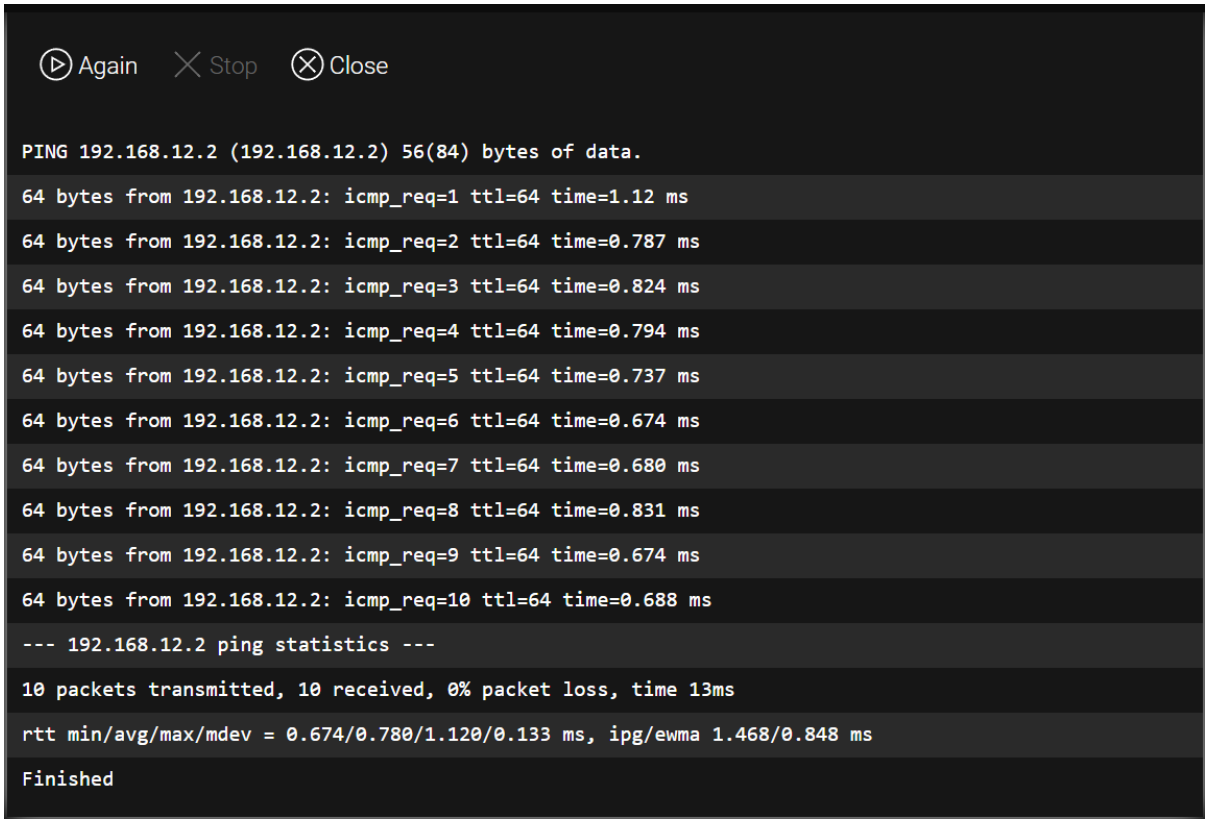
```
/network bridge bridge0 port L2TPv3
apply
```

An identical configuration procedure must be performed on the second router.

By default, tunnel interfaces are not filtered by the firewall. If filtering is required, it must be configured in the */firewall/filter* section.

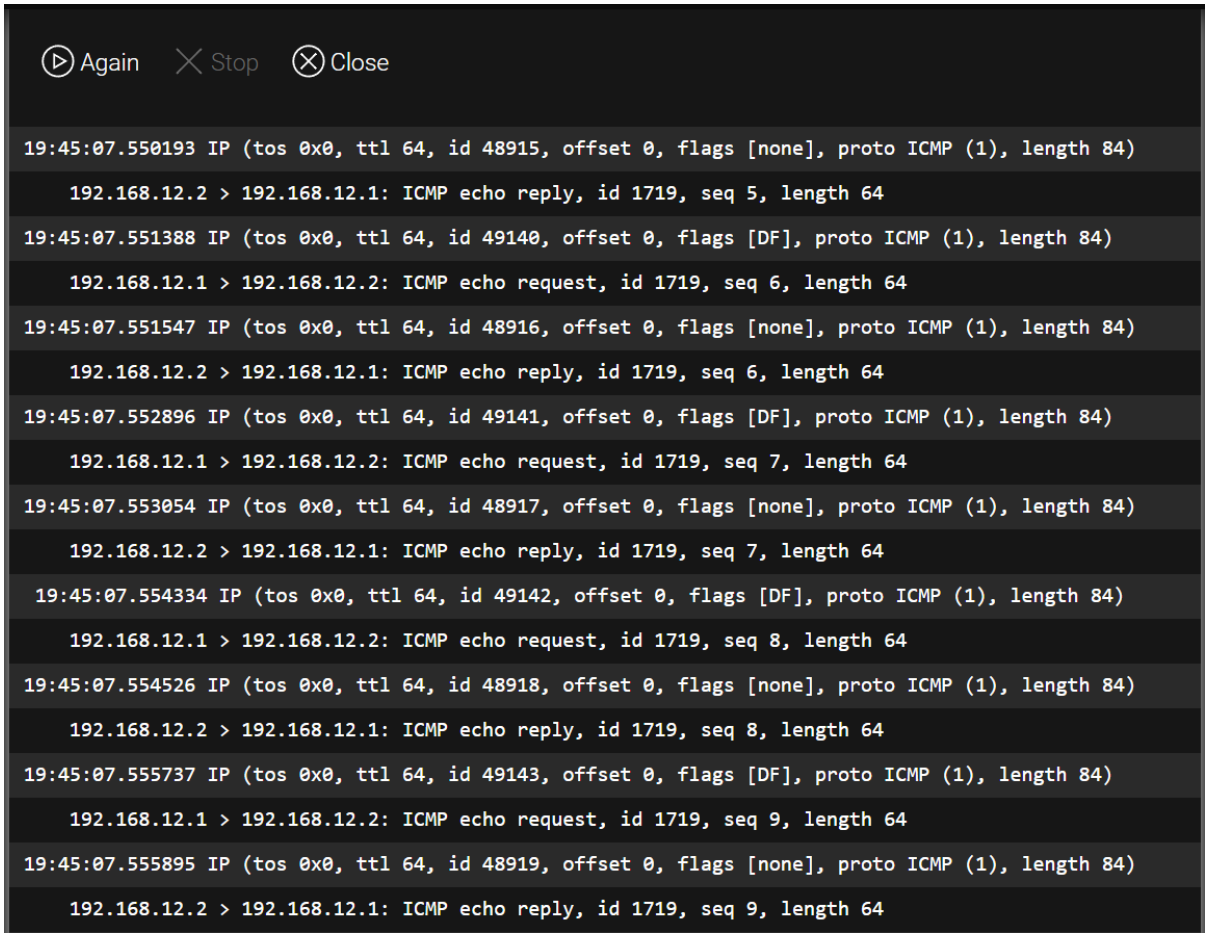
Ping (/tools/ping) — R2 from R1

Tunnel operation can be verified by sending a ping from the local address of router R1 to the address of the remote router R2.



Tcpdump (/tools/sniffer) — R2

Use the sniffer to capture and analyze traffic passing through the interface.



The successful exchange of **ICMP** packets indicates that the configuration is complete.

L2TPv3 Tunnel Configuration with IP Encapsulation

Configuration using **IP encapsulation** is performed in a similar manner.

All modifications are permanently saved to the router configuration only after executing the */system config commit* command or clicking the **commit** button in the web interface.