

RUT950 VPN (legacy WebUI)

[Main Page](#) > [RUT Routers](#) > [RUT950](#) > [RUT950 Manual](#) > [RUT950 Legacy WebUI](#) > [RUT950 Services section \(legacy\)](#) > **RUT950 VPN (legacy WebUI)**

The information in this page is updated in accordance with firmware version [RUT9XX_R_00.06.09.5](#).

Note: this user manual page is for RUT950's old WebUI style available in earlier FW versions. [Click here](#) for information based on the latest FW version.

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Contents

- [1 Summary](#)
- [2 OpenVPN](#)
 - [2.1 OpenVPN client](#)
 - [2.2 OpenVPN server](#)
 - [2.2.1 TLS Clients](#)
- [3 IPsec](#)
 - [3.1 IPsec configuration](#)
 - [3.2 Phase settings](#)
 - [3.3 Pre-shared keys](#)
- [4 GRE Tunnel](#)
 - [4.1 GRE: main & tunnel settings](#)
 - [4.2 GRE: routing settings](#)
- [5 PPTP](#)
 - [5.1 PPTP client](#)
 - [5.2 PPTP server](#)
- [6 L2TP](#)
 - [6.1 L2TP client](#)
 - [6.2 L2TP server](#)
- [7 SSTP](#)
 - [7.1 SSTP configuration](#)
- [8 Stunnel](#)
 - [8.1 Stunnel Globals](#)
 - [8.2 Stunnel client/server](#)
- [9 DMVPN](#)
 - [9.1 DMVPN configuration](#)
- [10 ZeroTier](#)
 - [10.1 ZeroTier General](#)
 - [10.2 ZeroTier VPN](#)
- [11 See also](#)

Summary

Virtual Private Network (VPN) is a method of connecting multiple private networks across the Internet. VPNs can serve to achieve many different goals, but some of its main purposes are:

- providing access between remote private networks;
- providing data encryption and anonymity when browsing the Internet.

This chapter of the user manual provides an overview of the Firewall page for RUT950 devices.

OpenVPN

OpenVPN is an open-source software application that implements virtual private network (VPN) techniques for creating secure point-to-point or site-to-site connections in routed or bridged configurations and remote access facilities. It is often regarded as being the most universal VPN protocol because of its flexibility, support of SSL/TLS security, multiple encryption methods, many networking features and compatibility with most OS platforms.

RUT950 routers run OpenVPN version **2.4.5**.

OpenVPN client

An **OpenVPN client** is an entity that initiates a connection to an OpenVPN server. To create a new client instance, go to the **Services → VPN → OpenVPN** section, select **Role: Client**, enter a custom name and click the 'Add New' button. An OpenVPN client instance with the given name will appear in the "OpenVPN Configuration" list. A maximum of six OpenVPN client instances are allowed to be added.

To begin configuration, click the 'Edit' button next to the client instance. Refer to the figure and table below for information on the OpenVPN client's configuration fields:



Field	Value	Description
Enable OpenVPN config from file	yes no; default: no	Enables custom OpenVPN configuration from file.
Enable	yes no; default: no	Turns the OpenVPN instance on or off.
TUN/TAP	TUN (tunnel) TAP (bridged); default: TUN (tunnel)	Virtual network device type. <ul style="list-style-type: none">• TUN - a virtual point-to-point IP link which operates at the network layer (OSI layer 3), used when routing is required.• TAP - a virtual Ethernet adapter (switch), operates at the data link layer (OSI layer 2), used when bridging is required.

Protocol	UDP TCP; default: UDP	<p>Transfer protocol used for the OpenVPN connection.</p> <ul style="list-style-type: none"> • Transmission Control Protocol (TCP) - most commonly used protocol in the Internet Protocol (IP) suite. It ensures the recipient will receive packets in the order they were sent by numbering, analysing response messages, checking for errors and resending them if an issue occurs. It should be used when reliability is crucial (for example, in file transfer). • User Datagram Protocol (UDP) - packets are sent to the recipient without error-checking or back-and-forth quality control, meaning that when packets are lost, they are gone forever. This makes it less reliable but faster than TCP; therefore, it should be used when transfer speed is crucial (for example, in video streaming, live calls).
Port	integer [0..65535]; default: 1194	<p>TCP/UDP port number used for the connection. Make sure it matches the port number specified on the server side.</p> <p>NOTE: traffic on the selected port will be automatically allowed in the router's firewall rules.</p>
LZO	yes no; default: no	<p>Turns LZO data compression on or off.</p>
Authentication	<p>TLS Static Key Password TLS/Password; default: TLS</p>	<p>Authentication mode, used to secure data sessions.</p> <ul style="list-style-type: none"> • Static key is a secret key used for server-client authentication. • TLS authentication mode uses X.509 type certificates: <ul style="list-style-type: none"> - Certificate Authority (CA) - Client certificate - Client key <p>All mentioned certificates can be generated using OpenVPN or Open SSL utilities on any type of host machine. One of the most popular utilities used for this purpose is called Easy-RSA.</p> <ul style="list-style-type: none"> • Password is a simple username/password based authentication where the owner of the OpenVPN server provides the login data. • TLS/Password uses both TLS and username/password authentication.

Encryption	DES-CBC 64 RC2-CBC 128 DES-EDE-CBC 128 DES-EDE3-CBC 192 DESX-CBC 192 RC2-40-CBC 40 CAST5-CBC 128 RC2-64-CBC 64 AES-128-CFB 128 AES-128-CFB1 128 AES-128-CFB8 128 AES-128-OFB 128 AES-128-CBC 128 AES-128-GCM 128 AES-192-CFB 192 AES-192-CFB1 192 AES-192-CFB8 192 AES-192-OFB 192 AES-192-CBC 192 AES-192-GCM 192 AES-256-CFB 256 AES-256-CFB1 256 AES-256-CFB8 256 AES-256-OFB 256 AES-256-CBC 256 AES-256-GCM 256 none ; default: BF-CBC 128	Algorithm used for packet encryption.
TLS: TLS cipher	All DHE+RSA Custom; default: All	Packet encryption algorithm cipher.
TLS: Allowed TLS ciphers	All DHE+RSA Custom; default: All	A list of TLS ciphers accepted for this connection.
Remote host/IP address	ip; default: none	IP address or hostname of an OpenVPN server.
Resolve retry	integer infinite; default: infinite	In case server hostname resolve fails, this field indicates the amount of time (in seconds) to retry the resolve. Specify <i>infinite</i> to retry indefinitely.
Keep alive	two integers separated by a space; default: none	Defines two time intervals: the first is used to periodically send ICMP requests to the OpenVPN server, the second one defines a time window, which is used to restart the OpenVPN service if no ICMP response is received during the specified time slice. When this value is specified on the OpenVPN server, it overrides the 'keep alive' values set on client instances. Example: 10 120
Static key: Local tunnel endpoint IP	ip; default: none	IP address of the local OpenVPN network interface.
Static key: Remote tunnel endpoint IP	ip; default: none	IP address of the remote OpenVPN network (server) interface.
Remote network IP address	ip; default: none	LAN IP address of the remote network (server).
Remote network IP netmask	netmask; default: none	LAN IP subnet mask of the remote network (server).
Password: User name string; default: none		Username used for authentication to the OpenVPN server.

Password: Password	string; default: none	Password used for authentication to the OpenVPN server.
Extra options	string; default: none	Extra OpenVPN options to be used by the OpenVPN instance.
Use PKCS #12 format	yes no; default: no	Use PKCS #12 archive file format to bundle all the members of a chain of trust.
PKCS #12 passphrase	string; default: none	Passphrase to decrypt PKCS #12 certificates.
PKCS #12 certificate chain	string; default: none	Uploads PKCS #12 certificate chain file.
TLS/Password: HMAC authentication algorithm	none SHA1 SHA256 SHA384 SHA512; default: SHA1	HMAC authentication algorithm type.
TLS/Password: Additional HMAC authentication	none Authentication only (tls-auth) Authentication and encryption (tls-crypt); default: none	An additional layer of HMAC authentication on top of the TLS control channel to protect against DoS attacks.
TLS/Password: HMAC authentication key	.key file; default: none	Uploads an HMAC authentication key file.
TLS/Password: HMAC key direction	0 1 none; default: 1	The value of the key direction parameter should be complementary on either side (client and server) of the connection. If one side uses <i>0</i> , the other side should use <i>1</i> , or both sides should omit the parameter altogether.
TLS/Password: Certificate authority	.ca file; default: none	Certificate authority (CA) is an entity that issues digital certificates. A digital certificate certifies the ownership of a public key by the named subject of the certificate.
TLS: Client certificate	.crt file; default: none	Client certificate is a type of digital certificate that is used by client systems to make authenticated requests to a remote server. Client certificates play a key role in many mutual authentication designs, providing strong assurances of a requester's identity.
TLS: Client key	.key file; default: none	Authenticates the client to the server and establishes precisely who they are.
TLS: Private key decryption password (optional)	string; default: none	A password used to decrypt the server's private key. Use only if server's .key file is encrypted with a password.
Static key: Static pre-shared key	.key file; default: none	Uploads a secret key file used for server-client authentication.

Additional notes:

- Some configuration fields become available only when certain other parameters are selected. The names of the parameters are followed by a prefix that specifies the authentication type under which they become visible. Different color codes are used for different prefixes:
 - Red for **Authentication: TLS**
 - Purple for **Authentication: Static key**
 - Blue for **Authentication: Password**
- After changing any of the parameters, don't forget to click the **Save** button located at the

bottom-right side of the page.

OpenVPN server

An **OpenVPN server** is an entity that waits for incoming connections from OpenVPN clients. To create a new server instance, go to the *Services* → *VPN* → *OpenVPN* section, select *Role: Server*, enter a custom name and click the 'Add New' button. An OpenVPN server instance with the given name will appear in the "OpenVPN Configuration" list. Only one OpenVPN server instance is allowed to be added.

A server needs to have a [public IP address](#) in order to be available from the public network (the Internet).

To begin configuration, click the 'Edit' button next to the server instance. Refer to the figure and table below for information on the OpenVPN server's configuration fields:



Field	Value	Description
Enable OpenVPN config from file	yes no; default: no	Enables custom OpenVPN configuration from file.
Enable	yes no; default: no	Turns the OpenVPN instance on or off.
TUN/TAP	TUN (tunnel) TAP (bridged); default: TUN (tunnel)	Virtual network device type. <ul style="list-style-type: none">• TUN - a virtual point-to-point IP link which operates at the network layer (OSI layer 3), used when routing is required.• TAP - a virtual Ethernet adapter (switch), operates at the data link layer (OSI layer 2), used when bridging is required.
Protocol	UDP TCP; default: UDP	Transfer protocol used for the connection. <ul style="list-style-type: none">• Transmission Control Protocol (TCP) - most commonly used protocol in the Internet Protocol (IP) suite. It ensures the recipient will receive packets in the order they were sent by numbering, analysing response messages, checking for errors and resending them if an issue occurs. It should be used when reliability is crucial (for example, file transfer).• User Datagram Protocol (UDP) - packets are sent to the recipient without error-checking or back-and-forth quality control, meaning that when packets are lost, they are gone forever. This makes it less reliable but faster than TCP; therefore, it should be used when transfer speed is crucial (for example, video streaming, live calls).

Port	integer [0..65535]; default: 1194	TCP/UDP port number used for the connection. Make sure it matches the port number specified on the server side. NOTE: traffic on the selected port will be automatically allowed in the router's firewall rules.
LZO	yes no; default: no	Turns LZO data compression on or off.
Authentication	TLS Static Key TLS/Password; default: TLS	Authentication mode, used to secure data sessions. <ul style="list-style-type: none"> • Static key is a secret key used for server-client authentication. • TLS authentication mode uses X.509 type certificates: <ul style="list-style-type: none"> - Certificate Authority (CA) - Client certificate - Client key All mentioned certificates can be generated using OpenVPN or Open SSL utilities on any type of host machine. One of the most popular utilities used for this purpose is called Easy-RSA. <ul style="list-style-type: none"> • TLS/Password uses both TLS and username/password authentication.
Encryption	DES-CBC 64 RC2-CBC 128 DES-EDE-CBC 128 DES-EDE3-CBC 192 DESX-CBC 192 RC2-40-CBC 40 CAST5-CBC 128 RC2-64-CBC 64 AES-128-CFB 128 AES-128-CFB1 128 AES-128-CFB8 128 AES-128-OFB 128 AES-128-CBC 128 AES-128-GCM 128 AES-192-CFB 192 AES-192-CFB1 192 AES-192-CFB8 192 AES-192-OFB 192 AES-192-CBC 192 AES-192-GCM 192 AES-256-CFB 256 AES-256-CFB1 256 AES-256-CFB8 256 AES-256-OFB 256 AES-256-CBC 256 AES-256-GCM 256 none ; default: BF-CBC 128	Algorithm used for packet encryption.
Static key: Local tunnel endpoint IP	ip; default: none	IP address of the local OpenVPN network interface.
Static key: Remote tunnel endpoint IP	ip; default: none	IP address of the remote OpenVPN network (client) interface.
Static key: Remote network IP address	ip; default: none	LAN IP address of the remote network (client).

Static key: Remote network IP netmask	netmask; default: none	LAN IP subnet mask of the remote network (client).
TLS/TLS/Password: TLS cipher	All DHE+RSA Custom; default: All	Packet encryption algorithm cipher.
TLS/Password: Allowed TLS ciphers	All DHE+RSA Custom; default: All	A list of TLS ciphers accepted for this connection.
TLS/TLS/Password: Client to client	yes no; default: no	Allows OpenVPN clients to communicate with each other on the VPN network. Defines two time intervals: the first is used to periodically send ICMP requests to the OpenVPN server, the second one defines a time window, which is used to restart the OpenVPN service if no ICMP response is received during the specified time slice. When this value is specified on the OpenVPN server, it overrides the 'keep alive' values set on client instances. Example: <i>10 120</i>
TLS/TLS/Password: Keep alive	two integers separated by a space; default: none	
TLS/TLS/Password: Virtual network IP address	ip; default: none	IP address of the OpenVPN network.
TLS/TLS/Password: Virtual network netmask	netmask; default: none	Subnet mask of the OpenVPN network.
TLS/TLS/Password: Push option	OpenVPN options; default: none	Push options are a way to "push" routes and other additional OpenVPN options to connecting clients.
TLS/TLS/Password: Allow duplicate certificates	yes no; default: no	When enabled allows multiple clients to connect using the same certificates.
Use PKCS #12 format	yes no; default: no	Use PKCS #12 archive file format to bundle all the members of a chain of trust.
PKCS #12 passphrase	string; default: none	Passphrase to decrypt PKCS #12 certificates.
PKCS #12 certificate chain	string; default: none	Uploads PKCS #12 certificate chain file.
TLS/Password: User name	string; default: none	Username used for authentication to this OpenVPN server.
TLS/Password: Password	string; default: none	Password used for authentication to this OpenVPN server.
Static key: Static pre-shared key	.key file; default: none	Uploads a secret key file used for server-client authentication.
TLS/TLS/Password: Certificate authority	.ca file; default: none	Certificate authority is an entity that issues digital certificates. A digital certificate certifies the ownership of a public key by the named subject of the certificate.
TLS/TLS/Password: Server certificate	.crt file; default: none	A type of digital certificate that is used to identify the OpenVPN server.
TLS/TLS/Password: Server key	.key file; default: none	Authenticates clients to the server.
TLS/TLS/Password: Diffie Hellman parameters	.pem file; default: none	DH parameters define how OpenSSL performs the Diffie-Hellman (DH) key-exchange.

TLS/TLS/Password: CRL file (optional)	.pem file .crl file; default: none	A certificate revocation list (CRL) file is a list of certificates that have been revoked by the certificate authority (CA). It indicates which certificates are no longer accepted by the CA and therefore cannot be authenticated to the server.
TLS/TLS/Password: Enable manual ccd upload	yes no; default: no	Enable manual upload of client-config-dir files.

Additional notes:

- Some configuration fields become available only when certain other parameters are selected. The names of the parameters are followed by a prefix that specifies the authentication type under which they become visible. Different color codes are used for different prefixes:
 - Red for **Authentication: TLS**
 - Purple for **Authentication: Static key**
 - Blue for **Authentication: TLS/Password**
- After changing any of the parameters, don't forget to click the **Save** button located at the bottom-right side of the page.

TLS Clients

TLS Clients is a way to differentiate clients by their Common Names (CN), which are found in the client certificate file. It can be used to assign specific VPN addresses to corresponding clients and bind them to their LAN addresses, making the server aware of which client has which LAN IP address.

The TLS Clients section can be found in the OpenVPN Server configuration window, provided that the OpenVPN server uses TLS or TLS/Password authentication methods. To create a new TLS client, type in the new client's name in the text field found bellow the TLS Clients tab and click the 'Add' button. Refer to the figure and table below for information on the TLS Clients' configuration fields:



Field	Value	Description
Endpoint name	string; default: none	A custom name for the client.
Common name (CN)	string; default: none	Client's Common Name (CN) found in the client certificate file.
Virtual local endpoint	ip; default: none	Client's local address in the virtual network.
Virtual remote endpoint	ip; default: none	Client's remote address in the virtual network.
Private network	ip; default: none	Client's private network (LAN) IP address.
Private netmask	ip; default: none	Client's private network (LAN) IP netmask.

IPsec

To create a new IPsec instance, go to the *Services* → *VPN* → *IPsec* section, enter a custom name and click "Add". An IPsec instance with the given name will appear in the "IPsec Configuration" list.

To begin configuration, click the 'Edit' button located next to the instance.

IPsec configuration

The **IPsec configuration** section is used to configure the main parameters of an IPsec connection. Refer to the figure and table below for information on the configuration fields located in the general settings section.



Field	Value	Description
Enable	yes no; default: no	Turns the IPsec instance on or off.
IKE version	IKEv1 IKEv2; default: IKEv1	Internet Key Exchange (IKE) version used for key exchange. <ul style="list-style-type: none">• IKEv1 - more commonly used but contains known issues, for example, dealing with NAT.• IKEv2 - updated version with increased and improved capabilities, such as integrated NAT support, supported multihosting, deprecated exchange modes (does not use main or aggressive mode; only 4 messages required to establish a connection).
Mode	Main Aggressive; default: Main	Internet Security and Key Management Protocol (ISAKMP) phase 1 exchange mode. <ul style="list-style-type: none">• Main - performs three two-way exchanges between the initiator and the receiver (a total of 9 messages).• Aggressive - performs fewer exchanges than main mode (a total of 6 messages) by storing most data into the first exchange. In aggressive mode, the information is exchanged before there is a secure channel, making it less secure but faster than main mode.
Type	Tunnel Transport; default: Tunnel	Type of connection. <ul style="list-style-type: none">• Tunnel - protects internal routing information by encapsulating the entire IP packet (IP header and payload); commonly used in site-to-site VPN connections; supports NAT traversal.• Transport - only encapsulates IP payload data; used in client-to-site VPN connections; does not support NAT traversal; usually implemented with other tunneling protocols (for example, L2TP).
On startup	Ignore Add Route Start; default: Start	Defines how the instance should act on router startup. <ul style="list-style-type: none">• Ignore - does not start the tunnel.• Add - loads a connection without starting it.• Route - starts the tunnel only if there is traffic.• Start - starts the tunnel on router startup.
My identifier	ip string; default: none	Defines how the user (IPsec instance) will be identified during authentication.

Tunnel: Local IP address/Subnet mask	ip/netmask default: none	Local IP address and subnet mask used to determine which part of the network can be accessed in the VPN network. Netmask range [0..32]. If left empty, IP address will be selected automatically.
Left firewall	off on; default: on	Adds necessary firewall rules to allow traffic of this IPsec instance on this router.
Force encapsulation	yes no; default: no	Forces UDP encapsulation for ESP packets even if a "no NAT" situation is detected.
Dead Peer Detection	yes no; default: no	A function used during Internet Key Exchange (IKE) to detect a "dead" peer. It used to reduce traffic by minimizing the number of messages when the opposite peer is unavailable and as failover mechanism.
Dead Peer Detection: Delay (sec)	integer; default: none	The frequency of checking whether a peer is still available or not.
Dead Peer Detection: Timeout (sec)	integer; default: none	Time limit after which the IPsec instance will stop checking the availability of a peer and determine it to be "dead" if no response is received.
Authentication type	Pre-shared key X.509; default: Pre-shared key	Here you can choose authentication type accordingly to your IPsec configuration
Certificate file	.crt file; default: none	Uploads a certificate file.
Key file	.key file; default: none	Uploads a key file.
CA certificate	.crt file; default: none	Uploads a Certificate authority (CA) file.
Remote participant's certificate	.crt file; default: none	Remote participant's certificate certificate is used to authenticate remote peer
Use additional xauth authentication	yes no; default: no	Adds additional xauth authentication options.
Xauth: Xauth password	string; default: none	Password for additional peer authentication.
Remote VPN endpoint	host ip; default: none	IP address or hostname of the remote IPsec instance.
Remote identifier	ip string; default: none	Defines remote IPsec instance identification.
Tunnel: Remote IP address/subnet mask	ip/netmask; default: none	Remote network IP address and subnet mask used to determine which part of the network can be accessed in the VPN network. Netmask range [0..32]. This value must differ from the device's LAN IP.
Right firewall	yes no; default: yes	Adds necessary firewall rules to allow traffic of from the opposite IPsec instance on this router.
Transport: Use with DMVPN	yes no; default: no	Adds several necessary options to make DMVPN work.
Passthrough networks	None LAN Wired WiFi Mobile custom; default: none	Select networks which should be passthrough and excluded from routing through tunnel
Enable keepalive	yes no; default: no	When enabled, the instance sends ICMP packets to the specified host at the specified frequency. If no response is received, the router will attempt to restart the connection.



Host	host ip; default: none	Hostname or IP address to which keepalive ICMP packets will be sent to.
Ping period (sec)	integer [0..9999999]; default: none	The frequency at which keepalive ICMP packets will be sent to the specified host or IP address.
Allow WebUI access	yes no; default: no	Allows WebUI access for hosts in the VPN network.
Custom options	ipsec options; default: none	Provides the possibility to further customize the connection by adding extra IPsec options.

Additional notes:

- Some configuration fields become available only when certain other parameters are selected. Different color codes are used for different parameters:
 - Orange for **Type: Xauth**
 - Red for **Type: Tunnel**
 - Purple for **Type: Transport**
 - Blue for **Dead Peer Detection: Enabled**
- After changing any of the parameters, don't forget to click the **Save** button located at the bottom-right side of the page.

Phase settings

IKE (Internet Key Exchange) is a protocol used to set up security associations (SAs) for the IPsec connection. This process is required before the IPsec tunnel can be established. It is done in two phases:

Phase	Mode
<p>Phase 1</p> <ul style="list-style-type: none"> • Establishes a secure channel between peers • Authenticates peers • Negotiates SA policy • Shares secret keys • Establishes secure tunnel for phase 2 <p>Phase 2</p> <ul style="list-style-type: none"> • Sets up matching IPsec SAs • Periodically renegotiates IPsec SAs 	<p>Main mode (figure 1)</p> <ul style="list-style-type: none"> • 6 packets exchanged • Identity protected during exchange <p>Quick mode</p> <ul style="list-style-type: none"> • 3 packets exchanged • IPsec SA parameters (ESP/AH, SHA/MD5) established • SA lifetime set <p>Aggressive mode (figure 2)</p> <ul style="list-style-type: none"> • 3 packets exchanged • Identity information exchanged before a secure channel is established
<p>Figure 1</p> 	<p>Figure 2</p> 

Field	Value	Description
Encryption algorithm	DES 3DES AES128 AES192 AES256; default: 3DES	Algorithm used for data encryption.
Authentication/Hash algorithm	MD5 SHA1 SHA256 SHA384 SHA512; default: SHA1	Algorithm used for exchanging authentication and hash information.

DH group/PFS group	MODP768 MODP1024 MODP1536 MODP2048 MODP3072 MODP4096; default: MODP1536	Diffie-Hellman (DH) group used in the key exchange process. Higher group numbers provide more security, but take longer and use more resources to compute the key.
Lifetime	integer; default: 8 hours	Defines a time period after which the phase will re-initiate its exchange of information.

Pre-shared keys

A **pre-shared key** is a secret password used for authentication between IPsec peers before a secure tunnel is established. During authentication device will try to check if connection matches any **Secret's ID selector** and then the **pre-shared key** from the first match will be used.

To create a new key, click the 'Add' button.

The figure below is an example of the Pre-shared keys section and the table below provides information on configuration fields contained in that section:



Field	Value	Description
Pre-shared key	string; default: none	A shared password used for authentication between IPsec peers before a secure channel is established.
Secret's ID selector	string; default: none	Each secret can be preceded by a list of optional ID selectors. A selector is an IP address, a Fully Qualified Domain Name, user@FQDN or %any. NOTE: IKEv1 only supports IP address ID selector.

GRE Tunnel

Generic Routing Encapsulation (GRE) is a tunneling protocol used to establish point-to-point connections between remote private networks. GRE tunnels encapsulate data packets in order to route other protocols over IP networks.

GRE: main & tunnel settings

To create a new GRE Tunnel instance, go to the *Services* → *VPN* → *GRE Tunnel* section, enter a custom name and click the 'Add' button. A GRE instance with the given name will appear in the "GRE Configuration" list.

To begin configuration, click the 'Edit' button located next to the instance. Refer to the figure and table below for information on the fields located in the GRE Tunnel instance configuration section.



Field	Value	Description
Enabled	yes no; default: no	Turns the GRE Tunnel instance on or off.
Tunnel source	network interface; default: none	Network interface used to establish the GRE Tunnel.
Remote endpoint IP address	ip; default: none	External IP address of another GRE instance used to establish the initial connection between peers.
MTU	integer; default: 1476	Sets the maximum transmission unit (MTU) size. It is the largest size of a protocol data unit (PDU) that can be transmitted in a single network layer transaction.
TTL	integer [0..255]; default: 255	Sets a custom TTL (Time to Live) value for encapsulated packets. TTL is a field in the IP packet header which is initially set by the sender and decreased by 1 on each hop. When it reaches 0 it is dropped and the last host to receive the packet sends an ICMP "Time Exceeded" message back to the source.
Outbound key	integer [0..65535]; default: none	A key used to identify outgoing packets. A This value should match the "Inbound key" value set on the opposite GRE instance or both key values should be omitted on both sides.
Inbound key	integer [0..65535]; default: none	A key used to identify incoming packets. This value should match the "Outbound key" value set on the opposite GRE instance or both key values should be omitted on both sides.
Don't fragment	yes no; default: yes	When unchecked, sets the <i>noptudisc</i> option for tunnel. Can not be used together with the TTL option.
Keep alive	yes no; default: no	Turns "keep alive" on or off. The "keep alive" feature sends packets to the remote instance in order to determine the health of the connection. If no response is received, the device will attempt to re-establish the tunnel.
Keep alive interval	integer [0..255]; default: none	Frequency (in seconds) at which "keep alive" packets are sent to the remote instance.
Local GRE interface IP address	ip; default: none	IP address of the local GRE Tunnel network interface.
Local GRE interface netmask	netmask; default: none	Subnet mask of the local GRE Tunnel network interface.
Bind to SIM	None SIM1 SIM2; default: None	Specifies whether to bind instance to a SIM card.

GRE: routing settings

Routing settings are used to configure routes to networks that are behind the device that hosts the opposite GRE instance. To add a new route, simply click the 'Add' button. For information on configuring the route refer to the figure and table below.



Field	Value	Description
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Remote subnet IP address	ip; default: none	IP address of the network behind the device that hosts the remote GRE instance.
Remote subnet netmask	netmask; default: none	Subnet mask of the network behind the device that hosts the remote GRE instance.

PPTP

Point-to-Point Tunneling Protocol (PPTP) is a type of VPN protocol that uses a TCP control channel and a Generic Routing Encapsulation tunnel to encapsulate PPP packets.

PPTP client

A **PPTP client** is an entity that initiates a connection to a PPTP server. To create a new client instance, go to the *Services* → *VPN* → *PPTP* section, select *Role: Client*, enter a custom name and click the 'Add New' button. A PPTP client instance with the given name will appear in the "PPTP Configuration" list.

To begin configuration, click the 'Edit' button located next to the client instance. Refer to the figure and table below for information on the PPTP client's configuration fields:



Field	Value	Description
Enable	yes no; default: no	Turns the PPTP instance on or off.
Use as default gateway	yes no; default: no	When turned on, this connection will become the router's default route. This means that all traffic directed to the Internet will go through the PPTP server and the server's IP address will be seen as this device's source IP to other hosts on the Internet. NOTE: this can only be used when WAN Failover is turned off.
Client to client	yes no; default: no	Adds a route that makes other PPTP clients accessible within the PPTP network.
Server	ip host; default: none	IP address or hostname of a PPTP server.
Username	string; default: none	Username used for authentication to the PPTP server.
Password	string; default: none	Password used for authentication to the PPTP server.

PPTP server

A **PPTP server** is an entity that waits for incoming connections from PPTP clients. To create a new server instance, go to the *Services* → *VPN* → *PPTP* section, select *Role: Server*, enter a custom name and click the 'Add New' button. A PPTP server instance with the given name will appear in the "PPTP Configuration" list. Only one PPTP server instance is allowed to be added.

A server needs to have a [public IP address](#) in order to be available from the public network (the Internet).

To begin configuration, click the 'Edit' button located next to the server instance. Refer to the figure and table below for information on the PPTP server's configuration fields:



Field	Value	Description
Enable	yes no; default: no	Turns the PPTP instance on or off.
Local IP	ip; default: 192.168.0.1	IP address of this PPTP network interface.
Remote IP range start	ip; default: 192.168.0.20	PPTP IP address leases will begin from the address specified in this field.
Remote IP range end	ip; default: 192.168.0.30	PPTP IP address leases will end with the address specified in this field.
User name	string; default: youruser	Username used for authentication to this PPTP server.
Password	string; default: yourpass	Password used for authentication to this PPTP server.
PPTP Client's IP	ip; default: none	Assigns an IP address to the client that uses the adjacent authentication info. This field is optional and if left empty the client will simply receive an IP address from the IP pool defined above.

L2TP

In computer networking, **Layer 2 Tunneling Protocol (L2TP)** is a tunneling protocol used to support virtual private networks (VPNs). It is more secure than PPTP but, because it encapsulates the transferred data twice, but it is slower and uses more CPU power.

L2TP client

An **L2TP client** is an entity that initiates a connection to an L2TP server. To create a new client instance, go to the *Services* → *VPN* → *L2TP* section, select *Role: Client*, enter a custom name and click the 'Add New' button. An L2TP client instance with the given name will appear in the "L2TP Configuration" list.

To begin configuration, click the 'Edit' button located next to the client instance. Refer to the figure and table below for information on the L2TP client's configuration fields:



Field	Value	Description
Enable	yes no; default: no	Turns the L2TP instance on or off.
Server	ip host; default: none	IP address or hostname of an L2TP server.
Username	string; default: none	Username used in authorization to the L2TP server.
Password	string; default: none	Password used in authorization to the L2TP server.

Authentication	string; default: none	Optional. Password used in L2TP tunnel CHAP authentication.
Keep alive	integer; default: none	Frequency (in seconds) at which LCP echo requests are sent to the remote instance in order to determine the health of the connection.
Default route	yes no; default: no	When turned on, this connection will become the router's default route. This means that all traffic directed to the Internet will go through the L2TP server and the server's IP address will be seen as this device's source IP to other hosts on the Internet. NOTE: this can only be used when WAN Failover is turned off.

L2TP server

An **L2TP server** is an entity that waits for incoming connections from L2TP clients. To create a new server instance, go to the *Services* → *VPN* → *L2TP* section, select *Role: Server*, enter a custom name and click the 'Add New' button. An L2TP server instance with the given name will appear in the "L2TP Configuration" list. Only one L2TP server instance is allowed to be added.

A server needs to have a [public IP address](#) in order to be available from the public network (the Internet).

To begin configuration, click the 'Edit' button located next to the server instance. Refer to the figure and table below for information on the L2TP server's configuration fields:



Field	Value	Description
Enable	yes no; default: no	Turns the L2TP instance on or off.
Local IP	ip; default: 192.168.0.1	IP address of this L2TP network interface.
Remote IP range begin	ip; default: 192.168.0.20	L2TP IP address leases will begin from the address specified in this field.
Remote IP range end	ip; default: 192.168.0.30	L2TP IP address leases will end with the address specified in this field.
User name	string; default: user	Username used for authentication to this L2TP server.
Password	string; default: pass	Password used for authentication to this L2TP server.
L2TP Client's IP	ip; default: none	Assigns an IP address to the client that uses the adjacent authentication info. This field is optional and if left empty the client will simply receive an IP address from the IP pool defined above.

SSTP

Secure Socket Tunneling Protocol (SSTP) is a VPN protocol designed to transport PPP traffic via a secure SSL/TLS channel.

SSTP configuration

To create a new SSTP instance, go to the *Services* → *VPN* → *SSTP* section, enter a custom name and click the 'Add' button. An SSTP instance with the given name will appear in the "SSTP Configuration" list.

To begin configuration, click the 'Edit' button located next to the instance. Refer to the figure and table below for information on the SSTP instance's configuration fields:



Field	Value	Description
Enabled	yes no; default: no	Turns the SSTP instance on or off. When turned on, this connection will become the router's default route. This means that all traffic directed to the Internet will go through the L2TP server and the server's IP address will be seen as this device's source IP to other hosts on the Internet.
Use as default gateway	yes no; default: no	NOTE: this can only be used when WAN Failover is turned off.
Server IP address	ip host; default: none	IP address or hostname of an SSTP server.
Username	string; default: none	Username used for authentication to the SSTP server.
Password	string; default: none	Password used for authentication to the SSTP server.
CA cert	.crt file; default: none	Uploads a Certificate authority (CA) file.

Stunnel

Stunnel is an open-source a proxy service that adds TLS encryption to clients and servers already existing on a VPN network. TLS encryption provided by Stunnel can be used as an additional layer of encryption for data sent by VPN. This procedure increases the security of the established connection and provides higher chances of passing a Deep packet inspection (DPI) check.

For a more in-depth Stunnel configuration example visit this page: [OpenVPN over Stunnel](#).

Stunnel Globals

The **Stunnel Globals** section is used to manage the Stunnel service as a whole. Refer to the figure and table below for information on the fields contained in the Stunnel Globals section.



Field	Value	Description
Enabled	yes no; default: no	Turns the Stunnel service on or off. If this is unchecked, Stunnel instances will not start (even if they are enabled individually); therefore, it is necessary to check this field in order to make Stunnel active on the router.

Debug Level	integer [0..7]; default: 5	<p>Debugging to log output level.</p> <ul style="list-style-type: none"> • 0 (emergency) - a panic condition, i.e., system is no longer usable. • 1 (alert) - a condition that must be corrected immediately. • 2 (critical) - critical conditions, device errors. • 3 (error) - errors that are fatal to the operation, but not the service or application (can't open a required file, missing data, etc.) Solving these types of errors will usually require user intervention. • 4 (warning) - anything that can potentially cause application oddities, but for which the system is automatically recovering from (e.g., retrying an operation, missing secondary data, etc.) • 5 (notice) - conditions that are not error conditions, but that may require special handling. • 6 (info) - general useful information (e.g., configuration changes, starts and stops of services, etc.) • 7 (debug) - contains basic information that is diagnostically helpful to most people (i.e., not just engineers).
Use alternative config	yes no; default: no	Turns the possibility to upload an external Stunnel configuration file on or off. If you turn this on, other Stunnel configurations present in the router will become inactive.
Upload alternative config	file; default: none	Uploads an Stunnel configuration file.

Stunnel client/server

To create a new Stunnel instance, go to the *Services* → *VPN* → *Stunnel* section, enter a custom name and click the 'Add' button. An Stunnel instance with the given name will appear in the "Stunnel Configuration" list.

To begin configuration, click the 'Edit' button located next to the instance. Refer to the figure and table below for information on the Stunnel instance's configuration fields:



Field	Value	Description
Enable	yes no; default: no	Turns the Stunnel instance on or off.
Operating Mode	Server Client; default: Server	<p>Selects the Stunnel instance's role.</p> <ul style="list-style-type: none"> • Server - listens for connecting Stunnel clients. • Client - listens for connecting OpenVPN clients and connects to an Stunnel server.
Listen IP	ip; default: none	<p>Makes the instance "listen" for incoming connections on the specified IP address. When left empty, the value of this field defaults to <i>localhost</i> (127.0.0.1).</p>
Listen Port	integer [0..65535]; default: none	<p>Makes the instance "listen" for incoming connections on the specified TCP port. Make sure you chose a port that is not being used by another service. You will also have to allow traffic on the specified port. You can do this via the Network → Firewall → Traffic Rules → Open Ports On Router section.</p>

Connect IP's	ip:port; default: none	IP:Port to listen for VPN connections. When left empty the value of this field is interpreted as <i>localhost</i> . Must contain at least one item. If multiple options are specified, remote address is chosen using a round-robin algorithm.
TLS Cipher	None Secure Custom; default: None	Packet encryption algorithm cipher.
Allowed TLS Ciphers	string; default: none	A list of TLS ciphers accepted for this connection.
Application Protocol	Connect SMTP Not specified; default: Not specified	This option enables initial, protocol-specific negotiation of the TLS encryption. The protocol option should not be used with TLS encryption on a separate port.
Protocol Authentication	Connect: Basic NTLM; default: Basic SMTP: Plain Login; default: Plain	Authentication type for the protocol negotiations.
Protocol Domain	string; default: none	Domain for the protocol negotiations.
Protocol Host	host:port; default: none	Specifies the final TLS server to be connected to by the proxy, and not the proxy server directly connected by Stunnel. The proxy server should be specified along with the <i>connect</i> option.
Protocol Username	string; Default: none	Username for authentication to the protocol negotiations.
Protocol Password	string; default: none	Password for authentication to the protocol negotiations.
Certificate File	.crt file; default: none	TLS client or server certificate file.
Private Key	.key file; default: none	TLS client or server key file.

DMVPN

Dynamic Multipoint VPN (DMVPN) is a method of building scalable IPsec VPNs. DMVPN is configured as a hub-and-spoke network, where tunnels between spokes are built dynamically; therefore, no change in configuration is required on the hub in order to connect new spokes.

DMVPN configuration

To create a new DMVPN instance, go to the *Services* → *VPN* → *DMVPN* section, enter a custom name and click the 'Add' button. A DMVPN instance with the given name will appear in the "DMVPN Configuration" list.

To begin configuration, click the 'Edit' button located next to the instance. Refer to the figures and tables below for information on the DMVPN instance configuration:



Field	Value	Description
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Enabled	yes no; default: no	Turns the DMVPN instance on or off.
Working mode	Spoke Hub; default: Spoke	Selects the role of this instance <ul style="list-style-type: none"> • Hub - the central instance of DMVPN that connects other peers (spokes) into single network. There is no need to reconfigure the hub when connecting new spokes to it. • Spoke - an instance that connects to the hub.
Hub address	ip host; default: off	IP address or hostname of a DMVPN hub.



Field	Value	Description
Tunnel source	network interface; default: none	Network interface used to establish the GRE Tunnel.
Local GRE interface IP address	ip; default: none	IP address of the local GRE Tunnel network interface.
Spoke: Remote GRE interface IP address	ip; default: none	IP address of the remote GRE Tunnel instance.
Hub: Local GRE interface netmask	netmask; default: none	Subnet mask of the local GRE Tunnel network interface.
GRE MTU	integer; default: 1476	Sets the maximum transmission unit (MTU) size. It is the largest size of a protocol data unit (PDU) that can be transmitted in a single network layer transaction.
GRE keys	integer [0..65535]; default: none	A key used to identify incoming and outgoing GRE packets.



Field	Value	Description
Negotiation mode	Main Aggressive; default: Main	Internet Security and Key Management Protocol (ISAKMP) phase 1 exchange mode. <ul style="list-style-type: none"> • Main - performs three two-way exchanges between the initiator and the receiver (a total of 9 messages). • Aggressive - performs fewer exchanges than main mode (a total of 6 messages) by storing most data into the first exchange. In aggressive mode, the information is exchanged before there is a secure channel, making it less secure but faster than main mode.

		Defines the type of identity used in user (IPsec instance) authentication.
My identifier type	FQDN User FQDN Address; default: FQDN	<ul style="list-style-type: none"> • FQDN - identity defined by fully qualified domain name. It is the complete domain name for a host (for example, <i>something.somedomain.com</i>). Only supported with IKEv2. • User FQDN - identity defined by fully qualified username string (for example, <i>username@something.somedomain.com</i>). Only supported with IKEv2. • Address - identity by IP address.
My identifier	ip string; default: none	Defines how the user (IPsec instance) will be identified during authentication.
Encryption algorithm	DES 3DES AES128 AES192 AES256; default: 3DES	Algorithm used for data encryption.
Authentication/Hash algorithm	MD5 SHA1 SHA256 SHA384 SHA512; default: SHA1	Algorithm used for exchanging authentication and hash information.
DH group/PFS group	MODP768 MODP1024 MODP1536 MODP2048 MODP3072 MODP4096; default: MODP1536	
Lifetime	integer; default: 8 hours	Defines a time period after which the phase will re-initiate its exchange of information.
Pre shared key	string; default: none	A shared password used for authentication between IPsec peers.
Secret's ID selector	string; default: none	Each secret can be preceded by a list of optional ID selectors. A selector is an IP address, a Fully Qualified Domain Name, user@FQDN or %any. NOTE: IKEv1 only supports IP address ID selector.



Field	Value	Description
NHRP network ID	integer; default: 1	An identifier used to define the NHRP domain. This is a local parameter and its value does not need to match the values specified on other domains. However, the NHRP ID is added to packets which arrive on the GRE interface; therefore, it may be helpful to use the same ID for troubleshooting purposes.
NHRP hold time	integer; default: 7200	Specifies the holding time for NHRP Registration Requests and Resolution Replies sent from this interface or shortcut-target. The hold time is specified in seconds and defaults to two hours.

ZeroTier

ZeroTier One is an open source software product which establishes Peer to Peer VPN (P2PVPN) connection between laptops, desktops, phones, embedded devices, cloud resources, and apps.

To make this section visible on the router, you must first install the **zerotier** package from the the **System** → **Packages** section.

[Click here](#) to see a usage example of ZeroTier One VPN.

ZeroTier General

The **General** section is used to enable the ZeroTier service.



Field	Value	Description
Enabled	yes no; default: no	Turns the ZeroTier service on or off.
Address	string; default: none	Your ZeroTier address. This field is filled automatically after a successful connection.
Networks	string; default: none	ZeroTier network address. This value should be taken from your ZeroTier account.

ZeroTier VPN

The **VPN** section is used to turn ZeroTier VPN on or off and select its role.



Field	Value	Description
Enable VPN	yes no; default: no	Turns ZeroTier VPN on or off.
Mode	Server Client; default: Server	ZeroTier VPN operating mode.

See also

- Configuration examples for RUTxxx VPN services:
 - [OpenVPN configuration examples](#)
 - [IPsec configuration examples](#)
 - [GRE Tunnel configuration examples](#)
 - [PPTP configuration examples](#)
 - [L2TP configuration examples](#)
 - [DMVPN configuration](#)
- Configuration examples for third party VPN services
 - [expressvpn.com](#)
 - [vpngate.net](#)
 - [vpnbook.com](#)
 - [hide.me](#)

- Other related examples:
 - [How to generate TLS certificates \(Windows\)?](#)
 - [L2TP over IPsec](#)
 - [OpenVPN traffic split](#)
 - [OpenVPN client on Windows](#)