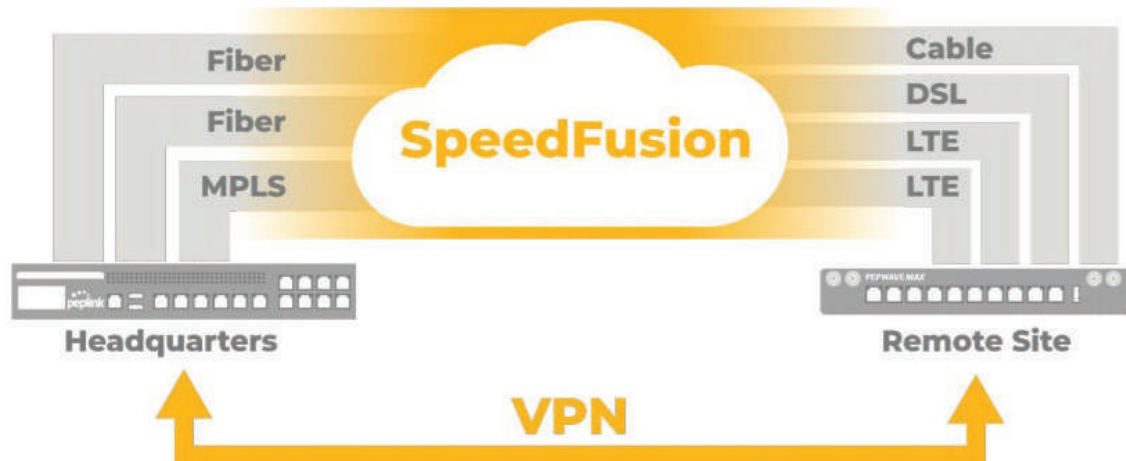


13 Bandwidth Bonding SpeedFusion™ / PepVPN



Pepwave bandwidth bonding SpeedFusion™ is our patented technology that enables our SD-WAN routers to bond multiple Internet connections to increase site-to-site bandwidth and reliability. SpeedFusion functionality securely connects your Pepwave router to another Pepwave or Peplink device (Peplink Balance 210/310/380/580/710/1350 only). Data, voice, or video communications between these locations are kept confidential across the public Internet.

Bandwidth bonding SpeedFusion™ is specifically designed for multi-WAN environments. In case of failures and network congestion at one or more WANs, other WANs can be used to continue carrying the network traffic.

Different models of our SD-WAN routers have different numbers of site-to-site connections allowed. End-users who need to have more site-to-site connections can purchase a SpeedFusion license to increase the number of site-to-site connections allowed.

Pepwave routers can aggregate all WAN connections' bandwidth for routing SpeedFusion™ traffic. Unless all the WAN connections of one site are down, Pepwave routers can keep the VPN up and running.


VPN bandwidth bonding is supported in Firmware 5.1 or above. All available bandwidth will be utilized to establish the VPN tunnel, and all traffic will be load balanced at packet level across all links. VPN bandwidth bonding is enabled by default.


13.1 PepVPN


To configure PepVPN and SpeedFusion, navigate to **Advanced>SpeedFusion™** or

Advanced>PepVPN.

PepVPN with SpeedFusion™



 InControl management enabled. Settings can now be configured on [InControl](#).

Profile	Remote ID	Remote Address(es)	?
 FL Office	8345-5F7A-DE97		✖
<input type="button" value="New Profile"/>			

Send All Traffic To

No PepVPN profile selected ?

PepVPN

Local ID ? MAX_HD2_DEF1 ?

Link Failure Detection

Link Failure Detection Time ?

- Recommended (Approx. 15 secs)
- Fast (Approx. 6 secs)
- Faster (Approx. 2 secs)
- Extreme (Under 1 sec)

Shorter detection time incurs more health checks and higher bandwidth overhead


The local LAN subnet and subnets behind the LAN (defined under **Static Route** on the LAN settings page) will be advertised to the VPN. All VPN members (branch offices and headquarters) will be able to route to local subnets.


Note that all LAN subnets and the subnets behind them must be unique. Otherwise, VPN members will not be able to access each other.

All data can be routed over the VPN using the 256-bit AES encryption standard. To configure, navigate to **Advanced>SpeedFusion™** or **Advanced>PepVPN** and click the **New Profile** button to create a new VPN profile (you may have to first save the displayed default profile in order to access the **New Profile** button). Each profile specifies the settings for making VPN connection with one remote Pepwave or Peplink device. Note that available settings vary by model.

A list of defined SpeedFusion connection profiles and a **Link Failure Detection Time** option will be shown. Click the **New Profile** button to create a new VPN connection profile for making a VPN connection to a remote Pepwave or Peplink device via the available WAN connections. Each profile is for making a VPN connection with one remote Pepwave or Peplink Device.


PepVPN Profile					
Name	<input type="text"/>				
Active	<input checked="" type="checkbox"/>				
Encryption	<input checked="" type="radio"/> 256-bit AES <input type="radio"/> OFF				
Authentication	<input checked="" type="radio"/> Remote ID / Pre-shared Key <input type="radio"/> X.509				
Remote ID / Pre-shared Key	<table border="1"> <tr> <th>Remote ID</th> <th>Pre-shared Key</th> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Remote ID	Pre-shared Key	<input type="text"/>	<input type="text"/>
Remote ID	Pre-shared Key				
<input type="text"/>	<input type="text"/>				
NAT Mode	<input type="checkbox"/>				
Remote IP Address / Host Names (Optional)	<input type="text"/> <small>If this field is empty, this field on the remote unit must be filled</small>				
Cost	<input type="text" value="10"/>				
Data Port	<input checked="" type="radio"/> Auto <input type="radio"/> Custom <input type="text"/>				
Bandwidth Limit	<input type="checkbox"/>				
WAN Smoothing	<input type="text" value="Off"/>				
Use IP ToS	<input type="checkbox"/>				
Latency Difference Cutoff	<input type="text" value="500"/> ms				

PepVPN Profile Settings	
Name	This field is for specifying a name to represent this profile. The name can be any combination of alphanumeric characters (0-9, A-Z, a-z), underscores (_), dashes (-), and/or non-leading/trailing spaces ().
Active	When this box is checked, this VPN connection profile will be enabled. Otherwise, it will be disabled.
Encryption	By default, VPN traffic is encrypted with 256-bit AES . If Off is selected on both sides of a VPN connection, no encryption will be applied.
Authentication	Select from By Remote ID Only , Preshared Key , or X.509 to specify the method the Pepwave MAX will use to authenticate peers. When selecting By Remote ID Only , be sure to enter a unique peer ID number in the Remote ID field.
Remote ID / Pre-shared Key	<p>This optional field becomes available when Remote ID / Pre-shared Key is selected as the Pepwave router's VPN Authentication method, as explained above. Pre-shared Key defines the pre-shared key used for this particular VPN connection. The VPN connection's session key will be further protected by the pre-shared key. The connection will be up only if the pre-shared keys on each side match. When the peer is running firmware 5.0+, this setting will be ignored.</p> <p>Enter Remote IDs either by typing out each Remote ID and Pre-shared Key, or by pasting a CSV. If you wish to paste a CSV, click the  icon next to the "Remote ID / Preshared Key" setting.</p>
Remote ID/Remote	These optional fields become available when X.509 is selected as the Pepwave MAX's VPN authentication method, as explained above. To authenticate VPN

Certificate	connections using X.509 certificates, copy and paste certificate details into these fields. To get more information on a listed X.509 certificate, click the Show Details link below the field.
Allow Shared Remote ID	When this option is enabled, the router will allow multiple peers to run using the same remote ID.
NAT Mode	Check this box to allow the local DHCP server to assign an IP address to the remote peer. When NAT Mode is enabled, all remote traffic over the VPN will be tagged with the assigned IP address using network address translation.
Remote IP Address / Host Names (Optional)	<p>If NAT Mode is not enabled, you can enter a remote peer's WAN IP address or hostname(s) here. If the remote uses more than one address, enter only one of them here. Multiple hostnames are allowed and can be separated by a space character or carriage return. Dynamic-DNS host names are also accepted.</p> <p>This field is optional. With this field filled, the Pepwave MAX will initiate connection to each of the remote IP addresses until it succeeds in making a connection. If the field is empty, the Pepwave MAX will wait for connection from the remote peer. Therefore, at least one of the two VPN peers must specify this value. Otherwise, VPN connections cannot be established.</p>
Cost	<p>Define path cost for this profile.</p> <p>OSPF will determine the best route through the network using the assigned cost.</p> <p>Default: 10</p>
Data Port	<p>This field is used to specify a UDP port number for transporting outgoing VPN data. If Default is selected, UDP port 4500 will be used. Port 32015 will be used if the remote unit uses Firmware prior to version 5.4 or if port 4500 is unavailable. If Custom is selected, enter an outgoing port number from 1 to 65535.</p> <p>Click the  icon to configure data stream using TCP protocol [EXPERIMENTAL]. In the case TCP protocol is used, the exposed TCP session option can be authorised to work with TCP accelerated WAN link.</p>
Bandwidth Limit	Define maximum download and upload speed to each individual peer. This functionality requires the peer to use PepVPN version 4.0.0 or above.
Cost	<p>Define path cost for this profile.</p> <p>OSPF will determine the best route through the network using the assigned cost.</p> <p>Default: 10</p>
WAN Smoothing^A	Select the degree to which WAN Smoothing will be implemented across your WAN links.
Use IP ToS	Checking this button enables the use of IP ToS header field.
Latency Difference Cutoff	Traffic will be stopped for links that exceed the specified millisecond value with respect to the lowest latency link. (e.g. Lowest latency is 100ms, a value of 500ms means links with latency 600ms or more will not be used)

A - Advanced feature, please click the  button on the top right-hand corner to activate.


To enable Layer 2 Bridging between PepVPN profiles, navigate to **Network>LAN>Basic Settings>*LAN Profile Name*** and refer to instructions in section 9.1

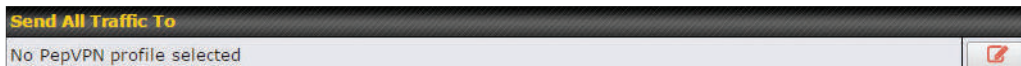
WAN Connection Priority 					
	Priority	Direction	Connect to Remote	Cut-off latency (ms)	Suspension Time after Packet Loss (ms)
1. WAN 1	1 (Highest) ▼	Up/Down ▼	All ▼	<input type="text"/>	<input type="text"/>
2. WAN 2	1 (Highest) ▼	Up/Down ▼	All ▼	<input type="text"/>	<input type="text"/>
3. Wi-Fi WAN	1 (Highest) ▼	Up/Down ▼	All ▼	<input type="text"/>	<input type="text"/>
4. Cellular 1	1 (Highest) ▼	Up/Down ▼	All ▼	<input type="text"/>	<input type="text"/>
5. Cellular 2	1 (Highest) ▼	Up/Down ▼	All ▼	<input type="text"/>	<input type="text"/>
6. USB	1 (Highest) ▼	Up/Down ▼	All ▼	<input type="text"/>	<input type="text"/>

WAN Connection Priority

WAN Connection Priority

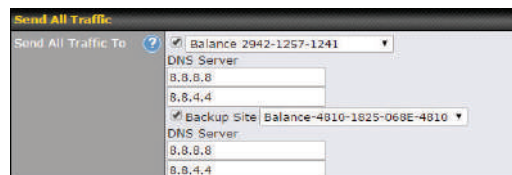
If your device supports it, you can specify the priority of WAN connections to be used for making VPN connections. WAN connections set to **OFF** will never be used. Only available WAN connections with the highest priority will be used.

To enable asymmetric connections, connection mapping to remote WANs, cut-off latency, and packet loss suspension time, click the  button.



Send All Traffic To

This feature allows you to redirect all traffic to a specified PepVPN connection. Click the  button to select your connection and the following menu will appear:



You could also specify a DNS server to resolve incoming DNS requests. Click the checkbox next to **Backup Site** to designate a backup SpeedFusion profile that will take over, should the main PepVPN connection fail.


Outbound Policy/PepVPN Outbound Custom Rules

Some models allow you to set outbound policy and custom outbound rules from **Advanced>PepVPN**. See **Section 14** for more information on outbound policy settings.

The screenshot shows two configuration panels. The top panel, titled "Outbound Policy", has a dropdown menu set to "According to custom rules" and an edit icon. The bottom panel, titled "PepVPN Outbound Custom Rules", is a table with columns for Service, Algorithm, Source, Destination, and Protocol. The "Source" field is set to "(Auto)" and there is an "Add Rule" button at the bottom.

The screenshot shows the "PepVPN Local ID" configuration panel. It has a text input field containing "MAX_HD2_8D1C" and an edit icon to its right.

PepVPN Local ID

The local ID is a text string to identify this local unit when establishing a VPN connection. When creating a profile on a remote unit, this local ID must be entered in the remote unit's **Remote ID** field. Click the  icon to edit **Local ID**.

The screenshot shows the "PepVPN Settings" configuration panel. It includes several settings: "Handshake Port" with radio buttons for "Default" and "Custom" (with an input field); "Backward Compatibility" with radio buttons for "High (firmware 5.3+)" and "Latest (firmware 6.2+)"; and "Link Failure Detection Time" with radio buttons for "Recommended (Approx. 15 secs)", "Fast (Approx. 6 secs)", "Faster (Approx. 2 secs)", and "Extreme (Under 1 sec)". A note at the bottom states: "Shorter detection time incurs more health checks and higher bandwidth overhead".

PepVPN Settings

Handshake Port^A To designate a custom handshake port (TCP), click the **custom** radio button and enter the port number you wish to designate.

Backward Compatibility Determine the level of backward compatibility needed for PepVPN tunnels. The use of the **Latest** setting is recommended as it will improve the performance and resilience of SpeedFusion connections.

Link Failure Detection Time

The bonded VPN can detect routing failures on the path between two sites over each WAN connection. Failed WAN connections will not be used to route VPN traffic. Health check packets are sent to the remote unit to detect any failure. The more frequently checks are sent, the shorter the detection time, although more bandwidth will be consumed.

When **Recommended** (default) is selected, a health check packet is sent every five seconds, and the expected detection time is 15 seconds.

When **Fast** is selected, a health check packet is sent every three seconds, and the expected detection time is six seconds.

When **Faster** is selected, a health check packet is sent every second, and the expected detection time is two seconds.

When **Extreme** is selected, a health check packet is sent every 0.1 second, and the expected detection time is less than one second.

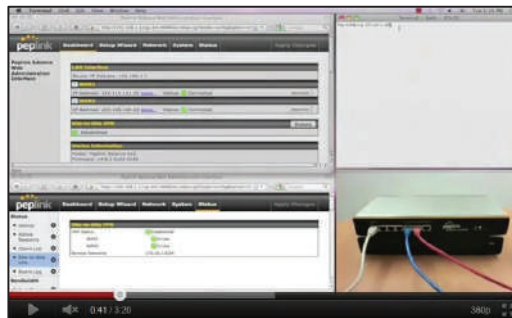
^A - Advanced feature, please click the  button on the top right-hand corner to activate.

Important Note

Peplink proprietary SpeedFusion™ uses TCP port 32015 and UDP port 4500 for establishing VPN connections. If you have a firewall in front of your Pepwave devices, you will need to add firewall rules for these ports and protocols to allow inbound and outbound traffic to pass through the firewall.

Tip

Want to know more about VPN sub-second session failover? Visit our YouTube Channel for a video tutorial!



<http://youtu.be/TLQgdpPSY88>

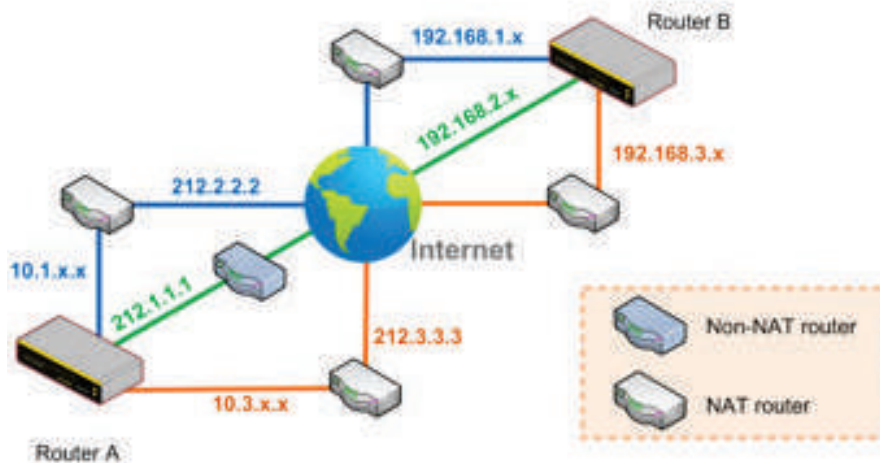
13.2 The Pepwave Router Behind a NAT Router

Pepwave routers support establishing SpeedFusion™ over WAN connections which are behind a NAT (network address translation) router.

To enable a WAN connection behind a NAT router to accept VPN connections, you can configure the NAT router in front of the WAN connection to inbound port-forward TCP port 32015 to the Pepwave router.

If one or more WAN connections on Unit A can accept VPN connections (by means of port forwarding or not), while none of the WAN connections on the peer Unit B can do so, you should enter all of Unit A's public IP addresses or hostnames into Unit B's **Remote IP Addresses / Host Names** field. Leave the field in Unit A blank. With this setting, a SpeedFusion™ connection can be set up and all WAN connections on both sides will be utilized.

See the following diagram for an example of this setup in use:



One of the WANs connected to Router A is non-NAT'd (212.1.1.1). The rest of the WANs connected to Router A and all WANs connected to Router B are NAT'd. In this case, the **Peer IP Addresses / Host Names** field for Router B should be filled with all of Router A's hostnames or public IP addresses (i.e., 212.1.1.1, 212.2.2.2, and 212.3.3.3), and the field in Router A can be left blank. The two NAT routers on WAN1 and WAN3 connected to Router A should inbound port-forward TCP port 32015 to Router A so that all WANs will be utilized in establishing the VPN.

13.3 SpeedFusion™ Status

SpeedFusion™ status is shown in the Dashboard. The connection status of each connection profile is shown as below.

SpeedFusion™		Status
FL Office	🔒	Established
NY Office	🔒	Established

After clicking the **Status** button at the top right corner of the SpeedFusion™ table, you will be forwarded to **Status>SpeedFusion™**, where you can view subnet and WAN connection information for each VPN peer. Please refer to **Section 22.6** for details.

IP Subnets Must Be Unique Among VPN Peers

The entire interconnected SpeedFusion™ network is a single non-NAT IP network. Avoid duplicating subnets in your sites to prevent connectivity problems when accessing those subnets.

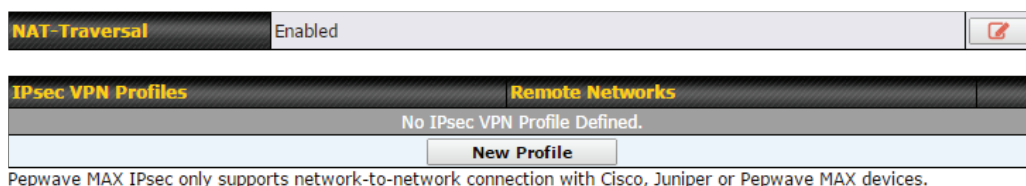
14 IPsec VPN

IPsec VPN functionality securely connects one or more branch offices to your company's main headquarters or to other branches. Data, voice, and video communications between these locations are kept safe and confidential across the public Internet.

IPsec VPN on Pepwave routers is specially designed for multi-WAN environments. For instance, if a user sets up multiple IPsec profiles for a multi-WAN environment and WAN1 is connected and healthy, IPsec traffic will go through this link. However, should unforeseen problems (e.g., unplugged cables or ISP problems) cause WAN1 to go down, our IPsec implementation will make use of WAN2 and WAN3 for failover.

14.1 IPsec VPN Settings

Many Pepwave products can make multiple IPsec VPN connections with Peplink, Pepwave, Cisco, and Juniper routers. Note that all LAN subnets and the subnets behind them must be unique. Otherwise, VPN members will not be able to access each other. All data can be routed over the VPN with a selection of encryption standards, such as 3DES, AES-128, and AES-256. To configure IPsec VPN on Pepwave devices that support it, navigate to **Advanced>IPsec VPN**.



A **NAT-Traversal** option and list of defined **IPsec VPN** profiles will be shown. **NAT-Traversal** should be enabled if your system is behind a NAT router. Click the **New Profile** button to create new IPsec VPN profiles that make VPN connections to remote Pepwave, Cisco, or Juniper routers via available WAN connections. To edit any of the profiles, click on its associated connection name in the leftmost column.

Name	Profile 1								
Active	<input checked="" type="checkbox"/>								
Connect Upon Disconnection of	<input checked="" type="checkbox"/>	WAN 2							
Remote Gateway IP Address / Host Name	12.12.12.12								
Local Networks	<p>Propose the following networks to remote gateway:</p> <input type="checkbox"/> 172.16.1.1/24 <input type="checkbox"/> 172.16.2.1/24 <input type="checkbox"/> 172.16.3.1/24 <input checked="" type="checkbox"/> 10.10.0.1/32 <input checked="" type="checkbox"/> 192.168.10.0/24 <input checked="" type="checkbox"/> 192.168.11.0/24 <input type="checkbox"/> <input type="text"/>								
	<p>Apply the following NAT policies:</p> <input checked="" type="checkbox"/> 172.16.1.0/24 <input checked="" type="checkbox"/> 192.168.10.0/24 <input checked="" type="checkbox"/> 172.16.2.0/24 <input checked="" type="checkbox"/> 10.10.0.1/32 <input checked="" type="checkbox"/> 172.16.3.11/32 <input checked="" type="checkbox"/> 192.168.11.101/32 <input checked="" type="checkbox"/> 172.16.3.21/32 <input checked="" type="checkbox"/> 192.168.11.201/32 <input type="checkbox"/> Local Network <input checked="" type="checkbox"/> NAT Network								
Remote Networks	<table border="1"> <thead> <tr> <th>Network</th> <th>Subnet Mask</th> <th></th> </tr> </thead> <tbody> <tr> <td>192.167.11.193</td> <td>255.255.255.0 (/24)</td> <td><input type="button" value="+"/></td> </tr> </tbody> </table>	Network	Subnet Mask		192.167.11.193	255.255.255.0 (/24)	<input type="button" value="+"/>		
Network	Subnet Mask								
192.167.11.193	255.255.255.0 (/24)	<input type="button" value="+"/>							
Authentication	<input checked="" type="radio"/> Preshared Key <input type="radio"/> X.509 Certificate								
Mode	<input checked="" type="radio"/> Main Mode (All WANs need to have Static IP) <input type="radio"/> Aggressive Mode								
Force UDP Encapsulation	<input type="checkbox"/>								
Preshared Key	<input type="text" value="....."/> <input checked="" type="checkbox"/> Hide Characters								
Local ID	<input type="text"/>								
Remote ID	<input type="text"/>								
Phase 1 (IKE) Proposal	1 <input type="text" value="AES-256 & SHA1"/> 2 <input type="text" value="-----"/>								
Phase 1 DH Group	<input checked="" type="checkbox"/> Group 2: MODP 1024 <input type="checkbox"/> Group 5: MODP 1536								
Phase 1 SA Lifetime	<input type="text" value="3600"/>	seconds	<input type="button" value="Default"/>						
Phase 2 (ESP) Proposal	1 <input type="text" value="AES-256 & SHA1"/> 2 <input type="text" value="-----"/>								
Phase 2 PFS Group	<input checked="" type="radio"/> None <input type="radio"/> Group 2: MODP 1024 <input type="radio"/> Group 5: MODP 1536								
Phase 2 SA Lifetime	<input type="text" value="28800"/>	seconds	<input type="button" value="Default"/>						

IPsec VPN Settings	
Name	This field is for specifying a local name to represent this connection profile.
Active	When this box is checked, this IPsec VPN connection profile will be enabled. Otherwise, it will be disabled.
Connect Upon Disconnection of	Check this box and select a WAN to connect to this VPN automatically when the specified WAN is disconnected.
Remote Gateway IP Address / Host Name	Enter the remote peer's public IP address. For Aggressive Mode , this is optional.
Local Networks	<p>Enter the local LAN subnets here. If you have defined static routes, they will be shown here.</p> <p>Using NAT, you can map a specific local network / IP address to another, and the packets received by remote gateway will appear to be coming from the mapped network / IP address. This allow you to establish IPsec connection to a remote site that has one or more subnets overlapped with local site.</p> <p>Two types of NAT policies can be defined:</p> <p>One-to-One NAT policy: if the defined subnet in Local Network and NAT Network has the same size, for example, policy "192.168.50.0/24 > 172.16.1.0/24" will translate the local IP address 192.168.50.10 to 172.16.1.10 and 192.168.50.20 to 172.16.1.20. This is a bidirectional mapping which means clients in remote site can initiate connection to the local clients using the mapped address too.</p> <p>Many-to-One NAT policy: if the defined NAT Network on the right hand side is an IP address (or having a network prefix /32), for example, policy "192.168.1.0/24 > 172.168.50.1/32" will translate all clients in 192.168.1.0/24 network to 172.168.50.1. This is a unidirectional mapping which means clients in remote site will not be able to initiate connection to the local clients.</p>
Remote Networks	Enter the LAN and subnets that are located at the remote site here.
Authentication	To access your VPN, clients will need to authenticate by your choice of methods. Choose between the Preshared Key and X.509 Certificate methods of authentication.
Mode	Choose Main Mode if both IPsec peers use static IP addresses. Choose Aggressive Mode if one of the IPsec peers uses dynamic IP addresses.
Force UDP	For forced UDP encapsulation regardless of NAT-traversal, tick this checkbox.

Encapsulation	
Pre-shared Key	This defines the peer authentication pre-shared key used to authenticate this VPN connection. The connection will be up only if the pre-shared keys on each side match.
Remote Certificate (pem encoded)	Available only when X.509 Certificate is chosen as the Authentication method, this field allows you to paste a valid X.509 certificate.
Local ID	In Main Mode , this field can be left blank. In Aggressive Mode , if Remote Gateway IP Address is filled on this end and the peer end, this field can be left blank. Otherwise, this field is typically a U-FQDN.
Remote ID	In Main Mode , this field can be left blank. In Aggressive Mode , if Remote Gateway IP Address is filled on this end and the peer end, this field can be left blank. Otherwise, this field is typically a U-FQDN.
Phase 1 (IKE) Proposal	In Main Mode , this allows setting up to six encryption standards, in descending order of priority, to be used in initial connection key negotiations. In Aggressive Mode , only one selection is permitted.
Phase 1 DH Group	This is the Diffie-Hellman group used within IKE. This allows two parties to establish a shared secret over an insecure communications channel. The larger the group number, the higher the security. Group 2: 1024-bit is the default value. Group 5: 1536-bit is the alternative option.
Phase 1 SA Lifetime	This setting specifies the lifetime limit of this Phase 1 Security Association. By default, it is set at 3600 seconds.
Phase 2 (ESP) Proposal	In Main Mode , this allows setting up to six encryption standards, in descending order of priority, to be used for the IP data that is being transferred. In Aggressive Mode , only one selection is permitted.
Phase 2 PFS Group	Perfect forward secrecy (PFS) ensures that if a key was compromised, the attacker will be able to access only the data protected by that key. None - Do not request for PFS when initiating connection. However, since there is no valid reason to refuse PFS, the system will allow the connection to use PFS if requested by the remote peer. This is the default value. Group 2: 1024-bit Diffie-Hellman group. The larger the group number, the higher the security. Group 5: 1536-bit is the third option.
Phase 2 SA Lifetime	This setting specifies the lifetime limit of this Phase 2 Security Association. By default, it is set at 28800 seconds.

WAN Connection Priority	
Priority	WAN Selection
1	WAN 1
2	-----

WAN Connection Priority

WAN Connection Select the appropriate WAN connection from the drop-down menu.

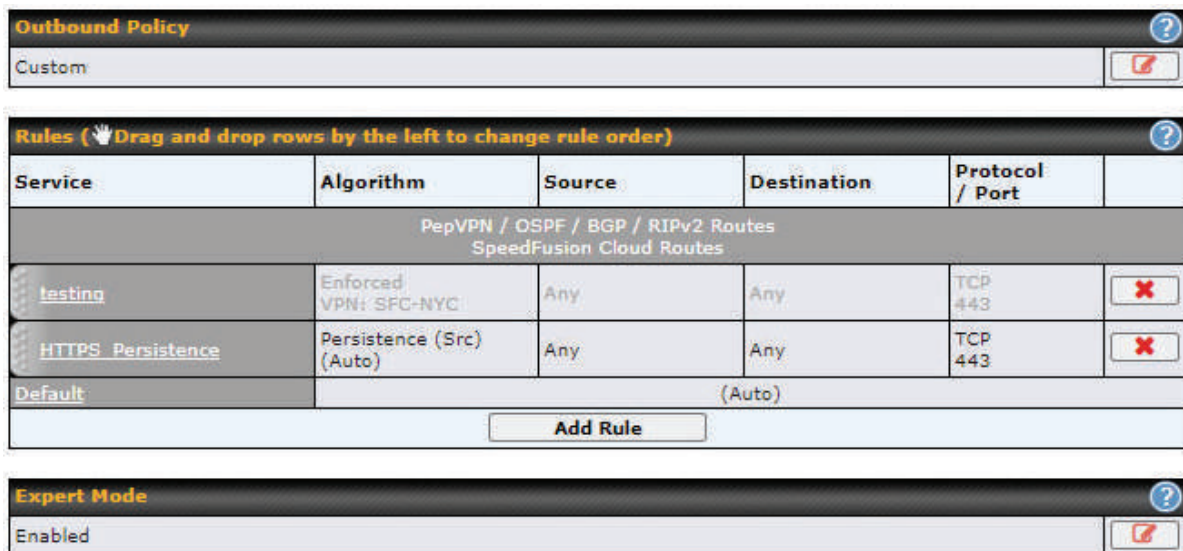
15 Outbound Policy

Pepwave routers can flexibly manage and load balance outbound traffic among WAN connections.

Important Note

Outbound policy is applied only when more than one WAN connection is active.

The settings for managing and load balancing outbound traffic are located at **Advanced>Outbound Policy** or **Advanced>PepVPN**, depending on the model.



Outbound Policy ?

Custom ✎

Rules (🖱️ Drag and drop rows by the left to change rule order) ?

Service	Algorithm	Source	Destination	Protocol / Port	
PepVPN / OSPF / BGP / RIPv2 Routes SpeedFusion Cloud Routes					
testing	Enforced VPN: SFC-NYC	Any	Any	TCP 443	✖
HTTPS Persistence	Persistence (Src) (Auto)	Any	Any	TCP 443	✖
Default	(Auto)				
<input type="button" value="Add Rule"/>					

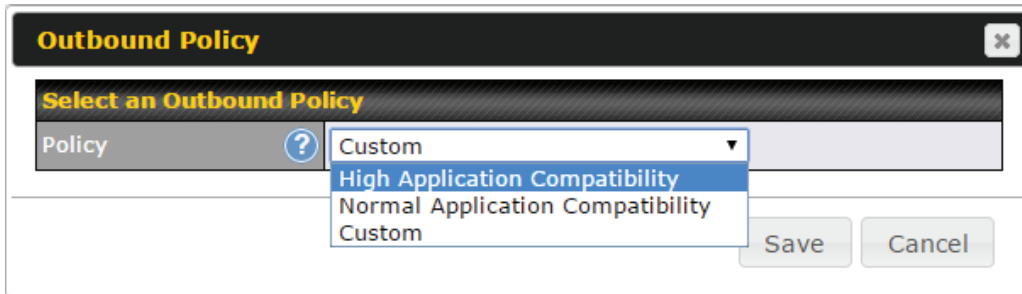
Expert Mode ?

Enabled ✎

15.1 Outbound Policy

Outbound policies for managing and load balancing outbound traffic are located at

Advanced>Outbound Policy> or **Advanced>PepVPN>Outbound Policy**. Click the  button beside the **Outbound Policy** box:



There are three main selections for the outbound traffic policy:

- High Application Compatibility
- Normal Application Compatibility
- Custom

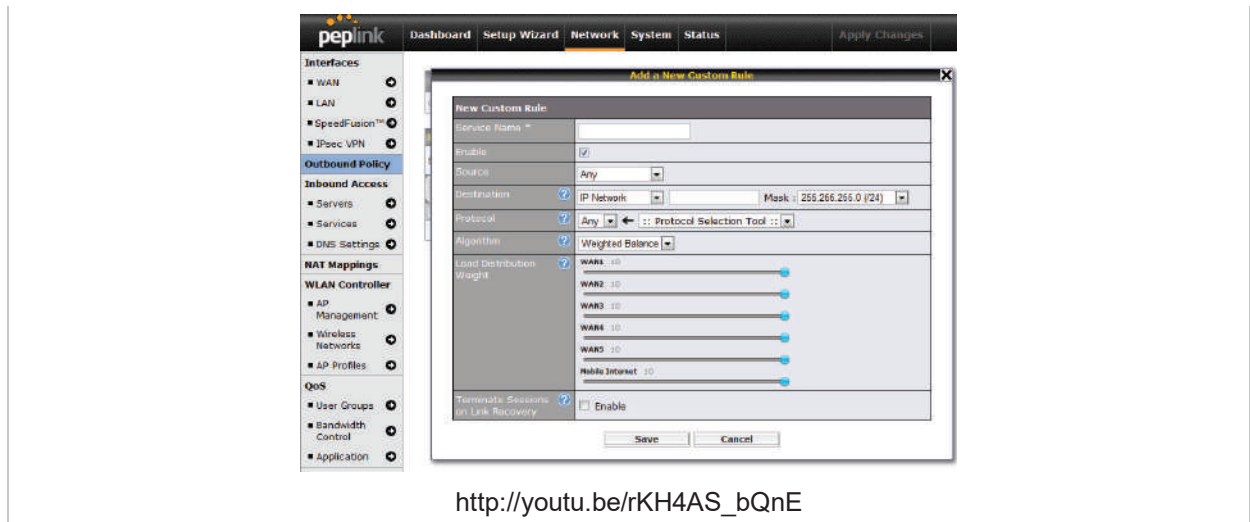
Note that some Pepwave routers provide only the **Send All Traffic To** setting here. See **Section 12.1** for details.

Outbound Policy Settings	
High Application Compatibility	Outbound traffic from a source LAN device is routed through the same WAN connection regardless of the destination Internet IP address and protocol. This option provides the highest application compatibility.
Normal Application Compatibility	Outbound traffic from a source LAN device to the same destination Internet IP address will be routed through the same WAN connection persistently, regardless of protocol. This option provides high compatibility to most applications, and users still benefit from WAN link load balancing when multiple Internet servers are accessed.
Custom	Outbound traffic behavior can be managed by defining rules in a custom rule table. A default rule can be defined for connections that cannot be matched with any of the rules.

The default policy is **Normal Application Compatibility**.

Tip

Want to know more about creating outbound rules? Visit our YouTube Channel for a video tutorial!



15.2 Adding Rules for Outbound Policy

The menu underneath enables you to define Outbound policy rules:

Rules (Drag and drop rows by the left to change rule order)					
Service	Algorithm	Source	Destination	Protocol / Port	
HTTPS Persistence	Persistence (Src) (Auto)	Any	Any	TCP 443	
Default			(Auto)		
Add Rule					

The bottom-most rule is **Default**. Edit this rule to change the device's default manner of controlling outbound traffic for all connections that do not match any of the rules above it. Under the **Service** heading, click **Default** to change these settings.

To rearrange the priority of outbound rules, drag and drop them into the desired sequence.

Default Rule	? <input checked="" type="radio"/> Custom <input type="radio"/> Auto
Algorithm	? Weighted Balance ▾
Load Distribution Weight	? WAN 1 10 WAN 2 10 WAN 3 10 WAN 4 10 WAN 5 10 Mobile Internet 10
When No Connections are Available	? Drop the Traffic ▾ Drop the Traffic Use Any Available Connections

Save Cancel

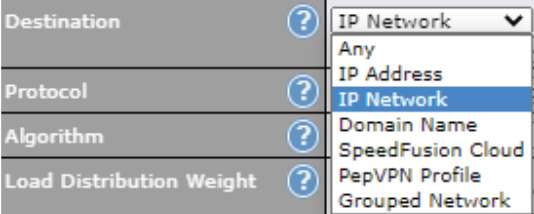
By default, **Auto** is selected as the **Default Rule**. You can select **Custom** to change the algorithm to be used. Please refer to the upcoming sections for the details on the available algorithms.

To create a custom rule, click **Add Rule** at the bottom of the table.

Add a New Custom Rule
✕

Service Name	<input type="text"/>		
Enable	<input checked="" type="checkbox"/>	Always on	▼
Source	Any ▼		
Destination	IP Network ▼	<input type="text"/>	Mask: 255.255.255.0 (/24) ▼
Protocol	Any ▼	←	:: Protocol Selection :: ▼
Algorithm	Weighted Balance ▼		
Load Distribution Weight	<div style="display: flex; flex-direction: column; gap: 5px;"> <div>WAN 1 10 ●</div> <div>WAN 2 10 ●</div> <div>WAN 3 10 ●</div> <div>WAN 4 10 ●</div> <div>WAN 5 10 ●</div> <div>Mobile Internet 10 ●</div> </div>		
When No Connections are Available	<input type="checkbox"/>	Drop the Traffic ▼	

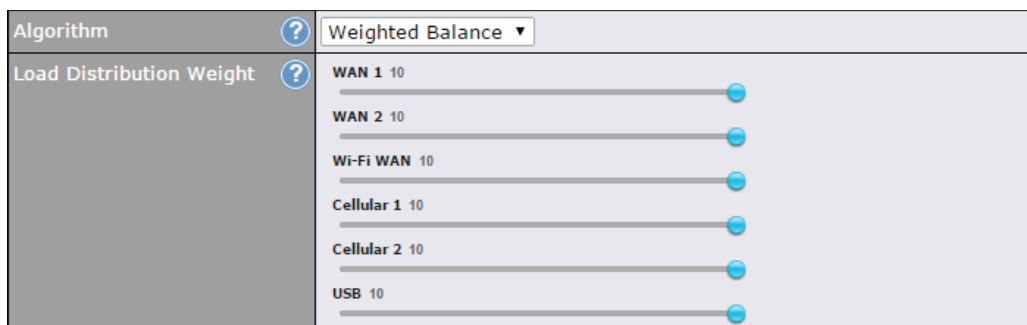
New Custom Rule Settings													
Service Name	This setting specifies the name of the outbound traffic rule.												
Enable	<p>This setting specifies whether the outbound traffic rule takes effect. When Enable is checked, the rule takes effect: traffic is matched and actions are taken by the Pepwave router based on the other parameters of the rule. When Enable is unchecked, the rule does not take effect: the Pepwave router disregards the other parameters of the rule.</p> <p>Click the drop-down menu next to the checkbox to apply a time schedule to this custom rule.</p>												
Source	<p>This setting specifies the source IP Address, IP Network, MAC Address or Grouped Network for traffic that matches the rule.</p> <div style="border: 1px solid gray; padding: 5px; width: fit-content;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Source</td> <td>Any ▼</td> </tr> <tr> <td>Destination</td> <td>Any</td> </tr> <tr> <td>Protocol</td> <td>IP Address</td> </tr> <tr> <td></td> <td>IP Network</td> </tr> <tr> <td></td> <td>MAC Address</td> </tr> <tr> <td></td> <td>Grouped Network</td> </tr> </table> </div>	Source	Any ▼	Destination	Any	Protocol	IP Address		IP Network		MAC Address		Grouped Network
Source	Any ▼												
Destination	Any												
Protocol	IP Address												
	IP Network												
	MAC Address												
	Grouped Network												
Destination	This setting specifies the destination IP address, IP network, Domain name, SpeedFusion Cloud, PepVPN Profile or Grouped network for traffic that matches the rule.												

	
	<p>If Domain Name is chosen and a domain name, such as <i>foobar.com</i>, is entered, any outgoing accesses to <i>foobar.com</i> and <i>*.foobar.com</i> will match this criterion. You may enter a wildcard (*) at the end of a domain name to match any host with a name having the domain name in the middle. If you enter <i>foobar.*</i>, for example, <i>www.foobar.com</i>, <i>www.foobar.co.jp</i>, or <i>foobar.co.uk</i> will also match. Placing wildcards in any other position is not supported. NOTE: if a server has one Internet IP address and multiple server names, and if one of the names is defined here, access to any one of the server names will also match this rule.</p>
<p>Protocol and Port</p>	<p>This setting specifies the IP protocol and port of traffic that matches this rule. Via a drop-down menu, the following protocols can be specified:</p> <ul style="list-style-type: none"> • Any • TCP • UDP • IP • DSCP <p>Alternatively, the Protocol Selection Tool drop-down menu can be used to automatically fill in the protocol and port number of common Internet services (e.g., HTTP, HTTPS, etc.) After selecting an item from the Protocol Selection Tool drop-down menu, the protocol and port number remains manually modifiable.</p>
<p>Algorithm</p>	<p>This setting specifies the behavior of the Pepwave router for the custom rule. One of the following values can be selected (note that some Pepwave routers provide only some of these options):</p> <ul style="list-style-type: none"> • Weighted Balance • Persistence • Enforced • Priority • Overflow • Least Used • Lowest Latency • Fastest Response Time <p>For a full explanation of each Algorithm, please see the following article: https://forum.peplink.com/t/exactly-how-do-peplinks-load-balancing-algorithms-work/8059</p>
<p>Load Distribution Weight</p>	<p>This is to define the outbound traffic weight ratio for each WAN connection.</p>

<p>When No connections are available</p>	<p>This field allows you to configure the default action when all the selected Connections are not available.</p> <p>Drop the Traffic - Traffic will be discarded.</p> <p>Use Any Available Connections - Traffic will be routed to any available Connection, even it is not selected in the list.</p> <p>Fall-through to Next Rule - Traffic will continue to match the next Outbound Policy rule just like this rule is inactive.</p>
<p>Terminate Sessions on Connection Recovery</p>	<p>This setting specifies whether to terminate existing IP sessions on a less preferred WAN connection in the event that a more preferred WAN connection is recovered. This setting is applicable to the Priority algorithms. By default, this setting is disabled. In this case, existing IP sessions will not be terminated or affected when any other WAN connection is recovered. When this setting is enabled, existing IP sessions may be terminated when another WAN connection is recovered, such that only the preferred healthy WAN connection(s) is used at any point in time.</p>

15.2.1 Algorithm : Weighted Balance

This setting specifies the ratio of WAN connection usage to be applied on the specified IP protocol and port. This setting is applicable only when **Algorithm** is set to **Weighted Balance**.



The amount of matching traffic that is distributed to a WAN connection is proportional to the weight of the WAN connection relative to the total weight. Use the sliders to change each WAN's weight.

For example, with the following weight settings:

- Ethernet WAN1: 10
- Ethernet WAN2: 10
- Wi-Fi WAN: 10
- Cellular 1: 10
- Cellular 2: 10

- USB: 10

Total weight is 60 = (10 +10 + 10 + 10 + 10 + 10).

Matching traffic distributed to Ethernet WAN1 is 16.7% = (10 / 60 x 100%.

Matching traffic distributed to Ethernet WAN2 is 16.7% = (10 / 60) x 100%.

Matching traffic distributed to Wi-Fi WAN is 16.7% = (10 / 60) x 100%.

Matching traffic distributed to Cellular 1 is 16.7% = (10 / 60) x 100%.

Matching traffic distributed to Cellular 2 is 16.7% = (10 / 60) x 100%.

Matching traffic distributed to USB is 16.7% = (10 / 60) x 100%.

15.2.2 Algorithm : Persistence

The configuration of persistent services is the solution to the few situations where link load distribution for Internet services is undesirable. For example, for security reasons, many e-banking and other secure websites terminate the session when the client computer’s Internet IP address changes mid-session.

In general, different Internet IP addresses represent different computers. The security concern is that an IP address change during a session may be the result of an unauthorized intrusion attempt. Therefore, to prevent damages from the potential intrusion, the session is terminated upon the detection of an IP address change.

Pepwave routers can be configured to distribute data traffic across multiple WAN connections. Also, the Internet IP depends on the WAN connections over which communication actually takes place. As a result, a LAN client computer behind the Pepwave router may communicate using multiple Internet IP addresses. For example, a LAN client computer behind a Pepwave router with three WAN connections may communicate on the Internet using three different IP addresses.

With the persistence feature, rules can be configured to enable client computers to persistently utilize the same WAN connections for e-banking and other secure websites. As a result, a client computer will communicate using one IP address, eliminating the issues mentioned above.

Algorithm	<input type="text" value="Persistence"/>
Persistence Mode	<input checked="" type="radio"/> By Source <input type="radio"/> By Destination
Load Distribution	<input type="radio"/> Auto <input checked="" type="radio"/> Custom
Load Distribution Weight	<p>WAN 1 10 <input type="range" value="10"/></p> <p>WAN 2 10 <input type="range" value="10"/></p> <p>Wi-Fi WAN 10 <input type="range" value="10"/></p> <p>Cellular 1 10 <input type="range" value="10"/></p> <p>Cellular 2 10 <input type="range" value="10"/></p> <p>USB 10 <input type="range" value="10"/></p>

There are two persistent modes: **By Source** and **By Destination**.

By Source:	The same WAN connection will be used for traffic matching the rule and originating from the same machine, regardless of its destination. This option will provide the highest level of application compatibility.
By Destination:	The same WAN connection will be used for traffic matching the rule, originating from the same machine, and going to the same destination. This option can better distribute loads to WAN connections when there are only a few client machines.

The default mode is **By Source**. When there are multiple client requests, they can be distributed (persistently) to WAN connections with a weight. If you choose **Auto** in **Load Distribution**, the weights will be automatically adjusted according to each WAN's **Downstream Bandwidth** which is specified in the WAN settings page). If you choose **Custom**, you can customize the weight of each WAN manually by using the sliders.

15.2.3 Algorithm : Enforced

This setting specifies the WAN connection usage to be applied on the specified IP protocol and port. This setting is applicable only when **Algorithm** is set to **Enforced**.

Matching traffic will be routed through the specified WAN connection, regardless of the health check status of the WAN connection. Starting from Firmware 5.2, outbound traffic can be enforced to go through a specified SpeedFusion™ connection.

15.2.4 Algorithm: Priority

This setting specifies the priority of the WAN connections used to route the specified network service. The highest priority WAN connection available will always be used for routing the specified type of traffic. A lower priority WAN connection will be used only when all higher priority connections have become unavailable.

Algorithm	Priority											
Priority Order	<table border="1"> <tr><th>Highest Priority</th></tr> <tr><td>WAN: WAN</td></tr> <tr><td>WAN: Cellular 1</td></tr> <tr><td>WAN: Cellular 2</td></tr> <tr><td>WAN: USB</td></tr> <tr><td>WAN: LAN 1 as WAN</td></tr> <tr><td>WAN: GRE WAN 1</td></tr> <tr><td>WAN: GRE WAN 2</td></tr> <tr><td>WAN: OpenVPN WAN 1</td></tr> <tr><td>Lowest Priority</td></tr> </table>	Highest Priority	WAN: WAN	WAN: Cellular 1	WAN: Cellular 2	WAN: USB	WAN: LAN 1 as WAN	WAN: GRE WAN 1	WAN: GRE WAN 2	WAN: OpenVPN WAN 1	Lowest Priority	Not In Use
Highest Priority												
WAN: WAN												
WAN: Cellular 1												
WAN: Cellular 2												
WAN: USB												
WAN: LAN 1 as WAN												
WAN: GRE WAN 1												
WAN: GRE WAN 2												
WAN: OpenVPN WAN 1												
Lowest Priority												
When No Connections are Available	Drop the Traffic											
Terminate Sessions on Connection Recovery	<input type="checkbox"/> Enable											

Starting from Firmware 5.2, outbound traffic can be prioritized to go through SpeedFusion™ connection(s). By default, VPN connections are not included in the priority list.

Tip

Configure multiple distribution rules to accommodate different kinds of services.

15.2.5 Algorithm : Overflow

The traffic matching this rule will be routed through the healthy WAN connection that has the highest priority and is not in full load. When this connection gets saturated, new sessions will be routed to the next healthy WAN connection that is not in full load.

Algorithm	Overflow									
Overflow Order	<table border="1"> <tr><th>Highest Priority</th></tr> <tr><td>WAN: WAN 1</td></tr> <tr><td>WAN: WAN 2</td></tr> <tr><td>WAN: Wi-Fi WAN</td></tr> <tr><td>WAN: Cellular 1</td></tr> <tr><td>WAN: Cellular 2</td></tr> <tr><td>WAN: USB</td></tr> <tr><td>Lowest Priority</td></tr> </table>	Highest Priority	WAN: WAN 1	WAN: WAN 2	WAN: Wi-Fi WAN	WAN: Cellular 1	WAN: Cellular 2	WAN: USB	Lowest Priority	
Highest Priority										
WAN: WAN 1										
WAN: WAN 2										
WAN: Wi-Fi WAN										
WAN: Cellular 1										
WAN: Cellular 2										
WAN: USB										
Lowest Priority										

Drag and drop to specify the order of WAN connections to be used for routing traffic. Only the highest priority healthy connection that is not in full load will be used.

15.2.6 Algorithm: Least Used

Algorithm	Least Used
Connection	<input checked="" type="checkbox"/> WAN 1 <input checked="" type="checkbox"/> WAN 2 <input checked="" type="checkbox"/> Wi-Fi WAN <input type="checkbox"/> Cellular 1 <input type="checkbox"/> Cellular 2 <input type="checkbox"/> USB

The traffic matching this rule will be routed through the healthy WAN connection that is selected in **Connection** and has the most available download bandwidth. The available download bandwidth of a WAN connection is calculated from the total download bandwidth specified on the WAN settings page and the current download usage. The available bandwidth and WAN selection is determined every time an IP session is made.

15.2.7 Algorithm : Lowest Latency

Algorithm	Lowest Latency <small>Note: Use of Lowest Latency will incur additional network usage.</small>
Connection	<input checked="" type="checkbox"/> WAN 1 <input checked="" type="checkbox"/> WAN 2 <input checked="" type="checkbox"/> Wi-Fi WAN <input type="checkbox"/> Cellular 1 <input type="checkbox"/> Cellular 2 <input type="checkbox"/> USB

The traffic matching this rule will be routed through the healthy WAN connection that is selected in **Connection** and has the lowest latency. Latency checking packets are issued periodically to a nearby router of each WAN connection to determine its latency value. The latency of a WAN is the packet round trip time of the WAN connection. Additional network usage may be incurred as a result.

Tip

The roundtrip time of a 6M down/640k uplink can be higher than that of a 2M down/2M up link because the overall round trip time is lengthened by its slower upload bandwidth, despite its higher downlink speed. Therefore, this algorithm is good for two scenarios:

- All WAN connections are symmetric; or
- A latency sensitive application must be routed through the lowest latency WAN, regardless of the WAN's available bandwidth.

15.2.8 Expert Mode

Expert Mode is available on some Pepwave routers for use by advanced users. To enable the

feature, click on the help icon and click **turn on Expert Mode**.

In Expert Mode, a new special rule, **SpeedFusion™ Routes**, is displayed in the **Custom Rules** table. This rule represents all SpeedFusion™ routes learned from remote VPN peers. By default, this bar is on the top of all custom rules. This position means that traffic for remote VPN subnets will be routed to the corresponding VPN peer. You can create custom **Priority** or **Enforced** rules and move them above the bar to override the SpeedFusion™ routes.

Upon disabling Expert Mode, all rules above the bar will be removed.

Help [Close](#)

This table allows you to fine tune how the outbound traffic should be distributed to the WAN connections.

Click the *Add Rule* button to add a new rule. Click the *X* button to remove a rule. Drag a rule to promote or demote its precedence. A higher position of a rule signifies a higher precedence. You may change the default outbound policy behavior by clicking the *Default* link.

If you require advanced control of PepVPN traffic, [turn on Expert Mode](#).

16 Port Forwarding

Pepwave routers can act as a firewall that blocks, by default, all inbound access from the Internet. By using port forwarding, Internet users can access servers behind the Pepwave router. Inbound port forwarding rules can be defined at **Advanced>Port Forwarding**.

Service	IP Address(es)	Server	Protocol
No Services Defined			
<input type="button" value="Add Service"/>			

To define a new service, click **Add Service**.

Enable	<input checked="" type="radio"/> Yes <input type="radio"/> No																												
Service Name	<input type="text" value="Service_1"/>																												
IP Protocol	<input type="button" value="TCP"/> <input type="button" value="←"/> <input type="button" value=":: Protocol Selection Tool ::"/> <input type="button" value="▼"/>																												
Port	<input type="button" value="Any Port"/> <input type="button" value="▼"/>																												
Inbound IP Address(es) <small>(Require at least one IP address)</small>	<table border="1"> <thead> <tr> <th colspan="2">Connection / IP Address(es)</th> <th>All</th> <th>Clear</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> WAN 1</td> <td><input checked="" type="checkbox"/> 10.88.3.158 (Interface IP)</td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> WAN 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Wi-Fi WAN</td> <td></td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Cellular 1</td> <td></td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Cellular 2</td> <td></td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> USB</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Connection / IP Address(es)		All	Clear	<input checked="" type="checkbox"/> WAN 1	<input checked="" type="checkbox"/> 10.88.3.158 (Interface IP)			<input type="checkbox"/> WAN 2				<input type="checkbox"/> Wi-Fi WAN				<input type="checkbox"/> Cellular 1				<input type="checkbox"/> Cellular 2				<input type="checkbox"/> USB			
Connection / IP Address(es)		All	Clear																										
<input checked="" type="checkbox"/> WAN 1	<input checked="" type="checkbox"/> 10.88.3.158 (Interface IP)																												
<input type="checkbox"/> WAN 2																													
<input type="checkbox"/> Wi-Fi WAN																													
<input type="checkbox"/> Cellular 1																													
<input type="checkbox"/> Cellular 2																													
<input type="checkbox"/> USB																													
Server IP Address	<input type="button" value="120.78.95.7"/>																												

Port Forwarding Settings	
Enable	This setting specifies whether the inbound service takes effect. When Enable is checked, the inbound service takes effect: traffic is matched and actions are taken by the Pepwave router based on the other parameters of the rule. When this setting is disabled, the inbound service does not take effect: the Pepwave router disregards the other parameters of the rule.
Service Name	This setting identifies the service to the system administrator. Valid values for this setting consist of only alphanumeric and underscore “_” characters.
IP Protocol	The IP Protocol setting, along with the Port setting, specifies the protocol of the service as TCP, UDP, ICMP, or IP. Traffic that is received by the Pepwave router via the specified protocol at the specified port(s) is forwarded to the LAN hosts specified by the Servers setting. Please see below for details on the Port and Servers settings. Alternatively, the Protocol Selection Tool drop-down menu can be used to automatically fill in the protocol and a single port number of common Internet services (e.g. HTTP, HTTPS, etc.). After selecting an item from the Protocol Selection Tool drop-down menu, the protocol and port number remain manually modifiable.

The **Port** setting specifies the port(s) that correspond to the service, and can be configured to behave in one of the following manners:

Any Port, Single Port, Port Range, Port Map, and Range Mapping

Port ? Any Port

Any Port: all traffic that is received by the Pepwave router via the specified protocol is forwarded to the servers specified by the **Servers** setting. For example, with **IP Protocol** set to **TCP**, and **Port** set to **Any Port**, all TCP traffic is forwarded to the configured servers.

Port ? Single Port Service Port: 80

Single Port: traffic that is received by the Pepwave router via the specified protocol at the specified port is forwarded via the same port to the servers specified by the **Servers** setting. For example, with **IP Protocol** set to **TCP**, and **Port** set to **Single Port** and **Service Port** 80, TCP traffic received on port 80 is forwarded to the configured servers via port 80.

Port ? Port Range Service Ports: 80 - 88

Port Range: traffic that is received by the Pepwave router via the specified protocol at the specified port range is forwarded via the same respective ports to the LAN hosts specified by the **Servers** setting. For example, with **IP Protocol** set to **TCP**, and **Port** set to **Port Range** and **Service Ports** 80-88, TCP traffic received on ports 80 through 88 is forwarded to the configured servers via the respective ports.

Port

Port ? Port Mapping Service Port: 80 Map to Port: 88

Port Mapping: traffic that is received by Pepwave router via the specified protocol at the specified port is forwarded via a different port to the servers specified by the **Servers** setting.

For example, with **IP Protocol** set to **TCP**, and **Port** set to **Port Mapping**, **Service Port** 80, and **Map to Port** 88, TCP traffic on port 80 is forwarded to the configured servers via port 88.

(Please see below for details on the **Servers** setting.)

Port ? Range Mapping Service Ports: 80 - 88 Map to Ports: 88 - 96

Range Mapping: traffic that is received by the Pepwave router via the specified protocol at the specified port range is forwarded via a different port to the servers specified by the **Servers** setting.

Inbound IP Address(es) This setting specifies the WAN connections and Internet IP address(es) from which the service can be accessed.

Server IP Address This setting specifies the LAN IP address of the server that handles the requests for the service.

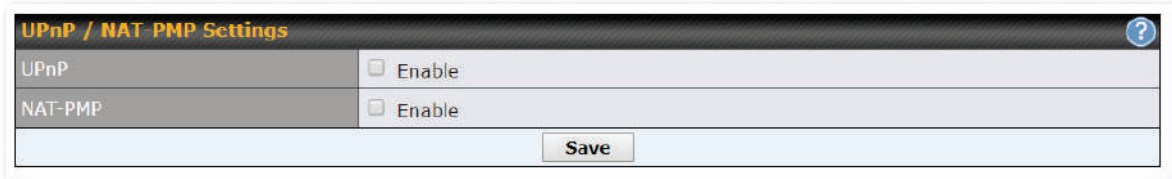
16.1 UPnP / NAT-PMP Settings

UPnP and NAT-PMP are network protocols which allow a computer connected to the LAN port to automatically configure the router to allow parties on the WAN port to connect to itself. That

way, the process of inbound port forwarding becomes automated.

When a computer creates a rule using these protocols, the specified TCP/UDP port of all WAN connections' default IP address will be forwarded.

Check the corresponding box(es) to enable UPnP and/or NAT-PMP. Enable these features only if you trust the computers connected to the LAN ports.



UPnP / NAT PMP Settings	
UPnP	<input type="checkbox"/> Enable
NAT-PMP	<input type="checkbox"/> Enable
<input type="button" value="Save"/>	

When the options are enabled, a table listing all the forwarded ports under these two protocols can be found at **Status > UPnP / NAT-PMP**.

17 NAT Mappings

NAT mappings allow IP address mapping of all inbound and outbound NAT'd traffic to and from an internal client IP address. Settings to configure NAT mappings are located at **Advanced > NAT Mappings**.

LAN Clients	Inbound Mappings	Outbound Mappings	
192.168.1.23	(WAN 1):10.88.3.158 (Interface IP)	Use <i>Interface IP</i> only	✖
<input type="button" value="Add NAT Rule"/>			

To add a rule for NAT mappings, click **Add NAT Rule**.

LAN Client(s)	? IP Address ▾												
Address	? <input type="text"/>												
Inbound Mappings	? Connection / Inbound IP Address(es) <input type="checkbox"/> WAN 1 <input type="checkbox"/> WAN 2 <input type="checkbox"/> Wi-Fi WAN <input type="checkbox"/> Cellular 1 <input type="checkbox"/> Cellular 2 <input type="checkbox"/> USB												
Outbound Mappings	? Connection / Outbound IP Address <table border="1"> <tr> <td>WAN 1</td> <td>10.88.3.158 (Interface IP) ▾</td> </tr> <tr> <td>WAN 2</td> <td>Interface IP ▾</td> </tr> <tr> <td>Wi-Fi WAN</td> <td>Interface IP ▾</td> </tr> <tr> <td>Cellular 1</td> <td>Interface IP ▾</td> </tr> <tr> <td>Cellular 2</td> <td>Interface IP ▾</td> </tr> <tr> <td>USB</td> <td>Interface IP ▾</td> </tr> </table>	WAN 1	10.88.3.158 (Interface IP) ▾	WAN 2	Interface IP ▾	Wi-Fi WAN	Interface IP ▾	Cellular 1	Interface IP ▾	Cellular 2	Interface IP ▾	USB	Interface IP ▾
WAN 1	10.88.3.158 (Interface IP) ▾												
WAN 2	Interface IP ▾												
Wi-Fi WAN	Interface IP ▾												
Cellular 1	Interface IP ▾												
Cellular 2	Interface IP ▾												
USB	Interface IP ▾												

NAT Mapping Settings	
LAN Client(s)	NAT mapping rules can be defined for a single LAN IP Address , an IP Range , or an IP Network .
Address	This refers to the LAN host's private IP address. The system maps this address to a number of public IP addresses (specified below) in order to facilitate inbound and outbound traffic. This option is only available when IP Address is selected.
Range	The IP range is a contiguous group of private IP addresses used by the LAN host. The system maps these addresses to a number of public IP addresses (specified below) to facilitate outbound traffic. This option is only available when IP Range is selected.
Network	The IP network refers to all private IP addresses and ranges managed by the LAN host. The system maps these addresses to a number of public IP addresses (specified below) to facilitate outbound traffic. This option is only available when IP Network is selected.
Inbound	This setting specifies the WAN connections and corresponding WAN-specific

<p>Mappings</p>	<p>Internet IP addresses on which the system should bind. Any access to the specified WAN connection(s) and IP address(es) will be forwarded to the LAN host. This option is only available when IP Address is selected in the LAN Client(s) field.</p> <p>Note that inbound mapping is not needed for WAN connections in drop-in mode or IP forwarding mode. Also note that each WAN IP address can be associated to one NAT mapping only.</p>
<p>Outbound Mappings</p>	<p>This setting specifies the WAN IP addresses that should be used when an IP connection is made from a LAN host to the Internet. Each LAN host in an IP range or IP network will be evenly mapped to one of each selected WAN's IP addresses (for better IP address utilization) in a persistent manner (for better application compatibility).</p> <p>Note that if you do not want to use a specific WAN for outgoing accesses, you should still choose default here, then customize the outbound access rule in the Outbound Policy section. Also note that WAN connections in drop-in mode or IP forwarding mode are not shown here.</p>

Click **Save** to save the settings when configuration has been completed.


<p>Important Note</p>
<p>Inbound firewall rules override the Inbound Mappings settings.</p>

18 QoS

18.1 User Groups

LAN and PPTP clients can be categorized into three user groups: **Manager, Staff, and Guest**. This menu allows you to define rules and assign client IP addresses or subnets to a user group. You can apply different bandwidth and traffic prioritization policies on each user group in the **Bandwidth Control** and **Application** sections (note that the options available here vary by model).

The table is automatically sorted by rule precedence. The smaller and more specific subnets are put towards the top of the table and have higher precedence; larger and less specific subnets are placed towards the bottom.

Click the **Add** button to define clients and their user group. Click the  button to remove the defined rule. Two default rules are pre-defined and put at the bottom. They are **All DHCP reservation clients** and **Everyone**, and they cannot be removed. The **All DHCP reservation client** represents the LAN clients defined in the DHCP Reservation table on the LAN settings page. **Everyone** represents all clients that are not defined in any rule above. Click on a rule to change its group.

Subnet / IP Address	User Group	Action
Guest Computer	Guest	
All DHCP reservation clients	Manager	
Everyone		

Add / Edit User Group

Client	Staff A
Subnet / IP Address	IP Address 192.168.1.99
Group	Manager Staff A (192.168.1.99)

Add / Edit User Group	
Subnet / IP Address	From the drop-down menu, choose whether you are going to define the client(s) by an IP Address or a Subnet . If IP Address is selected, enter a name defined in DHCP reservation table or a LAN client's IP address. If Subnet is selected, enter a subnet address and specify its subnet mask.
Group	This field is to define which User Group the specified subnet / IP address belongs to.

Once users have been assigned to a user group, their internet traffic will be restricted by rules defined for that particular group. Please refer to the following two sections for details.

18.2 Bandwidth Control

You can define a maximum download speed (over all WAN connections) and upload speed (for

each WAN connection) that each individual Staff and Guest member can consume. No limit can be imposed on individual Manager members. By default, download and upload bandwidth limits are set to unlimited (set as 0).

Group Bandwidth Reservation			
Enable	<input checked="" type="checkbox"/>		
	Manager	Staff	Guest
Bandwidth %	50%	30%	20%
WAN 1	500.0M/500.0M	300.0M/300.0M	200.0M/200.0M
WAN 2	500.0M/500.0M	300.0M/300.0M	200.0M/200.0M

18.3 Application

18.3.1 Application Prioritization

On many Pepwave routers, you can choose whether to apply the same prioritization settings to all user groups or customize the settings for each group.

Application Prioritization	
<input checked="" type="radio"/>	Apply same settings to all users
<input type="radio"/>	Customize

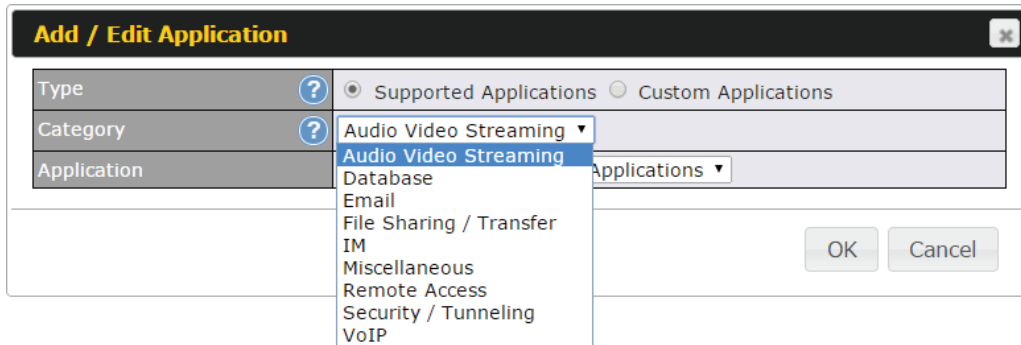
Three application priority levels can be set: **↑ High**, **— Normal**, and **↓ Low**. Pepwave routers can detect various application traffic types by inspecting the packet content. Select an application by choosing a supported application, or by defining a custom application manually. The priority preference of supported applications is placed at the top of the table. Custom applications are at the bottom.

Application	Priority			
	Manager	Staff	Guest	
All Supported Streaming Applications	↑ High	— Normal	↑ High	✘
All Email Protocols	↑ High	↑ High	↑ High	✘
MySQL	↑ High	— Normal	↓ Low	✘
SIP	↑ High	↓ Low	↓ Low	✘
<input type="button" value="Add"/>				

18.3.2 Prioritization for Custom Applications

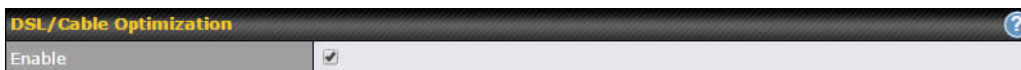
Click the **Add** button to define a custom application. Click the button **✘** in the **Action** column to delete the custom application in the corresponding row.

When **Supported Applications** is selected, the Pepwave router will inspect network traffic and prioritize the selected applications. Alternatively, you can select **Custom Applications** and define the application by providing the protocol, scope, port number, and DSCP value.



18.3.3 DSL/Cable Optimization

DSL/cable-based WAN connections have lower upload bandwidth and higher download bandwidth. When a DSL/cable circuit's uplink is congested, the download bandwidth will be affected. Users will not be able to download data at full speed until the uplink becomes less congested. **DSL/Cable Optimization** can relieve such an issue. When it is enabled, the download speed will become less affected by the upload traffic. By default, this feature is enabled.



19 Firewall

A firewall is a mechanism that selectively filters data traffic between the WAN side (the Internet) and the LAN side of the network. It can protect the local network from potential hacker attacks, access to offensive websites, and/or other inappropriate uses.

The firewall functionality of Pepwave routers supports the selective filtering of data traffic in both directions:

- Outbound (LAN to WAN)
- Inbound (WAN to LAN)
- Internal Network (VLAN to VLAN)

The firewall also supports the following functionality:

- Intrusion detection and DoS prevention
- Web blocking

With SpeedFusion™ enabled, the firewall rules also apply to VPN tunneled traffic.

Outbound Firewall Rules (Drag and drop rows by the left to change rule order) ?

Rule	Protocol	Source	Destination	Action
Default	Any	Any	Any	✔

Inbound Firewall Rules (Drag and drop rows by the left to change rule order) ?

Rule	Protocol	WAN	Source	Destination	Action
Default	Any	Any	Any	Any	✔

Internal Network Firewall Rules (Drag and drop rows by the left to change rule order) ?

Rule	Protocol	Source	Destination	Action
Default	Any	Any	Any	✔

Intrusion Detection and DoS Prevention ?

Disabled

Local Service Firewall Rules (Drag and drop rows by the left to change rule order)

Rule	Service	WAN	Source	Action
Default	Any	Any	Any	✔

19.1 Outbound and Inbound Firewall Rules

19.1.1 Access Rules

The outbound firewall settings are located at **Advanced>Firewall>Access Rules>Outbound Firewall Rules**.

Outbound Firewall Rules (Drag and drop rows by the left to change rule order)					
Rule	Protocol	Source	Destination	Action	
test	Any	Any	Any		
Default	Any	Any	Any		

Add Rule

Click **Add Rule** to display the following screen:

Add a New Outbound Firewall Rule ✕

New Firewall Rule

Rule Name	<input type="text"/>
Enable	<input checked="" type="checkbox"/> Always on ▼
Protocol	? Any ▼ ← :: Protocol Selection Tool :: ▼
Source IP & Port	? Any Address ▼
Destination IP & Port	? Any Address ▼
Action	? <input checked="" type="radio"/> Allow <input type="radio"/> Deny
Event Logging	? <input type="checkbox"/> Enable

Inbound firewall settings are located at **Advanced>Firewall>Access Rules>Inbound Firewall Rules**.

Inbound Firewall Rules (Drag and drop rows by the left to change rule order)					
Rule	Protocol	WAN	Source	Destination	Action
test	Any	Any	Any	Any	
Default	Any	Any	Any	Any	

Add Rule

Click **Add Rule** to display the following screen:

Add a New Inbound Firewall Rule ✕

New Firewall Rule

Rule Name	<input type="text"/>
Enable	<input checked="" type="checkbox"/>
WAN Connection	<input type="text" value="Any"/>
Protocol	<input type="text" value="Any"/> <input type="text" value=":: Protocol Selection Tool ::"/>
Source IP & Port	<input type="text" value="Any Address"/>
Destination IP & Port	<input type="text" value="Any Address"/>
Action	<input checked="" type="radio"/> Allow <input type="radio"/> Deny
Event Logging	<input type="checkbox"/> Enable

Internal Network firewall settings are located at **Advanced>Firewall>Access Rules>Internal Network Firewall Rules**.

Internal Network Firewall Rules ? Drag and drop rows by the left to change rule order)					
Rule	Protocol	Source	Destination	Action	
<input type="text" value="test"/>	Any	Any	Any	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="text" value="Default"/>	Any	Any	Any	<input checked="" type="checkbox"/>	

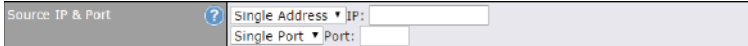

Click **Add Rule** to display the following window:

Add a New Internal Network Firewall Rule ✕

New Firewall Rule

Rule Name	<input type="text"/>
Enable	<input checked="" type="checkbox"/> Always on <input type="text"/>
Protocol	<input type="text" value="Any"/> <input type="text" value=":: Protocol Selection ::"/>
Source	<input type="text" value="Any Address"/>
Destination	<input type="text" value="Any Address"/>
Action	<input checked="" type="radio"/> Allow <input type="radio"/> Deny
Event Logging	<input type="checkbox"/> Enable

Inbound / Outbound / Internal Network Firewall Settings

Rule Name	This setting specifies a name for the firewall rule.
Enable	<p>This setting specifies whether the firewall rule should take effect. If the box is checked, the firewall rule takes effect. If the traffic matches the specified protocol/IP/port, actions will be taken by the Pepwave router based on the other parameters of the rule. If the box is not checked, the firewall rule does not take effect. The Pepwave router will disregard the other parameters of the rule.</p> <p>Click the dropdown menu next to the checkbox to place this firewall rule on a time schedule.</p>
WAN Connection (Inbound)	Select the WAN connection that this firewall rule should apply to.
Protocol	<p>This setting specifies the protocol to be matched. Via a drop-down menu, the following protocols can be specified:</p> <ul style="list-style-type: none"> • Any • TCP • UDP • ICMP • DSCP • IP <p>Alternatively, the Protocol Selection Tool drop-down menu can be used to automatically fill in the protocol and port number of common Internet services (e.g., HTTP, HTTPS, etc.)</p> <p>After selecting an item from the Protocol Selection Tool drop-down menu, the protocol and port number remains manually modifiable.</p>
Source IP & Port	<p>This specifies the source IP address(es) and port number(s) to be matched for the firewall rule. A single address, or a network, can be specified as the Source IP & Port setting, as indicated by the following screenshot:</p>  <p>In addition, a single port, or a range of ports, can be specified for the Source IP & Port settings.</p>
Destination IP & Port	<p>This specifies the destination IP address(es) and port number(s) to be matched for the firewall rule. A single address, or a network, can be specified as the Destination IP & Port setting, as indicated by the following screenshot:</p>  <p>In addition, a single port, or a range of ports, can be specified for the Destination IP & Port settings.</p>
Action	<p>This setting specifies the action to be taken by the router upon encountering traffic that matches the both of the following:</p> <ul style="list-style-type: none"> • Source IP & port • Destination IP & port

With the value of **Allow** for the **Action** setting, the matching traffic passes through the router (to be routed to the destination). If the value of the **Action** setting is set to **Deny**, the matching traffic does not pass through the router (and is discarded).

This setting specifies whether or not to log matched firewall events. The logged messages are shown on the page **Status>Event Log**. A sample message is as follows:

Aug 13 23:47:44 Denied CONN=Ethernet WAN SRC=20.3.2.1
DST=192.168.1.20 LEN=48 PROTO=TCP SPT=2260 DPT=80

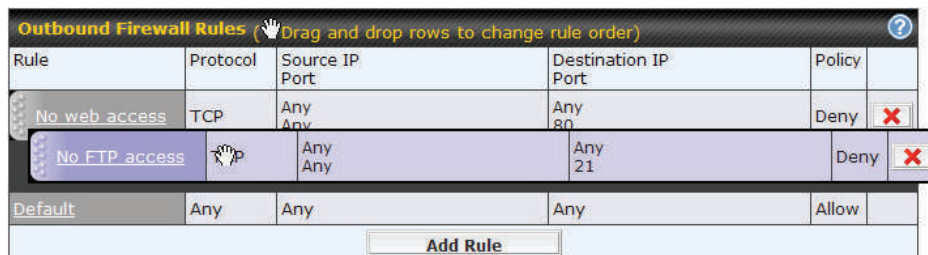
Event Logging

- **CONN:** The connection where the log entry refers to
- **SRC:** Source IP address
- **DST:** Destination IP address
- **LEN:** Packet length
- **PROTO:** Protocol
- **SPT:** Source port
- **DPT:** Destination port

Click **Save** to store your changes. To create an additional firewall rule, click **Add Rule** and repeat the above steps.

To change a rule's priority, simply drag and drop the rule:

- Hold the left mouse button on the rule.
- Move it to the desired position.
- Drop it by releasing the mouse button.



To remove a rule, click the  button.

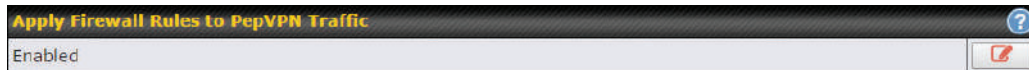
Rules are matched from top to bottom. If a connection matches any one of the upper rules, the matching process will stop. If none of the rules match, the **Default** rule will be applied. By default, the **Default** rule is set as **Allow** for Outbound, Inbound and Internal Network access.


Tip

If the default inbound rule is set to **Allow** for NAT-enabled WANs, no inbound Allow firewall rules will be required for inbound port forwarding and inbound NAT mapping rules. However, if the default

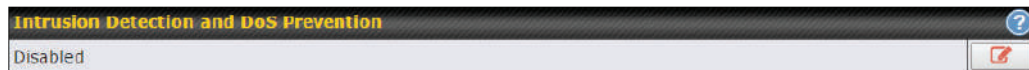
inbound rule is set as **Deny**, a corresponding Allow firewall rule will be required.


19.1.2 Apply Firewall Rules to PepVPN Traffic



When this option is enabled, Outbound Firewall Rules will be applied to PepVPN traffic. To turn on this feature, click , check the **Enable** check box, and press the **Save** button.

19.1.3 Intrusion Detection and DoS Prevention



Pepwave routers can detect and prevent intrusions and denial-of-service (DoS) attacks from the Internet. To turn on this feature, click , check the **Enable** check box, and press the **Save** button.

When this feature is enabled, the Pepwave router will detect and prevent the following kinds of intrusions and denial-of-service attacks.

- Port scan
 - NMAP FIN/URG/PSH
 - Xmas tree
 - Another Xmas tree
 - Null scan
 - SYN/RST
 - SYN/FIN
- SYN flood prevention
- Ping flood attack prevention

19.2 Content Blocking

Application Blocking ?

Please Select Application... +

Web Blocking ?

Preset Category

<input type="radio"/> High	<input type="checkbox"/> Abortion	<input type="checkbox"/> Adware	<input type="checkbox"/> Aggressive
<input type="radio"/> Moderate	<input type="checkbox"/> Alcohol	<input type="checkbox"/> Anti-Spyware	<input type="checkbox"/> Chatroom
<input type="radio"/> Low	<input type="checkbox"/> Dating	<input type="checkbox"/> Drugs	<input type="checkbox"/> Ecommerce/Shopping
<input checked="" type="radio"/> Custom	<input type="checkbox"/> Entertainment	<input type="checkbox"/> File Hosting	<input type="checkbox"/> P2P/File sharing
	<input type="checkbox"/> Gambling	<input type="checkbox"/> Games	<input type="checkbox"/> Hacking
	<input type="checkbox"/> Instant Messaging	<input type="checkbox"/> Job Search/Employment	<input type="checkbox"/> Kids Time Wasting
	<input type="checkbox"/> Lingerie	<input type="checkbox"/> Malware	<input type="checkbox"/> Manga/Anime/Webcomic
	<input type="checkbox"/> Nudity	<input type="checkbox"/> News/Media	<input type="checkbox"/> Auctions
	<input type="checkbox"/> Phishing	<input type="checkbox"/> Pornography	<input type="checkbox"/> Proxy/Anonymizer
	<input type="checkbox"/> Radio	<input type="checkbox"/> Remote Access	<input type="checkbox"/> Ringtones
	<input type="checkbox"/> Search Engines	<input type="checkbox"/> Sexuality Education	<input type="checkbox"/> Social Networking
	<input type="checkbox"/> Sports	<input type="checkbox"/> Spyware	<input type="checkbox"/> Tobacco
	<input type="checkbox"/> Update Sites	<input type="checkbox"/> Vacation	<input type="checkbox"/> Violence
	<input type="checkbox"/> Viruses	<input type="checkbox"/> Weapons	<input type="checkbox"/> Weather
	<input type="checkbox"/> Webmail	<input type="checkbox"/> WebTV	

Customized Domains

cbs.com	✖
	+

Exempted Domains from Web Blocking

	+
--	---

Exempted User Groups ?

Manager	<input type="checkbox"/> Exempt
Staff	<input type="checkbox"/> Exempt
Guest	<input checked="" type="checkbox"/> Exempt

Exempted Subnets ?

Network	Subnet Mask	
	255.255.255.0 (/24)	+

URL Logging

Enable	<input type="checkbox"/>
Log Server Host	<input style="width: 100%;" type="text"/> Port: <input style="width: 50px;" type="text"/>

19.2.1 Application Blocking

Choose applications to be blocked from LAN/PPTP/PepVPN peer clients' access, except for those on the Exempted User Groups or Exempted Subnets defined below.

19.2.2 Web Blocking

Defines website domain names to be blocked from LAN/PPTP/PepVPN peer clients' access

except for those on the Exempted User Groups or Exempted Subnets defined below.

If "foobar.com" is entered, any web site with a host name ending in foobar.com will be blocked, e.g. www.foobar.com, foobar.com, etc. However, "myfoobar.com" will not be blocked.

You may enter the wild card "." at the end of a domain name to block any web site with a host name having the domain name in the middle. If you enter "foobar.*", then "www.foobar.com", "www.foobar.co.jp", or "foobar.co.uk" will be blocked. Placing the wild card in any other position is not supported.

The device will inspect and look for blocked domain names on all HTTP and HTTPS traffic.

19.2.3 Customized Domains

Enter an appropriate website address, and the Pepwave MAX will block and disallow LAN/PPTP/SpeedFusion™ peer clients to access these websites. Exceptions can be added using the instructions in Sections 20.1.3.2 and 20.1.3.3.

You may enter the wild card "." at the end of a domain name to block any web site with a host name having the domain name in the middle. For example, If you enter "foobar.*", then "www.foobar.com," "www.foobar.co.jp," or "foobar.co.uk" will be blocked. Placing the wild card in any other position is not supported.

The Pepwave MAX will inspect and look for blocked domain names on all HTTP traffic. Secure web (HTTPS) traffic is not supported.

19.2.4 Exempted User Groups

Check and select pre-defined user group(s) who can be exempted from the access blocking rules. User groups can be defined at **QoS>User Groups** section. Please refer to **Section 17.1** for details.

19.2.5 Exempted Subnets

With the subnet defined in the field, clients on the particular subnet(s) can be exempted from the access blocking rules.

19.2.6 URL Logging

Click **enable**, and then enter the ip address and port (if applicable) where your remote syslog server is located.

20 Routing Protocols

20.1 OSPF & RIPv2

The Pepwave supports OSPF and RIPv2 dynamic routing protocols. Click the **Advanced** tab from the top bar, and then click the **Routing Protocols > OSPF & RIPv2** item on the sidebar to reach the following menu:

OSPF		
Router ID	LAN IP Address	
Area	Interfaces	
0.0.0.0	PepVPN	
<input type="button" value="Add"/>		

PepVPN OSPF Area	
0.0.0.0	

RIPv2	
No RIPv2 Defined.	

OSPF	
Router ID	This field determines the ID of the router. By default, this is specified as the LAN IP address. If you want to specify your own ID, enter it in the Custom field.
Area	This is an overview of the OSPFv2 areas you have defined. Click on the area name to configure it. To set a new area, click Add . To delete an existing area, click .

OSPF settings
✕

Area ID	<input type="text" value="0.0.0.0"/>
Link Type	<input checked="" type="radio"/> Broadcast <input type="radio"/> Point-to-Point
Authentication	<input type="text" value="None"/>
Interfaces	<input type="checkbox"/> Untagged LAN <input type="checkbox"/> V167 (192.168.167.1/24) <input type="checkbox"/> WAN 1 <input type="checkbox"/> WAN 2 <input type="checkbox"/> WAN 3 <input type="checkbox"/> WAN 4 <input type="checkbox"/> WAN 5 <input checked="" type="checkbox"/> PepVPN

OSPF Settings	
Area ID	Determine the name of your Area ID to apply to this group. Machines linked to this group will send and receive related OSPF packets, while unlinked machines will ignore it.
Link Type	Choose the network type that this area will use.
Authentication	Choose an authentication method, if one is used, from this drop-down menu. Available options are MD5 and Text . Enter the authentication key next to the drop-down menu.
Interfaces	Determine which interfaces this area will use to listen to and deliver OSPF packets

To access RIPv2 settings, click .

RIPv2 settings
✕

Authentication	<input type="text" value="None"/>
Interfaces	<input type="checkbox"/> Untagged LAN <input type="checkbox"/> V167 (192.168.167.1/24) <input type="checkbox"/> WAN 1 <input type="checkbox"/> WAN 2 <input type="checkbox"/> WAN 3 <input type="checkbox"/> WAN 4 <input type="checkbox"/> WAN 5

RIPv2 Settings	
Authentication	Choose an authentication method, if one is used, from this drop-down menu. Available options are MD5 and Text . Enter the authentication key next to the drop-down menu.
Interfaces	Determine which interfaces this group will use to listen to and deliver RIPv2 packets.

OSPF & RIPv2 Route Advertisement							
PepVPN Route Isolation	<input type="checkbox"/> Enable						
Network Advertising	<div style="border: 1px solid #ccc; padding: 2px;"> --- + </div> <small>All LAN/VLAN networks will be advertised when no network advertising is chosen.</small>						
Static Route Advertising	<input checked="" type="checkbox"/> Enable <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Excluded Networks</th> <th style="width: 20%;">Subnet Mask</th> <th style="width: 20%;"></th> </tr> </thead> <tbody> <tr> <td><input type="text"/></td> <td>255.255.255.0 (/24)</td> <td style="text-align: right;">+</td> </tr> </tbody> </table>	Excluded Networks	Subnet Mask		<input type="text"/>	255.255.255.0 (/24)	+
Excluded Networks	Subnet Mask						
<input type="text"/>	255.255.255.0 (/24)	+					
<input type="button" value="Save"/>							

OSPF & RIPv2 Route Advertisement	
PepVPN Route Isolation	Isolate PepVPN peers from each other. Received PepVPN routes will not be forwarded to other PepVPN peers to reduce bandwidth consumption..
Network Advertising	Networks to be advertised over OSPF & RIPv2. If no network is selected, all LAN / VLAN networks will be advertised by default.
Static Route Advertising	Enable this option to advertise LAN static routes over OSPF & RIPv2. Static routes that match the Excluded Networks table will not be advertised.

20.2 BGP

Click the **Advanced** tab from the top bar, and then click the **Routing Protocols>BGP** item on the sidebar to configure BGP.

BGP	AS	Neighbors	
Uplink	64520	172.16.51.1	✘
<input type="button" value="Add"/>			

Click "x" to delete a BGP profile.

Click "Add" to add a new BGP profile.

BGP Profile						
Profile Name	<input type="text"/>					
Enable	<input checked="" type="checkbox"/>					
Interface	WAN 1 ▾					
Router ID	<input type="radio"/> LAN IP Address <input type="radio"/> Custom: <input type="text"/>					
Autonomous System	<input type="text"/>					
Neighbor	IP Address	Autonomous System	Multihop / TTL	Password	AS-Path Prepending	<input type="text"/>
	<input type="text"/>	<input type="text"/>	disable	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hold Time	<input type="text" value="240"/>					

BGP	
Name	This field is for specifying a name to represent this profile.
Enable	When this box is checked, this BGP profile will be enabled. Otherwise, it will be disabled.
Interface	The interface where BGP neighbor is located
Autonomous System	The Autonomous System Number (ASN) of this profile
Neighbor	BGP Neighbor's details
IP address	Neighbor's IP address
Autonomous System	Neighbor's ASN
Multihop/TTL	Time-to-live (TTL) of BGP packet. Leave it blank if BGP neighbor is directly connected, otherwise you must specify a TTL value. Accurately, this option should be used if the configured neighbor IP address does not match the selected Interface's network subnets. TTL value must be between 2 to 255.
Password	Optional password for MD5 authentication of BGP sessions.
AS-Path Prepending:	AS path to be prepended to the routes received from this neighbor. The value must be a comma separated ASN. For example "64530,64531" will prepend "64530, 64531" to received routes.
Hold Time	Time in seconds to wait for a keepalive message from the neighbor before considering the BGP connection is staled. This value must be either 0 (infinite hold time) or between 3 and 65535 inclusively.

Route Advertisement							
Network Advertising	<input type="text" value="---"/> <input type="button" value="+"/>						
Static Route Advertising	<input checked="" type="checkbox"/> Enable <table border="1"> <thead> <tr> <th>Excluded Networks</th> <th>Subnet Mask</th> <th></th> </tr> </thead> <tbody> <tr> <td><input type="text"/></td> <td>255.255.255.0 (/24)</td> <td><input type="button" value="+"/></td> </tr> </tbody> </table>	Excluded Networks	Subnet Mask		<input type="text"/>	255.255.255.0 (/24)	<input type="button" value="+"/>
Excluded Networks	Subnet Mask						
<input type="text"/>	255.255.255.0 (/24)	<input type="button" value="+"/>					
Advertise OSPF Route	<input type="checkbox"/>						

Network Advertising	Networks to be advertised to BGP neighbor.
Static Route Advertising	Enable this option to advertise LAN static routes. Static routes that match the Excluded Networks table will not be advertised.
Advertise OSPF Route	When this box is checked, all learnt OSPF routes will be advertised.

Route Import									
Filter Mode	<input type="text" value="Accept"/> <input type="button" value="v"/>								
Restricted Networks	<table border="1"> <thead> <tr> <th>Network</th> <th>Subnet Mask</th> <th>Exact Match</th> <th></th> </tr> </thead> <tbody> <tr> <td><input type="text"/></td> <td>255.255.255.0 (/24)</td> <td><input type="checkbox"/></td> <td><input type="button" value="+"/></td> </tr> </tbody> </table>	Network	Subnet Mask	Exact Match		<input type="text"/>	255.255.255.0 (/24)	<input type="checkbox"/>	<input type="button" value="+"/>
Network	Subnet Mask	Exact Match							
<input type="text"/>	255.255.255.0 (/24)	<input type="checkbox"/>	<input type="button" value="+"/>						

Filter Mode	<p>This option selects the route import filter mode.</p> <p>None: all BGP routes will be accepted.</p> <p>Accept: Routes in "Restricted Networks" will be accepted, routes not in the list will be rejected.</p> <p>Reject: Routes in "Restricted Networks" will be rejected, routes not in the list will be accepted.</p>
Restricted Networks	<p>This specifies the network in the "route import" entry</p> <p>Exact Match: When this box is checked, only routes with the same Networks and Subnet Mask will be filtered. Otherwise, routes within the Networks and Subnet will be filtered.</p>

Route Export	
Export to other BGP Profile	<input type="checkbox"/>
Export to OSPF	<input type="checkbox"/>

Export to other BGP Profile	When this box is checked, routes learnt from this BGP profile will export to other BGP profiles.
------------------------------------	--


Export to OSPF When this box is checked, routes learnt from this BGP profile will export to the OSPF routing protocol.

21 Remote User Access

A remote-access VPN connection allows an individual user to connect to a private business network from a remote location using a laptop or desktop computer connected to the Internet. Networks routed by a Pepwave router can be remotely accessed via OpenVPN, L2TP with IPsec or PPTP. To configure this feature, navigate to **Network > Remote User Access** and choose the required VPN type.

21.1 L2TP with IPsec

Remote User Access Settings	
Enable	<input checked="" type="checkbox"/>
VPN Type	<input checked="" type="radio"/> L2TP with IPsec <input type="radio"/> PPTP <input type="radio"/> OpenVPN
Preshared Key	<input type="text"/> <input checked="" type="checkbox"/> Hide Characters

L2TP with IPsec Remote User Access Settings	
Pre-shared Key	Enter your pre shared key in the text field. Please note that remote devices will need this preshared key to access the Balance.
Listen On	This setting is for specifying the WAN IP addresses that allow remote user access.
Disable Weak Ciphers	Click the  button to show and enable this option. When checked, weak ciphers such as 3DES will be disabled.

Continue to configure the authentication method.

21.2 OpenVPN

Remote User Access Settings	
Enable	<input checked="" type="checkbox"/>
VPN Type	<input type="radio"/> L2TP with IPsec <input type="radio"/> PPTP <input checked="" type="radio"/> OpenVPN You can obtain the OpenVPN client profile from the status page

Select OpenVPN and continue to configure the authentication method.

The OpenVPN Client profile can be downloaded from the **Status > device** page after the configuration has been saved.

OpenVPN Client Profile	<input checked="" type="checkbox"/> Route all traffic Split tunnel
------------------------	--

You have a choice between 2 different OpenVPN Client profiles:

- **"route all traffic" profile**
Using this profile, VPN clients will send all the traffic through the OpenVPN tunnel
- **"split tunnel" profile**
Using this profile, VPN clients will ONLY send those traffic designated to the untagged LAN and VLAN segment through the OpenVPN tunnel.

2.1.3 P P T P

Remote User Access Settings	
Enable	<input checked="" type="checkbox"/>
VPN Type	<input type="radio"/> L2TP with IPsec <input checked="" type="radio"/> PPTP <input type="radio"/> OpenVPN

No additional configuration required.

The Point-to-Point Tunneling Protocol (PPTP) is an obsolete method for implementing virtual private networks. PPTP has many well known security issues

Continue to configure authentication method.

2.1.4 Authentication Methods

Connect to Network	<input type="text" value="Untagged LAN"/>						
Authentication	<input type="text" value="Local User Accounts"/>						
User Accounts	<table border="1"> <thead> <tr> <th>Username</th> <th>Password</th> <th></th> </tr> </thead> <tbody> <tr> <td><input type="text"/></td> <td><input type="password"/></td> <td><input type="button" value="+"/></td> </tr> </tbody> </table>	Username	Password		<input type="text"/>	<input type="password"/>	<input type="button" value="+"/>
Username	Password						
<input type="text"/>	<input type="password"/>	<input type="button" value="+"/>					

Authentication Method	
Connect to Network	Select the VLAN network for remote users to enable remote user access on.
Authentication	Determine the method of authenticating remote users

User accounts:

This setting allows you to define the Remote User Accounts. Click Add to input username and password to create an account. After adding the user accounts, you can click on a username to edit the account password.

Note:

The username must contain lowercase letters, numerics, underscore(_), dash(-), at sign(@), and period(.) only.

The password must be between 8 and 12 characters long.

LDAP Server:

Connect to Network	? Untagged LAN ▾
Authentication	LDAP Server ▾
LDAP Server	<input type="text"/> Port <input type="text" value="389"/> Default <input type="checkbox"/> Use DN/Password to bind to LDAP Server
Base DN	<input type="text"/>
Base Filter	<input type="text"/>

Enter the matching LDAP server details to allow for LDAP server authentication.

Radius Server:

Authentication	RADIUS Server ▾
Auth Protocol	MS-CHAP v2 ▾
Auth Server	<input type="text"/> Port <input type="text" value="1812"/> Default
Auth Server Secret	<input type="text"/> <input checked="" type="checkbox"/> Hide Characters
Accounting Server	<input type="text"/> Port <input type="text" value="1813"/> Default
Accounting Server Secret	<input type="text"/> <input checked="" type="checkbox"/> Hide Characters

Enter the matching Radius server details to allow for Radius server authentication.

Active Directory:

Connect to Network	? Untagged LAN ▾
Authentication	Active Directory ▾
Server Hostname	<input type="text"/>
Domain	<input type="text"/>
Admin Username	<input type="text"/>
Admin Password	<input type="text"/> <input checked="" type="checkbox"/> Hide Characters

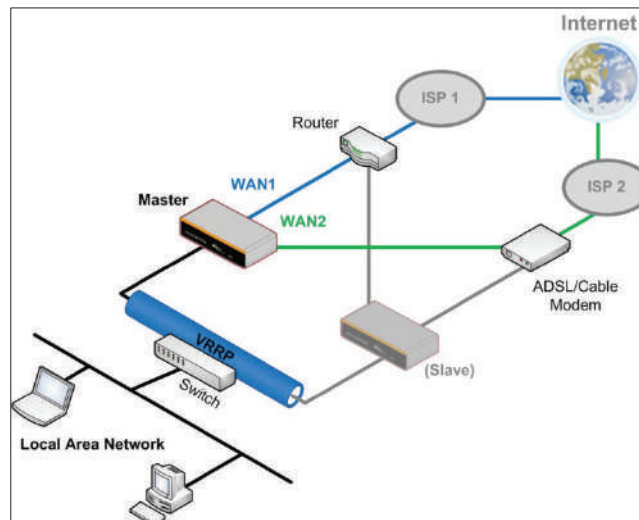
Enter the matching Active Directory details to allow for Active Directory server authentication.

22 Miscellaneous Settings

The miscellaneous settings include configuration for High Availability, Certificate Manager, service forwarding, service passthrough, GPS forwarding, GPIO, Groupe Networks and SIM Toolkit (depending the feature is supported on the model of Peplin router that is being used).

22.1 High Availability

Many Pepwave routers support high availability (HA) configurations via an open standard virtual router redundancy protocol (VRRP, RFC 3768). In an HA configuration, two Pepwave routers provide redundancy and failover in a master-slave arrangement. In the event that the master unit is down, the slave unit becomes active. High availability will be disabled automatically where there is a drop-in connection configured on a LAN bypass port.



In the diagram, the WAN ports of each Pepwave router connect to the router and to the modem. Both Pepwave routers connect to the same LAN switch via a LAN port.

An elaboration on the technical details of the implementation of the virtual router redundancy protocol (VRRP, RFC 3768) by Pepwave routers follows:

- In an HA configuration, the two Pepwave routers communicate with each other using VRRP over the LAN.
- The two Pepwave routers broadcast heartbeat signals to the LAN at a frequency of one heartbeat signal per second.
- In the event that no heartbeat signal from the master Pepwave router is received in 3 seconds (or longer) since the last heartbeat signal, the slave Pepwave router becomes active.
- The slave Pepwave router initiates the WAN connections and binds to a previously configured LAN IP address.
- At a subsequent point when the master Pepwave router recovers, it will once again

become active.

You can configure high availability at **Advanced>Misc. Settings>High Availability**.

Interface for Master Router

High Availability	
Enable	<input checked="" type="checkbox"/>
Group Number	<input type="text"/>
Preferred Role	<input checked="" type="radio"/> Master <input type="radio"/> Slave
Resume Master Role Upon Recovery	<input checked="" type="checkbox"/>
Virtual IP Address	<input type="text"/>
LAN Administration IP Address	192.168.86.1
Subnet Mask	255.255.255.0

Interface for Slave Router

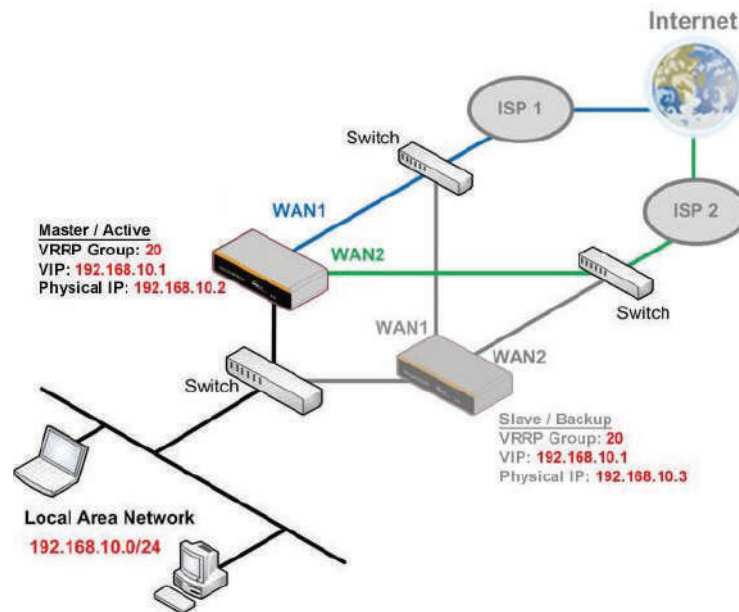
High Availability	
Enable	<input checked="" type="checkbox"/>
Group Number	<input type="text"/>
Preferred Role	<input type="radio"/> Master <input checked="" type="radio"/> Slave
Configuration Sync.	<input type="checkbox"/> Master Serial Number: <input type="text"/>
Establish Connections In Slave Role	<input type="checkbox"/>
Virtual IP Address	<input type="text"/>
LAN Administration IP Address	192.168.86.1
Subnet Mask	255.255.255.0

High Availability	
Enable	Checking this box specifies that the Pepwave router is part of a high availability configuration.
Group Number	This number identifies a pair of Pepwave routers operating in a high availability configuration. The two Pepwave routers in the pair must have the same Group Number value.
Preferred Role	This setting specifies whether the Pepwave router operates in master or slave mode. Click the corresponding radio button to set the role of the unit. One of the units in the pair must be configured as the master, and the other unit must be configured as the slave.
Resume Master Role Upon Recovery	This option is displayed when Master mode is selected in Preferred Role . If this option is enabled, once the device has recovered from an outage, it will take over and resume its Master role from the slave unit.
Configuration Sync.	This option is displayed when Slave mode is selected in Preferred Role . If this option is enabled and the Master Serial Number entered matches with the actual master unit's, the master unit will automatically transfer the configuration to this unit. Please make sure the LAN IP Address and the Subnet Mask fields are set correctly in the LAN settings page. You can refer to the Event Log for the configuration synchronization status.
Master Serial Number	If Configuration Sync. is checked, the serial number of the master unit is required here for the feature to work properly.
Virtual IP	The HA pair must share the same Virtual IP . The Virtual IP and the LAN Administration IP must be under the same network.

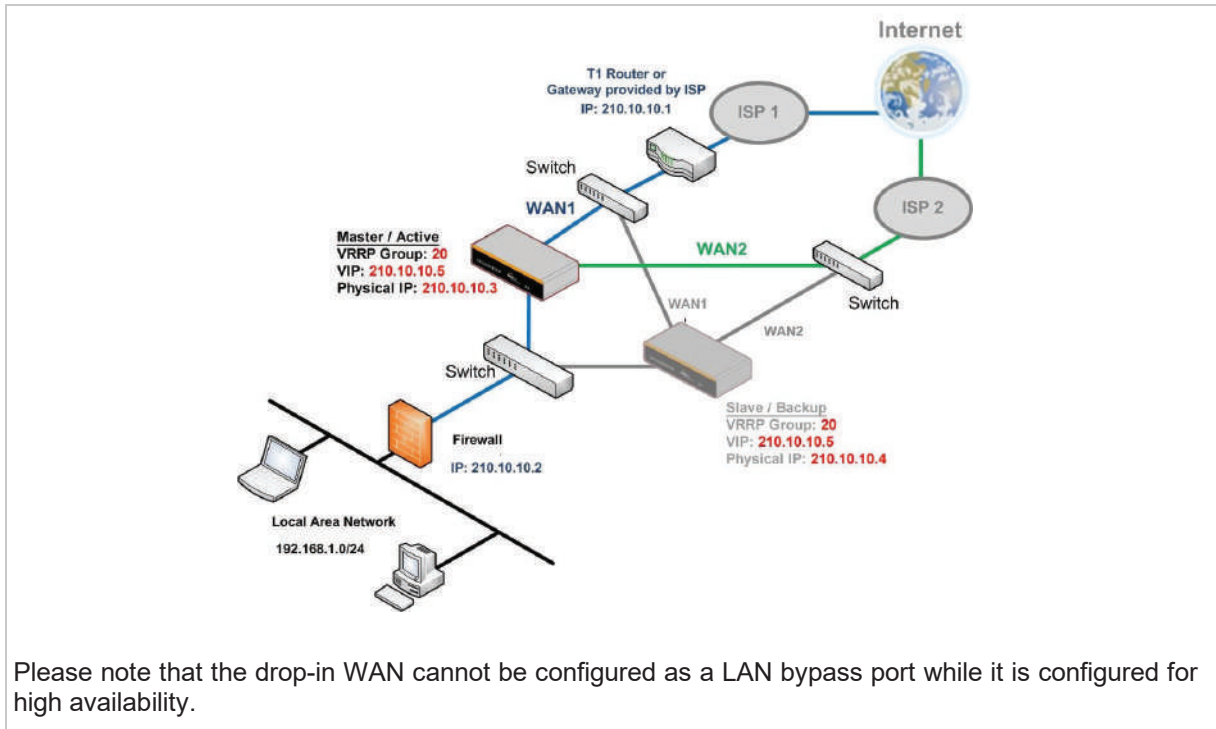
LAN Administration IP	This setting specifies a LAN IP address to be used for accessing administration functionality. This address should be unique within the LAN.
Subnet Mask	This setting specifies the subnet mask of the LAN.

Important Note

For Pepwave routers in NAT mode, the virtual IP (VIP) should be set as the default gateway for all hosts on the LAN segment. For example, a firewall sitting behind the Pepwave router should set its default gateway as the virtual IP instead of the IP of the master router.



In drop-in mode, no other configuration needs to be set.



22.2 Certificate Manager

Certificate		
SpeedFusion/IPsec VPN	No Certificate	
Web Admin SSL	Default Certificate is in use	
Captive Portal SSL	Default Certificate is in use	
OpenVPN CA	Default Certificate is in use	
Wi-Fi WAN Client Certificate		
No Certificates defined		
<input type="button" value="Add Certificate"/>		
Wi-Fi WAN CA Certificate		
No Certificates defined		
<input type="button" value="Add Certificate"/>		

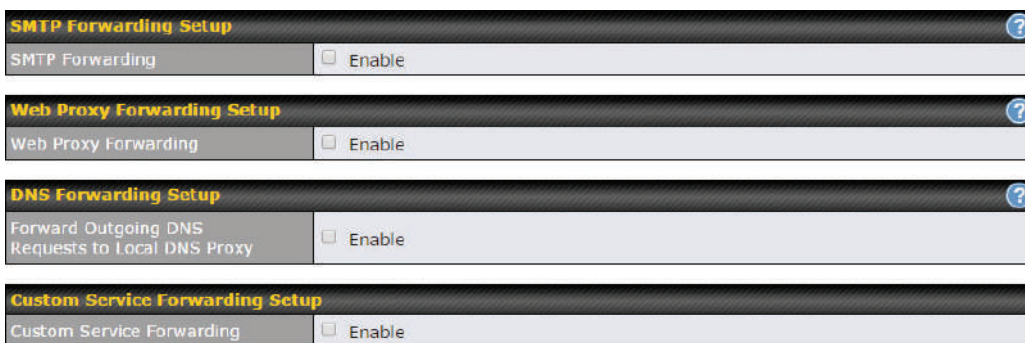
This section allows for certificates to be assigned to the local VPN, Web Admin SSL, Captive Portal SSL, OpenVPN CA, Wi-Fi WAN Client certificate and Wi-Fi WAN CA Certificate.

The following knowledge base article describes how to create self-signed certificates and import it to a Peplink Product.

<https://forum.peplink.com/t/how-to-create-a-self-signed-certificate-and-import-it-to-a-peplink-product/>

22.3 Service Forwarding

Service forwarding settings are located at **Advanced>Misc. Settings>Service Forwarding**.



Service Forwarding	
SMTP Forwarding	When this option is enabled, all outgoing SMTP connections destined for any host at TCP port 25 will be intercepted. These connections will be redirected to a specified SMTP server and port number. SMTP server settings for each WAN can be specified after selecting Enable .
Web Proxy Forwarding	When this option is enabled, all outgoing connections destined for the proxy server specified in Web Proxy Interception Settings will be intercepted. These connections will be redirected to a specified web proxy server and port number. Web proxy interception settings and proxy server settings for each WAN can be specified after selecting Enable .
DNS Forwarding	When this option is enabled, all outgoing DNS lookups will be intercepted and redirected to the built-in DNS name server. If any LAN device is using the DNS name servers of a WAN connection, you may want to enable this option to enhance the DNS availability without modifying the DNS server setting of the clients. The built-in DNS name server will distribute DNS lookups to corresponding DNS servers of all available WAN connections. In this case, DNS service will not be interrupted, even if any WAN connection is down.
Custom Service Forwarding	When custom service forwarding is enabled, outgoing traffic with the specified TCP port will be forwarded to a local or remote server by defining its IP address and port number.

22.3.1 SMTP Forwarding

Some ISPs require their users to send e-mails via the ISP's SMTP server. All outgoing SMTP connections are blocked except those connecting to the ISP's. Pepwave routers support intercepting and redirecting all outgoing SMTP connections (destined for TCP port 25) via a

WAN connection to the WAN's corresponding SMTP server.

SMTP Forwarding Setup			
SMTP Forwarding		<input checked="" type="checkbox"/> Enable	
Connection	Enable Forwarding?	SMTP Server	SMTP Port
WAN 1	<input type="checkbox"/>		
WAN 2	<input type="checkbox"/>		
Wi-Fi WAN	<input type="checkbox"/>		
Cellular 1	<input type="checkbox"/>		
Cellular 2	<input type="checkbox"/>		
USB	<input type="checkbox"/>		

To enable the feature, select **Enable** under **SMTP Forwarding Setup**. Check **Enable Forwarding** for the WAN connection(s) that needs forwarding. Under **SMTP Server**, enter the ISP's e-mail server host name or IP address. Under **SMTP Port**, enter the TCP port number for each WAN.

The Pepwave router will intercept SMTP connections. Choose a WAN port according to the outbound policy, and then forward the connection to the SMTP server if the chosen WAN has enabled forwarding. If the forwarding is disabled for a WAN connection, SMTP connections for the WAN will be simply be forwarded to the connection's original destination.

Note

If you want to route all SMTP connections only to particular WAN connection(s), you should create a custom rule in outbound policy (see **Section 14.2**).

22.3.2 Web Proxy Forwarding

Web Proxy Forwarding Setup			
Web Proxy Forwarding		<input checked="" type="checkbox"/> Enable	
Web Proxy Interception Settings			
Proxy Server		IP Address	Port
<small>(Current settings in users' browser)</small>			
Connection	Enable Forwarding?	Proxy Server IP Address : Port	
WAN 1	<input type="checkbox"/>		
WAN 2	<input type="checkbox"/>		
Wi-Fi WAN	<input type="checkbox"/>		
Cellular 1	<input type="checkbox"/>		
Cellular 2	<input type="checkbox"/>		
USB	<input type="checkbox"/>		

When this feature is enabled, the Pepwave router will intercept all outgoing connections destined for the proxy server specified in **Web Proxy Interception Settings**, choose a WAN connection with reference to the outbound policy, and then forward them to the specified web proxy server and port number. Redirected server settings for each WAN can be set here. If forwarding is disabled for a WAN, web proxy connections for the WAN will be simply forwarded

to the connection's original destination.

22.3.3 DNS Forwarding

DNS Forwarding Setup	
Forward Outgoing DNS Requests to Local DNS Proxy	<input type="checkbox"/> Enable

When DNS forwarding is enabled, all clients' outgoing DNS requests will also be intercepted and forwarded to the built-in DNS proxy server.

22.3.4 Custom Service Forwarding

Custom Service Forwarding Setup			
Custom Service Forwarding	<input checked="" type="checkbox"/> Enable		
Settings	TCP Port	Server IP Address	Server Port
	<input type="text"/>	<input type="text"/>	<input type="text"/>
			<input type="button" value="+"/>

After clicking the **enable** checkbox, enter your TCP port for traffic heading to the router, and then specify the IP Address and Port of the server you wish to forward to the service to.

22.4 Service Passthrough

Service passthrough settings can be found at **Advanced>Misc. Settings>Service Passthrough**.

Service Passthrough Support	
STP	<input type="radio"/> Standard Mode <input type="radio"/> Compatibility Mode <input checked="" type="checkbox"/> Define custom signal ports 1. <input type="text"/> 2. <input type="text"/> 3. <input type="text"/>
H.323	<input checked="" type="checkbox"/> Enable
FTP	<input checked="" type="checkbox"/> Enable <input type="checkbox"/> Define custom control ports
TFTP	<input checked="" type="checkbox"/> Enable
IPsec NAT-T	<input checked="" type="checkbox"/> Enable <input checked="" type="checkbox"/> Define custom ports 1. <input type="text"/> 2. <input type="text"/> 3. <input type="text"/> <input checked="" type="checkbox"/> Route IPsec Site-to-Site VPN via <input type="text" value="WAN 1"/>

Some Internet services need to be specially handled in a multi-WAN environment. Pepwave routers can handle these services such that Internet applications do not notice being behind a multi-WAN router. Settings for service passthrough support are available here.

Service Passthrough Support

<p>SIP</p>	<p>Session initiation protocol, aka SIP, is a voice-over-IP protocol. The Pepwave router can act as a SIP application layer gateway (ALG) which binds connections for the same SIP session to the same WAN connection and translate IP address in the SIP packets correctly in NAT mode. Such passthrough support is always enabled, and there are two modes for selection: Standard Mode and Compatibility Mode. If your SIP server's signal port number is non-standard, you can check the box Define custom signal ports and input the port numbers to the text boxes.</p>
<p>H.323</p>	<p>With this option enabled, protocols that provide audio-visual communication sessions will be defined on any packet network and pass through the Pepwave router.</p>
<p>FTP</p>	<p>FTP sessions consist of two TCP connections; one for control and one for data. In a multi-WAN situation, they must be routed to the same WAN connection. Otherwise, problems will arise in transferring files. By default, the Pepwave router monitors TCP control connections on port 21 for any FTP connections and binds TCP connections of the same FTP session to the same WAN. If you have an FTP server listening on a port number other than 21, you can check Define custom control ports and enter the port numbers in the text boxes.</p>
<p>TFTP</p>	<p>The Pepwave router monitors outgoing TFTP connections and routes any incoming TFTP data packets back to the client. Select Enable if you want to enable TFTP passthrough support.</p>
<p>IPsec NAT-T</p>	<p>This field is for enabling the support of IPsec NAT-T passthrough. UDP ports 500, 4500, and 10000 are monitored by default. You may add more custom data ports that your IPsec system uses by checking Define custom ports. If the VPN contains IPsec site-to-site VPN traffic, check Route IPsec Site-to-Site VPN and choose the WAN connection to route the traffic to.</p>

22.5 UART

Selected Pepwave MAX routers feature a RS-232 serial interface on the built-in terminal block. The RS-232 serial interface can be used to connect to a serial device and make it accessible over an TCP/IP network.

The serial interface can be enabled and parameters can be set on the web admin page under **Advanced > UART**. Make sure they match the serial device you are connecting to.

Serial to Network	
Enable	<input checked="" type="checkbox"/>
Allowed Source IP Subnets	<input checked="" type="radio"/> Any <input type="radio"/> Allows access from the following IP subnets only
Web Console	<input type="checkbox"/>

Serial Parameters	
Baud Rate	9600 ▾
Data Bits	8 ▾
Stop Bits	1 ▾
Parity	None ▾
Flow Control	None ▾
Interface	RS232 ▾

Operating Settings	
Operation Mode	TCP Server Mode ▾
Local TCP Port	4001
Max Connection	1
TCP Alive Check Time	7 min(s)
Inactivity Time	0 ms

Data Packing	
Packing Length	0 byte(s)
Delimiter	<input type="checkbox"/>
Delimiter process	Do Nothing ▾
Force Transmit	0 ms

There are 4 pins i.e. TX, RX, RTS, CTS on the terminal block for serial connection and they correspond to the pins in a DB-9 connector as follows:

DB-9 Pepwave MAX Terminal Block

Pin 1 –

Pin 2 Rx (rated +-25V)

Pin 3 Tx (rated +-12V)

Pin 4 –

Pin 5 –

Pin 6 –

Pin 7 RTS

Pin 8 CTS

Pin 9 –

The RS232 serial interface is not an isolated RS232. External galvanic isolation may be added if required.

Be sure to check whether your serial cable is a null modem cable, commonly known as crossover cable, or a straight through cable. If in doubt, swap Rx and Tx, and RTS and CTS, at the other end and give it another go.

Once connected, your serial device should be accessible on your Pepwave MAX router LAN IP address at the specified TCP port.

22.6 GPS Forwarding

Using the GPS forwarding feature, some Pepwave routers can automatically send GPS reports to a specified server. To set up GPS forwarding, navigate to **Advanced>GPS Forwarding**.

GPS Forwarding				
Enable	<input checked="" type="checkbox"/>			
Server	Server IP Address / Host Name	Port	Protocol	Report Interval (s)
	<input type="text"/>	<input type="text"/>	UDP	1 <input type="button" value="+"/>
GPS Report Format	<input checked="" type="radio"/> NMEA <input type="radio"/> TAIP			
NMEA Sentence Type	<input checked="" type="checkbox"/> GPRMC <input type="checkbox"/> GPGGA <input type="checkbox"/> GPVTG <input type="checkbox"/> GPGSA <input type="checkbox"/> GPGSV			
Vehicle ID	<input type="checkbox"/> <input type="button" value="?"/>			

GPS Forwarding	
Enable	Check this box to turn on GPS forwarding.
Server	Enter the name/IP address of the server that will receive GPS data. Also specify a port number, protocol (UDP or TCP), and a report interval of between 1 and 10 seconds. Click <input type="button" value="+"/> to save these settings.
GPS Report Format	Choose from NMEA or TAIP format for sending GPS reports.
NMEA Sentence Type	If you've chosen to send GPS reports in NMEA format, select one or more sentence types for sending the data (GPRMC , GPGGA , GPVTG , GPGSA , and GPGSV).
Vehicle ID	The vehicle ID will be appended in the last field of the NMEA sentence. Note that the NMEA sentence will become customized and non-standard.
TAIP Sentence Type/TAIP ID (optional)	If you've chosen to send GPS reports in TAIP format, select one or more sentence types for sending the data (PV—Position / Velocity Solution and CP—Compact Velocity Solution). You can also optionally include an ID number in the TAIP ID field.


22.7 Ignition Sensing

Ignition Sensing detects the ignition signal status of a vehicle it is installed in.

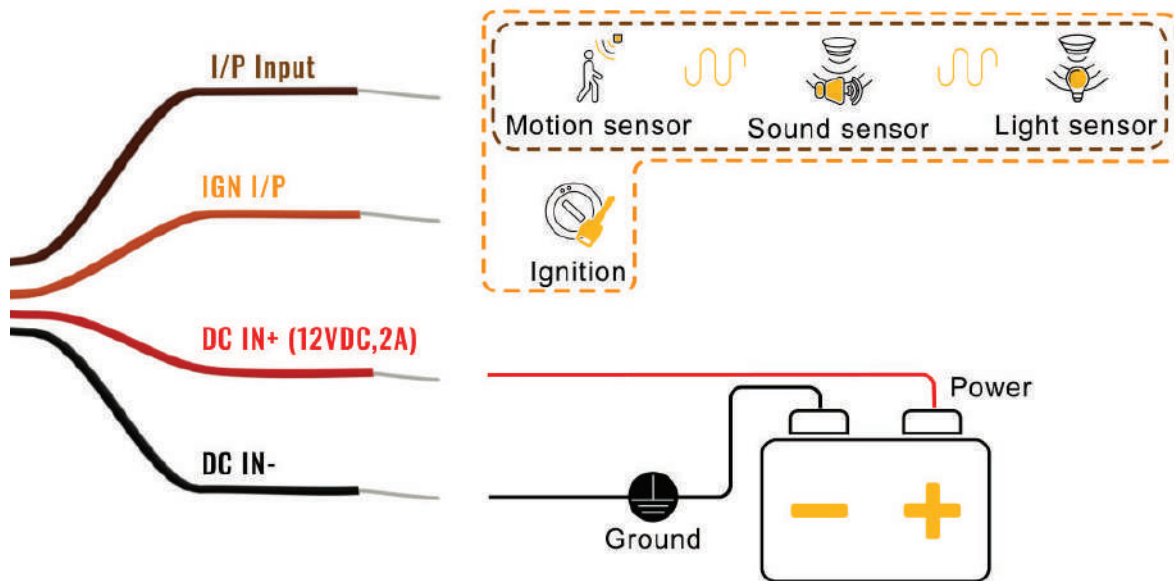
This feature allows the cellular router to start up or shut down when the engine of that vehicle is started or turned off.

The time delay setting between ignition off and power down of the router is a configurable setting, which allows the router to stay on for a period of time after the engine of a vehicle is turned off.

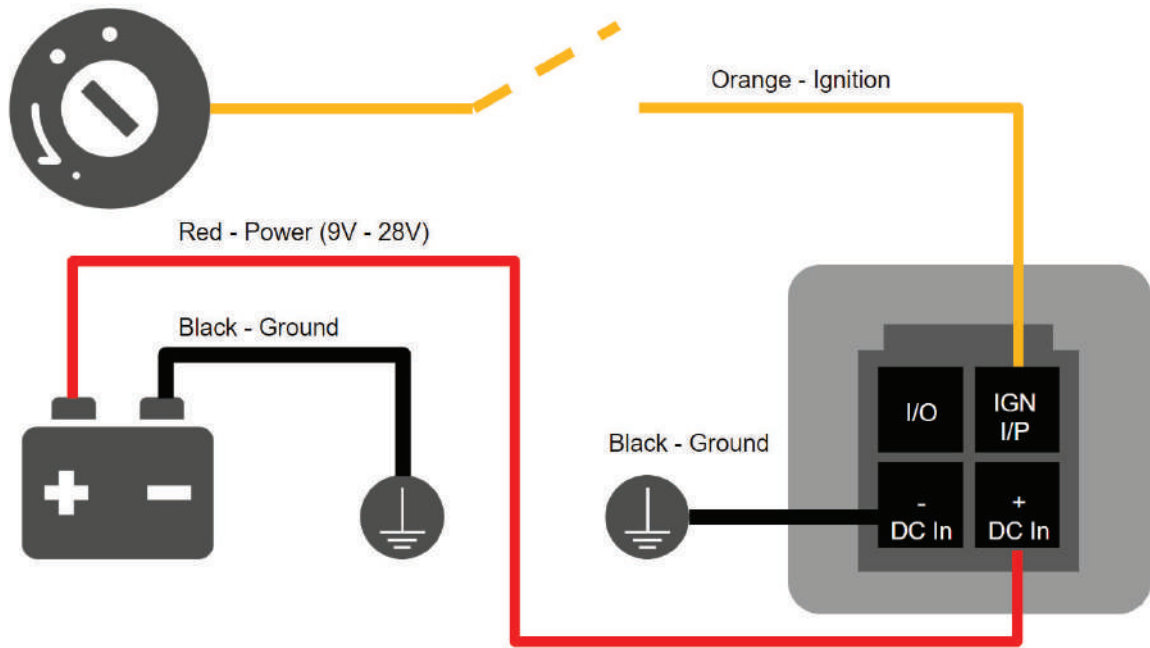
Ignition Sensing installation

	Function	Colour Wire
	I/O optional*	Brown
	IGN I/P connected to positive feed on the ignition .	Orange
	DC IN - connected to permanent negative feed (ground)	Black
	DC IN + connected to permanent positive feed (power 12VDC, 2A)).	Red

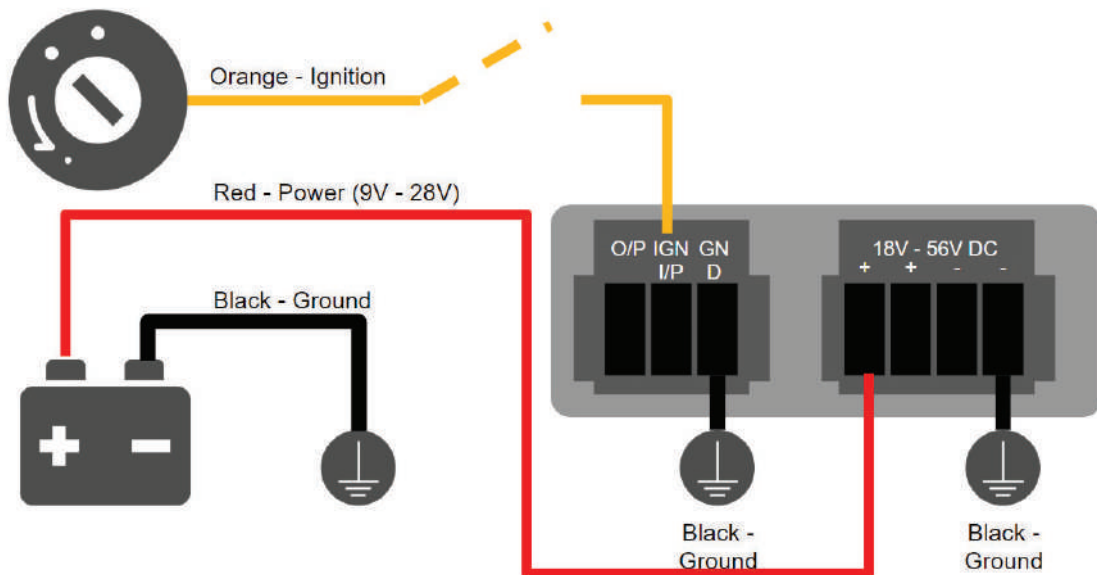
* Currently not functional; will be used for additional features in future firmware



Connectivity diagram for devices with 4-pin connector



Connectivity diagram for devices with terminal block connection



GPIO Menu

The Ignition Sensing options are available in **Advanced > GPIO**

The configurable option for Ignition Input is **Delay**; the time in seconds the router stays powered on after the ignition is turned off.

IGN I/P	
Enable	<input checked="" type="checkbox"/>
Type	Digital Input ▼
Mode	Ignition Sensing ▼
Delay	<input type="text"/> seconds

Still under development:

O/P (connected to I/O pin on 4 pin connector) can be configured as a digital input, digital output or analog input.

Digital Input - the connection supports input sensing; it reads the external input and determine if the settings should be 'High' (on) or 'Low' (off).

Digital Output - when there is a healthy WAN connection, the output pin is marked as 'High' (on). Otherwise, it will be marked as 'Low' (off).

Analog Input - to be confirmed. In most cases should read the external input and determine the voltage level.

O/P	
Enable	<input checked="" type="checkbox"/>
Type	Digital Output ▼
Mode	WAN Status ▼

22.8 NTP Server

Pepwave routers can now serve as a local NTP server. Upon start up, it is now able to provide connected devices with the accurate time, precise UTC from either an external NTP server or via GPS and ensuring that connected devices always receive the correct time.

Compatible with: BR1 ENT, 700 HW3, HD2/4, Transit

NTP Server setting can be found via: **Advanced>Misc. Settings>NTP Server**

NTP Server	
Enable	<input type="checkbox"/>

Time Settings can be found at **System>Time>Time Settings**

Time Settings	
Time Zone	(GMT) Casablanca <input type="checkbox"/> Show all
Time Sync	Time Server
Time Server	0.peplink.pool.ntp.org

22.9 Grouped Networks

Advanced > Grouped Networks allows to configure destination networks in grouped format.

Grouped Networks		
Name	Networks	
Example	192.168.1.71/28	<input type="button" value="X"/>
<input type="button" value="Add Group"/>		

Select Add group to create a new group with single IPAddresses or subnets from different VLANs.

Grouped Networks			
Name	Example		
Networks	Network	Subnet Mask	
	192.168.1.71	255.255.255.240 (/28)	<input type="button" value="X"/>
		255.255.255.255 (/32)	<input type="button" value="+"/>
<input type="button" value="Save"/> <input type="button" value="Cancel"/>			

The created network groups can be used in outbound policies, firewall rules.

22.10 Remote SIM Management

The Remote SIM management accessible via **Advanced > Misc Settings > Remote SIM Management**, which enables SIM Injector discovery. Default is disabled.

Remote SIM Host	
Remote SIM is disabled ✖	

Remote SIM Host Settings

Remote SIM Host Settings ✖	
Auto LAN Discovery	<input type="checkbox"/>
Remote SIM Host	<input type="text"/>
<input type="button" value="Save"/>	

22.11 SIM Toolkit

The SIM Toolkit, accessible via **Advanced > Misc Settings > SIM Toolkit**, supports two functionalities, USSD and SMS.

USSD

Unstructured Supplementary Service Data (USSD) is a protocol used by mobile phones to communicate with their service provider's computers. One of the most common uses is to query the available balance.

SIM Status	
WAN Connection	Cellular ▼
SIM Card	1
IMSI	856195002108538
Tool	USSD ▼
USSD	
USSD Code	<input type="text"/> <input type="button" value="Submit"/>

Enter your USSD code under the **USSD Code** text field and click **Submit**.

SIM Status	
WAN Connection	Cellular ▼
SIM Card	1
IMSI	856195002108538
USSD Code	*138# <input type="button" value="Submit"/>
Receive SMS	<input type="button" value="Get"/>

You will receive a confirmation. To check the SMS response, click **Get**.

SIM Status	
WAN Connection	Cellular
SIM Card	1
IMSI	856195002108538
USSD Code	*138# <input type="button" value="Submit"/>
USSD Status	Request is sent successfully
Receive SMS	<input type="button" value="Get"/>

After a few minutes you will receive a response to your USSD code

Received SMS		
May 27 20:02	<p>PCX As of May 27th Account Balance: \$ 0.00 Amount Unbilled Voice Calls: 0 minutes Video Calls: 0 minutes SMS (Roaming): 0 SMS (Within Network): 0 MMS (Roaming): 0 MMS (Within Network): 0 Data Usage: 7384KB (For reference only, please refer to bill)</p>	<input type="button" value="X"/>
Aug 8 , 2013 14:51	<p>PCX iPhone & Android users need to make sure "PCX" is entered as the APN under "Settings" > "Mobile network setting" for web browsing and mobile data service. Other handset models will receive handset settings via SMS shortly (PIN: 1234) (Consumer Service Hotline: 1000 / Business Customer Hotline 10088)</p>	<input type="button" value="X"/>

SMS

The SMS option allows you to read SMS (text) messages that have been sent to the SIM in your Pepwave router.

SIM Status	
WAN Connection	Cellular
SIM Card	1
IMSI	856195002108538
Tool	SMS

SMS		Refresh
Jun 21, 2017 18:00	<p>PEP Thank you, your new password is: yk10m000 + you can change this when you first login at www.peplink.com</p>	<input type="button" value="✘"/>
May 06, 2017 12:23	<p>PEP Welcome to Peplink! Your new email is ready to receive. Go to your PEPL account on your desktop or on a mobile phone click here http://www.peplink.com</p>	<input type="button" value="✘"/>
Mar 15, 2017 10:03	<p>From: Peplink Hello, there is planned maintenance in the gateway you use every day. If your services affected, you can get updates here: http://www.peplink.com</p>	<input type="button" value="✘"/>
Mar 06, 2017 14:50	<p>PEP Welcome to Peplink! Your new email is ready to receive. Go to your PEPL account on your desktop or on a mobile phone click here http://www.peplink.com</p>	<input type="button" value="✘"/>
Dec 28, 2016 09:53	<p>From: Peplink We are happy you've registered to receive high-price offers that we contact you. This offer applied to your first 10 calls. Your monthly recurring charge will be \$1.99 followed by your add-on. Thank</p>	<input type="button" value="✘"/>
Dec 06, 2016 13:09	<p>PEP Welcome to Peplink! Your new email is ready to receive. Go to your PEPL account on your desktop or on a mobile phone click here http://www.peplink.com</p>	<input type="button" value="✘"/>
Nov 08, 2016 11:29	<p>From: Peplink Hello, there is planned maintenance in the gateway that you use every day. If your services affected, you can get updates here: http://www.peplink.com</p>	<input type="button" value="✘"/>
Sep 07, 2016 17:05	<p>From: Peplink Thank you for registering your number on Peplink. We will be in touch with you in 24 hours to help your installation. Only Support@peplink.com</p>	<input type="button" value="✘"/>

23 AP

23.1 AP Controller

The AP controller acts as a centralized controller of Pepwave Access Points. With this feature, users can customize and manage up to 1500 Access Points from a single Pepwave router interface. To configure, navigate to the **AP** tab. and the following screen appears.

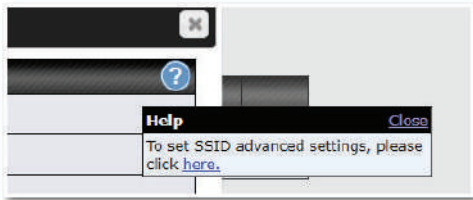
AP Controller	
AP Management	<input checked="" type="checkbox"/> Integrated AP <input checked="" type="checkbox"/> External AP
Sync. Method	As soon as possible ▾
Permitted AP	<input checked="" type="radio"/> Any <input type="radio"/> Approved List

AP Controller	
AP Management	The AP controller for managing Pepwave APs can be enabled by checking this box. When this option is enabled, the AP controller will wait for management connections originating from APs over the LAN on TCP and UDP port 11753. It will also wait for captive portal connections on TCP port 443. An extended DHCP option, CAPWAP Access Controller addresses (field 138), will be added to the DHCP server. A local DNS record, AP Controller , will be added to the local DNS proxy.
Sync Method	<ul style="list-style-type: none"> • As soon as possible • Progressively • One at a time
Permitted AP	Access points to manage can be specified here. If Any is selected, the AP controller will manage any AP that reports to it. If Approved List is selected, only APs with serial numbers listed in the provided text box will be managed.

23.2 Wireless SSID

SSID	Security Policy
No SSID Defined	
<input type="button" value="Add"/>	

Current SSID information appears in the **SSID** section. To edit an existing SSID, click its name in the list. To add a new SSID, click **Add**. Note that the following settings vary by model. The below settings shows a new SSID window with Advanced Settings enabled (these are available by selecting the question mark in the top right corner).



SSID
✕

SSID Settings
?

SSID	<input type="text"/>
Enable	<input checked="" type="checkbox"/>
VLAN	Untagged LAN ▾
Broadcast SSID	<input checked="" type="checkbox"/>
Data Rate	<input checked="" type="radio"/> Auto <input type="radio"/> Fixed
Multicast Filter	<input type="checkbox"/>
Multicast Rate	MCS0/6M ▾
IGMP Snooping	<input type="checkbox"/>
Layer 2 Isolation	<input type="checkbox"/>
Maximum number of clients	2.4 GHz: <input type="text" value="0"/> 5 GHz: <input type="text" value="0"/> (0: Unlimited)

Security Settings


Security Policy	Open (No Encryption) ▾
-----------------	------------------------

Access Control Settings

Restricted Mode	None ▾
-----------------	--------

SSID Settings	
SSID	This setting specifies the SSID of the virtual AP to be scanned by Wi-Fi clients.
Enable	Click the drop-down menu to apply a time schedule to this interface
VLAN	This setting specifies the VLAN ID to be tagged on all outgoing packets generated from this wireless network (i.e., packets that travel from the Wi-Fi segment through the Pepwave AP One unit to the Ethernet segment via the LAN port). The default value of this setting is 0 , which means VLAN tagging is disabled (instead of tagged with zero).
Broadcast SSID	This setting specifies whether or not Wi-Fi clients can scan the SSID of this wireless network. Broadcast SSID is enabled by default.

Data Rate ^A	Select Auto to allow the Pepwave router to set the data rate automatically, or select Fixed and choose a rate from the displayed drop-down menu.
Multicast Filter ^A	This setting enables the filtering of multicast network traffic to the wireless SSID.
Multicast Rate ^A	This setting specifies the transmit rate to be used for sending multicast network traffic. The selected Protocol and Channel Bonding settings will affect the rate options and values available here.
IGMP Snooping ^A	To allow the Pepwave router to listen to internet group management protocol (IGMP) network traffic, select this option.
DHCP Option 82 ^A	If you use a distributed DHCP server/relay environment, you can enable this option to provide additional information on the manner in which clients are physically connected to the network.
Layer 2 Isolation ^A	Layer 2 refers to the second layer in the ISO Open System Interconnect model. When this option is enabled, clients on the same VLAN, SSID, or subnet are isolated to that VLAN, SSID, or subnet, which can enhance security. Traffic is passed to the upper communication layer(s). By default, the setting is disabled.
Maximum Number of Clients	Indicate the maximum number of clients that should be able to connect to each frequency.

^A - Advanced feature. Click the  button on the top right-hand corner to activate.

Security Settings	
Security Policy	WPA2 - Personal ▼
Encryption	AES:CCMP
Shared Key	<input type="password" value="••••••"/> <input checked="" type="checkbox"/> Hide Characters

Security Settings	
Security Policy	<p>This setting configures the wireless authentication and encryption methods. Available options :</p> <ul style="list-style-type: none"> • Open (No Encryption) • WPA3 -Personal (AES:CCMP) • WPA2/WPA3 -Personal (AES:CCMP) • WPA2 -Personal (AES:CCMP) • WPA2 – Enterprise • WPA/WPA2 - Personal (TKIP/AES: CCMP) • WPA/WPA2 – Enterprise <p>When WPA/WPA2 - Enterprise is configured, RADIUS-based 802.1 x authentication is enabled. Under this configuration, the Shared Key option should be disabled. When</p>

using this method, select the appropriate version using the **V1/V2** controls. The security level of this method is known to be very high.

When **WPA/WPA2- Personal** is configured, a shared key is used for data encryption and authentication. When using this configuration, the **Shared Key** option should be enabled. Key length must be between eight and 63 characters (inclusive). The security level of this method is known to be high.

NOTE:

When **WPA2/WPA3- Personal** is configured, if a managed AP which is NOT WPA3 PSK capable, the AP Controller will not push those WPA3 and WPA2/WPA3 SSID to that AP.

Access Control Settings	
Restricted Mode	Deny all except listed ▼
MAC Address List	<input type="text"/>

Access Control

Restricted Mode

The settings allow administrator to control access using MAC address filtering. Available options are **None**, **Deny all except listed**, and **Accept all except listed**

MAC Address List

Connection coming from the MAC addresses in this list will be either denied or accepted based on the option selected in the previous field.
If more than one MAC address needs to be entered, you can use a carriage return to separate them.

RADIUS Server Settings	Primary Server	Secondary Server
Host	<input type="text"/>	<input type="text"/>
Secret	<input type="text"/> <input checked="" type="checkbox"/> Hide Characters	<input type="text"/> <input checked="" type="checkbox"/> Hide Characters
Authentication Port	1812 <input type="text"/> Default	1812 <input type="text"/> Default
Accounting Port	1813 <input type="text"/> Default	1813 <input type="text"/> Default
NAS-Identifier	Device Name ▼	

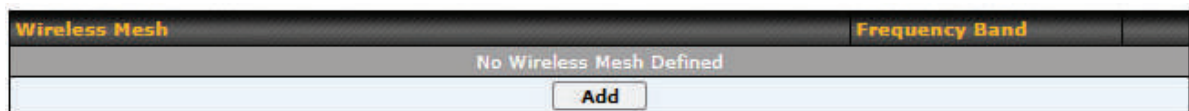
RADIUS Server Settings

Host

Enter the IP address of the primary RADIUS server and, if applicable, the secondary RADIUS server.

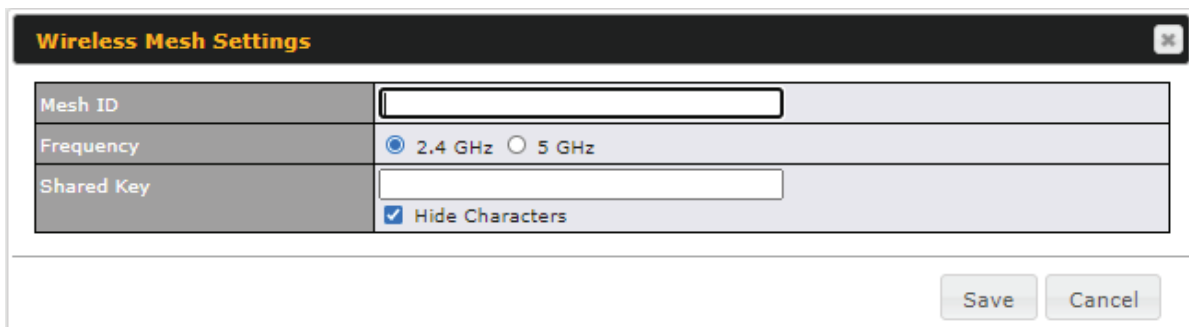
Secret	Enter the RADIUS shared secret for the primary server and, if applicable, the secondary RADIUS server.
Authentication Port	In field, enter the UDP authentication port(s) used by your RADIUS server(s) or click the Default button to enter 1812 .
Accounting Port	In field, enter the UDP accounting port(s) used by your RADIUS server(s) or click the Default button to enter 1813 .
NAS-Identifier	Choose between Device Name , LAN MAC address , Device Serial Number and Custom Value

23.3 Wireless Mesh



Wireless Mesh Support is available on devices running 802.11ac (Wi-Fi 5) and above. Along with the AP Controller, mesh network extensions can be established, which can expand network coverage. Note that the Wireless Mesh settings need to match the Mesh ID and Shared Key of the other devices on the same selected frequency band.

To create a new Wireless Mesh profile, go to **AP > Wireless Mesh**, and click **Add**.



Wireless Mesh Settings	
Mesh ID	Enter a name to represent the Mesh profile.
Frequency	Select the 2.4GHz or 5GHz frequency to be used.
Shared Key	Enter the shared key in the text field. Please note that it needs to match the shared keys of the other APs in the Wireless Mesh settings. Click Hide / Show Characters to toggle visibility.

23.4 Settings


On many Pepwave models, the AP settings screen (**AP>Settings**) looks similar to the example below:

AP Settings	
SSID	<input type="checkbox"/> 2.4 GHz <input checked="" type="checkbox"/> 5 GHz <input type="checkbox"/> Integrated AP supports 2.4 GHz only. Testing
Operating Country	United States
Preferred Frequency	<input checked="" type="radio"/> 2.4 GHz <input type="radio"/> 5 GHz Integrated AP supports 2.4 GHz only.
	<input type="checkbox"/> 2.4 GHz <input checked="" type="checkbox"/> 5 GHz
Protocol	<input type="checkbox"/> 802.11n <input checked="" type="checkbox"/> 802.11n/ac
Channel Width	<input type="checkbox"/> 20 MHz <input checked="" type="checkbox"/> Auto
Channel	<input type="checkbox"/> Auto <input type="button" value="Edit"/> <input type="checkbox"/> Auto <input type="button" value="Edit"/> <small>Channels: 1 2 3 4 5 6 7 8 9 10 11</small> <small>Channels: 36 40 44 48 52 56 60 64 100 104 108 112 116 120 124 128 132 136 140 149 153 157 161 165</small>
Auto Channel Update	Daily at <input type="text" value="03"/> :00 <input checked="" type="checkbox"/> Wait until no active client associated
Output Power	<input type="checkbox"/> Fixed: Max <input type="checkbox"/> Boost
Client Signal Strength Threshold	<input type="text" value="0"/> -95 dBm (0: Unlimited)
Maximum number of clients	<input type="text" value="0"/> (0: Unlimited)
Management VLAN ID	Untagged LAN (No VLAN)
Operating Schedule	Always on
Beacon Rate	<input type="text" value="1"/> Mbps <small>6 Mbps will be used for 5 GHz radio</small>
Beacon Interval	<input type="text" value="100"/> ms
DTIM	<input type="text" value="1"/> <input type="button" value="Default"/>
RTS Threshold	<input type="text" value="0"/> <input type="button" value="Default"/>
Fragmentation Threshold	<input type="text" value="0"/> (0: Disable) <input type="button" value="Default"/>
Distance / Time Converter	<input type="text" value="4050"/> m <small>Note: Input distance for recommended values</small>
Slot Time	<input type="radio"/> Auto <input checked="" type="radio"/> Custom <input type="text" value="9"/> μ s <input type="button" value="Default"/>
ACK Timeout	<input type="text" value="48"/> μ s <input type="button" value="Default"/>
Frame Aggregation	<input type="checkbox"/>

AP Settings	
SSID	These buttons specify which wireless networks will use this AP profile. You can also select the frequencies at which each network will transmit. Please note that the Pepwave MAX does not detect whether the AP is capable of transmitting at both frequencies. Instructions to transmit at unsupported frequencies will be ignored by the AP.
Operating Country	This drop-down menu specifies the national / regional regulations which the AP

	<p>should follow.</p> <ul style="list-style-type: none"> • If a North American region is selected, RF channels 1 to 11 will be available and the maximum transmission power will be 26 dBm (400 mW). • If European region is selected, RF channels 1 to 13 will be available. The maximum transmission power will be 20 dBm (100 mW). <p>NOTE: Users are required to choose an option suitable to local laws and regulations.</p> <p>Per FCC regulation, the country selection is not available on all models marketed in the US. All US models are fixed to US channels only.</p>
Preferred Frequency	These buttons determine the frequency at which access points will attempt to broadcast. This feature will only work for APs that can transmit at both 5.4GHz and 5GHz frequencies.
Protocol	This section displays the 2.4 GHz protocols your APs are using.
Channel Width	There are three options: 20 MHz, 20/40 MHz, and 40 MHz. With this feature enabled, the Wi-Fi system can use two channels at once. Using two channels improves the performance of the Wi-Fi connection.
Channel	This drop-down menu selects the 802.11 channel to be utilized. Available options are from 1 to 11 and from 1 to 13 for the North America region and Europe region, respectively. (Channel 14 is only available when the country is selected as Japan with protocol 802.11b.) If Auto is set, the system will perform channel scanning based on the scheduled time set and choose the most suitable channel automatically.
Auto Channel Update	Indicate the time of day at which update automatic channel selection.
Output Power^A	<p>This drop-down menu determines the power at which the AP under this profile will broadcast. When fixed settings are selected, the AP will broadcast at the specified power level, regardless of context. When Dynamic settings are selected, the AP will adjust its power level based on its surrounding APs in order to maximize performance.</p> <p>The Dynamic: Auto setting will set the AP to do this automatically. Otherwise, the Dynamic: Manual setting will set the AP to dynamically adjust only if instructed to do so. If you have set Dynamic:Manual, you can go to AP>Toolbox>Auto Power Adj. to give your AP further instructions.</p> <p>If you click the Boost checkbox, the AP under this profile will transmit using additional power. Please note that using this option with several APs in close proximity will lead to increased interference.</p>
Client Signal Strength Threshold^A	This field determines that maximum signal strength each individual client will receive. The measurement unit is megawatts.
Max number of Clients^A	This field determines the maximum clients that can be connected to APs under this profile.

Management VLAN ID	This field specifies the VLAN ID to tag to management traffic, such as AP to AP controller communication traffic. The value is 0 by default, meaning that no VLAN tagging will be applied. NOTE: change this value with caution as alterations may result in loss of connection to the AP controller.
Operating Schedule	Choose from the schedules that you have defined in System>Schedule . Select the schedule for the integrated AP to follow from the drop-down menu.
Beacon Rate^A	This drop-down menu provides the option to send beacons in different transmit bit rates. The bit rates are 1Mbps, 2Mbps, 5.5Mbps, 6Mbps, and 11Mbps .
Beacon Interval^A	This drop-down menu provides the option to set the time between each beacon send. Available options are 100ms, 250ms, and 500ms .
DTIM^A	This field provides the option to set the frequency for beacon to include delivery traffic indication message (DTIM). The interval unit is measured in milliseconds.
RTS Threshold^A	This field provides the option to set the minimum packet size for the unit to send an RTS using the RTS/CTS handshake. Setting 0 disables this feature.
Fragmentation Threshold^A	Determines the maximum size (in bytes) that each packet fragment will be broken down into. Set 0 to disable fragmentation.
Distance/Time Converter^A	Select the distance you want your Wi-Fi to cover in order to adjust the below parameters. Default values are recommended.
Slot Time^A	This field provides the option to modify the unit wait time before it transmits. The default value is 9µs .
ACK Timeout^A	This field provides the option to set the wait time to receive acknowledgement packet before doing retransmission. The default value is 48µs .
Frame Aggregation^A	With this feature enabled, throughput will be increased by sending two or more data frames in a single transmission.
Frame Length	This field is only available when Frame Aggregation is enabled. It specifies the frame length for frame aggregation. By default, it is set to 50000 .

^A - Advanced feature. Click the  button on the top right-hand corner to activate.

Web Administration Settings (on External AP)	
Enable	<input checked="" type="checkbox"/>
Web Access Protocol	<input type="radio"/> HTTP <input checked="" type="radio"/> HTTPS
Management Port	<input type="text" value="443"/>
HTTP to HTTPS Redirection	<input checked="" type="checkbox"/>
Admin Username	<input type="text" value="admin"/>
Admin Password	<input type="text" value="25db591396e0"/> <input type="button" value="Generate"/>







Web Administration Settings

Enable	Check the box to allow the Pepwave router to manage the web admin access information of the AP.
Web Access Protocol	These buttons specify the web access protocol used for accessing the web admin of the AP. The two available options are HTTP and HTTPS .
Management Port	This field specifies the management port used for accessing the device.
HTTP to HTTPS Redirection	This option will be available if you have chosen HTTPS as the Web Access Protocol . With this enabled, any HTTP access to the web admin will redirect to HTTPS automatically.
Admin User Name	This field specifies the administrator username of the web admin. It is set as <i>admin</i> by default.
Admin Password	This field allows you to specify a new administrator password. You may also click the Generate button and let the system generate a random password automatically.

Navigating to **AP>Settings** on some Pepwave models displays a screen similar to the one shown below:

 InControl management enabled. Settings can now be configured on [InControl](#).

Wi-Fi Radio Settings	
Operating Country	United States ▼
Wi-Fi Antenna	<input type="radio"/> Internal <input checked="" type="radio"/> External

Wi-Fi AP Settings 	
Protocol	802.11ng ▼
Channel	1 (2.412 GHz) ▼
Channel Width	Auto ▼
Output Power	Max ▼ <input type="checkbox"/> Boost
Beacon Rate 	1Mbps ▼
Beacon Interval 	100ms ▼
DTIM 	1
Slot Time 	9 μs
ACK Timeout 	48 μs
Frame Aggregation	<input checked="" type="checkbox"/> Enable
Guard Interval	<input type="radio"/> Short <input type="radio"/> Long

Wi-Fi Radio Settings

Operating Country	This option sets the country whose regulations the Pepwave router follows.
Wi-Fi Antenna	Choose from the router's internal or optional external antennas, if so equipped.

Important Note

Per FCC regulations, the country selection is not available on all models marketed in the US. All US models are fixed to US channels only.

Wi-Fi AP Settings

Protocol	This option allows you to specify whether 802.11b and/or 802.11g client association requests will be accepted. Available options are 802.11ng and 802.11na . By default, 802.11ng is selected.
Channel	This option allows you to select which 802.11 RF channel will be used. Channel 1 (2.412 GHz) is selected by default.
Channel Width	Auto (20/40 MHz) and 20 MHz are available. The default setting is Auto (20/40 MHz) , which allows both widths to be used simultaneously.
Output Power	This option is for specifying the transmission output power for the Wi-Fi AP. There are 4 relative power levels available – Max , High , Mid , and Low . The actual output power will be bound by the regulatory limits of the selected country.
Beacon Rate^A	This option is for setting the transmit bit rate for sending a beacon. By default, 1Mbps is selected.

Beacon Interval^A	This option is for setting the time interval between each beacon. By default, 100ms is selected.
DTIM^A	This field allows you to set the frequency for the beacon to include a delivery traffic indication message. The interval is measured in milliseconds. The default value is set to 1 ms .
Slot Time^A	This field is for specifying the wait time before the Router transmits a packet. By default, this field is set to 9 μs .
ACK Timeout^A	This field is for setting the wait time to receive an acknowledgement packet before performing a retransmission. By default, this field is set to 48 μs .
Frame Aggregation^A	This option allows you to enable frame aggregation to increase transmission throughput.
Guard Interval^A	This setting allows choosing a short or long guard period interval for your transmissions.

^A - Advanced feature, please click the  button on the top right-hand corner to activate.

24 AP Controller Status

24.1 Info

A comprehensive overview of your AP can be accessed by navigating to **AP > Controller Status > Info**.



AP Controller	
License Limit	This field displays the maximum number of AP your Balance router can control. You can purchase licenses to increase the number of AP you can manage.
Frequency	Underneath, there are two check boxes labeled 2.4 Ghz and 5 Ghz . Clicking either box will toggle the display of information for that frequency. By default, the graphs display the number of clients and data usage for both 2.4GHz and 5 GHz frequencies.
SSID	The colored boxes indicate the SSID to display information for. Clicking any colored box will toggle the display of information for that SSID. By default, all the graphs show information for all SSIDs.
No. of APs	This pie chart and table indicates how many APs are online and how many are offline.
No. of Clients	This graph displays the number of clients connected to each network at any given time. Mouse over any line on the graph to see how many clients connected to a

specific SSID for that point in time.

Data Usage

This graph enables you to see the data usage of any SSID for any given time period. Mouse over any line on the graph to see the data usage by each SSID for that point in time. Use the buttons next to **Zoom** to select the time scale you wish to view. In addition, you could use the sliders at the bottom to further refine your timescale.

Events		View Alerts
Jan 2 11:01:11	AP One 300M: Client 54:EA:A8:2D:A0:D5 disassociated from Marketing_11a	
Jan 2 11:00:42	AP One 300M: Client 54:EA:A8:2D:A0:D5 associated with Marketing_11a	
Jan 2 11:00:38	AP One 300M: Client 54:EA:A8:2D:A0:D5 disassociated from Marketing_11a	
Jan 2 11:00:36	AP One 300M: Client 00:21:6A:35:59:A4 associated with Balance_11a	
Jan 2 11:00:20	AP One 300M: Client 60:67:20:24:B6:4C disassociated from Marketing_11a	
Jan 2 11:00:09	AP One 300M: Client 54:EA:A8:2D:A0:D5 associated with Marketing_11a	
Jan 2 10:59:09	AP One 300M: Client 00:21:6A:35:59:A4 disassociated from Balance_11a	
Jan 2 10:59:08	Office Fiber AP: Client 18:00:2D:3D:4E:7F associated with Balance	
Jan 2 10:58:53	Michael's Desk: Client 18:00:2D:3D:4E:7F disassociated from Wireless	
Jan 2 10:58:18	AP One 300M: Client 54:EA:A8:2D:A0:D5 disassociated from Marketing_11a	
Jan 2 10:58:03	Office InWall: Client 10:BF:48:E9:76:C7 associated with Wireless	
Jan 2 10:57:47	AP One 300M: Client 54:EA:A8:2D:A0:D5 associated with Marketing_11a	
Jan 2 10:57:19	AP One 300M: Client 54:EA:A8:2D:A0:D5 disassociated from Marketing_11a	
Jan 2 10:57:09	AP One 300M: Client 54:EA:A8:2D:A0:D5 associated with Marketing_11a	
Jan 2 10:56:48	AP One 300M: Client 54:EA:A8:2D:A0:D5 disassociated from Marketing_11a	
Jan 2 10:56:39	AP One 300M: Client 54:EA:A8:2D:A0:D5 associated with Marketing_11a	
Jan 2 10:56:19	AP One 300M: Client 00:26:BB:05:84:A4 associated with Marketing_11a	
Jan 2 10:56:09	AP One 300M: Client 9C:04:EB:10:39:4C associated with Marketing_11a	
Jan 2 10:55:42	AP One 300M: Client 54:EA:A8:2D:A0:D5 disassociated from Marketing_11a	
Jan 2 10:55:29	AP One 300M: Client 54:EA:A8:2D:A0:D5 associated with Marketing_11a	
		More...

Events

This event log displays all activity on your AP network, down to the client level. Click **View Alerts** to see only alerts, and click the **More...** link for additional records.