

Branch Office Side:

Setup details: the same operation as done in Head Office side

Item	Function		Description
1	Connection Name	B-to-H	Give a name for IPSec connection
2	Local Network		Branch Office network
	Subnet		
	IP Address	192.168.0.0	
	Netmask	255.255.255.0	
3	Remote Secure Gateway Address(Hostanme)	69.121.1.3	IP address of the Head office router (on WAN side)
4	Remote Network		Head office network
	Subnet		
	IP Address	192.168.1.0	
	Netmask	255.255.255.0	
5	Proposal		Security Plan
	Method	ESP	
	Authentication	MD5	
	Encryption	3DES	
	Prefer Forward Security	MODP 1024(group2)	
	Pre-shared Key	123456	

VPN

IPSec

IPSec Settings

L2TP over IPSec Enable

Connection Name: B-to-H WAN Interface: Default IP Version: IPv4

Local Network: Subnet IP Address: 192.168.0.0 Netmask: 255.255.255.0

Remote Security Gateway: 69.121.1.3 Anonymous

Remote Network: Subnet IP Address: 192.168.1.0 Netmask: 255.255.255.0

Key Exchange Method: IKE IPsec Protocol: ESP

Pre-Shared Key: 123456

Local ID Type: Default ID Content: Remote ID Type: Default ID Content:

Phase 1

Mode: Main

Encryption Algorithm: 3DES Integrity Algorithm: MD5

DH Group: MODP1024(DH2) SA Lifetime: 480 Minute(s) [60-1440]

Phase 2

Encryption Algorithm: 3DES Integrity Algorithm: MD5

DH Group: None IPsec Lifetime: 60 Minute(s) [60-1440]

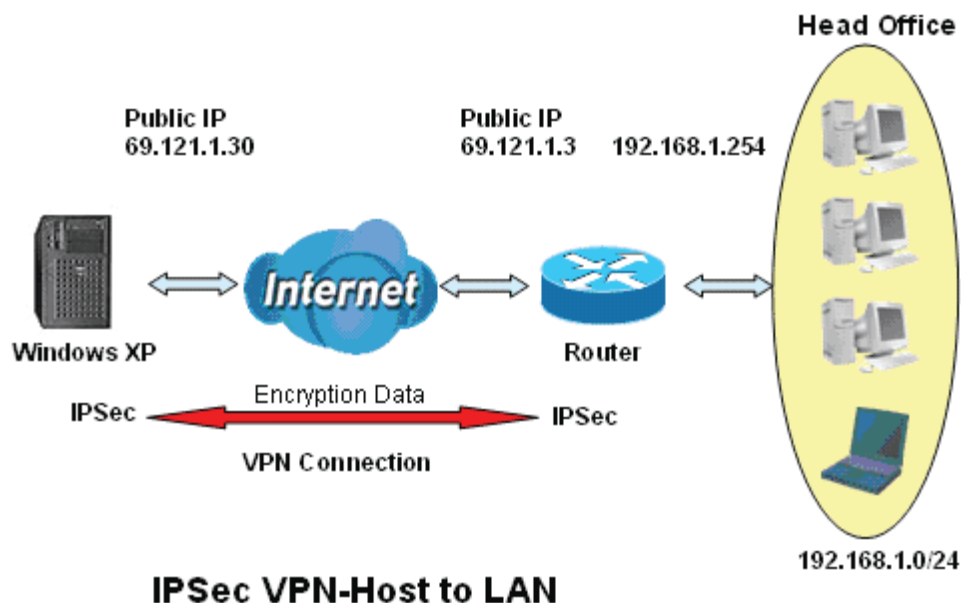
Keep Alive: DPD

Detection Interval: 180 Second(s) [180-86400] Idle Timeout: 5 Consecutive times [5-99]

MTU: 1500 (0 : Default)

1. Host to LAN

Router servers as VPN server, and host should install the IPSec client to connect to head office through IPSec VPN.



Item	Function		Description
1	Connection Name	Headoffice-to-Host	Give a name for IPSec connection
2	Local Network		
	Subnet		Select Subnet
	IP Address	192.168.1.0	Head Office network
	Netmask	255.255.255.0	
3	Remote Secure Gateway (Hostanme)	69.121.1.30	IP address of the Branch office router (on WAN side)
4	Remote Network		
	Single Address	69.121.1.30	Host
5	Proposal		
	Method	ESP	Security Plan
	Authentication	MD5	
	Encryption	3DES	
	Prefer Forward Security	MODP 1024(group2)	
	Pre-shared Key	123456	



▼ IPsec

IPsec Settings

L2TP over IPsec	<input type="checkbox"/> Enable		
Connection Name	Headoffice-to-H	WAN Interface	Default
Local Network	Subnet	IP Address	192.168.1.0
Remote Security Gateway	69.121.1.30	<input type="checkbox"/> Anonymous	
Remote Network	Single Address	IP Address	69.121.1.30
Key Exchange Method	IKE	IPsec Protocol	ESP
Pre-Shared Key	123456		
Local ID Type	Default	ID Content	
Remote ID Type	Default	ID Content	

Phase 1

Mode	Main
Encryption Algorithm	3DES
Integrity Algorithm	MD5
DH Group	MODP1024(DH2)
SA Lifetime	480 Minute(s) [60-1440]

Phase 2

Encryption Algorithm	3DES
Integrity Algorithm	MD5
DH Group	None
IPsec Lifetime	60 Minute(s) [60-1440]
Keep Alive	DPD
Detection Interval	180 Second(s) [180-86400]
Idle Timeout	5 Consecutive times [5-99]
MTU	1500 (0 : Default)

VPN Account

PPTP L2TP and OpenVPN server share the same account database set in VPN Account page.

Parameters			
Name	<input type="text"/>	Tunnel	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
Username	<input type="text"/>	Password	<input type="text"/>
Connection Type	<input checked="" type="radio"/> Remote Access <input type="radio"/> LAN to LAN		
Peer Network IP	<input type="text"/>	Peer Netmask	<input type="text"/>

Name: A user-defined name for the connection.

Tunnel: Select **Enable** to activate the account. PPTP(L2TP/OpenVPN) server is waiting for the client to connect to this account.

Username: Please input the username for this account.

Password: Please input the password for this account.

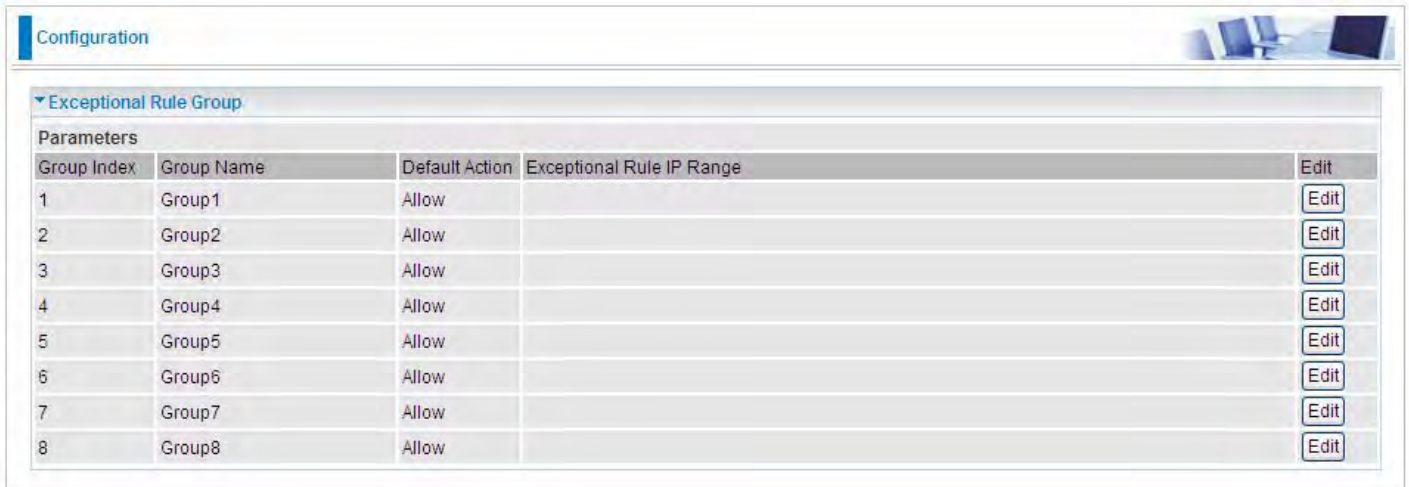
Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Peer Network IP: Please input the subnet IP for remote network.

Peer Netmask: Please input the Netmask for remote network.

Exceptional Rule Group

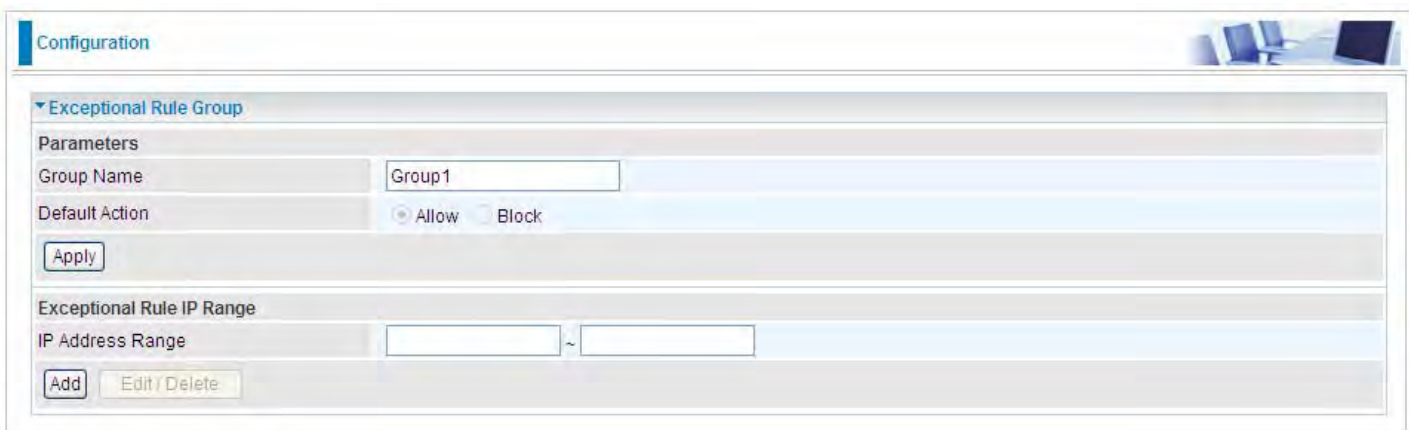
Exceptional Rule is dedicated to giving or blocking PPTP/L2TP server access to some specific IP or IPs(range). Users are allowed to set 8 different exceptional rule groups at most. In each group, user can add specific IP or IP range.



The screenshot shows the 'Configuration' page with a section for 'Exceptional Rule Group'. It contains a table with 8 rows, each representing a group. The columns are 'Group Index', 'Group Name', 'Default Action', 'Exceptional Rule IP Range', and 'Edit'. Each row has an 'Edit' button in the 'Edit' column.

Group Index	Group Name	Default Action	Exceptional Rule IP Range	Edit
1	Group1	Allow		Edit
2	Group2	Allow		Edit
3	Group3	Allow		Edit
4	Group4	Allow		Edit
5	Group5	Allow		Edit
6	Group6	Allow		Edit
7	Group7	Allow		Edit
8	Group8	Allow		Edit

Press **Edit** to set the exceptional IP (IP Range).



The screenshot shows the 'Configuration' page with the 'Exceptional Rule Group' section expanded. It displays the 'Parameters' section with a 'Group Name' field containing 'Group1' and a 'Default Action' section with radio buttons for 'Allow' (selected) and 'Block'. Below this is an 'Apply' button. The 'Exceptional Rule IP Range' section has an 'IP Address Range' field with two input boxes separated by a tilde (~) and an 'Add' button. There is also an 'Edit / Delete' button.

Default Action: Please first set the range to make “**Default Action**” setting available. Set “Allow” to ban the listed IP or IPs to access the PPTP and L2TP server.

Check “Block” to grant access to the listed IP or IPs to the PPTP and L2TP server.


Apply: Press **Apply** button to apply the change.

Exceptional Rule Range

IP Address Range: Specify the IP address range; IPv4 address range can be supported.

Click **Add** to add the IP Range.

For instance, if user wants to block IP range of 172.16.1.102-172.16.1.106 from accessing your PPTP and L2TP server, you can add this IP range and valid it.

Configuration 

▼ Exceptional Rule Group

Parameters

Group Name

Default Action Allow Block

Exceptional Rule IP Range

IP Address Range ~

Edit	Action	IP Address Range	Delete
<input type="radio"/>	Block	172.16.1.102 ~ 172.16.1.106	<input type="checkbox"/>
<input type="radio"/>	Block	172.16.1.108 ~ 172.16.1.108	<input type="checkbox"/>

PPTP

The **Point-to-Point Tunneling Protocol (PPTP)** is a Layer2 tunneling protocol for implementing virtual private networks through IP network. PPTP uses an enhanced GRE (Generic Routing Encapsulation) mechanism to provide a flow- and congestion-controlled encapsulated datagram service for carrying PPP packets.

In the Microsoft implementation, the tunneled PPP traffic can be authenticated with PAP, CHAP, Microsoft CHAP V1/V2 or EAP-TLS. The PPP payload is encrypted using Microsoft Point-to-Point Encryption (MPPE) when using MSCHAPv1/v2 or EAP-TLS.

Note: 4 sessions for Client and 4 sessions for Server respectively.

PPTP Server

In PPTP session, users can set the basic parameters(authentication, encryption, peer address, etc) for PPTP Server, and accounts in the next page of PPTP Account. They both constitutes the PPTP Server setting.

Parameters	
PPTP Function	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
WAN Interface	Default
Auth. Type	Pap or Chap
Encryption Key Length	Auto
Peer Encryption Mode	Only Stateless
IP Addresses Assigned to Peer	start from : 192.168.1.0
Idle Timeout	0 [0-120] Minute(s)
Exceptional Rule Group	None

Apply Cancel

PPTP Function: Select **Enable** to activate PPTP Server. **Disable** to deactivate PPTP Server function.

WAN Interface: Select the exact WAN interface configured for the tunnel. Select **Default** to use the now-working WAN interface for the tunnel.

Auth. Type: The authentication type, Pap or Chap, PaP, Chap and MS-CHAPv2. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client. When passed the authentication with MS-CHAPv2, the MPPE encryption is supported.

Encryption Key Length: The data can be encrypted by MPPE algorithm with 40 bits or 128 bits. Default is Auto, it is negotiated when establishing a connection. 128 bit keys provide stronger encryption than 40 bit keys.

Peer Encryption Mode: You may select "Only Stateless" or "Allow Stateless and Stateful" mode. The key will be changed every packet when you select Stateless mode.

IP Addresses Assigned to Peer: 192.168.1.x: please input the IP assigned range from 1~ 254.

Idle Timeout: Specify the time for remote peer to be disconnected without any activities, from 0~120

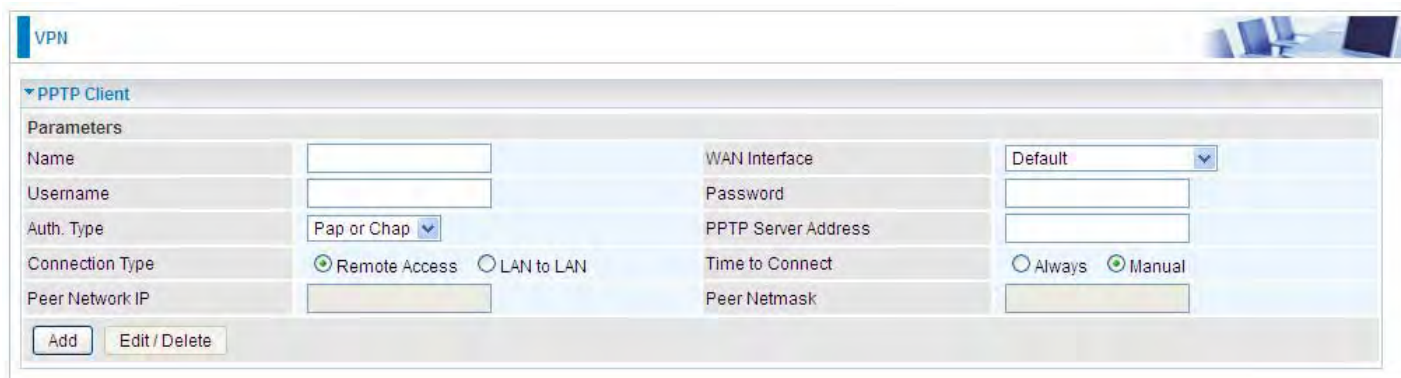
minutes.

Exceptional Rule Group: Select to grant or block access to a group of IPs to the PPTP server. See [Exceptional Rule Group](#). If there is not any restriction, select none.

Click **Apply** to submit your PPTP Server basic settings.

PPTP Client

PPTP client can help you dial-in the PPTP server to establish PPTP tunnel over Internet.



The screenshot shows a web-based configuration interface for a VPN. At the top left, there is a 'VPN' tab. Below it, a section titled 'PPTP Client' is expanded. Underneath, a 'Parameters' section contains a grid of input fields and controls. The fields include: 'Name' (text input), 'WAN Interface' (dropdown menu set to 'Default'), 'Username' (text input), 'Password' (text input), 'Auth. Type' (dropdown menu set to 'Pap or Chap'), 'PPTP Server Address' (text input), 'Connection Type' (radio buttons for 'Remote Access' (selected) and 'LAN to LAN'), 'Time to Connect' (radio buttons for 'Always' and 'Manual' (selected)), and 'Peer Network IP' (text input). Below the grid are two buttons: 'Add' and 'Edit / Delete'.

Name: user-defined name for identification.

WAN Interface: Select the exact WAN interface configured for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Username: Enter the username provided by your VPN Server.

Password: Enter the password provided by your VPN Server.

Auth. Type: Default is Auto if you want the router to determine the authentication type to use, or else manually specify CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol) if you know which type the server is using (when acting as a client), or else the authentication type you want clients connecting to you to use (when acting as a server). When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

PPTP Server Address: Enter the IP address of the PPTP server.

Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Time to Connect: Select Always to keep the connection always on, or Manual to connect manually any time.

Peer Network IP: Please input the subnet IP for Server peer.

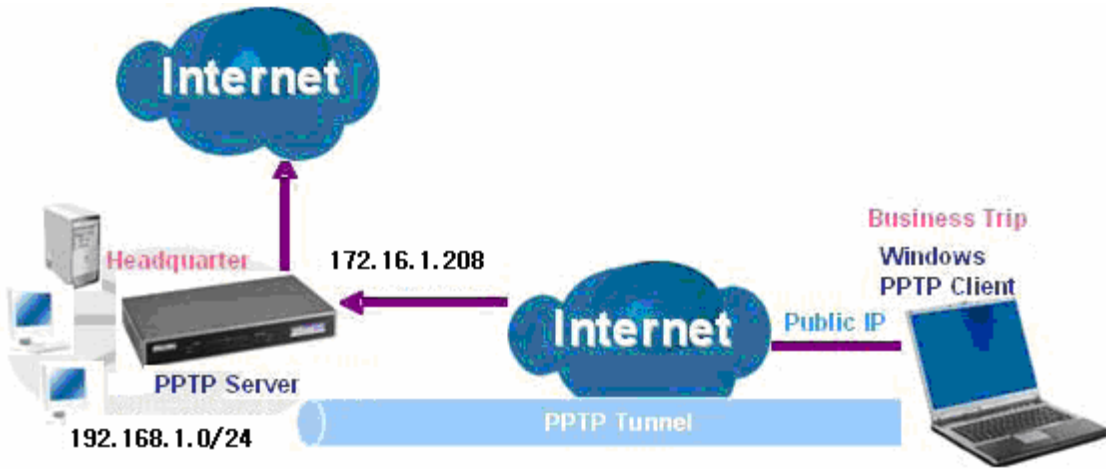
Peer Netmask: Please input the Netmask for server peer.

Click **Add** button to save your changes.

Example: PPTP Remote Access with Windows series

(Note: 1. inside test with 172.16.1.208, just an example for illustration

2. Here is a configuration example on Windows 7; Windows series including Windows 10/ 8/ 7 vista/ also supports the application with similar steps.)



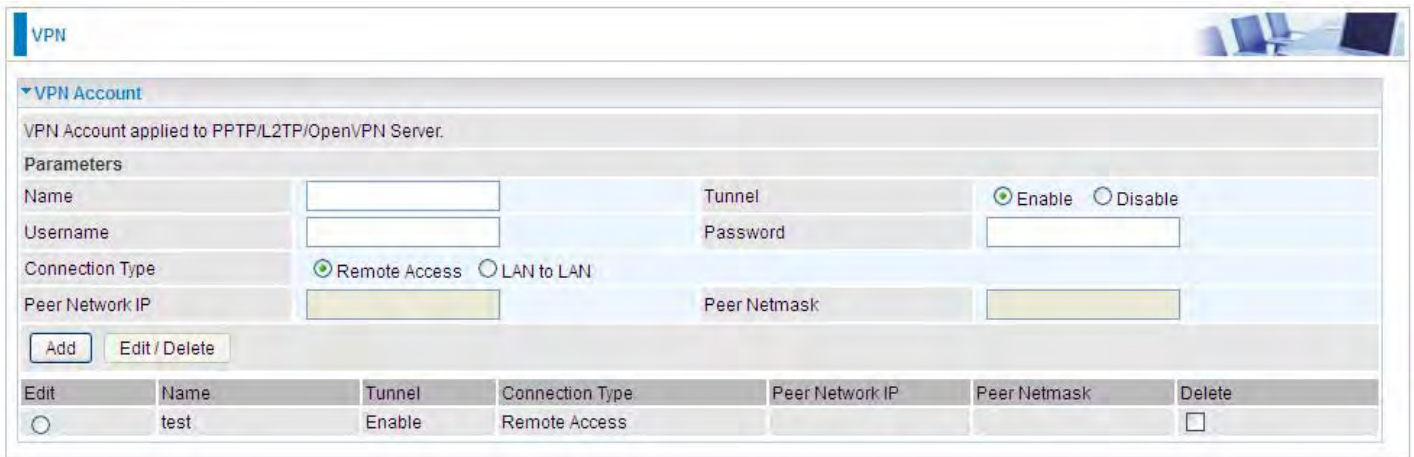
Server Side:

1. **Configuration > VPN > PPTP** and Enable the PPTP function, Click **Apply**.

The screenshot shows the 'VPN' configuration page for a 'PPTP Server'. The 'PPTP Function' is enabled. The 'WAN Interface' is set to 'Default', 'Auth. Type' is 'MS-CHAPv2', 'Encryption Key Length' is 'Auto', and 'Peer Encryption Mode' is 'Only Stateless'. The 'IP Addresses Assigned to Peer' is set to 'start from : 192.168.1.00'. The 'Idle Timeout' is set to '10' minutes. The 'Exceptional Rule Group' is set to 'None'. There are 'Apply' and 'Cancel' buttons at the bottom.

Parameter	Value
PPTP Function	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
WAN Interface	Default
Auth. Type	MS-CHAPv2
Encryption Key Length	Auto
Peer Encryption Mode	Only Stateless
IP Addresses Assigned to Peer	start from : 192.168.1.00
Idle Timeout	10 [0-120] Minute(s)
Exceptional Rule Group	None

2. Create a PPTP Account “test”.



The screenshot shows a VPN configuration window with the following fields and options:

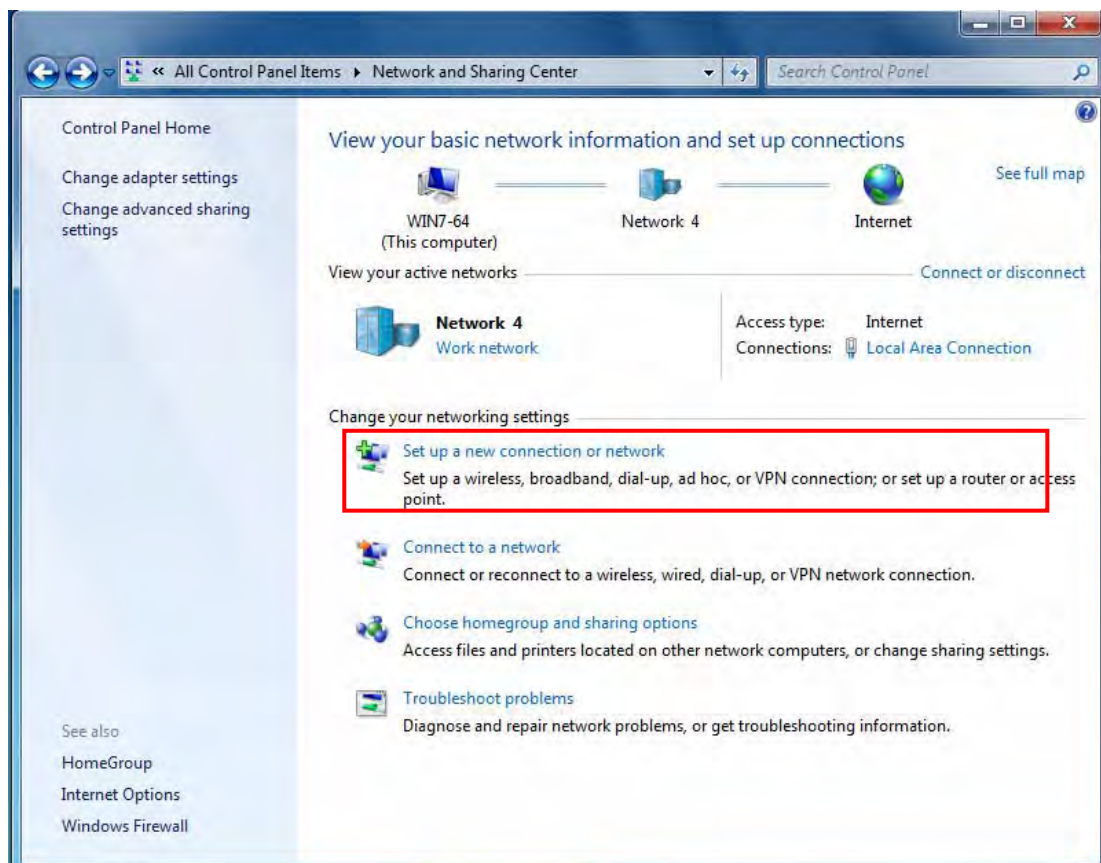
- VPN Account:** VPN Account applied to PPTP/L2TP/OpenVPN Server.
- Parameters:**
 - Name: [Empty text box]
 - Tunnel: Enable Disable
 - Username: [Empty text box]
 - Password: [Empty text box]
 - Connection Type: Remote Access LAN to LAN
 - Peer Network IP: [Empty text box]
 - Peer Netmask: [Empty text box]
- Buttons:** Add, Edit / Delete
- Table:**

Edit	Name	Tunnel	Connection Type	Peer Network IP	Peer Netmask	Delete
<input type="radio"/>	test	Enable	Remote Access			<input type="checkbox"/>

Client Side: Windows series

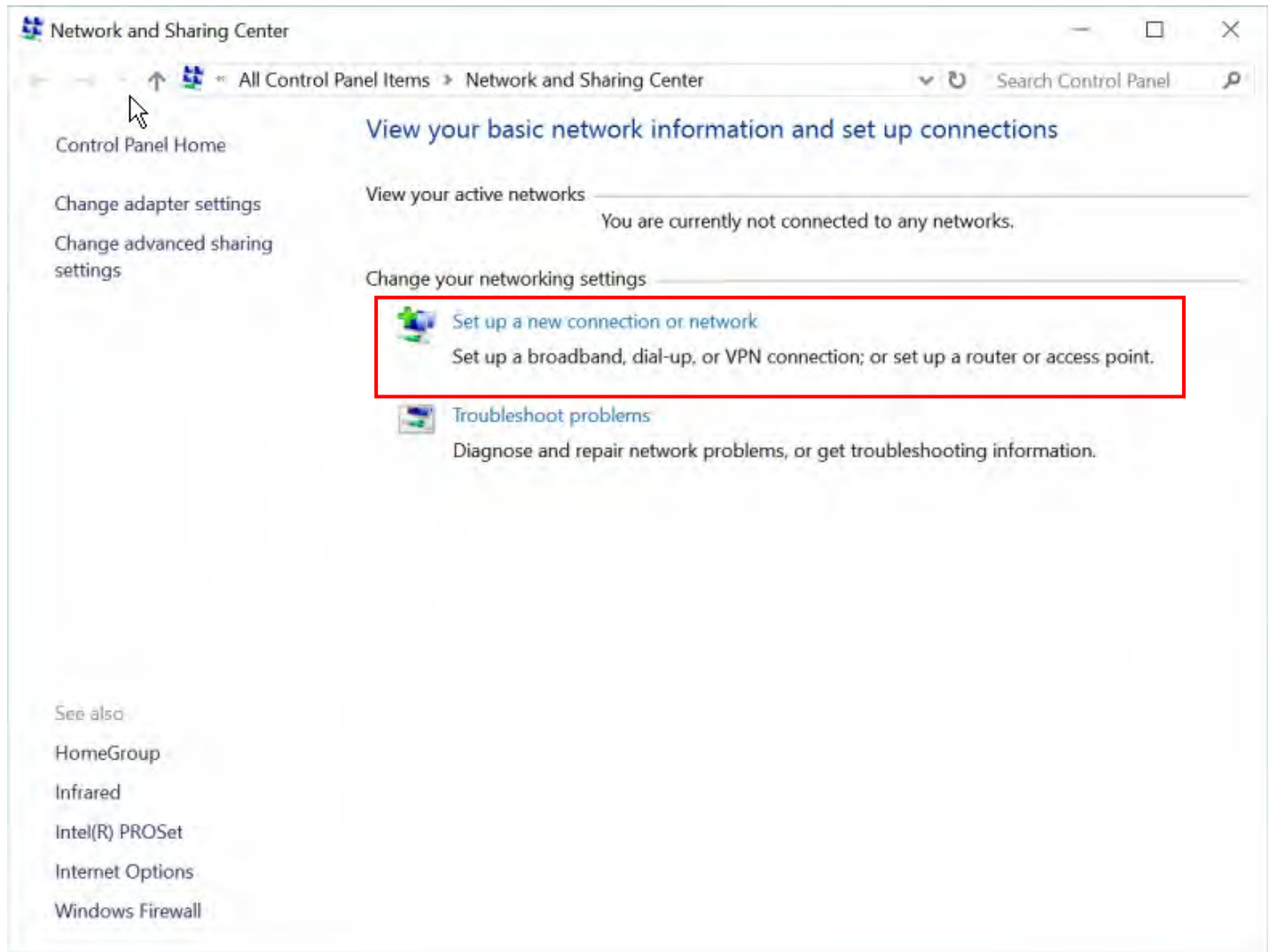
Note: Here is a configuration example on Windows 7; Windows series including Windows 10/ vista/ 8/ 7 also supports the application with similar steps.

1. In Windows7, click **Start > Control Panel> Network and Sharing Center**, Click **Set up a new connection network**.



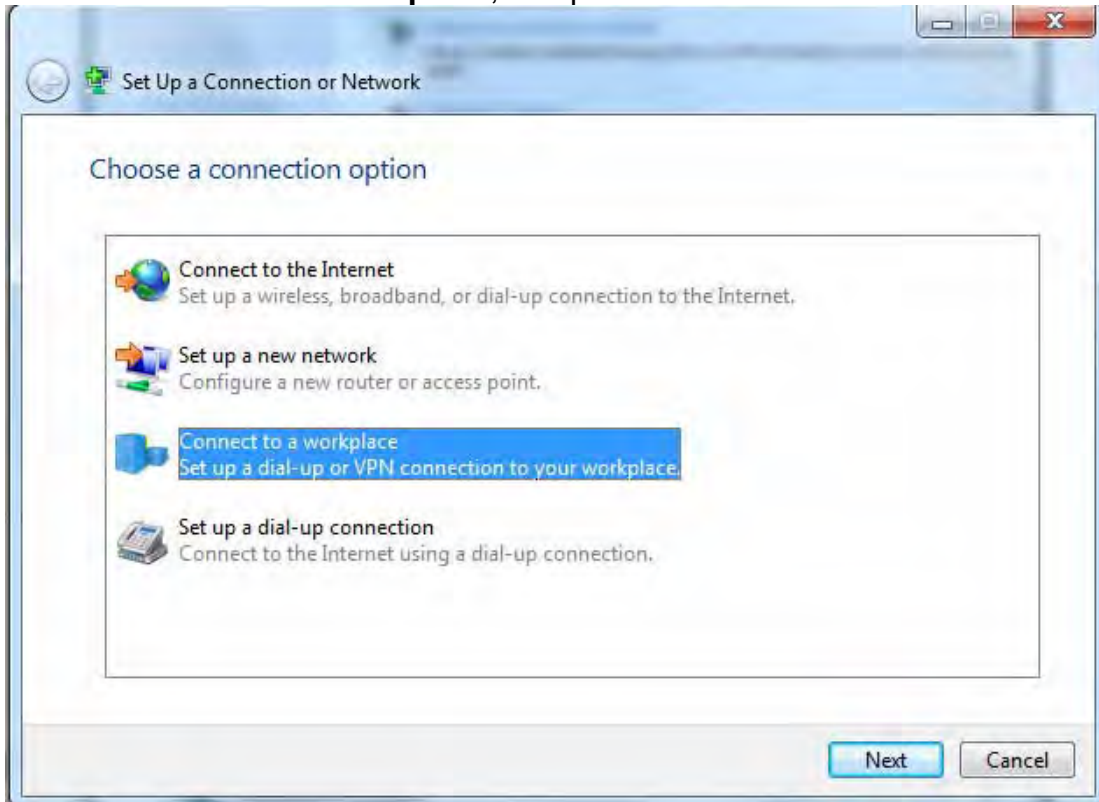
(Windows 7)

For Windows 10, Users can click **Start > Settings**; or right click the mouse when it points at Windows ICON (**Start**), then click **Control Panel > Network and Sharing Center**, then **Set up a new connection network**.



(Windows 10)

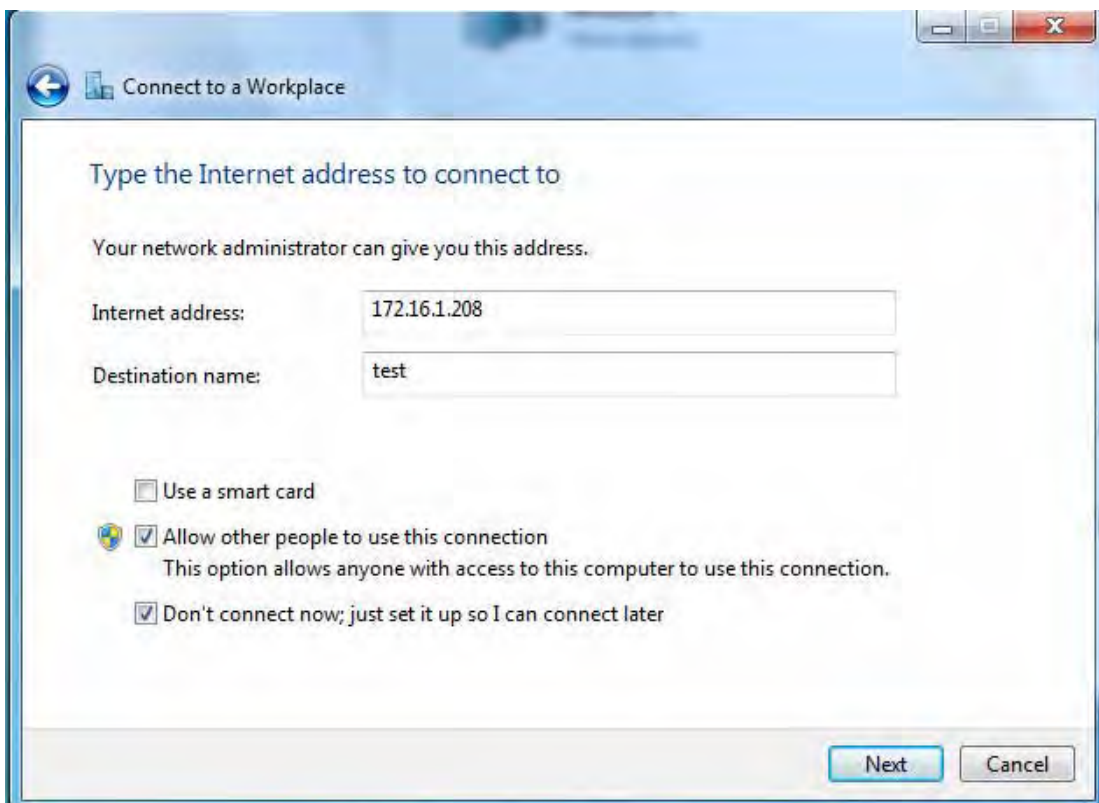
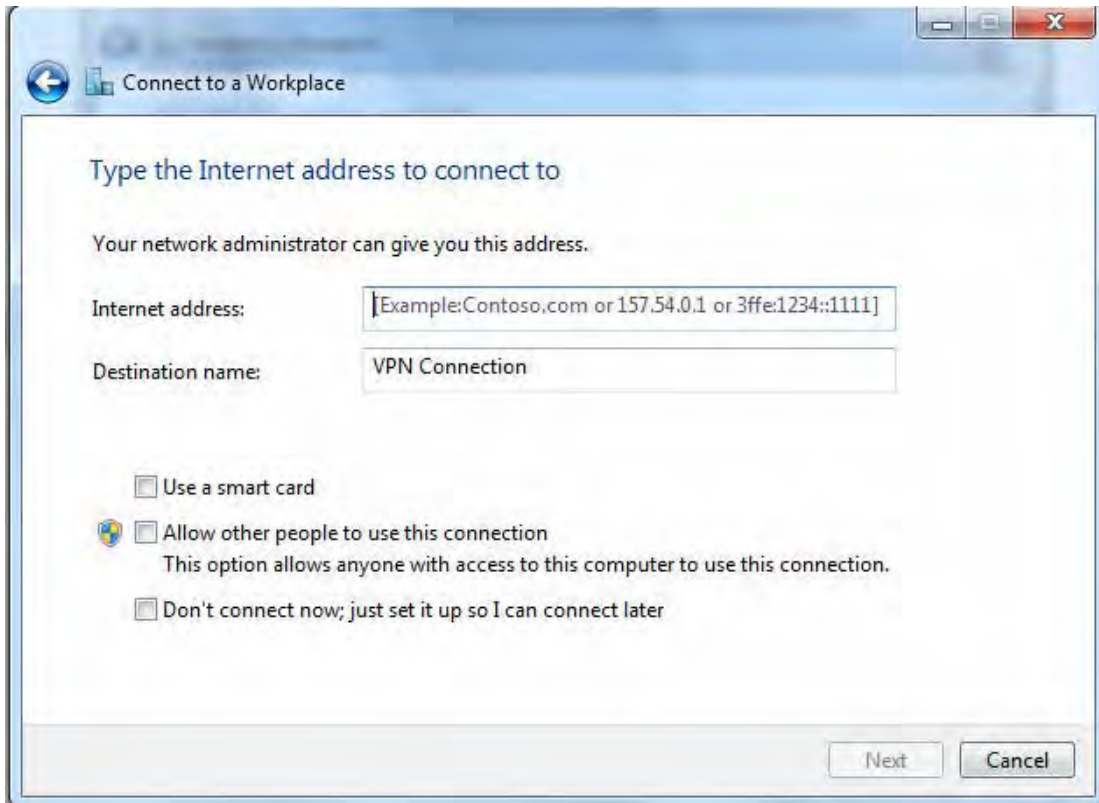
2. Click **Connect to a workplace**, and press **Next**.



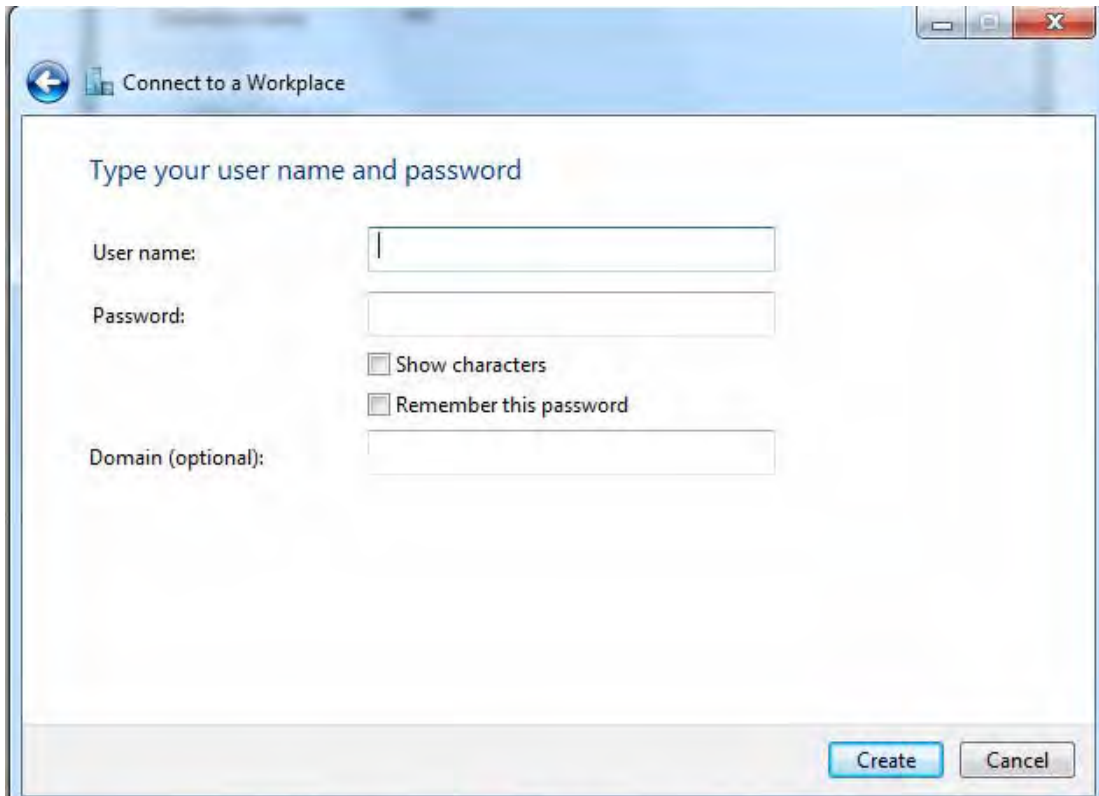
3. Select **Use my Internet connection (VPN)** and press **Next**.



4. Input **Internet address** and **Destination name** for this connection and press **Next**.



5. Input the account (**user name** and **password**) and press **Create**.

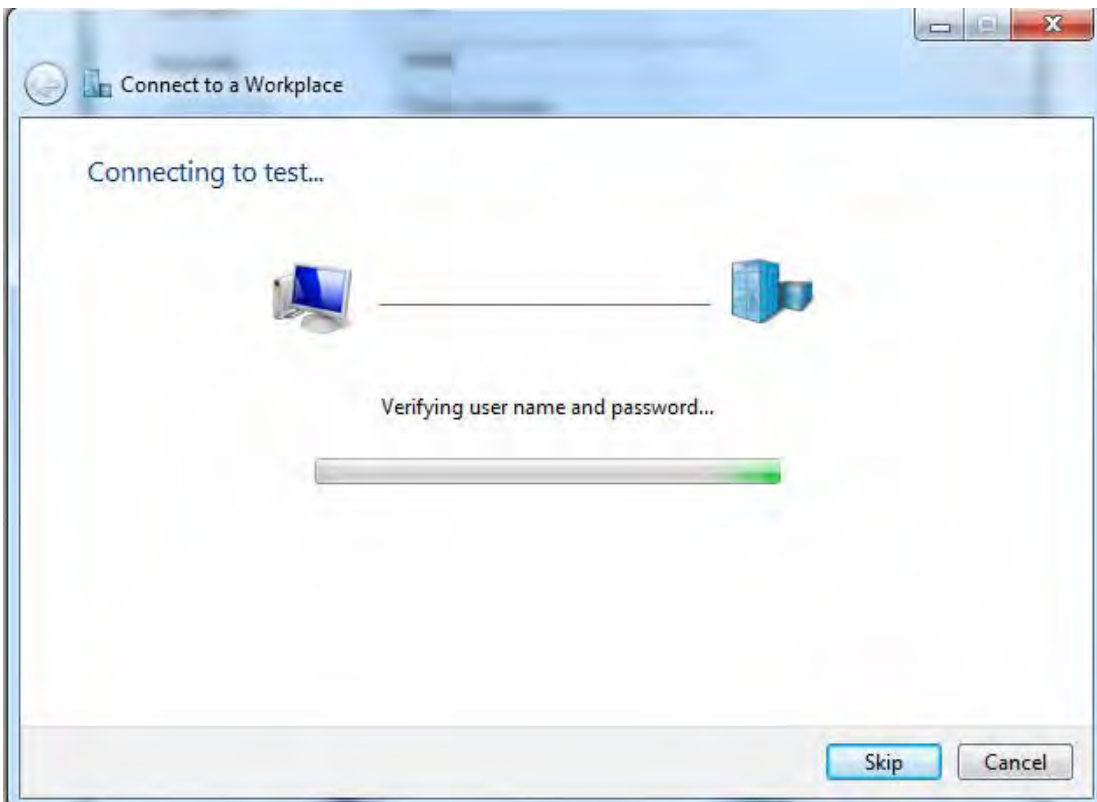
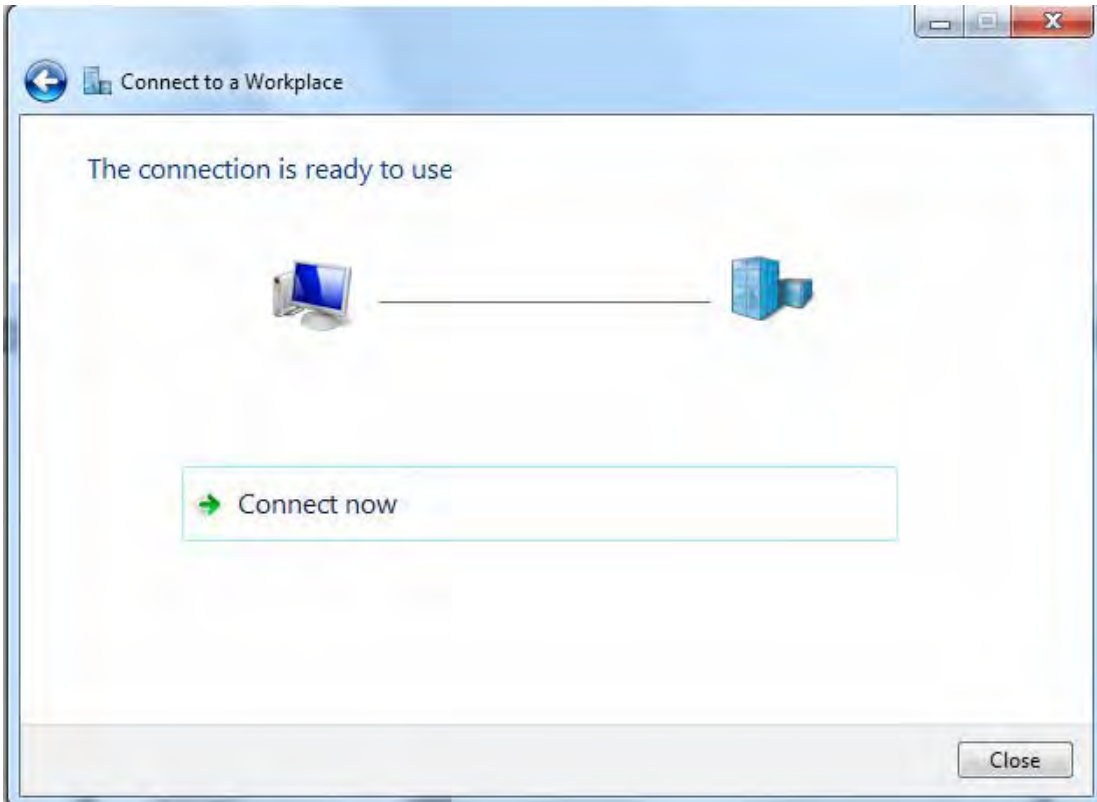


The screenshot shows a Windows-style dialog box titled "Connect to a Workplace". The main heading is "Type your user name and password". There are four input fields: "User name:" (empty), "Password:" (empty), "Domain (optional):" (empty), and a "Show characters" checkbox (unchecked). Below the password field is a "Remember this password" checkbox (unchecked). At the bottom right, there are two buttons: "Create" and "Cancel".

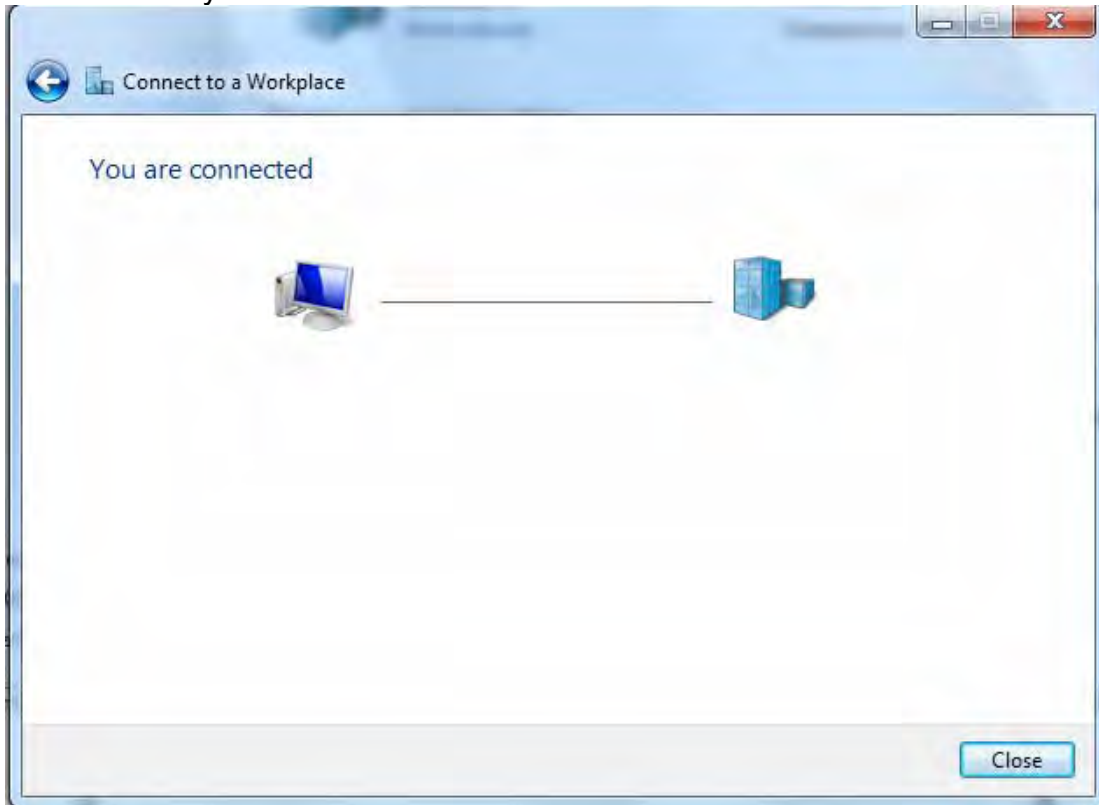


The screenshot shows the same "Connect to a Workplace" dialog box. The "User name:" field now contains the text "test". The "Password:" field contains four black dots, indicating a masked password. The "Domain (optional):" field remains empty. The "Show characters" and "Remember this password" checkboxes are still unchecked. The "Create" and "Cancel" buttons are visible at the bottom right.

6. Connect to the server.

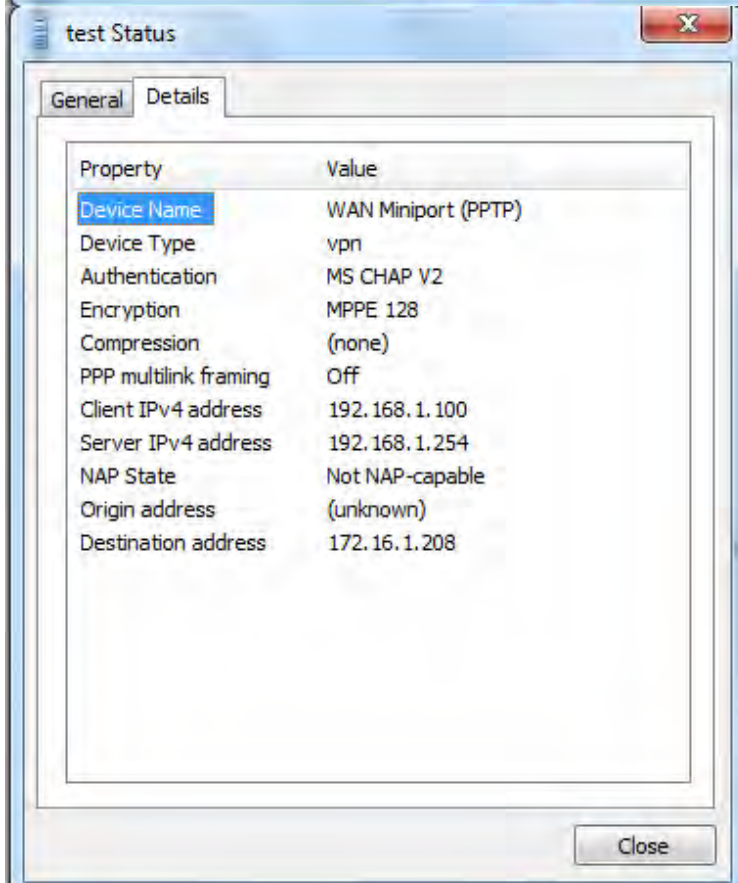
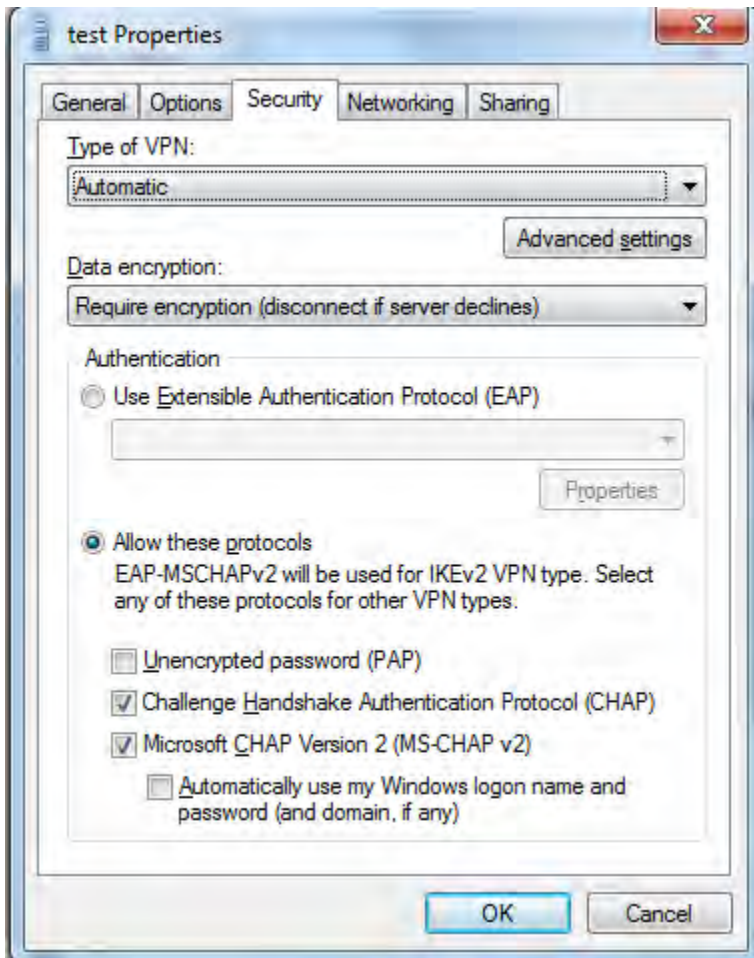


7. Successfully connected.



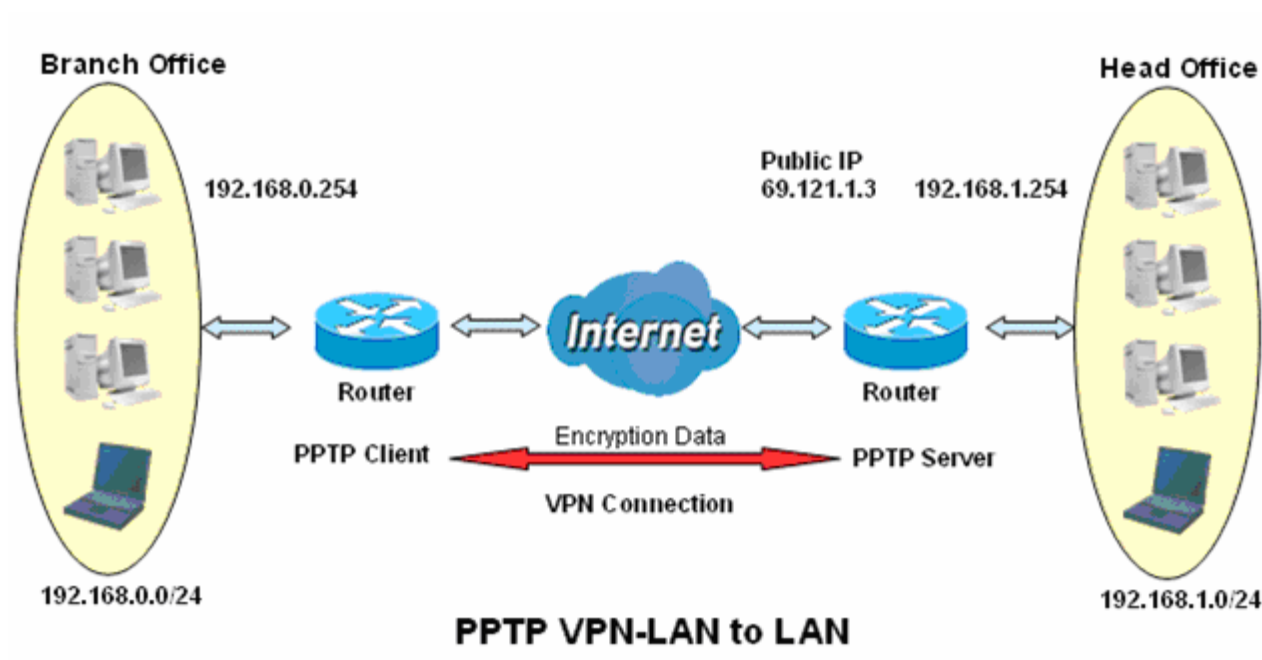
PS: You can also go to **Network Connections** shown below to check the detail of the connection. Right click "test" icon, and select "Properties" to change the security parameters (if the connection fails, users can go here to change the settings)





Example: Configuring a LAN-to-LAN PPTP VPN Connection

The branch office establishes a PPTP VPN tunnel with head office to connect two private networks over the Internet. The routers are installed in the head office and branch offices accordingly.



Server side: Head Office

The screenshot shows the configuration interface for the PPTP Server. The **VPN** section is expanded to show **PPTP Server** parameters. The settings are as follows:

- PPTP Function:** Enable Disable
- WAN Interface:** Default
- Auth. Type:** MS-CHAPv2
- Encryption Key Length:** Auto
- Peer Encryption Mode:** Only Stateless
- IP Addresses Assigned to Peer:** start from : 192.168.1.00
- Idle Timeout:** 10 [0-120] Minute(s)
- Exceptional Rule Group:** None

Buttons for **Apply** and **Cancel** are visible at the bottom of the configuration panel.

The above is the common setting for PPTP Server, set as you like for authentication and encryption. The settings in Client side should be in accordance with settings in Server side.

Then the PPTP Account.

VPN Account applied to PPTP/L2TP/OpenVPN Server.

Parameters

Name: HO Tunnel: Enable Disable

Username: test Password:

Connection Type: Remote Access LAN to LAN

Peer Network IP: 192.168.0.0 Peer Netmask: 255.255.255.0

Buttons: Add, Edit / Delete

Edit	Name	Tunnel	Connection Type	Peer Network IP	Peer Netmask	Delete
<input checked="" type="radio"/>	HO	Enable	LAN to LAN	192.168.0.0	255.255.255.0	<input type="checkbox"/>

Client Side: Branch Office

The client user can set up a tunnel connecting to the PPTP server, and can also set the tunnel as the default route for all outgoing traffic.

Parameters

Name: BO WAN Interface: Default

Username: test Password:

Auth. Type: MS-CHAPv2 PPTP Server Address: 69.121.1.3

Connection Type: Remote Access LAN to LAN Time to Connect: Always Manual

Peer Network IP: 192.168.1.0 Peer Netmask: 255.255.255.0

Buttons: Add, Edit / Delete

Edit	Enable	Default Gateway	Name	Time to Connect	PPTP Server Address	Connection Type	Peer Network IP	Peer Netmask	Delete
<input checked="" type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BO	Manual	69.121.1.3	LAN to LAN	192.168.1.0	255.255.255.0	<input type="checkbox"/>

Note: users can see the “Default Gateway” item in the bar, and user can check to select the tunnel as the default gateway (default route) for traffic. If selected, all outgoing traffic will be forwarded to this tunnel and routed to the next hop.

L2TP

The **Layer 2 Tunneling Protocol (L2TP)** is a Layer2 tunneling protocol for implementing virtual private networks.

L2TP does not provide confidentiality or strong authentication by itself. IPsec is often used to secure L2TP packets by providing confidentiality, authentication and integrity. The combination of these two protocols is generally known as L2TP/IPsec.

In L2TP section, both pure L2TP and L2TP/IPSec are supported. Users can choose your preferable option for your own needs.

Note: 4 sessions for Client and only one for Server respectively.

L2TP Server

In L2TP session, users can set the basic parameters(authentication, encryption, peer address, etc) for L2TP Server, and accounts in the page of VPN Account. They both constitutes the complete L2TP Server settings.

The screenshot shows the configuration page for the L2TP Server. The 'L2TP' checkbox is checked, indicating it is enabled. The 'WAN Interface' is set to 'Default or IPsec Tunnel'. The 'Auth. Type' is set to 'Pap or Chap'. The 'IP Addresses Assigned to Peer' field is set to 'start from : 192.168.1.0'. The 'Tunnel Authentication' checkbox is unchecked. The 'Secret', 'Remote Host Name', and 'Local Host Name' fields are empty. The 'Exceptional Rule Group' is set to 'None'. There are 'Apply' and 'Cancel' buttons at the bottom.

L2TP: Select **Enable** to activate L2TP Server. **Disable** to deactivate L2TP Server.

WAN Interface: Select the exact WAN interface configured as source for the tunnel. Select different interfaces, you will decide whether to use L2TP over IPsec or the pure L2TP.

- ① **L2TP over IPsec,** Select “Default or IPsec Tunnel” only when there is IPsec for L2TP rule in place.
- ① **Pure L2TP,** Select Default (there is no IPsec for L2TP in place) or other interface to activate the pure L2TP.

Auth. Type: The authentication type, Pap or Chap, PaP, Chap. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

IP Addresses Assigned to Peer: 192.168.1.x: please input the IP assigned range from 1~ 254.

Tunnel Authentication: Select whether to enable L2TP tunnel authentication. Enable it if needed

and set the same in the client side.

Secret: Enter the secretly pre-shared password for tunnel authentication.

Remote Host Name: Enter the remote host name (of peer) featuring the destination of the L2TP tunnel.

Local Host Name: Enter the local host name featuring the source of the L2TP tunnel.

Exceptional Rule Group: Select to grant or block access to a group of IPs to the L2TP server. See [Exceptional Rule Group](#). If there is not any restriction, select none.

Click **Apply** to submit your L2TP Server basic settings.

L2TP Client

L2TP client can help you dial-in the L2TP server to establish L2TP tunnel over Internet.

The screenshot shows the 'L2TP Client' configuration page. The 'L2TP over IPsec' checkbox is unchecked. The 'Connection Type' is set to 'Remote Access'. Other fields include Name, WAN Interface (Default), Username, Password, Auth. Type (Pap or Chap), L2TP Server Address, Peer Network IP, Peer Netmask, Tunnel Authentication, Remote Host Name, and Local Host Name. There are 'Add' and 'Edit / Delete' buttons at the bottom.

Name: user-defined name for identification.

L2TP over IPsec: If your L2TP server has used L2TP over IPsec feature, please enable this item. under this circumstance, client and server communicate using L2TP over IPsec.

① Enable

The screenshot shows the 'L2TP Client' configuration page with the 'L2TP over IPsec' checkbox checked. An 'IPSec Tunnel' dropdown menu is now visible, showing 'test2' and 'IPSec' options. The rest of the configuration fields and buttons are the same as in the previous screenshot.

IPsec Tunnel: Select the appropriate IPsec for L2TP rule configured for the L2TP Client.

Username: Enter the username provided by your L2TP Server.

Password: Enter the password provided by your L2TP Server.

Auth. Type: Default is Pap or CHap if you want the router to determine the authentication type to use, or else manually specify CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol) if you know which type the server is using. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

L2TP Server Address: Enter the IP address of the L2TP server.

Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Peer Network IP: Please input the subnet IP for Server.

Peer Netmask: Please input the Netmask for Server.

Tunnel Authentication: Select whether to enable L2TP tunnel authentication, if the server side enables this feature, please follow.

Secret: Enter the set secret password in the server side.

Remote Host Name: Enter the remote host name featuring the destination of the L2TP tunnel.

Local Host Name: Enter the local host name featuring the source of the L2TP tunnel.

Click **Add** button to save your changes.

❶ Disable

The screenshot displays the 'VPN' configuration page, specifically the 'L2TP Client' section. The 'Parameters' table is as follows:

Field	Value	Field	Value
Name	[Empty]	L2TP over IPsec	<input type="checkbox"/> Enable
WAN Interface	Default	Password	[Empty]
Username	[Empty]	L2TP Server Address	[Empty]
Auth. Type	Pap or Chap	Peer Network IP	[Empty]
Connection Type	<input checked="" type="radio"/> Remote Access <input type="radio"/> LAN to LAN	Peer Netmask	[Empty]
Peer Network IP	[Empty]	Secret	[Empty]
Tunnel Authentication	<input type="checkbox"/>	Local Host Name	[Empty]
Remote Host Name	[Empty]		

Buttons: Add, Edit / Delete

WAN Interface: Select the exact WAN interface configured for the tunnel. Select Default to use the now-working WAN interface for the tunnel. Under this circumstance, client and server communicate through pure L2TP server.

Username: Enter the username provided by your L2TP Server.

Password: Enter the password provided by your L2TP Server.

Auth. Type: Default is Pap or CHap if you want the router to determine the authentication type to use, or else manually specify CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol) if you know which type the server is using. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

L2TP Server Address: Enter the IP address of the L2TP server.

Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Peer Network IP: Please input the subnet IP for Server.

Peer Netmask: Please input the Netmask for server.

Tunnel Authentication: Select whether to enable L2TP tunnel authentication, if the server side enables this feature, please follow.

Secret: Enter the set secret password in the server side.

Remote Host Name: Enter the remote host name featuring the destination of the L2TP tunnel.

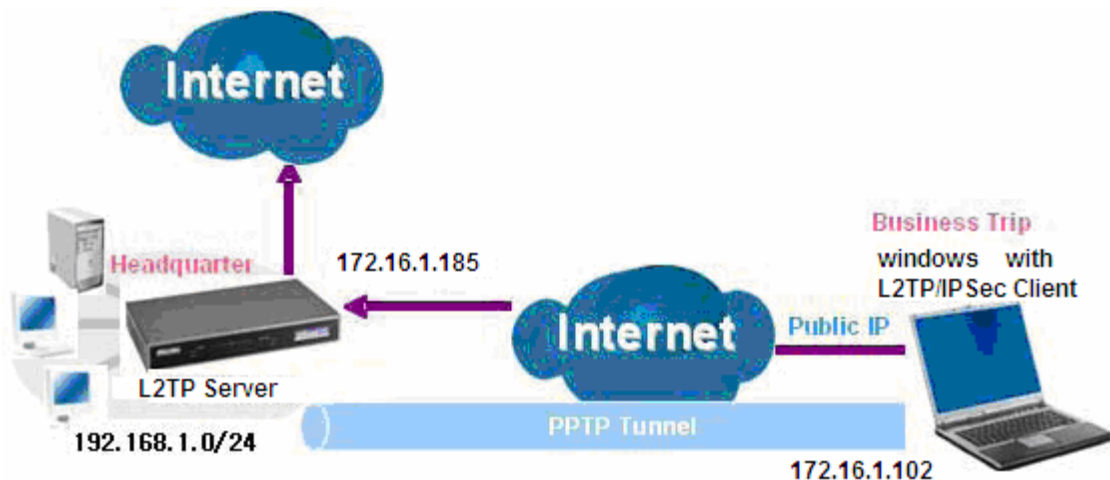
Local Host Name: Enter the local host name featuring the source of the L2TP tunnel.

Click **Add** button to save your changes.

Example: L2TP over IPSec Remote Access with Windows series

(Note: 1. inside test with 172.16.1.185, just an example for illustration

2. Here is a configuration example on Windows 7; Windows series including Windows 10/ 8/ 7 vista/ also supports the application with similar steps.)



Server Side:

1. **Configuration > VPN > L2TP** and Enable the L2TP function, Click **Apply**.

The screenshot shows the 'VPN' configuration page for the 'L2TP Server'. The 'L2TP' checkbox is checked and labeled 'Enable'. The 'WAN Interface' is set to 'Default or IPSec Tunnel'. The 'Auth. Type' is set to 'Chap'. The 'IP Addresses Assigned to Peer' field is set to 'start from : 192.168.1.10'. There are 'Apply' and 'Cancel' buttons at the bottom.

The IPSec for L2TP rule

The screenshot shows the 'VPN' configuration page for the 'IPSec' settings. The 'L2TP over IPSec' checkbox is checked and labeled 'Enable'. The 'Connection Name' is empty. The 'WAN Interface' is set to 'Default'. The 'IP Version' is set to 'IPv4'. The 'Remote Security Gateway' is set to 'Anonymous'. The 'Key Exchange Method' is set to 'IKE' and the 'IPsec Protocol' is set to 'ESP'. The 'Pre-Shared Key' is set to '123456'. There is an 'Apply' button at the bottom.

2. Create a L2TP Account “test1”.



VPN Account applied to PPTP/L2TP/OpenVPN Server.

Parameters

Name	test1	Tunnel	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
Username	test1	Password
Connection Type	<input checked="" type="radio"/> Remote Access <input type="radio"/> LAN to LAN		
Peer Network IP		Peer Netmask	

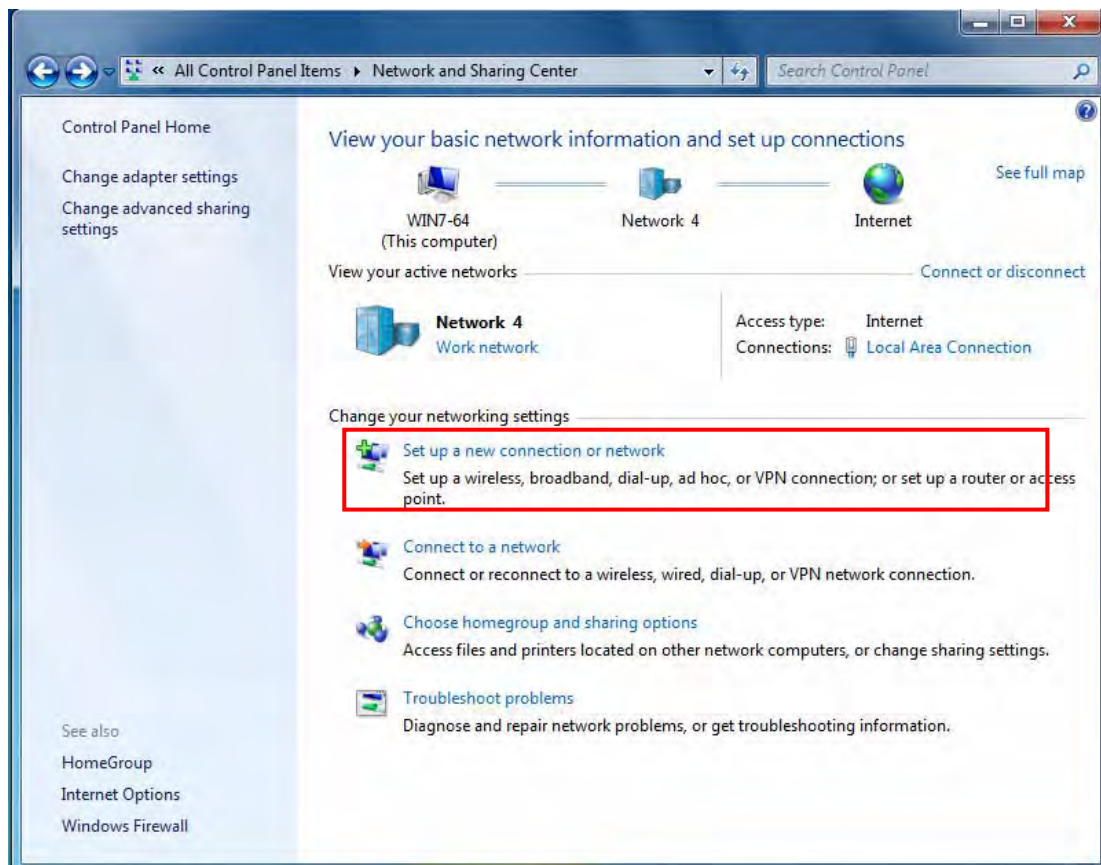
Add Edit / Delete

Edit	Name	Tunnel	Connection Type	Peer Network IP	Peer Netmask	Delete
<input checked="" type="checkbox"/>	test1	Enable	Remote Access			<input type="checkbox"/>

Client Side: Windows series

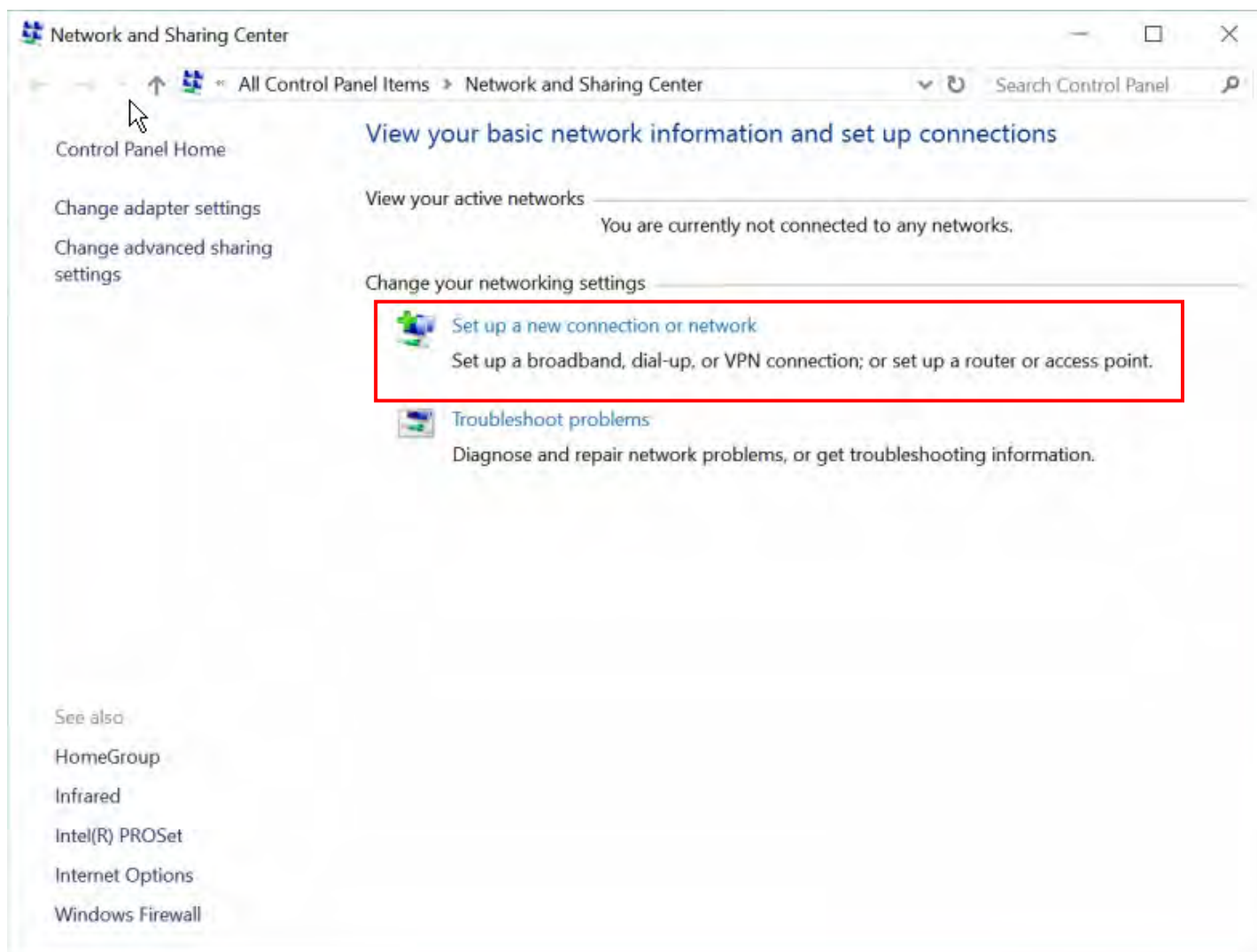
Note: Here is a configuration example on Windows 7; Windows series including Windows 10/ vista/ 8/ 7 also supports the application with similar steps.

1. In Windows7, click **Start > Control Panel> Network and Sharing Center**, Click **Set up a new connection network**.



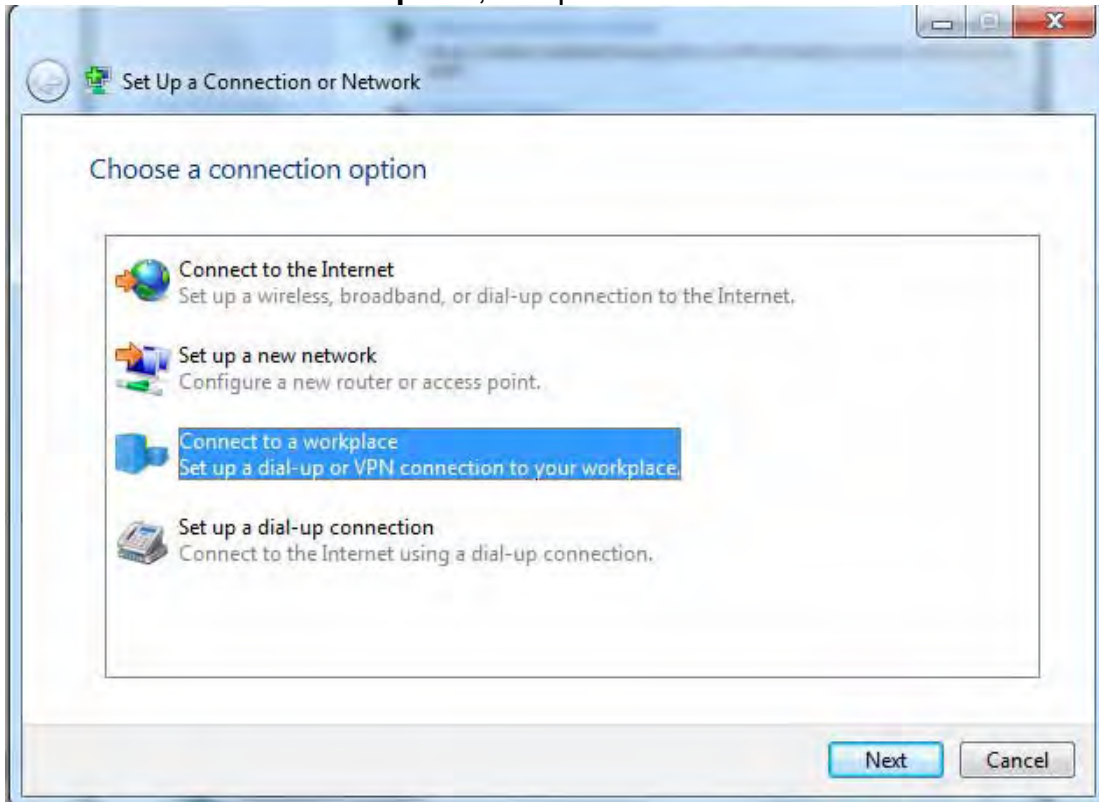
(Windows 7)

For Windows 10, Users can click **Start > Settings**; or right click the mouse when it points at Windows ICON (**Start**), then click **Control Panel > Network and Sharing Center**, then **Set up a new connection network**.

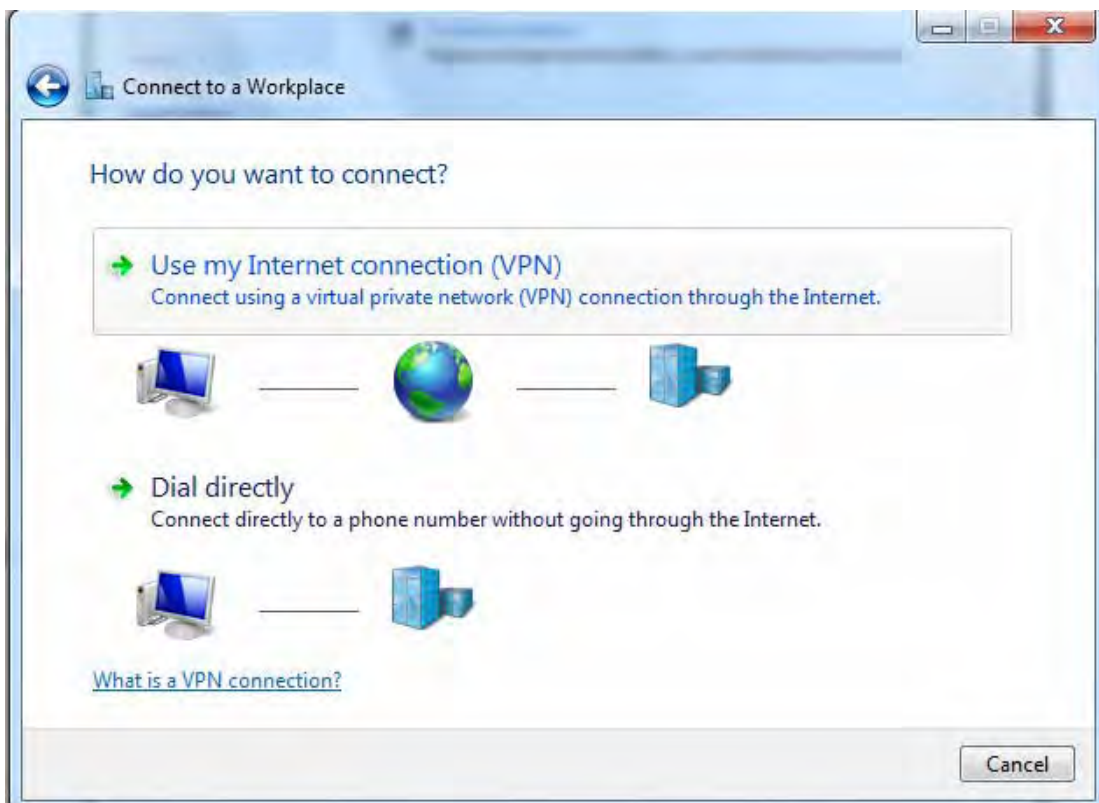


(Windows 10)

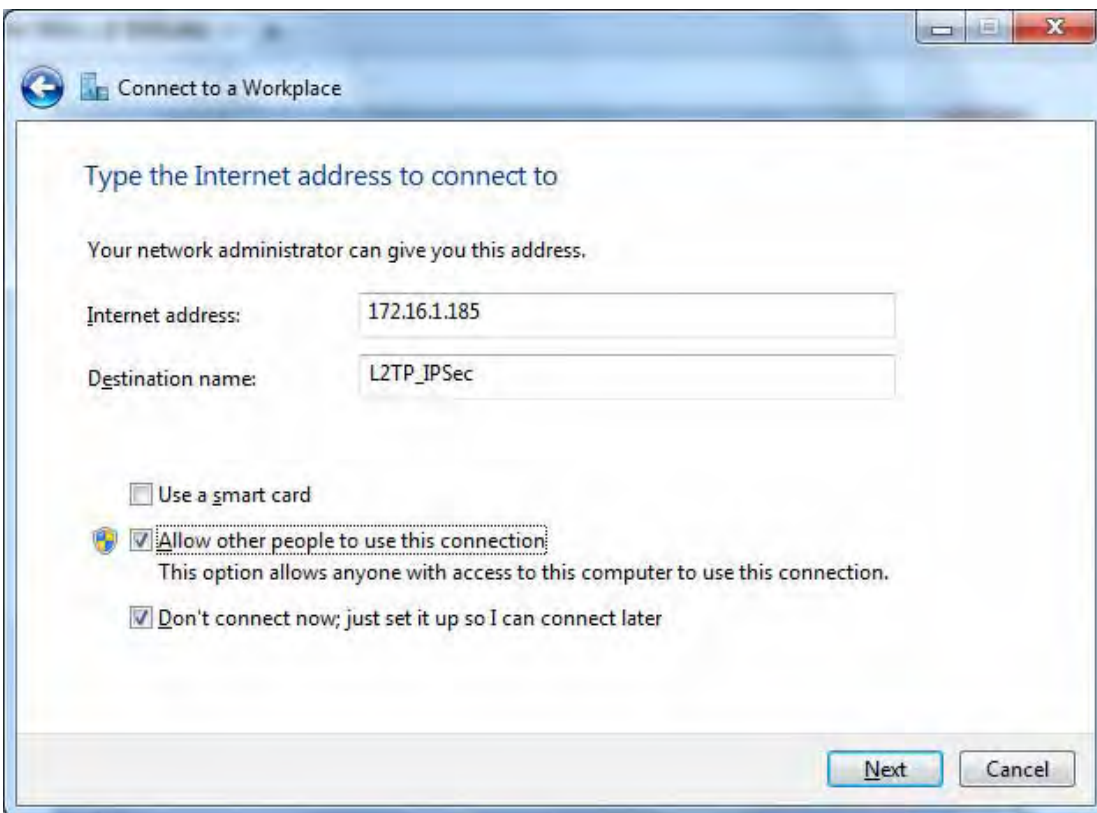
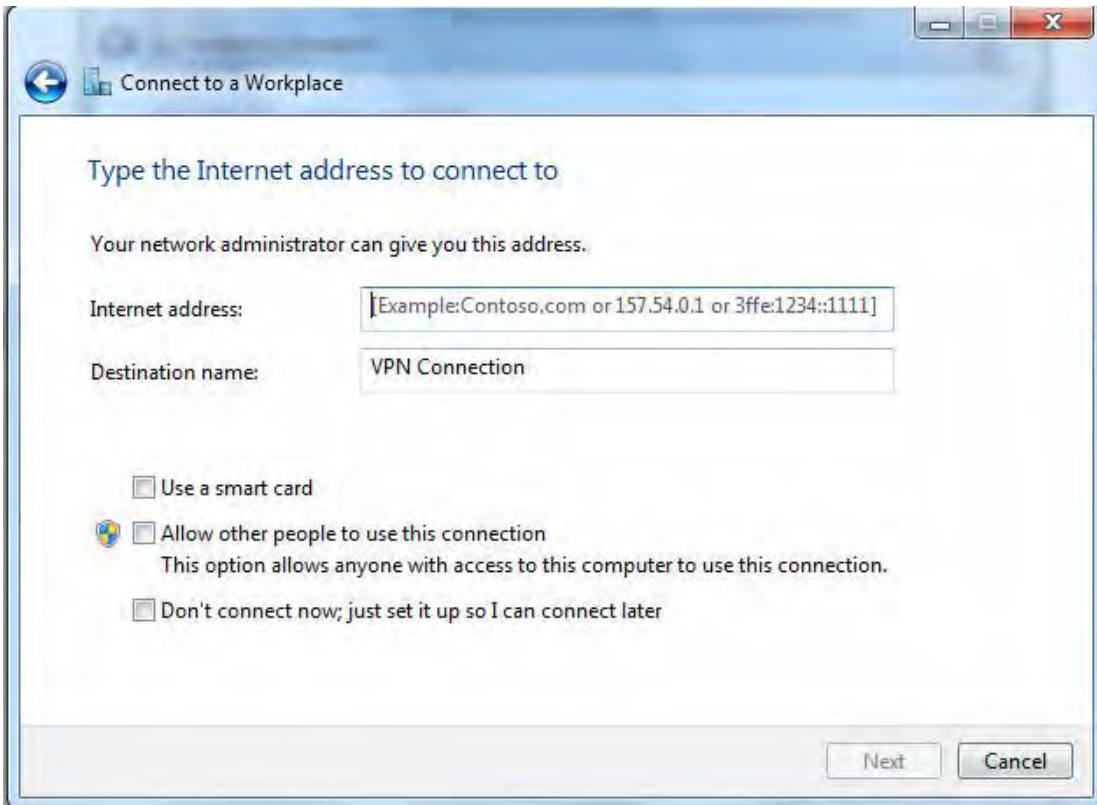
2. Click **Connect to a workplace**, and press **Next**.



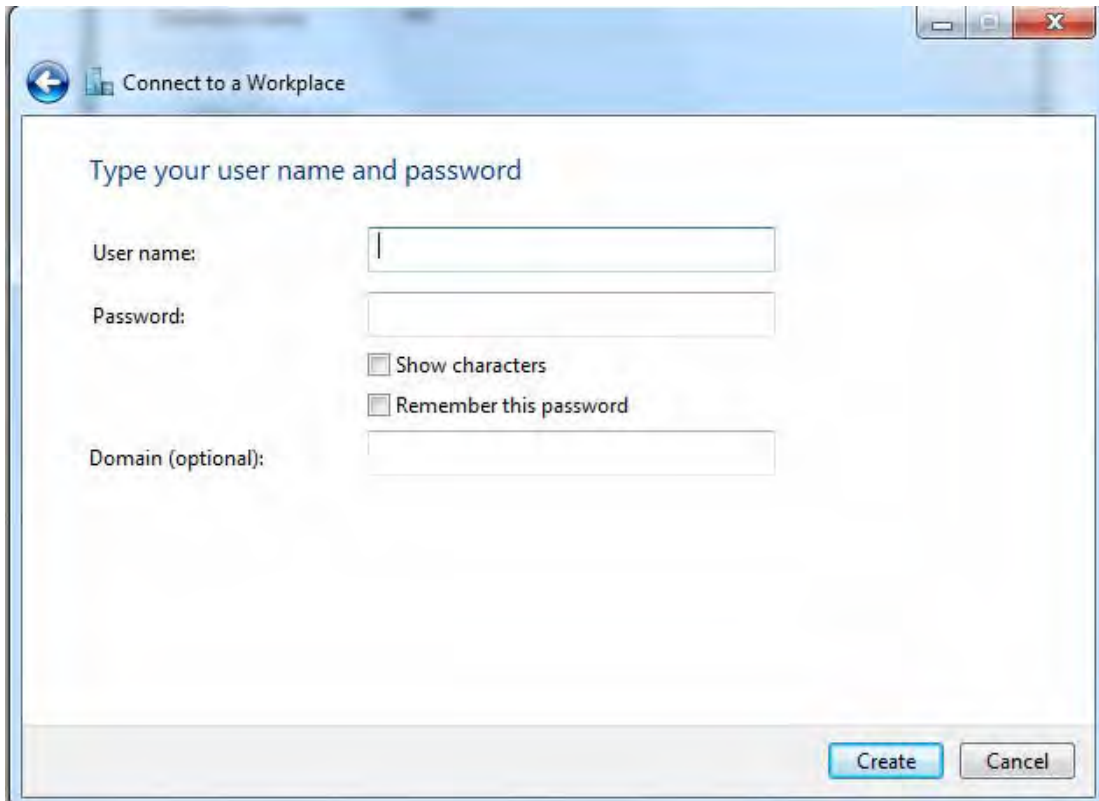
3. Select **Use my Internet connection (VPN)** and press **Next**.



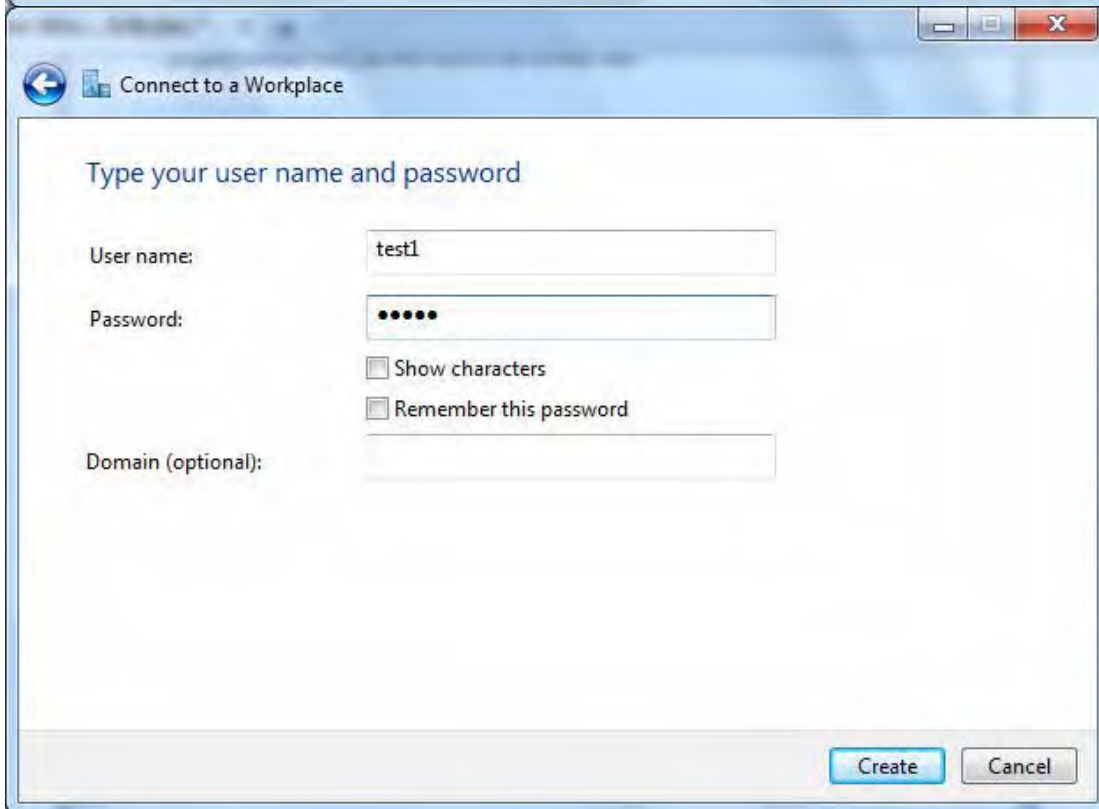
4. Input **Internet address** and **Destination name** for this connection and press **Next**.



5. Input the account (**user name** and **password**) and press **Create**.

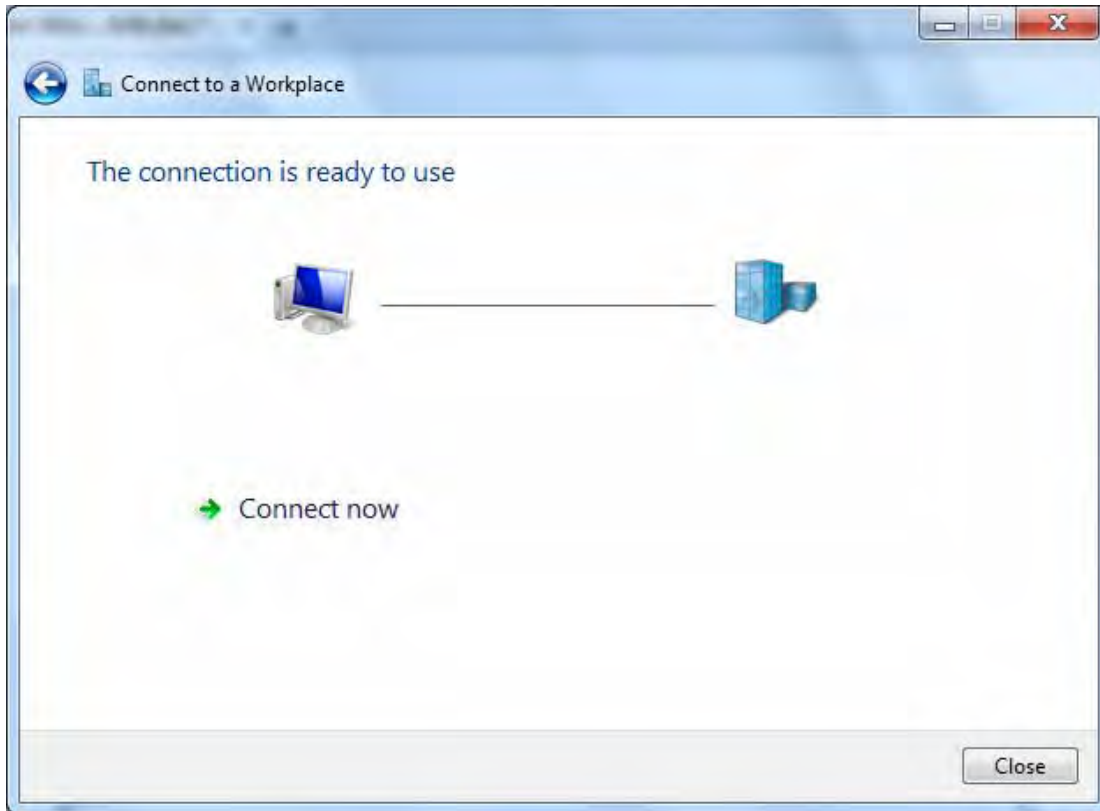


The screenshot shows a dialog box titled "Connect to a Workplace" with a blue header bar. Below the header, the text "Type your user name and password" is displayed. There are three input fields: "User name:" (empty), "Password:" (empty), and "Domain (optional):" (empty). Below the "Password:" field are two checkboxes: "Show characters" and "Remember this password", both of which are unchecked. At the bottom right of the dialog box are two buttons: "Create" (highlighted in blue) and "Cancel".

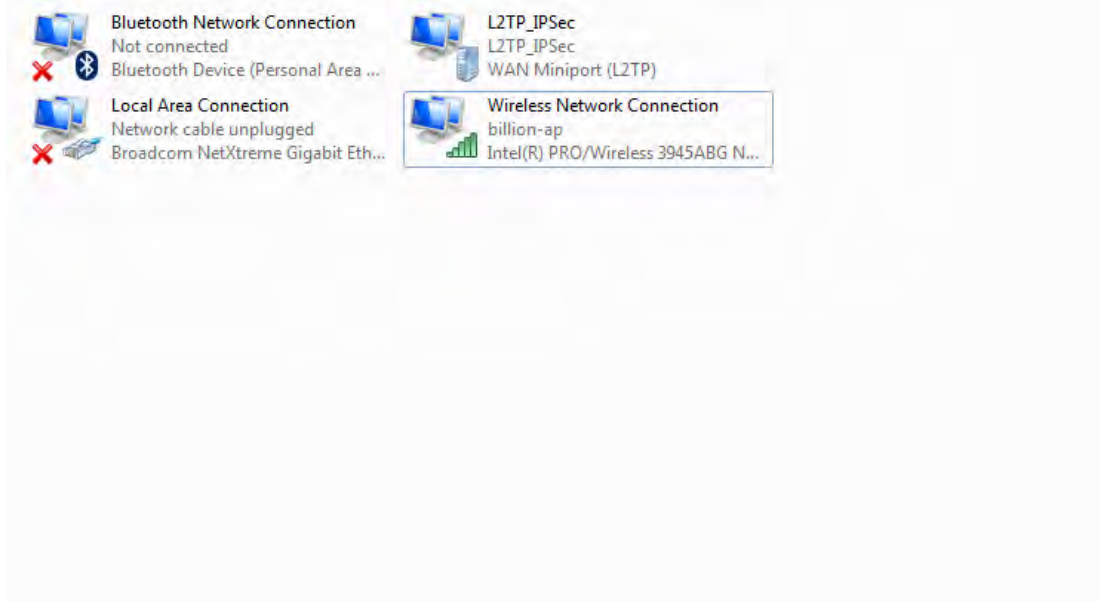


The screenshot shows the same "Connect to a Workplace" dialog box. The "User name:" field now contains the text "test1". The "Password:" field is filled with six black dots, indicating a masked password. The "Domain (optional):" field remains empty. The "Show characters" and "Remember this password" checkboxes are still unchecked. The "Create" button is highlighted in blue, and the "Cancel" button is visible next to it.

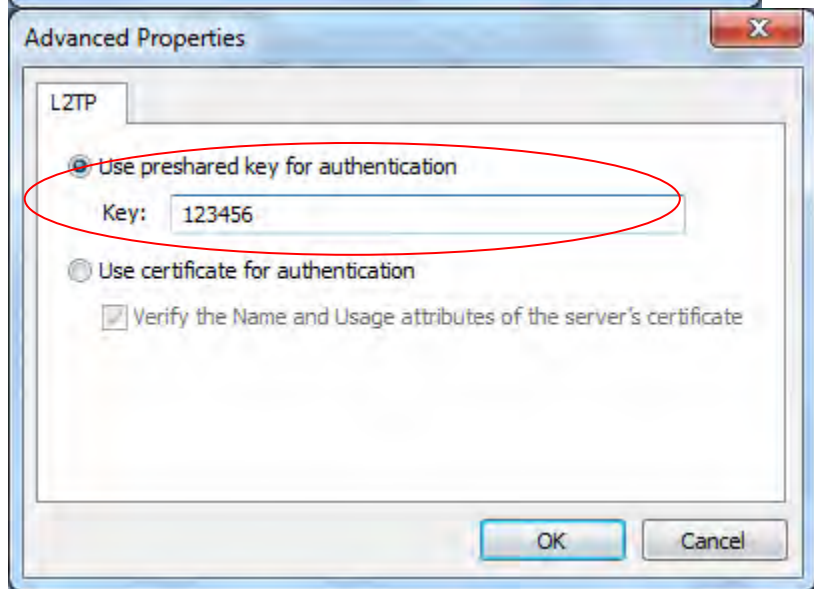
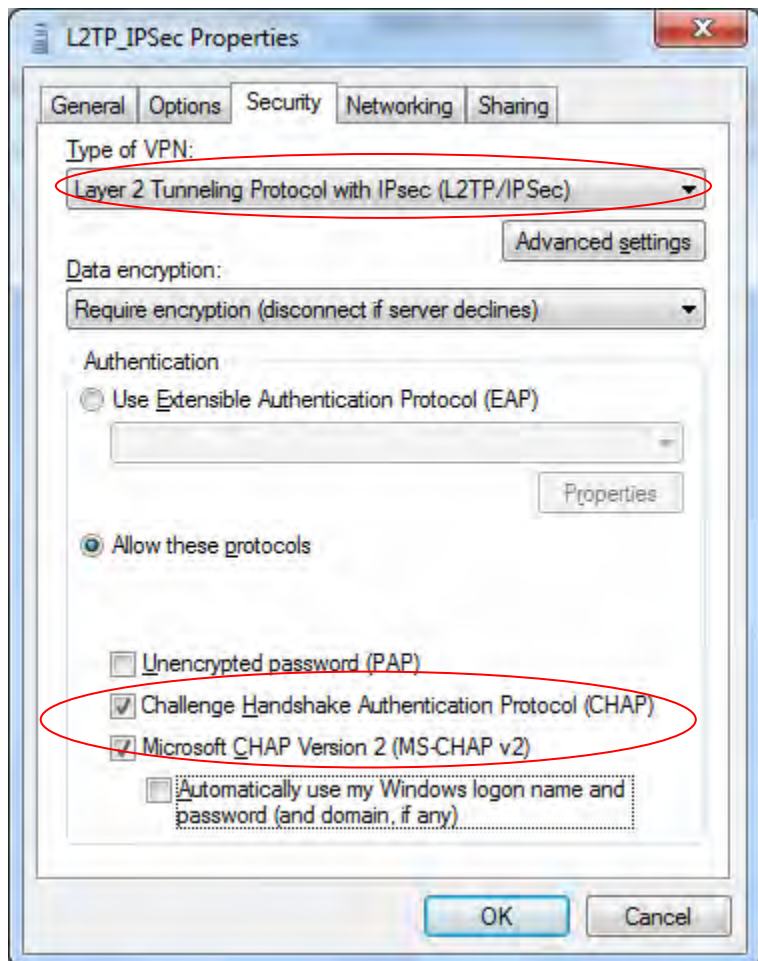
6. Connection created. Press **Close**.



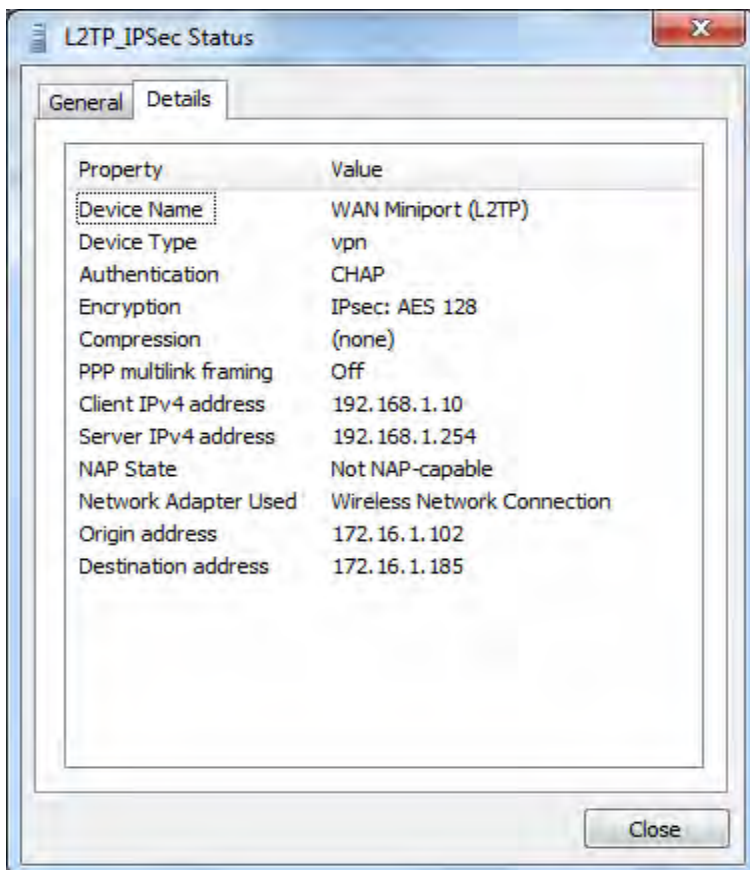
7. Go to **Network Connections** shown below to check the detail of the connection. Right click "L2TP_IPSec" icon, and select "**Properties**" to change the security parameters.



8. Change the type of VPN to “**Layer 2 Tunneling Protocol with IPsec (L2TP/IPSec)**” and Click Advanced Settings to set the pre-shared (set in IPsec) key for authentication.



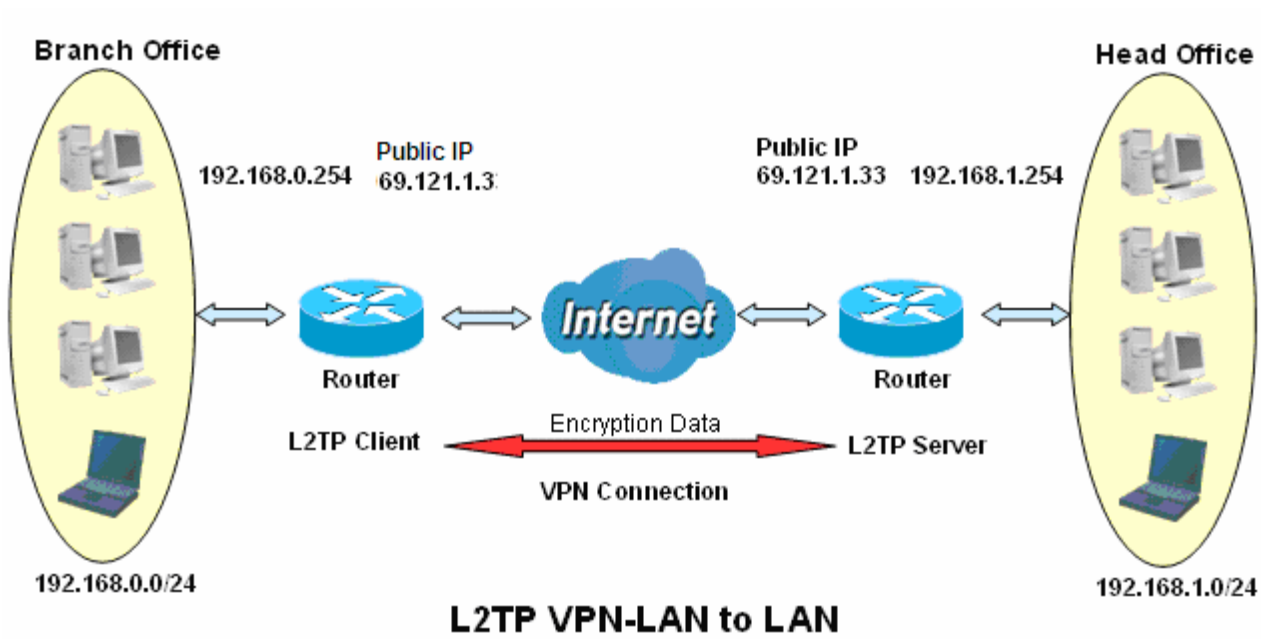
9. Go to **Network connections**, enter username and password to connect L2TP_IPSec and check the connection status.



Example: Configuring L2TP LAN-to-LAN VPN Connection

The branch office establishes a L2TP VPN tunnel with head office to connect two private networks over the Internet. The routers are installed in the head office and branch office accordingly.

Note: Both office LAN networks must be in different subnets with the LAN-LAN application.



Server side: Head Office

VPN

L2TP Server

Parameters

L2TP Enable Disable

WAN Interface Default or IPsec Tunnel

Auth. Type Chap

IP Addresses Assigned to Peer start from : 192.168.1.10

Tunnel Authentication

Secret

Remote Host Name

Local Host Name

Exceptional Rule Group None

VPN

IPSec

IPSec Settings

L2TP over IPsec Enable

Connection Name test2 WAN Interface Default IP Version IPv4

Remote Security Gateway Anonymous

Key Exchange Method IKE IPsec Protocol ESP

Pre-Shared Key 123456

Tunnel Mode Connections

Active	L2TP	Connection Name	Local Network	Remote Network	Remote Security Gateway	Remove	Edit
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	test2			Anonymous	<input type="checkbox"/>	<input type="button" value="Edit"/>

The above is the commonly setting for L2TP Server, set as you like for authentication and encryption. The settings in Client side should be in accordance with settings in Server side.

Then account the L2TP Account.



VPN Account applied to PPTP/L2TP/OpenVPN Server.

Parameters

Name	HO	Tunnel	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
Username	test2	Password	*****
Connection Type	<input type="radio"/> Remote Access <input checked="" type="radio"/> LAN to LAN		
Peer Network IP	192.168.0.0	Peer Netmask	255.255.255.0

Edit	Name	Tunnel	Connection Type	Peer Network IP	Peer Netmask	Delete
<input checked="" type="radio"/>	HO	Enable	LAN to LAN	192.168.0.0	255.255.255.0	<input type="checkbox"/>

Client Side: Branch Office

The client user can set up a tunnel connecting to the L2TP server, and can also set the tunnel as the default route for all outgoing traffic.

The screenshot shows the 'VPN' configuration page for an 'L2TP Client'. The 'Parameters' section includes fields for Name (BO), IPsec Tunnel (test2), Username (test2), Auth. Type (Chap), Connection Type (LAN to LAN), Peer Network IP (192.168.1.0), Tunnel Authentication, Remote Host Name, L2TP over IPsec (checked), Password (masked), L2TP Server Address (69.121.1.33), Peer Netmask (255.255.255.0), Secret, and Local Host Name. Below the form is a table with columns: Edit, Enable, Default Gateway, Name, L2TP Server Address, Connection Type, Peer Network IP, Peer Netmask, and Delete. The 'Default Gateway' checkbox for the 'BO' tunnel is highlighted with a red box.

Edit	Enable	Default Gateway	Name	L2TP Server Address	Connection Type	Peer Network IP	Peer Netmask	Delete
	<input type="checkbox"/>	<input type="checkbox"/>	BO	69.121.1.33	LAN to LAN	192.168.1.0	255.255.255.0	<input type="checkbox"/>

Note: users can see the “Default Gateway” item in the bar, and user can check to select the tunnel as the default gateway (default route) for traffic. If selected, all outgoing traffic will be forwarded to this tunnel and routed to the next hop.

OpenVPN

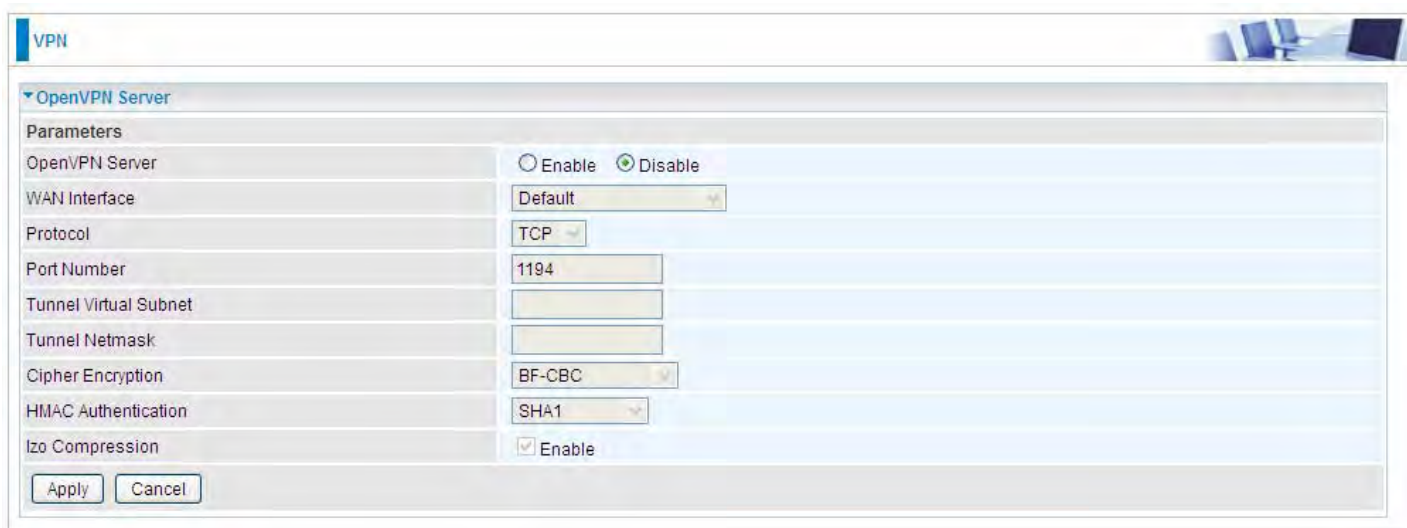
OpenVPN is an open source software application that implements virtual private network (VPN) techniques for creating secure point-to-point or site-to-site connections in routed or bridged configurations and remote access facilities. It uses a custom security protocol that utilizes SSL/TLS for key exchange. It is capable of traversing network address translation (NAT) and firewalls.

OpenVPN allows peers to authenticate each other using a pre-shared secret key, certificates, or username/password. When used in a multiclient-server configuration, it allows the server to release an authentication certificate for every client, using signature and Certificate authority. It uses the OpenSSL encryption library extensively, as well as the SSLv3/TLSv1 protocol, and contains many security and control features.

OpenVPN is good at portability. OpenVPN has been ported and embedded to several systems.

OpenVPN Server

Users can set the basic parameters (source/destination address, protocol/port, authentication, encryption, etc) for OpenVPN Server.



Parameters	
OpenVPN Server	<input type="radio"/> Enable <input checked="" type="radio"/> Disable
WAN Interface	Default
Protocol	TCP
Port Number	1194
Tunnel Virtual Subnet	
Tunnel Netmask	
Cipher Encryption	BF-CBC
HMAC Authentication	SHA1
Lzo Compression	<input checked="" type="checkbox"/> Enable

Apply Cancel

OpenVPN Server: Select **Enable** to activate OpenVPN Server.

WAN Interface: Select the exact WAN interface configured as source for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Protocol: OpenVPN can run over User Datagram Protocol (UDP) or Transmission Control Protocol (TCP) transports. Select the protocol.

Port Number: Port 1194 is the official assigned port number for OpenVPN

Tunnel Virtual Subnet: Set the tunnel virtual subnet IP for OpenVPN server.

Tunnel Network: Set the tunnel virtual subnet mask.

Cipher Encryption: OpenVPN uses all the ciphers available in the OpenSSL package to encrypt both the data and channels. Select the encryption method.

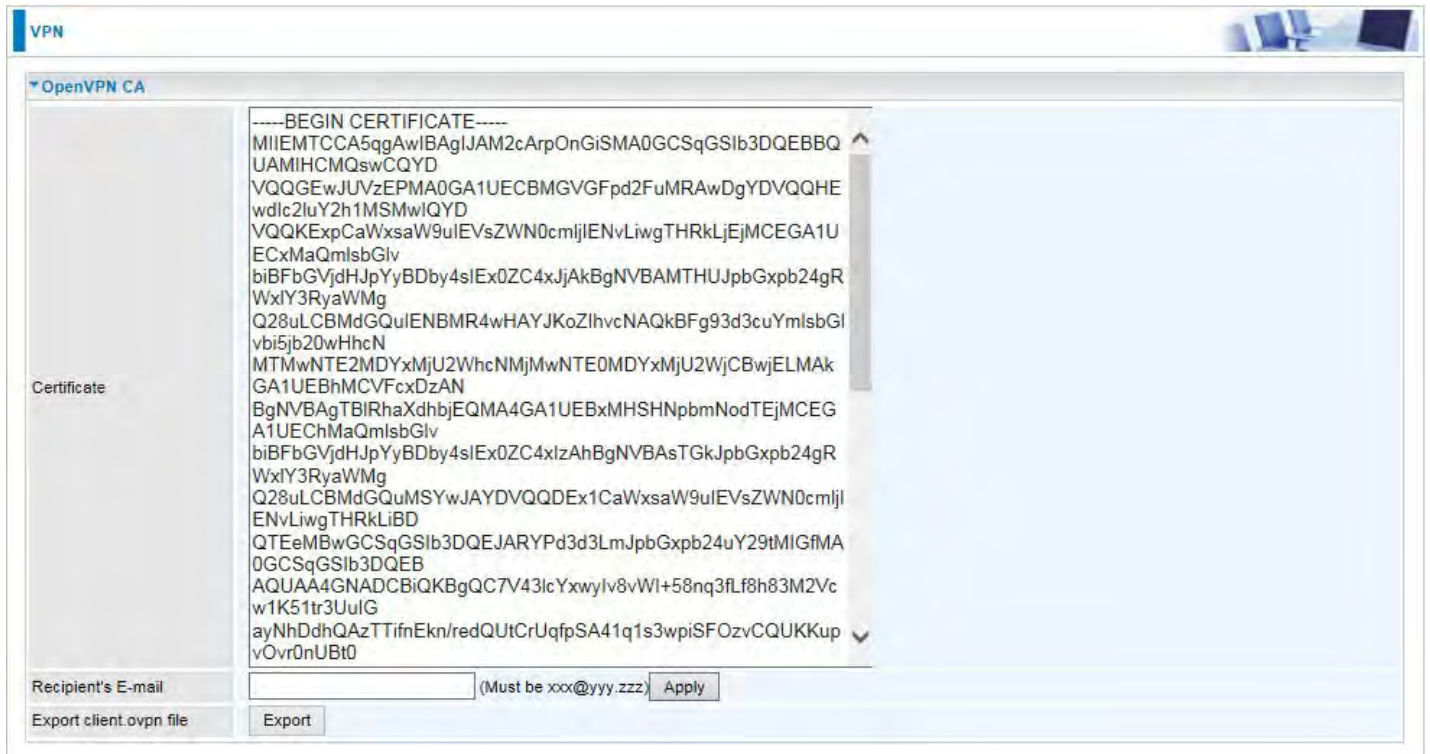
HMAC Authentication: OpenVPN support [HMAC](#) authentication, please select authentication item from the list.

Izo Compression: Enable to use the LZO compression library to compress the data stream.

Click **Apply** to submit your OpenVPN Server basic settings.

OpenVPN CA

OpenVPN offers pre-shared keys, certificate-based, and username/password-based authentication, with certificate-based being the most robust. Generally, the part offers the billion factory-defined authentication certificate.



Recipient's Email: Set the recipient's email address to send the trusted CA to the OpenVPN client. OpenVPN server and client need matched certificate to establish trusted VPN tunnel, on client side, please import this certificate in [Trusted CA](#).



(Client side CA)

OpenVPN Client

OpenVPN client can help you dial-in the OpenVPN server to establish a trusted OpenVPN tunnel over Internet.

The screenshot shows the 'OpenVPN Client' configuration window. It has a title bar with 'VPN' and a small icon of a computer. Below the title bar is a section titled 'OpenVPN Client' with a dropdown arrow. Underneath is a 'Parameters' section with a grid of fields:

Name	<input type="text"/>	WAN Interface	Default
Username	<input type="text"/>	Password	<input type="text"/>
OpenVPN Server Address	<input type="text"/>		
Protocol	TCP	Port Number	1194
Cipher Encryption	BF-CBC	HMAC Authentication	SHA1
Izo Compression	<input checked="" type="checkbox"/> Enable	Certificate Authority	CA-billion Trusted CA

At the bottom of the parameters section are two buttons: 'Add' and 'Edit / Delete'.

Name: user-defined name for identification.

WAN Interface: Select the exact WAN interface configured as source for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Username: Enter the username provided by your OpenVPN Server.

Password: Enter the password provided by your OpenVPN Server.

OpenVPN Server Address: Enter the WAN IP address of the OpenVPN server.

Protocol: The protocol, same as set in server side.

Port Number: 1194.

Cipher Encryption: Be consistent with what set on server side.

HMAC Authentication: Be consistent with what set on server side.

Izo Compression: Enable to use the LZO compression library to compress the data stream

Certificate Authority: Select your trusted CA from your server side to establish the trusted VPN tunnel with server.

Click **Add** button to save your changes.

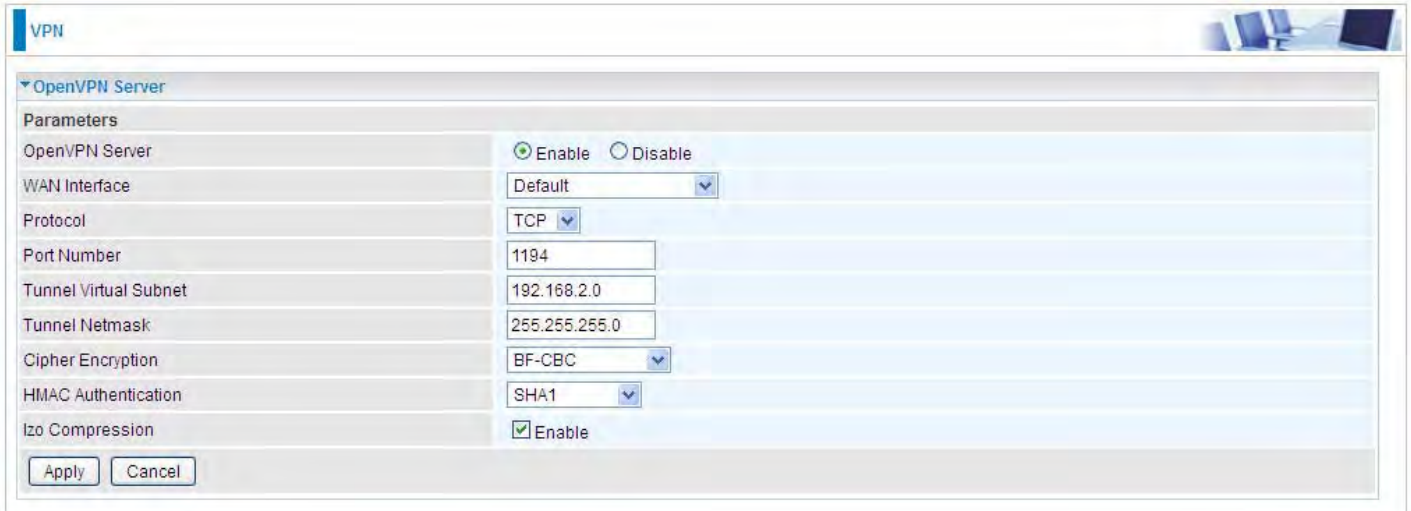
How to establish OpenVPN tunnel

1. Remote Access OpenVPN

(If the client wants to remotely access the OpenVPN Server, on client side, users had better install an OpenVPN client application/installer and connect to server accordingly. Here only give the configuration on server side.)

Server side on router

1. Set up parameters (WAN interface, port, tunnel virtual subnet IP/mask, encryption, authentication, etc) on OpenVPN server side.



The screenshot shows the 'VPN' configuration page for the 'OpenVPN Server'. The 'Parameters' section includes the following settings:

- OpenVPN Server: Enable Disable
- WAN Interface: Default
- Protocol: TCP
- Port Number: 1194
- Tunnel Virtual Subnet: 192.168.2.0
- Tunnel Netmask: 255.255.255.0
- Cipher Encryption: BF-CBC
- HMAC Authentication: SHA1
- Izo Compression: Enable

Buttons for 'Apply' and 'Cancel' are located at the bottom left of the configuration area.

2. Create an account for the OpenVPN tunnel for client to connect in.



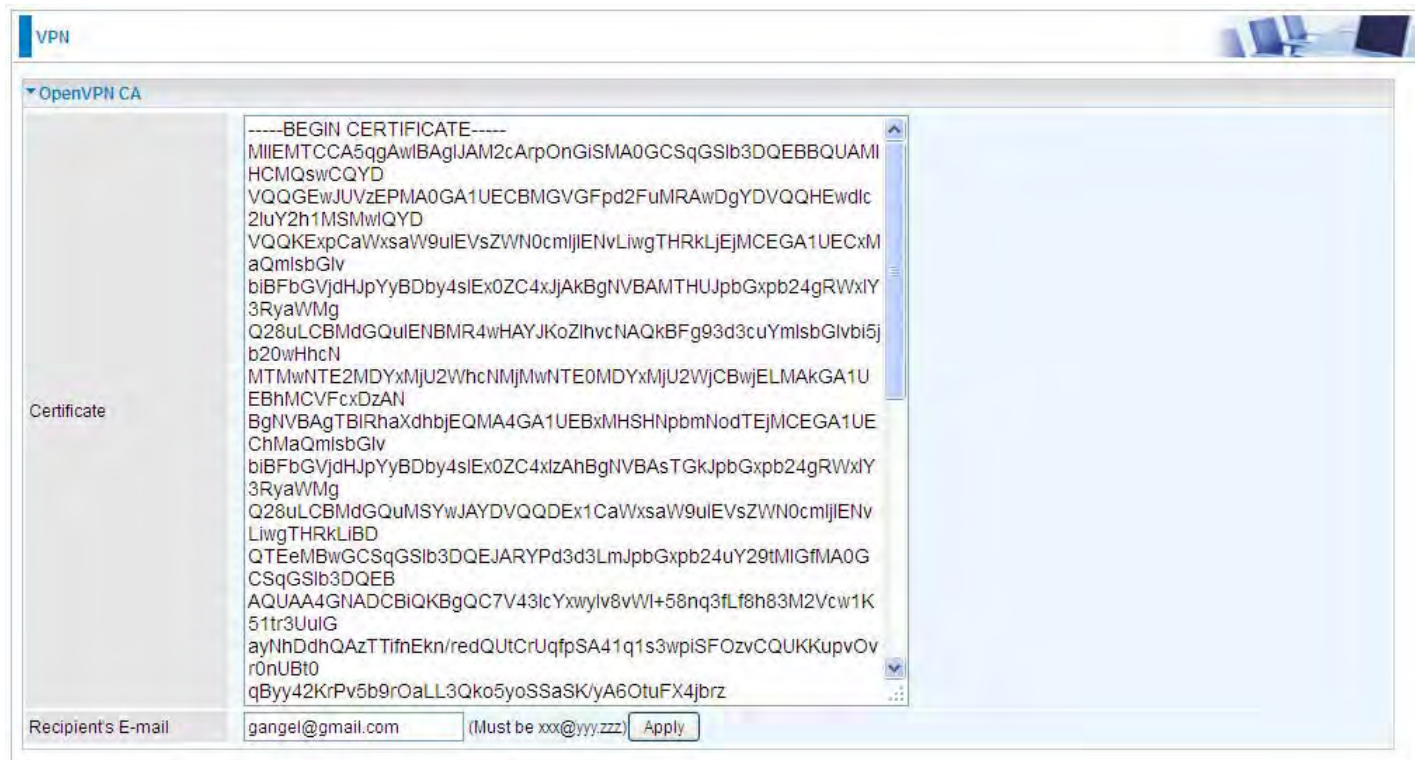
The screenshot shows the 'VPN Account' configuration page. The 'Parameters' section includes the following settings:

- Name: test4
- Username: tes4
- Connection Type: Remote Access LAN to LAN
- Tunnel: Enable Disable
- Password: [masked]
- Peer Network IP: [empty]
- Peer Netmask: [empty]

Buttons for 'Add' and 'Edit / Delete' are located below the form fields.

Edit	Name	Tunnel	Connection Type	Peer Network IP	Peer Netmask	Delete
<input checked="" type="radio"/>	test4	Enable	Remote Access			<input type="checkbox"/>

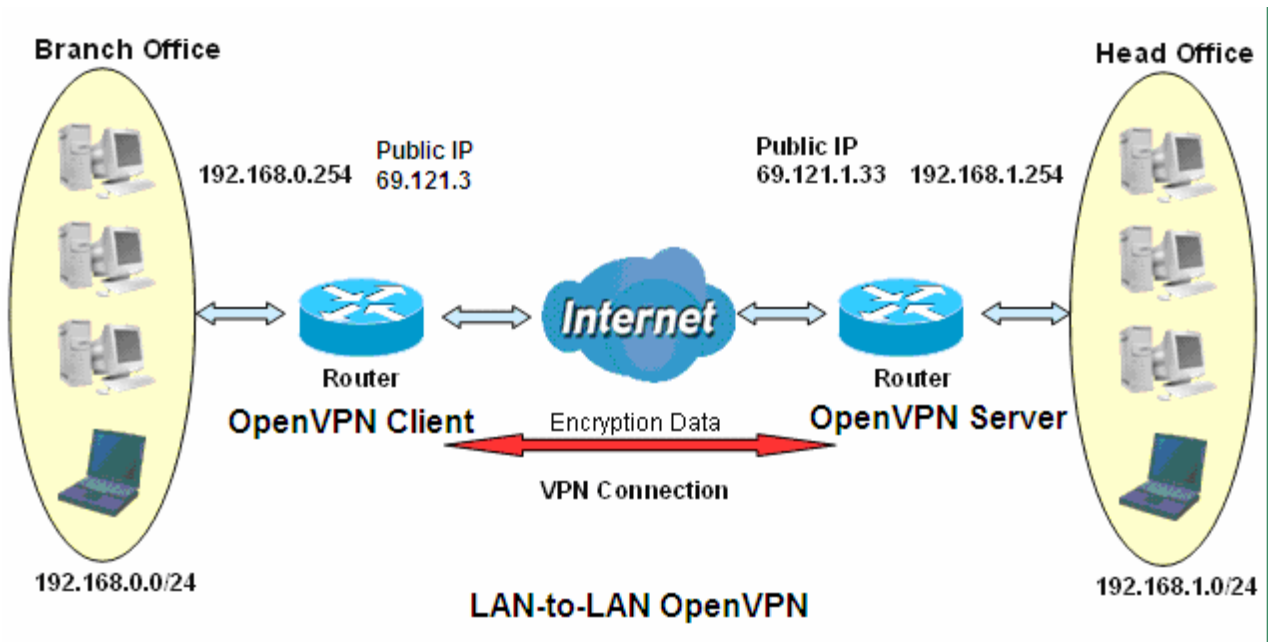
3. Set the OpenVPN client's E-mail address to receive trusted CA from server to establish a trusted OpenVPN tunnel.



2. LAN-to-LAN OpenVPN

The branch office establishes a OpenVPN tunnel with head office to connect two private networks over the Internet. The routers are installed in the head office and branch office accordingly. Configured in this way, head office and branch office can access each other.

Note: Both office LAN networks must be in different subnets with the LAN-to-LAN application.



Server side: Head Office

1. Set up parameters (WAN interface, port, tunnel virtual subnet IP/mask, encryption, authentication, etc) on OpenVPN server side.

The screenshot shows the configuration interface for the OpenVPN Server. The title bar reads "VPN". The main heading is "OpenVPN Server". Under "Parameters", the "OpenVPN Server" checkbox is checked (Enable). The "WAN Interface" is set to "Default". The "Protocol" is set to "TCP". The "Port Number" is "1194". The "Tunnel Virtual Subnet" is "192.168.2.0". The "Tunnel Netmask" is "255.255.255.0". The "Cipher Encryption" is set to "BF-CBC". The "HMAC Authentication" is set to "SHA1". The "Izo Compression" checkbox is checked (Enable). At the bottom, there are "Apply" and "Cancel" buttons.

2. Create an account for client to connect in

VPN

VPN Account

VPN Account applied to PPTP/L2TP/OpenVPN Server.

Parameters

Name: test3 Tunnel: Enable Disable

Username: test3 Password:

Connection Type: Remote Access LAN to LAN

Peer Network IP: 192.168.0.0 Peer Netmask: 255.255.255.0

Edit	Name	Tunnel	Connection Type	Peer Network IP	Peer Netmask	Delete
<input checked="" type="radio"/>	test3	Enable	LAN to LAN	192.168.0.0	255.255.255.0	<input type="checkbox"/>

3. Set the OpenVPN client's E-mail address to receive trusted CA from server to establish a trusted OpenVPN tunnel.

VPN

OpenVPN CA

Certificate

```
-----BEGIN CERTIFICATE-----
MIEMTCCA5qAwIBAgIJAM2cArpOnGiSMA0GCSqGSIb3DQEBBQ
UAMIHCMQswCQYD
VQQGEwJUVzEPMA0GA1UECBMGVGFpd2FuMRawDgYDVQQHE
wdlc2luY2h1MSMwIQYD
VQQKExpCaWxsaW9uEVsZWN0cmijIENvLiwgTHRkLjEjMCEGA1U
ECxMaQmlsbGlv
biBFbGVjdHJpYyBDby4sIEx0ZC4xJjAkBgNVBAMTHUJpbGxpb24gR
WxY3RyaWMg
Q28uLCBMdGQuIENBMR4wHAYJKoZIhvcNAQkBFg93d3cuYmlsbG
vbi5jb20wHhcN
MTMwNTE2MDYxMjU2WhcNMjMwNTE2MDYxMjU2WjCBwJELMAK
GA1UEBhMCVFcxDzAN
BgNVBAGTBIRhaXdhbjEQMA4GA1UEBxMHSNpbmNodTEjMCEG
A1UEChMaQmlsbGlv
biBFbGVjdHJpYyBDby4sIEx0ZC4xJjAkBgNVBAsTGkIpbGxpb24gR
WxY3RyaWMg
Q28uLCBMdGQuMSYwJAYDVQQDE1CaWxsaW9uEVsZWN0cmijI
ENvLiwgTHRkLiBD
QTEeMBwGCSqGSIb3DQEJARYPd3d3LmJpbGxpb24uY29tMIGfMA
0GCSqGSIb3DQEB
AQUAA4GNADCBiQKBgQC7V43lcYxwylv8vWI+58nq3FLf8h83M2Vc
w1K51tr3UuIG
ayNhDdhQAzTTifnEkn/redQUtCrUqfpSA41q1s3wpiSFOzvCQUKkup
vOvr0nUBt0
-----
```

Recipient's E-mail: gangel@gmail.com (Must be xxx@yyy.zzz)

Export client.ovpn file:

Client Side: Branch Office

1. Import your trusted certificate from server side, which is used to authenticate between client and server for establishing trusted OpenVPN tunnel.

Advanced Setup

Trusted CA - Import CA certificate

Parameters

Name: CA-billion

Certificate:

```
-----BEGIN CERTIFICATE-----
MIIEMTCCA5qgAwIBAgIJAM2cArpOnGISMA0GCSqGSIb3DQE
BBQUAMIHCMQswCQYD
VQQGEwJUVzEPMA0GA1UECBMGVGFpd2FuMRAwDgYDVQ
QHEwdlc2luY2h1MSMwIQYD
VQQKExpCaWxsaW9uLEVszWN0cmJlJENvLiwgTHRkLjEjMCEG
A1UECxMaQmIsbGlv
biBFbGVjdHJpYyBDby4sIEx0ZC4xJjAkBgNVBAMTHUJpbGxpb
24gRWxIY3RyaWVm
Q28uL0CBMmGQulENBMR4wHAYJKoZIhvcNAQkBFg93d3cuYm
IsbGlvbi5jb20wHhcN
MTMwNTE2MDYxMjU2WWhcNjMwNTE0MDYxMjU2WjCBwjELM
AKGA1UEBhMCVFcxdzAN
BgNVBAGTBIRhaXdhbjEQMA4GA1UEBxMHSNpbmNodTEjM
CEGA1UEChMaQmIsbGlv
biBFbGVjdHJpYyBDby4sIEx0ZC4xIzAhBgNVBAStGkJPbGxpb2
4gRWxIY3RyaWVm
Q28uL0CBMmGQUMSYwJAYDVQQDEx1CaWxsaW9uLEVszWN
0cmJlJENvLiwgTHRkLjEj
QTEeMBwGCsGSIb3DQEJARYPd3d3LmJpbGxpb24uY29tMI
GfMA0GCSqGSIb3DQEB
AQUAA4GNADCBiQKBgQC7V43IcYxyIv6vWI+58nq3fL8h83
M2Vcw1K51tr3UuIG
ayNhDdhQAzTTIfnEkn/redQUtCrUqfpSA41q1s3wpiSFOzvCQU
KKupvOvr0nUbt0
qByy42KrPv5b9rOaLL3Qko5yoSSaSK/yA6OtuFX4jbrz
-----END CERTIFICATE-----
```

Apply

2. On the OpenVPN client side, fill in the parameters the same as set for OpenVPN server.

VPN

OpenVPN Client

Parameters

Name: test3

WAN Interface: Default

Username: test3

Password:

OpenVPN Server Address: 69.121.1.33

Protocol: TCP

Port Number: 1194

Cipher Encryption: BF-CBC

HMAC Authentication: SHA1

Izo Compression: Enable

Certificate Authority: CA-billion Trusted CA

Add Edit / Delete

VPN

OpenVPN Client

Parameters

Name:

WAN Interface: Default

Username:

Password:

OpenVPN Server Address:

Protocol: TCP

Port Number: 1194

Cipher Encryption: BF-CBC

HMAC Authentication: SHA1

Izo Compression: Enable

Certificate Authority: CA-billion Trusted CA

Add Edit / Delete

Edit	Enable	Name	WAN Interface	OpenVPN Server Address	Protocol	Port Number	Delete
<input type="radio"/>	<input checked="" type="checkbox"/>	test3	default	69.121.1.33	TCP	1194	<input type="checkbox"/>

Note: users can see the “Default Gateway” item in the bar, and user can check to select the tunnel as the default gateway (default route) for traffic. If selected, all outgoing traffic will be forwarded to this tunnel and routed to the next hop.

GRE

Generic Routing Encapsulation (GRE) is a tunneling protocol that can encapsulate a wide variety of network layer protocol packets inside virtual point-to-point links over an Internet Protocol (IP) network. And the common use can be GRE over IPSec.

Note: up to 8 tunnels can be added, but only 4 can be activated.



The screenshot shows a web-based configuration interface for GRE tunnels. The interface is titled 'VPN' and has a 'GRE' section expanded. Under 'Parameters', there are several input fields and a dropdown menu:

- Name:** An empty text input field.
- WAN Interface:** A dropdown menu currently set to 'Default'.
- Local Tunnel Virtual IP:** An empty text input field.
- Local Netmask:** An empty text input field.
- Remote Tunnel Virtual IP:** An empty text input field.
- Remote Gateway IP:** An empty text input field.
- Remote Network:** A dropdown menu set to 'Single Address'.
- IP Address:** An empty text input field.
- Netmask:** An empty text input field.
- Enable Keepalive:** An unchecked checkbox.
- Keepalive Retry Times:** A text input field containing '10'.
- Keepalive Interval:** A text input field containing '3', followed by the label 'Second(s)'.

At the bottom of the form, there are two buttons: 'Add' and 'Edit / Delete'.

Name: User-defined identification.

WAN Interface: Select the exact WAN interface configured for the tunnel as the source tunnel IP. Select Default to use the now-working WAN interface for the tunnel.

Local Tunnel Virtual IP: Please input the virtual IP for the local tunnel.

Local Netmask: Input the netmask for the local tunnel.

Remote Tunnel Virtual IP: Please input the virtual destination IP for tunnel.

Remote Gateway IP: Set the destination IP for the tunnel.

Remote Network: Select the peer topology, Single address (client) or Subnet.

IP Address: Set the IP address if the peer is a client. If the peer is a subnet, please enter the IP and netmask.

Enable Keepalive: Normally, the tunnel interface is always up. Enable keepalive to determine when the tunnel interface is to be closed. The local router sends keepalive packets to the peer router, if keepalive response is not received from peer router within the allowed time ('retry time' multiply 'interval', based on default settings, the time interval can be 30 seconds), the local router will shut up its tunnel interface.

Keepalive Retry Times: Set the keepalive retry times, default is 10.

Keepalive Interval: Set the keepalive Interval, unit in seconds. Default is 3 seconds.

Advanced Setup

There are sub-items within the System section: [Routing](#), [DNS](#), [Static ARP](#), [UPnP](#), [Certificate](#), [Multicast](#), [Management](#), and [Diagnostics](#).



▶ Status
• Quick Start
▶ Configuration
▼ Advanced Setup
▶ Routing
▶ DNS
• Static ARP
• UPnP
▶ Certificate
• Multicast
▶ Management
▶ Diagnostics

Routing

Default Gateway



WAN port: Select the port this gateway applies to.

To set **Default Gateway** and **Available Routed WAN Interface**. This interfaces are the ones you have set in WAN section, here select the one you want to be the default gateway by moving the interface via  or  . And select a Default IPv6 Gateway from the drop-down menu.

Note: Only one default gateway interface will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected.

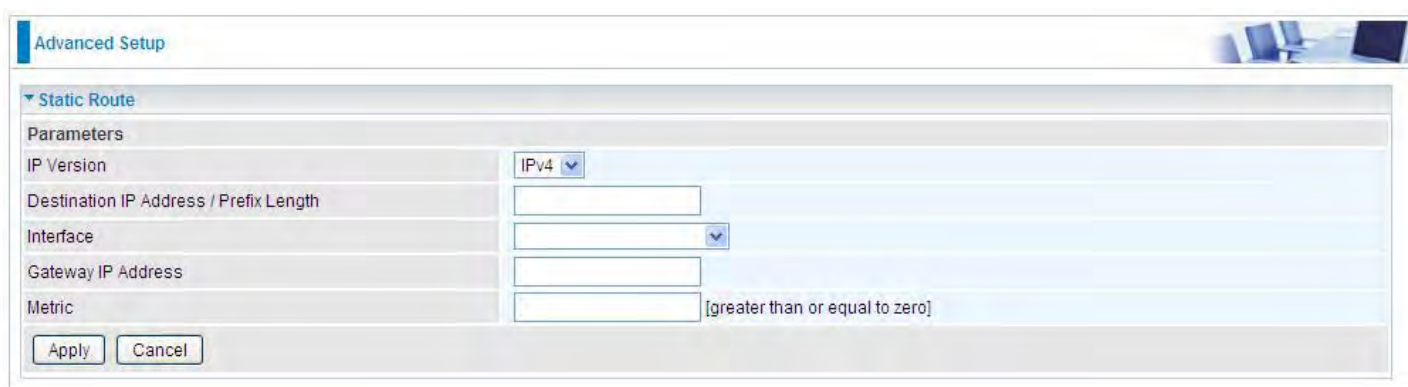
Static Route

With static route feature, you can control the routing of all the traffic across your network. With each routing rule created, you can specifically assign the destination where the traffic will be routed.



The screenshot shows the 'Advanced Setup' window with the 'Static Route' section expanded. Below the title bar, there is a 'Parameters' section containing a table with the following columns: 'IP Version', 'Dst IP / Prefix Length', 'Gateway', 'Interface', 'Metric', and 'Remove'. Below the table are two buttons: 'Add' and 'Remove'.

Above is the static route listing table, click **Add** to create static routing.



The screenshot shows the 'Advanced Setup' window with the 'Static Route' section expanded. Below the title bar, there is a 'Parameters' section with the following fields: 'IP Version' (a dropdown menu set to 'IPv4'), 'Destination IP Address / Prefix Length' (a text input field), 'Interface' (a dropdown menu), 'Gateway IP Address' (a text input field), and 'Metric' (a text input field with a note '[greater than or equal to zero]'). At the bottom of the form are two buttons: 'Apply' and 'Cancel'.

IP Version: Select the IP version, IPv4 or IPv6.

Destination IP Address / Prefix Length: Enter the destination IP address and the prefix length. For IPv4, the prefix length means the number of '1' in the submask, it is another mode of presenting submask. One IPv4 address, 192.168.1.0/24, submask is 255.255.255.0. While in IPv6, IPv6 address composes of two parts, thus, the prefix and the interface ID, the prefix is like the net ID in IPv4, and the interface ID is like the host ID in IPv4. The prefix length is to identify the net ID in the address. One IPv6 address, 3FFE:FFFF:0:CD30:0:0:0:0 / 64, the prefix is 3FFE:FFFF:0:CD3.

Interface: The exit interface of local router to the next hop.

Gateway IP Address: Enter the gateway IP address/ the entry address of the next hop, .

Metric: Metric is the hops from local to destination, which signals the quality of the link, to determine the optimal route. Enter one number greater than or equal to 0.

Click **Apply** to apply this route and it will be listed in the route listing table.

In listing table you can remove the one you don't want by checking the checking box and press **Remove** button.

Advanced Setup

Static Route

Parameters

IP Version	Dst IP/Prefix Length	Gateway	Interface	Metric	Remove
4	192.168.1.0/24		ppp0	1	<input checked="" type="checkbox"/>

Add Remove

Policy Routing

Here users can set a route for the host (source IP) in a LAN to access outside through a specified a WAN interface to the next hop.

The following is the policy Routing listing table.



The screenshot shows the 'Advanced Setup' interface with the 'Policy Routing' section expanded. Below the section title is a 'Parameters' table with the following columns: Policy Name, Source IP, LAN Port, WAN, Default Gateway, and Remove. Below the table are two buttons: 'Add' and 'Remove'.

Policy Name	Source IP	LAN Port	WAN	Default Gateway	Remove
-------------	-----------	----------	-----	-----------------	--------

Click **Add** to create a policy route.



The screenshot shows the 'Advanced Setup' interface with the 'Policy Routing' section expanded. The configuration form contains the following fields: Policy Name (text input), Physical LAN Port (dropdown menu), Source IP (text input), Interface (dropdown menu with 'pppoe_0_0_35/ppp0.1' selected), and Default Gateway (text input). At the bottom of the form are two buttons: 'Apply' and 'Cancel'.

Policy Name: User-defined name.

Physical LAN Port: Select the LAN port.

Source IP: Enter the Host Source IP.


Interface: Select the WAN interface (exit interface) of local router to the next hop.

Default Gateway: Enter the gateway IP address/ the entry address of the next hop,

Click **Apply** to apply your settings. And the item will be listed in the policy Routing listing table. Here if you want to remove the route, check the remove checkbox and press **Remove** to delete it.

RIP

RIP, Router Information Protocol, is a simple Interior Gateway Protocol (IGP). RIP has two versions, RIP-1 and RIP-2.



Advanced Setup

▼ RIP

Parameters

RIP CANNOT BE CONFIGURED on the WAN interface which has NAT enabled (such as PPPoE).

Interface	Version	Operation	Enable
atm0.2	2	Passive	<input type="checkbox"/>

Apply Cancel

Interface: The interface the rule applies to.

Version: Select the RIP version, RIP-1, RIP-2 and both.

Operation: RIP has two operation mode.

- ① **Passive:** only receive the routing information broadcasted by other routers and modifies its routing table according to the received information.
- ① **Active:** working in this mode, the router sends and receives RIP routing information and modifies routing table according to the received information.

Enable: check the checkbox to enable RIP rule for the interface.

Note: RIP can't be configured on the WAN interface which has NAT enabled (such as PPPoE).

Click **Apply** to apply your settings.

DNS

DNS, Domain Name System, is a distributed database of TCP/IP application. DNS provides translation of Domain name to IP.

DNS

Parameters
Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses OR IP addresses provided by Parental Control Provider for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered. DNS Server Interfaces can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

Select DNS Server Interface from available WAN interfaces

Selected DNS Server Interfaces: ppp0.1, USB3G0

Available WAN Interfaces: (empty)

Use the following Static DNS IP address

Primary DNS server: []

Secondary DNS server: []

Use the IP Addresses provided by Parental Control Provider

Note that selecting a WAN interface for IPv6 DNS server will enable DHCPv6 Client on that interface.

Obtain IPv6 DNS info from a WAN interface

WAN interface selected: pppoe_0_8_35/ppp0.1

Use the following Static IPv6 DNS address

Primary IPv6 DNS server: []

Secondary IPv6 DNS server: []

Apply Cancel

➤ IPv4

Three ways to set an IPv4 DNS server

- ① **Select DNS server from available WAN interfaces:** Select a desirable WAN interface as the IPv4 DNS server.
- ① **User the following Static DNS IP address:** To specify DNS server manually by entering your primary and secondary DNS server addresses.
- ① **Use the IP address provided by Parental Control Provider:** If user registers and gets an DNS account in the parental control provider website, expecting to enjoy a more reliable and safer internet surfing environment, please select this option (need to configure at [Parental Control Provider](#)).

➤ IPv6:

IPv6 DNS Server's operation is similar to IPv4 DNS server. There are two modes to get DNS server address: Auto and Static mode.

Obtain IPv6 DNS info from a WAN interface

WAN Interface selected: Select one configured IPv6 WAN connection from the drop-down menu to be as an IPv6 DNS.

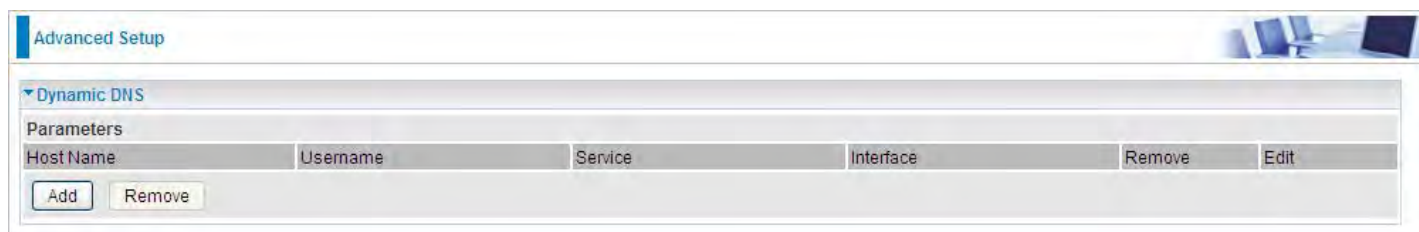
Use the following Static IPv6 DNS address

Primary IPv6 DNS Server / Secondary IPv6 DNS Server: Type the specific primary and secondary IPv6 DNS Server address.

Dynamic DNS

The Dynamic DNS function allows you to alias a dynamic IP address to a static hostname, allowing users whose ISP does not assign them a static IP address to use a domain name. This is especially useful for hosting servers via your ADSL connection, so that anyone wishing to connect to you may use your domain name, rather than having to use your dynamic IP address, which changes from time to time. This dynamic IP address is the WAN IP address of the router, which is assigned to you by your ISP.

Here users can register different WAN interfaces with different DNS(es).



Advanced Setup

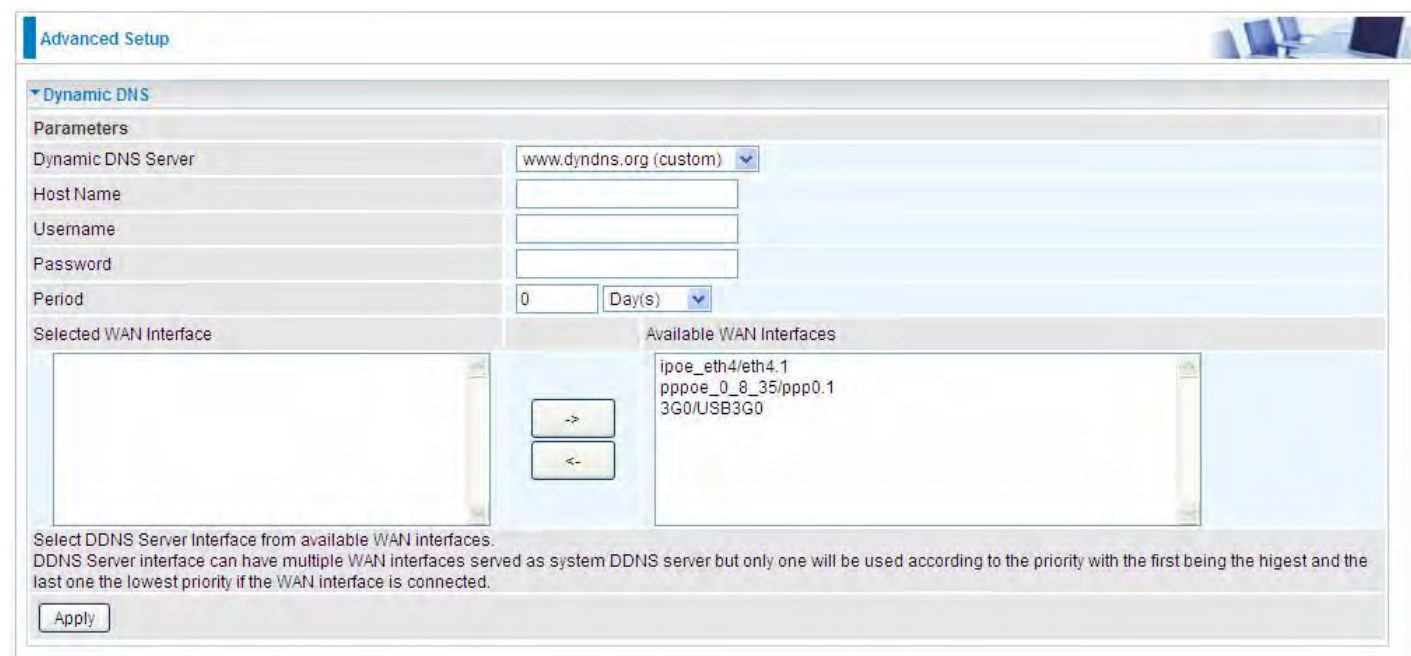
Dynamic DNS

Parameters

Host Name	Username	Service	Interface	Remove	Edit
-----------	----------	---------	-----------	--------	------

Add Remove

Click **Add** to register a WAN interface with the exact DNS.



Advanced Setup

Dynamic DNS

Parameters

Dynamic DNS Server: www.dyndns.org (custom)

Host Name:

Username:

Password:

Period: 0 Day(s)

Selected WAN Interface:

Available WAN Interfaces:

- ipoe_eth4/eth4.1
- pppoe_0_8_35/ppp0.1
- 3G0/USB3G0

Select DDNS Server interface from available WAN interfaces.
DDNS Server interface can have multiple WAN interfaces served as system DDNS server but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected.

Apply

You will first need to register and establish an account with the Dynamic DNS provider using their website, for example <http://www.dyndns.org/>

Dynamic DNS Server: Select the DDNS service you have established an account with.

Host Name, Username and Password: Enter your registered domain name and your username and password for this service.

Period: Set the time period between updates, for the Router to exchange information with the DDNS server. In addition to updating periodically as per your settings, the router will perform an update when your dynamic IP address changes.

Selected WAN Interface: Select the Interface that is bound to the registered Domain name.

User can register different DDNS to different interfaces.

Examples: **Note** first users have to go to the Dynamic DNS registration service provider to register an account.

User **test** register two Dynamic Domain Names in DDNS provider <http://www.dyndns.org/> .

1. pppoe_0_8_35 with DDNS: www.hometest.com using username/password test/test

Advanced Setup

Dynamic DNS

Parameters

Dynamic DNS Server: www.dyndns.org (custom)

Host Name: www.hometest.com

Username: test

Password: ●●●●

Period: 25 Day(s)

Selected WAN Interface: pppoe_0_8_35/ppp0.1

Available WAN Interfaces: ipoe_eth4/eth4.1, 3G0/USB3G0

Select DDNS Server Interface from available WAN interfaces.
DDNS Server interface can have multiple WAN interfaces served as system DDNS server but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected.

Apply

Advanced Setup

Dynamic DNS

Parameters

Host Name	Username	Service	Interface	Remove	Edit
www.hometest.com	test	dyndns-custom	ppp0.1	<input type="checkbox"/>	Edit

Add Remove

2. ipoe_eth4 with DDNS: www.hometest1.com using username/password test/test.

Advanced Setup

Dynamic DNS

Parameters

Dynamic DNS Server: www.dyndns.org (custom)

Host Name: www.hometest1.com

Username: test

Password: ●●●●

Period: 25 Day(s)

Selected WAN Interface: ipoe_eth4/eth4.1

Available WAN Interfaces: pppoe_0_8_35/ppp0.1, 3G0/USB3G0

Select DDNS Server Interface from available WAN interfaces.
DDNS Server interface can have multiple WAN interfaces served as system DDNS server but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected.

Apply

Advanced Setup

Dynamic DNS

Host Name	Username	Service	Interface	Remove	Edit
www.hometest.com	test	dyndns-custom	ppp0.1	<input type="checkbox"/>	Edit
www.hometest1.com	test	dyndns-custom	eth4.1	<input type="checkbox"/>	Edit

Add Remove

DNS Proxy

DNS proxy is used to forward request and response message between DNS Client and DNS Server. Hosts in LAN can use router serving as a DNS proxy to connect to the DNS Server in public to correctly resolve Domain name to access the internet.



The screenshot shows a configuration window titled "Advanced Setup" with a sub-section for "DNS Proxy". Under "Parameters", there are three fields: "DNS Proxy" with radio buttons for "Enable" (selected) and "Disable"; "Host name of the Broadband Router" with a text box containing "home.gateway"; and "Domain name of the LAN network" with a text box containing "home.gateway". At the bottom are "Apply" and "Cancel" buttons.

DNS Proxy: Select whether to enable or disable DNS Proxy function, default is enabled.

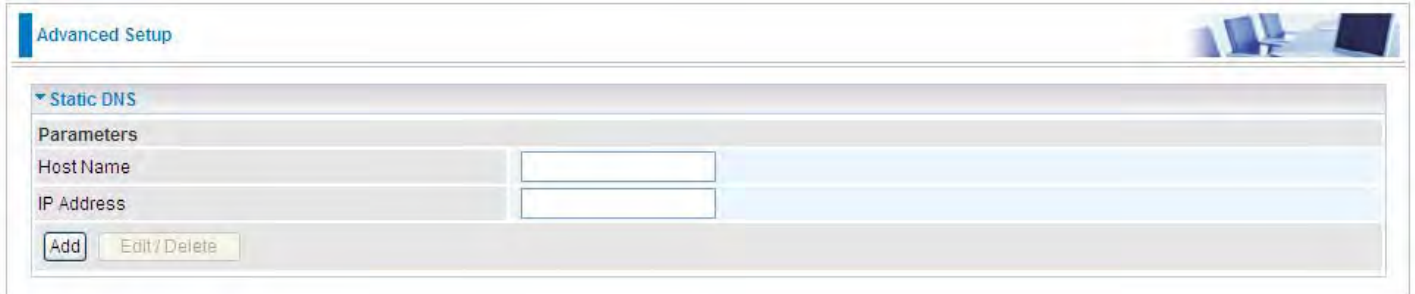
Host name of the Broadband Router: Enter the host name of the router. Default is home.gateway.

Domain name of the LAN network: Enter the domain name of the LAN network. home.gateway.

Static DNS

Static DNS is a concept relative to Dynamic DNS; in static DNS system, the IP mapped is static without change.

You can map the specific IP to a user-friendly domain name. In LAN, you can map a PC to a domain name for convenient access. Or you can set some well-known Internet IP mapping item so your router will response quickly for your DNS query instead of querying from the ISP's DNS server.



The screenshot shows a web interface for 'Advanced Setup'. Under the 'Static DNS' section, there is a 'Parameters' table with two rows: 'Host Name' and 'IP Address', each with an empty text input field. Below the table are two buttons: 'Add' and 'Edit/Delete'.

Parameters	
Host Name	<input type="text"/>
IP Address	<input type="text"/>


Host Name: Type the domain name (host name) for the specific IP .

IP Address: Type the IP address bound to the set host name above.

Click **Add** to save your settings.

Static ARP

ARP (Address Resolution Protocol) is a TCP/IP protocol that allows the resolution of network layer addresses into the link layer addresses. And “Static ARP” here allows user to map manually the layer-3 MAC (Media Access Control) address to the layer-2 IP address of the device.



The screenshot shows a web-based configuration interface for Static ARP. At the top, there is a tab labeled "Advanced Setup". Below it, a section titled "Static ARP" is expanded. Under the "Parameters" heading, there are two input fields: "IP Address" and "MAC Address". Below these fields are two buttons: "Add" and "Edit / Delete".

IP Address: Enter the IP of the device that the corresponding MAC address will be mapped to.

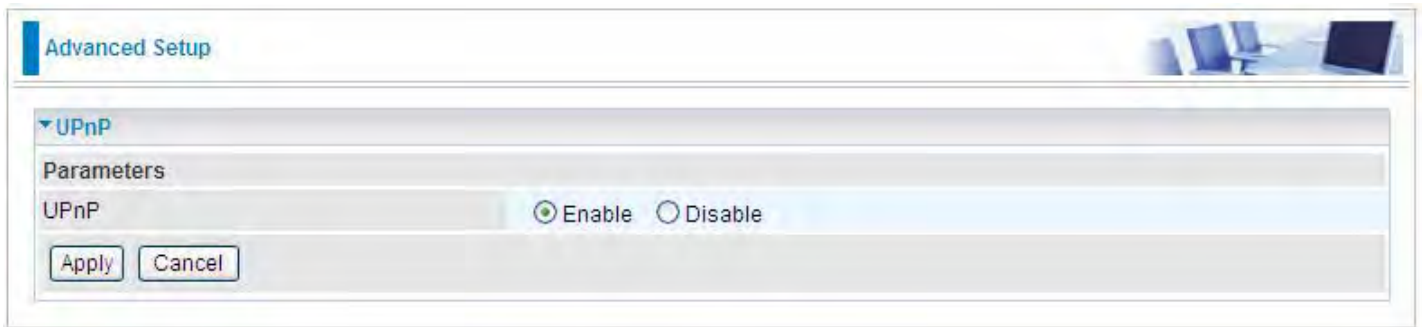
MAC Address: Enter the MAC address that corresponds to the IP address of the device.

Click **Add** to confirm the settings.

UPnP

UPnP offers peer-to-peer network connectivity for PCs and other network devices, along with control and data transfer between devices. UPnP offers many advantages for users running NAT routers through UPnP NAT Traversal, and on supported systems makes tasks such as port forwarding much easier by letting the application control the required settings, removing the need for the user to control advanced configuration of their device.

Both the user's Operating System and the relevant application must support UPnP in addition to the router. Windows XP and Windows Me natively support UPnP (when the component is installed), and Windows 98 users may install the Internet Connection Sharing client from Windows XP in order to support UPnP. Windows 2000 does not support UPnP.



UPnP:

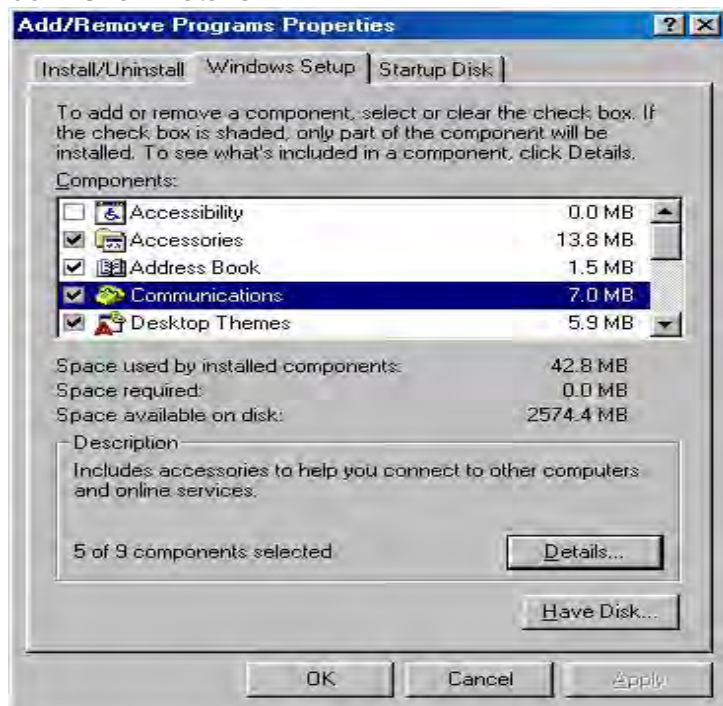
- ① **Enable:** Check to enable the router's UPnP functionality.
- ① **Disable:** Check to disable the router's UPnP functionality.

Installing UPnP in Windows Example

Follow the steps below to install the UPnP in Windows Me.

Step 1: Click Start and Control Panel. Double-click Add/Remove Programs.

Step 2: Click on the Windows Setup tab and select Communication in the Components selection box. Click Details.



Step 3: In the Communications window, select the Universal Plug and Play check box in the Components selection box.



Step 4: Click OK to go back to the Add/Remove Programs Properties window. Click Next.

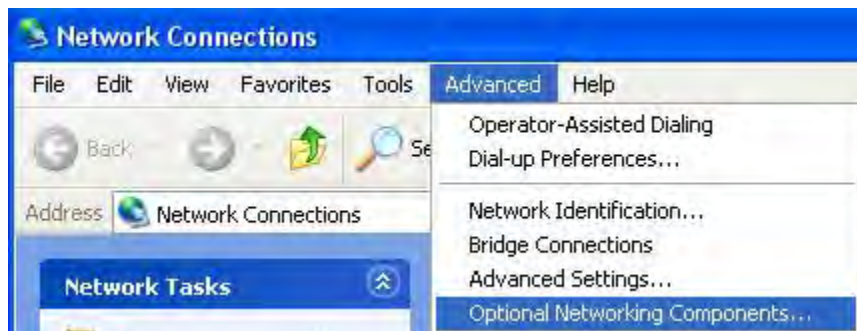
Step 5: Restart the computer when prompted.

Follow the steps below to install the UPnP in Windows XP.

Step 1: Click Start and Control Panel.

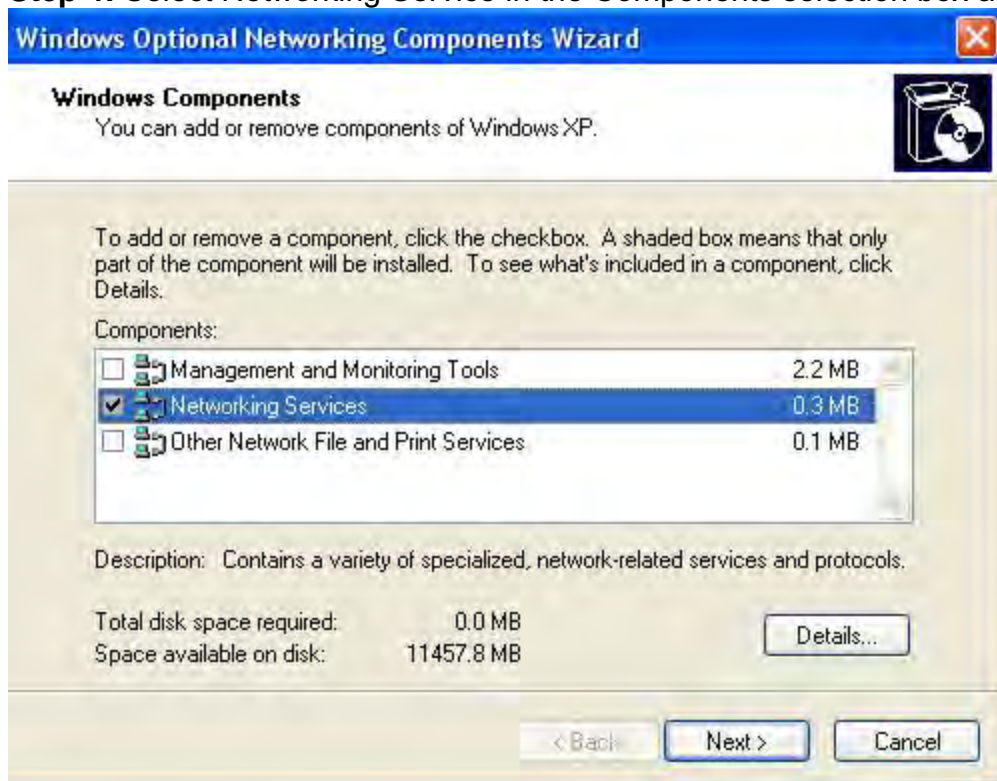
Step 2: Double-click Network Connections.

Step 3: In the Network Connections window, click Advanced in the main menu and select Optional Networking Components



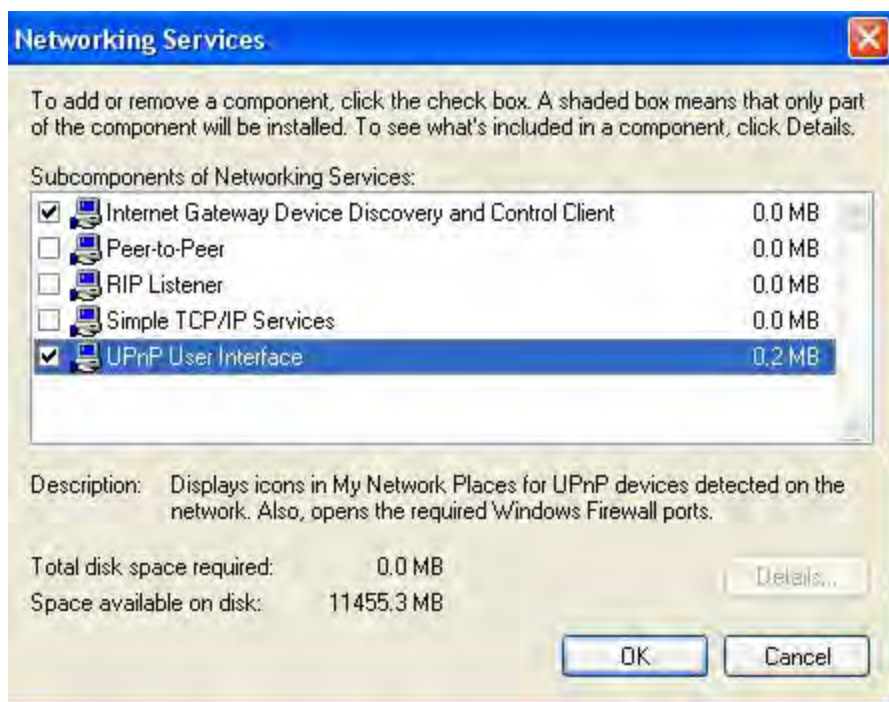
The Windows Optional Networking Components Wizard window displays.

Step 4: Select Networking Service in the Components selection box and click Details.



Step 5: In the Networking Services window, select the Universal Plug and Play check box.

Step 6: Click **OK** to go back to the Windows Optional Networking Component Wizard window and click **Next**.



Auto-discover Your UPnP-enabled Network Device

Step 1: Click start and Control Panel. Double-click Network Connections. An icon displays under Internet Gateway.

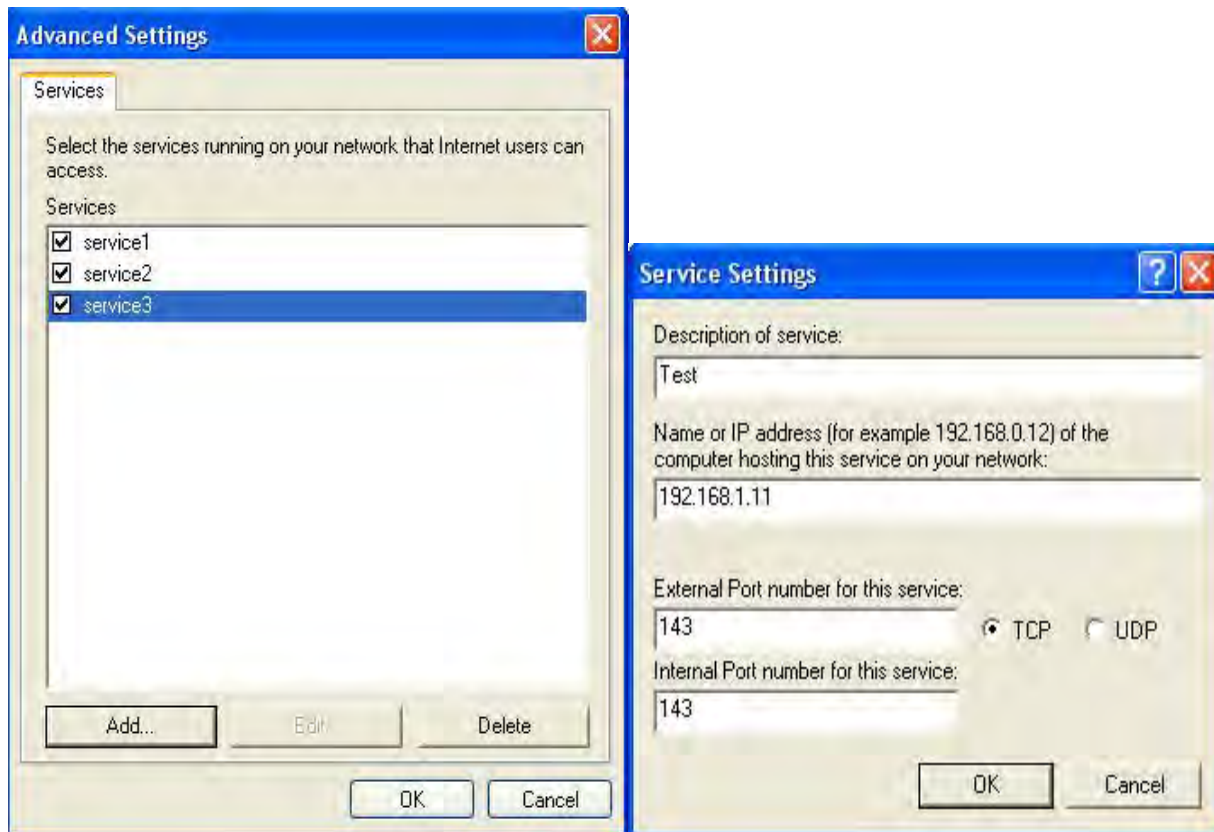
Step 2: Right-click the icon and select Properties.



Step 3: In the Internet Connection Properties window, click Settings to see the port mappings that were automatically created.

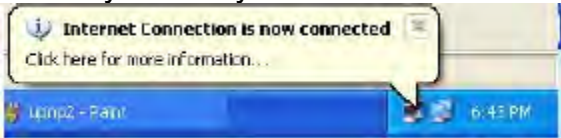


Step 4: You may edit or delete the port mappings or click Add to manually add port mappings.



Step 5: Select Show icon in notification area when connected option and click OK. An icon displays

in the system tray



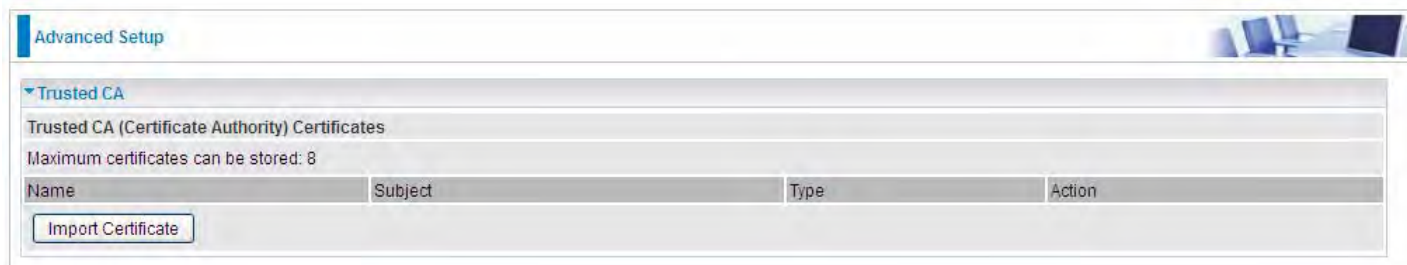
Step 6: Double-click on the icon to display your current Internet connection status.



Certificate

This feature is used for TR069 ACS Server authentication of the device using certificate, if necessary. If the imported certificate does not match the authorized certificate of the ACS Server, the device will have no access to the server.

Trusted CA



Certificate Name: The certificate identification name.

Subject: The certificate subject.

Type: The certificate type information. "ca", indicates that the certificate is a CA-signed certificate. "self", indicates that the certificate is a certificate owner signed one.

"x.509", indicates the certificate is the one created and signed according to the definition of Public-Key System suggested by x.509.

Action:

- View: view the certificate.
- Remove: remove the certificate.

Click **Import Certificate** button to import your certificate.

Advanced Setup

Trusted CA -- Import CA certificate

Parameters

Name

Certificate

```
-----BEGIN CERTIFICATE-----
<insert certificate here>
-----END CERTIFICATE-----
```

Apply

Enter the certificate name and insert the certificate.

Advanced Setup

Trusted CA -- Import CA certificate

Parameters

Name

Certificate

```
-----BEGIN CERTIFICATE-----
MIICjDCCAFWgAwIBAgIEOUSLuTANBgkqhkiG9w0BAQUFADAmMQswCQYDVQQQ
GEwJD
TjEXMBUGA1UEChMOQ0ZDQSBQb2xpY3kgQ0EwHhcNMDAwNjEyMDc0OTUyWhc
NMjAw
NjEyMDQzNzA2WjApMQswCQYDVQQGEwJDTjEaMBGGA1UEChMRQ0ZDQSBPcGV
yYXRp
b24gQ0EwgZSwDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBANesUKqN1sWtSpN
ZuTJD
rSwXGjaexPnBis5zNJc70SPQYGvhn3Qv9+vIuU2jYFzF8qiDYPQBv7hFjI/
Uu9be
pUJBenxvYRgTImUfJOPEy+SsRUpcDAPxTWNp4Efv8QEnMOJGEHAOtLHDY73
/se+H
jB7Wh9HhzCTF5QqZRL3o2ILXAgMBAAGjgcMwgcAwSAYDVROfBEEwPzA9oDu
gOaQ3
MDUxCzAJBgNVBAYTAKNOMRcwFQYDVQQKEw5DRkNBIFBvbG1jeSBBDQENMAg
GA1UE
AxMEQ1JMMTALBgNVHQ8EBAMCAQYwHwYDVROjBBgwFoAUL5Jufe7tBb/wveS
FaAqX
k1NCotAwHQYDVROBBYEFMMnxjZoyCdlJIEvkdLJjMC5RrpMAwGA1UdEwQ
```

Apply

Click Apply to confirm your settings.

Advanced Setup

Trusted CA

Trusted CA (Certificate Authority) Certificates

Maximum certificates can be stored: 8

Name	Subject	Type	Action
acscert	C=CN/O=CFCA Operation CA	ca	<input type="button" value="View"/> <input type="button" value="Remove"/>

Multicast

Multicast is one of the three network transmission modes, Unicast, Multicast, Broadcast. It is a transmission mode that supports point-to-multipoint connections between the sender and the recipient. IGMP protocol is used to establish and maintain the relationship between IP host and the host directly connected multicast router.

IGMP stands for **Internet Group Management Protocol**, it is a communications protocols used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and the adjacent multicast routers to establish multicast group members. There are three versions for IGMP, that is IGMPv1, IGMPv2 and IGMPv3.

MLD, short for **Multicast Listener Discovery** protocol, is a component if the Internet Protocol version 6(IPv6) suite. MLD is used by IPv6 to discover multicast listeners on a directly attached link, much as IGMP used in IPv4. The protocol is embedded in ICMPv6 instead of using a separate protocol. MLDv1 is similar to IGMPv2 and MLDv2 is similar to IGMPv3.

Advanced Setup

▼ Multicast

Multicast Precedence: lower value, higher priority

Multicast Strict Grouping Enforcement:

IGMP

Default Version: [1-3]

Query Interval:

Query Response Interval:

Last Member Query Interval:

Robustness Value:

Maximum Multicast Groups:

Maximum Multicast Data Sources (for IGMPv3): [1-24]

Maximum Multicast Group Members:

Fast Leave: Enable

IGMP Group Exception List

Group Address	Subnet Mask	Remove
224.0.0.0	255.255.255.0	
239.255.255.250	255.255.255.255	<input type="checkbox"/>
224.0.255.135	255.255.255.255	<input type="checkbox"/>
<input type="text"/>	<input type="text"/>	<input type="button" value="Add"/>

MLD

Default Version: [1-2]

Query Interval:

Query Response Interval:

Last Member Query Interval:

Robustness Value:

Maximum Multicast Groups:

Maximum Multicast Data Sources (for MLDv2): [1-24]

Maximum Multicast Group Members:

Fast Leave: Enable

MLD Group Exception List

Group Address	Subnet Mask	Remove
ff01::0000	ffff::0000	
ff02::0000	ffff::0000	
ff05::0001:0003	ffff.ffff.ffff.ffff.ffff.ffff	<input type="checkbox"/>
<input type="text"/>	<input type="text"/>	<input type="button" value="Add"/>

IGMP

Multicast Precedence: It is for multicast QoS. With lower multicast precedence, IGMP packets will be put into higher-priority queue. Default is set to disable.

Default Version: Enter the supported IGMP version, 1-3, default is IGMP v3.

Query Interval: Enter the periodic query interval time (sec) the multicast router sending the query message to hosts to understand the group membership information.

Query Response Interval: Enter the response interval time (sec).

Last Member Query Interval: Enter the interval time (sec) the multicast router query the specified group after it has received leave message.

Robustness Value: Enter the router robustness parameter, 2-7, the greater the robustness value, the more robust the Querier is.

Maximum Multicast Groups: Enter the Maximum Multicast Groups.

Maximum Multicast Data Sources(for IGMP v3): Enter the Maximum Multicast Data Sources,1-24.

Maximum Multicast Group Members: Enter the Maximum Multicast Group Members.

Fast leave: Check to determine whether to support fast leave. If this value is enabled, IGMP proxy removes the membership of a group member immediately without sending an IGMP membership query on downstream. This is very helpful if user wants fast channel (group change) changing in cases like IPTV environment.

IGMP Exception List

The multicast group(s) listed in the IGMP exception list will not be subject to IGMP snooping.

Here the pair of group address and the subnet mask indicates a multicast group range, and 224.0.1.0/255.255.255.0 is a multicast group range of 224.0.1.0 - 224.0.1.255.

Group Address: Set the exception multicast group address.

Subnet Mask: Set the multicast subnet mask

Remove: Select the group which is to be removed.

MLD

Default Version: Enter the supported MLD version, 1-2, default is MLDv2.

Query Interval: Enter the periodic query interval time (sec) the multicast router sending the query message to hosts to understand the group membership information.

Query Response Interval: Enter the response interval time (sec).

Last Member Query Interval: Enter the interval time (sec) the multicast router query the specified group after it has received leave message.

Robustness Value: Enter the router robustness parameter, default is 2, the greater the robustness value, the more robust the Querier is.

Maximum Multicast Groups: Enter the Maximum Multicast Groups.

Maximum Multicast Data Sources(for MLDv2): Enter the Maximum Multicast Data Sources,1-24.

Maximum Multicast Group Members: Enter the Maximum Multicast Group Members.

Fast leave: Check to determine whether to support fast leave. If this value is enabled, MLD proxy removes the membership of a group member immediately without sending an MLD membership query on downstream. This is very helpful if user wants fast channel (group change) changing in cases like IPTV environment.

MLD Exception List

The multicast group(s) listed in the MLD exception list will not be subject to MLD snooping.

Group Address: Set the exception multicast group address.

Subnet Mask: Set the multicast subnet mask

Remove: Select the group which is to be removed.

Management

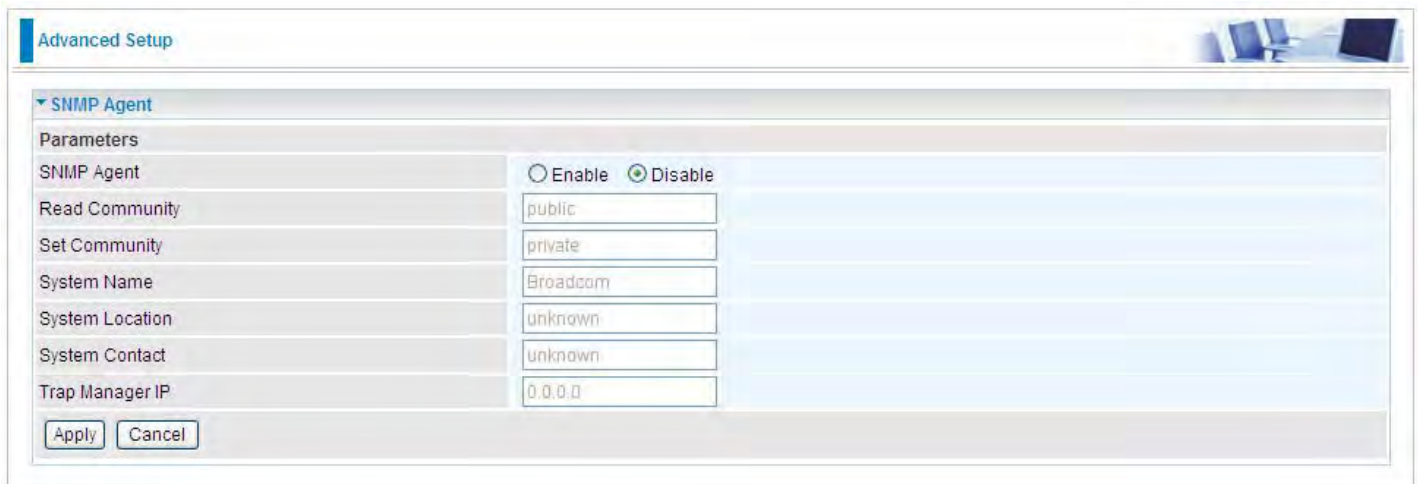
SNMP Agent

SNMP, Simple Network Management Protocol, is the most popular one in network. It consists of SNMP Manager, SNMP Agent and MIB. Every network device supporting SNMP will have a SNMP Agent which is a management software running in the device.

SNMP Manager, the management software running on the server, it uses SNMP protocol to send GetRequest, GetNextRequest, SetRequest message to Agent to view and change the information of the device.

SNMP Agents, the management software running in the device, accepts the message from the manager, Reads or Writes the management variable in MIB accordingly and then generates Response message to send it to the manager. Also, agent will send Trap message to the manager when agent finds some exceptions.

Trap message, is the message automatically sent by the managed device without request to the manager about the emergency events.



The screenshot shows the 'Advanced Setup' page for the 'SNMP Agent' configuration. The page has a header 'Advanced Setup' and a sub-header 'SNMP Agent'. Below the sub-header is a 'Parameters' section with the following fields:

Parameter	Value
SNMP Agent	<input type="radio"/> Enable <input checked="" type="radio"/> Disable
Read Community	public
Set Community	private
System Name	Broadcom
System Location	unknown
System Contact	unknown
Trap Manager IP	0.0.0.0

At the bottom of the form are 'Apply' and 'Cancel' buttons.

SNMP Agent: enable or disable SNMP Agent.

Read Community: Type the Get Community, which is the authentication for the incoming Get-and GetNext requests from the management station.

Set Community: Type the Set Community, which is the authentication for incoming Set requests from the management station.

System Name: here it refers to your router.

System Location: user-defined location.

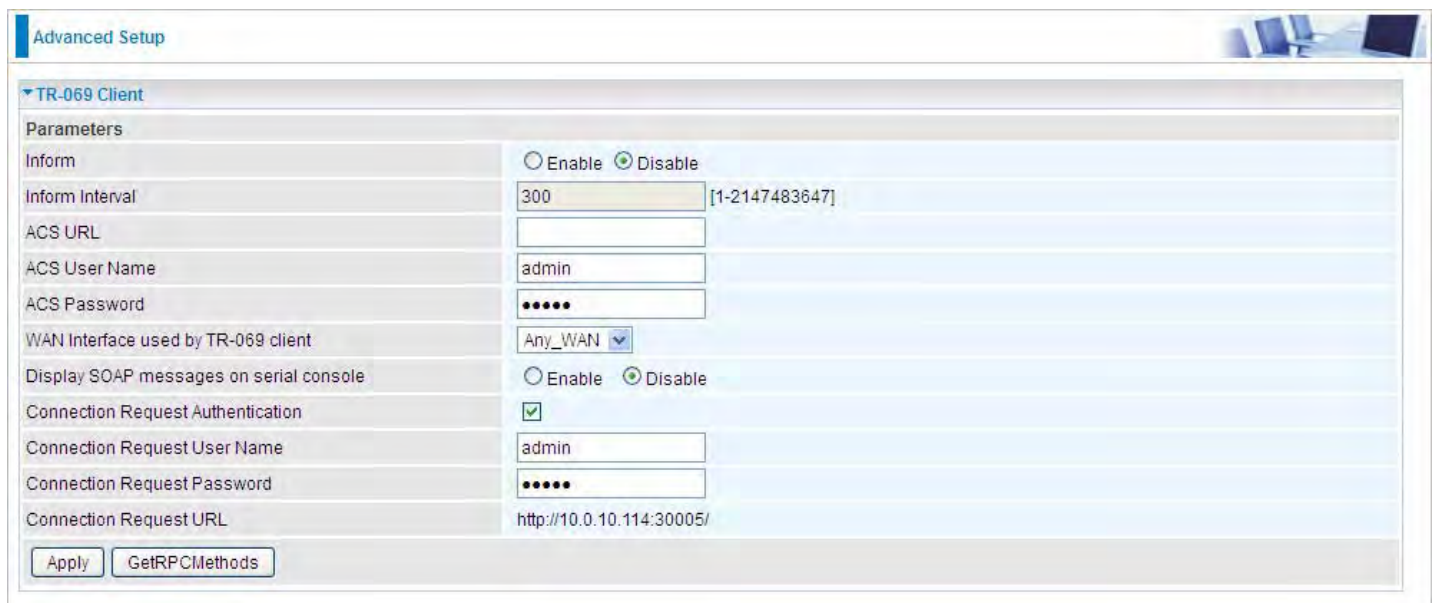
System Contact: user-defined contact message.

Trap manager IP: enter the IP address of the server receiving the trap sent by SNMP agent.

TR- 069 Client

TR-069 (short for Technical Report 069) is a DSL Forum (which was later renamed as Broadband Forum) technical specification entitled CPE WAN Management Protocol (CWMP). It defines an application layer protocol for remote management of end-user devices.

As a bidirectional SOAP/HTTP based protocol it can provides the communication between customer premises equipment (CPE) and Auto Configuration Server (ACS). It includes both a safe configuration and the control of other CPE management functions within an integrated framework. In the course of the booming broadband market, the number of different internet access possibilities grew as well (e.g. modems, routers, gateways, set-top box, VoIP-phones).At the same time the configuration of this equipment became more complicated –too complicated for end-users. For this reason, TR-069 was developed. It provides the possibility of auto configuration of the access types. Using TR-069 the terminals can get in contact with the Auto Configuration Servers (ACS) and establish the configuration automatically and let ACS configure CPE automatically.



The screenshot shows the 'Advanced Setup' page for the 'TR-069 Client'. The page is titled 'Advanced Setup' and has a sub-section 'TR-069 Client'. Under 'Parameters', there are several fields and options:

- Inform:** Radio buttons for 'Enable' and 'Disable' (selected).
- Inform Interval:** Text input field with '300' and a range indicator '[1-2147483647]'.
- ACS URL:** Empty text input field.
- ACS User Name:** Text input field with 'admin'.
- ACS Password:** Password input field with masked characters '•••••'.
- WAN Interface used by TR-069 client:** Dropdown menu with 'Any_WAN' selected.
- Display SOAP messages on serial console:** Radio buttons for 'Enable' and 'Disable' (selected).
- Connection Request Authentication:** Checkmark box (checked).
- Connection Request User Name:** Text input field with 'admin'.
- Connection Request Password:** Password input field with masked characters '•••••'.
- Connection Request URL:** Text input field with 'http://10.0.10.114:30005/'.

At the bottom of the form, there are two buttons: 'Apply' and 'GetRPCMethods'.

Inform: select enable to let CPE be authorized to send Inform message to automatically connect to ACS.

Inform Interval: Specify the inform interval time (sec) which CPE used to periodically send inform message to automatically connect to ACS. When the inform interval time arrives, the CPE will send inform message to automatically connect to ACS.

ACS URL: Enter the ACS server login name.

ACS User Name: Specify the ACS User Name for ACS authentication to the connection from CPE.

ACS password: Enter the ACS server login password.

WAN interface used by TR-069: select the interface used by TR-069.

Display SOAP message on serial console: select whether to display SOAP message on serial console.

Connection Request Authentication: Check to enable connection request authentication feature.

Connection Request User Name: Enter the username for ACS server to make connection request.

Connection Request User Password: Enter the password for ACS server to make connection request.

Connection Request URL: Automatically match the URL for ACS server to make connection request.

GetRPCMethods: Supported by both CPE and ACS, display the supported RFC listing methods.

Click **Apply** to apply your settings.

HTTP Port

The device equips user to change the embedded web server accessing port. Default is 80.



The screenshot shows a web-based configuration interface titled "Advanced Setup". Under the "HTTP Port" section, there is a "Parameters" area. The "HTTP Port" parameter is set to "80" in a text input field, with "(Default: 80)" displayed to its right. Below the input field are two buttons: "Apply" and "Cancel".

Remote Access

It is to allow remote access to the router to view or configure.

The screenshot shows the 'Advanced Setup' page for 'Remote Access'. Under the 'Parameters' section, 'Remote Access' is checked 'Enable'. Under 'Enable Service', 'HTTP' is checked, while 'SSH', 'FTP', 'TELNET', and 'SNMP' are unchecked. An 'Apply' button is present. Below, the 'Allowed Access IP Address Range' section has 'Valid' checked. The 'IP Version' is set to 'IPv4', and there are two empty text boxes for the IP address range, separated by a tilde (~). 'Add' and 'Edit / Delete' buttons are at the bottom.

Remote Access: Select “Enable” to allow management access from remote side (mostly from internet). If disabled, no remote access is allowed for any IPs even if you set allowed access IP address. So, please note that enabling remote access is an essential step before granting remote access to IPs.

Enable Service: Select to determine which service(s) is (are) allowed for remote access when remote access is enabled. By default (on condition that remote access is enabled), the web service (HTTP) is allowed for remote access.

Click **Apply** button to submit your settings.

"**Allowed Access IP Address Range**" was used to restrict which IP address could login to access system web GUI.

Valid: Enable/Disable Allowed Access IP Address Range

IP Address Range: Specify the IP address Range, IPv4 and IPv6 address range can be supported, users can set IPv4 and IPv6 address range individually.

Click **Add** to add an IP Range to allow remote access.

Note: 1. If user wants to grant remote access to IPs, first enable **Remote Access**.

2. Remote Access enabled:

- 1) Enable **Valid** for the specific IP(s) in the IP range to allow the specific IP(s) to remote access the router.
- 2) Disable **Valid** for all specific IP(s) in the IP range to allow any IP(s) to remote access the router.
- 3) No listing of IP range is to allow any IP(s) to remote access the router.

Power Management

Power management is a feature of some electrical appliances, especially computers that turn off the power or switch to a low-power state when inactive.

Five main parameters are listed for users to check to manage the performance of the router.



Advanced Setup

Power Management

Parameters

Parameter	Enable	Status	Value
MIPS CPU Clock divider when Idle	<input checked="" type="checkbox"/> Enable	Status	Enabled
Wait instruction when Idle	<input checked="" type="checkbox"/> Enable	Status	Enabled
DRAM Self Refresh	<input checked="" type="checkbox"/> Enable	Status	Enabled
Energy Efficient Ethernet	<input checked="" type="checkbox"/> Enable	Status	Enabled
Ethernet Auto Power Down and Sleep	<input checked="" type="checkbox"/> Enable	Status	Enabled
Adaptive Voltage Scaling	<input checked="" type="checkbox"/> Enable	Status	Enabled

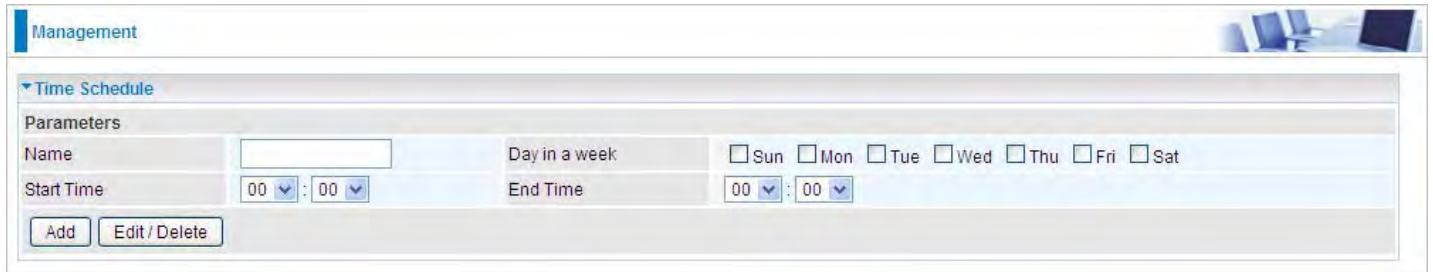
Number of ethernet interfaces in:
Powered up: 1
Powered down: 4

Apply Refresh

Time Schedule

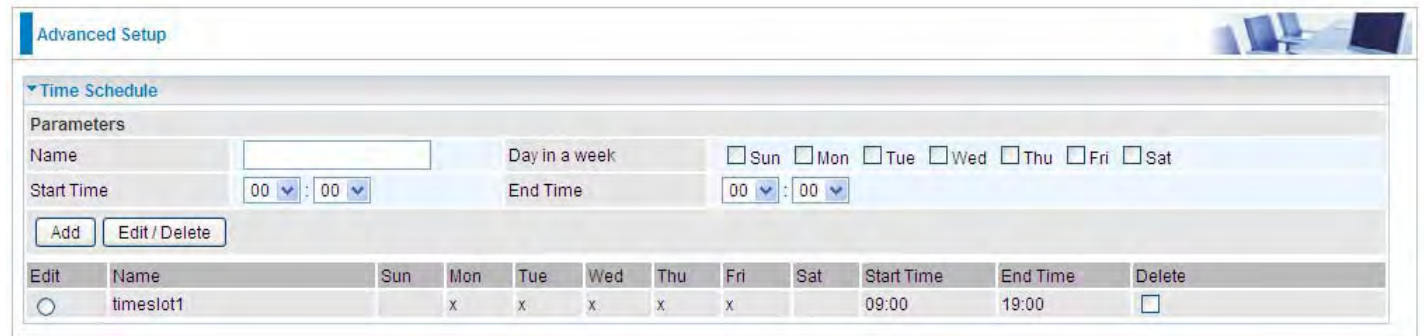
The Time Schedule supports up to **32** timeslots which helps you to manage your Internet connection. In each time profile, you may schedule specific day(s) i.e. Monday through Sunday to restrict or allowing the usage of the Internet by users or applications.

This Time Schedule correlates closely with router's time, since router does not have a real time clock on board; it uses the Simple Network Time Protocol (SNTP) to get the current time from an SNTP server from the Internet. Refer to [Internet Time](#) for details. Your router time should synchronize with NTP server.



The screenshot shows the 'Management' page with a 'Time Schedule' section. It includes a 'Parameters' form with fields for 'Name', 'Day in a week' (checkboxes for Sun-Sat), 'Start Time', and 'End Time'. There are 'Add' and 'Edit / Delete' buttons below the form.

For example, user can add a timeslot named "timeslot1" features a period of 9:00-19:00 on every weekday.



The screenshot shows the 'Advanced Setup' page with a 'Time Schedule' section. It includes a 'Parameters' form and a table of existing timeslots. The table has columns for 'Edit', 'Name', 'Sun', 'Mon', 'Tue', 'Wed', 'Thu', 'Fri', 'Sat', 'Start Time', 'End Time', and 'Delete'.

Edit	Name	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Start Time	End Time	Delete
<input type="radio"/>	timeslot1		x	x	x	x	x		09:00	19:00	<input type="checkbox"/>

Auto Reboot

Auto reboot offers flexible rebooting service (reboot with the current configuration) of router for users in line with scheduled timetable settings.

Advanced Setup

Auto Reboot

Parameters

Schedule

1. Enable Sun Mon Tue Wed Thu Fri Sat Time 00 : 00

2. Enable Sun Mon Tue Wed Thu Fri Sat Time 00 : 00

Apply

Enable to set the time schedule for rebooting.

For example, the router is scheduled to reboot at 22:00 every single weekday, and to reboot at 9:00 on Saturday and Sunday. You can set as follows:

Advanced Setup

Auto Reboot

Parameters

Schedule

1. Enable Sun Mon Tue Wed Thu Fri Sat Time 22 : 00

2. Enable Sun Mon Tue Wed Thu Fri Sat Time 09 : 00

Apply

Diagnostics

Diagnostics Tools

BiPAC 8700AX-1600 offers diagnostics tools including “Ping” and “Trace route test” tools to check for problems associated with network connections.

The screenshot shows the 'Advanced Setup' interface for the BiPAC 8700AX-1600. Under the 'Diagnostics Tools' section, there are two main test configurations:

- Ping Test:** Includes fields for 'Destination Host', 'Source Address' (with radio buttons for 'Interface' and 'IP Address'), and a 'Ping Test' button.
- Trace route Test:** Includes fields for 'Destination Host', 'Source Address' (with radio buttons for 'Interface' and 'IP Address'), 'Max TTL value' (set to 16, range [2-30]), and 'Wait time' (set to 3, range [2-999] seconds), along with a 'Trace route Test' button.

Ping Test: to verify the connectivity between source and destination.

Destination Host: Enter the destination host (IP, domain name) to be checked for connectivity.

Source Address: Select or set the source address to test the connectivity from the source to the destination.

Ping Test: Press this button to proceed ping test.

Trace route Test: to trace the route to see how many hops (also see the exact hops) the packet of data has to take to get to the destination.

Destination Host: Set the destination host (IP, domain name) to be traced.

Source Address: Select or set the source address to trace the route from the source to the destination.

Max TTL value: Set the max Time to live (TTL) value.

Wait time: Set waiting time for each response in seconds.

Example: Ping www.google.com

Advanced Setup

Diagnostics Tools

Ping Test

Destination Host:

Source Address: Interface IP Address

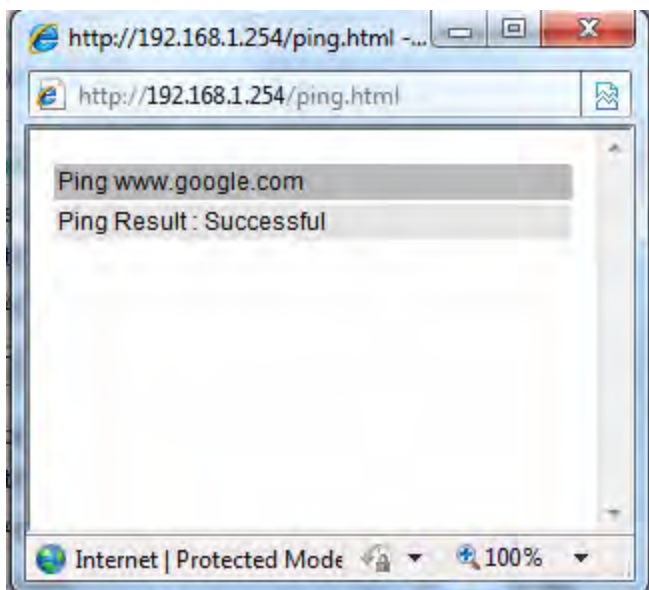
Trace route Test

Destination Host:

Source Address: Interface IP Address

Max TTL value: [2-30]

Wait time: seconds [2-999]



Example: “trace” www.google.com

Advanced Setup

▼ Diagnostics Tools

Ping Test

Destination Host:

Source Address: Interface IP Address

Trace route Test

Destination Host:

Source Address: Interface IP Address

Max TTL value: [2-30]

Wait time: seconds [2-999]

http://192.168.1.254/tracert.html - Windows Intern...

http://192.168.1.254/tracert.html

Trace www.google.com

No.	Route Address	Time
1	112.86.208.1	22.229 ms
2	221.6.9.93	20.352 ms
3	221.6.2.169	24.345 ms
4	219.158.24.41	52.837 ms
5	219.158.23.18	54.696 ms
6	219.158.19.190	54.904 ms
7	219.158.3.238	57.824 ms
8	72.14.215.130	58.851 ms
9	209.85.248.60	57.644 ms
10	209.85.250.122	81.242 ms
11	209.85.250.103	81.351 ms
12	*	**
13	173.194.72.147	79.753 ms

Push Service

With push service, the system can send email messages with consumption data and system information.




The screenshot shows a web interface for 'Advanced Setup'. Under the 'Push Service' section, there is a 'Parameters' area. It contains a text input field labeled 'Recipient's E-mail' with a placeholder '(Must be xxx@yyy.zzz)'. Below the input field is a button labeled 'Push Now'.

Recipient's E-mail: Enter the destination mail address. The email is used to receive **system log** , **system configuration**, **security log** sent by the device when the **Push Now** button is pressed (information sent only when pressing the button), but the mail address is not remembered.

Note: Please first set correct the SMTP server parameters in [Mail Alert](#).

Diagnostics

Check the connections, including Ethernet connection, Internet Connection and wireless connection. Click **Help** link that can lead you to the interpretation of the results and the possible, simply troubleshooting.

Advanced Setup 

▼ Test the connection to your local network --- pppoe_0_8_35

Test LAN Connection (P3)	FAIL	Help
Test LAN Connection (P2)	FAIL	Help
Test LAN Connection (P1)	FAIL	Help
Test LAN Connection (P4)	FAIL	Help
Test your Wireless Connection	PASSPASS	Help

▼ Test the connection to your DSL service provider

Test xDSL Synchronization	FAIL	Help
Test ATM OAM F5 segment ping	DISABLED	Help
Test ATM OAM F5 end-to-end ping	DISABLED	Help

▼ Test the connection to your Internet service provider

Test PPP server connection	FAILFAIL	Help
Test authentication with ISP	FAILFAIL	Help
Test the assigned IP address	FAILFAIL	Help
Ping default gateway	PASS	Help
Ping primary Domain Name Server	PASS	Help

Ethernet OAM

8700AX-1600 offers industry standard OAM capabilities to enable network providers to provision and operate their networks with full visibility and control, simply and efficiently to minimize ongoing OPEX.

Both peers should be Ethernet-OAM-enabled.

There are two phases of how Ethernet OAM is usually realized:

- 1.) **Ethernet Link OAM:** Ethernet in the First Mile (EFM) Link OAM as defined in IEEE 802.3ah, Designed for testing and maintaining access links between EFM-OAM-enabled devices on L2. It includes a set of discovery, link monitoring, remote failure detection and remote loop-back protocols.
- 2). **Ethernet Service OAM (802.1ag/Y1.1731):** designed to detect and isolate connectivity faults within the customer service path and ensure a health service end to end.

802/1ag/CFM enable Ethernet services to be partitioned into maintenance domains with maintenance endpoints (MEP) and intermediate points (MIP) across which continuity check, link trace and loopback tests can be performed as needed to validate connection integrity.

Y1.1731 extends beyond CFM (802.1ag) to support performance monitoring and testing of key Ethernet service attributes including frame loss, frame delay, and frame delay variation, which are necessary for ensuring conformance to SLAs and verifying end to end service quality.



The screenshot shows a web-based configuration interface titled "Advanced Setup". Under the "Ethernet OAM" section, there are two main parameters:

- Ethernet Link OAM (802.3ah):** A checkbox labeled "Enable" is currently unchecked.
- Ethernet Service OAM (802.1ag / Y.1731):** A checkbox labeled "Enable" is checked. Below it, there are two radio buttons: "802.1ag" (which is selected) and "Y.1731".

At the bottom of the configuration area, there are three buttons: "Apply", "Send Loopback", and "Send Linktrace".


Ethernet Link OAM(802.3ah): Enable to activate Ethernet in the First Mile (EFM) Link OAM to do link fault management.

Ethernet Service OAM (802.1ag/Y1.1731): Enable to activate Ethernet Service OAM check mechanism, including connectivity fault management and performance monitoring..

Linktrace: Operators trigger linktrace protocol to perform path discovery and fault isolation in their networks. Link Trace messages otherwise known as Mac Trace Route are Multicast frames that a MEP transmits to track the path (hop-by-hop) to a destination MEP which is similar in concept to User Datagram Protocol (UDP) Trace Route. Each receiving MEP sends a Trace route Reply directly to the Originating MEP, and regenerates the Trace Route Message.

Loopback: Loopback protocol is used to verify and isolate connectivity faults. Loop-back messages otherwise known as Mac ping are Unicast frames that a MEP transmits, they are similar in concept to an Internet Control Message Protocol (ICMP) Echo (Ping) messages, sending Loop-back to successive MIPs can determine the location of a fault. Sending a high volume of Loop-back Messages can test bandwidth, reliability, or jitter of a service, which is similar to flood ping. A MEP can send a Loop-back to any MEP or MIP in the service. Unlike CCMs, Loop back messages are administratively initiated and stopped.

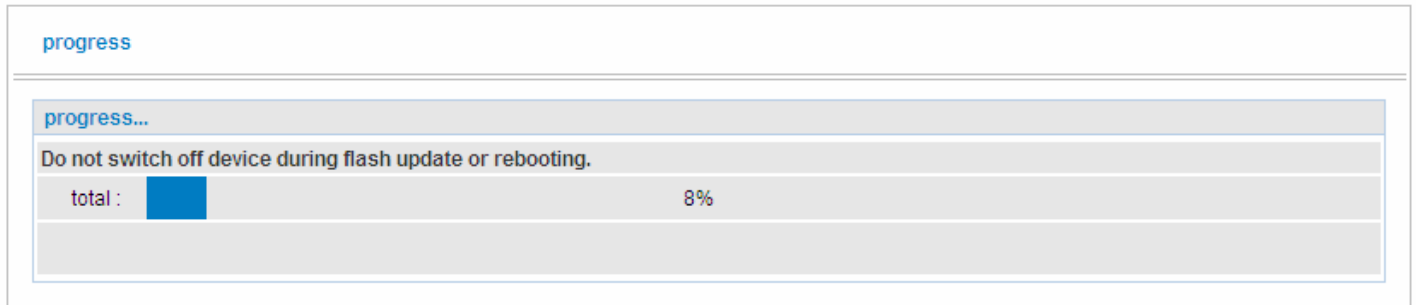
Restart

This section lets you restart your router if necessary. Click  **Restart** in the low right corner of each configuration page.



The screenshot shows a configuration page with a 'Configuration' header. Below it is a 'Restart' section. The text reads: 'After restarting, Please wait for several seconds to let the system come up.' Underneath, there are two radio button options: 'Factory Default Settings' and 'Current Settings'. The 'Current Settings' option is selected. A 'Restart' button is located at the bottom left of the section.

If you wish to restart the router using the factory default settings (for example, after a firmware upgrade or if you have saved an incorrect configuration), select Factory Default Settings to reset to factory default settings. Or you just want to restart after the current setting, the select the Current Settings, and Click Restart.



The screenshot shows a progress bar during a restart. The header is 'progress'. Below it, the text reads: 'progress... Do not switch off device during flash update or rebooting.' A progress bar is shown with the label 'total :', a blue bar representing 8% progress, and the text '8%' to the right.

Chapter 5: Troubleshooting

If your router is not functioning properly, please refer to the suggested solutions provided in this chapter. If your problems persist or the suggested solutions do not meet your needs, please kindly contact your service provider or Billion for support.

Problems with the router

Problem	Suggested Action
None of the LEDs is on when you turn on the router	Check the connection between the router and the adapter. If the problem persists, most likely it is due to the malfunction of your hardware. Please contact your service provider or Billion for technical support.
You have forgotten your login username or password	Try the default username "admin" and password "admin". If this fails, you can restore your router to its factory settings by pressing the reset button on the device rear side.

Problems with WAN interface

Problem	Suggested Action
Frequent loss of ADSL line sync (disconnections)	Ensure that all other devices connected to the same telephone line as your router (e.g. telephones, fax machines, analogue modems) have a line filter connected between them and the wall socket (unless you are using a Central Splitter or Central Filter installed by a qualified and licensed electrician), and ensure that all line filters are correctly installed and the right way around. Missing line filters or line filters installed the wrong way around can cause problems with your ADSL connection, including causing frequent disconnections. If you have a back-to-base alarm system you should contact your security provider for a technician to make any necessary changes.

Problem with LAN interface

Problem	Suggested Action
Cannot PING any PC on LAN	Check the Ethernet LEDs on the front panel. The LED should be on for the port that has a PC connected. If it does not lit, check to see if the cable between your router and the PC is properly connected. Make sure you have first uninstalled your firewall program before troubleshooting.
	Verify that the IP address and the subnet mask are consistent for both the router and the workstations.

Appendix: Product Support & Contact

If you come across any problems please contact the dealer from where you purchased your product.

Contact Billion

Worldwide:

<http://www.billion.com>

MAC OS is a registered Trademark of Apple Computer, Inc.

Windows XP, Windows Vista, Windows 7, Windows 8 and Windows 10 are registered Trademarks of Microsoft Corporation.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ♦ Reorient or relocate the receiving antenna.
- ♦ Increase the separation between the equipment and receiver.
- ♦ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ♦ Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference

(2) This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. . This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Co-location statement

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This equipment complies with ACTA TIA/EIA/IS-968-B-1 and Part 68 of the FCC rules and the requirements adopted by the ACTA. On the base of this equipment is a label that contains, among other information, a product identifier in the format US: B12DL01ABEC8700AXL. If requested, this number must be provided to the telephone company.

This equipment uses the following USOC jacks: RJ11C.

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant. See installation instructions for details.

The REN is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total REN, contact the local telephone company. The REN for this product is separately shown on the label and also part of the product identifier that has the format US: B12DL01ABEC8700AXL. The digits represented by ## are the REN without a decimal point (e.g., 03 is a REN of 0.3).

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required until the problem is resolved. But if advance notice is not practical, you will be notified

by the telephone company as soon as possible. You will be advised of your right to file a complaint with the FCC if you believe it is necessary. The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

The telephone company may ask that you disconnect this equipment from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning.

If you experience trouble with this equipment, or repair or warranty information, please contact the following address and phone number for information.

Billion Electric Co. Ltd.

8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 231, Taiwan

+886-2-29145665 ex.:221