D-Link DSR Series Router

User Manual

Part No.: TF1-DSR-1-0-0-UM-0002

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1. Introduction

The D-Link DSR series of routers are enterprise grade security gateway solutions with Firewall, VPN and in some cases 802.11n Access Point capabilities. These devices have wizards to allow for quick and easy configuration for internet access, VPN tunnels, and wireless networks. The GUI provides all the capabilities for novice and advanced users to administer this secure and feature rich router.

1.1 About this User Manual

This document is a high level manual to allow new D-Link DSR Series Router users to configure connectivity, setup VPN tunnels, establish firewall rules and perform general administrative tasks. Typical deployment and use case scenarios are described in each section. For more detailed setup instructions and explanations of each configuration parameter, refer to the online help that can be accessed from each page in the router GUI.

1.2 Typographical Conventions

The following is a list of the various terms, followed by an example of how that term is represented in this document:

- Product Name – D-Link DSR-1000 / DSR-1000N / DSR-500 / DSR-500N
- GUI Menu Path/GUI Navigation – ***Monitoring > Router Status***
- User input – Text
- Important note –

2. Configuring Your Network: LAN Setup

It is assumed that the user has a machine for management connected to the LAN to the router. The LAN connection may be through the wired Ethernet ports available on the router, or once the initial setup is complete, the device may also be managed through its wireless interface as it is bridged with the LAN. Access the router's graphical user interface (GUI) for management by using any web browser, such as Microsoft Internet Explorer or Mozilla Firefox:

- Go to **http://192.168.10.1** (default IP address) to display the router's management login screen.
- Default login credentials for the management GUI:
  - Username: **admin**
  - Password: **admin**

> If the router's LAN IP address was changed, use that IP address in the navigation bar of the browser to access the router's management UI.

2.1 LAN Configuration

Setup > Network Settings > LAN Configuration

By default, the router functions as a Dynamic Host Configuration Protocol (DHCP) server to the hosts on the WLAN or LAN network. With DHCP, PCs and other LAN devices can be assigned IP addresses as well as addresses for DNS servers, Windows Internet Name Service (WINS) servers, and the default gateway. With the DHCP server enabled the router's IP address serves as the gateway address for LAN and WLAN clients. The PCs in the LAN are assigned IP addresses from a pool of addresses specified in this procedure. Each pool address is tested before it is assigned to avoid duplicate addresses on the LAN.

For most applications the default DHCP and TCP/IP settings are satisfactory. If you want another PC on your network to be the DHCP server or if you are manually configuring the network settings of all of your PCs, set the DHCP

mode to ‘none’. DHCP relay can be used to forward DHCP lease information from another LAN device that is the network’s DHCP server; this is particularly useful for wireless clients.

Instead of using a DNS server, you can use a Windows Internet Naming Service (WINS) server. A WINS server is the equivalent of a DNS server but uses the NetBIOS protocol to resolve hostnames. The router includes the WINS server IP address in the DHCP configuration when acknowledging a DHCP request from a DHCP client.

You can also enable DNS proxy for the LAN. When this is enabled the router then as a proxy for all DNS requests and communicates with the ISP’s DNS servers. When disabled all DHCP clients receive the DNS IP addresses of the ISP.

To configure LAN Connectivity, please follow the steps below:

1. In the LAN Setup page, enter the following information for your router:
    - IP address (factory default: 192.168.10.1).

If you change the IP address and click Save Settings, the GUI will not respond. Open a new connection to the new IP address and log in again. Be sure the LAN host (the machine used to manage the router) has obtained IP address from newly assigned pool (or has a static IP address in the router’s LAN subnet) before accessing the router via changed IP address.

    - Subnet mask (factory default: 255.255.255.0).
2. In the DHCP section, select the DHCP mode:
    - None: the router’s DHCP server is disabled for the LAN
    - DHCP Server. With this option the router assigns an IP address within the specified range plus additional specified information to any LAN device that requests DHCP served addresses.

- DHCP Relay: With this option enabled, DHCP clients on the LAN can receive IP address leases and corresponding information from a DHCP server on a different subnet. Specify the Relay Gateway, and when LAN clients make a DHCP request it will be passed along to the server accessible via the Relay Gateway IP address.
- If DHCP is being enabled, enter the following DHCP server parameters:
  - Starting and Ending IP Addresses: Enter the first and last continuous addresses in the IP address pool. Any new DHCP client joining the LAN is assigned an IP address in this range. The default starting address is 192.168.10.2. The default ending address is 192.168.10.100. These addresses should be in the same IP address subnet as the router's LAN IP address. You may wish to save part of the subnet range for devices with statically assigned IP addresses in the LAN.
  - Primary and Secondary DNS servers: If configured domain name system (DNS) servers are available on the LAN enter their IP addresses here.
  - WINS Server (optional): Enter the IP address for the WINS server or, if present in your network, the Windows NetBios server.
  - Lease Time: Enter the time, in hours, for which IP addresses are leased to clients.
- Enable DNS Proxy: To enable the router to act as a proxy for all DNS requests and communicate with the ISP's DNS servers, click the checkbox.

3. Click Save Settings to apply all changes.

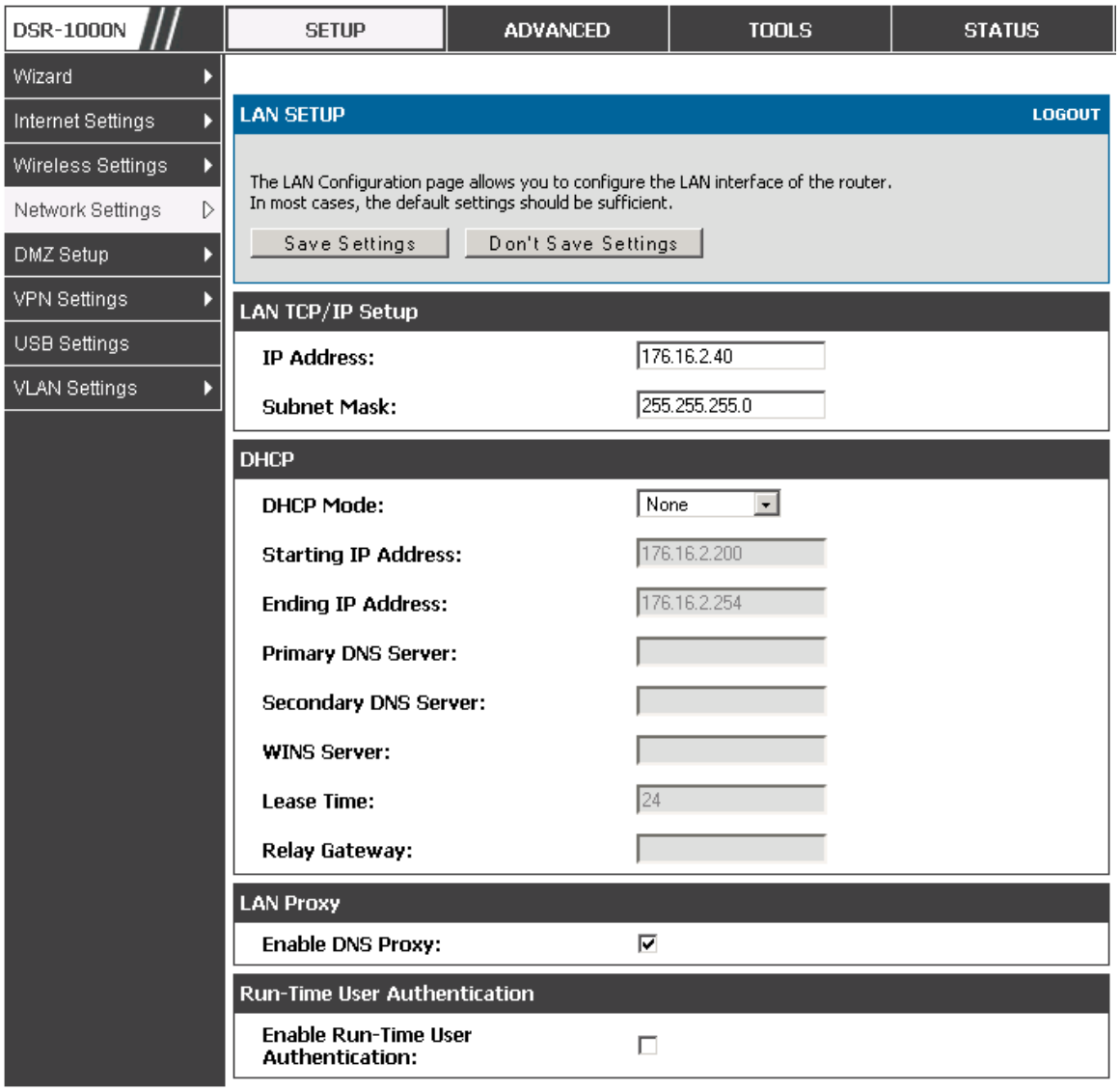


Figure 1: Setup page for LAN TCP/IP settings

2.1.1 LAN Configuration in an IPv6 Network

Advanced > IPv6 > IPv6 LAN > IPv6 LAN Config

In IPv6 mode, the LAN DHCP server is enabled by default (similar to IPv4 mode). The DHCPv6 server will serve IPv6 addresses from configured address pools with the IPv6 Prefix Length assigned to the LAN.

IPv4 / IPv6 mode must be enabled in the ***Advanced > IPv6 > IP mode*** to enable IPv6 configuration options.

2.1.1.1 LAN Settings

The default IPv6 LAN address for the router is **fec0::1**. You can change this 128 bit IPv6 address based on your network requirements. The other field that defines the LAN settings for the router is the prefix length. The IPv6 network (subnet) is identified by the initial bits of the address called the prefix. By default this is **64** bits long. All hosts in the network have common initial bits for their IPv6 address; the number of common initial bits in the network's addresses is set by the prefix length field.

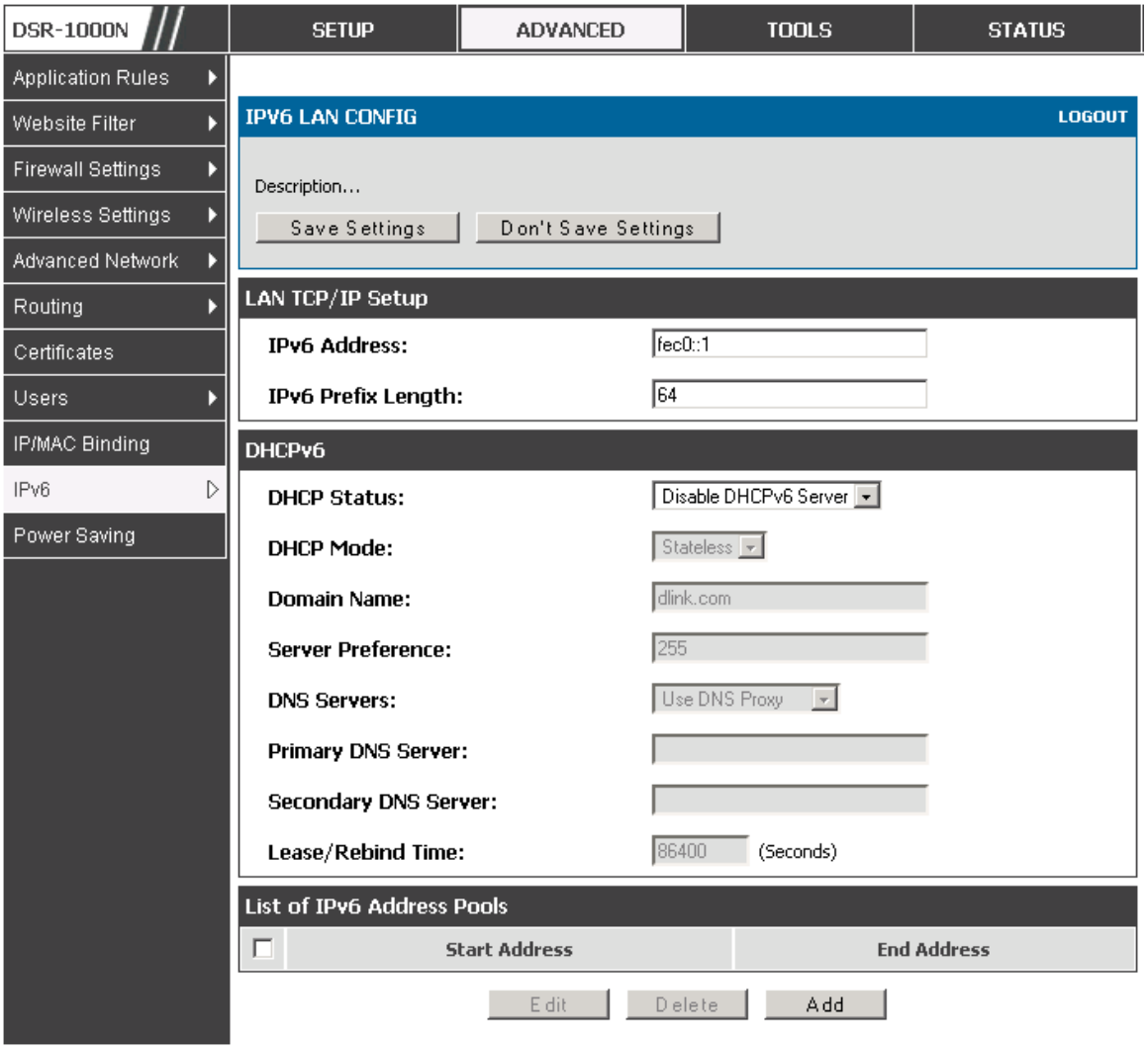


Figure 2: IPv6 LAN and DHCPv6 configuration

If you change the IP address and click Save Settings, the GUI will not respond. Open a new connection to the new IP address and log in again. Be sure the LAN host (the machine used to manage the router) has obtained IP address from newly assigned pool (or has a static IP address in the router's LAN subnet) before accessing the router via changed IP address.

As with an IPv4 LAN network, the router has a DHCPv6 server. If enabled, the router assigns an IP address within the specified range plus additional specified information to any LAN PC that requests DHCP served addresses.

The following settings are used to configure the DHCPv6 server:

- DHCP Mode: The IPv6 DHCP server is either stateless or stateful. If stateless is selected an external IPv6 DHCP server is not required as the IPv6 LAN hosts are auto-configured by this router. In this case the router advertisement daemon (RADVD) must be configured on this device and ICMPv6 router discovery messages are used by the host for auto-configuration. There are no managed addresses to serve the LAN nodes. If stateful is selected the IPv6 LAN host will rely on an external DHCPv6 server to provide required configuration settings
- The domain name of the DHCPv6 server is an optional setting
- Server Preference is used to indicate the preference level of this DHCP server. DHCP advertise messages with the highest server preference value to a LAN host are preferred over other DHCP server advertise messages. The default is 255.
- The DNS server details can be manually entered here (primary/secondary options. An alternative is to allow the LAN DHCP client to receive the DNS server details from the ISP directly. By selecting Use DNS proxy, this router acts as a proxy for all DNS requests and communicate with the ISP's DNS servers (a WAN configuration parameter).

- Primary and Secondary DNS servers: If there are configured domain name system (DNS) servers available on the LAN enter the IP addresses here.
- Lease/Rebind time sets the duration of the DHCPv6 lease from this router to the LAN client.

2.1.1.2 IPv6 Address Pools

This feature allows you to define the IPv6 delegation prefix for a range of IP addresses to be served by the gateway's DHCPv6 server. Using a delegation prefix you can automate the process of informing other networking equipment on the LAN of DHCP information specific for the assigned prefix.

2.1.2 Configuring IPv6 Router Advertisements

Router Advertisements are analogous to IPv4 DHCP assignments for LAN clients, in that the router will assign an IP address and supporting network information to devices that are configured to accept such details. Router Advertisement is required in an IPv6 network is required for stateless auto configuration of the IPv6 LAN. By configuring the Router Advertisement Daemon on this router, the device will listen on the LAN for router solicitations and respond to these LAN hosts with router advisements.

2.1.2.1 RADVD

Advanced > IPv6 > IPv6 LAN > Router Advertisement

To support stateless IPv6 auto configuration on the LAN, set the RADVD status to Enable. The following settings are used to configure RADVD:

- Advertise Mode: Select Unsolicited Multicast to send router advertisements (RA's) to all interfaces in the multicast group. To restrict RA's to well known IPv6 addresses on the LAN, and thereby reduce overall network traffic, select Unicast only.

- Advertise Interval: When advertisements are unsolicited multicast packets, this interval sets the maximum time between advertisements from the interface. The actual duration between advertisements is a random value between one third of this field and this field. The default is 30 seconds.
- RA Flags: The router advertisements (RA's) can be sent with one or both of these flags. Chose Managed to use the administered /stateful protocol for address auto configuration. If the Other flag is selected the host uses administered/stateful protocol for non-address auto configuration.
- Router Preference: this low/medium/high parameter determines the preference associated with the RADVD process of the router. This is useful if there are other RADVD enabled devices on the LAN as it helps avoid conflicts for IPv6 clients.
- MTU: The router advertisement will set this maximum transmission unit (MTU) value for all nodes in the LAN that are autoconfigured by the router. The default is 1500.
- Router Lifetime: This value is present in RA's and indicates the usefulness of this router as a default router for the interface. The default is 3600 seconds. Upon expiration of this value, a new RADVD exchange must take place between the host and this router.

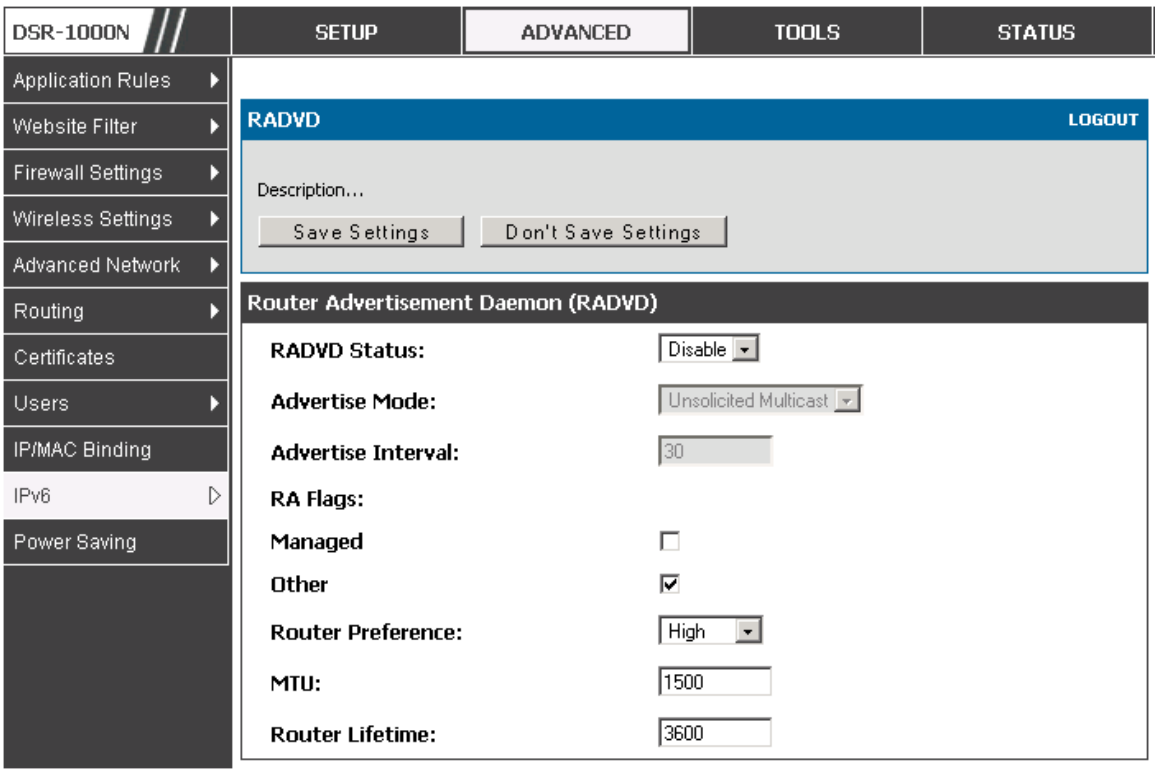


Figure 3: Configuring the Router Advertisement Daemon

2.1.2.2 Advertisement Prefixes

Advanced > IPv6 > IPv6 LAN > Advertisement Prefixes

The router advertisements configured with advertisement prefixes allow this router to inform hosts how to perform stateless address autoconfiguration. Router advertisements contain a list of subnet prefixes that allow the router to determine neighbors and whether the host is on the same link as the router.

The following prefix options are available for the router advertisements:

- IPv6 Prefix Type: To ensure hosts support IPv6 to IPv4 tunnel select the 6to4 prefix type. Selecting Global/Local/ISATAP will allow the nodes to support all other IPv6 routing options

- SLA ID: The SLA ID (Site-Level Aggregation Identifier) is available when 6to4 Prefixes are selected. This should be the interface ID of the router's LAN interface used for router advertisements.
- IPv6 Prefix: When using Global/Local/ISATAP prefixes, this field is used to define the IPv6 network advertised by this router.
- IPv6 Prefix Length: This value indicates the number contiguous, higher order bits of the IPv6 address that define up the network portion of the address. Typically this is 64.
- Prefix Lifetime: This defines the duration (in seconds) that the requesting node is allowed to use the advertised prefix. It is analogous to DHCP lease time in an IPv4 network.

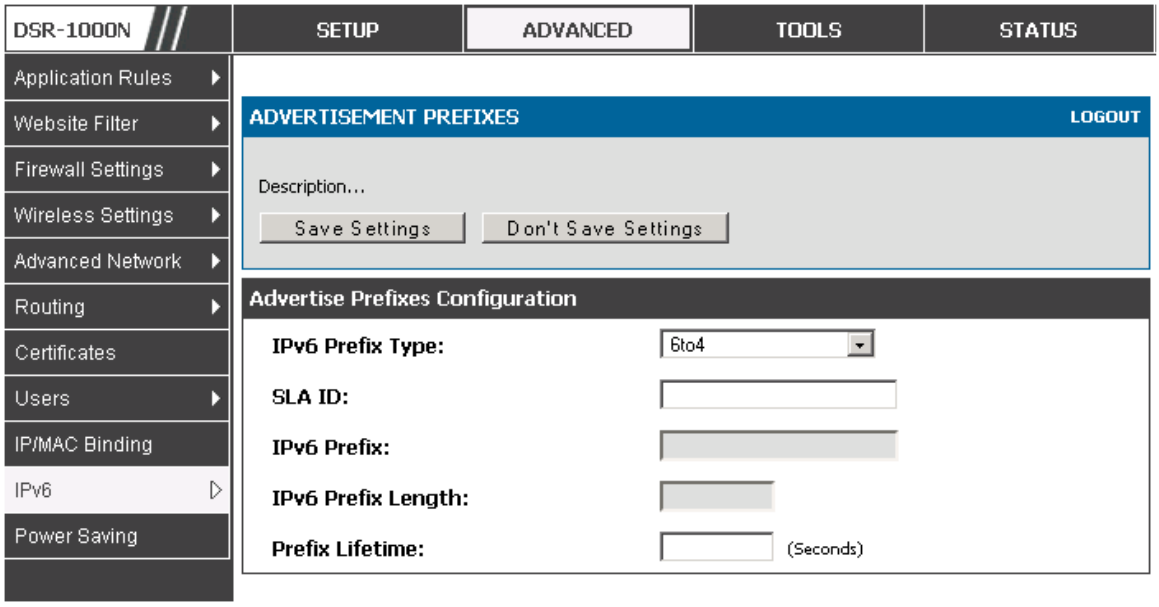


Figure 4: IPv6 Advertisement Prefix settings

2.2 VLAN Configuration

The router supports virtual network isolation on the LAN with the use of VLANs. LAN devices can be configured to communicate in a subnetwork defined by VLAN identifiers. LAN ports can be assigned unique VLAN IDs so that traffic to and from that physical port can be isolated from the general

LAN. VLAN filtering is particularly useful to limit broadcast packets of a device in a large network

VLAN support is disabled by default in the router. In the VLAN Configuration page, enable VLAN support on the router and then proceed to the next section to define the virtual network.

Setup > VLAN Settings > Available VLAN

The Available VLAN page shows a list of configured VLANs by name and VLAN ID. A VLAN membership can be created by clicking the Add button below the List of Available VLANs.

A VLAN membership entry consists of a VLAN identifier and the numerical VLAN ID which is assigned to the VLAN membership. The VLAN ID value can be any number from 2 to 4091. VLAN ID 1 is reserved for the default VLAN, which is used for untagged frames received on the interface. VLAN IDs 4092 is reserved and cannot be used. By enabling Inter VLAN Routing, you will allow traffic from LAN hosts belonging to this VLAN ID to pass through to other configured VLAN IDs that have Inter VLAN Routing enabled.

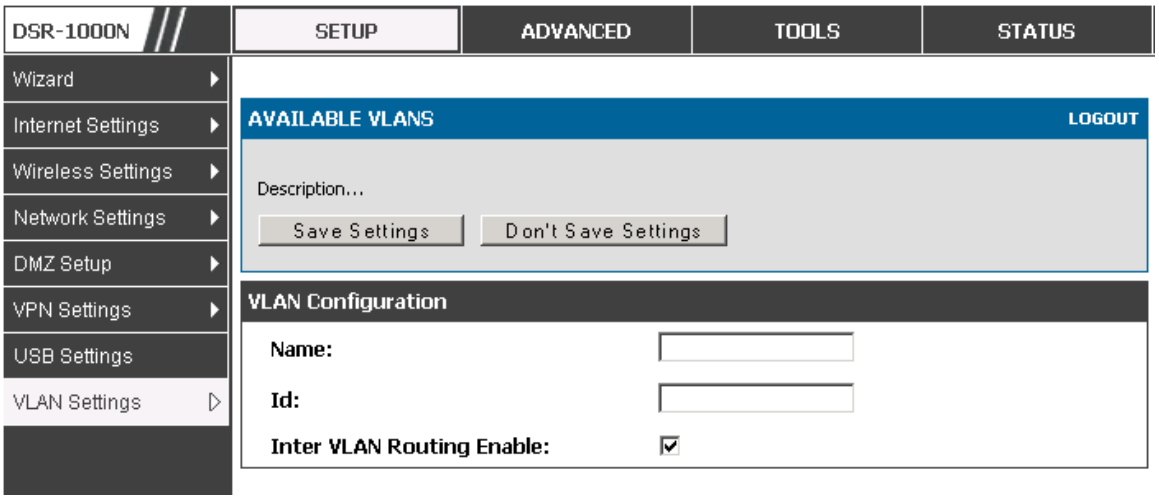


Figure 5: Adding VLAN memberships to the LAN

2.2.1 Associating VLANs to ports

In order to tag all traffic through a specific LAN port with a VLAN ID, you can associate a VLAN to a physical port.

Setup > VLAN Settings > Port VLAN

VLAN membership properties for the LAN and wireless LAN are listed on this page. The VLAN Port table displays the port identifier, the mode setting for that port and VLAN membership information. The configuration page is accessed by selecting one of the four physical ports or a configured access point and clicking Edit.

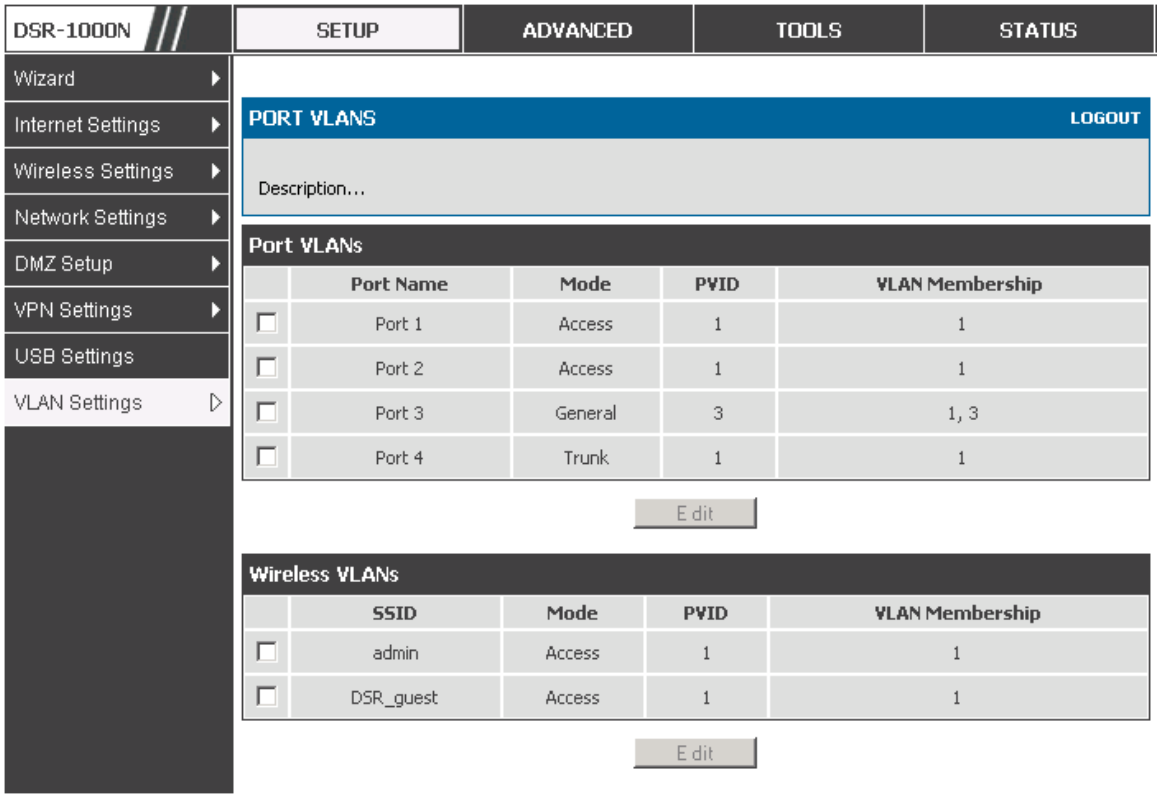


Figure 6: Port VLAN list

The edit page offers the following configuration options:

- Mode: The mode of this VLAN can be General, Access, or Trunk. The default is access.

- In General mode the port is a member of a user selectable set of VLANs. The port sends and receives data that is tagged or untagged with a VLAN ID. If the data into the port is untagged, it is assigned the defined PVID. In the configuration from Figure 4, Port 3 is a General port with PVID 3, so untagged data into Port 3 will be assigned PVID 3. All tagged data sent out of the port with the same PVID will be untagged. This is mode is typically used with IP Phones that have dual Ethernet ports. Data coming from phone to the switch port on the router will be tagged. Data passing through the phone from a connected device will be untagged.
- In Access mode the port is a member of a single VLAN (and only one). All data going into and out of the port is untagged. Traffic through a port in access mode looks like any other Ethernet frame.
- In Trunk mode the port is a member of a user selectable set of VLANs. All data going into and out of the port is tagged. Untagged coming into the port is not forwarded, except for the default VLAN with PVID=1, which is untagged. Trunk ports multiplex traffic for multiple VLANs over the same physical link.

- Select PVID for the port when the General mode is selected.
- Configured VLAN memberships will be displayed on the VLAN Membership Configuration for the port. By selecting one more VLAN membership options for a General or Trunk port, traffic can be routed between the selected VLAN membership IDs

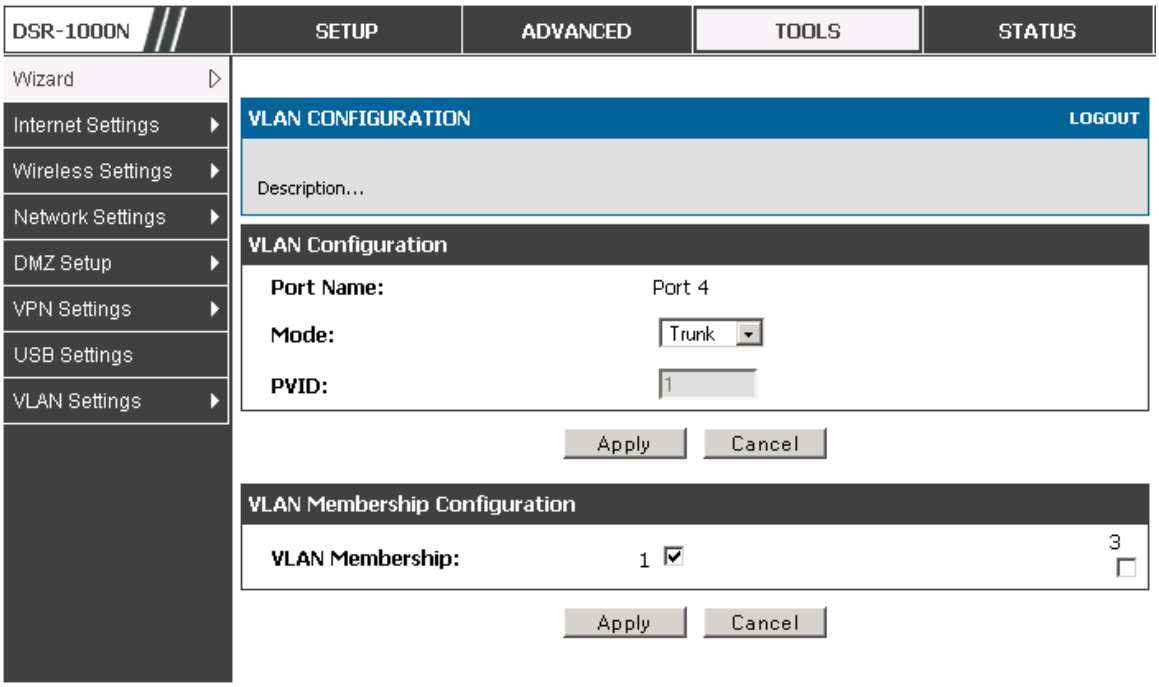


Figure 7: Configuring VLAN membership for a port

2.3 Configurable Port: DMZ Setup

This router supports one of the physical ports to be configured as a secondary WAN Ethernet port or a dedicated DMZ port. A DMZ is a subnetwork that is open to the public but behind the firewall. The DMZ adds an additional layer of security to the LAN, as specific services/ports that are exposed to the internet on the DMZ do not have to be exposed on the LAN. It is recommended that hosts that must be exposed to the internet (such as web or email servers) be placed in the DMZ network. Firewall rules can be allowed to permit access specific services/ports to the DMZ from both the LAN or WAN. In the event of an attack to any of the DMZ nodes, the LAN is not necessarily vulnerable as well.

Setup > DMZ Setup > DMZ Setup Configuration

DMZ configuration is identical to the LAN configuration. There are no restrictions on the IP address or subnet assigned to the DMZ port, other than

the fact that it cannot be identical to the IP address given to the LAN interface of this gateway.

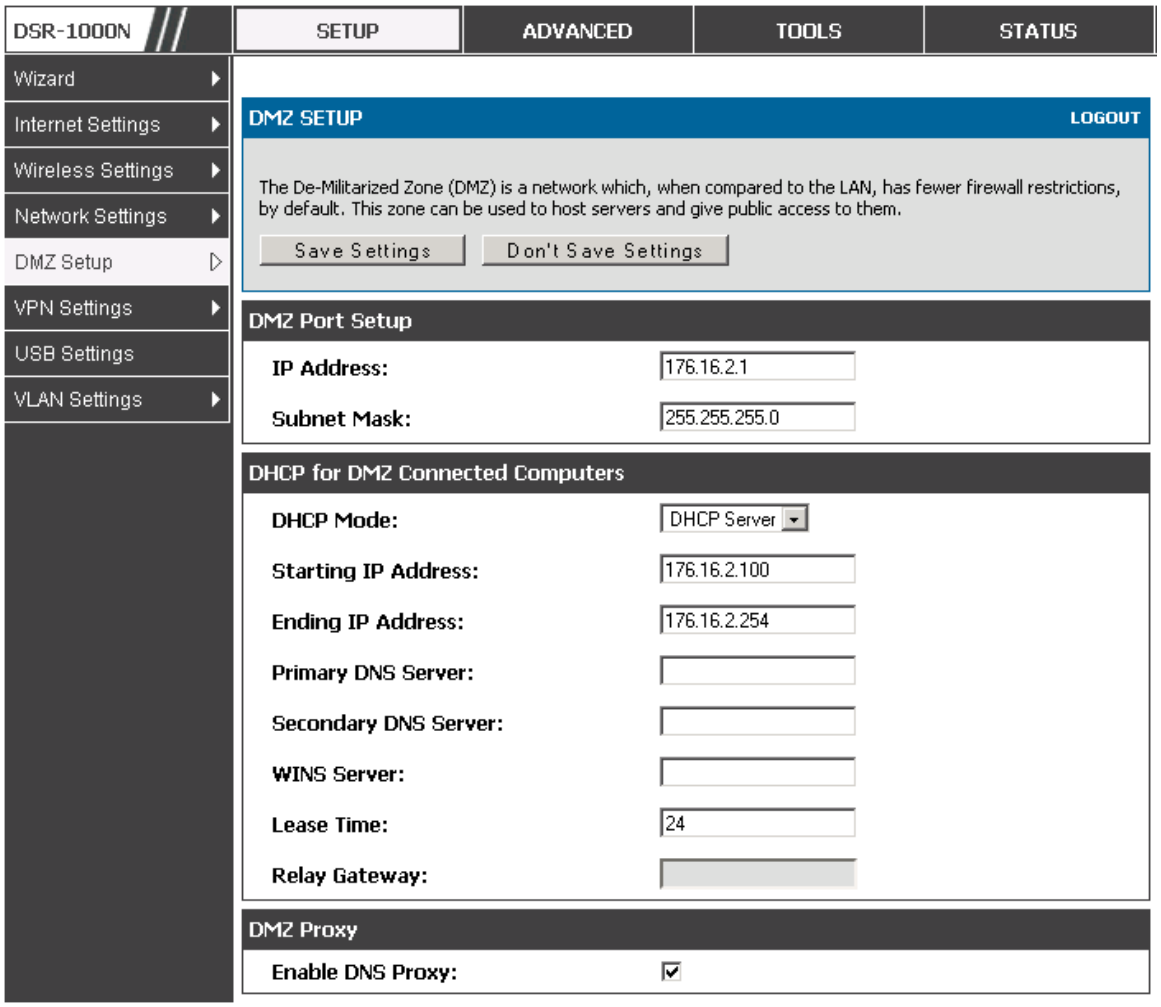


Figure 8: DMZ configuration

In order to configure a DMZ port, the router's configurable port must be set to DMZ in the ***Setup > Internet Settings > Configurable Port*** page.

2.4 Universal Plug and Play (UPnP)

Advanced > Advanced Network > UPnP

Universal Plug and Play (UPnP) is a feature that allows the router to discovery devices on the network that can communicate with the router and allow for auto configuration. If a network device is detected by UPnP, the router can open internal or external ports for the traffic protocol required by that network device.

Once UPnP is enabled, you can configure the router to detect UPnP-supporting devices on the LAN (or a configured VLAN). If disabled, the router will not allow for automatic device configuration.

Configure the following settings to use UPnP:

- Advertisement Period: This is the frequency that the router broadcasts UPnP information over the network. A large value will minimize network traffic but cause delays in identifying new UPnP devices to the network.
- Advertisement Time to Live: This is expressed in hops for each UPnP packet. This is the number of steps a packet is allowed to propagate before being discarded. Small values will limit the UPnP broadcast range. A default of 4 is typical for networks with few switches.

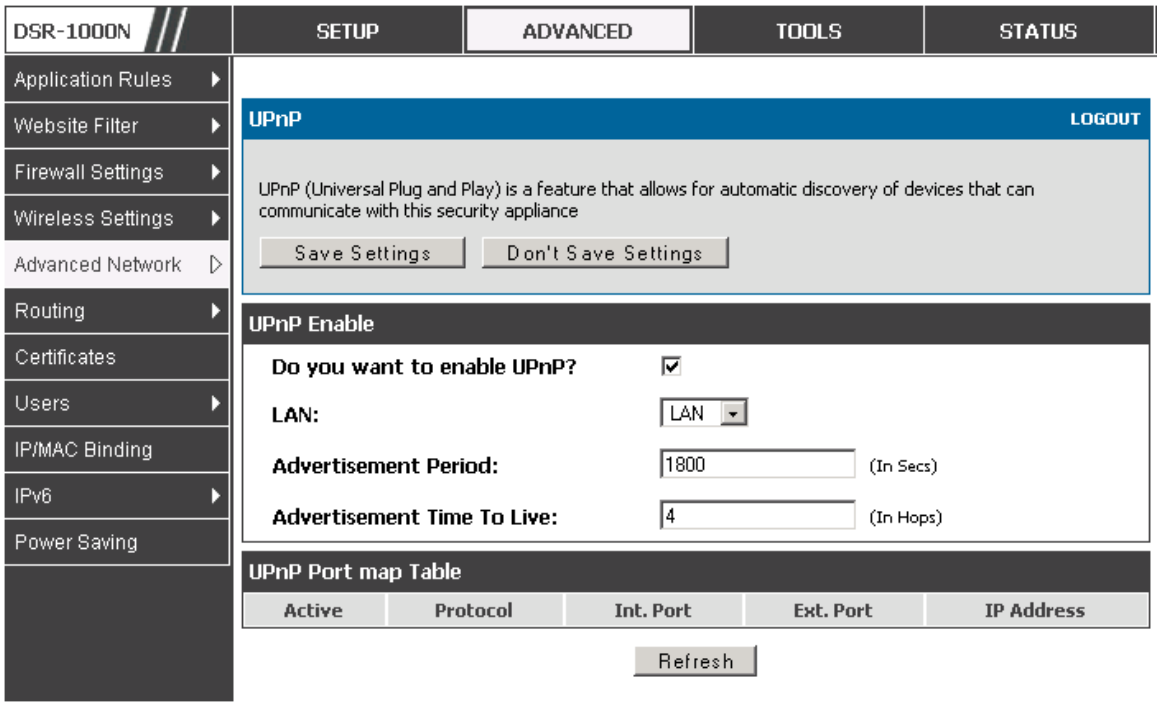


Figure 9: UPnP Configuration

UPnP Port map Table

The UPnP Port map Table has the details of UPnP devices that respond to the router's advertisements. The following information is displayed for each detected device:

- Active: A yes/no indicating whether the port of the UPnP device that established a connection is currently active
- Protocol: The network protocol (i.e. HTTP, FTP, etc.) used by the device
- Int. Port (Internal Port): The internal ports opened by UPnP (if any)
- Ext. Port (External Port): The external ports opened by UPnP (if any)
- IP Address: The IP address of the UPnP device detected by this router

Click Refresh to refresh the portmap table and search for any new UPnP devices.

3. Connecting to the Internet: WAN Setup

This router has two WAN ports that can be used to establish a connection to the internet. The following ISP connection types are supported: DHCP, Static, PPPoE, PPTP, L2TP, 3G Internet (via USB modem).

It is assumed that you have arranged for internet service with your Internet Service Provider (ISP). Please contact your ISP or network administrator for the configuration information that will be required to setup the router.

3.1 Internet Setup Wizard

Setup > Wizard > Internet

The Internet Connection Setup Wizard is available for users new to networking. By going through a few straightforward configuration pages you can take the information provided by your ISP to get your WAN connection up and enable internet access for your network.

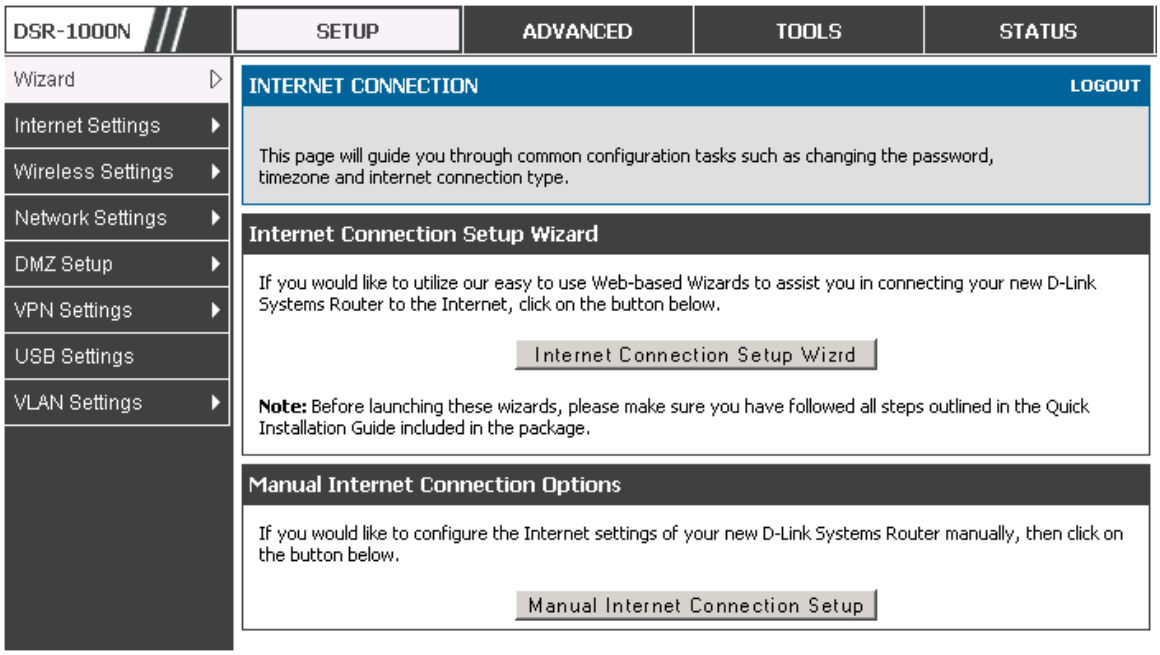


Figure 10: Internet Connection Setup Wizard

You can start using the Wizard by logging in with the administrator password for the router. Once authenticated set the time zone that you are located in,

and then choose the type of ISP connection type: DHCP, Static, PPPoE, PPTP, L2TP. Depending on the connection type a username/password may be required to register this router with the ISP. In most cases the default settings can be used if the ISP did not specify that parameter. The last step in the Wizard is to click the Connect button, which confirms the settings by establishing a link with the ISP. Once connected, you can move on and configure other features in this router.

✎ 3G Internet access with a USB modem is supported on the secondary WAN port (WAN2). The Internet Connection Setup Wizard assists with the primary WAN port (WAN1) configuration only.

3.2 WAN Configuration

Setup > Internet Settings > WAN1 Setup

You must either allow the router to detect WAN connection type automatically or configure manually the following basic settings to enable Internet connectivity:

- ISP Connection type: Based on the ISP you have selected for the primary WAN link for this router, choose Static IP address, DHCP client, Point-to-Point Tunneling Protocol (PPTP), Point-to-Point Protocol over Ethernet (PPPoE), Layer 2 Tunneling Protocol (L2TP). Required fields for the selected ISP type become highlighted. Enter the following information as needed and as provided by your ISP:
- PPPoE Profile Name. This menu lists configured PPPoE profiles, particularly useful when configuring multiple PPPoE connections (i.e. for Japan ISPs that have multiple PPPoE support).
- ISP login information. This is required for PPTP and L2TP ISPs.
  - User Name
  - Password
  - Secret (required for L2TP only)

- MPPE Encryption: For PPTP links, your ISP may require you to enable Microsoft Point-to-Point Encryption (MPPE).
- Split Tunnel (supported for PPTP and L2TP connection). This setting allows your LAN hosts to access internet sites over this WAN link while still permitting VPN traffic to be directed to a VPN configured on this WAN port.

With split tunneling enabled users can bypass content filtering and other firewall settings. Disable split tunneling on the WAN interface for highest gateway security measures.

- Connectivity Type. To keep the connection always on, click Keep Connected. To log out after the connection is idle for a period of time (useful if your ISP costs are based on logon times), click Idle Timeout and enter the time, in minutes, to wait before disconnecting in the Idle Time field.
- My IP Address: Enter the IP address assigned to you by the ISP.
- Server IP Address: Enter the IP address of the PPTP or L2TP server.

WAN Port IP address

Your ISP assigns you an IP address that is either dynamic (newly generated each time you log in) or static (permanent). The IP Address Source option allows you to define whether the address is statically provided by the ISP or should be received dynamically at each login. If static, enter your IP address, IPv4 subnet mask, and the ISP gateway's IP address. PPTP and L2TP ISPs also can provide a static IP address and subnet to configure, however the default is to receive that information dynamically from the ISP.

WAN DNS Servers

The IP Addresses of WAN Domain Name Servers (DNS) are typically provided dynamically from the ISP but in some cases you can define the static IP addresses of the DNS servers. DNS servers map Internet domain names (example: www.google.com) to IP addresses. Click to indicate whether to get DNS server addresses automatically from your ISP or to use ISP-specified

addresses. If the latter, enter addresses for the primary and secondary DNS servers. To avoid connectivity problems, ensure that you enter the addresses correctly.

DHCP WAN

For DHCP client connections, you can choose the MAC address of the router to register with the ISP. In some cases you may need to clone the LAN host's MAC address if the ISP is registered with that LAN host.

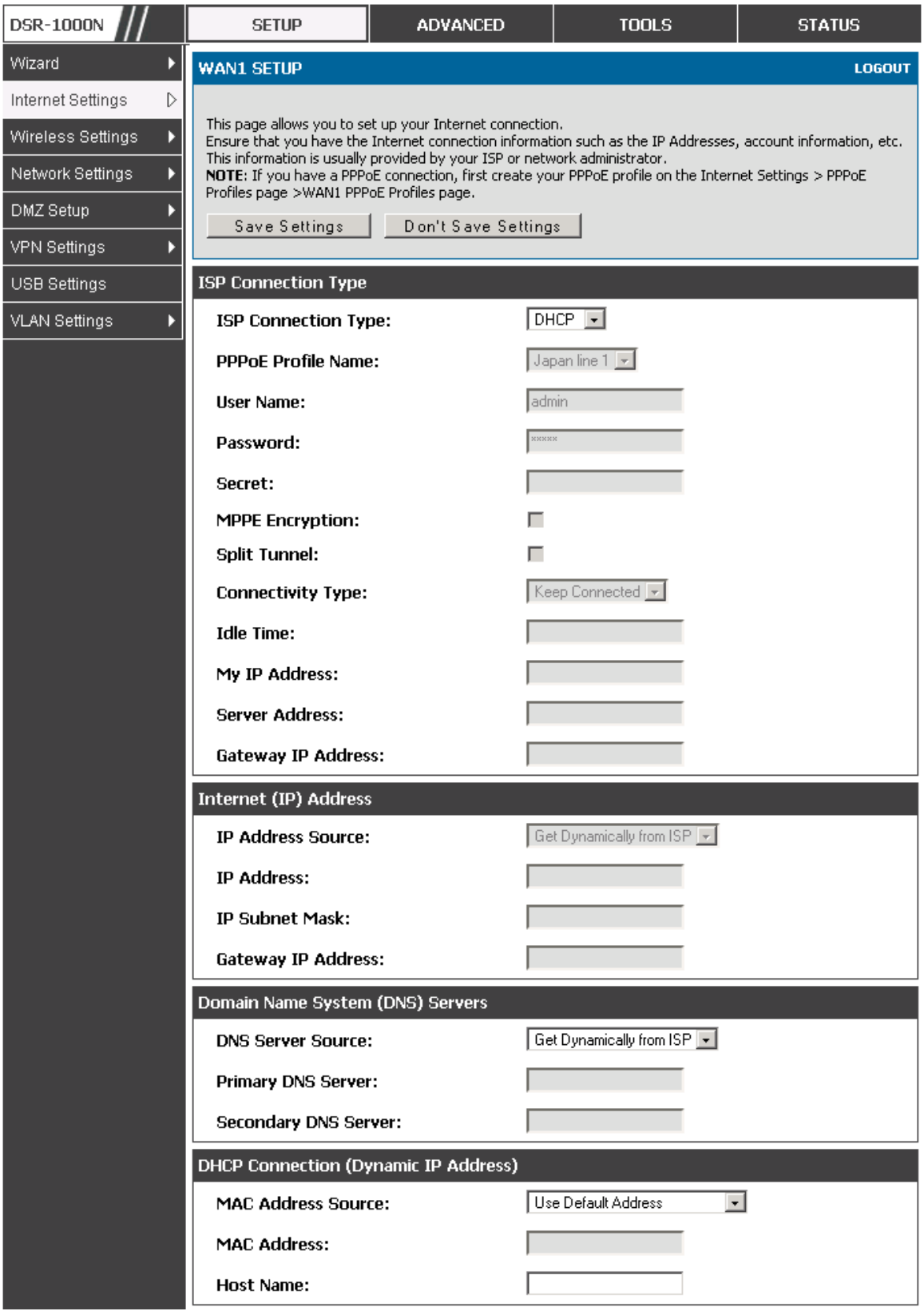


Figure 11: Manual WAN configuration

3.2.1 PPPoE Profiles

Setup > Internet Settings > PPPoE Profiles > WAN1 PPPoE Profiles

Some ISP's allow for multiple concurrent PPPoE sessions (it is most common in Japan). Each connection can have its own specific authentication requirements and will provide unique IP, gateway, and DNS address parameters to the associated WAN port.

The PPPoE Profiles page offers a convenient way to maintain multiple PPPoE accounts, which can then be associated with one of the available WAN interfaces. Once configured, a PPPoE profile name can be selected on the WAN configuration page to reduce the configuration requirements for that WAN port.

The PPPoE profile is referenced on the WAN Configuration page. The List of PPPoE profiles for a particular WAN (see figure below) outlines the available profile and their status and authentication type.

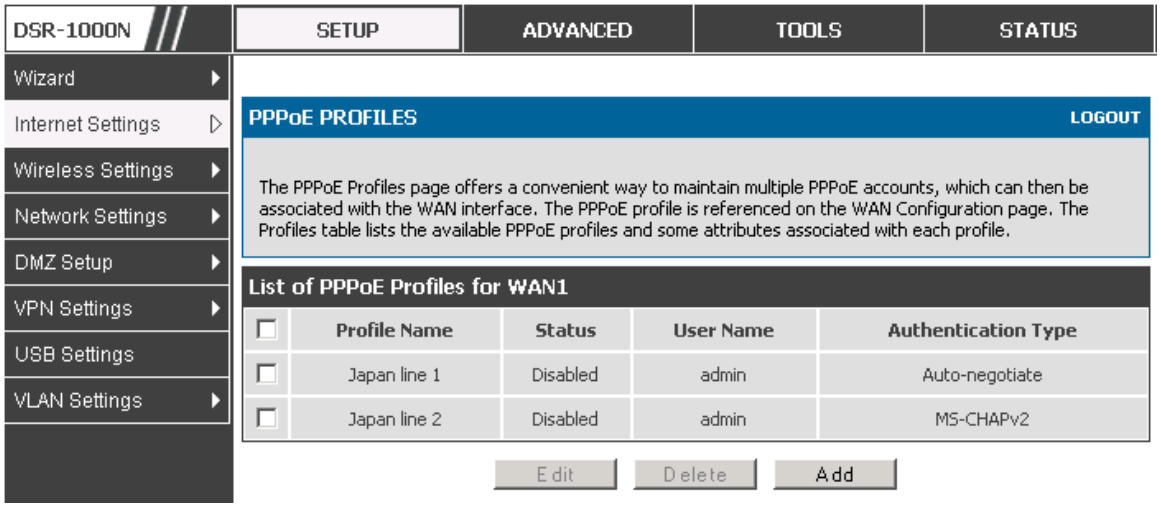


Figure 12: List of configured PPPoE profiles

To create a new PPPoE profile, select Add in the PPPoE Profile page. Each profile is associated to one of the two WAN ports. Similar to the PPPoE configuration options in the WAN configuration page, you need to define the ISP logon credentials, authentication type, and connectivity settings for the

PPPoE session. This information will be provided by the ISP that offers multiple PPPoE session support.

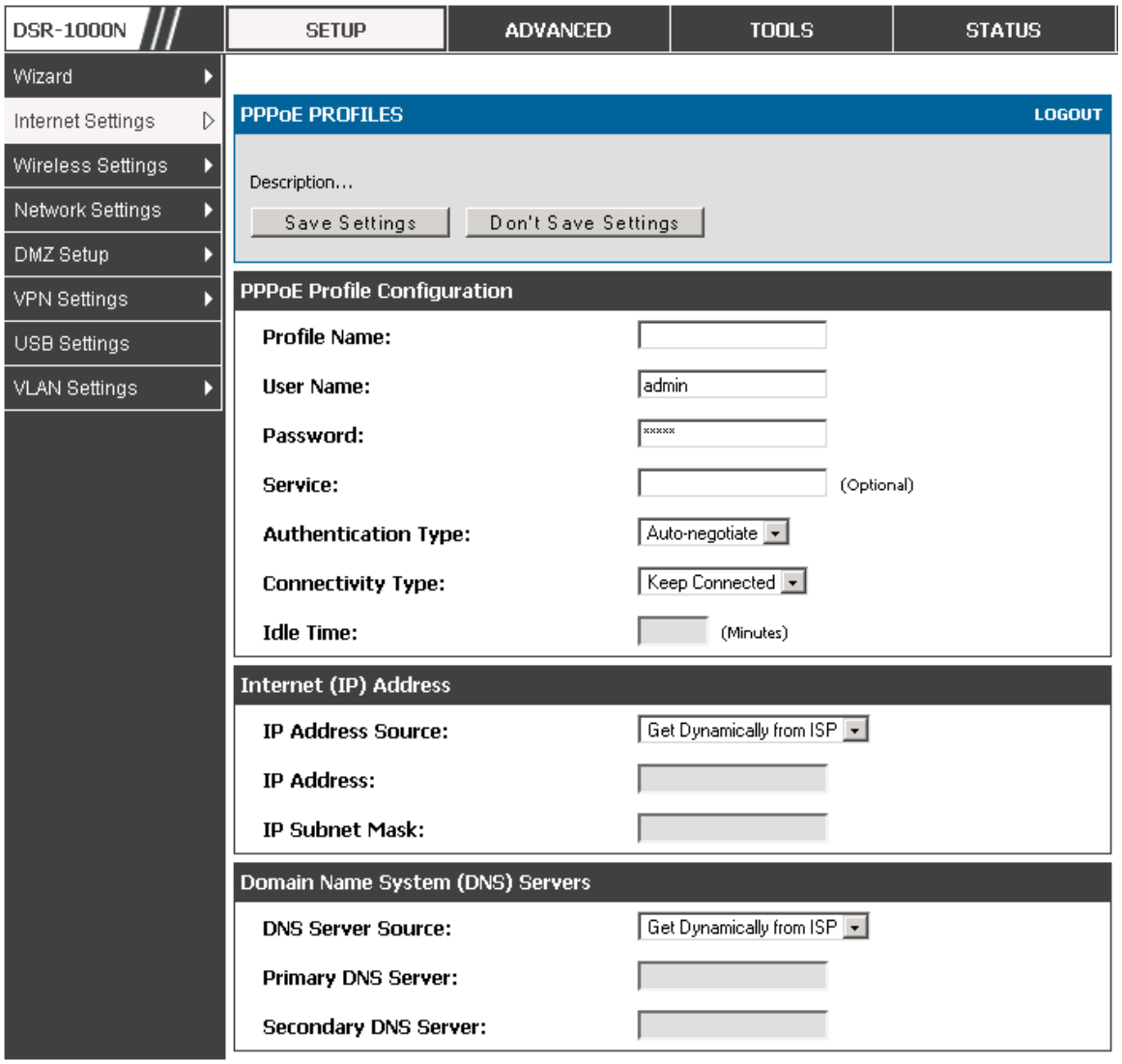


Figure 13: PPPoE profile configuration

3.2.2 WAN Configuration in an IPv6 Network

Setup > IPv6 > IPv6 WAN1 Config

For IPv6 WAN connections, this router can have a static IPv6 address or receive connection information when configured as a DHCPv6 client. In the case where the ISP assigns you a fixed address to access the internet, the

static configuration settings must be completed. In addition to the IPv6 address assigned to your router, the IPv6 prefix length defined by the ISP is needed. The default IPv6 Gateway address is the server at the ISP that this router will connect to for accessing the internet. The primary and secondary DNS servers on the ISP's IPv6 network are used for resolving internet addresses, and these are provided along with the static IP address and prefix length from the ISP.

When the ISP allows you to obtain the WAN IP settings via DHCP, you need to provide details for the DHCPv6 client configuration. The DHCPv6 client on the gateway can be either stateless or stateful. If a stateful client is selected the gateway will connect to the ISP's DHCPv6 server for a leased address. For stateless DHCP there need not be a DHCPv6 server available at the ISP, rather ICMPv6 discover messages will originate from this gateway and will be used for auto configuration. A third option to specify the IP address and prefix length of a preferred DHCPv6 server is available as well.

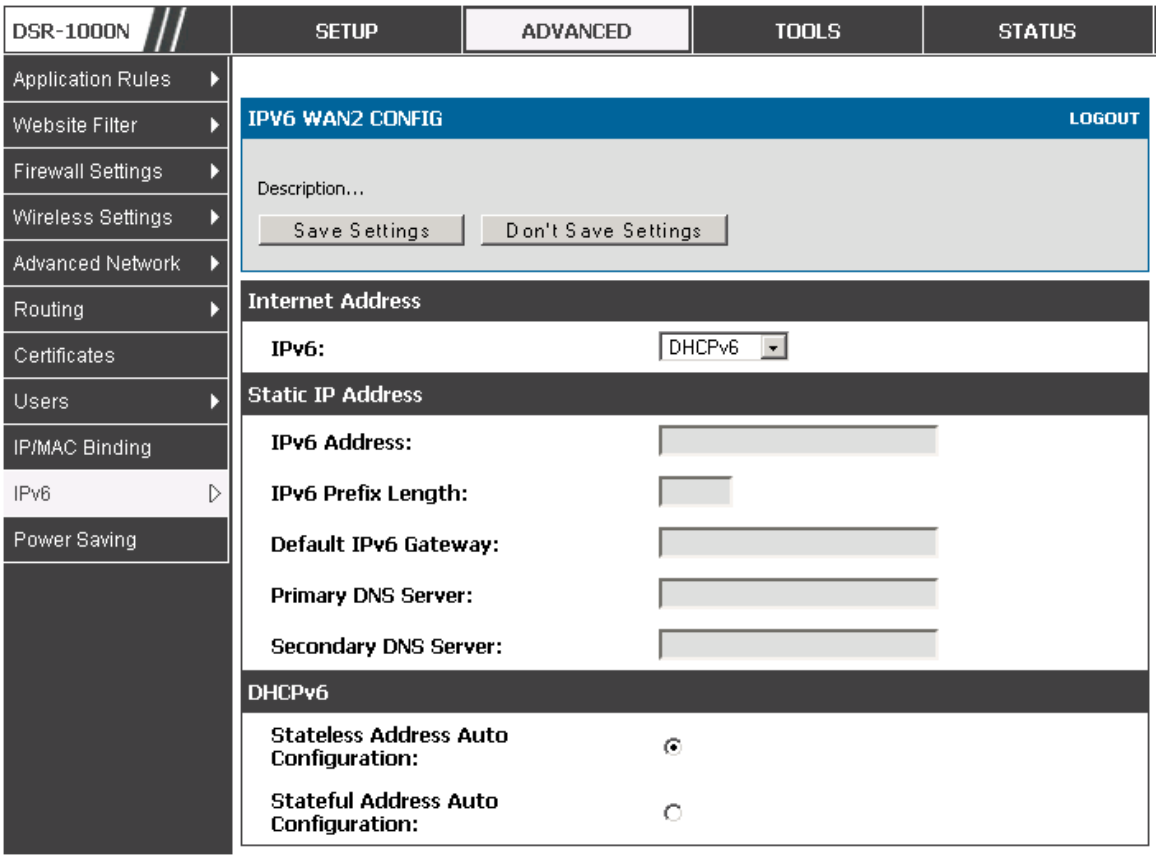


Figure 14: IPv6 WAN Setup page

3.2.3 Checking WAN Status

Setup > Internet Settings > WAN Status

The status and summary of configured settings for both WAN1 and WAN2 are available on the WAN Status page. You can view the following key connection status information for each WAN port:

- Connection time
- Connection type: dynamic IP or static IP
- Connection state: This is whether the WAN is connected or disconnected to an ISP. The Link State is whether the physical WAN connection in place; the Link State can be UP (i.e. cable inserted) while the WAN Connection State is down.
- IP address / subnet mask
- Gateway IP address

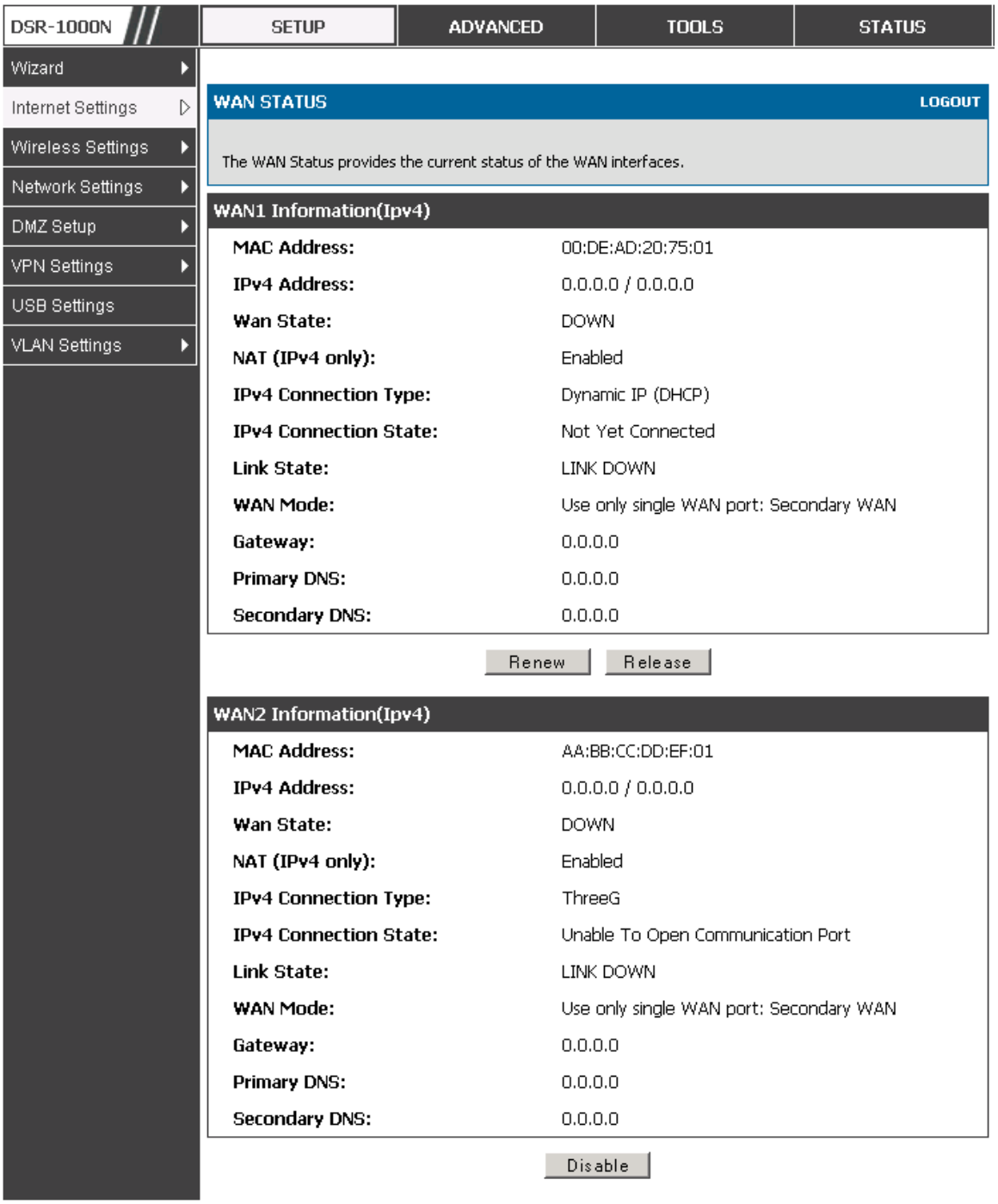


Figure 15: Connection Status information for both WAN ports

The WAN status page allows you to Enable or Disable static WAN links. For WAN settings that are dynamically received from the ISP, you can Renew or Release the link parameters if required.

3.3 Bandwidth Controls

Advanced > Advanced Network > Traffic Management > Bandwidth Profiles

Bandwidth profiles allow you to regulate the traffic flow from the LAN to WAN 1 or WAN 2. This is useful to ensure that low priority LAN users (like guests or HTTP service) does not monopolize the available WAN's bandwidth for cost-savings or bandwidth-priority-allocation purposes.

Bandwidth profiles configuration consists of enabling the bandwidth control feature from the GUI and adding a profile which defines the control parameters. The profile can then be associated with a traffic selector, so that bandwidth profile can be applied to the traffic matching the selectors. Selectors are elements like IP addresses or services that would trigger the configured bandwidth regulation.

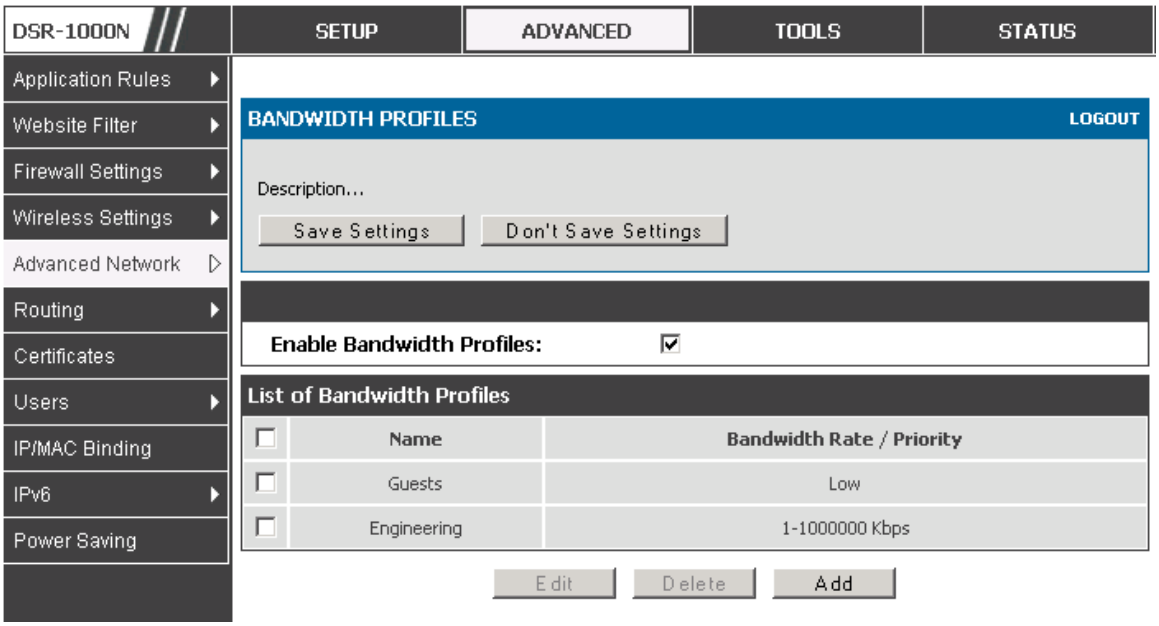


Figure 16: List of Configured Bandwidth Profiles

To create a new bandwidth profile, click Add in the List of Bandwidth Profiles. The following configuration parameters are used to define a bandwidth profile:

- Profile Name: This identifier is used to associate the configured profile to the traffic selector
- You can choose to limit the bandwidth either using priority or rate.
  - If using priority “Low”, “High”, “Medium” can be selected. If there is a low priority profile associated with traffic selector A and a high priority profile associated with traffic selector B, then the WAN bandwidth allocation preference will be to traffic selector B packets.
  - For finer control, the Rate profile type can be used. With this option the minimum and maximum bandwidth allowed by this profile can be limited.
- Choose the WAN interface that the profile should be associated with

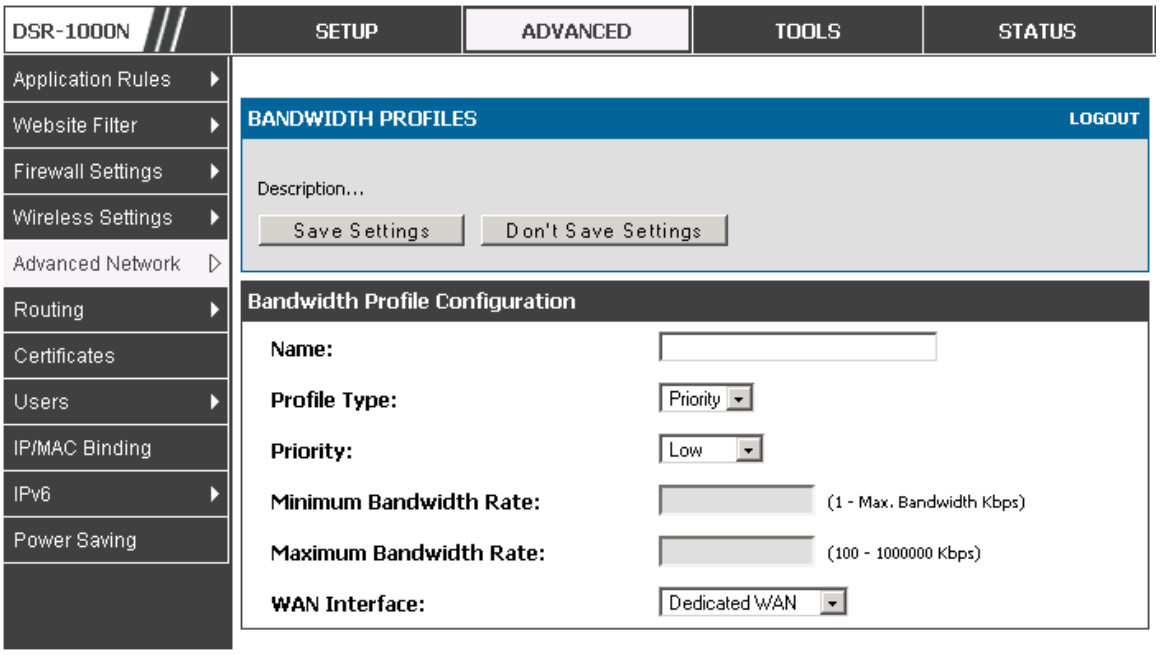


Figure 17: Bandwidth Profile Configuration page

Advanced > Advanced Network > Traffic Management > Traffic Selectors

Once a profile has been created it can then be associated with a traffic flow from the LAN to WAN. To create a traffic selector, click Add on the Traffic

Selectors page. Traffic selector configuration binds a bandwidth profile to a type or source of LAN traffic with the following settings:

- Available profiles: Assign one of the defined bandwidth profiles
- Service: You can have the selected bandwidth regulation apply to a specific service (i.e. FTP) from the LAN. If you do not see a service that you want, you can configure a custom service through the ***Advanced > Firewall Settings > Custom Services*** page. To have the profile apply to all services, select ANY.
- Traffic Selector Match Type: this defines the parameter to filter against when applying the bandwidth profile. A specific machine on the LAN can be identified via IP address or MAC address, or the profile can apply to a LAN port or VLAN group. As well a wireless network can be selected by its BSSID for bandwidth shaping.

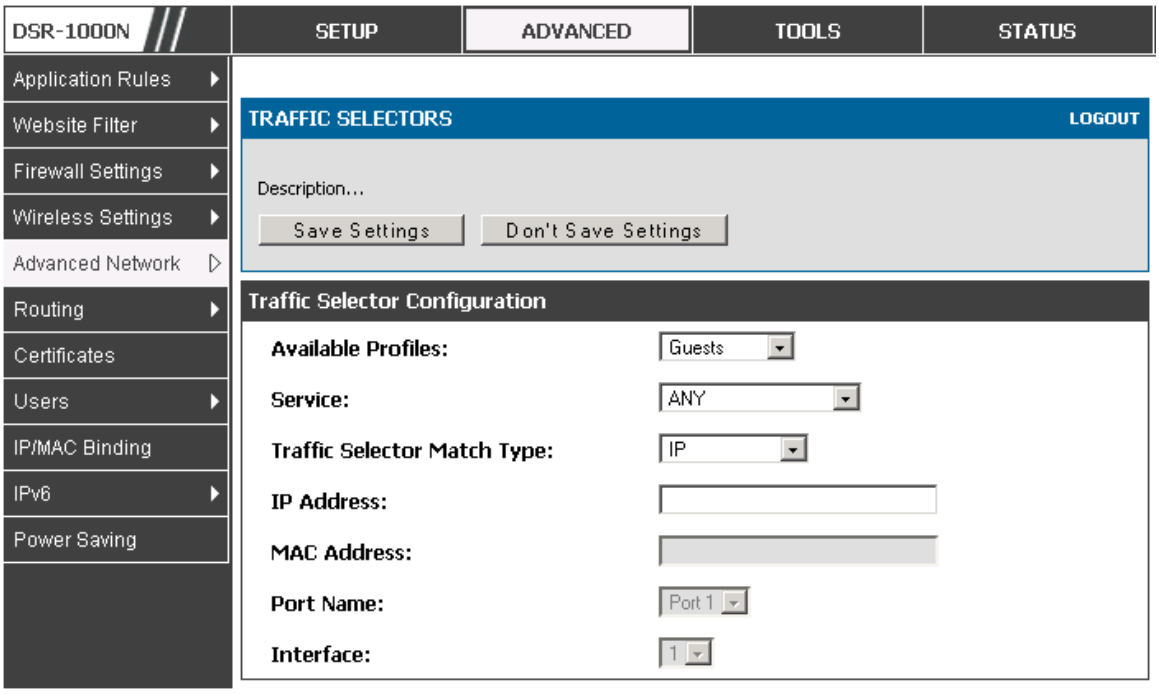


Figure 18: Traffic Selector Configuration

3.4 Features with Multiple WAN Links

This router supports multiple WAN links. This allows you to take advantage of failover and load balancing features to ensure certain internet dependent services are prioritized in the event of unstable WAN connectivity on one of the ports.

Setup > Internet Settings > WAN Mode

To use Auto Failover or Load Balancing, WAN link failure detection must be configured. This involves accessing DNS servers on the internet or ping to an internet address (user defined). If required, you can configure the number of retry attempts when the link seems to be disconnected or the threshold of failures that determines if a WAN port is down.

3.4.1 Auto Failover

In this case one of your WAN ports is assigned as the primary internet link for all internet traffic. The secondary WAN port is used for redundancy in case the primary link goes down for any reason. Both WAN ports (primary and secondary) must be configured to connect to the respective ISP's before

enabling this feature. The secondary WAN port will remain unconnected until a failure is detected on the primary link (either port can be assigned as the primary). In the event of a failure on the primary port, all internet traffic will be rolled over to the backup port. When configured in Auto Failover mode, the link status of the primary WAN port is checked at regular intervals as defined by the failure detection settings.

3.4.2 Load Balancing

This feature allows you to use multiple WAN links (and presumably multiple ISP's) simultaneously. After configuring more than one WAN port, the load balancing option is available to carry traffic over more than one link. Protocol bindings are used to segregate and assign services over one WAN port in order to manage internet flow. The configured failure detection method is used at regular intervals on all configured WAN ports when in Load Balancing mode.

Load balancing is particularly useful when the connection speed of one WAN port greatly differs from another. In this case you can define protocol bindings to route low-latency services (such as VOIP) over the higher-speed link and let low-volume background traffic (such as SMPT) go over the lower speed link.

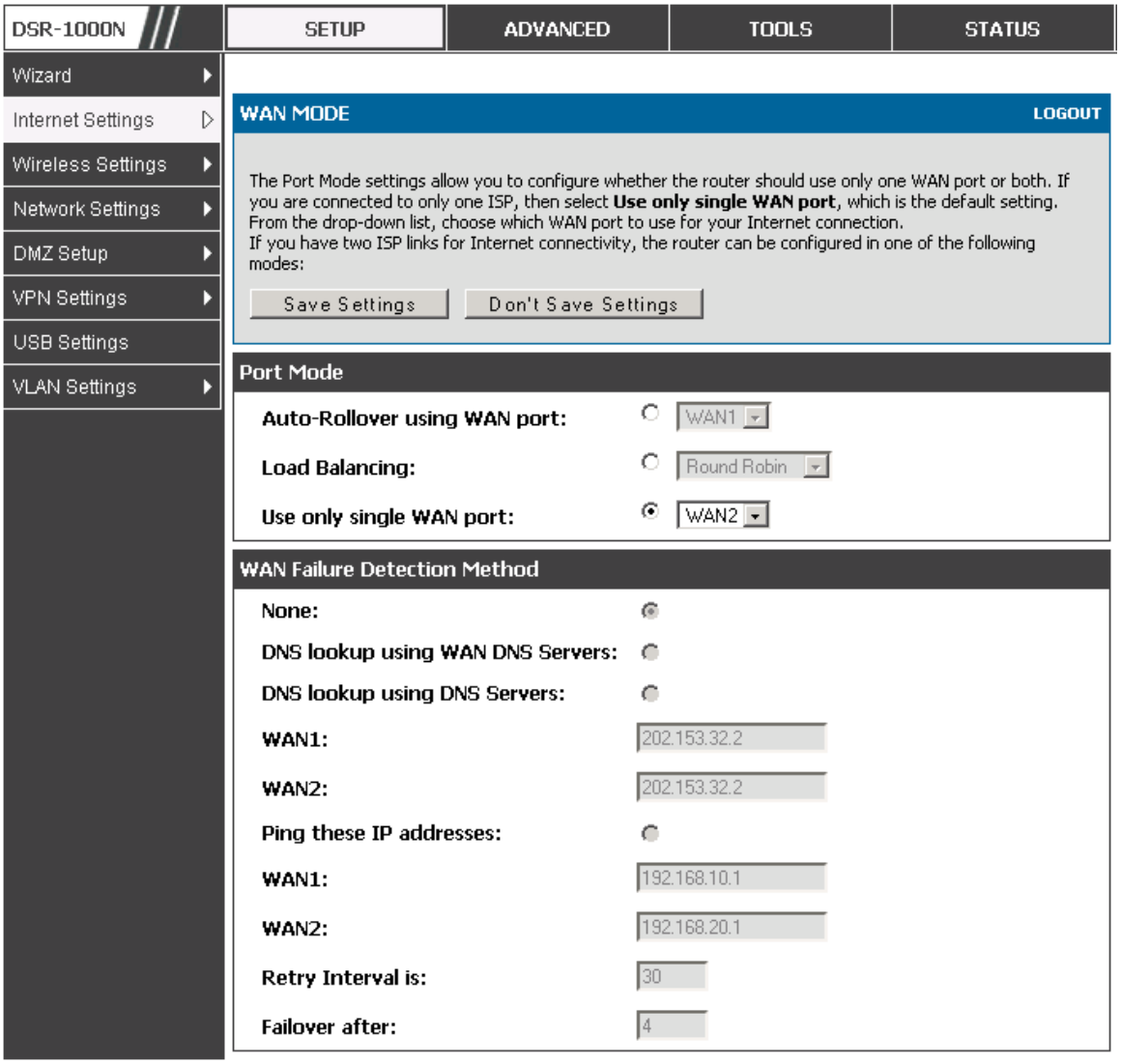


Figure 19: Load Balancing is available when multiple WAN ports are configured and Protocol Bindings have been defined

3.4.3 Protocol Bindings

Advanced > Routing > Protocol Bindings

Protocol bindings are required when the Load Balancing feature is in use. Choosing from a list of configured services or any of the user-defined services, the type of traffic can be assigned to go over only one of the available WAN ports. For increased flexibility the source network or machines can be specified as well as the destination network or machines. For example the VOIP traffic for a set of LAN IP addresses can be assigned

to one WAN and any VIOP traffic from the remaining IP addresses can be assigned to the other WAN link. Protocol bindings are only applicable when load balancing mode is enabled and more than one WAN is configured.

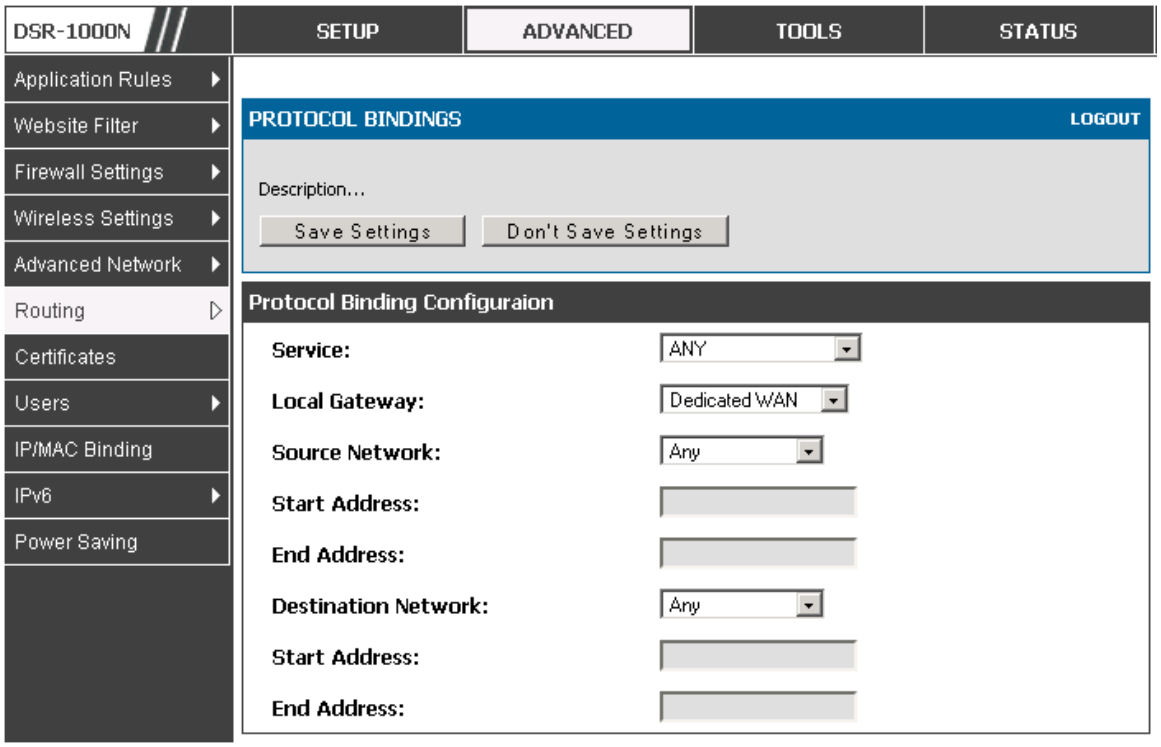


Figure 20: Protocol binding setup to associate a service and/or LAN source to a WAN and/or destination network

3.5 Routing Configuration

Routing between the LAN and WAN will impact the way this router handles traffic that is received on any of its physical interfaces. The routing mode of the gateway is core to the behavior of the traffic flow between the secure LAN and the internet.

3.5.1 Routing Mode

Setup > Internet Settings > Routing Mode

This device supports classical routing, network address translation (NAT), and transport mode routing.

- With classical routing, devices on the LAN can be directly accessed from the internet by their public IP addresses (assuming appropriate firewall settings). If your ISP has assigned an IP address for each of the computers that you use, select Classic Routing.
- NAT is a technique which allows several computers on a LAN to share an Internet connection. The computers on the LAN use a "private" IP address range while the WAN port on the router is configured with a single "public" IP address. Along with connection sharing, NAT also hides internal IP addresses from the computers on the Internet. NAT is required if your ISP has assigned only one IP address to you. The computers that connect through the router will need to be assigned IP addresses from a private subnet.
- Transparent mode routing between the LAN and WAN does not perform NAT. Broadcast and multicast packets that arrive on the LAN interface are switched to the WAN and vice versa, if they do not get filtered by firewall or VPN policies. If the LAN and WAN are in the same broadcast domain, select Transparent mode.

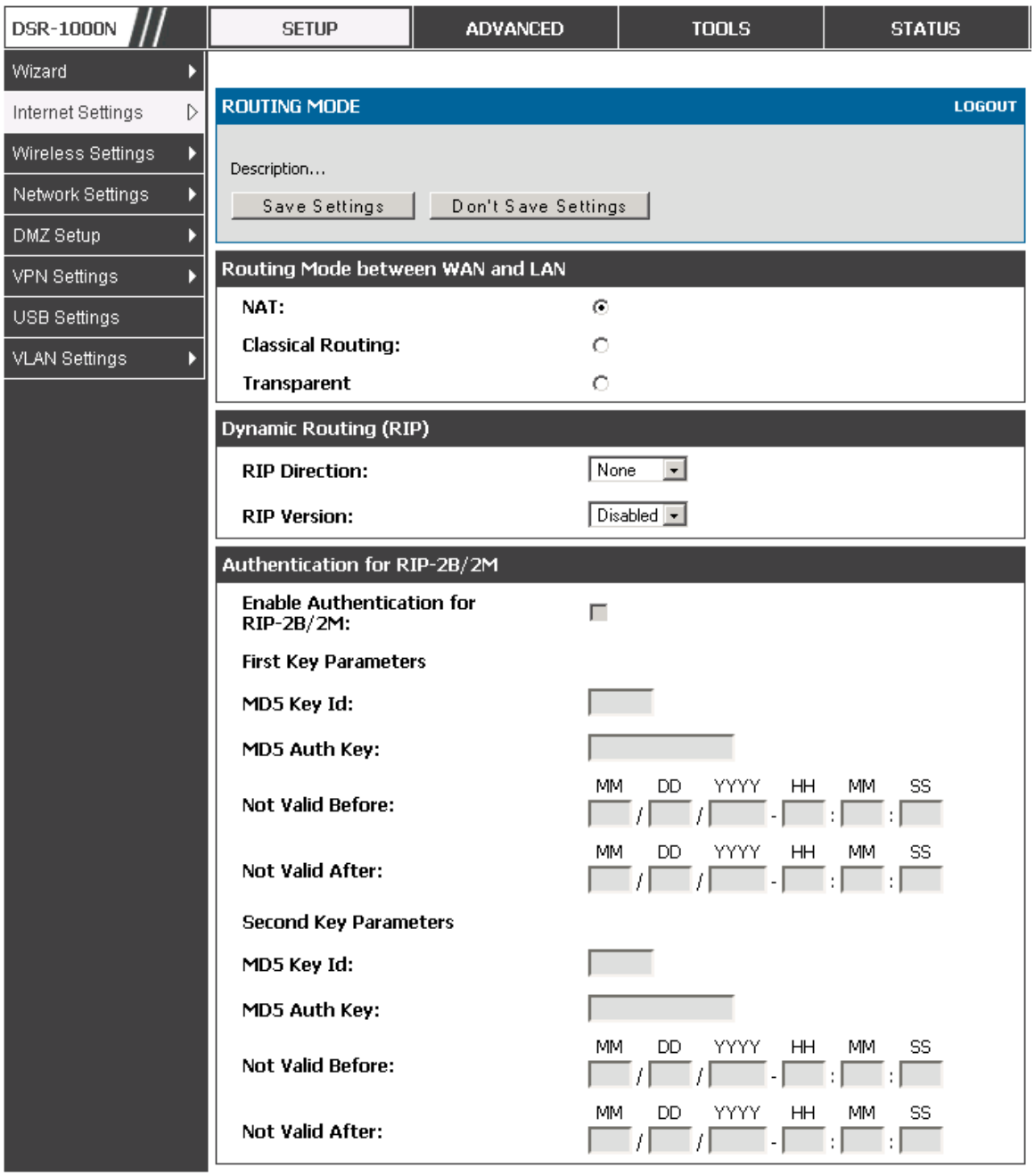


Figure 21: The Routing Mode page is used to configure the device's routing between WAN and LAN, as well as Dynamic routing (RIP)

3.5.2 Dynamic Routing (RIP)

Setup > Internet Settings > Routing Mode

Dynamic routing using the Routing Information Protocol (RIP) is an Interior Gateway Protocol (IGP) that is common in LANs. With RIP this router can exchange routing information with other supported routers in the LAN and

allow for dynamic adjustment of routing tables in order to adapt to modifications in the LAN without interrupting traffic flow.

The RIP direction will define how this router sends and receives RIP packets. Choose between:

- Both: The router both broadcasts its routing table and also processes RIP information received from other routers. This is the recommended setting in order to fully utilize RIP capabilities.
- Out Only: The router broadcasts its routing table periodically but does not accept RIP information from other routers.
- In Only: The router accepts RIP information from other routers, but does not broadcast its routing table.
- None: The router neither broadcasts its route table nor does it accept any RIP packets from other routers. This effectively disables RIP.

The RIP version is dependent on the RIP support of other routing devices in the LAN.

- Disabled: This is the setting when RIP is disabled.
- RIP-1 is a class-based routing version that does not include subnet information. This is the most commonly supported version.
- RIP-2 includes all the functionality of RIPv1 plus it supports subnet information. Though the data is sent in RIP-2 format for both RIP-2B and RIP-2M, the mode in which packets are sent is different. RIP-2B broadcasts data in the entire subnet while RIP-2M sends data to multicast addresses.

If RIP-2B or RIP-2M is the selected version, authentication between this router and other routers (configured with the same RIP version) is required. MD5 authentication is used in a first/second key exchange process. The authentication key validity lifetimes are configurable to ensure that the routing information exchange is with current and supported routers detected on the LAN.

3.5.3 Static Routing

Advanced > Routing > Static Routing

Advanced > IPv6 > IPv6 Static Routing

Manually adding static routes to this device allows you to define the path selection of traffic from one interface to another. There is no communication between this router and other devices to account for changes in the path; once configured the static route will be active and effective until the network changes.

The List of Static Routes displays all routes that have been added manually by an administrator and allows several operations on the static routes. The List of IPv4 Static Routes and List of IPv6 Static Routes share the same fields (with one exception):

- Name: Name of the route, for identification and management.
- Active: Determines whether the route is active or inactive. A route can be added to the table and made inactive, if not needed. This allows routes to be used as needed without deleting and re-adding the entry. An inactive route is not broadcast if RIP is enabled.
- Private: Determines whether the route can be shared with other routers when RIP is enabled. If the route is made private, then the route will not be shared in a RIP broadcast or multicast. This is only applicable for IPv4 static routes.
- Destination: the route will lead to this destination host or IP address.
- IP Subnet Mask: This is valid for IPv4 networks only, and identifies the subnet that is affected by this static route
- Interface: The physical network interface (WAN1, WAN2, DMZ or LAN), through which this route is accessible.
- Gateway: IP address of the gateway through which the destination host or network can be reached.

- Metric: Determines the priority of the route. If multiple routes to the same destination exist, the route with the lowest metric is chosen.

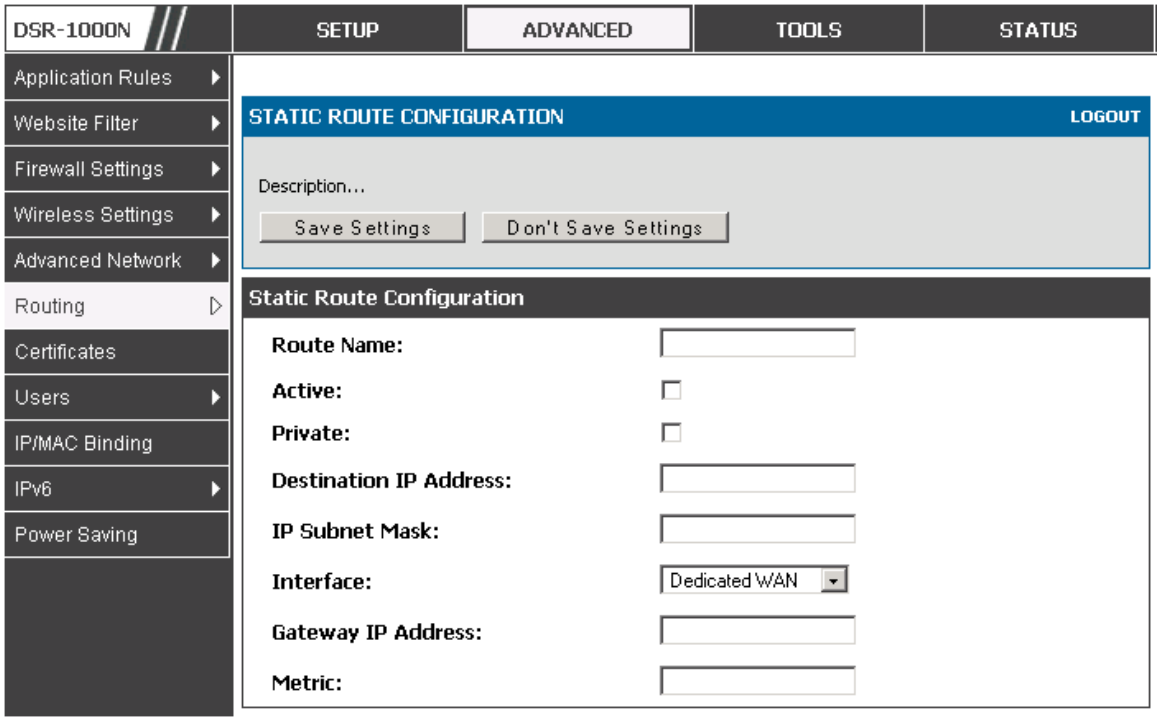


Figure 22: Static route configuration fields

3.6 Configurable Port - WAN Option

This router supports one of the physical ports to be configured as a secondary WAN Ethernet port or a dedicated DMZ port. If the port is selected to be a secondary WAN interface, all configuration pages relating to WAN2 are enabled.

Setup > Internet Settings > WAN2 Setup

WAN2 configuration is identical to the WAN1 configuration with one significant exception: configuration for the 3G USB modem is available only on WAN2.

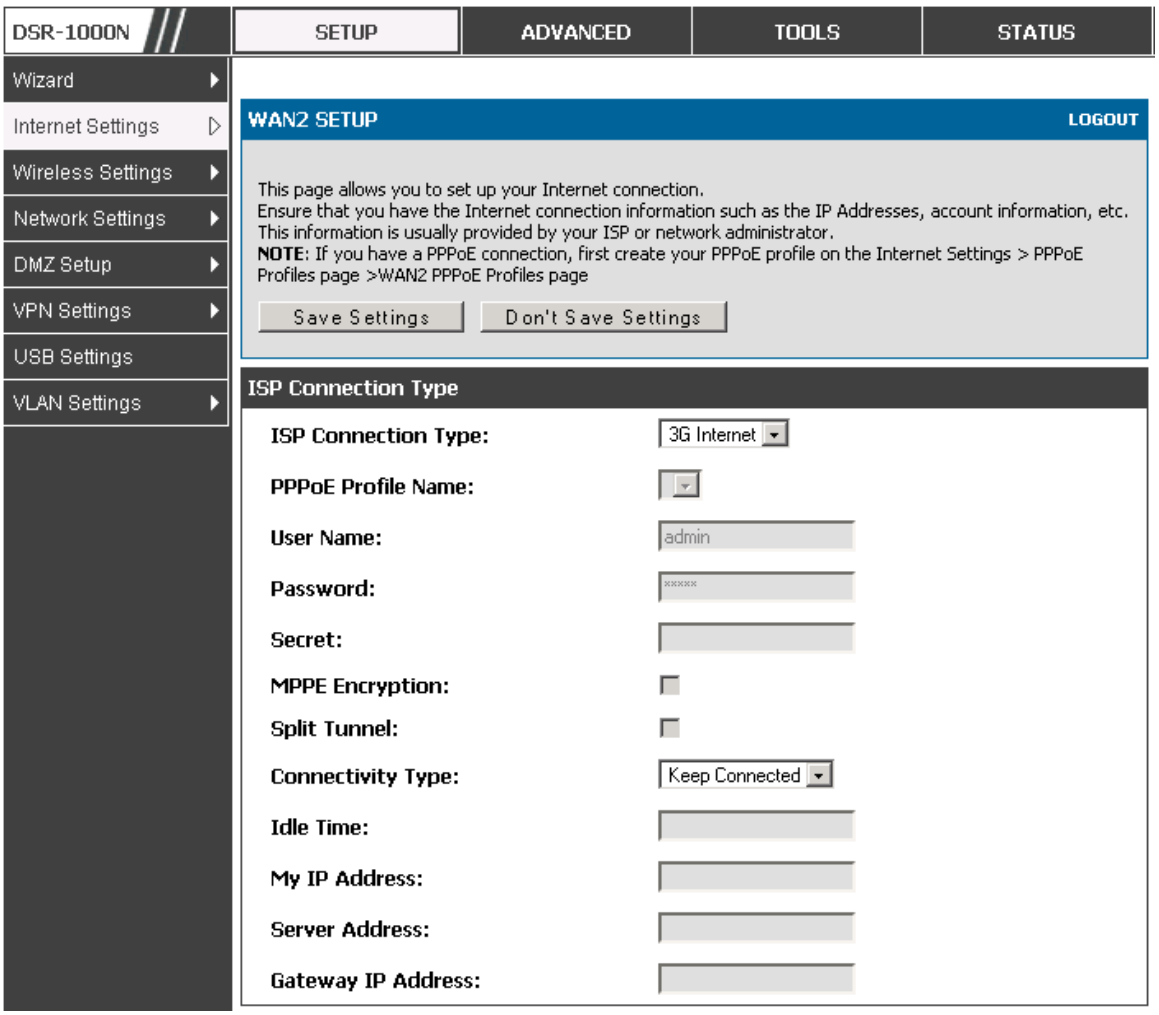


Figure 23: WAN2 configuration for 3G internet (part 1)

Cellular 3G internet access is available on WAN2 via a USB modem. The cellular ISP that provides the 3G data plan will provide the authentication requirements to establish a connection. The dial Number and APN are specific to the cellular carriers. Once the connection type settings are configured and saved, navigate to the WAN status page (***Setup > Internet Settings > WAN Status***) and Enable the WAN2 link to establish the 3G connection.

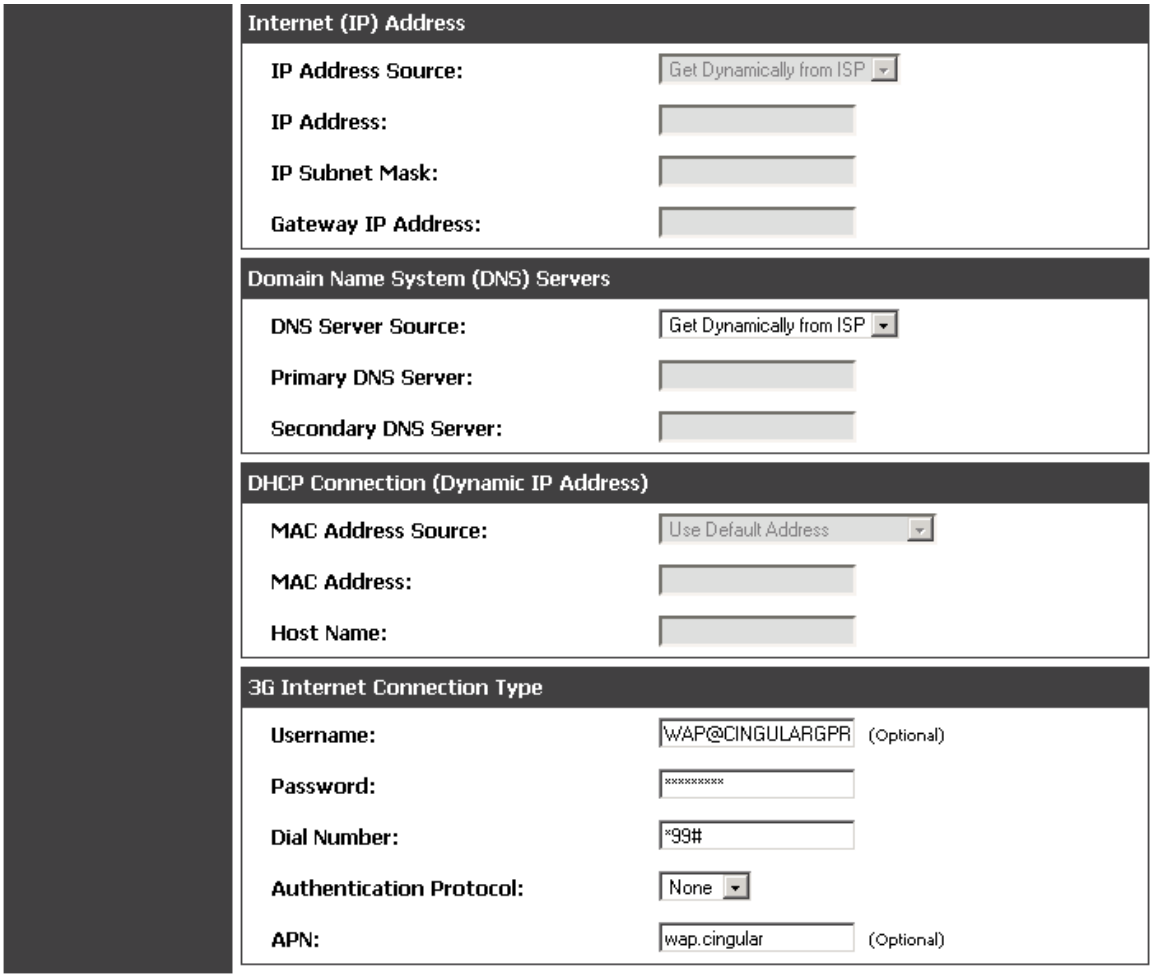


Figure 24: WAN2 configuration for 3G internet (part 2)

3.7 WAN Port Settings

Advanced > Advanced Network > WAN Port Setup

The physical port settings for each WAN link can be defined here. If your ISP account defines the WAN port speed or is associated with a MAC address, this information is required by the router to ensure a smooth connection with the network.

The default MTU size supported by all ports is 1500. This is the largest packet size that can pass through the interface without fragmentation. This size can be increased, however large packets can introduce network lag and bring down the interface speed. Note that a 1500 byte size packet is the largest allowed by the Ethernet protocol at the network layer.

The port speed can be sensed by the router when Auto is selected. With this option the optimal port settings are determined by the router and network. The duplex (half or full) can be defined based on the port support, as well as one of three port speeds: 10 Mbps, 100 Mbps and 1000 Mbps (i.e. 1 Gbps). The default setting is 100 Mbps for all ports.

The default MAC address is defined during the manufacturing process for the interfaces, and can uniquely identify this router. You can customize each WAN port's MAC address as needed, either by letting the WAN port assume the current LAN host's MAC address or by entering a MAC address manually.

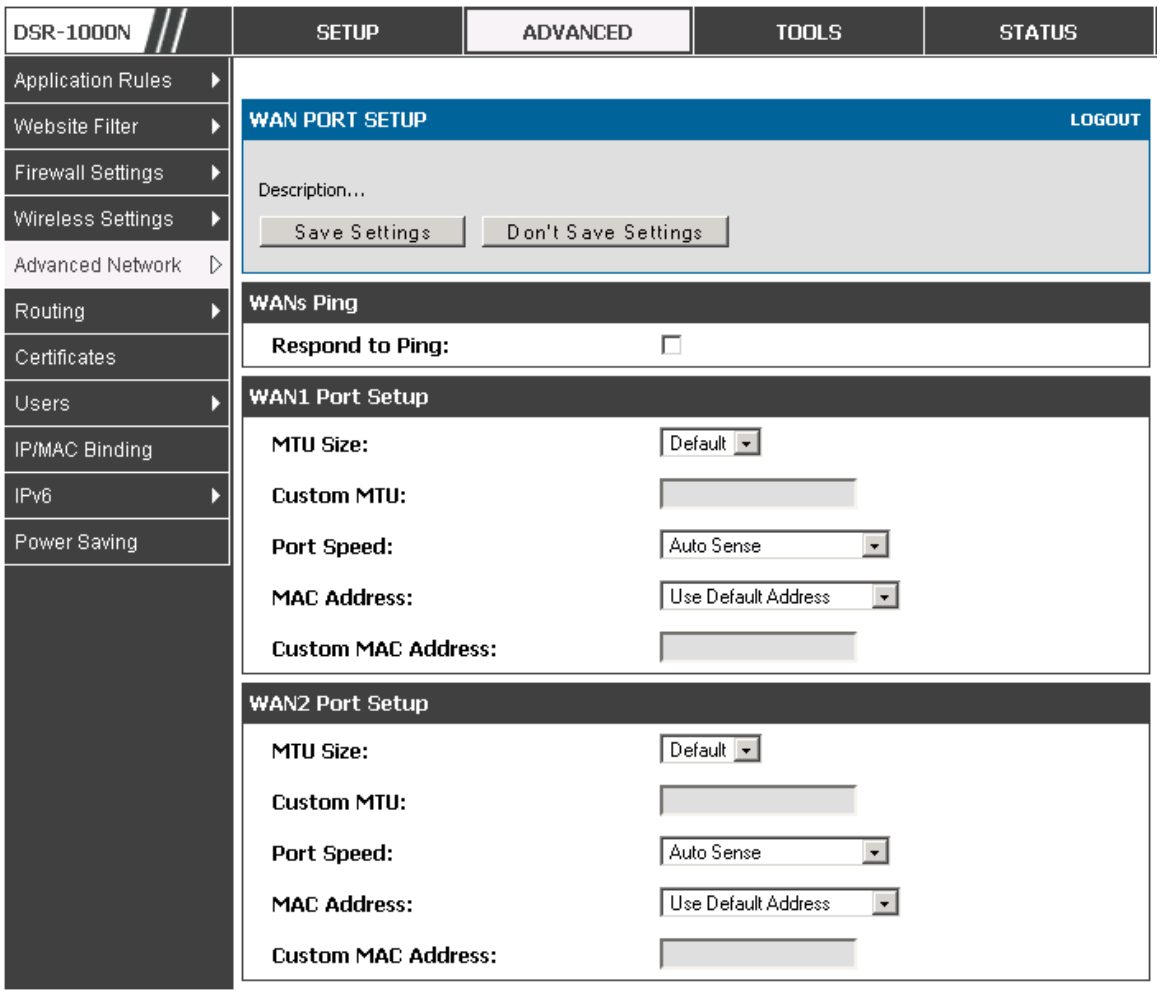


Figure 25: Physical WAN port settings

4. Wireless Access Point Setup

This router has an integrated 802.11n radio that allows you to create an access point for wireless LAN clients. The security/encryption/authentication options are grouped in a wireless Profile, and each configured profile will be available for selection in the AP configuration menu. The profile defines various parameters for the AP, including the security between the wireless client and the AP, and can be shared between multiple APs instances on the same device when needed.

Up to four unique wireless networks can be created by configuring multiple “virtual” APs. Each such virtual AP appears as an independent AP (unique SSID) to supported clients in the environment, but is actually running on the same physical radio integrated with this router.

You will need the following information to configure your wireless network:

- Types of devices expected to access the wireless network and their supported Wi-Fi™ modes
- The router’s geographical region
- The security settings to use for securing the wireless network.

> Profiles may be thought of as a grouping of AP parameters that can then be applied to not just one but multiple AP instances (SSIDs), thus avoiding duplication if the same parameters are to be used on multiple AP instances or SSIDs.

4.1 Wireless Settings Wizard

Setup > Wizard > Wireless Settings

The Wireless Network Setup Wizard is available for users new to networking. By going through a few straightforward configuration pages you can enable a

Wi-Fi™ network on your LAN and allow supported 802.11 clients to connect to the configured Access Point.

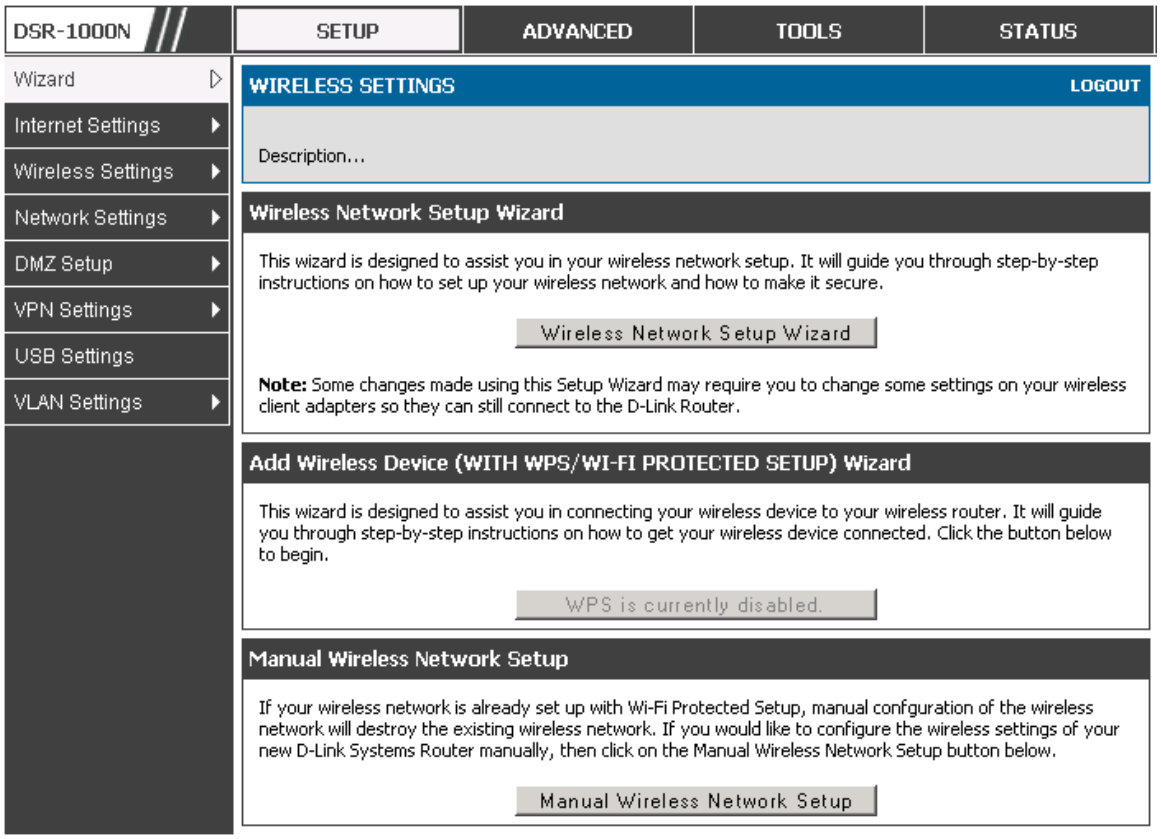


Figure 26: Wireless Network Setup Wizards

4.1.1 Wireless Network Setup Wizard

This wizard provides a step-by-step guide to create and secure a new access point on the router. The network name (SSID) is the AP identifier that will be detected by supported clients. The Wizard uses a TKIP+AES cipher for WPA / WPA2 security; depending on support on the client side, devices associate with this AP using either WPA or WPA2 security with the same pre-shared key.

The wizard has the option to automatically generate a network key for the AP. This key is the pre-shared key for WPA or WPA2 type security. Supported clients that have been given this PSK can associate with this AP. The default (auto-assigned) PSK is “passphrase”.

The last step in the Wizard is to click the Connect button, which confirms the settings and enables this AP to broadcast its availability in the LAN.

4.1.2 Add Wireless Device with WPS

With WPS enabled on your router, the selected access point allows supported WPS clients to join the network very easily. When the Auto option for connecting a wireless device is chose, you will be presented with two common WPS setup options:

- **Personal Identification Number (PIN):** The wireless device that supports WPS may have an alphanumeric PIN, and if entered in this field the AP will establish a link to the client. Click Connect to complete setup and connect to the client.
- **Push Button Configuration (PBC):** for wireless devices that support PBC, press and hold down on this button and within 2 minutes, click the PBC connect button. The AP will detect the wireless device and establish a link to the client.

> You need to enable at least one AP with WPA/WPA2 security and also enable WPS in the ***Advanced > Wireless Settings > WPS*** page to use the WPS wizard.

4.1.3 Manual Wireless Network Setup

This button on the Wizard page will link to the ***Setup > Wireless Settings > Access Points*** page. The manual options allow you to create new APs or modify the parameters of APs created by the Wizard.

4.2 Wireless Profiles

Setup > Wireless Settings > Profiles

The profile allows you to assign the security type, encryption and authentication to use when connecting the AP to a wireless client. The default mode is “open”, i.e. no security. This mode is insecure as it allows any

compatible wireless clients to connect to an AP configured with this security profile.

To create a new profile, use a unique profile name to identify the combination of settings. Configure a unique SSID that will be the identifier used by the clients to communicate to the AP using this profile. By choosing to broadcast the SSID, compatible wireless clients within range of the AP can detect this profile's availability.

The AP offers all advanced 802.11 security modes, including WEP, WPA, WPA2 and WPA+WPA2 options. The security of the Access point is configured by the Wireless Security Type section:

- Open: select this option to create a public "open" network to allow unauthenticated devices to access this wireless gateway.
- WEP (Wired Equivalent Privacy): this option requires a static (pre-shared) key to be shared between the AP and wireless client. Note that WEP does not support 802.11n data rates; is it appropriate for legacy 802.11 connections.
- WPA (Wi-Fi Protected Access): For stronger wireless security than WEP, choose this option. The encryption for WPA will use TKIP and also CCMP if required. The authentication can be a pre-shared key (PSK), Enterprise mode with RADIUS server, or both. Note that WPA does not support 802.11n data rates; is it appropriate for legacy 802.11 connections.
- WPA2: this security type uses CCMP encryption (and the option to add TKIP encryption) on either PSK (pre-shared key) or Enterprise (RADIUS Server) authentication.
- WPA + WPA2: this uses both encryption algorithms, TKIP and CCMP. WPA clients will use TKIP and WPA2 clients will use CCMP encryption algorithms.

"WPA+WPA2" is a security option that allows devices to connect to an AP using the strongest security that it supports. This mode allows legacy devices that only support WPA2 keys (such as an older wireless printer) to connect to a secure AP where all the other wireless clients are using WPA2.

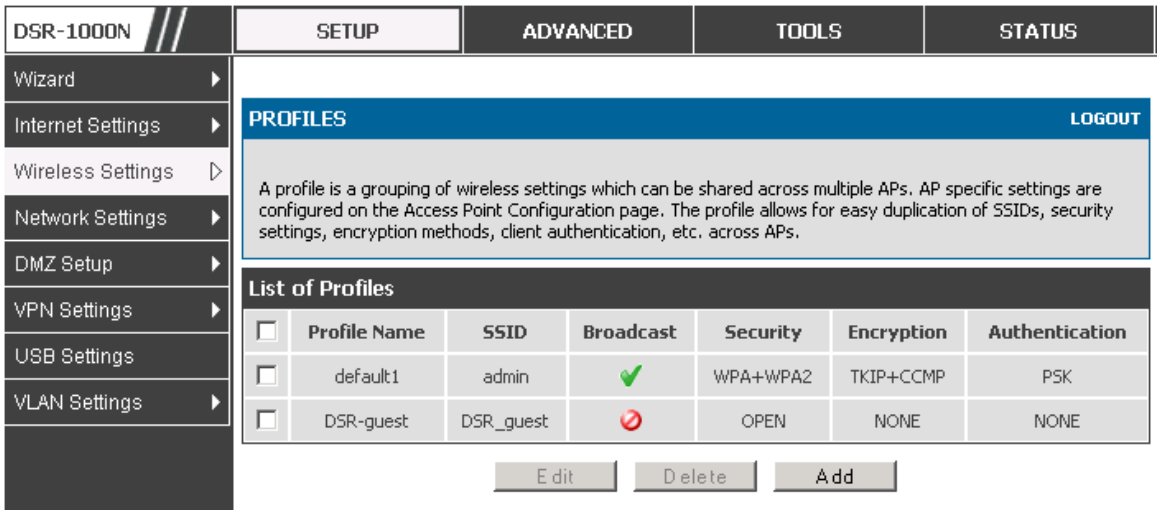


Figure 27: List of Available Profiles shows the variety of options available to secure the wireless link

4.2.1 WEP Security

If WEP is the chosen security option, you must set a unique static key to be shared with clients that wish to access this secured wireless network. This static key can be generated from an easy-to-remember passphrase and the selected encryption length.

- Authentication: select between Open System, or Shared Key schemes
- Encryption: select the encryption key size -- 64 bit WEP or 128 bit WEP. The larger size keys provide stronger encryption, thus making the key more difficult to crack
- WEP Passphrase: enter a alphanumeric phrase and click Generate Key to generate 4 unique WEP keys with length determined by the encryption key size. Next choose one of the keys to be used for authentication. The selected key must be shared with wireless clients to connect to this device.

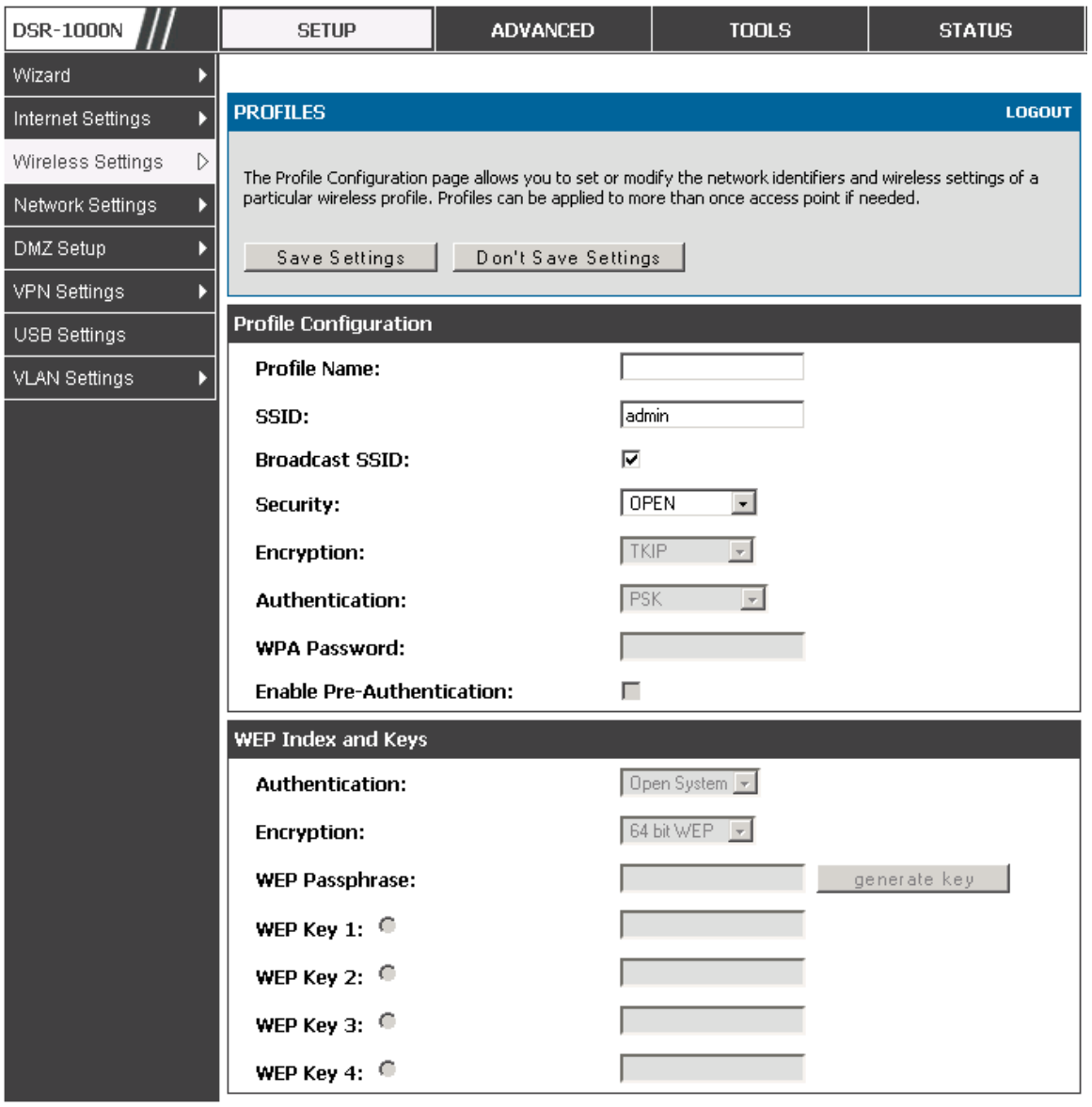


Figure 28: Profile configuration to set network security

4.2.2 WPA or WPA2 with PSK

A pre-shared key (PSK) is a known passphrase configured on the AP and client both and is used to authenticate the wireless client. An acceptable passphrase is between 8 to 63 characters in length.

4.2.3 RADIUS Authentication

Setup > Wireless Settings > RADIUS Settings

Enterprise Mode uses a RADIUS Server for WPA and/or WPA2 security. A RADIUS server must be configured and accessible by the router to authenticate wireless client connections to an AP enabled with a profile that uses RADIUS authentication.

- The Authentication IP Address is required to identify the server. A secondary RADIUS server provides redundancy in the event that the primary server cannot be reached by the router when needed.
- Authentication Port: the port for the RADIUS server connection
- Secret: enter the shared secret that allows this router to log into the specified RADIUS server(s). This key must match the shared secret on the RADIUS Server.
- The Timeout and Retries fields are used to either move to a secondary server if the primary cannot be reached, or to give up the RADIUS authentication attempt if communication with the server is not possible.

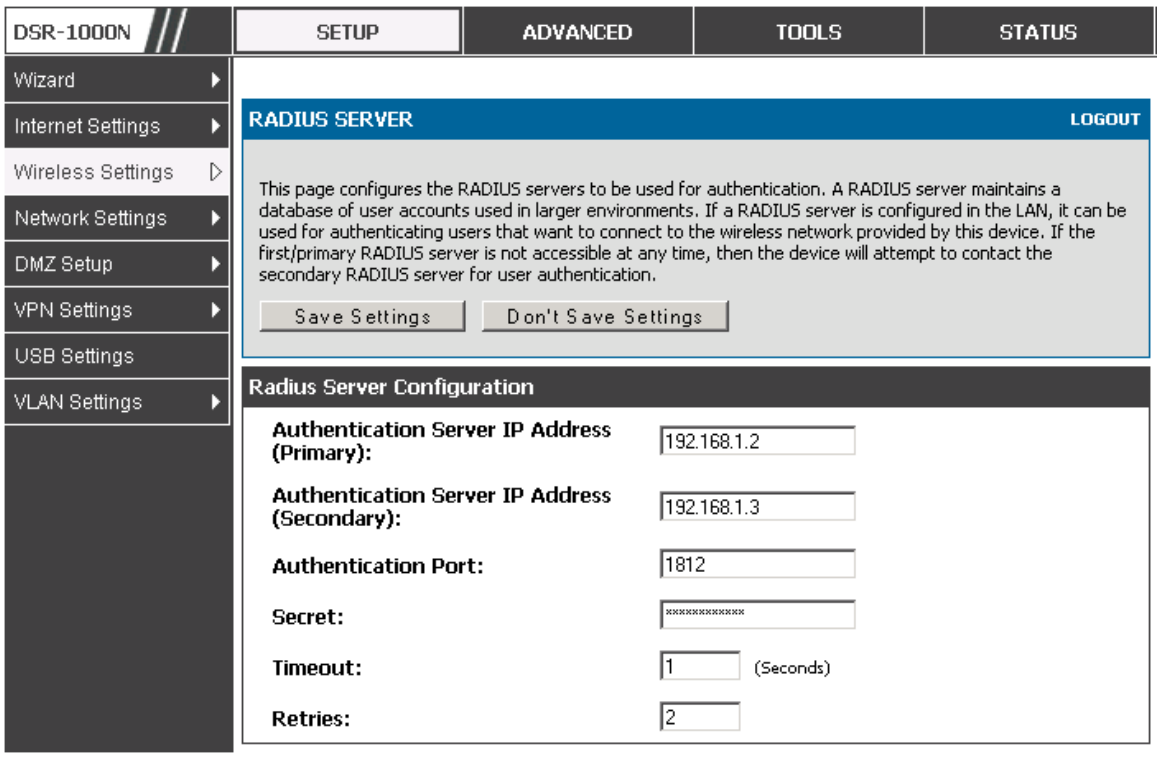


Figure 29: RADIUS server (External Authentication) configuration

4.3 Creating and Using Access Points

Setup > Wireless Settings > Access Points

Once a profile (a group of security settings) is created, it can be assigned to an AP on the router. The AP SSID can be configured to broadcast its availability to the 802.11 environment can be used to establish a WLAN network.

The AP configuration page allows you to create a new AP and link to it one of the available profiles. This router supports multiple AP's referred to as virtual access points (VAPs). Each virtual AP that has a unique SSIDs appears as an independent access point to clients. This valuable feature allows the router's radio to be configured in a way to optimize security and throughput for a group of clients as required by the user. To create a VAP, click the "add" button on the ***Setup > Wireless Settings > Access Points*** page. After setting the AP name, the profile dropdown menu is used to select one of the configured profiles.

The AP Name is a unique identifier used to manage the AP from the GUI, and is not the SSID that is detected by clients when the AP has broadcast enabled.

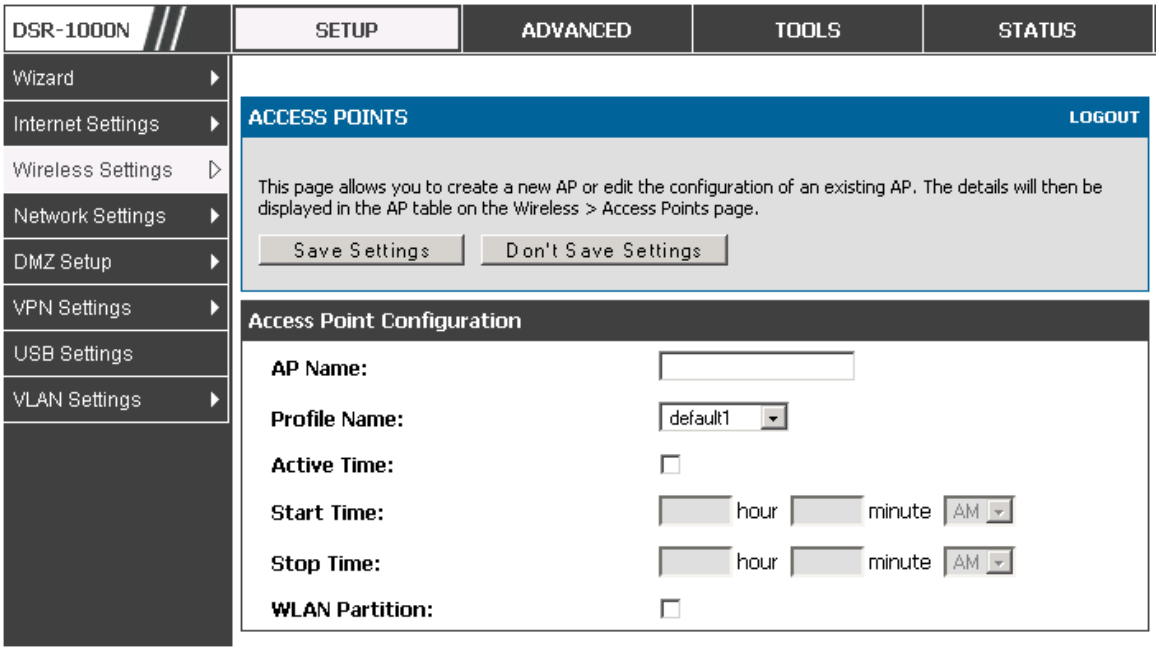


Figure 30: Virtual AP configuration

A valuable power saving feature is the start and stop time control for this AP. You can conserve on the radio power by disabling the AP when it is not in use. For example on evenings and weekends if you know there are no wireless clients, the start and stop time will enable/disable the access point automatically.

Once the AP settings are configured, you must enable the AP on the radio on the ***Setup > Wireless Settings > Access Points*** page. The status field changes to “Enabled” if the AP is available to accept wireless clients. If the AP is configured to broadcast its SSID (a profile parameter), a green check mark indicating it is broadcasting will be shown in the List of Available Access points.

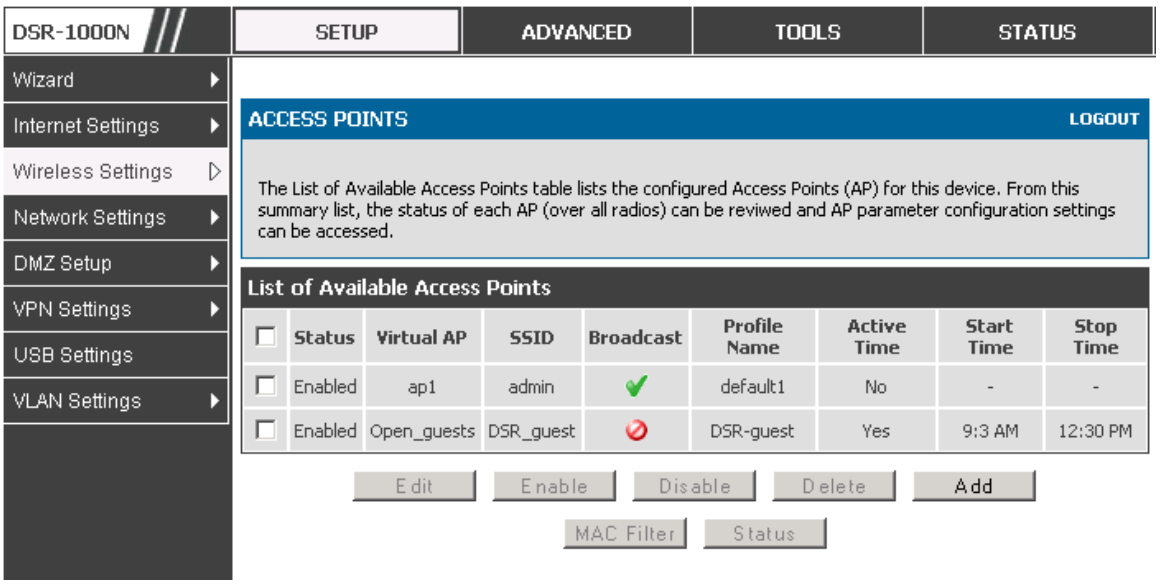


Figure 31: List of configured access points (Virtual APs) shows one enabled access point on the radio, broadcasting its SSID

The clients connected to a particular AP can be viewed by using the Status Button on the List of Available Access Points. Traffic statistics are shown for that individual AP, as compared to the summary stats for each AP on the Statistics table. Connected clients are sorted by the MAC address and indicate the security parameters used by the wireless link, as well as the time connected to this particular AP. Clicking the Details button next to the connected client will give the detailed send and receive traffic statistics for the wireless link between this AP and the client.

4.3.1 Primary benefits of Virtual APs:

- Optimize throughput: if 802.11b, 802.11 g, and 802.11n clients are expected to access the LAN via this router, creating 3 VAPs will allow you to manage or shape traffic for each group of clients. A unique SSID can be created for the network of 802.11b clients and another SSID can be assigned for the 802.11n clients. Each can have different security parameters – remember, the SSID and security of the link is determined by the profile. In this way legacy clients can access the network without bringing down the overall throughput of more capable 802.11n clients.

- Optimize security: you may wish to support select legacy clients that only offer WEP security while using WPA2 security for the majority of clients for the radio. By creating two VAPs configured with different SSIDs and different security parameters, both types of clients can connect to the LAN. Since WPA2 is more secure, you may want to broadcast this SSID and not broadcast the SSID for the VAP with WEP since it is meant to be used for a few legacy devices in this scenario.

4.4 Tuning Radio Specific Settings

Setup > Wireless Settings > Radio Settings

The Radio Settings page lets you configure the channels and power levels available for the AP's enabled on the device. The router has a dual band 802.11n radio, meaning either 2.4 GHz or 5 GHz frequency of operation can be selected (not concurrently though). Based on the selected operating frequency, the mode selection will let you define whether legacy connections or only 802.11n connections (or both) are accepted on configured APs.

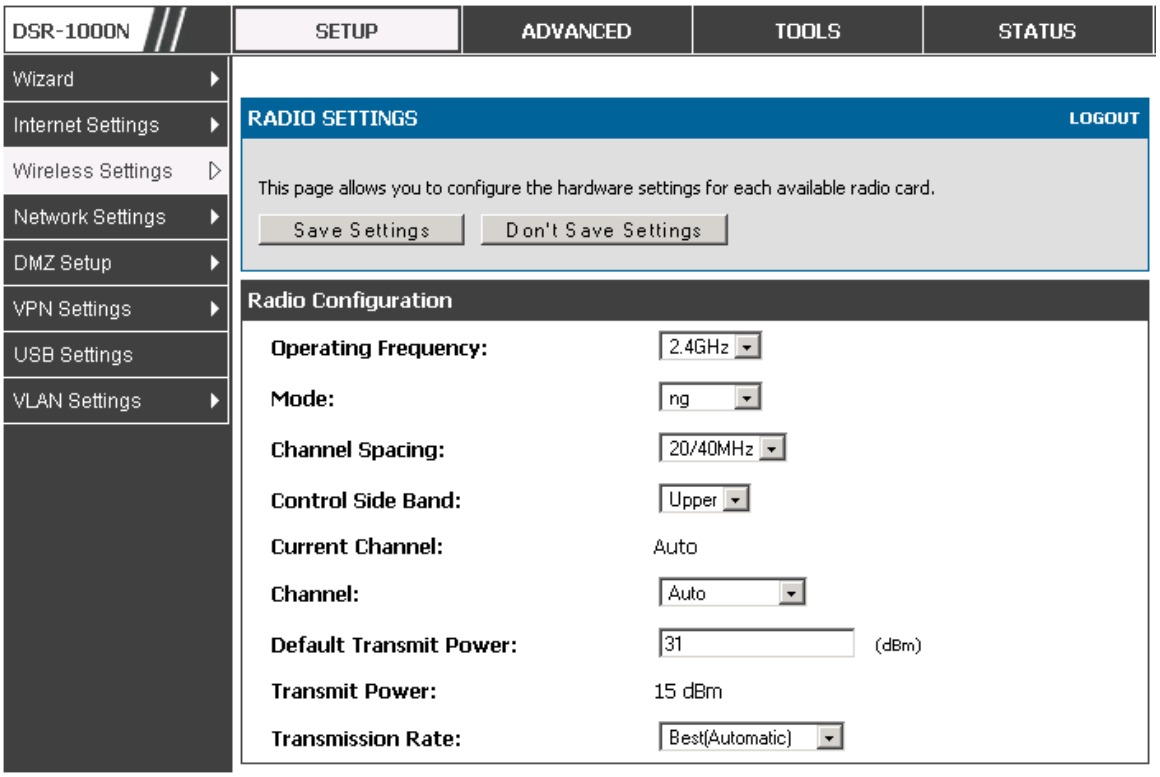


Figure 32: Radio card configuration options

The ratified 802.11n support on this radio requires selecting the appropriate broadcast (NA or NG etc.) mode, and then defining the channel spacing and control side band for 802.11n traffic. The default settings are appropriate for most networks. For example, changing the channel spacing to 40 MHz can improve bandwidth at the expense of supporting earlier 802.11n clients.

The available transmission channels are governed by regulatory constraints based on the region setting of the router. The maximum transmission power is similarly governed by regulatory limits; you have the option to decrease from the default maximum to reduce the signal strength of traffic out of the radio.

4.5 Advanced Wireless Settings

Advanced > Wireless Settings > Advanced Wireless

Sophisticated wireless administrators can modify the 802.11 communication parameters in this page. Generally, the default settings are appropriate for

most networks. Please refer to the GUI integrated help text for further details on the use of each configuration parameter.

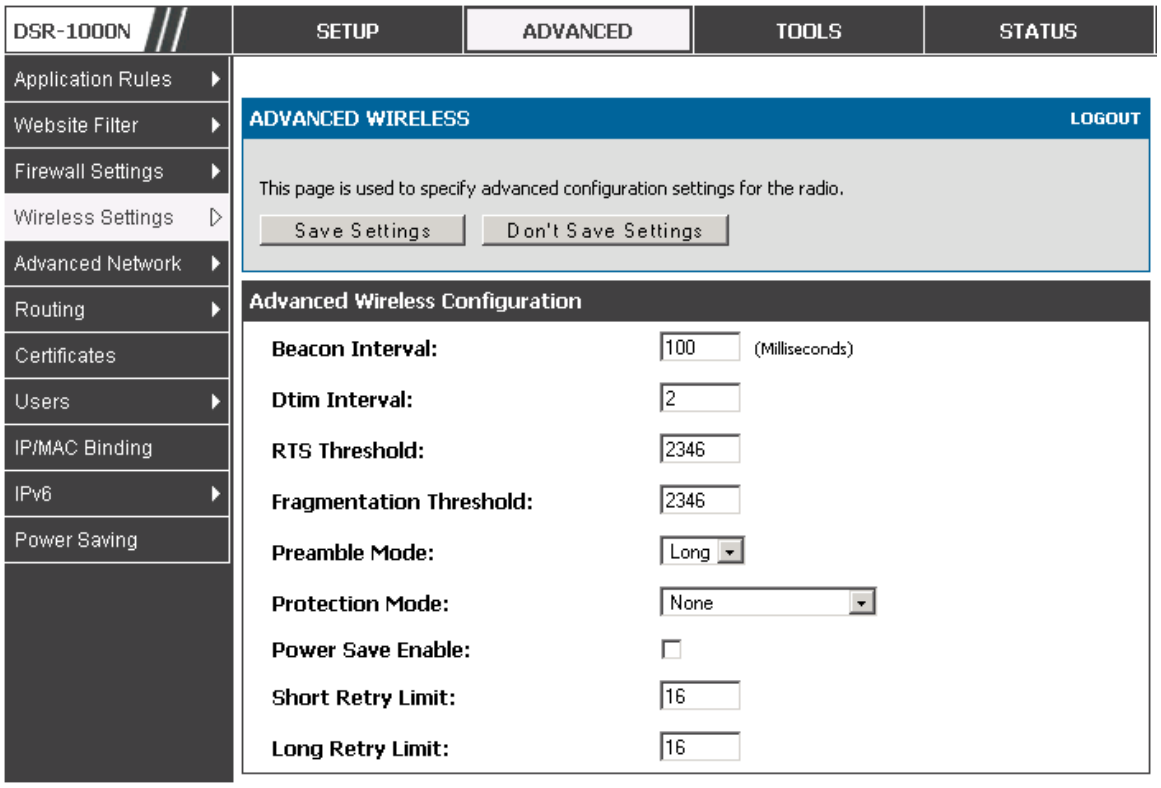


Figure 33: Advanced Wireless communication settings

4.6 Wi-Fi Protected Setup (WPS)

Advanced > Wireless Settings > WPS

WPS is a simplified method to add supporting wireless clients to the network. WPS is only applicable for APs that employ WPA or WPA2 security. To use WPS, select the eligible VAPs from the dropdown list of APs that have been configured with this security and enable WPS status for this AP.

The WPS Current Status section outlines the security, authentication, and encryption settings of the selected AP. These are consistent with the AP's profile. There are two setup options available for WPS:

- **Personal Identification Number (PIN):** The wireless device that supports WPS may have an alphanumeric PIN, if so add the PIN in this field. The router will connect within 60 seconds of clicking the “Configure via PIN” button immediately below the PIN field. There is no LED indication that a client has connected.
- **Push Button Configuration (PBC):** for wireless devices that support PBC, press and hold down on this button and within 2 minutes click the PBC connect button. The AP will detect the wireless device and establish a link to the client.

More than one AP can use WPS, but only one AP can be used to establish WPS links to client at any given time.

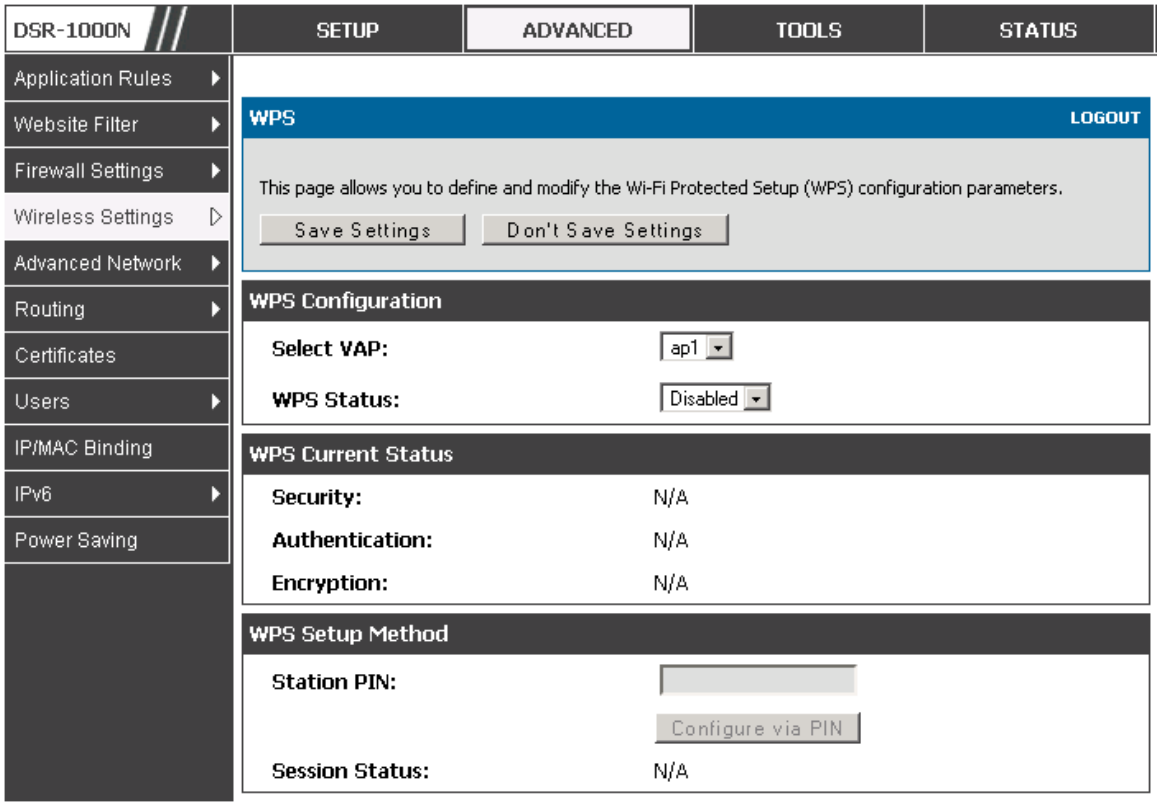


Figure 34: WPS configuration for an AP with WPA/WPA2 profile

5. Securing the Private Network

You can secure your network by creating and applying rules that your router uses to selectively block and allow inbound and outbound Internet traffic. You then specify how and to whom the rules apply. To do so, you must define the following:

- Services or traffic types (examples: web browsing, VoIP, other standard services and also custom services that you define)
- Direction for the traffic by specifying the source and destination of traffic; this is done by specifying the “From Zone” (LAN/WAN/DMZ) and “To Zone” (LAN/WAN/DMZ)
- Schedules as to when the router should apply rules
- Any Keywords (in a domain name or on a URL of a web page) that the router should allow or block
- Rules for allowing or blocking inbound and outbound Internet traffic for specified services on specified schedules
- MAC addresses of devices that should not access the internet
- Port triggers that signal the router to allow or block access to specified services as defined by port number
- Reports and alerts that you want the router to send to you

You can, for example, establish restricted-access policies based on time-of-day, web addresses, and web address keywords. You can block Internet access by applications and services on the LAN, such as chat rooms or games. You can block just certain groups of PCs on your network from being accessed by the WAN or public DMZ network.

5.1 Firewall Rules

Advanced > Firewall Settings > Firewall Rules

Inbound (WAN to LAN/DMZ) rules restrict access to traffic entering your network, selectively allowing only specific outside users to access specific local resources.

By default all access from the insecure WAN side are blocked from accessing the secure LAN, except in response to requests from the LAN or DMZ. To allow outside devices to access services on the secure LAN, you must create an inbound firewall rule for each service.

If you want to allow incoming traffic, you must make the router's WAN port IP address known to the public. This is called "exposing your host." How you make your address known depends on how the WAN ports are configured; for this router you may use the IP address if a static address is assigned to the WAN port, or if your WAN address is dynamic a DDNS (Dynamic DNS) name can be used.

Outbound (LAN/DMZ to WAN) rules restrict access to traffic leaving your network, selectively allowing only specific local users to access specific outside resources. The default outbound rule is to allow access from the secure zone (LAN) to either the public DMZ or insecure WAN. You can change this default behavior in the ***Firewall Settings > Default Outbound Policy*** page. When the default outbound policy is allow always, you can to block hosts on the LAN from accessing internet services by creating an outbound firewall rule for each service.

Figure 35: List of Available Firewall Rules

5.2 Defining Rule Schedules

Tools > Schedules

Firewall rules can be enabled or disabled automatically if they are associated with a configured schedule. The schedule configuration page allows you to define days of the week and the time of day for a new schedule, and then this schedule can be selected in the firewall rule configuration page.

All schedules will follow the time in the routers configured time zone. Refer to the section on choosing your Time Zone and configuring NTP servers for more information.

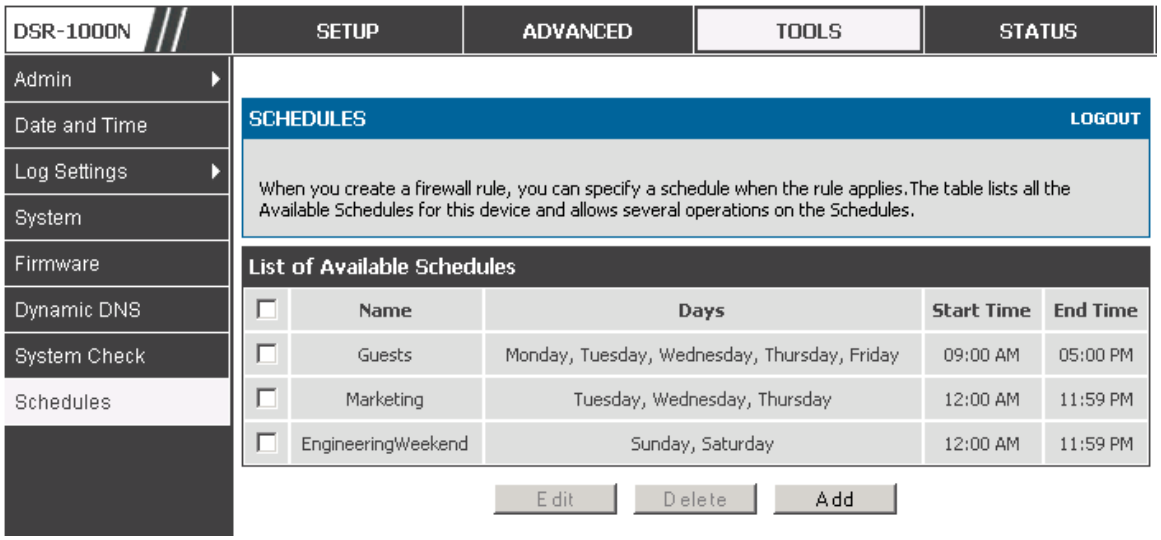


Figure 36: List of Available Schedules to bind to a firewall rule

5.3 Configuring Firewall Rules

Advanced > Firewall Settings > Firewall Rules

All configured firewall rules on the router are displayed in the Firewall Rules list. This list also indicates whether the rule is enabled (active) or not, and gives a summary of the From/To zone as well as the services or users that the rule affects.

To create a new firewall rules, follow the steps below:

1. View the existing rules in the List of Available Firewall Rules table.
2. To edit or add an outbound or inbound services rule, do the following:
   - To edit a rule, click the checkbox next to the rule and click Edit to reach that rule's configuration page.
   - To add a new rule, click Add to be taken to a new rule's configuration page. Once created, the new rule is automatically added to the original table.
3. Chose the From Zone to be the source of originating traffic: either the secure LAN, public DMZ, or insecure WAN. For an inbound rule WAN should be selected as the From Zone.

4. Choose the To Zone to be the destination of traffic covered by this rule. If the From Zone is the WAN, the To Zone can be the public DMZ or secure LAN. Similarly if the From Zone is the LAN, then the To Zone can be the public DMZ or insecure WAN.
5. Parameters that define the firewall rule include the following:
    - Service: ANY means all traffic is affected by this rule. For a specific service the drop down list has common services, or you can select a custom defined service.
    - Action & Schedule: Select one of the 4 actions that this rule defines: BLOCK always, ALLOW always, BLOCK by schedule otherwise ALLOW, or ALLOW by schedule otherwise BLOCK. A schedule must be preconfigured in order for it to be available in the dropdown list to assign to this rule.

    ▫ Source & Destination users: For each relevant category, select the users to which the rule applies:
        - Any (all users)
        - Single Address (enter an IP address)
        - Address Range (enter the appropriate IP address range)

    ▫ Log: traffic that is filtered by this rule can be logged; this requires configuring the router's logging feature separately.

    ▫ QoS Priority: Outbound rules (where To Zone = insecure WAN only) can have the traffic marked with a QoS priority tag. Select a priority level:
        - Normal-Service: ToS=0 (lowest QoS)
        - Minimize-Cost: ToS=1
        - Maximize-Reliability: ToS=2
        - Maximize-Throughput: ToS=4

- Minimize-Delay: ToS=8 (highest QoS)

6. Inbound rules can use Destination NAT (DNAT) for managing traffic from the WAN. Destination NAT is available when the To Zone = DMZ or secure LAN.
   - With an inbound allow rule you can enter the internal server address that is hosting the selected service.
   - You can enable port forwarding for an incoming service specific rule (From Zone = WAN) by selecting the appropriate checkbox. This will allow the selected service traffic from the internet to reach the appropriate LAN port via a port forwarding rule.
   - Translate Port Number: With port forwarding, the incoming traffic to be forwarded to the port number entered here.
   - External IP address: The rule can be bound to a specific WAN interface by selecting either the primary WAN or configurable port WAN as the source IP address for incoming traffic.

> This router supports multi-NAT and so the External IP address does not necessarily have to be the WAN address. On a single WAN interface, multiple public IP addresses are supported. If your ISP assigns you more than one public IP address, one of these can be used as your primary IP address on the WAN port, and the others can be assigned to servers on the LAN or DMZ. In this way the LAN/DMZ server can be accessed from the internet by its aliased public IP address.

7. Outbound rules can use Source NAT (SNAT) in order to statically map (bind) all LAN/DMZ traffic matching the rule parameters to a specific WAN interface or external IP address (usually provided by your ISP).

Once the new or modified rule parameters are saved, it appears in the master list of firewall rules. To enable or disable a rule, click the checkbox next to the rule in the list of firewall rules and choose Enable or Disable.

The router applies firewall rules in the order listed. As a general rule, you should move the strictest rules (those with the most specific services or addresses) to the top of the list. To reorder rules, click the checkbox next to a rule and click up or down.

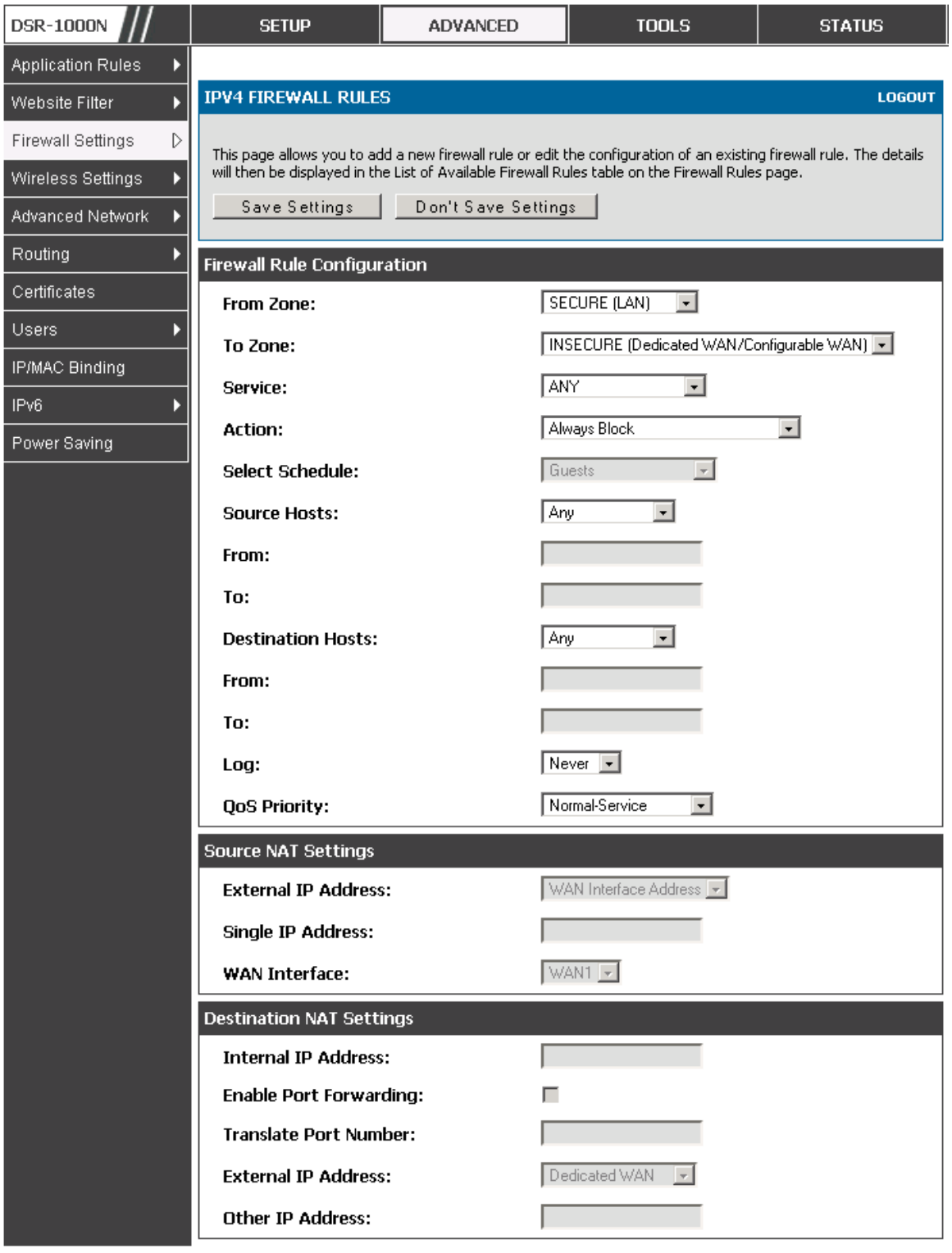


Figure 37: The firewall rule configuration page allows you to define the To/From zone, service, action, schedules, and specify source/destination IP addresses as needed.

5.3.1 Firewall Rule Configuration Examples

Example 1: Allow inbound HTTP traffic to the DMZ

Situation: You host a public web server on your local DMZ network. You want to allow inbound HTTP requests from any outside IP address to the IP address of your web server at any time of day.

Solution: Create an inbound rule as follows.

Parameter	Value
From Zone	Insecure (WAN1/WAN2)
To Zone	Public (DMZ)
Service	HTTP
Action	ALLOW always
Send to Local Server (DNAT IP)	192.168.5.2 (web server IP address)
Destination Users	Any
Log	Never

Example 2: Allow videoconferencing from range of outside IP addresses

Situation: You want to allow incoming videoconferencing to be initiated from a restricted range of outside IP addresses (132.177.88.2 - 132.177.88.254), from a branch office.

Solution: Create an inbound rule as follows. In the example, CUSeeMe (the video conference service used) connections are allowed only from a specified range of external IP addresses.

Parameter	Value
From Zone	Insecure (WAN1/WAN2)
To Zone	Secure (LAN)
Service	CU-SEEME:UDP
Action	ALLOW always
Send to Local Server (DNAT IP)	192.168.10.11
Destination Users	Address Range
From	132.177.88.2
To	134.177.88.254
Enable Port Forwarding	Yes (enabled)

Example 3: Multi-NAT configuration

Situation: You want to configure multi-NAT to support multiple public IP addresses on one WAN port interface.

Solution: Create an inbound rule that configures the firewall to host an additional public IP address. Associate this address with a web server on the DMZ. If you arrange with your ISP to have more than one public IP address for your use, you can use the additional public IP addresses to map to servers on your LAN. One of these public IP addresses is used as the primary IP address of the router. This address is used to provide Internet access to your LAN PCs through NAT. The other addresses are available to map to your DMZ servers.

The following addressing scheme is used to illustrate this procedure:

Router

- WAN IP address: 10.1.0.118

- LAN IP address: 192.168.10.1; subnet 255.255.255.0
- Web server host in the DMZ, IP address: 192.168.12.222
- Access to Web server: (simulated) public IP address 10.1.0.52

Parameter	Value
From Zone	Insecure (WAN1/WAN2)
To Zone	Public (DMZ)
Service	HTTP
Action	ALLOW always
Send to Local Server (DNAT IP)	192.168.12.222 (web server local IP address)
Destination Users	Single Address
From	10.1.0.52
WAN Users	Any
Log	Never

Example 4: Block traffic by schedule if generated from specific range of machines

Use Case: Block all HTTP traffic on the weekends if the request originates from a specific group of machines in the LAN having a known range of IP addresses, and anyone coming in through the Network from the WAN (i.e. all remote users).

Configuration:

1. Setup a schedule:
   - To setup a schedule that affects traffic on weekends only, navigate to Security: Schedule, and name the schedule “Weekend”

- Define “weekend” to mean 12 am Saturday morning to 12 am Monday morning – all day Saturday & Sunday
- In the Scheduled days box, check that you want the schedule to be active for “specific days”. Select “Saturday” and “Sunday”
- In the scheduled time of day, select “all day” – this will apply the schedule between 12 am to 11:59 pm of the selected day.
- Click apply – now schedule “Weekend” isolates all day Saturday and Sunday from the rest of the week.

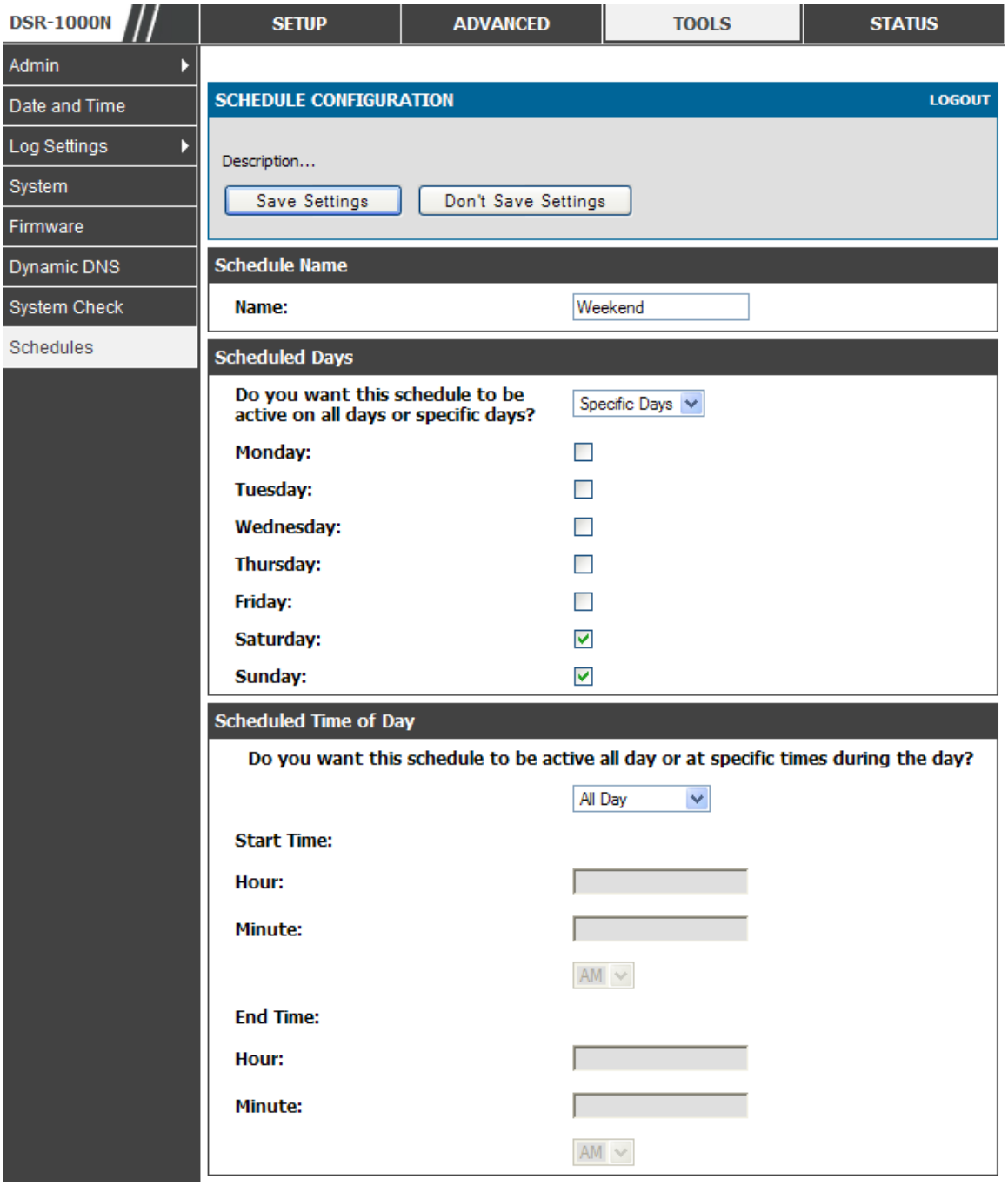


Figure 38: Schedule configuration for the above example.

2. Since we are trying to block HTTP requests, it is a service with To Zone: Insecure (WAN1/WAN2) that is to be blocked according to schedule “Weekend”.

3. Select the Action to “Block by Schedule, otherwise allow”. This will take a predefined schedule and make sure the rule is a blocking rule during the defined dates/times. All other times outside the schedule will not be affected by this firewall blocking rule
4. As we defined our schedule in schedule “Weekend”, this is available in the dropdown menu
5. We want to block the IP range assigned to the marketing group. Let’s say they have IP 192.168.10.20 to 192.168.10.30. On the Source Users dropdown, select Address Range and add this IP range as the From and To IP addresses.
6. We want to block all HTTP traffic to any services going to the insecure zone. The Destination Users dropdown should be “any”.
7. We don’t need to change default QoS priority or Logging (unless desired) – clicking apply will add this firewall rule to the list of firewall rules.
8. The last step is to enable this firewall rule. Select the rule, and click “enable” below the list to make sure the firewall rule is active

5.4 Security on Custom Services

Advanced > Firewall Settings > Custom Services

Custom services can be defined to add to the list of services available during firewall rule configuration. While common services have known TCP/UDP/ICMP ports for traffic, many custom or uncommon applications exist in the LAN or WAN. In the custom service configuration menu you can define a range of ports and identify the traffic type (TCP/UDP/ICMP) for this service. Once defined, the new service will appear in the services list of the firewall rules configuration menu.

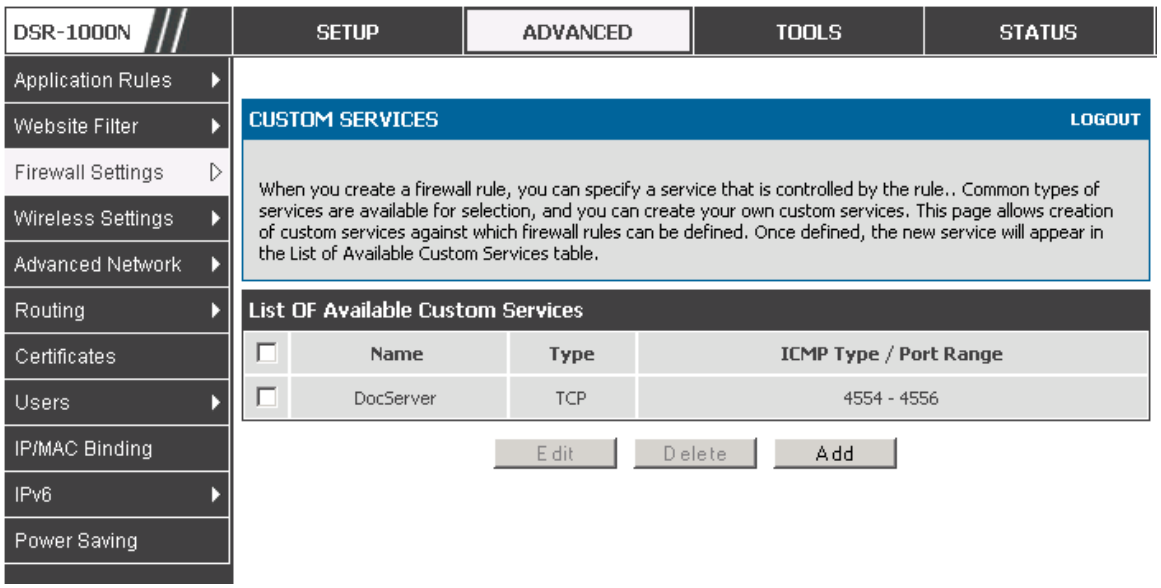


Figure 39: Schedule configuration for the above example.

5.5 ALG support

Advanced > Firewall Settings > ALGs

Application Level Gateways (ALGs) are security component that enhance the firewall and NAT support of this router to seamlessly support application layer protocols. In some cases enabling the ALG will allow the firewall to use dynamic ephemeral TCP/ UDP ports to communicate with the known ports a particular client application (such as H.323 or RTSP) requires, without which the admin would have to open large number of ports to accomplish the same support. Because the ALG understands the protocol used by the specific application that it supports, it is a very secure and efficient way of introducing support for client applications through the router's firewall.

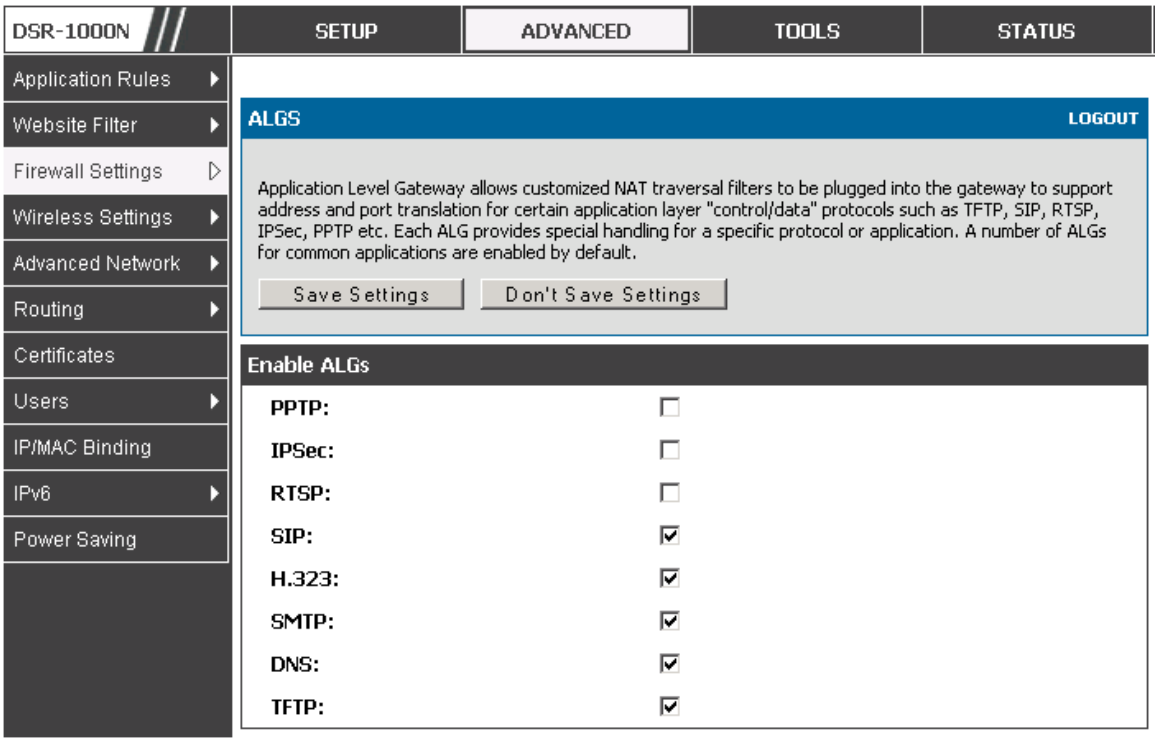


Figure 40: Available ALG support on the router.

5.6 VPN Passthrough for Firewall

Advanced > Firewall Settings > VPN Passthrough

This router's firewall settings can be configured to allow encrypted VPN traffic for IPsec, PPTP, and L2TP VPN tunnel connections between the LAN and internet. A specific firewall rule or service is not appropriate to introduce this passthrough support; instead the appropriate check boxes in the VPN Passthrough page must be enabled.

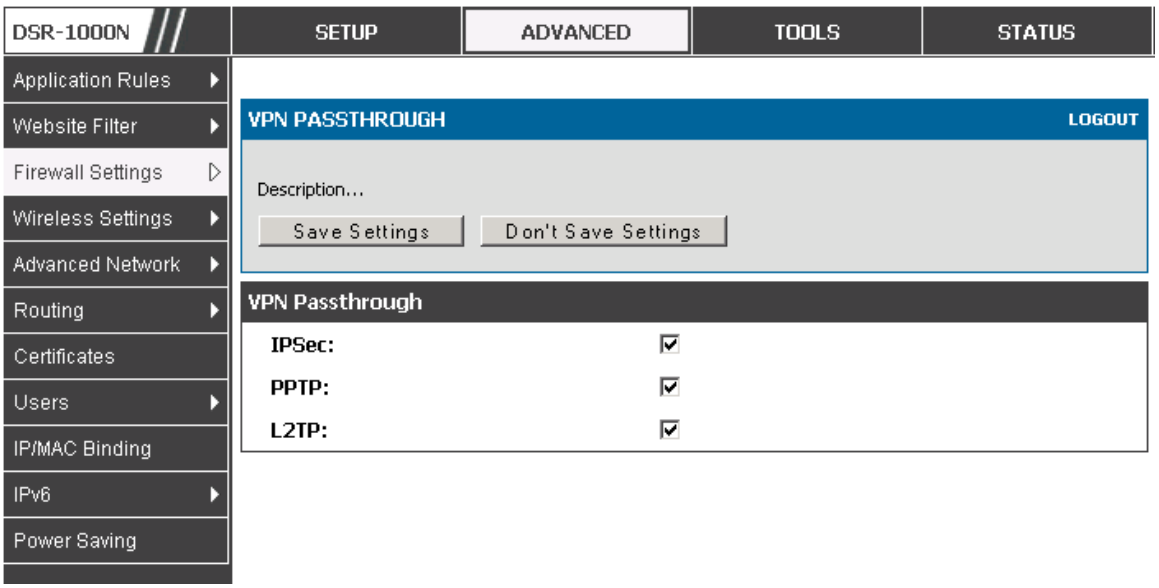


Figure 41: Passthrough options for VPN tunnels

5.7 Application Rules

Advanced > Application Rules > Application Rules

Application rules are also referred to as port triggering. This feature allows devices on the LAN or DMZ to request one or more ports to be forwarded to them. Port triggering waits for an outbound request form the LAN/DMZ on one of the defined outgoing ports, and then opens an incoming port for that specified type of traffic. This can be thought of as a form of dynamic port forwarding while an application is transmitting data over the opened outgoing or incoming port(s).

Port triggering application rules are more flexible than static port forwarding that is an available option when configuring firewall rules. This is because a port triggering rule does not have to reference a specific LAN IP or IP range. As well ports are not left open when not in use, thereby providing a level of security that port forwarding does not offer.

Port triggering is not appropriate for servers on the LAN, since there is a dependency on the LAN device making an outgoing connection before incoming ports are opened.

Some applications require that when external devices connect to them, they receive data on a specific port or range of ports in order to function properly. The router must send all incoming data for that application only on the required port or range of ports. The router has a list of common applications and games with corresponding outbound and inbound ports to open. You can also specify a port triggering rule by defining the type of traffic (TCP or UDP) and the range of incoming and outgoing ports to open when enabled.

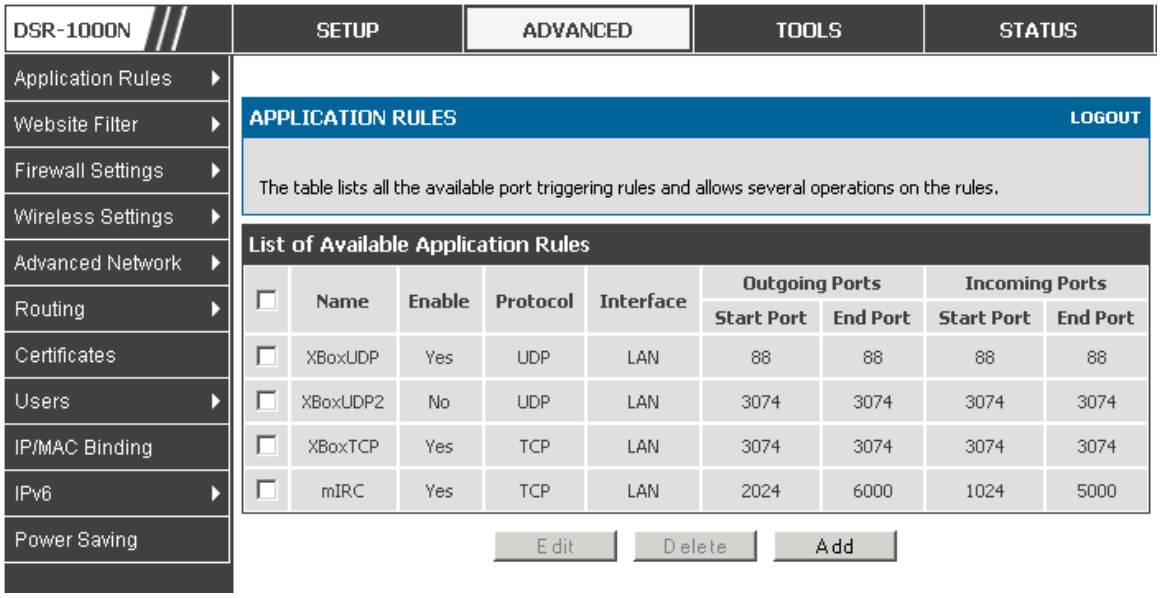


Figure 42: List of Available Application Rules showing 4 unique rules

The application rule status page will list any active rules, i.e. incoming ports that are being triggered based on outbound requests from a defined outgoing port.

5.8 Web Content Filtering

The gateway offers some standard web filtering options to allow the admin to easily create internet access policies between the secure LAN and insecure WAN. Instead of creating policies based on the type of traffic (as is the case when using firewall rules), web based content itself can be used to determine if traffic is allowed or dropped.

Content Filtering

Advanced > Website Filter > Content Filtering

Content filtering must be enabled to configure and use the subsequent features (list of Trusted Domains, filtering on Blocked Keywords, etc.). Proxy servers, which can be used to circumvent certain firewall rules and thus a potential security gap, can be blocked for all LAN devices. Java applets can be prevented from being downloaded from internet sites, and similarly the gateway can prevent ActiveX controls from being downloaded via Internet Explorer. For added security cookies, which typically contain session information, can be blocked as well for all devices on the private network.

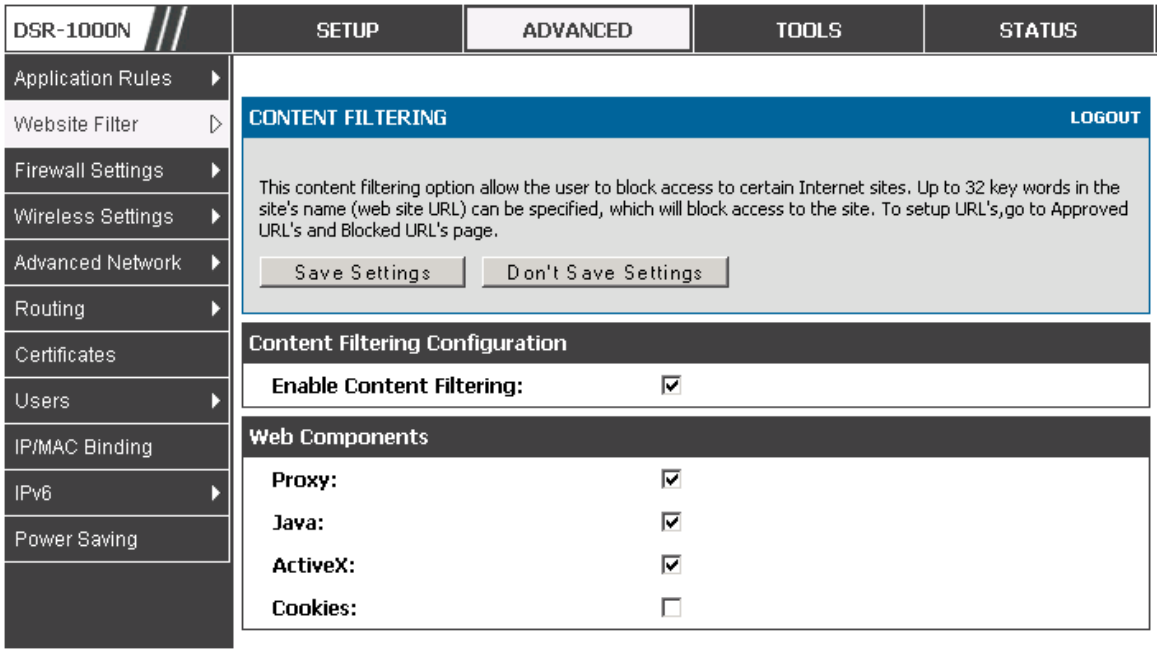


Figure 43: Content Filtering used to block access to proxy servers and prevent ActiveX controls from being downloaded

Approved URLs

Advanced > Website Filter > Approved URLs

The Approved URLs is an acceptance list for all URL domain names. Domains added to this list are allowed in any form. For example, if the

domain “yahoo” is added to this list then all of the following URL’s are permitted access from the LAN: www.yahoo.com, yahoo.co.uk, etc.

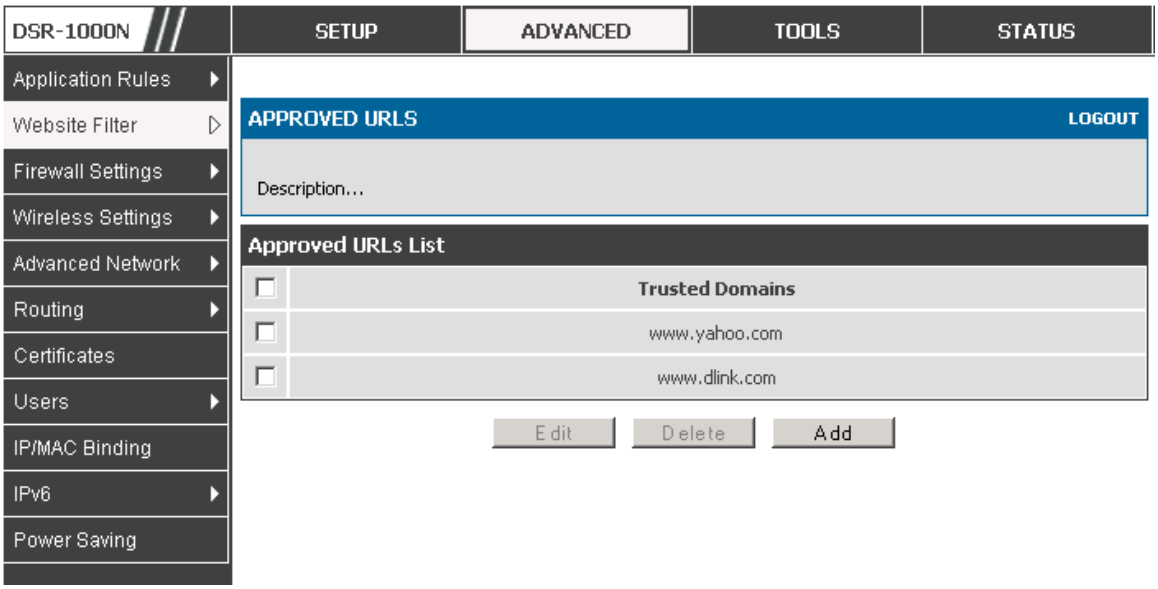


Figure 44: Two trusted domains added to the Approved URLs List

Blocked Keywords

Advanced > Website Filter > Blocked URLs

Keyword blocking allows you to block all website URL’s or site content that contains the keywords in the configured list. This is lower priority than the Approved URL List; i.e. if the blocked keyword is present in a site allowed by a Trusted Domain in the Approved URL List, then access to that site will be allowed.

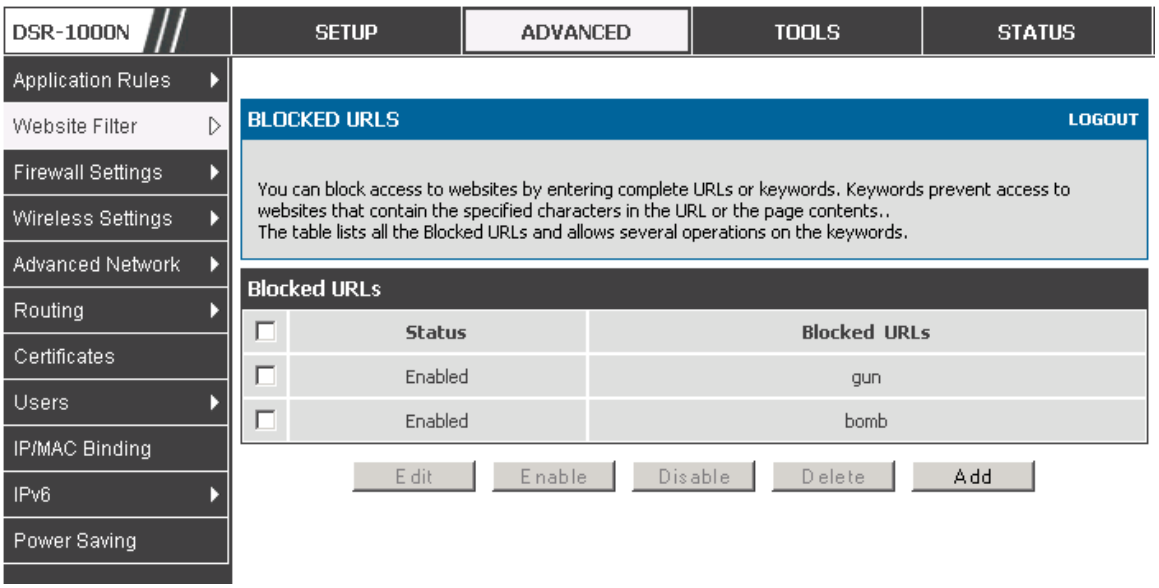


Figure 45: Two keywords added to the block list

5.9 IP/MAC Binding

Advanced > IP/MAC Binding

Another available security measure is to only allow outbound traffic (from the LAN to WAN) when the LAN node has an IP address matching the MAC address bound to it. This is IP/MAC Binding, and by enforcing the gateway to validate the source traffic's IP address with the unique MAC Address of the configured LAN node, the administrator can ensure traffic from that IP address is not spoofed. In the event of a violation (i.e. the traffic's source IP address doesn't match up with the expected MAC address having the same IP address) the packets will be dropped and can be logged for diagnosis.

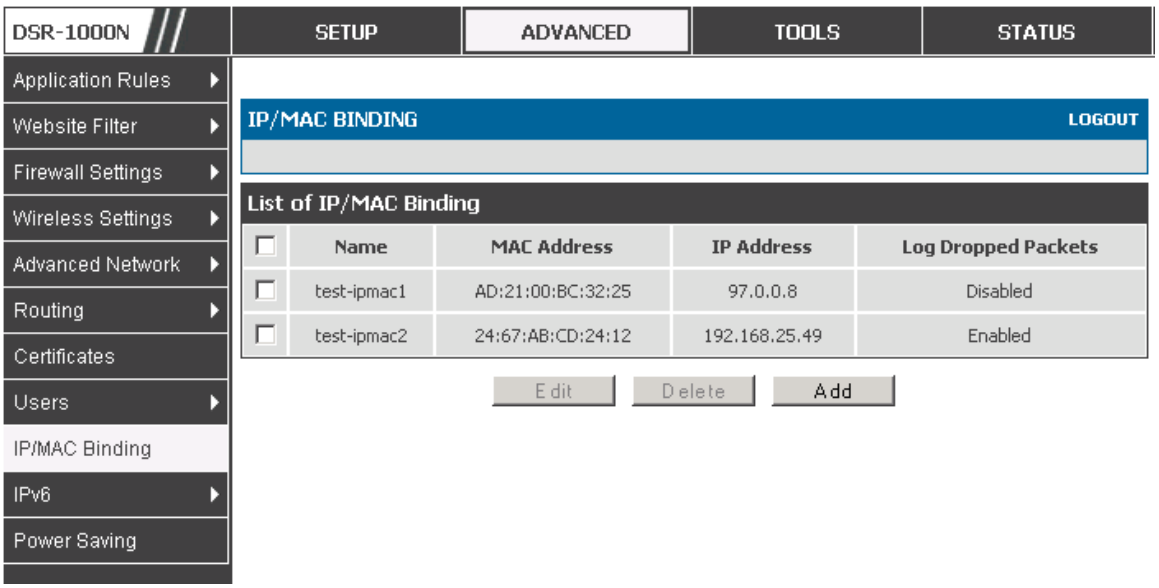


Figure 46: The above example of IP/MAC Binding binds a LAN host's MAC Address to an IP address. If there is an IP/MAC Binding violation, the violating packet will be dropped and logs will be captured

5.10 Intrusion Prevention (IPS)

Advanced > Advanced Network > IPS

The gateway's Intrusion Prevention System (IPS) prevents malicious attacks from the internet from accessing the private network. Static attack signatures loaded to the device allow common attacks to be detected and prevented. The checks can be enabled between the WAN and DMZ or LAN, and a running counter will allow the administrator to see how many malicious intrusion attempts from the WAN have been detected and prevented.

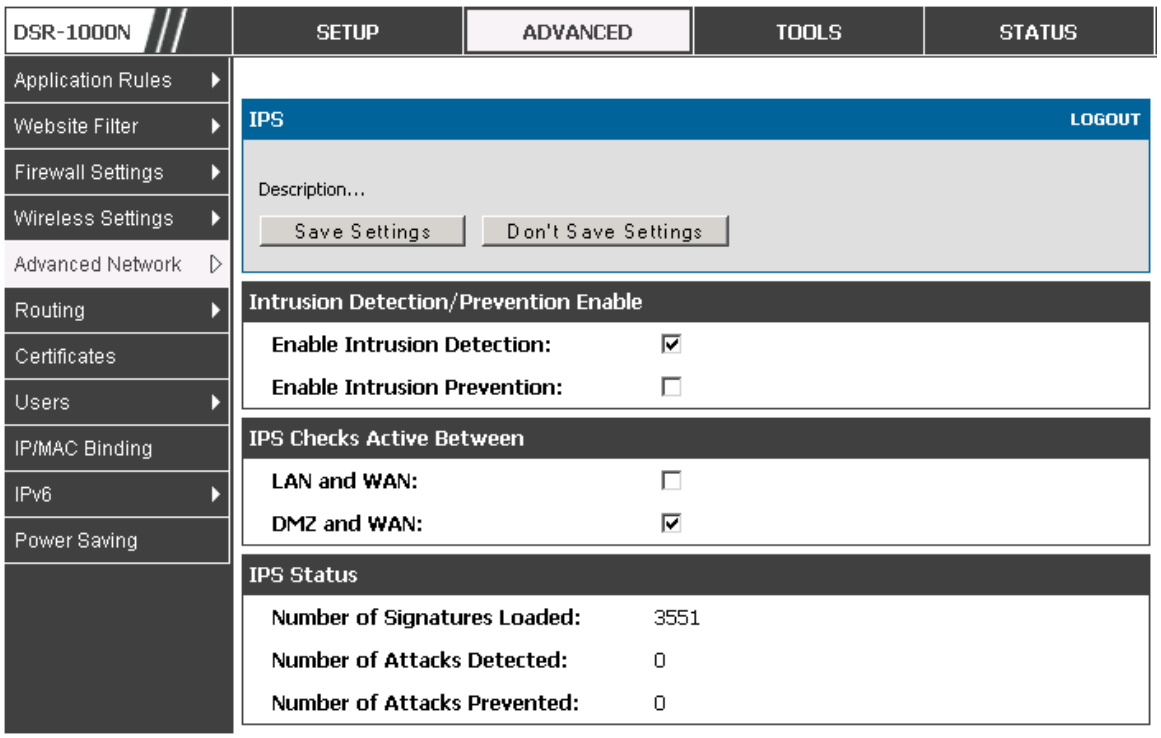


Figure 47: Intrusion Prevention features on the router

5.10.1 Protecting from Internet Attacks

Advanced > Advanced Network > Attack Checks

Attacks can be malicious security breaches or unintentional network issues that render the router unusable. Attack checks allow you to manage WAN security threats such as continual ping requests and discovery via ARP scans. TCP and UDP flood attack checks can be enabled to manage extreme usage of WAN resources.

Additionally certain Denial-of-Service (DoS) attacks can be blocked. These attacks, if uninhibited, can use up processing power and bandwidth and prevent regular network services from running normally. ICMP packet flooding, SYN traffic flooding, and Echo storm thresholds can be configured to temporarily suspect traffic from the offending source.

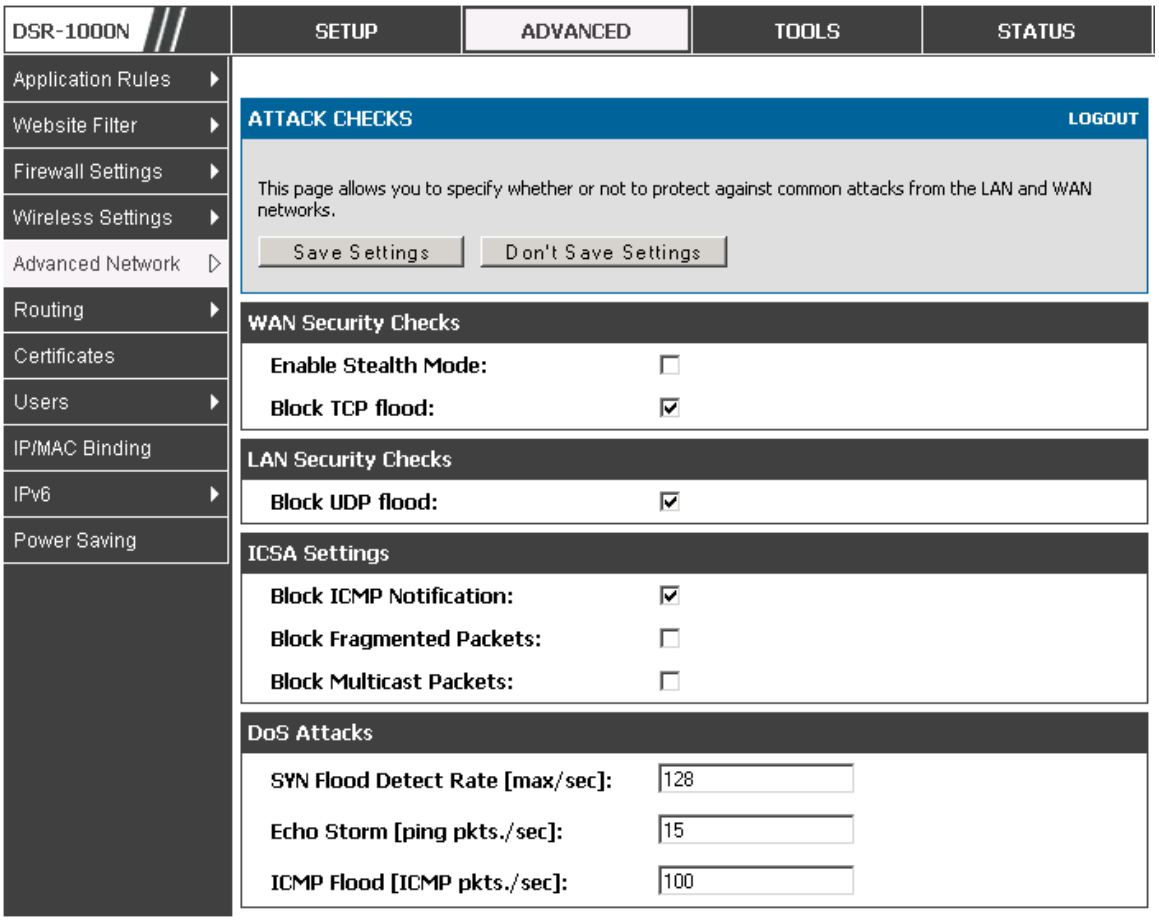


Figure 48: Protecting the router and LAN from internet attacks

6. IPsec VPN

A VPN provides a secure communication channel (“tunnel”) between two gateway routers or a remote PC client. The following types of tunnels can be created:

- Gateway-to-gateway VPN: to connect two or more routers to secure traffic between remote sites.
- Remote Client (client-to-gateway VPN tunnel): A remote client initiates a VPN tunnel as the IP address of the remote PC client is not known in advance. The gateway in this case acts as a responder.
- Remote client behind a NAT router: The client has a dynamic IP address and is behind a NAT Router. The remote PC client at the NAT router initiates a VPN tunnel as the IP address of the remote NAT router is not known in advance. The gateway WAN port acts as responder.

6.1 VPN Wizard

Setup > Wizard > VPN Wizard

You can use the VPN wizard to quickly create both IKE and VPN policies. Once the IKE or VPN policy is created, you can modify it as required.

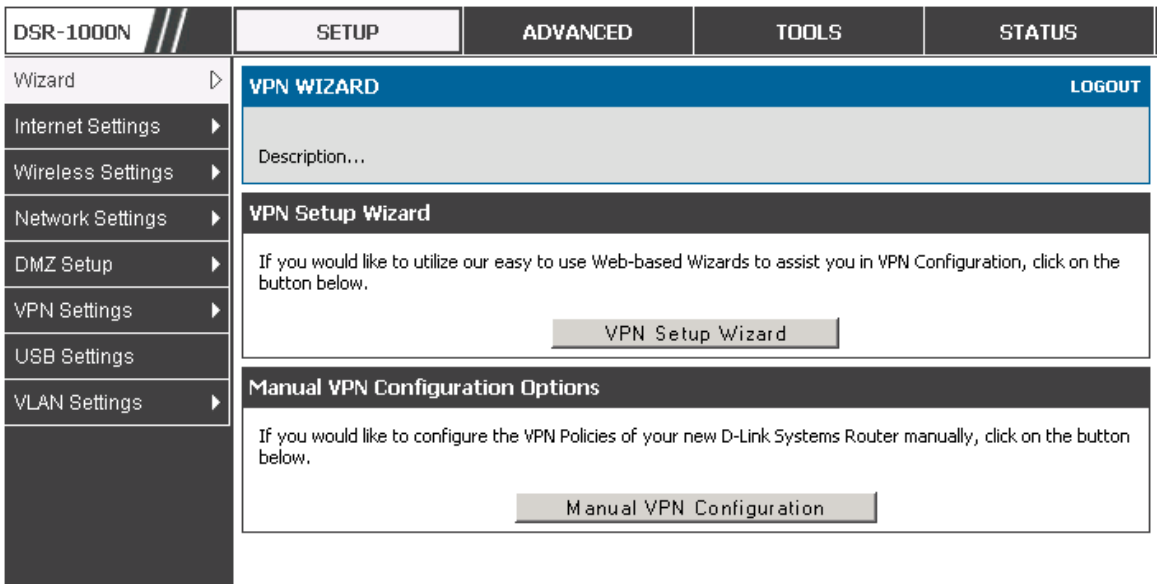


Figure 49: VPN Wizard launch screen

To easily establish a VPN tunnel using VPN Wizard, follow the steps below:

1. Step 1: Select the VPN tunnel type to create
   - The tunnel can either be a gateway to gateway connection (site-to-site) or a tunnel to a host on the internet (remote access).
   - Set the Connection Name and pre-shared key: the connection name is used for management, and the pre-shared key will be required on the VPN client or gateway to establish the tunnel
   - Determine the local gateway for this tunnel; if there is more than 1 WAN configured the tunnel can be configured for either of the gateways.
2. Step 2: Configure Remote and Local WAN address for the tunnel endpoints
   - Remote Gateway Type: identify the remote endpoint of the tunnel by FQDN or static IP address
   - Remote WAN IP address / FQDN: This field is enabled only if the peer you are trying to connect to is a Gateway. For VPN Clients, this IP address or Internet Name is determined when a connection request is received from a client.

- Local Gateway Type: identify this router's endpoint of the tunnel by FQDN or static IP address
- Local WAN IP address / FQDN: This field can be left blank if you are not using a different FQDN or IP address than the one specified in the WAN port's configuration.

3. Step 3: Configure the Secure Connection Remote Accessibility fields to identify the remote network:
   - Remote LAN IP address: address of the LAN behind the peer gateway
   - Remote LAN Subnet Mask: the subnet mask of the LAN behind the peer

> **Note:** The IP address range used on the remote LAN must be different from the IP address range used on the local LAN.

4. Step4: review the settings and click Connect to establish the tunnel.

The Wizard will create a corresponding IKE policy with the following default values for a VPN Client or Gateway policy (these can be accessed from a link on the Wizard page):

Parameter	Default value from Wizard
Exchange Mode	Aggressive (Client policy) or Main (Gateway policy)
ID Type	FQDN
Local WAN ID	wan_local.com (only applies to Client policies)
Remote WAN ID	wan_remote.com (only applies to Client policies)
Encryption Algorithm	3DES
Authentication Algorithm	SHA-1
Authentication Method	Pre-shared Key

Key-Group	DH-Group 2(1024 bit)
Life Time	24 hours

As well, the Wizard will create a matching VPN policy to the IKE policy with the following default values:

Parameter	Default value from Wizard
Encryption Algorithm	3DES
Authentication Algorithm	SHA-1
Life Time	8 hours
PFS Key Group	DH-Group 2(1024 bit)
NETBIOS	Enabled (only applies to Gateway policies)

The VPN Wizard is the recommended method to set up corresponding IKE and VPN policies for establishing a VPN tunnel. Once the Wizard creates the matching IKE and VPN policies, one can modify the required fields through the edit link. Advanced users can create an IKE policy from the Add link but must be sure to use compatible encryption, authentication, and key-group parameters for the VPN policy. Refer to the online help for details.

6.2 Configuring IKE Policies

Setup > VPN Settings > IPsec > IKE Policies

The Internet Key Exchange (IKE) protocol dynamically exchanges keys between two IPsec hosts. You can create IKE policies to define the security parameters such as authentication of the peer, encryption algorithms, etc. to be used in this process.

IKE policies can be created by clicking “Add” on the VPN > IKE Policies web page.

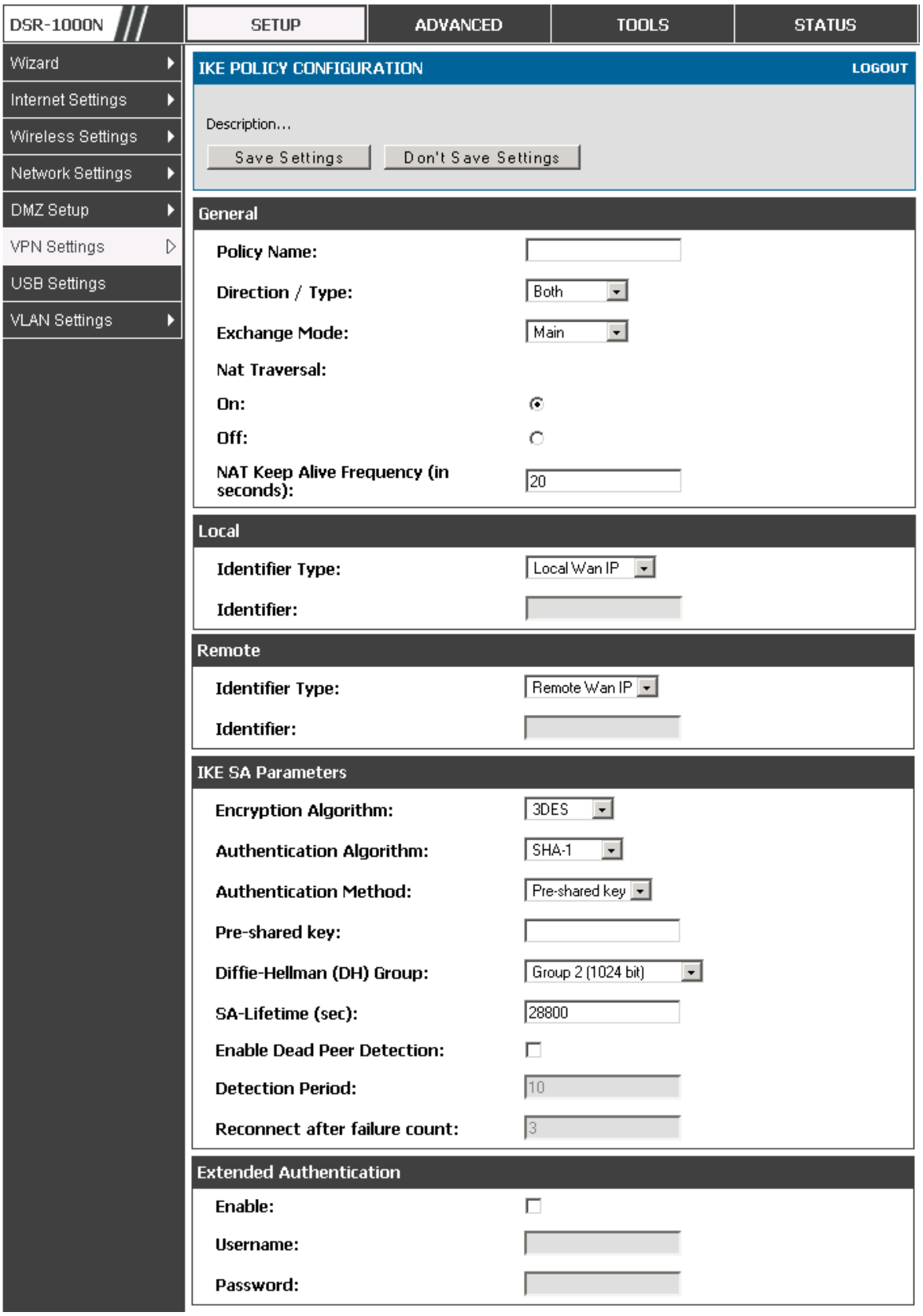


Figure 50: IKE policy created by the VPN Wizard then modified manually

6.2.1 Configuring an IKE Policy using XAUTH

You can also configure extended authentication (XAUTH). Rather than configure a unique VPN policy for each user, you can configure the VPN gateway router to authenticate users from a stored list of user accounts or with an external authentication server such as a RADIUS server. With a user database, user accounts created in the router are used to authenticate users.

With a configured RADIUS server, the router connects to a RADIUS server and passes to it the credentials that it receives from the VPN client. You can secure the connection between the router and the RADIUS server with the authentication protocol supported by the server (PAP or CHAP). For RADIUS – PAP, the router first checks in the user database to see if the user credentials are available; if they are not, the router connects to the RADIUS server.

6.3 Configuring VPN Policies

Setup > VPN Settings > IPsec > VPN Policies

The VPN policy is one half of the IKE/VPN policy pair required to establish a VPN tunnel. The IP addresses of the machine or machines on the two VPN endpoints are configured here, along with the policy parameters required to secure the tunnel.

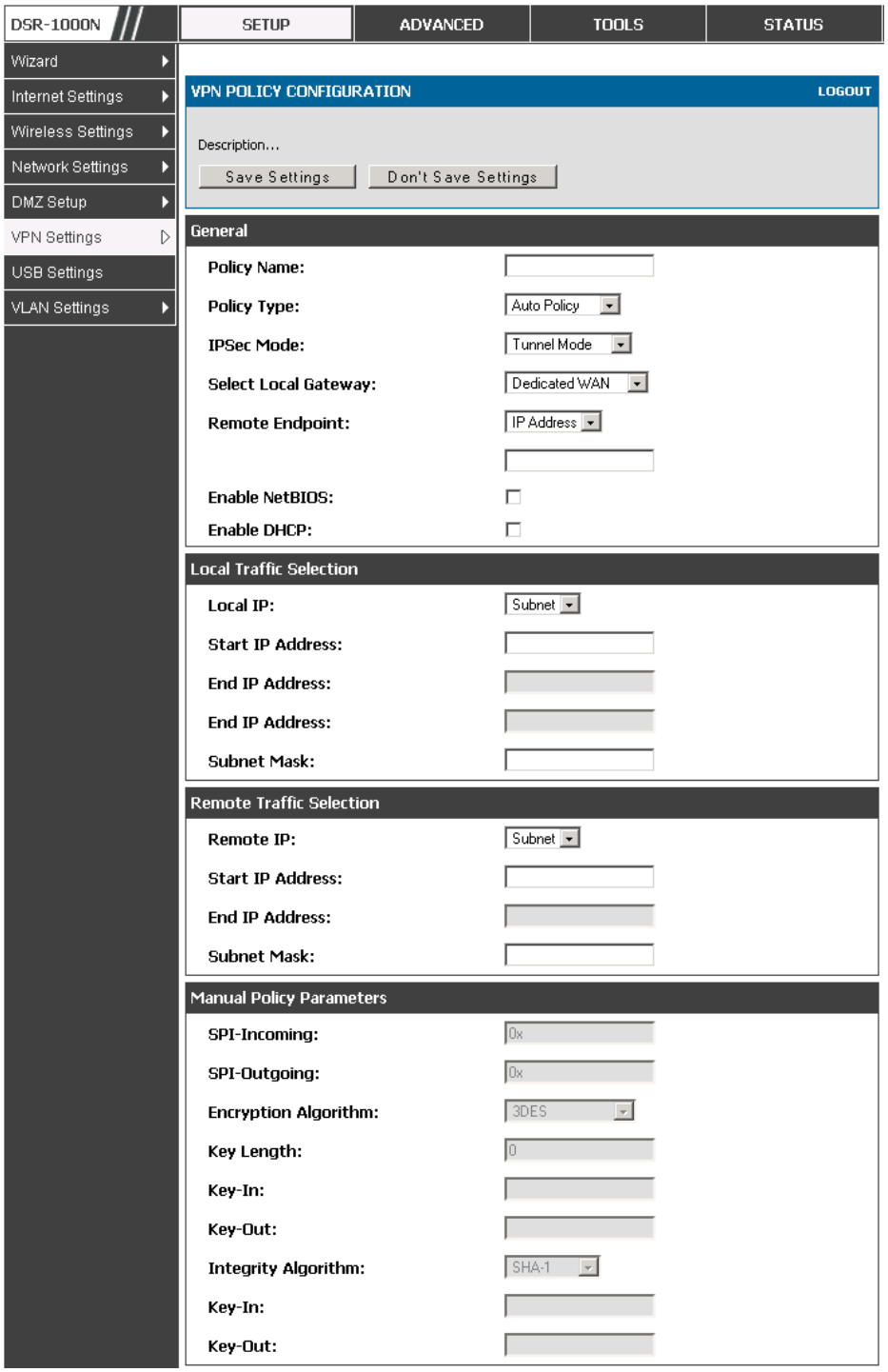


Figure 51: VPN policy created by the VPN Wizard then modified manually

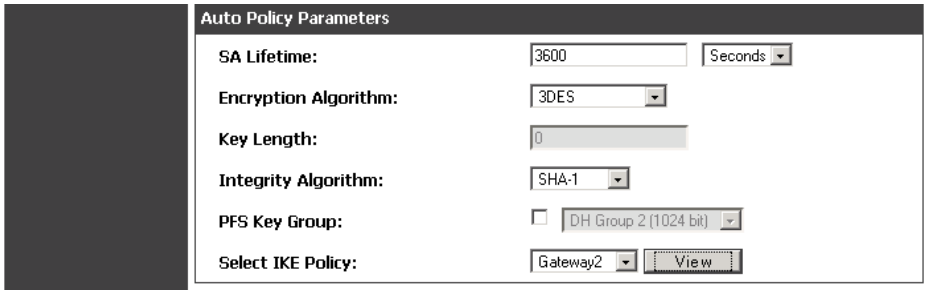


Figure 52: VPN policy created by the VPN Wizard then modified manually (continued)

6.4 Configuring VPN clients

Remote VPN clients must be configured with the same VPN policy parameters used in the VPN tunnel that the client wishes to use: encryption, authentication, life time, and PFS key-group. Upon establishing these authentication parameters, the VPN Client user database must also be populated with an account to give a user access to the tunnel.

VPN client software is required to establish a VPN tunnel between the router and remote endpoint. Open source software (such as OpenVPN or Openswan) as well as Microsoft IPSec VPN software can be configured with the required IKE policy parameters to establish an IPSec VPN tunnel. Refer to the client software guide for detailed instructions on setup as well as the router's online help.

The user database contains the list of VPN user accounts that are authorized to use a given VPN tunnel. Alternatively VPN tunnel users can be authenticated using a configured Radius database. Refer to the online help to determine how to populate the user database and/or configure RADIUS authentication.

6.5 PPTP / L2TP Tunnels

This router supports VPN tunnels from either PPTP or L2TP ISP servers. The router acts as a broker device to allow the ISP's server to create a TCP control connection between the LAN VPN client and the VPN server.

6.5.1 PPTP Tunnel Support

Setup > VPN Settings > PPTP > PPTP Server

A PPTP VPN can be established through this router. If the WAN mode has configured a PPTP ISP, then LAN hosts on this router can connect directly to the PPTP server. The PPTP server will indicate the range of IP addresses in your LAN to assign to LAN side VPN clients to allow the PPTP clients to establish a direct tunnel to the WAN side PPTP server.

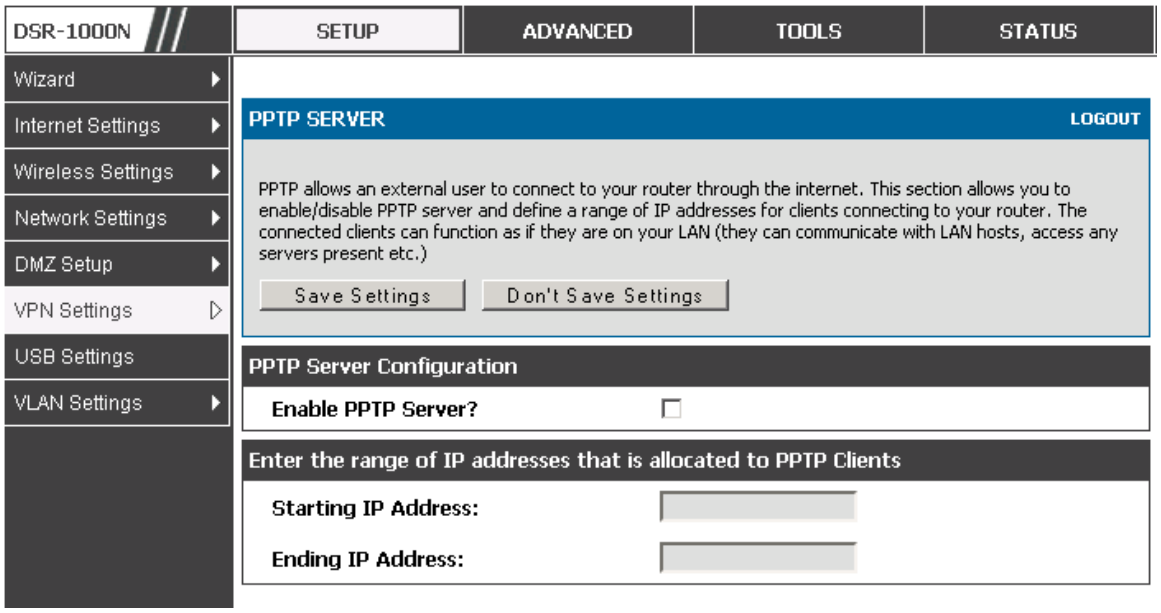


Figure 53: PPTP tunnel configuration – PPTP Server

6.5.2 L2TP Tunnel Support

Setup > VPN Settings > L2TP > L2TP Server

A L2TP VPN can be established through this router If the WAN mode has configured a L2TP ISP, then LAN hosts on this router can connect directly to the L2TP server. The L2TP server will indicate the range of IP addresses in

your LAN to assign to LAN side VPN clients to allow the L2TP clients to establish a direct tunnel to the WAN side L2TP server.

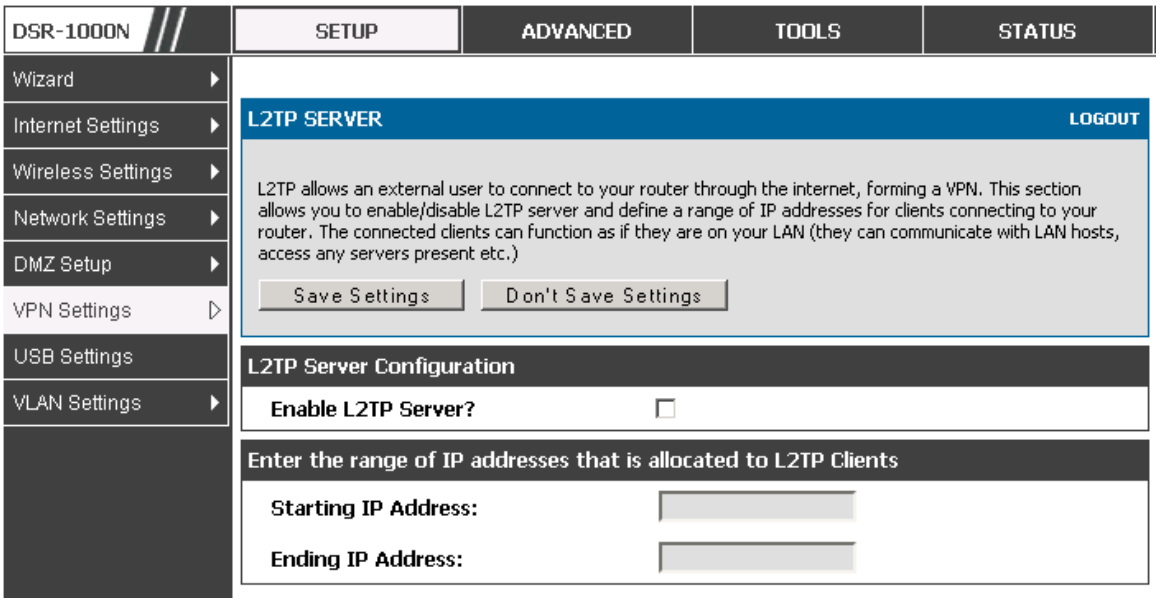


Figure 54: L2TP tunnel configuration – L2TP Server

7. SSL VPN

The router provides an intrinsic SSL VPN feature as an alternate to the standard IPsec VPN. SSL VPN differs from IPsec VPN mainly by removing the requirement of a pre-installed VPN client on the remote host. Instead, users can securely login through the SSL User Portal using a standard web browser and receive access to configured network resources within the corporate LAN. The router supports multiple concurrent sessions to allow remote users to access the LAN over an encrypted link through a customizable user portal interface, and each SSL VPN user can be assigned unique privileges and network resource access levels.

The remote user can be provided different options for SSL service through this router:

- **VPN Tunnel**: The remote user's SSL enabled browser is used in place of a VPN client on the remote host to establish a secure VPN tunnel. A SSL VPN client (Active-X or Java based) is installed in the remote host to allow the client to join the corporate LAN with pre-configured access/policy privileges. At this point a virtual network interface is created on the user's host and this will be assigned an IP address and DNS server address from the router. Once established, the host machine can access allocated network resources.
- **Port Forwarding**: A web-based (ActiveX or Java) client is installed on the client machine again. Note that Port Forwarding service only supports TCP connections between the remote user and the router. The router administrator can define specific services or applications that are available to remote port forwarding users instead of access to the full LAN like the VPN tunnel.

> ActiveX clients are used when the remote user accesses the portal using the Internet Explorer browser. The Java client is used for other browsers like Mozilla Firefox, Netscape Navigator, Google Chrome, and Apple Safari.

7.1 Users, Groups, and Domains

Advanced > Users > Users

Authentication of the remote SSL VPN user is done by the router using either a local database on the router or external authentication servers (i.e. LDAP or RADIUS). The remote user must specify the user, group and domain when logging in to the SSL VPN router. One or more users are members of a Group. One or more Groups belong to an authentication Domain.

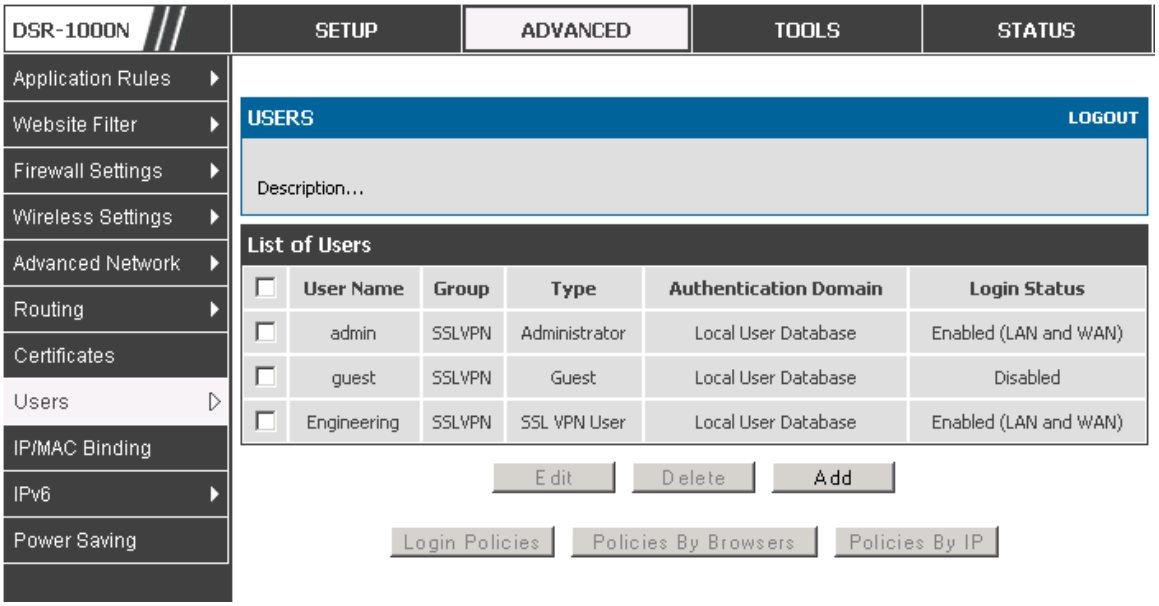


Figure 55: Available Users with login status and associated Group/Domain

Advanced > Users > Domains

The Domain determines the authentication method (local user database, external server) to be used when validating the remote user's connection. As well the Domain determines the portal layout presented to the remote SSL user. Since the portal layout assigns access to SSL VPN tunnel and/or SSL VPN Port Forwarding features, the domain is essential in defining the authentication and features exposed to SSL users.

Advanced > Users > Groups

Groups are used to assign access policies to a set of SSL users within a domain. Groups are domain subsets that can be seen as types of SSL users; some groups require access to all available network resources and some can be provided access to a select few. With groups, a very secure hierarchy of SSL VPN remote access can be created for all types of users with minimal number of policies to configure.

You must create a Domain first, and then a new Group can be created and assigned to the Domain. The last step is to add specific SSL VPN users to an already-configured Group.

7.1.1 User Types and Passwords

Advanced > Users > Users

User level policies can be specified by browser, IP address of the host, and whether the user can login to the router's GUI in addition to the SSL VPN portal. The following user types are assigned to a user that reaches the GUI login screen from the LAN or WAN:

- Administrator: This is the router's super-user, and can manage the router, use SSL VPN to access network resources, and login to L2TP/PPTP servers on the WAN. There will always be one default administrator user for the GUI.
- Guest (read only): The guest user gains read only access to the GUI to observe and review configuration settings. The guest does not have SSL VPN access.
- SSL VPN User: This user has access to the SSL VPN services as determined by the group policies and authentication domain of which it is a member. The domain-determined SSL VPN portal will be displayed when logging in with this user type.
- XAuth User: This user's authentication is performed by an externally configured RADIUS or other Enterprise server. It is not part of the local user database.

- L2TP User: These are L2TP VPN tunnel LAN users that can establish a tunnel with the L2TP server on the WAN.
- PPTP User: These are PPTP VPN tunnel LAN users that can establish a tunnel with the PPTP server on the WAN.
- Local User: This user's authentication domain is located on the router itself.

Once the user type is determined, you can define/modify the password and idle login timeout for the user. It is recommended that passwords contains no dictionary words from any language, and is a mixture of letters (both uppercase and lowercase), numbers, and symbols. The password can be up to 30 characters.

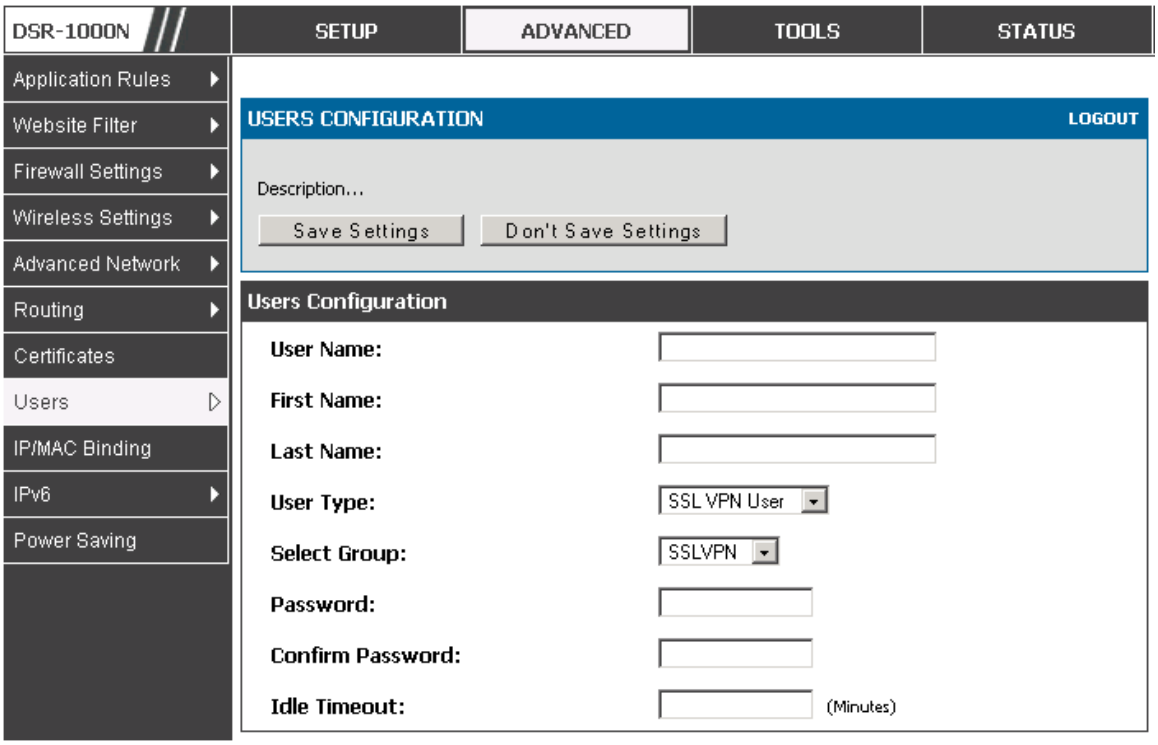


Figure 56: User configuration options

7.2 Using SSL VPN Policies

Setup > VPN Settings > SSL VPN Server > SSL VPN Policies

SSL VPN Policies can be created on a Global, Group, or User level. User level policies take precedence over Group level policies and Group level

policies take precedence over Global policies. These policies can be applied to a specific network resource, IP address or ranges on the LAN, or to different SSL VPN services supported by the router. The List of Available Policies can be filtered based on whether it applies to a user, group, or all users (global).

A more specific policy takes precedence over a generic policy when both are applied to the same user/group/global domain. I.e. a policy for a specific IP address takes precedence over a policy for a range of addresses containing the IP address already referenced.

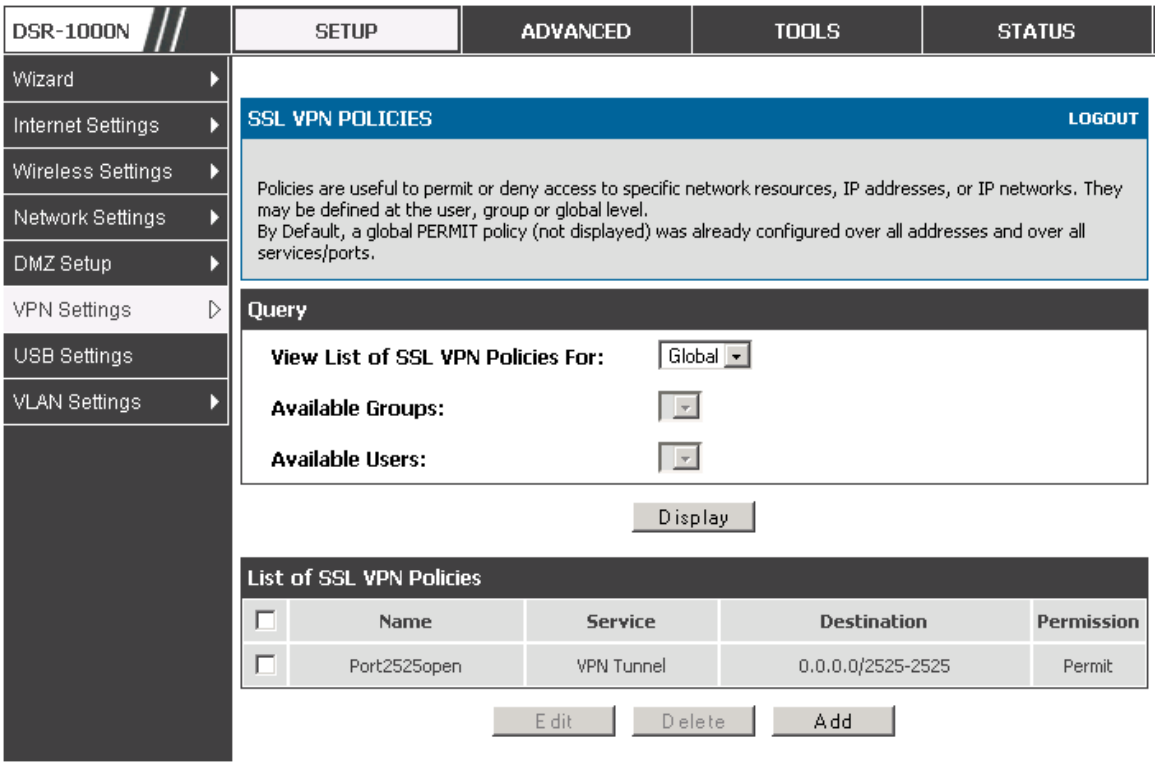


Figure 57: List of SSL VPN polices (Global filter)

To add a SSL VPN policy, you must first assign it to a user, group, or make it global (i.e. applicable to all SSL VPN users). If the policy is for a group, the available configured groups are shown in a drop down menu and one must be

selected. Similarly, for a user defined policy a SSL VPN user must be chosen from the available list of configured users.

The next step is to define the policy details. The policy name is a unique identifier for this rule. The policy can be assigned to a specific Network Resource (details follow in the subsequent section), IP address, IP network, or all devices on the LAN of the router. Based on the selection of one of these four options, the appropriate configuration fields are required (i.e. choosing the network resources from a list of defined resources, or defining the IP addresses). For applying the policy to addresses the port range/port number can be defined.

The final steps require the policy permission to be set to either permit or deny access to the selected addresses or network resources. As well the policy can be specified for one or all of the supported SSL VPN services (i.e. VPN tunnel)

Once defined, the policy goes into effect immediately. The policy name, SSL service it applies to, destination (network resource or IP addresses) and permission (deny/permit) is outlined in a list of configured policies for the router.

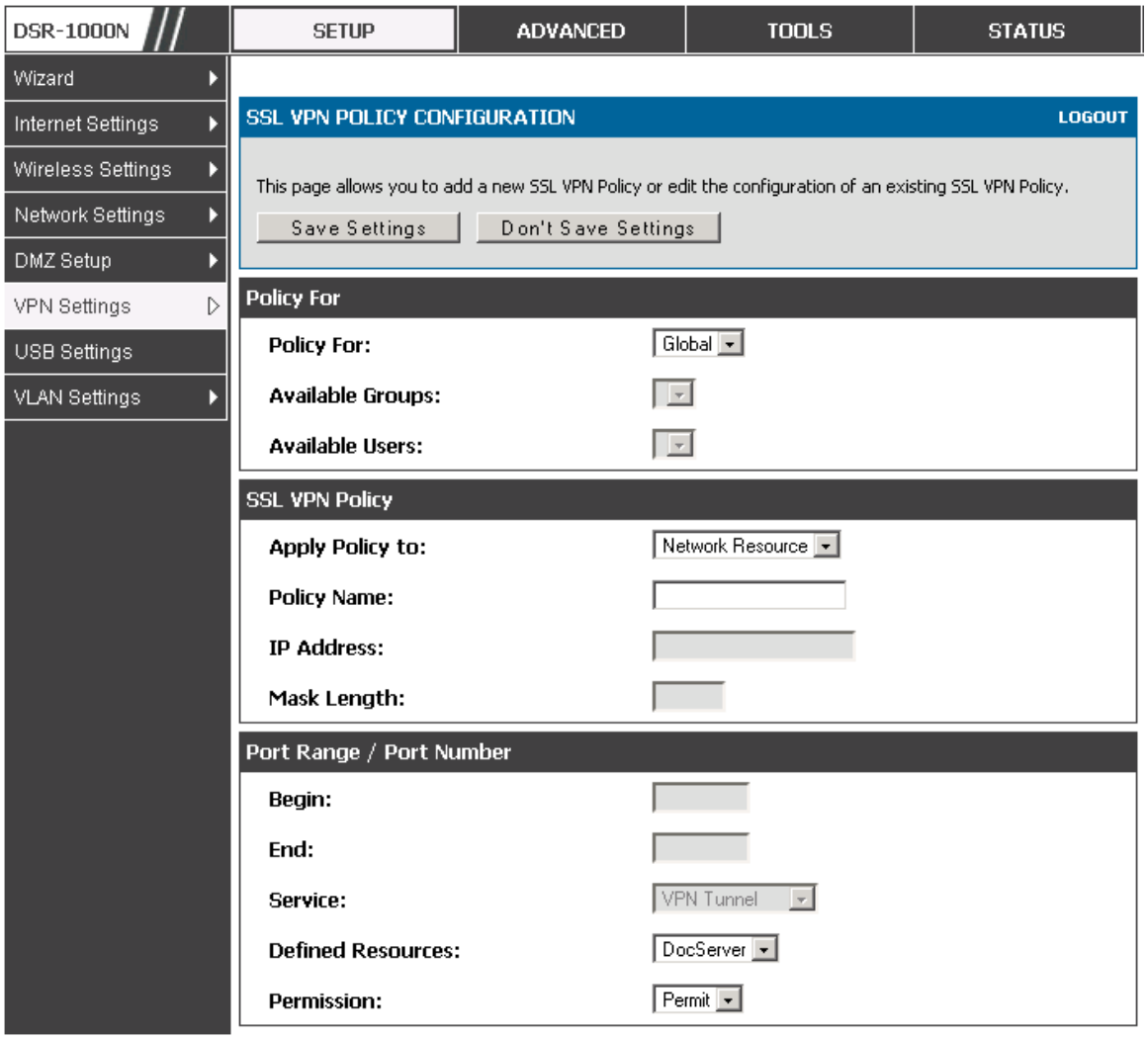


Figure 58: SSL VPN policy configuration

7.2.1 Using Network Resources

Setup > VPN Settings > SSL VPN Server > Resources

Network resources are services or groups of LAN IP addresses that are used to easily create and configure SSL VPN policies. This shortcut saves time when creating similar policies for multiple remote SSL VPN users.

Adding a Network Resource involves creating a unique name to identify the resource and assigning it to one or all of the supported SSL services. Once this is done, editing one of the created network resources allows you to configure the object type (either IP address or IP range) associated with the

service. The Network Address, Mask Length, and Port Range/Port Number can all be defined for this resource as required.

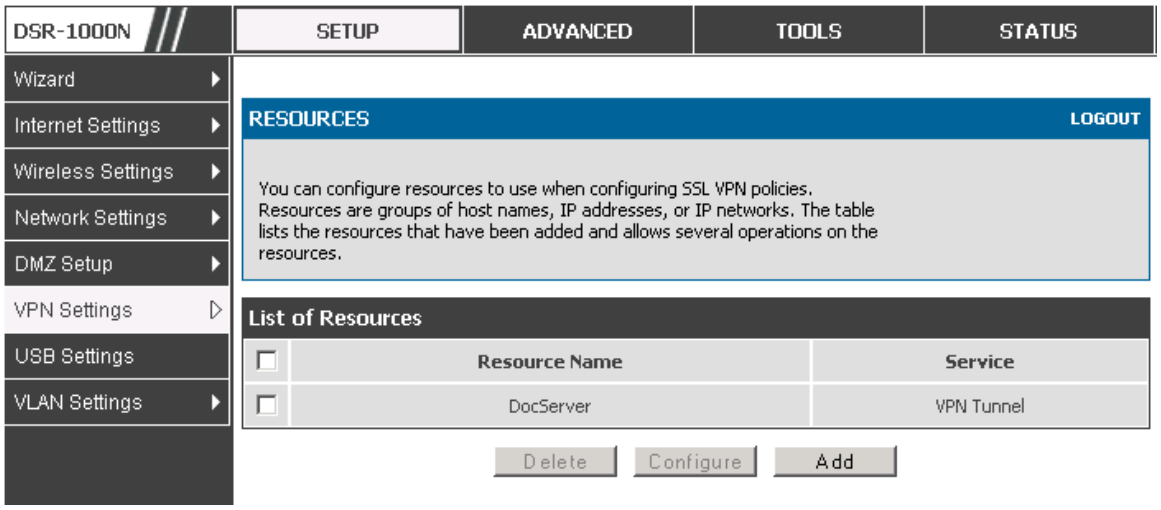


Figure 59: List of configured resources, which are available to assign to SSL VPN policies

7.3 Application Port Forwarding

Setup > VPN Settings > SSL VPN Server > Port Forwarding

Port forwarding allows remote SSL users to access specified network applications or services after they login to the User Portal and launch the Port Forwarding service. Traffic from the remote user to the router is detected and re-routed based on configured port forwarding rules.

Internal host servers or TCP applications must be specified as being made accessible to remote users. Allowing access to a LAN server requires entering the local server IP address and TCP port number of the application to be tunneled. The table below lists some common applications and corresponding TCP port numbers:

TCP Application	Port Number
FTP Data (usually not needed)	20
FTP Control Protocol	21

SSH	22
Telnet	23
SMTP (send mail)	25
HTTP (web)	80
POP3 (receive mail)	110
NTP (network time protocol)	123
Citrix	1494
Terminal Services	3389
VNC (virtual network computing)	5900 or 5800

As a convenience for remote users, the hostname (FQDN) of the network server can be configured to allow for IP address resolution. This host name resolution provides users with easy-to-remember FQDN's to access TCP applications instead of error-prone IP addresses when using the Port Forwarding service through the SSL User Portal.

Defining the hostname is optional as minimum requirement for port forwarding is identifying the TCP application and local server IP address. The local server IP address of the configured hostname must match the IP address of the configured application for port forwarding.

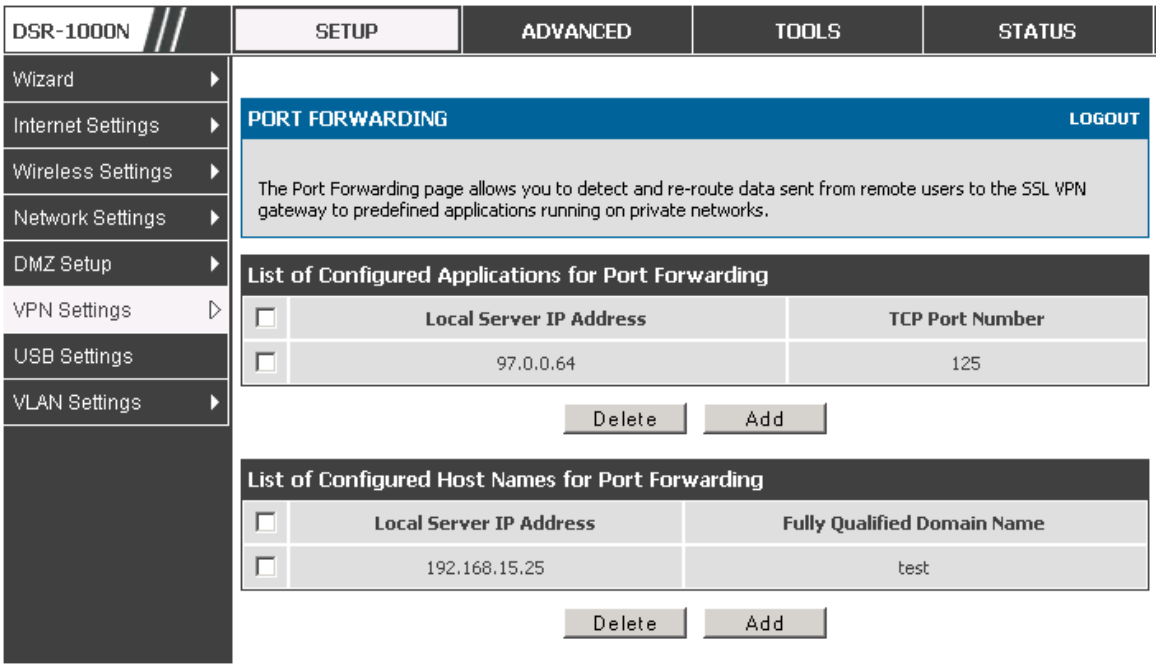


Figure 60: List of Available Applications for SSL Port Forwarding

7.4 SSL VPN Client Configuration

Setup > VPN Settings > SSL VPN Client > SSL VPN Client

An SSL VPN tunnel client provides a point-to-point connection between the browser-side machine and this router. When a SSL VPN client is launched from the user portal, a "network adapter" with an IP address from the corporate subnet, DNS and WINS settings is automatically created. This allows local applications to access services on the private network without any special network configuration on the remote SSL VPN client machine.

It is important to ensure that the virtual (PPP) interface address of the VPN tunnel client does not conflict with physical devices on the LAN. The IP address range for the SSL VPN virtual network adapter should be either in a different subnet or non-overlapping range as the corporate LAN.

The IP addresses of the client's network interfaces (Ethernet, Wireless, etc.) cannot be identical to the router's IP address or a server on the corporate LAN that is being accessed through the SSL VPN tunnel.

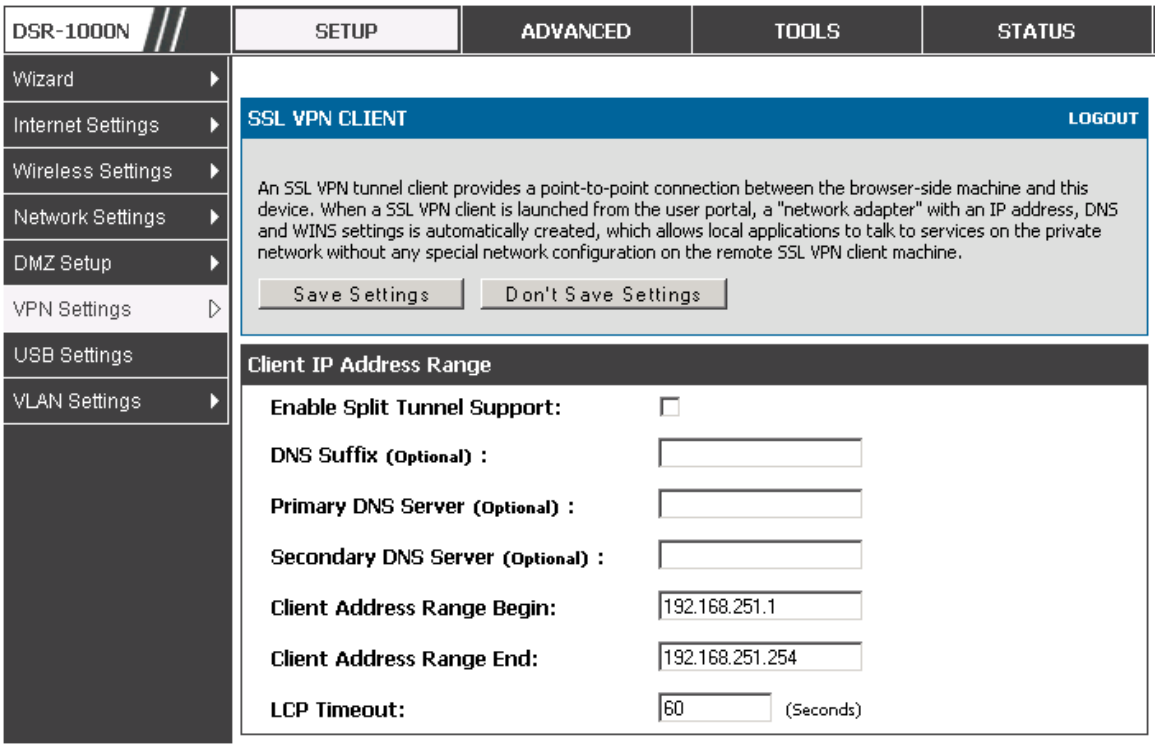


Figure 61: SSL VPN client adapter and access configuration

The router allows full tunnel and split tunnel support. Full tunnel mode just sends all traffic from the client across the VPN tunnel to the router. Split tunnel mode only sends traffic to the private LAN based on pre-specified client routes. These client routes give the SSL client access to specific private networks, thereby allowing access control over specific LAN services.

Setup > VPN Settings > SSL VPN Client > Configured Client Routes

If the SSL VPN client is assigned an IP address in a different subnet than the corporate network, a client route must be added to allow access to the private LAN through the VPN tunnel. As well a static route on the private LAN's firewall (typically this router) is needed to forward private traffic through the VPN Firewall to the remote SSL VPN client.

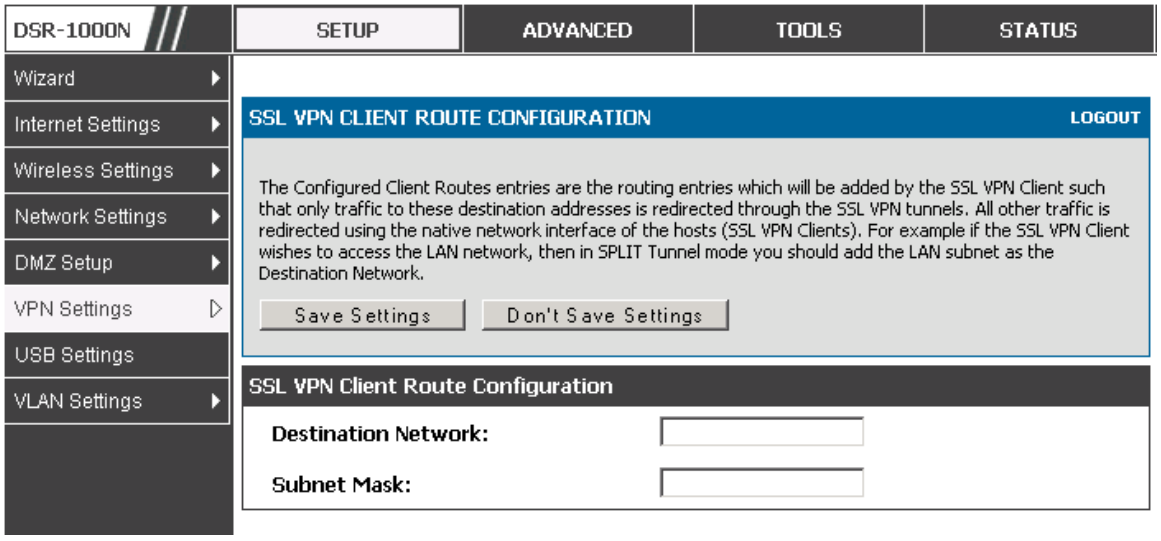


Figure 62: Configured client routes only apply in split tunnel mode.

7.5 User Portal

Setup > VPN Settings > SSL VPN Client > SSL VPN Client Portal

When remote users want to access the private network through an SSL tunnel (either using the Port Forwarding or VPN tunnel service), they login through a user portal. This portal provides the authentication fields to provide the appropriate access levels and privileges as determined by the router administrator. The domain where the user account is stored must be specified, and the domain determines the authentication method and portal layout screen presented to the remote user.

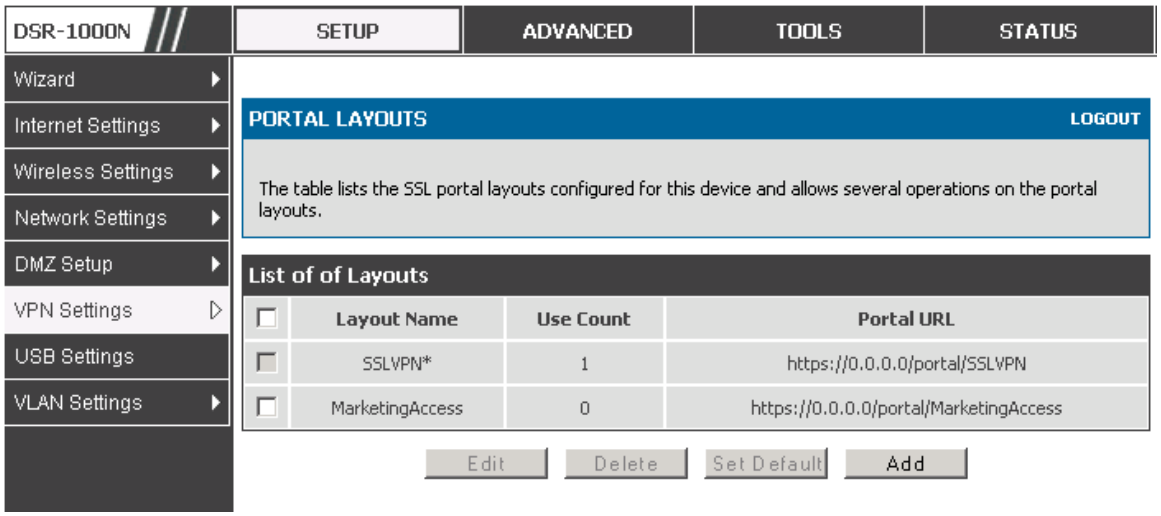


Figure 63: List of configured SSL VPN portals. The configured portal can then be associated with an authentication domain

7.5.1 Creating Portal Layouts

Setup > VPN Settings > SSL VPN Server > Portal Layouts

The router allows you to create a custom page for remote SSL VPN users that is presented upon authentication. There are various fields in the portal that are customizable for the domain, and this allows the router administrator to communicate details such as login instructions, available services, and other usage details in the portal visible to remote users. During domain setup, configured portal layouts are available to select for all users authenticated by the domain.

✎ The default portal LAN IP address is https://192.168.10.1/scgi-bin/userPortal/portal. This is the same page that opens when the “User Portal” link is clicked on the SSL VPN menu of the router GUI.

The router administrator creates and edits portal layouts from the configuration pages in the SSL VPN menu. The portal name, title, banner name, and banner contents are all customizable to the intended users for this portal. The portal name is appended to the SSL VPN portal URL. As well, the users assigned to this portal (through their authentication domain)

can be presented with one or more of the router's supported SSL services such as the VPN Tunnel page or Port Forwarding page.

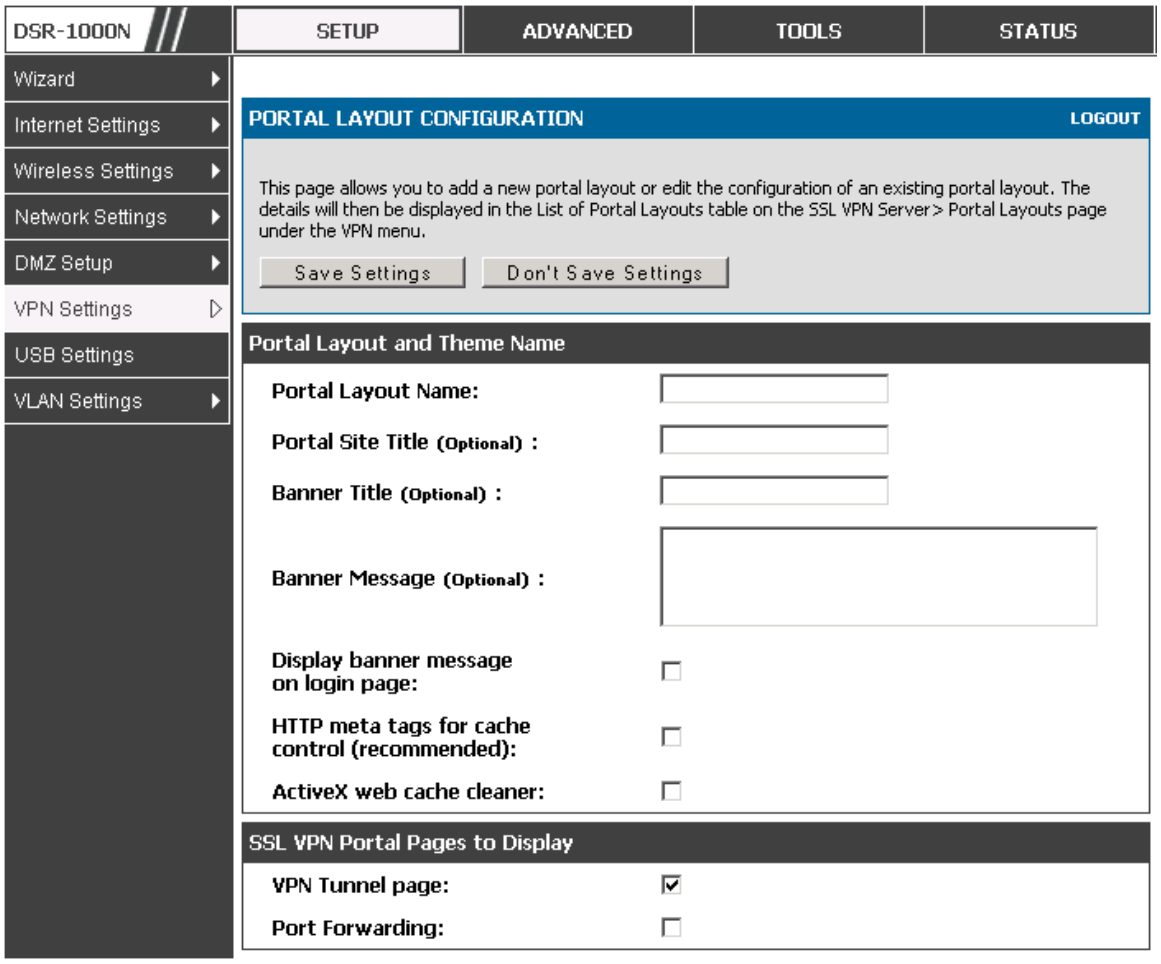


Figure 64: SSL VPN Portal configuration

8. Advanced Configuration Tools

8.1 USB Device Setup

There are two USB ports on the DSR router. The port supports a 3G modem where the USB dongle is used as a secondary WAN interface. Additionally, the port can be used for a USB storage device if USB Disc is type is selected. This storage can be accessed by LAN devices if appropriate policies are configured.

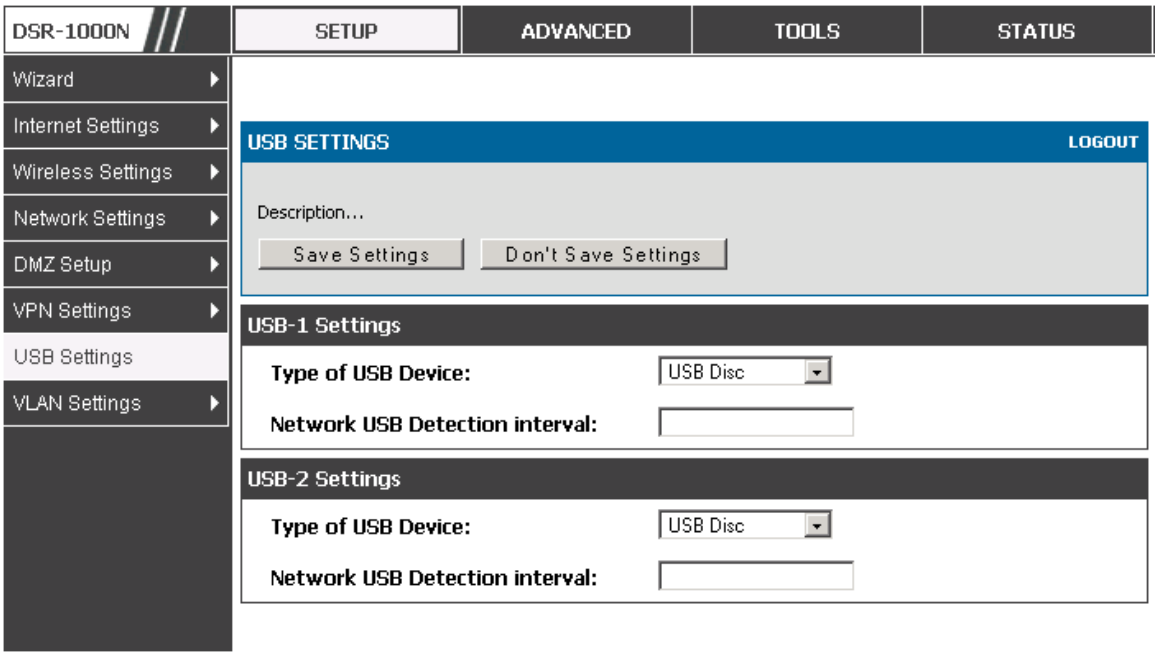


Figure 65: USB device configuration

8.2 Authentication Certificates

This gateway uses digital certificates for IPsec VPN authentication as well as SSL validation (for HTTPS and SSL VPN authentication). You can obtain a digital certificate from a well known Certificate Authority (CA) such as VeriSign, or generate and sign your own certificate using functionality available on this gateway. The gateway comes with a self-signed certificate, and this can be replaced by one signed by a CA as per your networking requirements. A CA certificate provides strong assurance of the server's identity and is a requirement for most corporate network VPN solutions.

The certificates menu allows you to view a list of certificates (both from a CA and self-signed) currently loaded on the gateway. The following certificate data is displayed in the list of Trusted (CA) certificates:

- CA Identity (Subject Name): The certificate is issued to this person or organization
- Issuer Name: This is the CA name that issued this certificate
- Expiry Time: The date after which this Trusted certificate becomes invalid

A self certificate is a certificate issued by a CA identifying your device (or self-signed if you don't want the identity protection of a CA). The Active Self Certificate table lists the self certificates currently loaded on the gateway. The following information is displayed for each uploaded self certificate:

- Name: The name you use to identify this certificate, it is not displayed to IPSec VPN peers or SSL users.
- Subject Name: This is the name that will be displayed as the owner of this certificate. This should be your official registered or company name, as IPsec or SSL VPN peers are shown this field.
- Serial Number: The serial number is maintained by the CA and used to identify this signed certificate.
- Issuer Name: This is the CA name that issued (signed) this certificate
- Expiry Time: The date after which this signed certificate becomes invalid – you should renew the certificate before it expires.

To request a self certificate to be signed by a CA, you can generate a Certificate Signing Request from the gateway by entering identification parameters and passing it along to the CA for signing. Once signed, the CA's Trusted Certificate and signed certificate from the CA are uploaded to activate the self-certificate validating the identity of this gateway. The self certificate is then used in IPsec and SSL connections with peers to validate the gateway's authenticity.

9. Administration & Management

9.1 Configuration Access Control

The primary means to configure this gateway via the browser-independent GUI. The GUI can be accessed from LAN node by using the gateway's LAN IP address and HTTP, or from the WAN by using the gateway's WAN IP address and HTTPS (HTTP over SSL).

Administrator and Guest users are permitted to login to the router's management interface. The user type is set in the ***Advanced > Users > Users*** page. The Admin or Guest user can be configured to access the router GUI from the LAN or the Internet (WAN) by enabling the corresponding Login Policy.

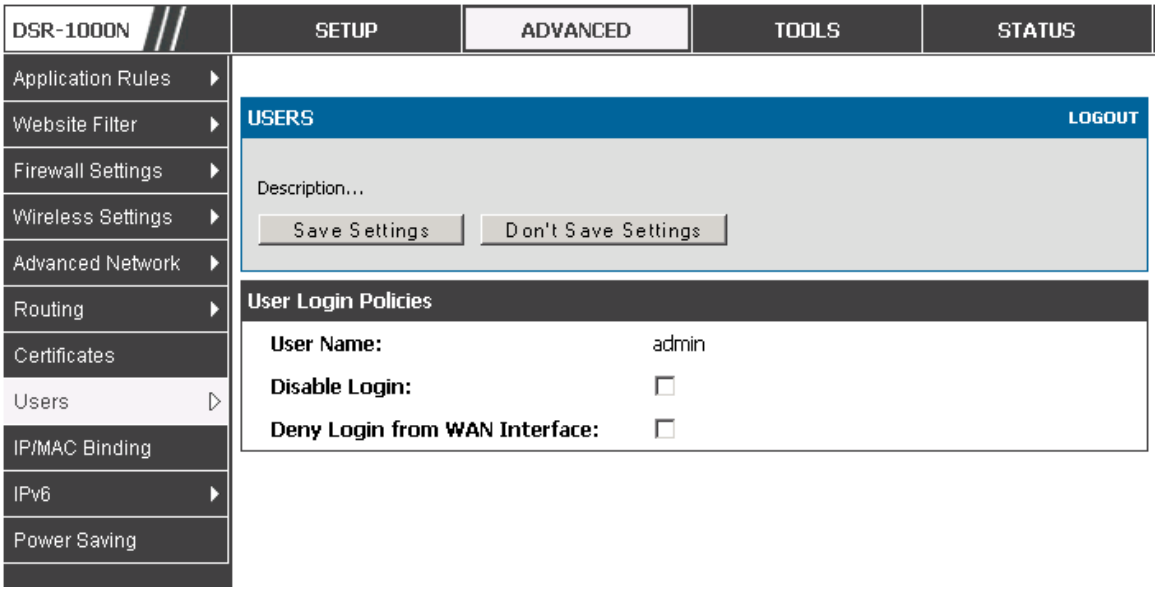


Figure 66: User Login policy configuration

9.1.1 Remote Management

Both HTTPS and telnet access can be restricted to a subset of IP addresses. The router administrator can define a known PC, single IP address or range of IP addresses that are allowed to access the GUI with HTTPS. The opened

port for SSL traffic can be changed from the default of 443 at the same time as defining the allowed remote management IP address range.

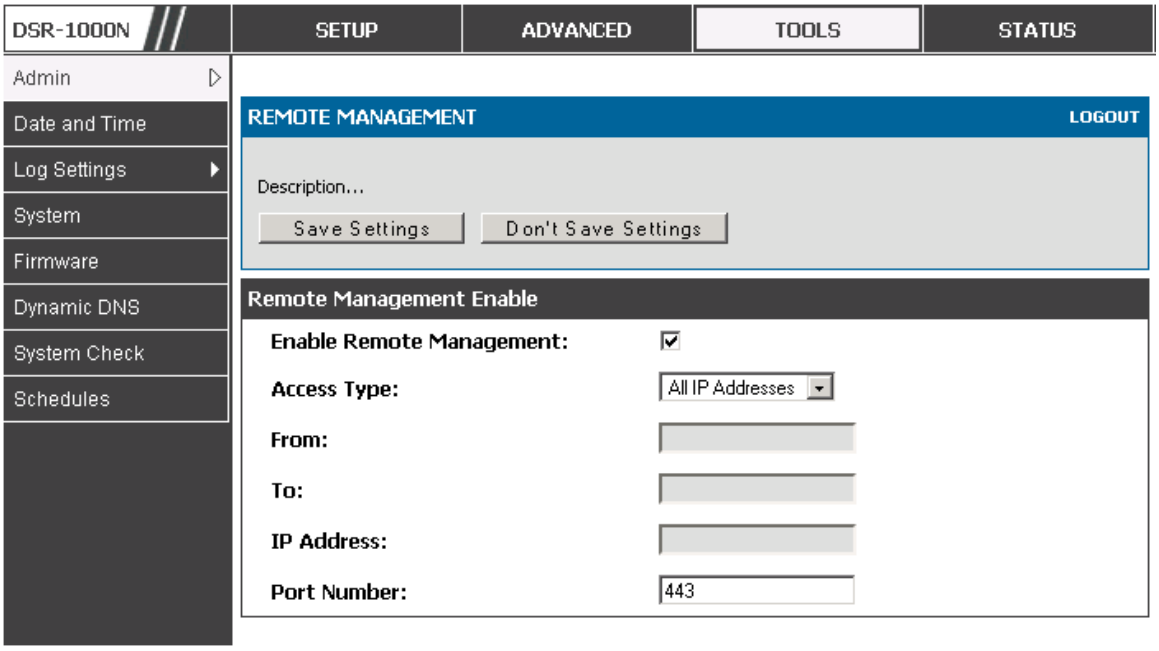


Figure 67: Remote Management from the WAN

9.1.2 CLI Access

In addition to the web-based GUI, the gateway supports SSH and Telnet management for command-line interaction. The CLI login credentials are shared with the GUI for administrator users. To access the CLI, type “cli” in the SSH or console prompt and login with administrator user credentials.

9.2 SNMP Configuration

Tools > Admin > SNMP

SNMP is an additional management tool that is useful when multiple routers in a network are being managed by a central Master system. When an external SNMP manager is provided with this router’s Management Information Base (MIB) file, the manager can update the router’s hierarchal variables to view or update configuration parameters. The router as a managed device has an

SNMP agent that allows the MIB configuration variables to be accessed by the Master (the SNMP manager). The Access Control List on the router identifies managers in the network that have read-only or read-write SNMP credentials. The Traps List outlines the port over which notifications from this router are provided to the SNMP community (managers) and also the SNMP version (v1, v2c, v3) for the trap.

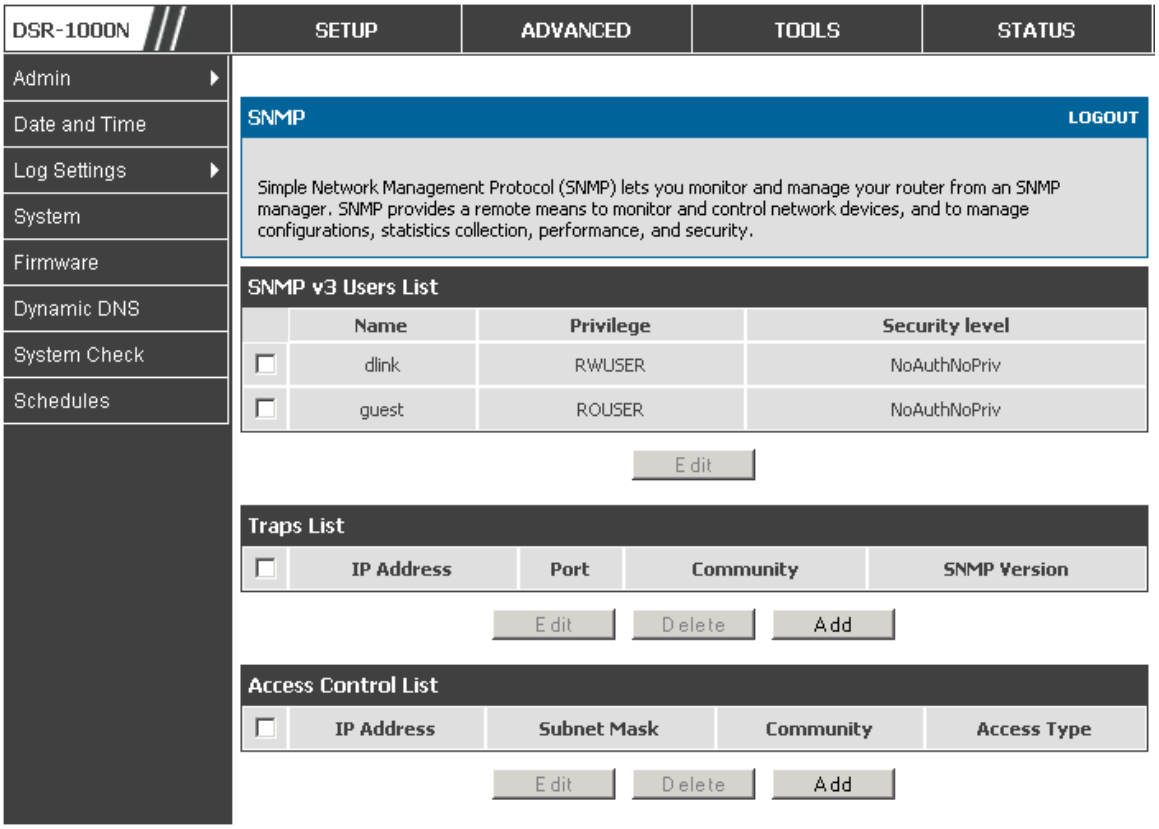


Figure 68: SNMP Users, Traps, and Access Control

Tools > Admin > SNMP System Info

The router is identified by an SNMP manager via the System Information. The identifier settings The SysName set here is also used to identify the router for SysLog logging.

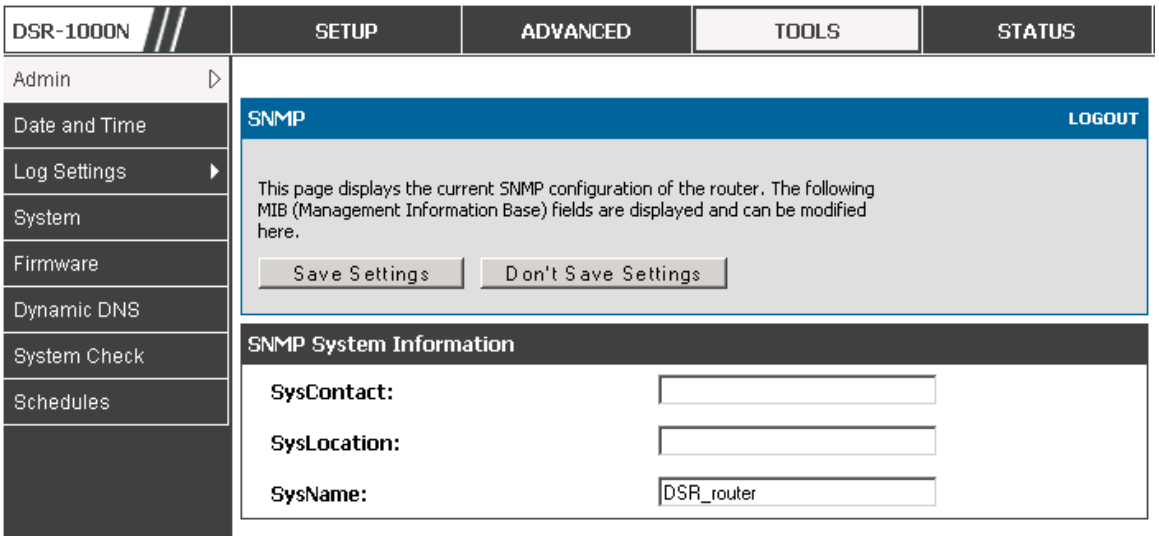


Figure 69: SNMP system information for this router

9.3 Configuring Time Zone and NTP

Tools > Date and Time

You can configure your time zone, whether or not to adjust for Daylight Savings Time, and with which Network Time Protocol (NTP) server to synchronize the date and time. You can choose to set Date and Time manually, which will store the information on the router's real time clock (RTC). If the router has access to the internet, the most accurate mechanism to set the router time is to enable NTP server communication.

Accurate date and time on the router is critical for firewall schedules, Wi-Fi power saving support to disable APs at certain times of the day, and accurate logging.

Please follow the steps below to configure the NTP server:

1. Select the router's time zone, relative to Greenwich Mean Time (GMT).
2. If supported for your region, click to Enable Daylight Savings.
3. Determine whether to use default or custom Network Time Protocol (NTP) servers. If custom, enter the server addresses or FQDN.

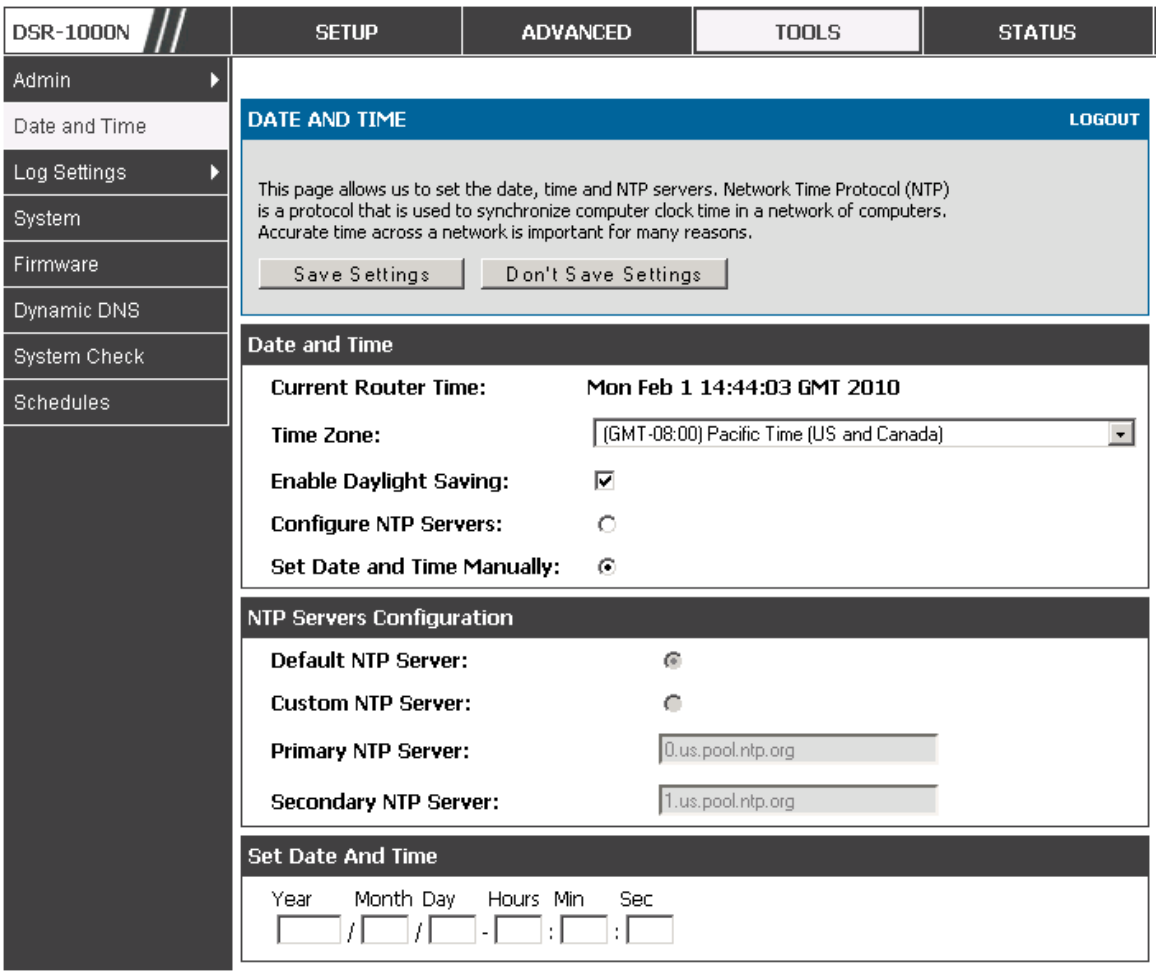


Figure 70: Date, Time, and NTP server setup

9.4 Backing up and Restoring Configuration Settings

Tools > System

You can back up the router's custom configuration settings to restore them to a different device or the same router after some other changes. During backup, your settings are saved as a file on your host. You can restore the router's saved settings from this file as well. This page will also allow you revert to factory default settings or execute a soft reboot of the router.

IMPORTANT! During a restore operation, do NOT try to go online, turn off the router, shut down the PC, or do anything else to the router until the operation is complete. This will take approximately 1 minute. Once the LEDs are turned off, wait a few more seconds before doing anything with the router.

For backing up configuration or restoring a previously saved configuration, please follow the steps below:

1. To save a copy of your current settings, click the Backup button in the Save Current Settings option. The browser initiates an export of the configuration file and prompts to save the file on your host.
2. To restore your saved settings from a backup file, click Browse then locate the file on the host. After clicking Restore, the router begins importing the file's saved configuration settings. After the restore, the router reboots automatically with the restored settings.
3. To erase your current settings and revert to factory default settings, click the Default button. The router will then restore configuration settings to factory defaults and will reboot automatically. (See Appendix B for the factory default parameters for the router).

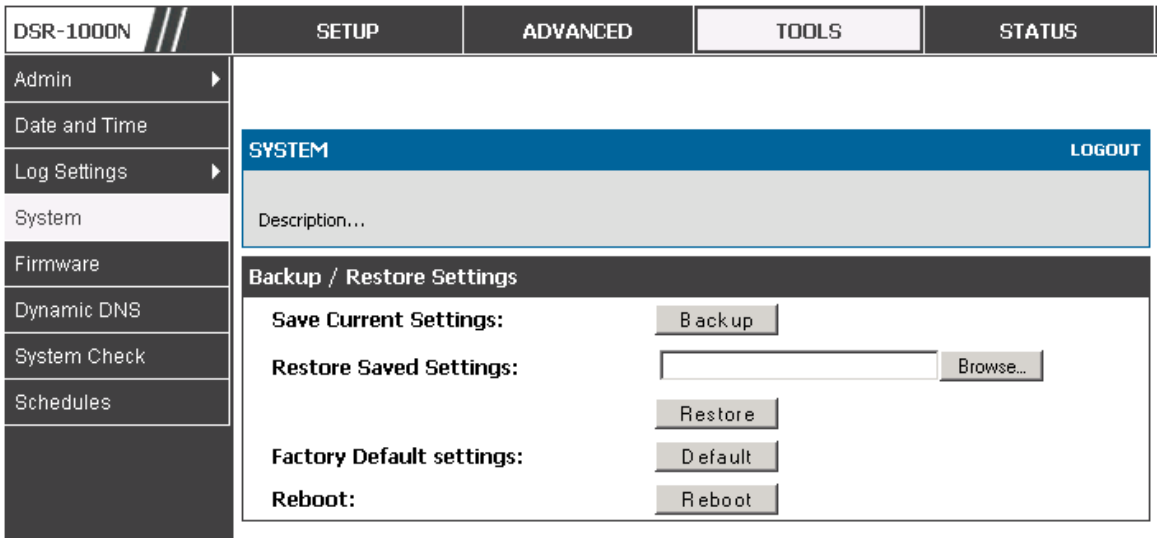


Figure 71: Restoring configuration from a saved file will result in the current configuration being overwritten and a reboot

9.5 Upgrading Router Firmware

Tools > Firmware

You can upgrade to a newer software version from the Administration web page. In the Firmware Upgrade section, to upgrade your firmware, click Browse, locate and select the firmware image on your host, and click Upgrade. After the new firmware image is validated, the new image is written to flash, and the router is automatically rebooted with the new firmware. The Firmware Information and also the ***Status > Device Info > Device Status*** page will reflect the new firmware version.

IMPORTANT! During firmware upgrade, do NOT try to go online, turn off the device, shut down the PC, or interrupt the process in anyway until the operation is complete. This should take only a minute or so including the reboot process. Interrupting the upgrade process at specific points when the flash is being written to may corrupt the flash memory and render the router unusable without a low-level process of restoring the flash firmware (not through the web GUI).

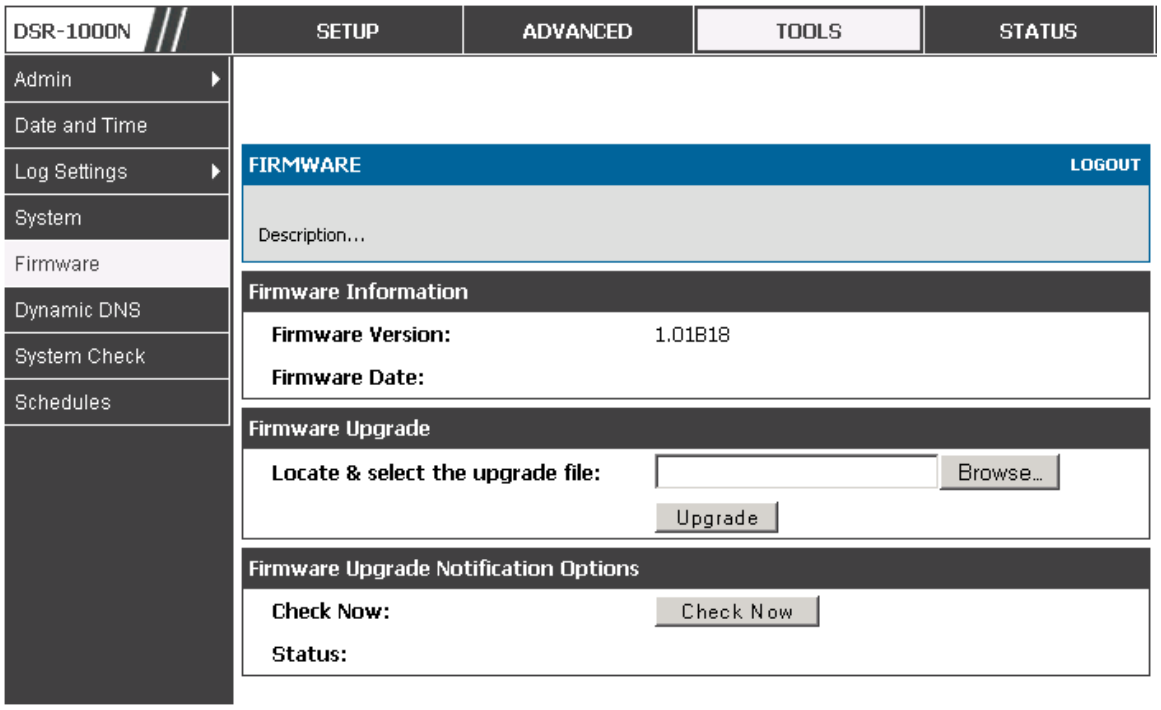


Figure 72: Firmware version information and upgrade option

This router also supports an automated notification to determine if a newer firmware version is available for this router. By clicking the Check Now button in the notification section, the router will check a D-Link server to see if a newer firmware version for this router is available for download and update the Status field below.

9.6 Dynamic DNS Setup

Tools > Dynamic DNS

Dynamic DNS (DDNS) is an Internet service that allows routers with varying public IP addresses to be located using Internet domain names. To use DDNS, you must setup an account with a DDNS provider such as DynDNS.org, D-Link DDNS, or Oray.net.

Each configured WAN can have a different DDNS service if required. Once configured, the router will update DDNS services changes in the WAN IP address so that features that are dependent on accessing the router's WAN

via FQDN will be directed to the correct IP address. When you set up an account with a DDNS service, the host and domain name, username, password and wildcard support will be provided by the account provider.

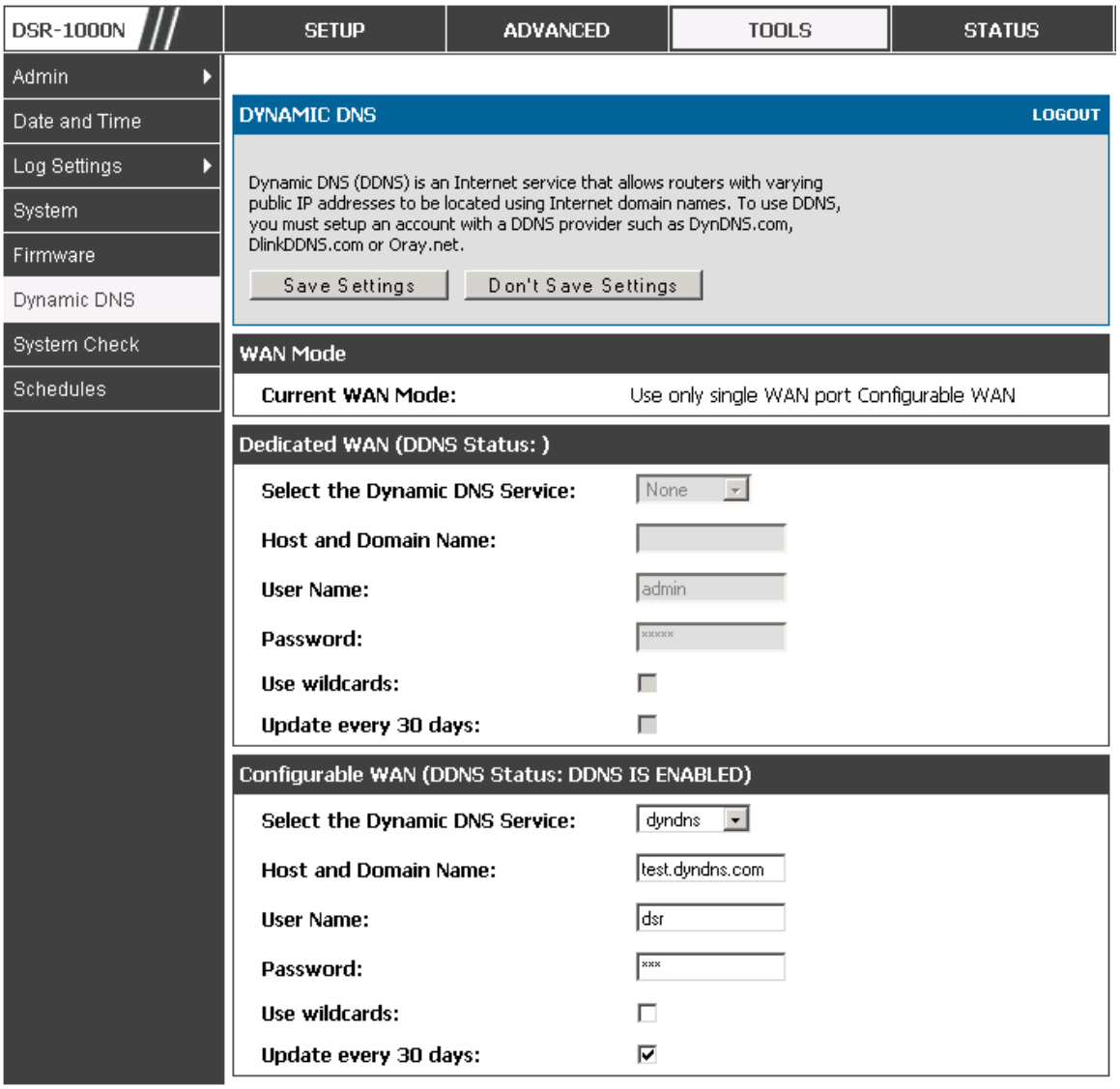


Figure 73: Dynamic DNS configuration

9.7 Using Diagnostic Tools

Tools > System Check

The router has built in tools to allow an administrator to evaluate the communication status and overall network health.

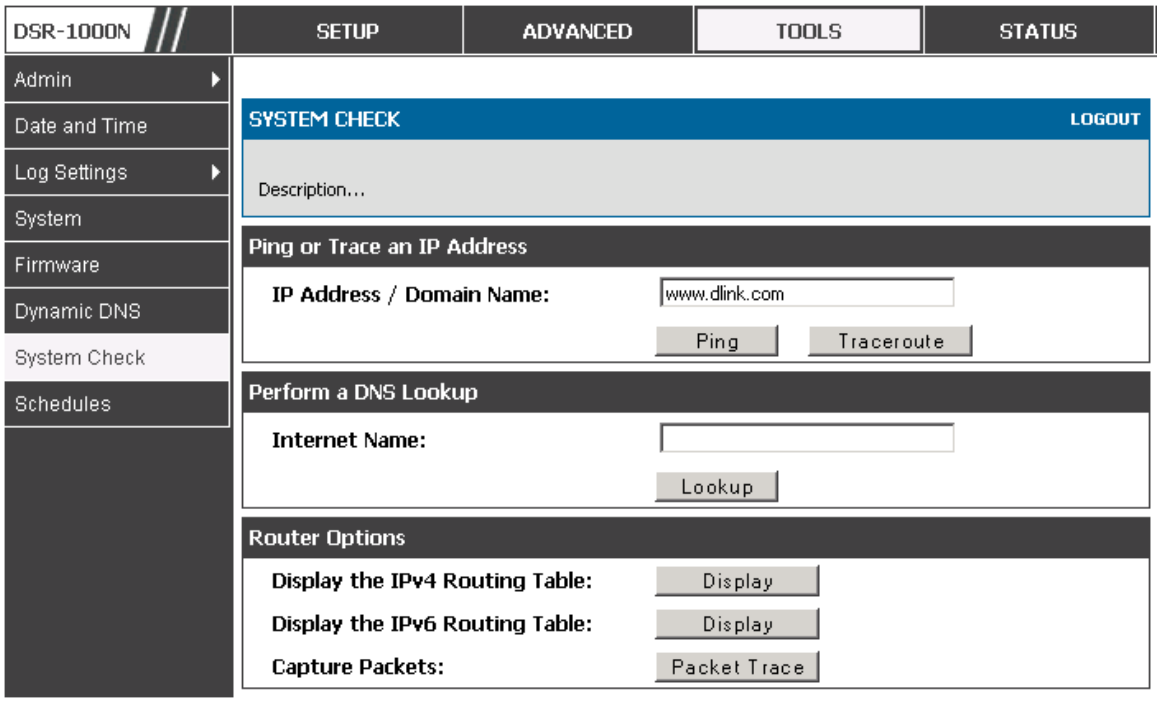


Figure 74: Router diagnostics tools available in the GUI

9.7.1 Ping

This utility can be used to test connectivity between this router and another device on the network connected to this router. Enter an IP address and click PING. The command output will appear indicating the ICMP echo request status.

9.7.2 Trace Route

This utility will display all the routers present between the destination IP address and this router. Up to 30 “hops” (intermediate routers) between this router and the destination will be displayed.

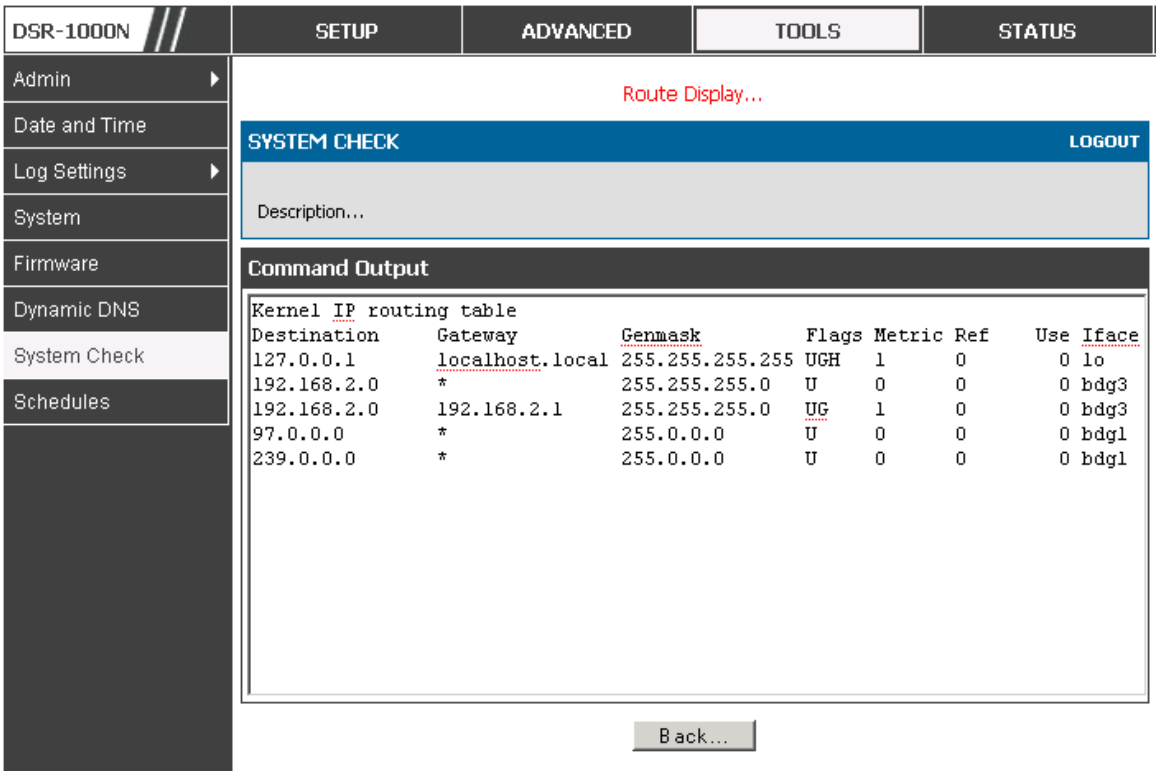


Figure 75: Sample traceroute output

9.7.3 DNS Lookup

To retrieve the IP address of a Web, FTP, Mail or any other server on the Internet, type the Internet Name in the text box and click Lookup. If the host or domain entry exists, you will see a response with the IP address. A message stating “Unknown Host” indicates that the specified Internet Name does not exist.

This feature assumes there is internet access available on the WAN link(s).

9.7.4 Router Options

The static and dynamic routes configured on this router can be shown by clicking Display for the corresponding routing table. Clicking the Packet Trace button will allow the router to capture and display traffic through the device between the LAN and WAN interface as well. This information is often very useful in debugging traffic and routing issues.

10. Router Status and Statistics

10.1 System Overview

The Status page allows you to get a detailed overview of the system configuration. The settings for the wired and wireless interfaces are displayed in the Device Status page, and then the resulting hardware resource and router usage details are summarized on the router's Dashboard.

10.1.1 Device Status

Status > Device Info > Device Status

The Device Status page gives a summary of the router configuration settings configured in the Setup and Advanced menus. The static hardware serial number and current firmware version are presented in the General section. The WAN and LAN interface information shown on this page are based on the administrator configuration parameters. The radio band and channel settings are presented below along with all configured and active APs that are enabled on this router.

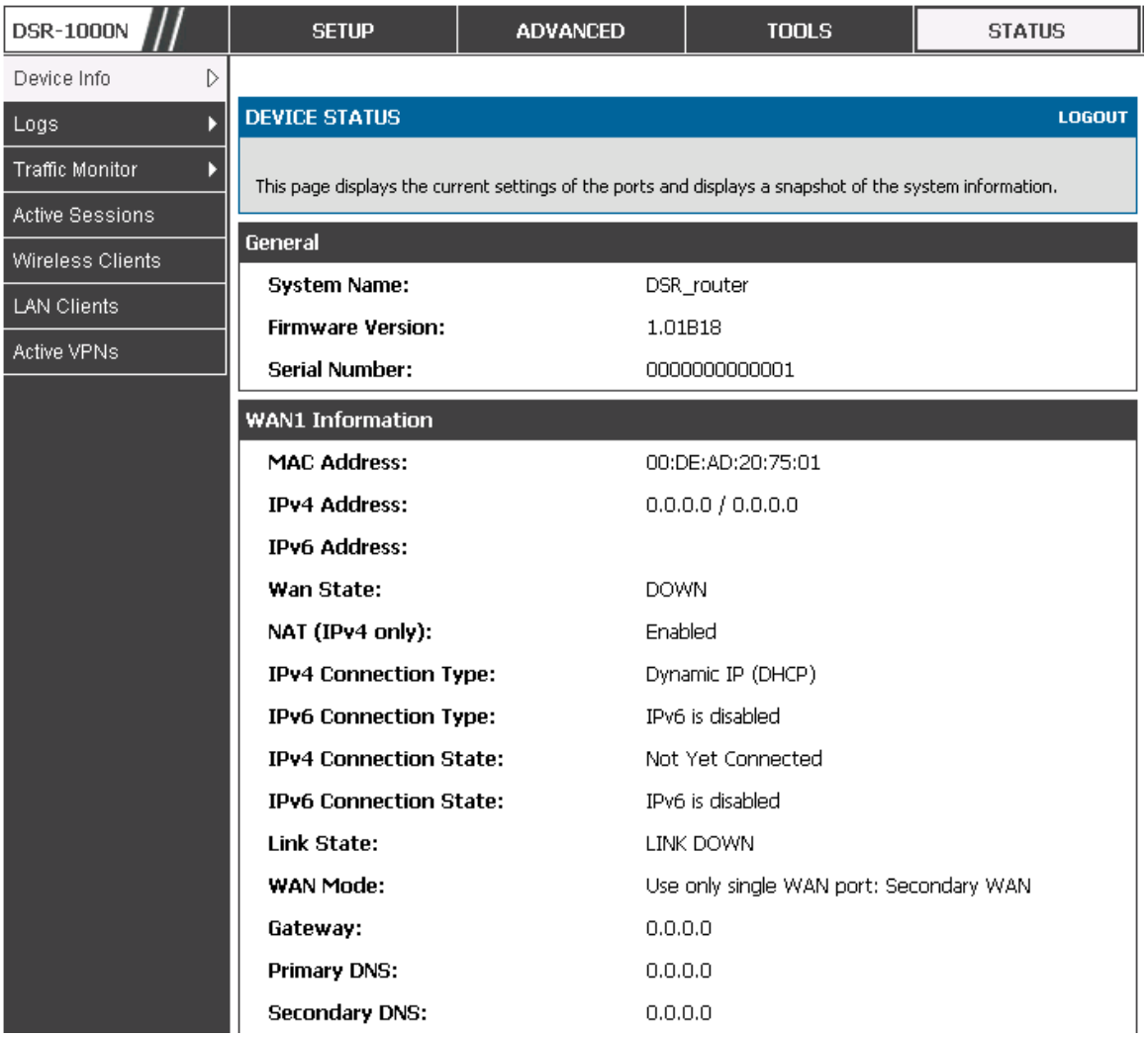
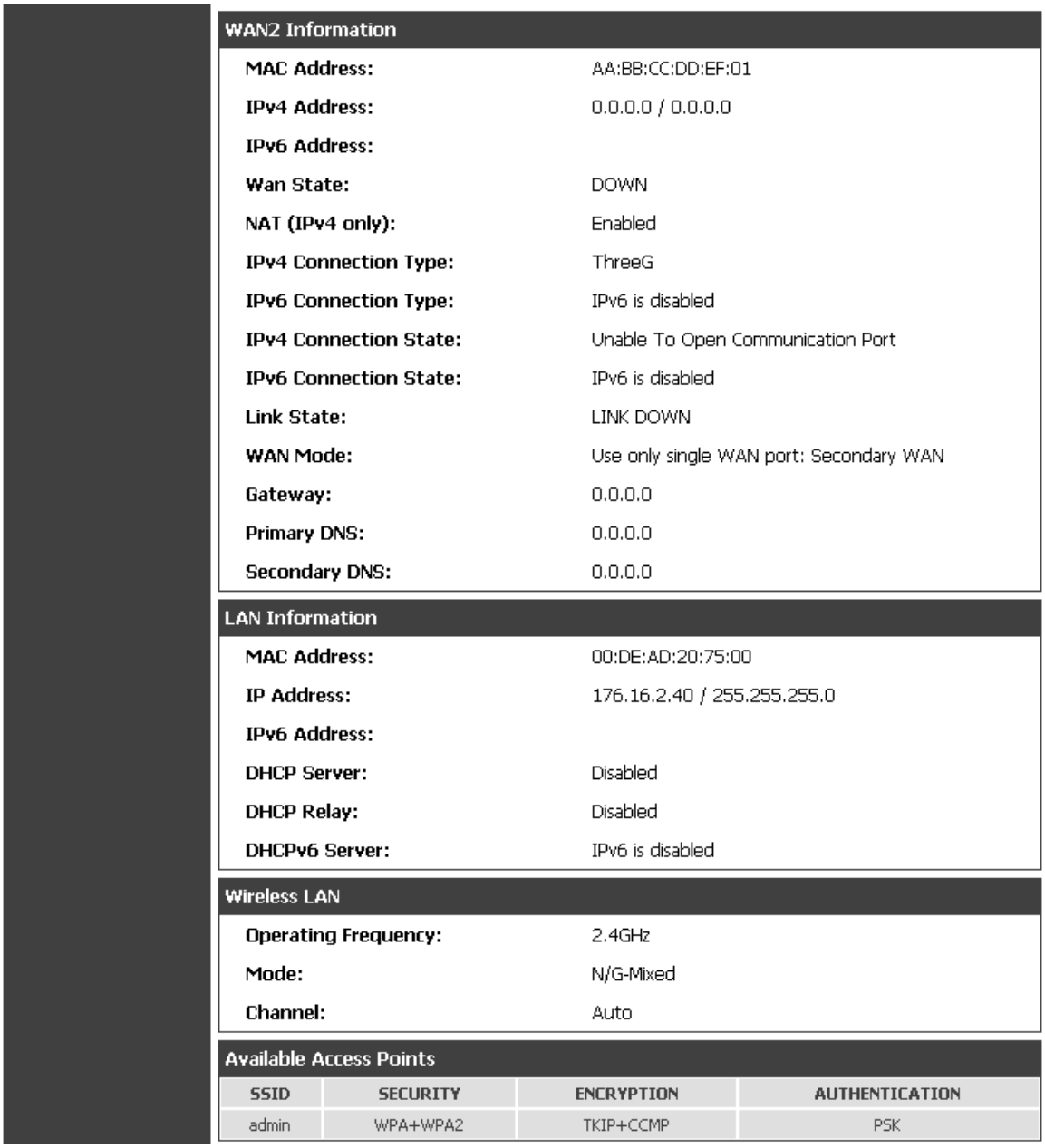


Figure 76: Device Status display



WAN2 Information

MAC Address:	AA:BB:CC:DD:EF:01
IPv4 Address:	0.0.0.0 / 0.0.0.0
IPv6 Address:	
Wan State:	DOWN
NAT (IPv4 only):	Enabled
IPv4 Connection Type:	ThreeG
IPv6 Connection Type:	IPv6 is disabled
IPv4 Connection State:	Unable To Open Communication Port
IPv6 Connection State:	IPv6 is disabled
Link State:	LINK DOWN
WAN Mode:	Use only single WAN port: Secondary WAN
Gateway:	0.0.0.0
Primary DNS:	0.0.0.0
Secondary DNS:	0.0.0.0

LAN Information

MAC Address:	00:DE:AD:20:75:00
IP Address:	176.16.2.40 / 255.255.255.0
IPv6 Address:	
DHCP Server:	Disabled
DHCP Relay:	Disabled
DHCPv6 Server:	IPv6 is disabled

Wireless LAN

Operating Frequency:	2.4GHz
Mode:	N/G-Mixed
Channel:	Auto

Available Access Points

SSID	SECURITY	ENCRYPTION	AUTHENTICATION
admin	WPA+WPA2	TKIP+CCMP	PSK

Figure 77: Device Status display (continued)

10.1.2 Resource Utilization

Status > Device Info > Dashboard

The Dashboard page presents hardware and usage statistics. The CPU and Memory utilization is a function of the available hardware and current configuration and traffic through the router. Interface statistics for the wired connections (LAN, WAN1, WAN2/DMZ, VLANs) provide indication of packets

through and packets dropped by the interface. Click refresh to have this page retrieve the most current statistics.

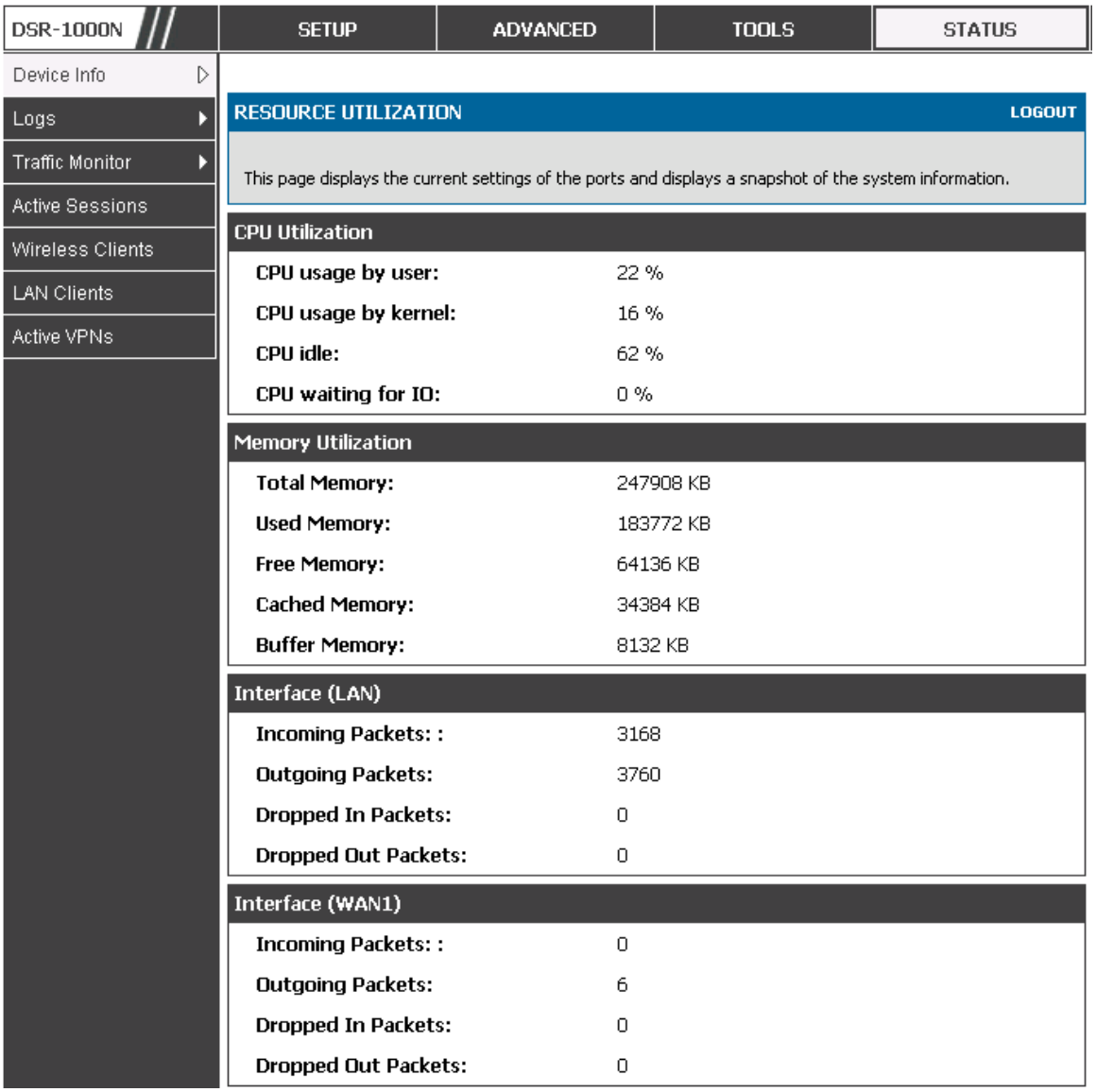
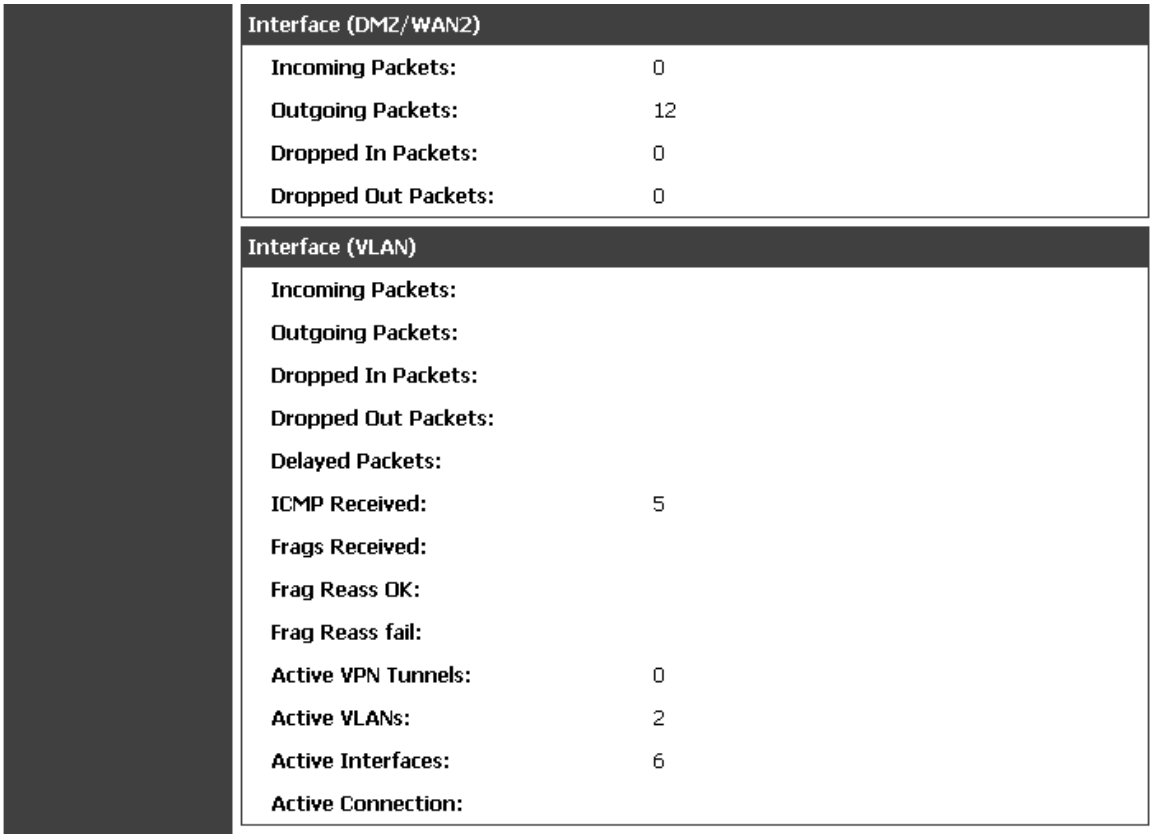


Figure 78: Resource Utilization data



Interface (DMZ/WAN2)	
Incoming Packets:	0
Outgoing Packets:	12
Dropped In Packets:	0
Dropped Out Packets:	0

Interface (VLAN)	
Incoming Packets:	
Outgoing Packets:	
Dropped In Packets:	
Dropped Out Packets:	
Delayed Packets:	
ICMP Received:	5
Frags Received:	
Frag Reass OK:	
Frag Reass fail:	
Active VPN Tunnels:	0
Active VLANs:	2
Active Interfaces:	6
Active Connection:	

Figure 79: Resource Utilization data (continued)

10.2 Traffic Statistics

10.2.1 Wired Port Statistics

Status > Traffic Monitor > Device Statistics

Detailed transmit and receive statistics for each physical port are presented here. Each interface (WAN1, WAN2/DMZ, LAN, and VLANs) have port specific packet level information provided for review. Transmitted/received packets, port collisions, and the cumulating bytes/sec for transmit/receive directions are provided for each interface along with the port up time. If you suspect issues with any of the wired ports, this table will help diagnose uptime or transmit level issues with the port.

The statistics table has auto-refresh control which allows display of the most current port level data at each page refresh. The default auto-refresh for this page is 10 seconds.

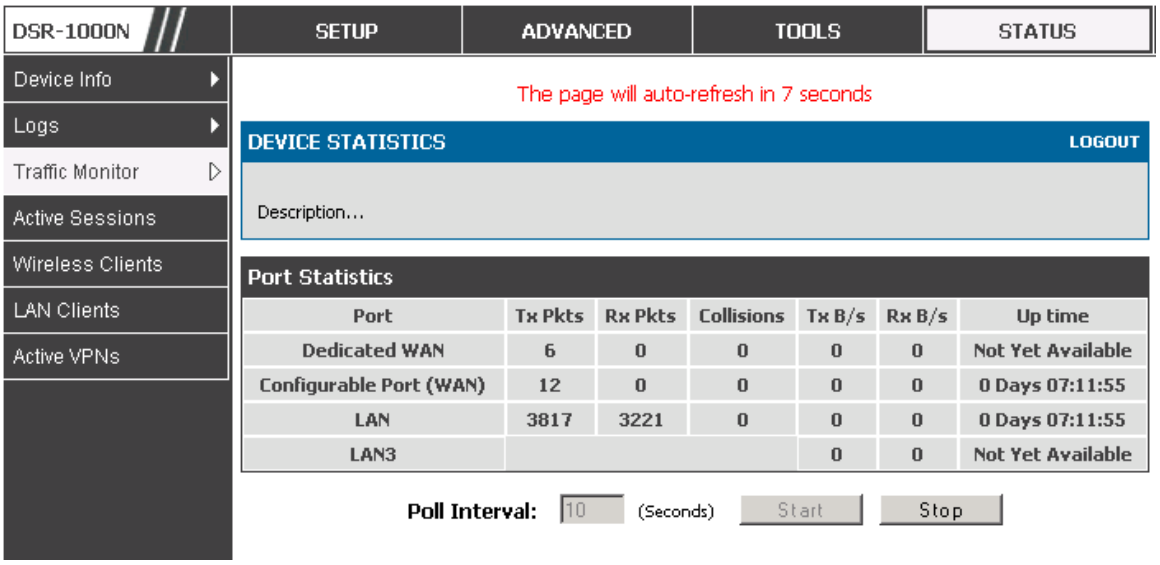


Figure 80: Physical port statistics

10.2.2 Wireless Statistics

Status > Traffic Monitor > Wireless Statistics

The Wireless Statistics tab displays the incrementing traffic statistics for each enabled access point. This page will give a snapshot of how much traffic is being transmitted over each wireless link. If you suspect that a radio or VAP may be down, the details on this page would confirm if traffic is being sent and received through the VAP.

The clients connected to a particular AP can be viewed by using the Status Button on the list of APs in the ***Setup > Wireless > Access Points*** page. Traffic statistics are shown for that individual AP, as compared to the summary stats for each AP on this Statistics page. The poll interval (the refresh rate for the statistics) can be modified to view more frequent traffic and collision statistics.

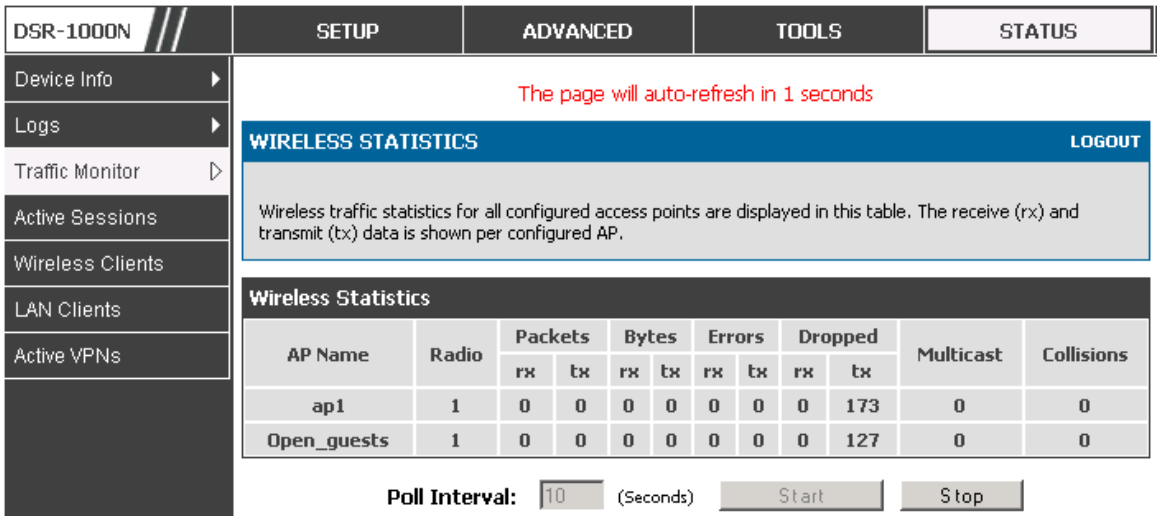


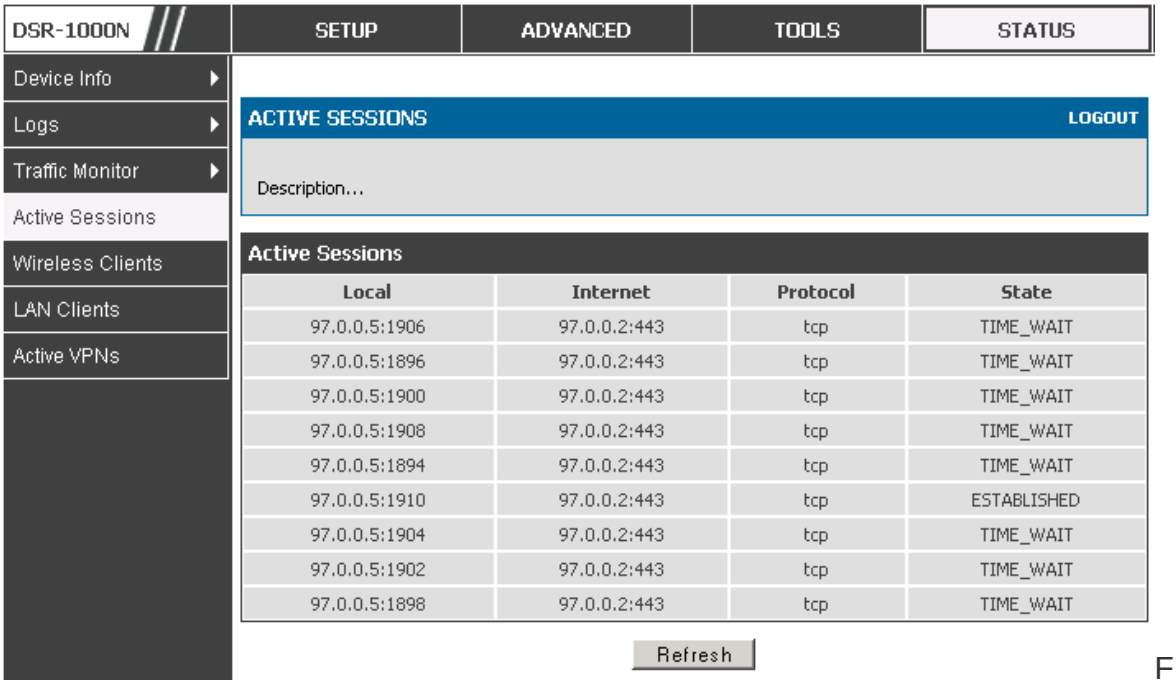
Figure 81: AP specific statistics

10.3 Active Connections

10.3.1 Sessions through the Router

Status > Active Sessions

This table lists the active internet sessions through the router's firewall. The session's protocol, state, local and remote IP addresses are shown.



F

Figure 82: List of current Active Firewall Sessions

10.3.2 Wireless Clients

Status > Wireless Clients

The clients connected to a particular AP can be viewed on this page. Connected clients are sorted by the MAC address and indicate the security parameters used by the wireless link, as well as the time connected to the corresponding AP.

The statistics table has auto-refresh control which allows display of the most current port level data at each page refresh. The default auto-refresh for this page is 10 seconds.

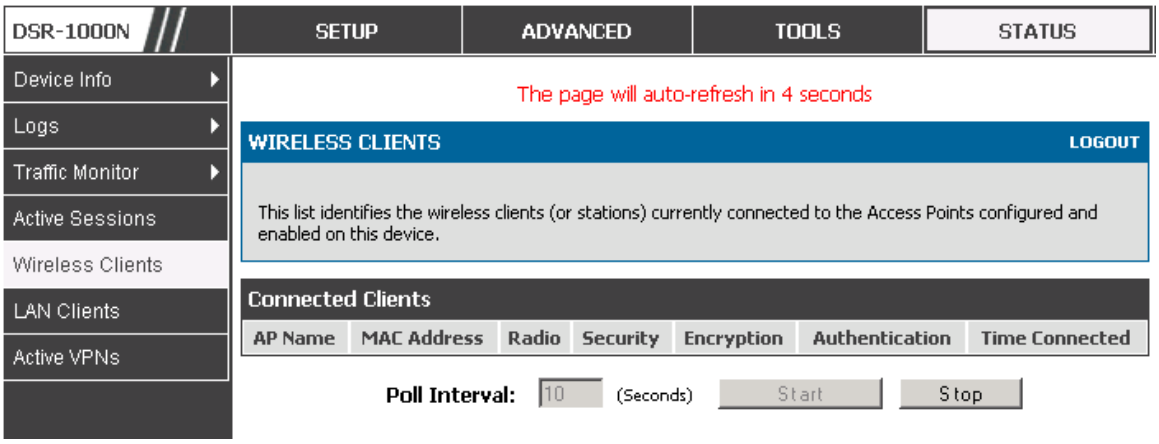


Figure 83: List of connected 802.11 clients per AP

10.3.3 LAN Clients

Status > LAN Clients

The LAN clients to the router are identified by an ARP scan through the LAN switch. The NetBios name (if available), IP address and MAC address of discovered LAN hosts are displayed.

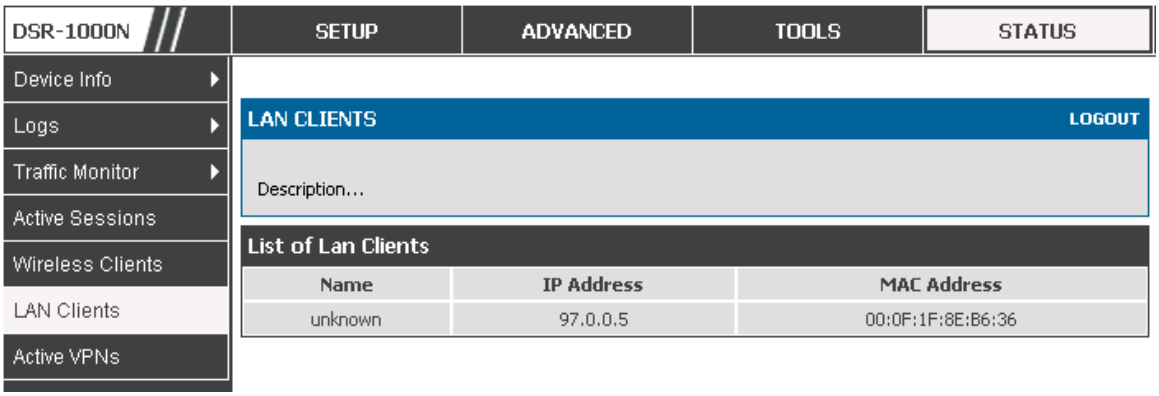


Figure 84: List of LAN hosts

10.3.4 Active VPN Tunnels

Status > Active VPNs

You can view and change the status (connect or drop) of the router's IPSec security associations. Here, the active IPSec SAs (security associations) are listed along with the traffic details and tunnel state. The traffic is a cumulative measure of transmitted/received packets since the tunnel was established.

If a VPN policy state is "IPsec SA Not Established", it can be enabled by clicking the Connect button of the corresponding policy. The Active IPSec SAs table displays a list of active IPSec SAs. Table fields are as follows.

Field	Description
Policy Name	IKE or VPN policy associated with this SA.
Endpoint	IP address of the remote VPN gateway or client.
Tx (KB)	Kilobytes of data transmitted over this SA.
Tx (Packets)	Number of IP packets transmitted over this SA.
State	Status of the SA for IKE policies: Not Connected or IPSec SA Established.

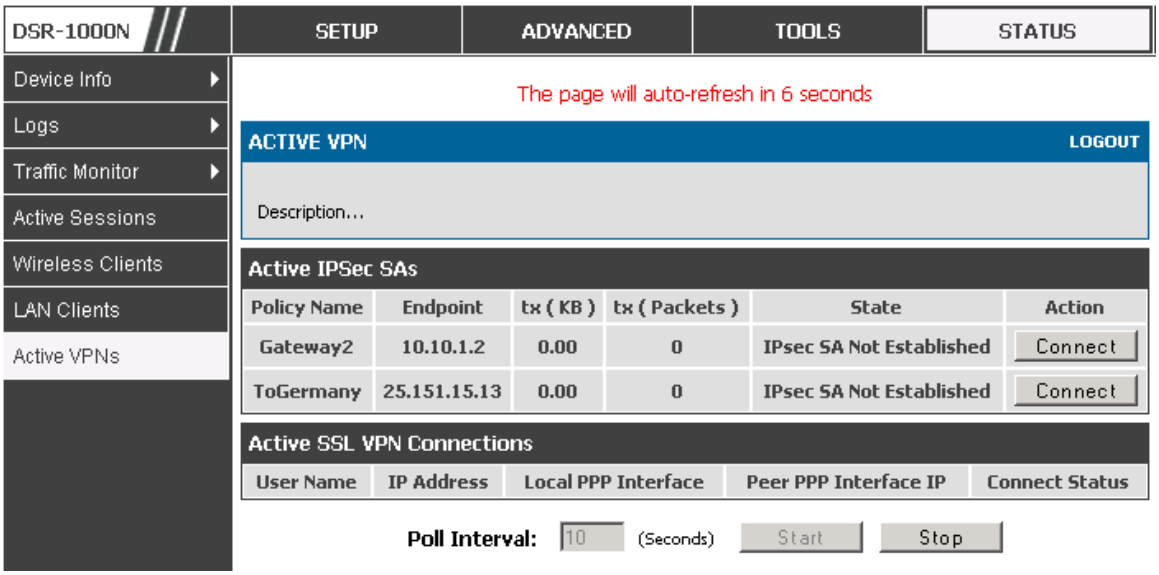


Figure 85: List of current Active Firewall Sessions

All active SSL VPN connections, both for VPN tunnel and VPN Port forwarding, are displayed on this page as well. Table fields are as follows.

Field	Description
User Name	The SSL VPN user that has an active tunnel or port forwarding session to this router.
IP Address	IP address of the remote VPN client.
Local PPP Interface	The interface (WAN1 or WAN2) through which the session is active.
Peer PPP Interface IP	The assigned IP address of the virtual network adapter.
Connect Status	Status of the SSL connection between this router and the remote VPN client: Not Connected or Connected.

11.Trouble Shooting

11.1 Internet connection

Symptom: You cannot access the router's web-configuration interface from a PC on your LAN.

Recommended action:

1. Check the Ethernet connection between the PC and the router.
2. Ensure that your PC's IP address is on the same subnet as the router. If you are using the recommended addressing scheme, your PC's address should be in the range 192.168.10.2 to 192.168.10.254.
3. Check your PC's IP address. If the PC cannot reach a DHCP server, some versions of Windows and Mac OS generate and assign an IP address. These auto-generated addresses are in the range 169.254.x.x. If your IP address is in this range, check the connection from the PC to the firewall and reboot your PC.
4. If your router's IP address has changed and you don't know what it is, reset the router configuration to factory defaults (this sets the firewall's IP address to 192.168.10.1).
5. If you do not want to reset to factory default settings and lose your configuration, reboot the router and use a packet sniffer (such as Ethereal™) to capture packets sent during the reboot. Look at the Address Resolution Protocol (ARP) packets to locate the router's LAN interface address.
6. Launch your browser and ensure that Java, JavaScript, or ActiveX is enabled. If you are using Internet Explorer, click Refresh to ensure that the Java applet is loaded. Close the browser and launch it again.
7. Ensure that you are using the correct login information. The factory default login name is admin and the password is password. Ensure that CAPS LOCK is off when entering this information.

Symptom: Router does not save configuration changes.

Recommended action:

1. When entering configuration settings, click Apply before moving to another menu or tab; otherwise your changes are lost.
2. Click Refresh or Reload in the browser. Your changes may have been made, but the browser may be caching the old configuration.

Symptom: Router cannot access the Internet.

Possible cause: If you use dynamic IP addresses, your router may not have requested an IP address from the ISP.

Recommended action:

1. Launch your browser and go to an external site such as www.google.com.
2. Access the firewall's configuration main menu at http://192.168.10.1.
3. Select Monitoring > Router Status.
4. Ensure that an IP address is shown for the WAN port. If 0.0.0.0 is shown, your firewall has not obtained an IP address from your ISP. See the next symptom.

Symptom: Router cannot obtain an IP address from the ISP.

Recommended action:

1. Turn off power to the cable or DSL modem.
2. Turn off the router.
3. Wait 5 minutes, and then reapply power to the cable or DSL modem.
4. When the modem LEDs indicate that it has resynchronized with the ISP, reapply power to the router. If the router still cannot obtain an ISP address, see the next symptom.

Symptom: Router still cannot obtain an IP address from the ISP.

Recommended action:

1. Ask your ISP if it requires a login program — PPP over Ethernet (PPPoE) or some other type of login.
2. If yes, verify that your configured login name and password are correct.

3. Ask your ISP if it checks for your PC's hostname.
4. If yes, select Network Configuration > WAN Settings > Ethernet ISP Settings and set the account name to the PC hostname of your ISP account.
5. Ask your ISP if it allows only one Ethernet MAC address to connect to the Internet, and therefore checks for your PC’s MAC address.
6. If yes, inform your ISP that you have bought a new network device, and ask them to use the firewall’s MAC address.
7. Alternatively, select Network Configuration > WAN Settings > Ethernet ISP Settings and configure your router to spoof your PC’s MAC address.

Symptom: Router can obtain an IP address, but PC is unable to load Internet pages.

Recommended action:

1. Ask your ISP for the addresses of its designated Domain Name System (DNS) servers. Configure your PC to recognize those addresses. For details, see your operating system documentation.
2. On your PC, configure the router to be its TCP/IP gateway.

11.2 Date and time

Symptom: Date shown is January 1, 1970.

Possible cause: The router has not yet successfully reached a network time server (NTS).

Recommended action:

1. If you have just configured the router, wait at least 5 minutes, select Administration > Time Zone, and recheck the date and time.
2. Verify your Internet access settings.

Symptom: Time is off by one hour.

Possible cause: The router does not automatically adjust for Daylight Savings Time.

Recommended action:

1. Select Administration > Time Zone and view the current date and time settings.
2. Click to check or uncheck “Automatically adjust for Daylight Savings Time”, then click Apply.

11.3 Pinging to Test LAN Connectivity

Most TCP/IP terminal devices and firewalls contain a ping utility that sends an ICMP echo-request packet to the designated device. The device responds with an echo reply. Troubleshooting a TCP/IP network is made very easy by using the ping utility in your PC or workstation.

11.3.1 Testing the LAN path from your PC to your router

1. From the PC’s Windows toolbar, select Start > Run.
2. Type ping <IP_address> where <IP_address> is the router’s IP address.
   Example: ping 192.168.10.1.
3. Click OK.
4. Observe the display:
   - If the path is working, you see this message sequence:

     Pinging <IP address> with 32 bytes of data

     Reply from <IP address>: bytes=32 time=NN ms TTL=xxx
   - If the path is not working, you see this message sequence:

     Pinging <IP address> with 32 bytes of data

     Request timed out
5. If the path is not working, Test the physical connections between PC and router
   - If the LAN port LED is off, go to the “LED displays” section on page B-1 and follow instructions for “LAN or Internet port LEDs are not lit.”
   - Verify that the corresponding link LEDs are lit for your network interface card and for any hub ports that are connected to your workstation and firewall.

6. If the path is still not up, test the network configuration:
    - Verify that the Ethernet card driver software and TCP/IP software are installed and configured on the PC.
    - Verify that the IP address for the router and PC are correct and on the same subnet.

11.3.2 Testing the LAN path from your PC to a remote device

1. From the PC's Windows toolbar, select Start > Run.
2. Type ping -n 10 <IP_address> where -n 10 specifies a maximum of 10 tries and <IP address> is the IP address of a remote device such as your ISP's DNS server. Example: ping -n 10 10.1.1.1.
3. Click OK and then observe the display (see the previous procedure).
4. If the path is not working, do the following:
    - Check that the PC has the IP address of your firewall listed as the default gateway. (If the IP configuration of your PC is assigned by DHCP, this information is not visible in your PC's Network Control Panel.)
    - Verify that the network (subnet) address of your PC is different from the network address of the remote device.
    - Verify that the cable or DSL modem is connected and functioning.
    - Ask your ISP if it assigned a hostname to your PC.

    If yes, select Network Configuration > WAN Settings > Ethernet ISP Settings and enter that hostname as the ISP account name.
    - Ask your ISP if it rejects the Ethernet MAC addresses of all but one of your PCs.

    Many broadband ISPs restrict access by allowing traffic from the MAC address of only your broadband modem; but some ISPs additionally restrict access to the MAC address of just a single PC connected to that modem. If

this is the case, configure your firewall to clone or spoof the MAC address from the authorized PC.

11.4 Restoring factory-default configuration settings

To restore factory-default configuration settings, do either of the following:

1. Do you know the account password and IP address?
   - If yes, select Administration > Settings Backup & Upgrade and click default.
   - If no, do the following:

   On the rear panel of the router, press and hold the Reset button about 10 seconds, until the test LED lights and then blinks.

   Release the button and wait for the router to reboot.
2. If the router does not restart automatically; manually restart it to make the default settings effective.
3. After a restore to factory defaults —whether initiated from the configuration interface or the Reset button — the following settings apply:
   - LAN IP address: 192.168.10.1
   - Username: admin
   - Password: password
   - DHCP server on LAN: enabled
   - WAN port configuration: Get configuration via DHCP

12.Credits

Microsoft, Windows are registered trademarks of Microsoft Corp.

Linux is a registered trademark of Linus Torvalds.

UNIX is a registered trademark of The Open Group.

Appendix A. Glossary

ARP	Address Resolution Protocol. Broadcast protocol for mapping IP addresses to MAC addresses.
CHAP	Challenge-Handshake Authentication Protocol. Protocol for authenticating users to an ISP.
DDNS	Dynamic DNS. System for updating domain names in real time. Allows a domain name to be assigned to a device with a dynamic IP address.
DHCP	Dynamic Host Configuration Protocol. Protocol for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.
DNS	Domain Name System. Mechanism for translating H.323 IDs, URLs, or e-mail IDs into IP addresses. Also used to assist in locating remote gatekeepers and to map IP addresses to hostnames of administrative domains.
FQDN	Fully qualified domain name. Complete domain name, including the host portion. Example: serverA.companyA.com.
FTP	File Transfer Protocol. Protocol for transferring files between network nodes.
HTTP	Hypertext Transfer Protocol. Protocol used by web browsers and web servers to transfer files.
IKE	Internet Key Exchange. Mode for securely exchanging encryption keys in ISAKMP as part of building a VPN tunnel.
IPSec	IP security. Suite of protocols for securing VPN tunnels by authenticating or encrypting IP packets in a data stream. IPSec operates in either transport mode (encrypts payload but not packet headers) or tunnel mode (encrypts both payload and packet headers).
ISAKMP	Internet Key Exchange Security Protocol. Protocol for establishing security associations and cryptographic keys on the Internet.
ISP	Internet service provider.

MAC Address	Media-access-control address. Unique physical-address identifier attached to a network adapter.
MTU	Maximum transmission unit. Size, in bytes, of the largest packet that can be passed on. The MTU for Ethernet is a 1500-byte packet.
NAT	Network Address Translation. Process of rewriting IP addresses as a packet passes through a router or firewall. NAT enables multiple hosts on a LAN to access the Internet using the single public IP address of the LAN's gateway router.
NetBIOS	Microsoft Windows protocol for file sharing, printer sharing, messaging, authentication, and name resolution.
NTP	Network Time Protocol. Protocol for synchronizing a router to a single clock on the network, known as the clock master.
PAP	Password Authentication Protocol. Protocol for authenticating users to a remote access server or ISP.
PPPoE	Point-to-Point Protocol over Ethernet. Protocol for connecting a network of hosts to an ISP without the ISP having to manage the allocation of IP addresses.
PPTP	Point-to-Point Tunneling Protocol. Protocol for creation of VPNs for the secure transfer of data from remote clients to private servers over the Internet.
RADIUS	Remote Authentication Dial-In User Service. Protocol for remote user authentication and accounting. Provides centralized management of usernames and passwords.
RSA	Rivest-Shamir-Adleman. Public key encryption algorithm.
TCP	Transmission Control Protocol. Protocol for transmitting data over the Internet with guaranteed reliability and in-order delivery.
UDP	User Data Protocol. Protocol for transmitting data over the Internet quickly but with no guarantee of reliability or in-order delivery.
VPN	Virtual private network. Network that enables IP traffic to travel securely over a public TCP/IP network by encrypting all traffic from one network to another. Uses tunneling to encrypt all information at the IP level.

WINS	Windows Internet Name Service. Service for name resolution. Allows clients on different IP subnets to dynamically resolve addresses, register themselves, and browse the network without sending broadcasts.
XAUTH	IKE Extended Authentication. Method, based on the IKE protocol, for authenticating not just devices (which IKE authenticates) but also users. User authentication is performed after device authentication and before IPSec negotiation.

Appendix B. Factory Default Settings

Feature	Description	Default Setting
Device login	User login URL	http://192.168.10.1
	User name (case sensitive)	admin
	Login password (case sensitive)	admin
Internet Connection	WAN MAC address	Use default address
	WAN MTU size	1500
	Port speed	Autosense
Local area network (LAN)	IP address	192.168.10.1
	IPv4 subnet mask	255.255.255.0
	RIP direction	None
	RIP version	Disabled
	RIP authentication	Disabled
	DHCP server	Enabled
	DHCP starting IP address	192.168.10.2
	DHCP ending IP address	192.168.10.100
	Time zone	GMT
	Time zone adjusted for Daylight Saving Time	Disabled
	SNMP	Disabled
	Remote management	Disabled

Firewall	Inbound communications from the Internet	Disabled (except traffic on port 80, the HTTP port)
	Outbound communications to the Internet	Enabled (all)
	Source MAC filtering	Disabled
	Stealth mode	Enabled

Appendix C. Standard Services Available for Port Forwarding & Firewall Configuration

ANY
AIM
BGP
BOOTP_CLIENT
BOOTP_SERVER
CU-SEEME:UDP
CU-SEEME:TCP
DNS:UDP
DNS:TCP
FINGER
FTP
HTTP
HTTPS
ICMP-TYPE-3
ICMP-TYPE-4
ICMP-TYPE-5
ICMP-TYPE-6
ICMP-TYPE-7
ICMP-TYPE-8
ICMP-TYPE-9
ICMP-TYPE-10
ICMP-TYPE-11
ICMP-TYPE-13
ICQ
IMAP2
IMAP3
IRC
NEWS
NFS
NNTP
PING
POP3
PPTP
RCMD
REAL-AUDIO
REXEC
RLOGIN
RTELNET
RTSP:TCP
RTSP:UDP
SFTP
SMTP
SNMP:TCP
SNMP:UDP
SNMP-TRAPS:TCP
SNMP-TRAPS:UDP
SQL-NET
SSH:TCP
SSH:UDP
STRMWORKS
TACACS
TELNET
TFTP
VDOLIVE

Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

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 Radiation Exposure Statement

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

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The antennas used for this transmitter must be installed to provide a spectrum distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

This transmitter is restricted to indoor use in the 5150MHz to 5250MHz frequency range.

Non-modification Statement

Use only the integral antenna supplied by the manufacturer when operating this device. Unauthorized antennas, modifications, or attachments could damage the TI Navigator access point and violate FCC regulations. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Canadian Department of Communications Industry Canada (IC) Notice

This Class B digital apparatus complies with Canadian ICES-003 and RSS-210. Cet appareil numérique de la classe B est conforme à la norme NMB-003 et CNR-210 du Canada.

ndustry Canada Statement

This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE: Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. To maintain compliance with IC RF exposure compliance requirements, please follow operation instruction as documented in this manual.

This transmitter is restricted to indoor use in the 5150MHz to 5250MHz frequency range.

Europe – EU Declaration of Conformity

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:

- EN 60950-1: 2006+A11:2009
  Safety of information technology equipment

- EN 300 328 V1.7.1 (2006-10)
  Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

- EN 301 893-1 V1.5.1 (2008-12)
  Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive

- EN 301 489-17 V1.3.2 (2008-04) and EN 301 489-1 V1.8.1 (2008-04)
  Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment

This device is a 2.4 GHz wideband transmission system (transceiver), intended for use in all EU member states and EFTA countries under the following conditions and/or with the following restrictions:

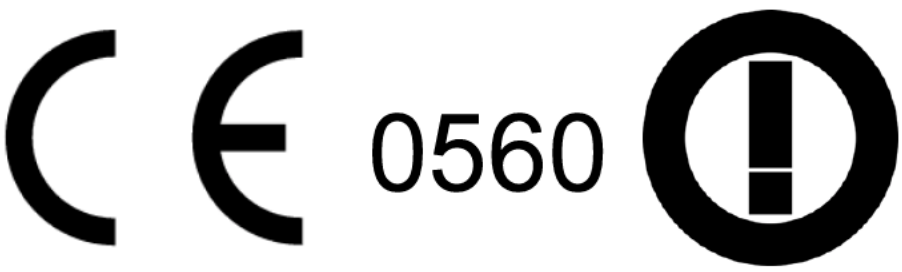
- In Italy the end-user should apply for a license at the national spectrum authorities in order to obtain authorization to use the device for setting up outdoor radio links and/or for supplying public access to telecommunications and/or network services.

- This device may not be used for setting up outdoor radio links in France and in some areas the RF output power may be limited to 10 mW EIRP in the frequency range of 2454 – 2483.5 MHz. For detailed information the enduser should contact the national spectrum authority in France.

This device is a 5 GHz wideband transmission system (transceiver), intended for use in all EU member states and EFTA countries under the following conditions and/or with the following restrictions:

- This device may only be used indoors in the frequency bands 5150 – 5250 MHz.

- In France and Luxembourg a limited implementation of the frequency bands 5150 – 5250 MHz and 5250 – 5350 MHz. In Luxermbourg it is not allowed to make use of the frequency band 5470 – 5725 MHz. End-users are encouraged to contact the national spectrum authorities in France and Luxembourg in order to obtain the latest information about any restrictions in the 5 GHz frequency band(s).



Česky [Czech]	[D-Link Corporation] tímto prohlašuje, že tento [DSR-1000N] je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk [Danish]	Undertegnede [D-Link Corporation] erklærer herved, at følgende udstyr [DSR-1000N] overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt [D-Link Corporation], dass sich das Gerät [DSR-1000N] in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab [D-Link Corporation] seadme [DSR-1000N] vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, [D-Link Corporation], declares that this [DSR-1000N] is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente [D-Link Corporation] declara que el [DSR-1000N] cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ [D-Link Corporation] ΔΗΛΩΝΕΙ ΟΤΙ [DSR-1000N] ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français [French]	Par la présente [D-Link Corporation] déclare que l'appareil [DSR-1000N] est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente [D-Link Corporation] dichiara che questo [DSR-1000N] è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo [D-Link Corporation] deklarē, ka [DSR-1000N] atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo [D-Link Corporation] deklaruoja, kad šis [DSR-1000N] atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart [D-Link Corporation] dat het toestel [DSR-1000N] in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, [D-Link Corporation], jiddikjara li dan [DSR-1000N] jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, [D-Link Corporation] nyilatkozom, hogy a [DSR-1000N] megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski [Polish]	Niniejszym [D-Link Corporation] oświadcza, że [DSR-1000N] jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.

pt Português [Portuguese]	[D-Link Corporation] declara que este [DSR-1000N]está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
sl Slovensko [Slovenian]	[D-Link Corporation] izjavlja, da je ta [DSR-1000N] v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	[D-Link Corporation] týmto vyhlasuje, že [DSR-1000N] spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
fi Suomi [Finnish]	[D-Link Corporation] vakuuttaa täten että [DSR-1000N] tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
sv Svenska [Swedish]	Härmed intygar [D-Link Corporation] att denna [DSR-1000N] står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.