D-Link DFL-900

VPN/Firewall Router

User Manual

D-Link

Building Networks for People

DFL-900 User Manual

Version 1.600

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Part I

Overview

Chapter 1
Quick Start

This chapter introduces how to quick setup the DFL-900.

DFL-900 is an integrated all-in-one solution that can facilitate the maximum security and the best resource utilization for the enterprises. It contains a high-performance stateful packet inspection (SPI) **Firewall**, policy-based **NAT**, ASIC-based wire-speed **VPN**, upgradeable **Intrusion Detection System**, **Dynamic Routing**, **Content Filtering**, **Bandwidth Management**, **WAN Load Balancer**, and other solutions in a single box. It is one of the most cost-effective all-in-one solutions for enterprises.

1.1 Check Your Package Contents

These are the items included with your DFL-900 purchase as Figure 1-1. They are the following items

1. DFL-900 Device * 1
2. Ethernet cable (RJ-45) * 2
3. RS-232 console * 1
4. CD (include User's manual and Quick Guide) * 1
5. Power cord * 1

Figure 1-1 All items in the DFL-900 package

1.2 Five steps to configure DFL-900 quickly

Let's look at the common network topology without DFL-900 applying like Figure 1-2. This is a topology which is almost used by all the small/medium business or SOHO use as their internet connectivity. Although that your topology is not necessarily the same diagram below, but it still can give you a guideline to configure DFL-900 quickly.

Now you can pay attention at the `IP Sharer` in the diagram. The `IP Sharer` can provide you with NAT (Network Address Translation), PAT (Port Address Translation) and other functions.

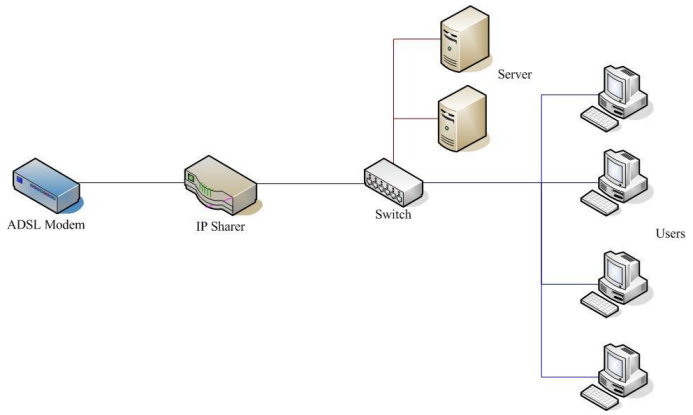


Figure 1-2 The example before DFL-900 applies on it

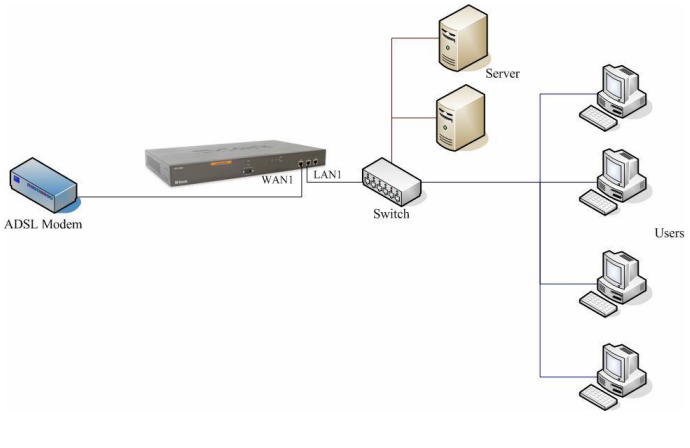


Figure 1-3 The example after DFL-900 applies on it

Here we would like to alter the original IP Sharer with the DFL-900 like Figure 1-3. If we hope to have DFL-900 to replace the IP Sharer, we just need to simply execute the following five steps as Figure 1-4 showed. By these steps, we hope to build an image to tell you how to let DFL-900 work basically.

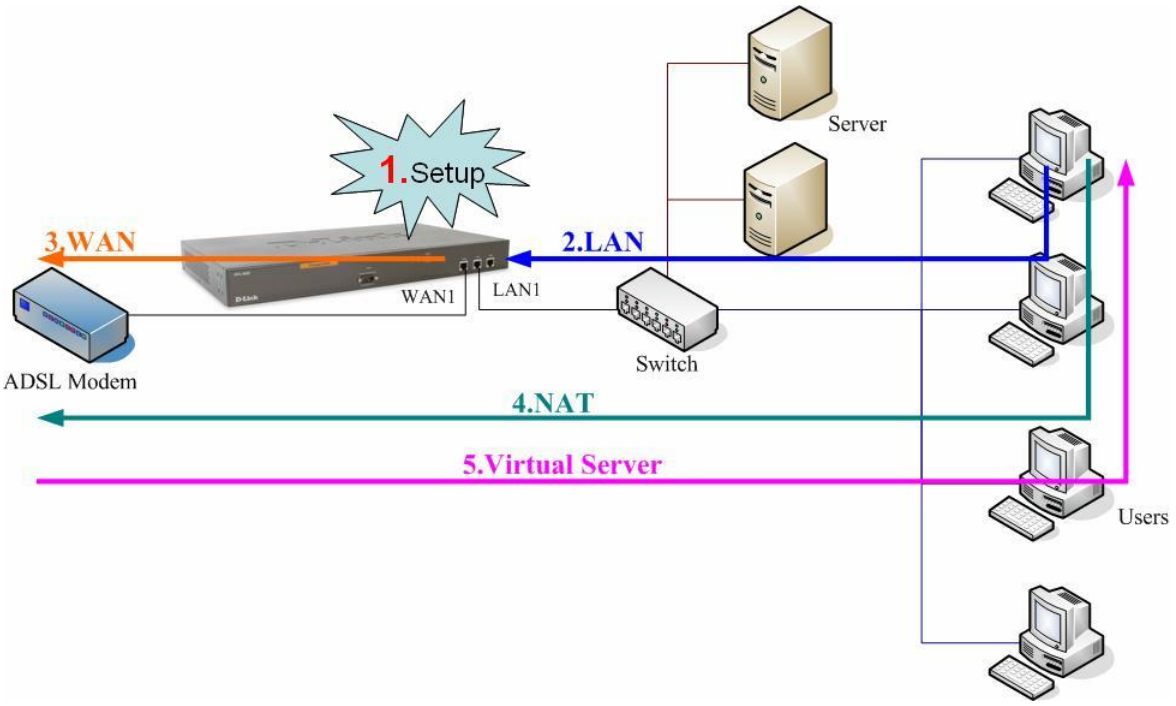


Figure 1-4 Five steps to configure DFL-900

As the Figure 1-4 illustrated, with the five-step configurations, DFL-900 will have the same functions with the original IP Sharer. Please see the following description of the five-step configurations.

1. Setup:
   Install three physical lines inclusive of the power cord, outbound link (connected WAN1 port) and inbound direction (connected LAN1 port). For the details, please refer section 1.3.
   Continually, we will connect to the web GUI of DFL-900. So you must make sure that you have a PC which is located in the same subnet with DFL-900 before this step. Note: The default LAN1 port is (192.168.1.254 / 255.255.255.0). Refer to section 1.5 for more information.

2. LAN:
   Configure the LAN1 port of DFL-900. You can refer to section 1.4 for the default network configurations of DFL-900. Note: If you were connected from LAN1 port and changed the LAN1 IP address settings of DFL-900. The network will be disconnected since the IP address is different between your pc and DFL-900 LAN1 port.

3. WAN:
   Configure the WAN1 port of DFL-900. You can refer to section 1.4 for the default network configurations of DFL-900.

4. NAT:
   Configure the connection of LAN to WAN direction. It will make all the client pc access the internet through DFL-900. For more information, please refer to section 1.6.1.

5. Virtual Server:
   If there is any server located inside the DFL-900. You may hope these servers can provide services outside. So you should configure the Virtual Server which provides connections of WAN to LAN direction. For more information, please refer to section 1.6.2.

After you completely finished the above steps, the connectivity function of DFL-900 is probably well-done.

1.3 Wiring the DFL-900

A. First, connect the power cord to the socket at the back panel of the DFL-900 as in Figure 1-5 and then plug the other end of the power adapter to a wall outlet or power strip. The Power LED will turn **ON** to indicate proper operation.

Figure 1-5 Back panel of the DFL-900

B. Using an Ethernet cable, insert one end of the cable to the WAN port on the front panel of the DFL-900 and the other end of the cable to a DSL or Cable modem, as in Figure 1-6.

C. Computers with an Ethernet adapter can be directly connected to any of the LAN ports using a cross-over Ethernet cable, as in Figure 1-6.

D. Computers that act as servers to provide Internet services should be connected to the DMZ port using an Ethernet Cable, as in Figure 1-6.

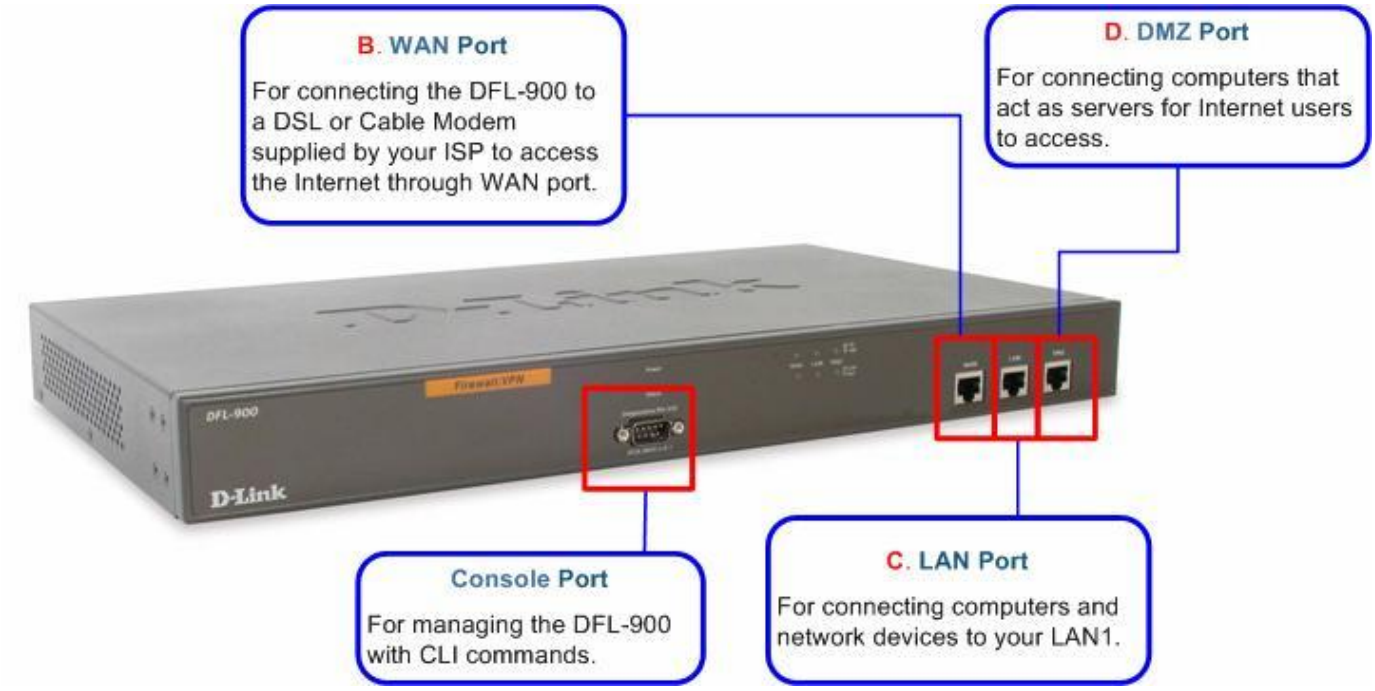


Figure 1-6 Front end of the DFL-900

1.4 Default Settings and architecture of DFL-900

You should have an Internet account already set up and have been given most of the following information as Table 1-1. Fill out this table when you edit the web configuration of DFL-900.

Items			Default value	New value
Password:			admin	
WAN1 (Port 1)	Fixed IP	IP Address	Not initialized	____.____.____.____
		Subnet Mask		____.____.____.____
		Gateway IP		____.____.____.____
		Primary DNS		____.____.____.____
		Secondary DNS		____.____.____.____
	PPPoE	PPPoE Username		____.____.____.____
		PPPoE Password		____.____.____.____
	DHCP			
LAN 1(Port 2)		IP Address	192.168.1.254	____.____.____.____
		IP Subnet Mask	255.255. 255.0	____.____.____.____
DMZ 1(Port 3)		IP Address	10.1.1.254	____.____.____.____
		IP Subnet Mask	255.255.255.0	____.____.____.____

Table 1-1 DFL-900 related network settings

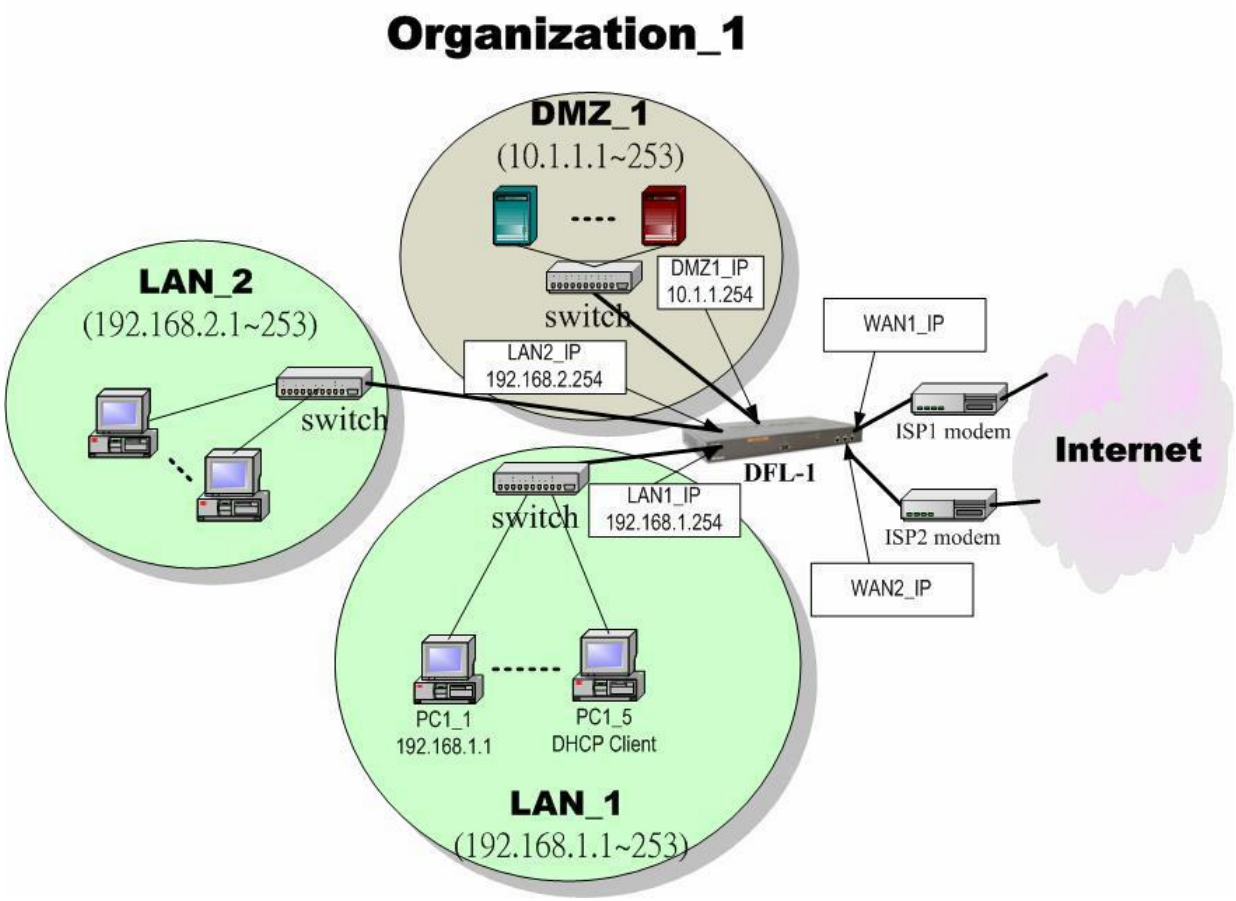


Figure 1-7 The default settings of DFL-900

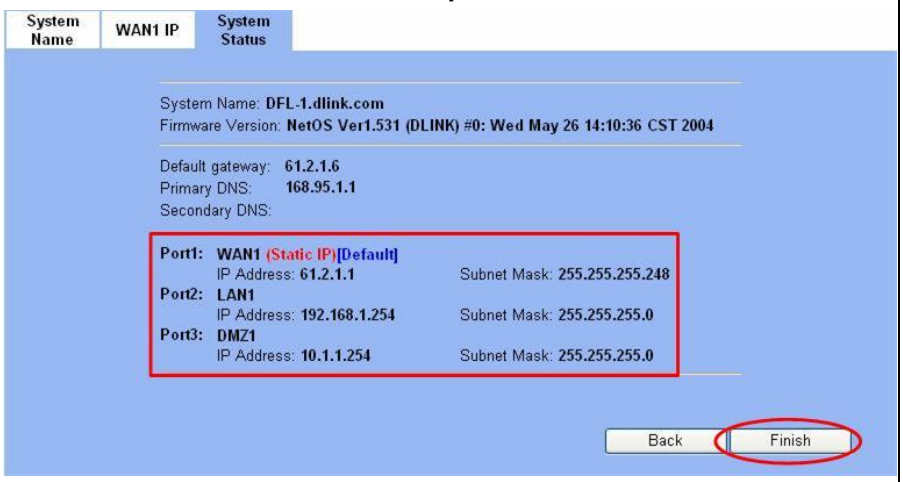
As the above diagram Figure 1-7 illustrated, this diagram shows the default topology of DFL-900. And you can configure the DFL-900 by connecting to the LAN1_IP (192.168.1.254) from the PC1_1 (192.168.1.1). In the following sections, we will teach you how to quickly setup the DFL-900 in the basic appliances.

1.5 Using the Setup Wizard

A computer on your LAN1 must be assigned an IP address and Subnet Mask from the same range as the IP address and Subnet Mask assigned to the DFL-900 in order to be able to make an HTTPS connection using a web browser. The DFL-900 is assigned an IP address of 192.168.1.254 with a Subnet Mask of 255.255.255.0 by default. The computer that will be used to configure the DFL-900 must be assigned an IP address between 192.168.1.1 and 192.168.1.253 with a Subnet Mask of 255.255.255.0 to be able to connect to the DFL-900. This address range can be changed later. There are instructions in the DFL-900 Quick Installation Guide, if you do not know how to set the IP address and Subnet Mask for your computer.

Step 1. Login Type "`admin`" in the account field, "`admin`" in the `Password` field and click `Login`.	**Connect to https://192.168.1.254** 
Step 2. Run Setup Wizard Click the `Run Setup Wizard`.	**After login to https://192.168.1.254** **BASIC SETUP > Wizard** 
Step 3. System Name Enter the `Host Name` and the `Domain Name`, followed by clicking the `Next`.	**BASIC SETUP > Wizard** 

Step 4. WAN Connectivity Choose the type of `IP Address Assignment` provided by your ISP to access the Internet. Here we have four types to select. This will determine how the IP address of WAN1 is obtained. Click `Next` to proceed.	**BASIC SETUP > Wizard > Next** System Name | WAN1 IP | System Status IP Address Assignment: Get IP Automatically (DHCP) Get IP Automatically (DHCP) Fixed IP Address PPP over Ethernet Not initialized IP Address 0.0.0.0 Gateway IP 0.0.0.0 DNS IP Address Primary DNS 0.0.0.0 Secondary DNS 0.0.0.0 Routing Protocol None OSPF Area ID Back | Next
Step 4.a — DHCP client If `Get IP Automatically (DHCP)` is selected, DFL-900 will request for IP address, netmask, and DNS servers from your ISP. You can use your preferred DNS by clicking the `DNS IP Address` and then completing the `Primary DNS` and `Secondary DNS` server IP addresses. Click `Next` to proceed.	**BASIC SETUP > Wizard > Next > DHCP** System Name | WAN1 IP | System Status IP Address Assignment: Get IP Automatically (DHCP) Get DNS Automatically DNS IP Address Primary DNS 168.95.1.1 Secondary DNS 0.0.0.0 Routing Protocol None OSPF Area ID Back | Next
Step 4.b — Fixed IP If `Fixed IP Address` is selected, enter the ISP-given `IP Address`, `Subnet Mask`, `Gateway IP`, `Primary DNS` and `Secondary DNS` IP. Click `Next` to proceed.	**BASIC SETUP > Wizard > Next > Fixed IP** System Name | WAN1 IP | System Status IP Address Assignment: Fixed IP Address IP Address 61.2.1.1 Subnet Mask 255.255.255.248 Gateway IP 61.2.1.6 DNS IP Address Primary DNS 168.95.1.1 Secondary DNS 0.0.0.0 Routing Protocol None OSPF Area ID Back | Next

Step 4.c — PPPoE client If `PPP over Ethernet` is selected, enter the ISP-given `User Name`, `Password` and the optional `Service Name`. Click `Next` to proceed. Notice: On the current firmware version, if you select PPPoE method as the WAN link connection. The bandwidth management feature will not be supported.	**BASIC SETUP > Wizard > Next > PPPoE** 
Step 4.d — Alert Message Please Note that an alert message box "`When changing to none fixed ip mode, system will delete all ip alias!`" will appear while you change `Get IP Automatically (DHCP)` or `PPP over Ethernet` but not `Fixed IP Address` as your WAN link.	
Step 5. System Status Here we select `Fixed IP` method in WAN1 port. Then the DFL-900 provides a short summary of the system. Please check if anything mentioned above is properly set into the system. Click `Finish` to close the wizard.	**BASIC SETUP > Wizard > Run Setup Wizard > Next > Next** 

1.6 Internet Connectivity

After setting up DFL-900 with the wizard, DFL-900 can connect to the ISP. In this chapter, we introduce **LAN1-to-WAN1** Connectivity to explain how the computers under LAN1 can access the Internet at WAN1 through DFL-900. Subsequently, we introduce **WAN1-to-DMZ1** Connectivity to explain how the servers under DMZ1 can be accessed by the LAN1 users and other Internet users on the WAN1 side.

You MUST press Apply to proceed to the next page. Once applying any changes, the settings are immediately updated into the flash memory.

1.6.1 LAN1-to-WAN1 Connectivity

The LAN Settings page allows you to modify the IP address and Subnet Mask that will identify the DFL-900 on your LAN. This is the IP address you will enter in the URL field of your web browser to connect to the DFL-900. It is also the IP address that all of the computers and devices on your LAN will use as their Default Gateway.

Step 1. Device IP Address

Setup the `IP Address` and `IP Subnet Mask` for the DFL-900.

Step 2. Client IP Range

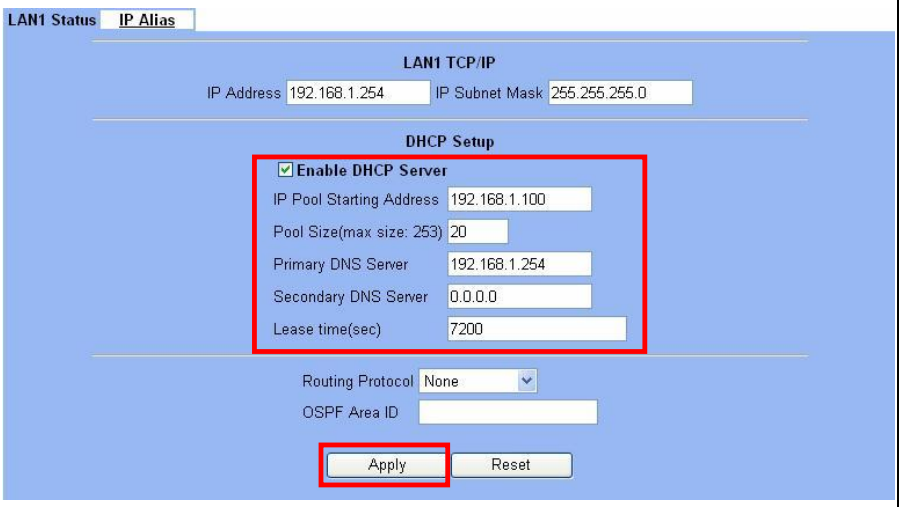
Enable the `DHCP server` if you want to use DFL-900 to assign IP addresses to the computers under LAN1. Specify the `Pool Starting Address`, `Pool Size`, `Primary DNS`, and `Secondary DNS` that will be assigned to them.

Example: in the figure, the DFL-900 will assign one IP address from `192.168.1.100` ~ `192.168.1.119`, together with the DNS server `192.168.1.254`, to the LAN1 PC that requests for an IP address.

Step 3. Apply the Changes

Click `Apply` to save. Now you can enable the DHCP clients on your LAN1 PCs to get an IP.

BASIC SETUP > LAN Settings > LAN1 Status

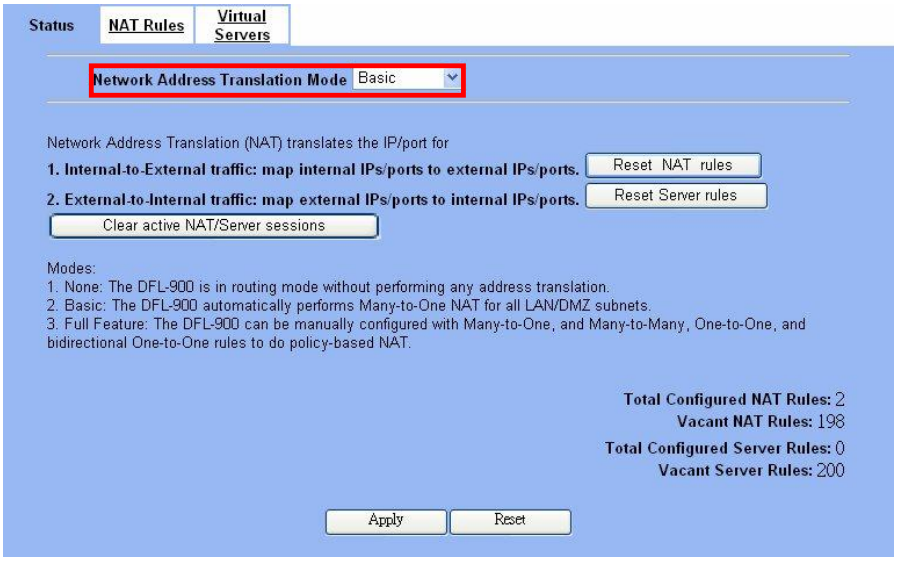


Note: The `IP Pool Starting Address` must be on the same subnet specified in the `IP Address` and the `IP Subnet Mask` field. For example, the addresses given by the `192.168.1.100` with a pool size of `20` (`192.168.1.100` ~ `192.168.1.119`) are all within the same range of `192.168.1.254` / `255.255.255.0`

Step 4. Check NAT Status

The default setting of NAT is in `Basic` Mode. After completing Step 3, the NAT is automatically configured related rules to let all private-IP LAN/DMZ-to-WAN requests to be translated with the public IP assigned by the ISP.

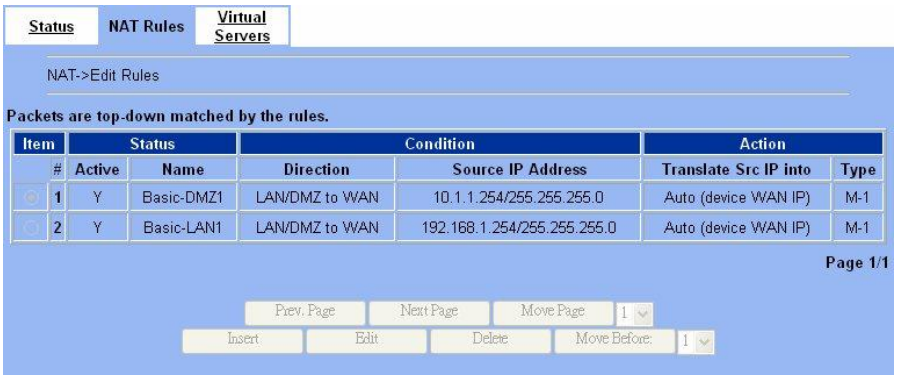
ADVANCED SETTINGS > NAT > Status



Step 5. Check NAT Rules

The DFL-900 has added the NAT rules as the right diagram. The rule `Basic-LAN1` means that, when matching the condition (requests of `LAN/DMZ-to-WAN` direction with its source IP falling in the range of `192.168.1.254 / 255.255.255.0`), the request will be translated into a public-source-IP requests, and then be forwarded to the destinations.

ADVANCED SETTINGS > NAT > NAT Rules



1.6.2 WAN1-to-DMZ1 Connectivity

This section tells you how to provide an FTP service with a server installed under your DMZ1 to the public Internet users. After following the steps, users at the WAN side can connect to the FTP server at the DMZ1 side.

Step 1. Device IP Address

Setup the `IP Address` and `IP Subnet Mask` for the DFL-900 of the DMZ1 interface.

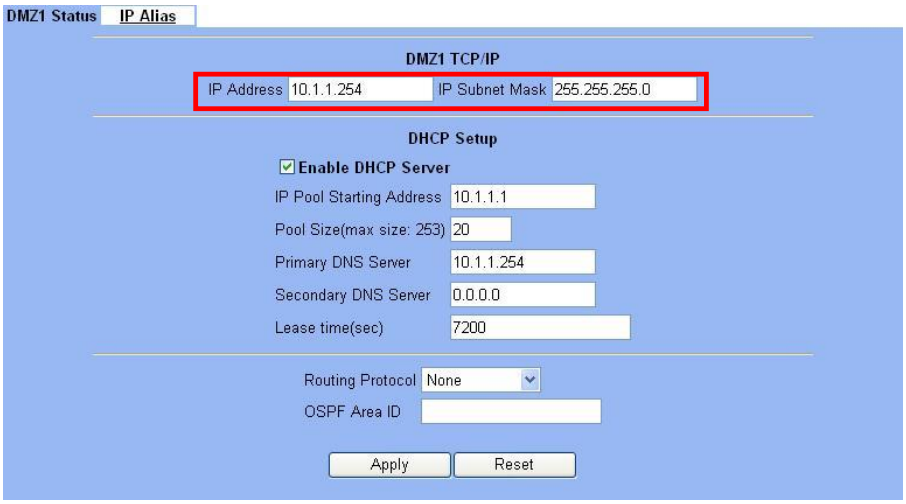
Step 2. Client IP Range

Enable the `DHCP server` if you want to use DFL-900 to assign IP addresses to the computers under DMZ1.

Step 3. Apply the Changes

Click `Apply` to save your settings.

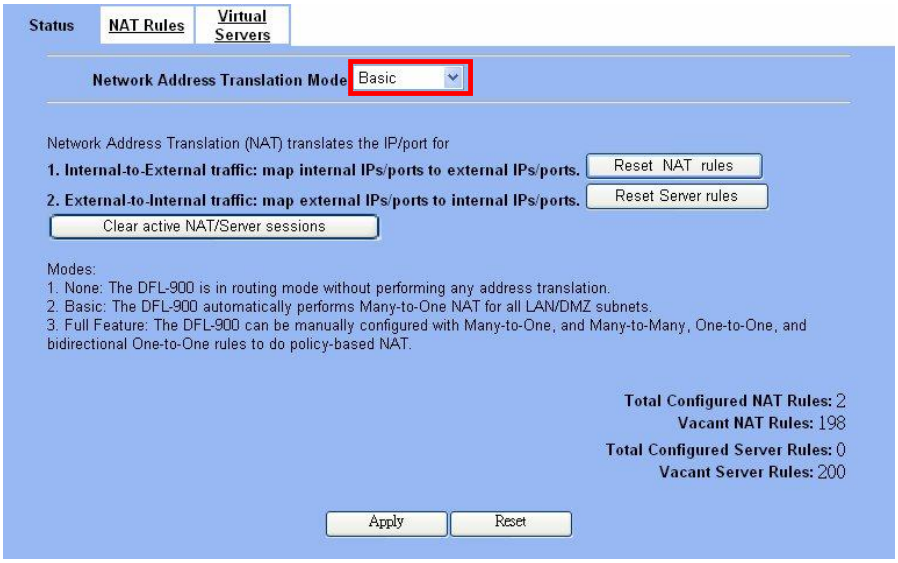
BASIC SETUP > DMZ Settings > DMZ1 Status



Step 4. Check NAT Status

The default setting of NAT is in `Basic` Mode. After applying the Step 3, the NAT is automatically configured related rules to let all private-IP LAN/DMZ-to-WAN requests to be translated with the public IP assigned by the ISP.

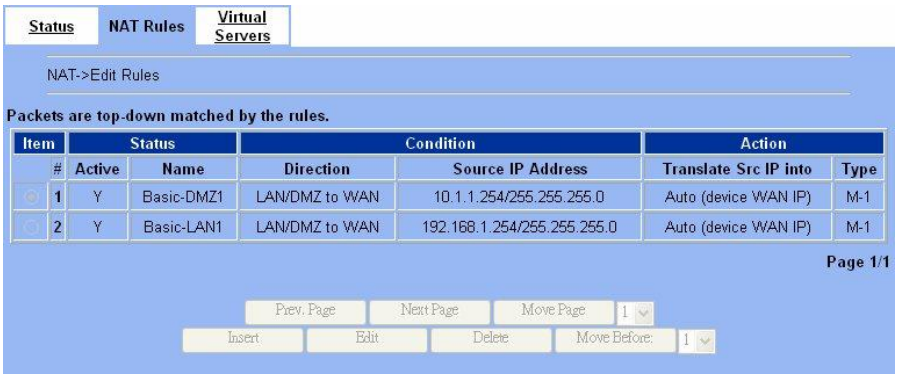
ADVANCED SETTINGS > NAT > Status



Step 5. Check NAT Rules

The DFL-900 has added the NAT rules as the right diagram. The rule `Basic-DMZ1` (number 1) means that, when matching the condition (requests of `LAN/DMZ-to-WAN` direction with its source IP falling in the range of `10.1.1.254 / 255.255.255.0`), the request will be translated into a public-source-IP requests, and then be forwarded to the destinations.

ADVANCED SETTINGS > NAT > NAT Rules



Step 6. Setup IP for the FTP Server

Assign an IP of 10.1.1.5/255.255.255.0 to the FTP server under DMZ1. Assume the FTP Server is at 10.1.1.5. And it is listening on the well-known port (21).

Step 7. Setup Server Rules

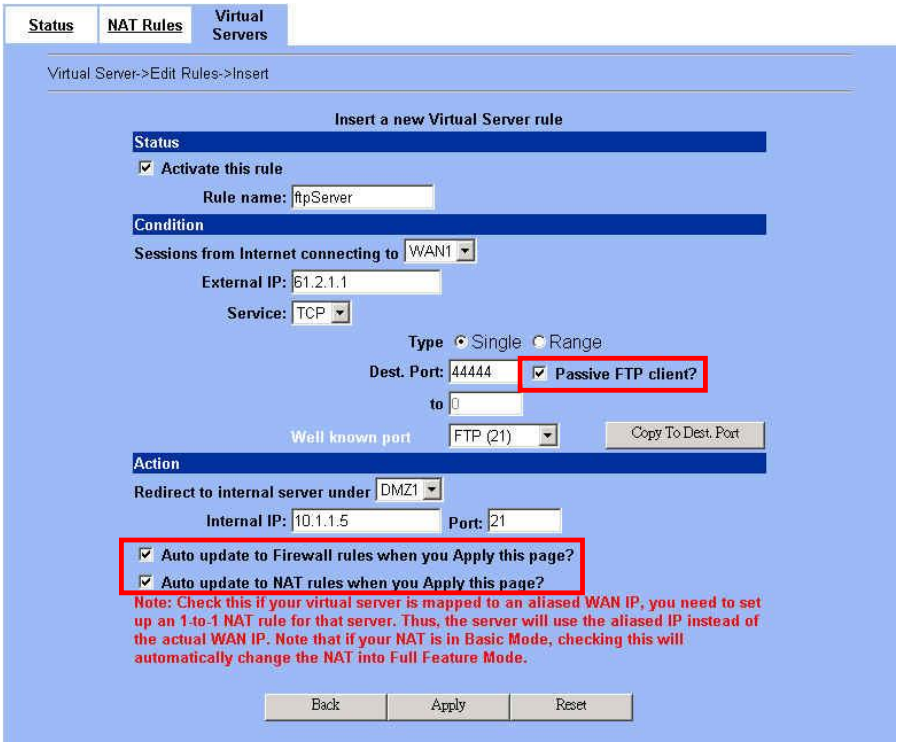
Insert a virtual server rule by clicking the `Insert` button.

ADVANCED SETTINGS > NAT > Virtual Servers

Step 8. Customize the Rule

Customize the rule name as the `ftpServer`. For any packets with its destination IP address equaling to the WAN1 IP (`61.2.1.1`) and destination port equaling to `44444`. DFL-900 will translate the packet's destination IP/port into `10.1.1.5/21`. Check the `Passive FTP client` to maximize the compatibility of the FTP protocol. This is useful if you want to provide connectivity to passive FTP clients. For passive FTP clients, the server at DMZ will return them the private IP address (10.1.1.5) and the port number for the clients to connect back for data transmissions. Since the FTP clients at the WAN side cannot connect to a private-IP (ex.10.1.1.5) through the internet. The data connections would be fail. After enabling this feature, the DFL-900 will translate the private IP/port into an IP/port of its own. Thus the problem is gracefully solved. Another point is to be sure to check "`Auto update to Firewall rules when you Apply this page?`" or "`Auto update to NAT rules when you Apply this page?`". Then, the virtual server rule will add a Firewall or NAT rule automatically. Click `Apply` to proceed.

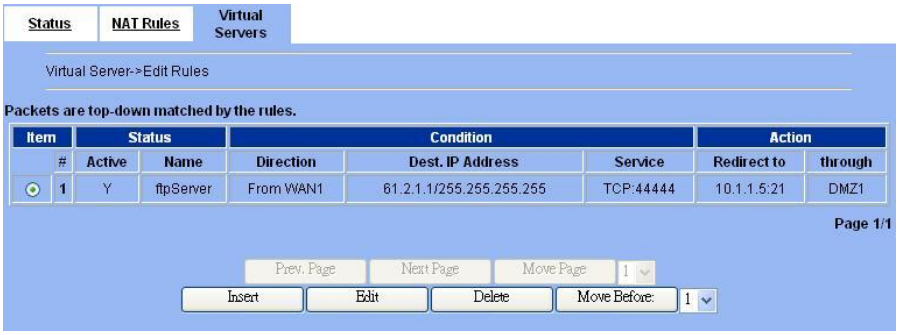
ADVANCED SETTINGS > NAT > Virtual Servers > Insert



Step 9. View the Result

Now any request towards the DFL-900's WAN1 IP (`61.2.1.1`) with dest. port `44444` will be translated into a request towards `10.1.1.5` with port `21`, and then be forwarded to the `10.1.1.5`. The FTP server listening at port `21` in `10.1.1.5` will pick up the request.

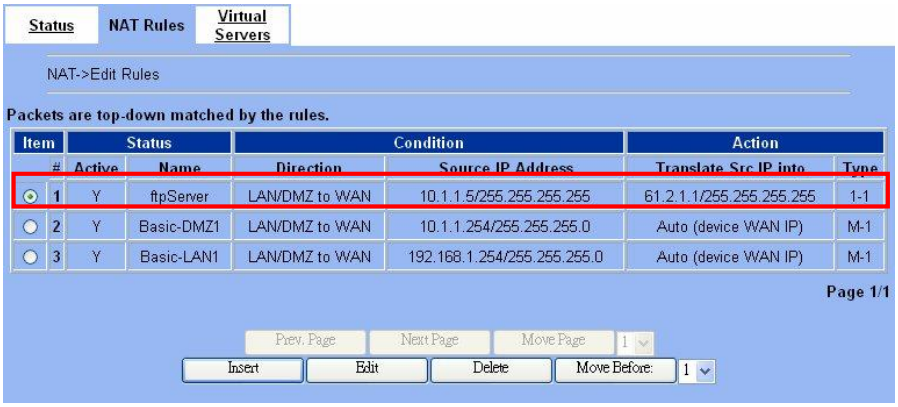
ADVANCED SETTINGS > NAT > Virtual Servers



Step 10. View the NAT Rules

In the previous Step 8, we have already checked "Auto update to Firewall/NAT rules when you Apply this page", so it will automatically add one NAT rule to transfer the IP address of virtual server when server responses packet back to the client.

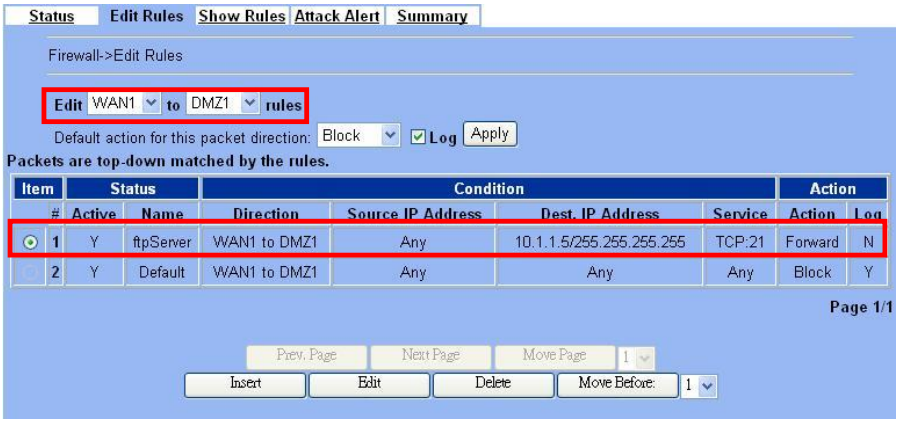
ADVANCED SETTINGS > NAT > NAT Rules



Step 11. View the Firewall Rules

The same as Step 10. When we check "Auto update to Firewall/NAT rules when you Apply this page", it will automatically add one Firewall rule in the WAN1 to DMZ1 direction. This firewall rule will let the packets with dest. IP address/port be matched with virtual server rule in order to pass through DFL-900.

ADVANCED SETTINGS > Firewall > Edit Rules



Chapter 2
System Overview

In this chapter, we will introduce the network topology for use with later chapters.

2.1 Typical Example Topology

In this chapter, we introduce a typical network topology for the DFL-900. In Figure 2-1, the left half side is a DFL-900 with one LAN, one DMZ, and one WAN link. We will demonstrate the administration procedure in the later chapters by using the below Figure 2-1.

The right half side contains another DFL-900 connected with one LAN, one DMZ, and one WAN. You can imagine this is a branch office of Organization_1. In this architecture, all the users under Organization can access sever reside in the Internet or DMZ region smoothly. Besides, Organization_1 communicates with Organization_2 with a VPN tunnel established by the two DFL-900 VPN/Firewall routers. The VPN tunnel secures communications between Organizations more safely.

We will focus on how to build up the topology using the DFL-900 as the following Figure 2-1. In order to achieve this purpose, we need to know all the administration procedure.

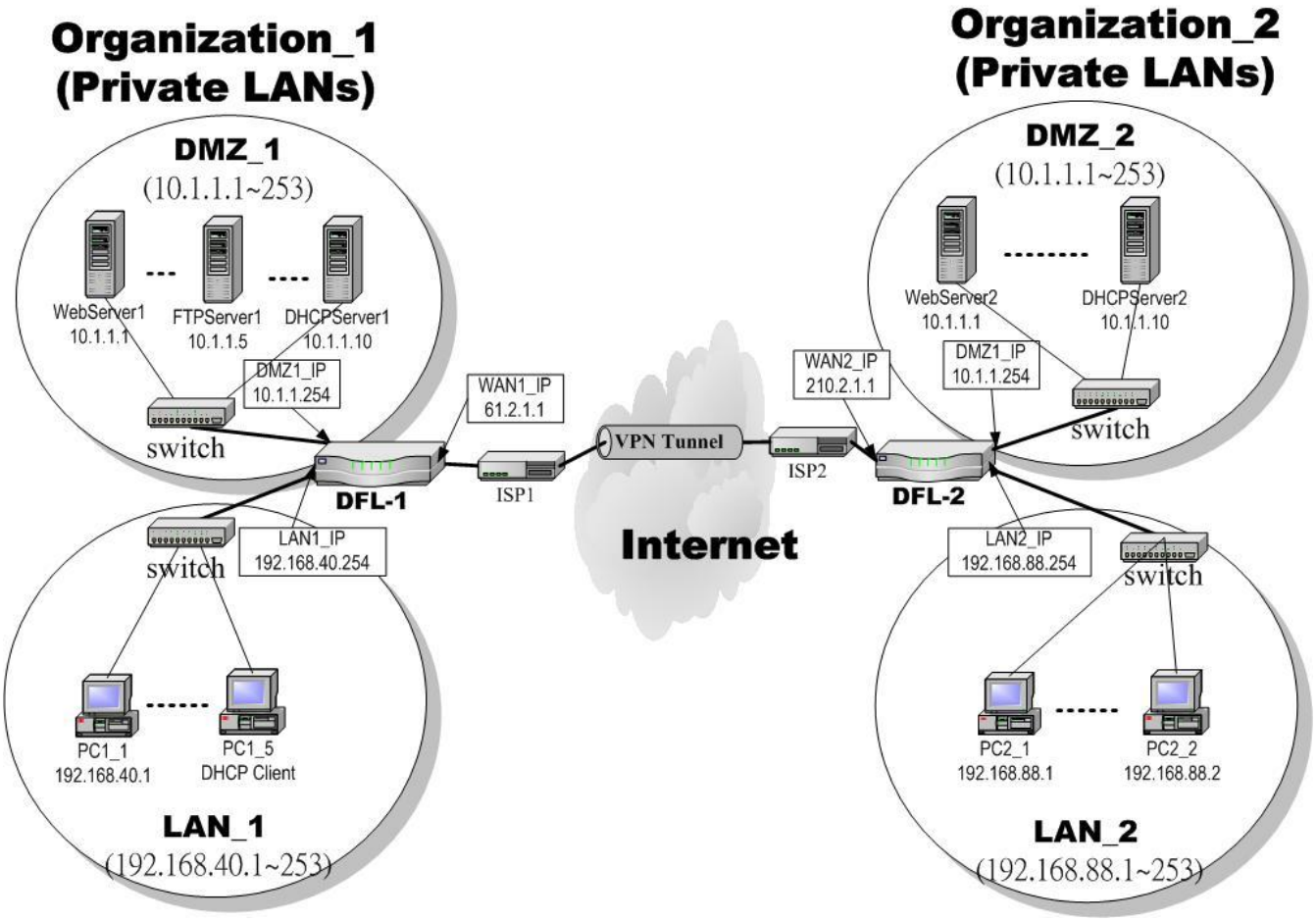


Figure 2-1 Typical topology for deploying DFL-900

Continually, we will introduce all the needed administration procedure in the following section.

1. Part II Basic Configuration
   How to configure the WAN/DMZ/LAN port settings..

2. Part III NAT、Routing & Firewall
   Introducing the NAT, Routing, Firewall features.

3. Part IV Virtual Private Network
   If you need to build a secure channel with your branch office, or wish to access the inside company resource as usual while outside your company, the Virtual Private Network (VPN) function can satisfy you.

4. Part V Content Filters
   If you hope to restrict the web contents, mail attachments, downloaded ftp file from intranet region, try this feature to fit your requirement.

5. Part VI Intrusion Detection System
   Use the Intrusion Detection System (IDS) to detect all the potential DoS attacks, worms, hackers from Internet.

6. Part VII Bandwidth Management
   If you wish to make your inbound/outbound bandwidth utilized more efficiently, you may use the Bandwidth Management feature to manage your bandwidth.

7. Part VIII System Maintenance
   In this part, we provide some useful skills to help you to justify DFL-900 more securely and steadily.

2.2 Changing the LAN1 IP Address

The default settings of DFL-900 are listing in Table 1-1. However, the original LAN1 setting is 192.168.1.254/255.255.255.0 instead of 192.168.40.254/255.255.255.0 as in Figure 2-1. We will change the LAN1 IP of the DFL-900 to 192.168.40.254.

We provide two normal ways to configure the LAN1 IP address. One is to configure the LAN1 IP from LAN1 port. The other way is to configure the LAN1 IP through console.

2.2.1 From LAN1 to configure DFL-900 LAN1 network settings

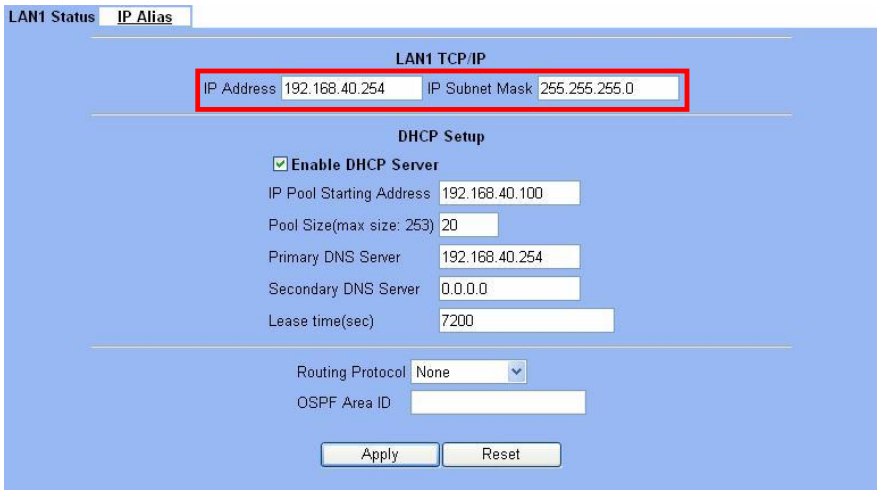
Step 1. Connect to the DFL-900 Using a network line to connect DFL-900 with LAN1 port. The PC which connected to DFL-900 must be assigned 192.168.1.X address (LAN1 default IP address is 192.168.1.254/24). Type https://192.168.1.254 or http://192.168.1.254:8080 to configure the DFL-900 in the web browser.	**Use an IE at 192.168.1.1 to connect to** https://192.168.1.254

Step 2. Setup LAN1 IP information

Enter the `IP Address` and `IP Subnet Mask` with `192.168.40.254 / 255.255.255.0` and click `Apply`.

Warning: After you apply the changed settings, the network will be disconnected instantly since the network IP address you are logining is changed.

BASIC SETUP > LAN Settings > LAN1 Status



2.2.2 From CLI (command line interface) to configure DFL-900 LAN1 network settings

Step 1. Use Console port to configure DFL-900

Use the supplied console line to connect the PC to the Diagnostic RS-232 socket of the DFL-900. Start a new connection using the HyperTerminal with parameters: `No Parity`, `8 Data bits`, `1 stop bit`, and `baud rate 9600`. Enter `admin` for `user name` and `admin` for `password` to login. After logging into DFL-900, enter the commands "`en`" to enter the privileged mode. Enter the command "`ip ifconfig INTF1 192.168.40.254 255.255.255.0`" to change the IP of the LAN1 interface.

```
DFL-900> en
DFL-900# ip ifconfig INTF1 192.168.40.254 255.255.255.0

DFL-900# ip ifconfig INTF1

  ==== ========= ================ ================ ====== ===================
  Port Interface IP Address       Netmask          Status Type
  ---- --------- ---------------- ---------------- ------ -------------------
    2     LAN1   192.168.40.254   255.255.255.0      UP
  ==== ========= ================ ================ ====== ===================

DFL-900# _
```

2.3 The design principle

2.3.1 Web GUI design principle

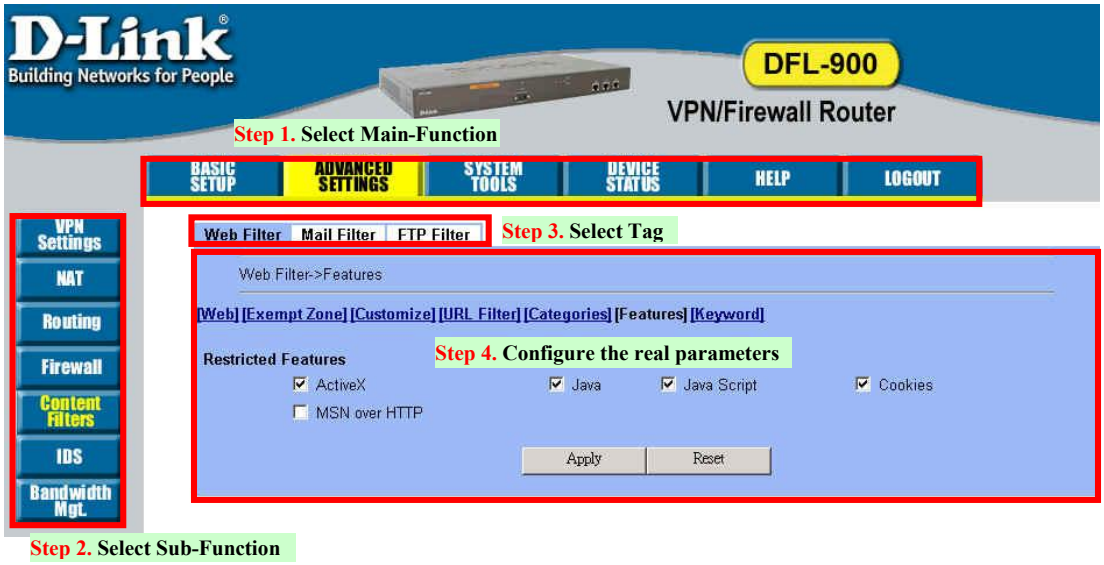


Figure 2-2 You can select the functional area by the sequence in Web GUI

If we want to configure DFL-900, we can follow the sequence as the Figure 2-2 illustrated.

Step1. Select Main-function

Step2. Select Sub-function

Step3. Select Tag

Step4. Configure the real parameters

2.3.2 Rule principle

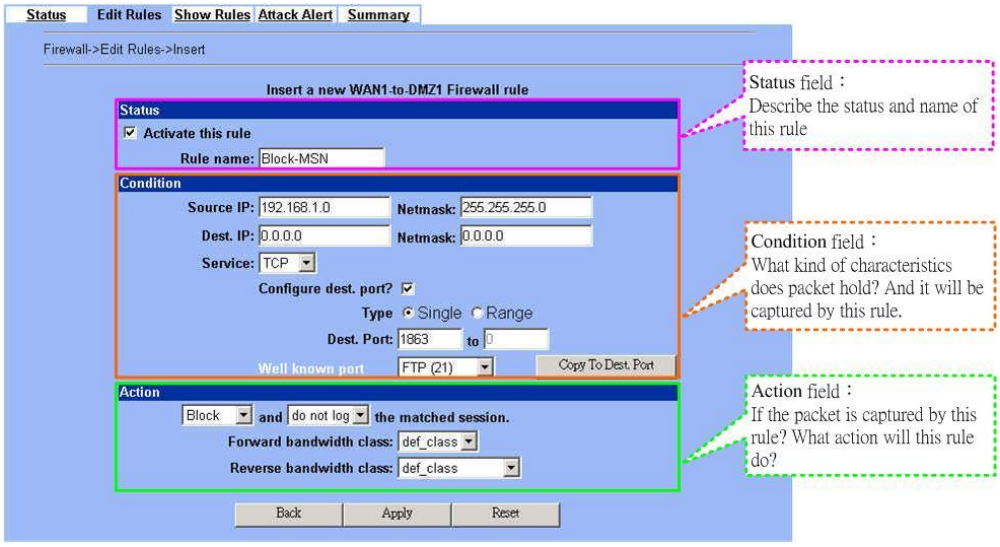


Figure 2-3 The rule configuration is divided into three parts

You may find many rules configuration in the DFL-900. They are distributed in the respective feature. These rules include

1. NAT rule
2. Virtual Server rule
3. Firewall rule
4. Policy route rule
5. Bandwidth management rule

The behavior of each rule is different, and so are their configuration parameters. But the designed principle of each rule is the same. The configuration is divided into three parts as Figure 2-3 illustrated. You just need to enter the necessary information onto each part according to your requirement. As for the definitions of the three-part configuration, please refer to the following description.

1. `Status`: Describe the status and name of this rule.

2. `Condition`: What kind of characteristics does packet hold? And it will be captured by this rule.

3. `Action`: If the packet is captured by this rule? What action will this rule do?

As the Figure 2-4 illustrated, the page of the rule edition is also divided into three parts. Their definitions are also the same as we have discussed in Figure 2-3.

Additionly, please note that there is a button named "Move Before" in the Figure 2-4. If you are not satisfied with the current rule sequence, you can adjust the rule sequence by using the "Move Before" button.

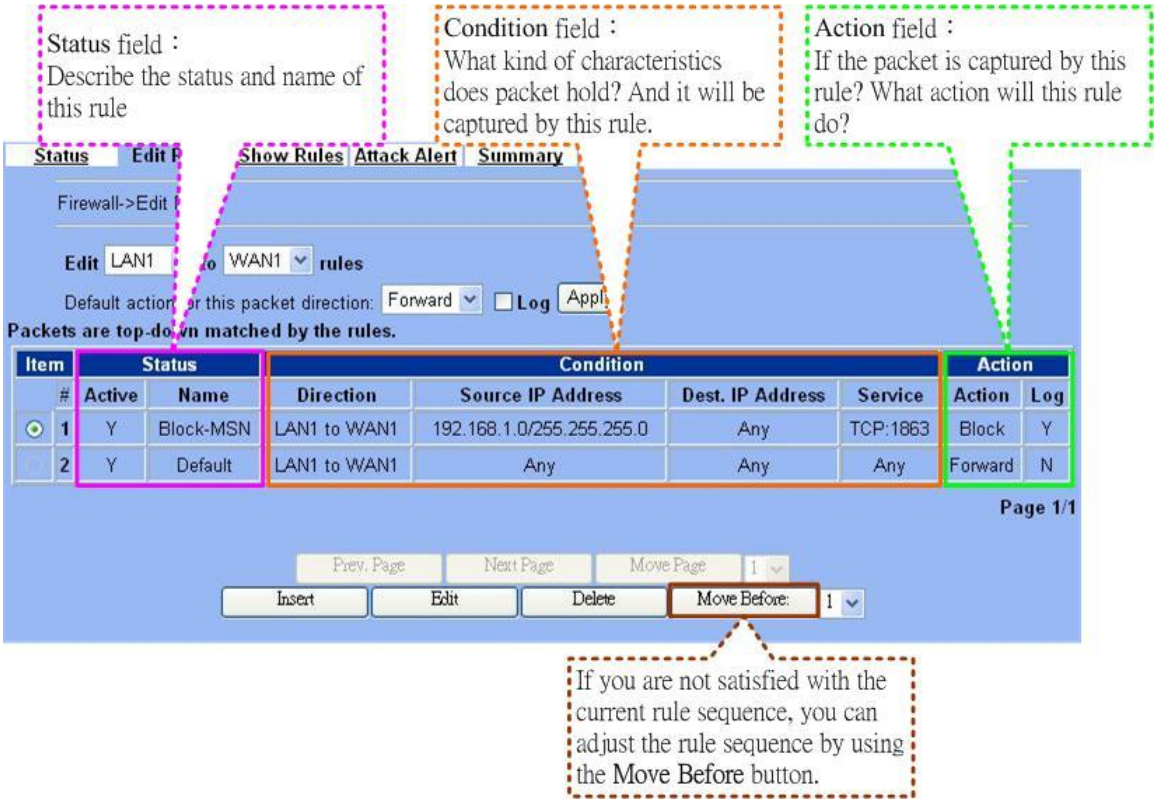


Figure 2-4 The rules in the page of the rule edition are also divided into three parts.

Part II

Basic Configuration

Chapter 3
Basic Setup

In this chapter, we will introduce how to setup network settings for each port separately

3.1 Demand

1. For the external network, suppose your company uses DSL to connect Internet via fixed-IP. By this way, you should setup WAN port of the DFL-900 in advance.
2. There are some adjustment within your company, so the original network stucture has been changed. Now, you should modify the configuration between the internal network (DMZ, LAN).
3. Your company needs more network bandwidth if it is insufficent for your company to connect to the external network. Suppose there are many public IPs in your commpany. You would like to specify an unique public IP to a local server.

3.2 Objectives

1. Configure the network settings of the DFL-900 WAN1 port.
2. Configure the network settings of the DFL-900 DMZ1 and LAN1 ports.
3. We hope to assign another IP address to the same WAN port we have configured an existed IP address before.

3.3 Methods

1. Select the Fixed IP Address method in the DFL-900 Basic Setup/WAN settings/WAN1 IP, and then configure the related account and password in order to connet to the internet.
2. Configure the related network settings in the pages of the DFL-900 Basic Setup / DMZ settings / DMZ1 Status、Basic Setup / LAN settings / LAN1 Status.
3. Configure the IP alias in WAN1 port.

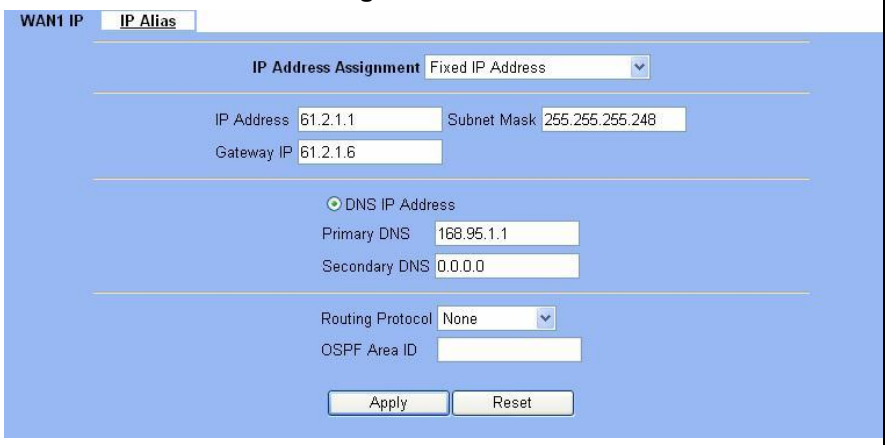
3.4 Steps

3.4.1 Setup WAN1 IP

Step 1. Setup WAN1 port

Here we select `Fixed IP Address` method in WAN1 port. Fill in the `IP Address`, `Subnet Mask`, `Gateway IP`. And then enter the other `DNS IP Address`, `Routing Protocol` fields. Click `Apply` to finish this setting.

BASIC SETUP > WAN Settings > WAN1 IP > Fixed IP Address



IP Address Assignment	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Get IP Automatically (DHCP)	Get DNS Automatically / DNS IP Address	Get DNS Automatically → Get DNS related information from DHCP Server DNS IP Address → manually specify these Primary and Secondary DNS Server information	Get DNS Automatically / DNS IP Address	Get DNS Automatically
	Routing Protocol	Determine to enable the dynamic routing protocol, to receive RIP message, to send out the RIP message if the RIP message is received or not.	None, RIPv1/In, RIPv1/In+Out, RIPv2/In, RIPv2/In+Out, OSPF	None
	OSPF Area ID	Specify OSPF area ID number	IPv4 format or digit string (Max 9 bits)	
Fixed IP Address	IP Address	Specified IP address	IPv4 format	61.2.1.1
	Subnet Mask	Specified subnet mask	IPv4 format	255.255.255.248
	Gateway IP	Default gateway IP address	IPv4 format	61.2.1.6
	DNS IP Address: Primary DNS Secondary DNS	Specified Primary and Secondary DNS Server address	IPv4 format	Primary DNS: 168.95.1.1 Secondary DNS: 0.0.0.0
	Routing Protocol	Determine to enable the dynamic routing protocol, to receive RIP message, to send out the RIP message if the RIP message is received or not.	None, RIPv1/In, RIPv1/In+Out, RIPv2/In, RIPv2/In+Out, OSPF	None
	OSPF Area ID	Specify OSPF area ID number	IPv4 format or digit string (Max 9 bits)	
PPP over Ethernet	Service Name	ISP vendor (Optional)	text string	So-Net
	User Name	The user name of PPPoE account	text string	Hey
	Password	The password of PPPoE account	text string	G54688
	Get DNS Automatically / DNS IP Address	Get DNS Automatically → Get DNS related information from PPPoE ISP DNS IP Address → manually specify these Primary and Secondary DNS Server information	Get DNS Automatically / DNS IP Address	Get DNS Automatically
	Disconnect button	Through click Disconnect button to disconnect PPPoE link	Disconnect	Click Disconnect

Table 3-1 Detailed information of setup WAN port configuration

Step 2. Bandwidth Management is not supported by PPPoE

Notice, if you select `PPPoE` type as `IP Address Assignment`. You may probably see the message as the right dialog box. That is because of you have already enabled `bandwidth management` (ADVANCED SETTINGS>Bandwidth Mgt>Enable Bandwidth Management) and then select `PPPoE` type as your internet connection. It will show you a message indicated as right column to tell you that Bandwidth management will not support PPPoE in this version. If you still like to use bandwidth management, please try to use another method, such as `DHCP` or `Fixed IP`, to connect Internet.

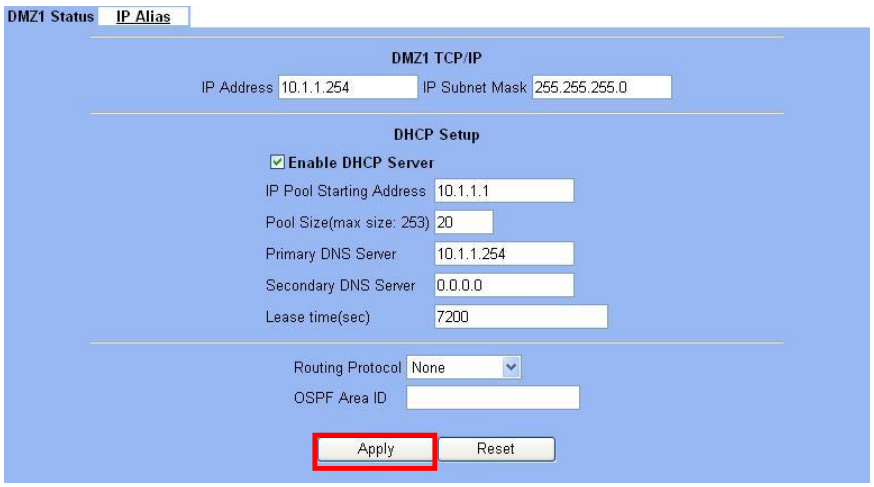
BASIC SETUP > WAN Settings > WAN1 IP > PPPoE

3.4.2 Setup DMZ1, LAN1 Status

Step 1. Setup DMZ port

Here we are going to configure the DMZ1 settings. Setup `IP Address` and `IP Subnet Mask`, and determine if you would like to `enable the DHCP Server`. And then select Routing Protocol. Click `Apply` to finish this setting.

BASIC SETUP > DMZ Settings > DMZ1 Status



FIELD	DESCRIPTION	Range / Format	EXAMPLE
IP Address	DMZ port IP address	IPv4 format	10.1.1.254
IP Subnet Mask	DMZ port IP subnet mask	netmask format	255.255.255.0
Enable DHCP Server	Enable DMZ port of the DHCP Sever or not	Enable/Disable	Enabled
IP Pool Starting Address	Specify the starting address of the DHCP IP address.	IPv4 format in the DMZ address range	10.1.1.1
Pool Size(max size: 253)	Specify the numbers of the DHCP IP address.	1 ~253	20
Primary DNS Server	Specify the Primary DNS Server IP address of the DHCP information.	IPv4 format	10.1.1.254
Secondary DNS Server	Specify the Secondary DNS Server IP address of the DHCP information.	IPv4 format	0.0.0.0

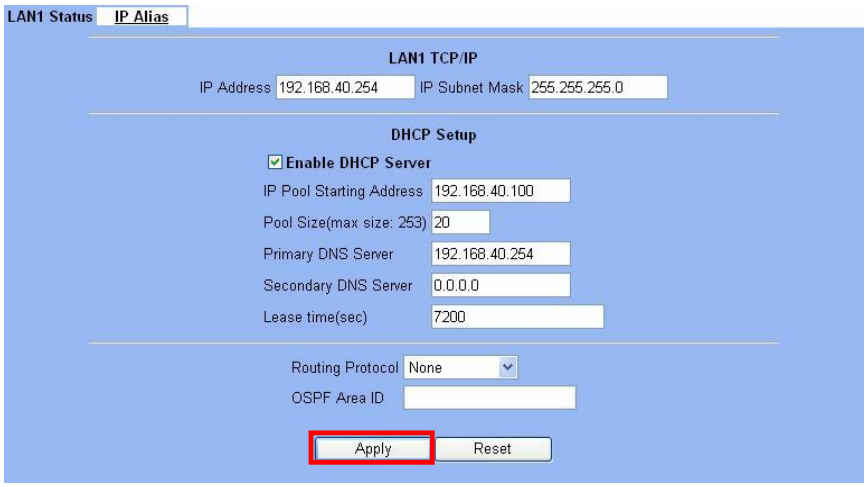
Lease time(sec)	Specify DHCP information lease time	greater than 0	7200
Routing Protocol	Determine to enable the dynamic routing protocol (RIP), to receive RIP message, to send out RIP message if the message is received or not.	None / RIPv1In / RIPv1In+out / RIPv2In / RIPv2In+out / OSPF	None
OSPF Area ID	Specify OSPF area ID number	IPv4 format or digit string (Max 9 bits)	N/A

Table 3-2 Configure DMZ network settings

Step 2. Setup LAN port

Here we are going to configure the LAN1 settings. Setup IP Address and IP Subnet Mask, and determine if you would like to enable the DHCP Server. And then select Routing Protocol. Click Apply to finish this setting.

BASIC SETUP > LAN Settings > LAN1 Status



FIELD	DESCRIPTION	Range / Format	EXAMPLE
IP Address	LAN1 port IP address	IPv4 format	192.168.40.254
IP Subnet Mask	LAN1 port IP subnet mask	netmask format	255.255.255.0
Enable DHCP Server	Enable LAN1 port of the DHCP Sever or not	Enable/Disable	Enabled
IP Pool Starting Address	Specify the starting address of the DHCP IP address.	IPv4 format in the LAN1 address range	192.168.40.100
Pool Size(max size: 253)	Specify the numbers of the DHCP IP address.	1 ~253	20
Primary DNS Server	Specify the Primary DNS Server IP address of the DHCP information.	IPv4 format	192.168.40.254
Secondary DNS Server	Specify the Secondary DNS Server IP address of the DHCP information.	IPv4 format	0.0.0.0
Lease time(sec)	Specify DHCP information lease time	greater than 0	7200
Routing Protocol	Determine to enable the dynamic routing protocol (RIP), to receive RIP message, to send out RIP message if the message is received or not.	None / RIPv1In / RIPv1In+out / RIPv2In / RIPv2In+out / OSPF	None

OSPF Area ID	Specify OSPF area ID number	IPv4 format or digit string (Max 9 bits)	N/A

Table 3-3 Configure LAN network settings

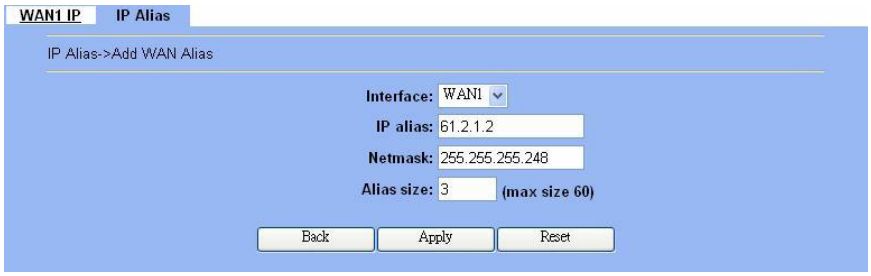
3.4.3 Setup WAN1 IP alias

Step 1. Add WAN1 IP alias

Suppose you apply 8 IP addresses from ISP. The range of the ISP-given IP address is from 61.2.1.0 to 61.2.1.7. Now you would like to add three WAN1 IP aliases. Select WAN1 in the Interface field. Enter the IP alias and Netmask with 61.2.1.2/255.255.255.248. Key in 3 into the Alias size field. And then click Apply.

Notice : It's the same way to set IP alias in DMZ or LAN.

BASIC SETUP > WAN Settings > IP Alias > Add



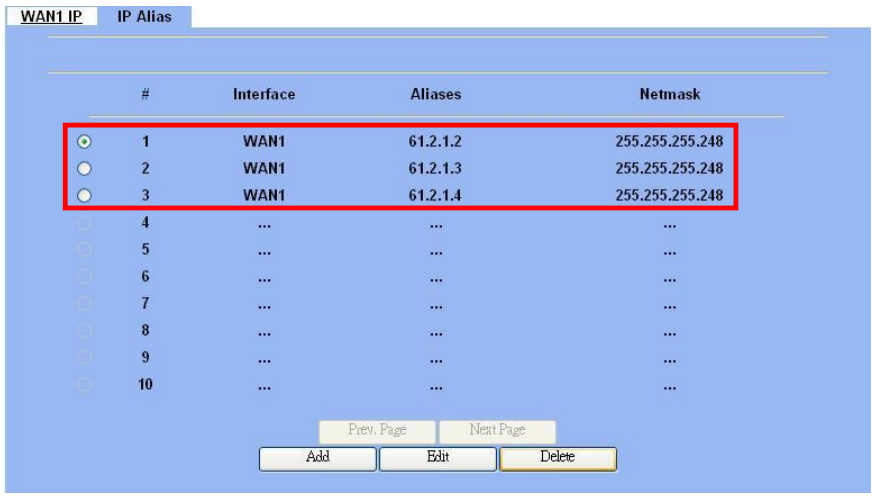
FIELD	DESCRIPTION	Range / Format	EXAMPLE
Interface	The interface which we set for the IP alias	WAN interfaces	WAN1
IP alias	The alias IP address	IPv4 format	61.2.1.2
Netmask	The netmask of the IP alias	netmask format	255.255.255.248
Alias size	The size of IP alias address	Max 60	3

Table 3-4 Add a IP alias record

Step 2. Edit, Delete IP alias record

You can easily add, edit, or delete IP alias records by the Add, Edit, or Delete button.

BASIC SETUP > WAN Settings > IP Alias



FIELD	DESCRIPTION	EXAMPLE
Prev. Page	If there are more than one IP alias pages, you can press Prev. Page to back to the previous page.	N/A
Add	Insert a new IP alias record.	N/A
Edit	Edit the properties of the existent record.	N/A
Delete	Delete the indicated record.	N/A
Next Page	If there are more than one action records, you can press Next Page to go to the next page.	N/A

Table 3-5 Show the entered IP alias records

Maximize IP alias records of DFL-900	WAN port	60 records
	DMZ port	10 records
	LAN port	10 records

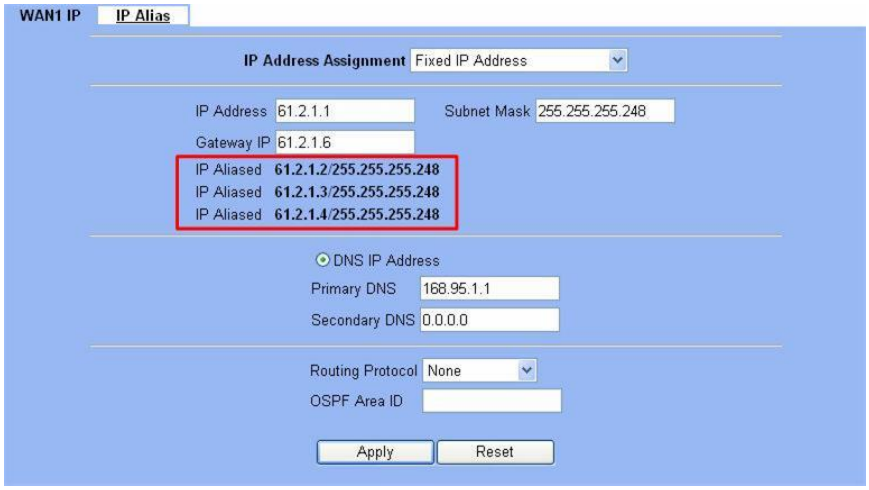
Table 3-6 IP alias limitation of each port

Step 3. See the IP alias setting in the "WAN1 IP" page

After entering the IP alias address, it will show the result in the "WAN1 IP" page.

Warning: If you select `Fixed IP Address` as your WAN link type and set any IP alias, the previous set IP aliases will disappear when you try to exchange the WAN link type to other type such as `DHCP` or `PPPoE`.

BASIC SETUP > WAN Settings > WAN1 IP > Fixed IP Address



Chapter 4
System Tools

This chapter introduces System Management and explains how to implement it.

4.1 Demand

1. Basic configurations for domain name, password, system time, timeout and services.
2. DDNS: Suppose the DFL-900's WAN uses dynamic IP but needs a fixed host name. When the IP is changed, it is necessary to have the DNS record updated accordingly. To use this service, one has to register the account, password, and the wanted host name with the service provider.
3. DNS Proxy: Shorten the time of DNS lookup performed by applications.
4. DHCP Relay: It is to solve the problem that when the DHCP client is not in the same domain with the DHCP server, the DHCP broadcast will not be received by the server. If the client is in the LAN (192.168.40.X) while the server is located in the DMZ (10.1.1.4), the server will not receive any broadcast packet from the client.
5. The System Administrator would like to monitor the device from remote side efficiently.

4.2 Objectives

1. Configure the general properties, such as domain name, password, system time, and connection timeout correctly. Besides, we can configure the prefered service name as the service name/numeric mapping list.
2. DDNS: By using the DDNS (Dynamic DNS), the DFL-900 will send the request for modification of the corresponding DNS record to the DDNS server after the IP is changed.
3. DNS Proxy: Reduce the number of DNS requests and the time for DNS lookup.
4. DHCP Relay: Enable the DHCP client to contact with the DHCP server located in different domain and get the required IP.
5. Through the SNMP manager, we can easily monitor the device status.

4.3 Methods

1. Configure the domain name, password, system time, connection timeout and service name.
2. DDNS: Configure the DFL-900 so that whenever the IP of the DFL-900 is changed, it will send requests to the DDNS server to refresh the DNS record. As the following Figure 4-1 demonstrated, the original DFL-1 has registered WAN1 IP address "61.2.1.1" on the DDNS server (www.dyndns.org). It's domain name address is "me.dyndns.org". If the WAN1 IP address is reassigned by the ISP, DFL-1 will update the registered IP address "61.2.1.1" as the assigned one. This is the base mechanism of the DDNS.

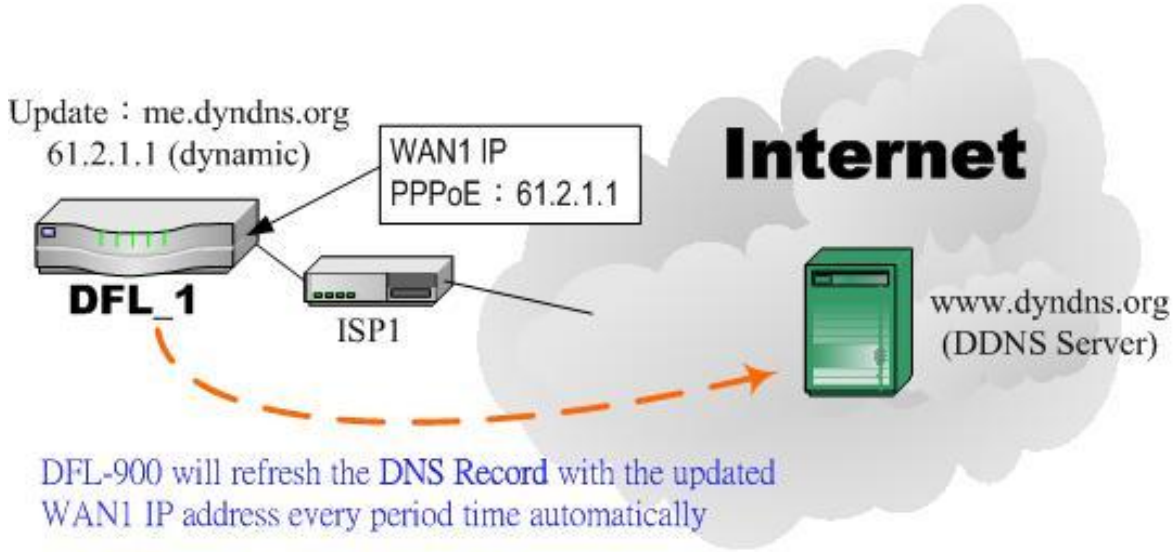


Figure 4-1 DDNS mechanism chart

3. DNS Proxy: After activating the DNS proxy mode, the client can set its DNS server to the DFL-900 (that is, send the DNS requests to the DFL-900). The DFL-900 will then make the enquiry to the DNS server and return the result to the client. Besides, the caching mechanism performed by the DNS proxy can also help reduce possible duplicate DNS lookups. As the following Figure 4-2 described. DFL-1 redirects the DNS request from PC1_1 to the real DNS server (140.113.1.1).

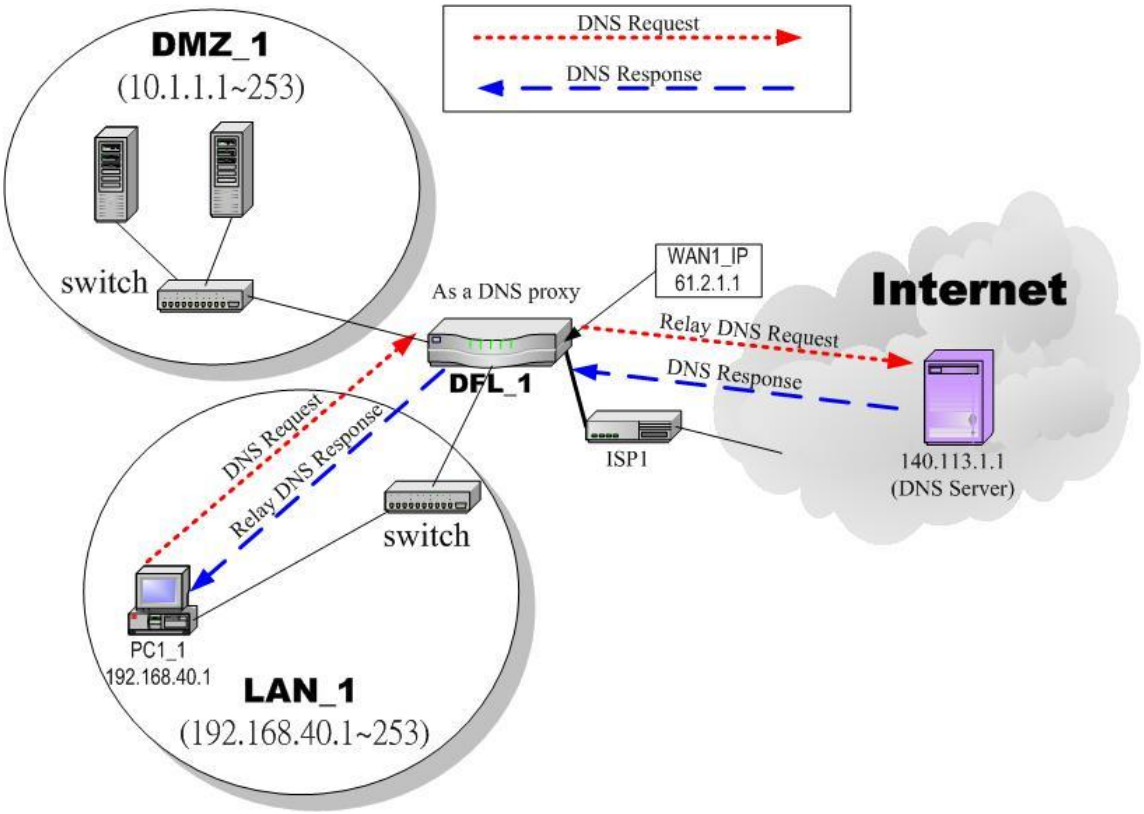


Figure 4-2 DNS Proxy mechanism chart

4. DHCP Relay: Activate the DHCP relay mode of DFL-900 so that the DFL-900 will become the relay agent and relay the DHCP broadcast to the configured DHCP server. As the following Figure 4-3 described, DFL-1 redirects the DHCP request from the preconfigured port (LAN1) to the real DHCP server (10.1.1.4). Besides, in this diagram, we can find that the PC of DMZ region communicated with the DHCP server directly.

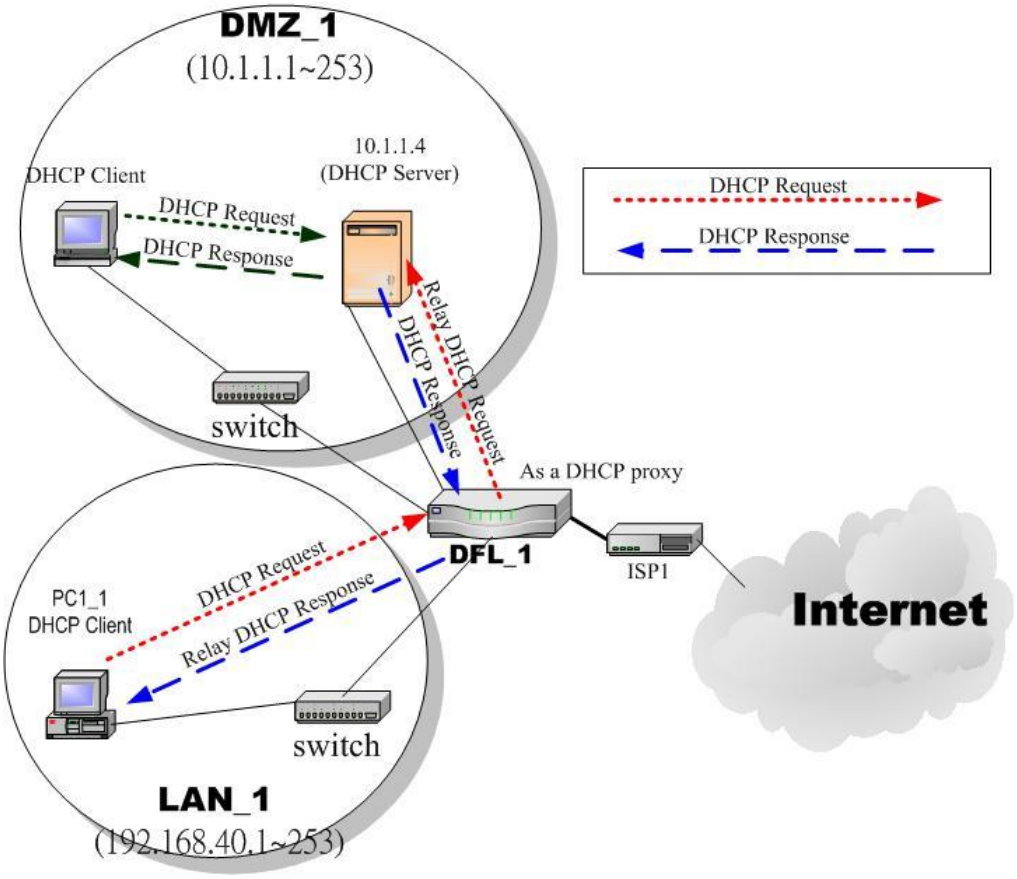


Figure 4-3 DHCP Relay mechanism chart

5. As the following Figure 4-4 demonstrated, there is an embedded snmp agent in the DFL-900. So you can use SNMP manager to monitor the DFL-900 system status, network status ,etc. from either LAN or internet.

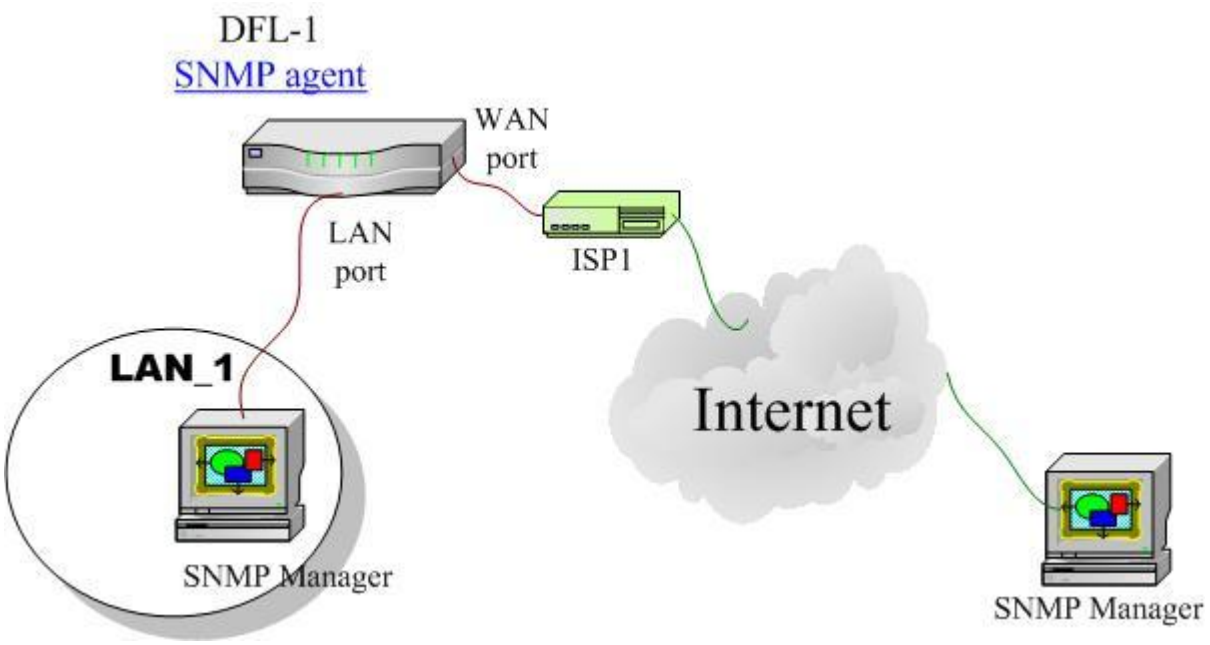


Figure 4-4 It is efficient to use SNMP Manager to monitor DFL-900 device

4.4 Steps

4.4.1 General settings

Step 1. General Setup

Enter the `Host Name` as `DFL-1`, `Domain Name` as the domain name of your company Click `Apply`.

SYSTEM TOOLS > Admin Settings > General

FIELD	DESCRIPTION	EXAMPLE
Host Name	The host name of the DFL-900 device	DFL-1
Domain Name	Fill in the domain name of company	dlink.com

Table 4-1 System Tools - General Setup menu

Step 2. Change Password

Enter the current password in the `Old Password` field. Enter the new password in the `New Password` and retype it in the `Confirm Password` field. Click `Apply`.

SYSTEM TOOLS > Admin Settings > Password

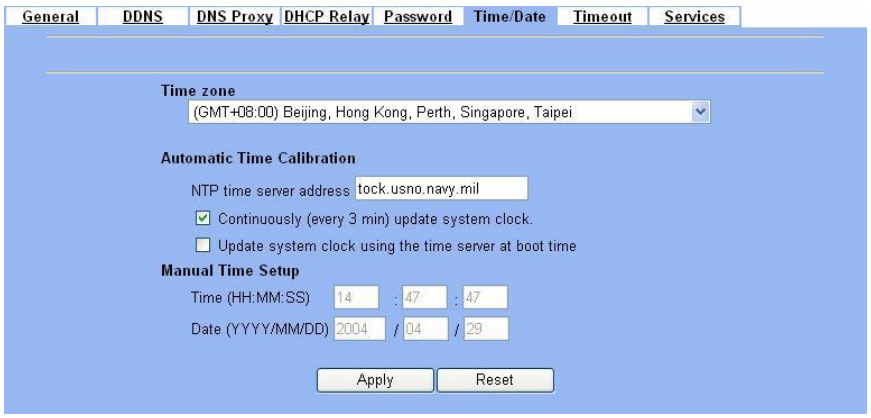
FIELD	DESCRIPTION	EXAMPLE
Old Password	The original password of administrator	admin
New Password	The new selected password	12345
Confirm Password	Double confirm the new selected password	12345

Table 4-2 Enter new password

Step 3. Setup Time/Date

Select the `Time Zone` where you are located. Enter the nearest NTP time server in the `NTP time server address`. Note that your DNS must be set if the entered address requires domain name lookup. You can also enter an IP address instead. Check the `Continuously (every 3 min) update system clock` and click `Apply`. The DFL-900 will immediately update the system time and will periodically update it. Check the `Update system clock using the time server at boot time` and click `Apply` if you want to update the clock at each boot. If you want to manually change the system time, uncheck the `Continuously (every 3 min) update system clock` and proceed by entering the target date.

SYSTEM TOOLS > Admin Settings > Time/Date



FIELD	DESCRIPTION	EXAMPLE
Time zone	the time zone of your area	N/A
NTP time server address	Use NTP time server to auto update date/time value	tock.usno.navy.mil
Continuously (every 3 min) update system clock	System will update system date/time value every 3 minutes to NTP time sever.	Enabled
Update system clock using the time server at boot time	System will update system date/time value to the NTP time server at boot time.	disabled
Manual Time Setup	Manual setting Time & Date value.	N/A

Table 4-3 System Tools – Time Data menu

Step 4. Setup Timeout

Select the target timeout (e.g. `10 min`) from the `System Auto Timeout Lifetime`. Click the `Apply` button. Now the browser will not timeout for the following 10 minutes after your last touching of it.

SYSTEM TOOLS > Admin Settings > Timeout

FIELD	DESCRIPTION	EXAMPLE
System Auto Timeout Lifetime	When system is idle for a specified time, system will force the people who logins into the system will logout automatically.	10

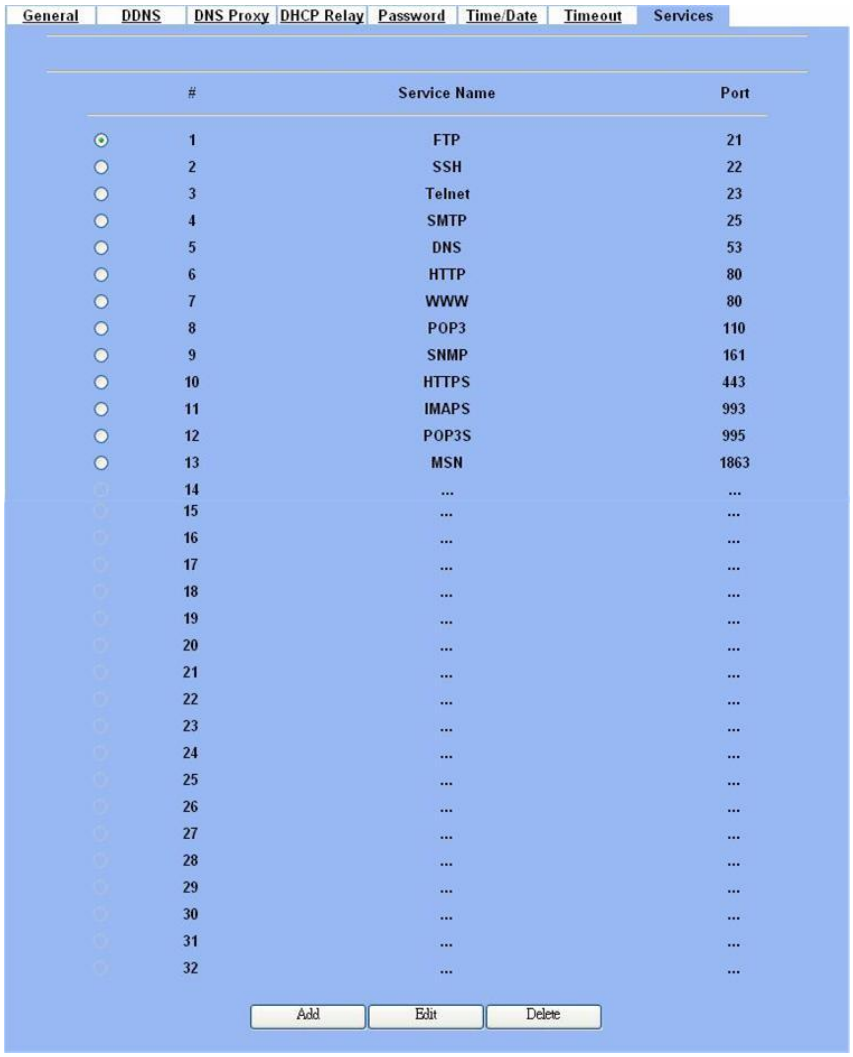
Table 4-4 System Tools – Timeout menu

Step 5. Configure Services

We can configure the service name and numeric port number as the same group, so you can simply use the domain name for the configuration in the DFL-900. If you want to add/edit/delete the service record, just click the below button to add/edit/delete it.

Remember that when you add a service, it will be sorted by the port number. And also the service name is top-down matched by the port number when the logs record the service in the firewall logs page.

SYSTEM TOOLS > Admin Settings > Services



#	Service Name	Port
1	FTP	21
2	SSH	22
3	Telnet	23
4	SMTP	25
5	DNS	53
6	HTTP	80
7	WWW	80
8	POP3	110
9	SNMP	161
10	HTTPS	443
11	IMAPS	993
12	POP3S	995
13	MSN	1863
14	...	...
15	...	...
16	...	...
17	...	...
18	...	...
19	...	...
20	...	...
21	...	...
22	...	...
23	...	...
24	...	...
25	...	...
26	...	...
27	...	...
28	...	...
29	...	...
30	...	...
31	...	...
32	...	...

BUTTON	DESCRIPTION
Add	Add a service name record
Edit	Edit an existing service name record
Delete	Delete an existing service name record

Table 4-5 Setup the service name record

4.4.2 DDNS setting

Step 1. Setup DDNS

If the IP address of DFL-900 WAN port is dynamic allocated, you may want to have the Dynamic DNS mechanism to make your partner always use the same domain name (like xxx.com) to connect to you. Select a WAN `interface` to update the DDNS record. Here we supply three DDNS `Service Providers`. Fill in the `Host Name`, `Username`, `Password` supplied by the DDNS web site. Please refer to the DDNS web site for the detailed information. Click `Apply` to activate the settings.

Before setting the DDNS information in this page. Make sure that you have registered an account in the indicated Service Provider. Then you can enter the related information in the DDNS page.

Note: If you choose "`WWW.ORAY.NET`" as your DDNS service provider, a default port number `5050` will show in the `Port` field. It means that if you use this port to connect to WWW.ORAY.NET, it will be free charge.

SYSTEM TOOLS > Admin Settings > DDNS

FIELD	DESCRIPTION	EXAMPLE
Enable DDNS for WAN1	Enable DDNS feature of DFL-900	Enabled
Interface	Assign which public IP address of interface to the DDNS server.	WAN1
Service Provider	The domain address of DDNS server. In the DFL-900, we provide WWW.DYNDNS.ORG, WWW.DHS.ORG and WWW.ORAY.NET three websites for choice. If you choose WWW.ORAY.NET as DDNS service provider, it would register the source IP address which is connected to the DDNS server. It means that the WAN1 IP address must be public address.	WWW.ORAY.NET
Hostname	The registered Hostname in the DDNS server.	abc.vicp.net
Username	The registered username in the DDNS server.	john
Password	The registered password in the DDNS server.	123456
Port	The default port number to connect to WWW.ORAY.NET for free charge	5050

Table 4-6 System Tools – DDNS setting page

4.4.3 DNS Proxy setting

Step 1. Setup DNS Proxy

Check the `Enable DNS Proxy` and click the `Apply` to store the settings. From now on, your LAN/DMZ PCs can use DFL-900 as their DNS server, as long as the DNS server for DFL-900 has been set in its WAN settings.

SYSTEM TOOLS > Admin Settings > DNS Proxy

FIELD	DESCRIPTION	EXAMPLE
Enable DNS Proxy	When the host which resides at the LAN/DMZ region sends a DNS Request to the DNS server (DFL-900). DFL-900 will request for forwarding it to the assigned DNS server. When there is a response from assigned DNS server, then DFL-900 will forward it back to the host of the LAN/DMZ.	Enabled

Table 4-7 System Tools – DNS Proxy menu

4.4.4 DHCP Relay setting

Step 1. Setup DHCP Relay

Check the `Enable DHCP Relay`. Enter the IP address of your `DHCP server`. Here we enter the DHCP Server address 10.1.1.4. Check the `relay domain` of DFL-900 that needs to be relayed. Namely, check the one where the DHCP clients are located. And click the `Apply` button finally.

Notice, the DHCP Server can not be located with the subnet range of `Relay Domain`.

SYSTEM TOOLS > Admin Settings > DHCP Relay

FIELD	DESCRIPTION	EXAMPLE
Enable DHCP Relay	When the host of the LAN/DMZ in the DFL-900 internal network sends a DHCP request, DFL-900 will forward it automatically to the specified DHCP server (different subnet from the network segment of the DHCP client).	Enabled
DHCP Server	Current location of the DHCP server.	10.1.1.4
Relay Domain	The locations of the DHCP clients.	Enable LAN1

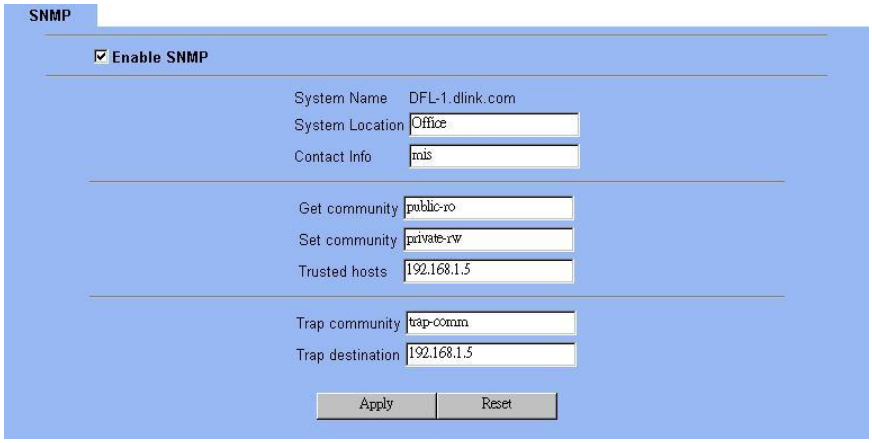
Table 4-8 System Tools – DHCP Relay menu

4.4.5 SNMP Control

Step 1. Setup SNMP Control

Through setting the related information in this page, we can use SNMP manager to monitor the system status, network status of DFL-900.

SYSTEM TOOLS > SNMP Control



FIELD	DESCRIPTION	EXAMPLE
Enable SNMP	Enable the SNMP function or not.	Enabled
System Name	The device name of DFL-900.	DFL-1.dlink.com
System Location	The settled location of DFL-900.	Office
Contact Info	The person who takes charge of the DFL-900.	mis
Get community	The community which can get the SNMP information. Here “community” is something like password.	public-ro
Set Community	The community which can get the SNMP information. Here “community” is something like password.	private-rw
Trusted hosts	The IP address which can get or set community from the DFL-900.	192.168.1.5
Trap community	The community which will send SNMP trap. Here “community” is something like password.	trap-comm
Trap destination	The IP address which will send SNMP trap from the DFL-900.	192.168.1.5

Chapter 5
Remote Management

This chapter introduces remote management and explains how to implement it.

5.1 Demands

Administrators may want to manage the DFL-900 remotely from any PC in LAN_1 with HTTP at port 8080, and from WAN_PC with TELNET. In addition, the DFL-900 may be more secure if monitored by a trusted host (PC1_1). What is more, the DFL-900 should not respond to ping to hide itself. The remote management function in DFL-900 devices is implemented by hidden Firewall rules.

5.2 Methods

1. Only allow management by WAN_PC (140.2.5.1) at the WAN1 side.
2. Administrators can use browsers to connect to http://192.168.40.254:8080 for management.
3. Allow SNMP monitoring by PC1_1 (192.168.40.1) at the LAN1 side.
4. Do not respond to ICMP ECHO packets at the WAN1 side.

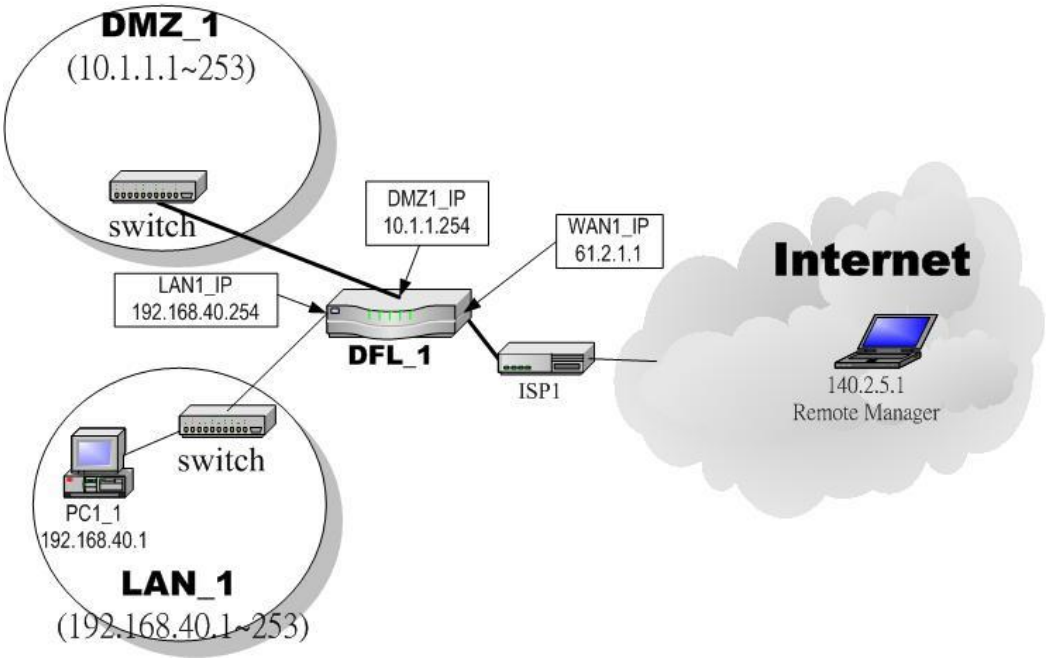


Figure 5-1 Some management methods of DFL-900

5.3 Steps

5.3.1 Telnet

Step 1. Setup Telnet Enter 23 instead of the default 2323 in the `Server Port` field. Check the `WAN1` checkbox. Click the `Selected` of `Secure Client IP Address`, and then enter the specified `IP address` (`140.2.5.1`) for accessing DFL-900. And click the `Apply`. Note that the `Secure Client IP Address` is the IP Address to be used to configure the DFL-900.	**SYSTEM TOOLS > Remote Mgt. > TELNET** 

5.3.2 WWW

Step 1. Setup WWW Check the `LAN1` checkbox, and enter the new `Server Port 8080` that will be accessed by the user's browser (http://192.168.40.254:8080). Here we click `All` for all no IP range limitation of clients. And click the `Apply` button.	**SYSTEM TOOLS > Remote Mgt. > WWW** 
Step 2. Warning message If you click the `Selected` of `Secure Client IP Address` and then enter the specified IP address, a warning message will appear to notice you that "`Warming! If you are connecting to this Firewall with HTTP, this action may disconnect your session. Please remember the settings and reconnect to the firewall again.`" after applying the settings.	

5.3.3 SNMP

Step 1. Setup SNMP Check the `LAN1` checkbox. In the `Secure Client Address` field. If you prefer indicated specified IP address. Just click the `Selected`, and enter the valid `IP address` for reading the SNMP MIBs at the DFL-900. Finally click the `Apply` button.	**SYSTEM TOOLS > Remote Mgt. > SNMP** 

5.3.4 ICMP

Step 1. Setup ICMP Uncheck the `WAN1` checkbox and make others checked. Then click the `Apply` button.	**SYSTEM TOOLS > Remote Mgt. > MISC** 

Part III

NAT、Routing & Firewall

Chapter 6
NAT

This chapter introduces NAT and explains how to implement it in DFL-900.

To facilitate the explanation on how DFL-900 implements NAT and how to use it, we zoom in the left part of Figure 1-7 into Figure 6-1.

6.1 Demands

1. The number of public IP address allocated to each Internet subscribers is often very limited compared to the number of PCs in the LAN1. Additionally, public-IP hosts are directly exposed to the Internet and have more chances to be cracked by intruders. As the Figure 6-1 illustrated, you hope all the pcs located at LAN1 and DMZ1 can connect internet through limited IP address (61.2.1.1).

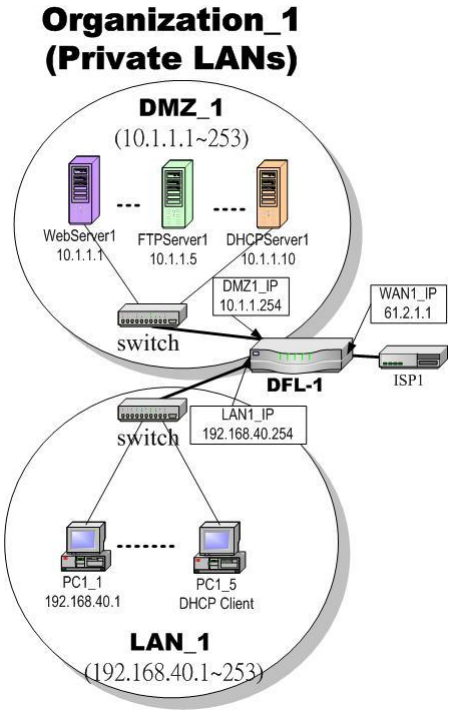


Figure 6-1 All the internal PCs can connect internet through limited WAN IP address by using NAT technology

2. Internet servers provided by your company may open many ports in default that may be dangerous if exposed to the public Internet. As the Figure 6-2 illustrated, we make the real servers hide behind the DFL-900. And all the internet clients can still access the service of servers.

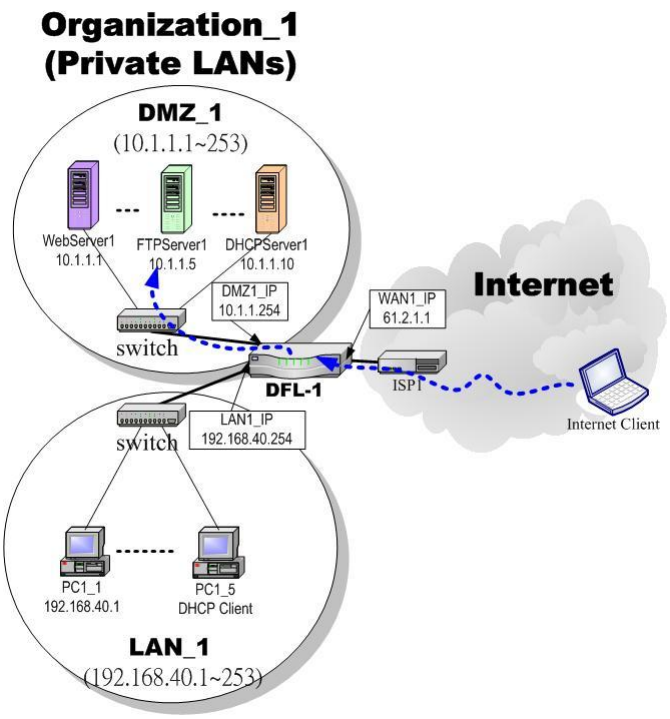


Figure 6-2 Internet clients can access the server behind the DFL-900

6.2 Objectives

1. Let PC1_1~PC1_5 connect to the Internet.
2. As the Figure 6-2 illustrated, the clients will connect to the DFL-900. Then DFL-900 will forward the packet to the real server. So FTPServer1 (10.1.1.5) will be accessed by other Internet users.

6.3 Methods

1. Assign private IP addresses to the PC1_1~PC1_5. Setup NAT at DFL-900 to map those assigned private hosts under LAN1 to the public IP address WAN_IP at the WAN1 side.
2. Assign a private IP address to the FTPServer1. Setup Virtual Server at DFL-900 to redirect “any connections towards some port of WAN1” to the port 21 at the FTPServer1.

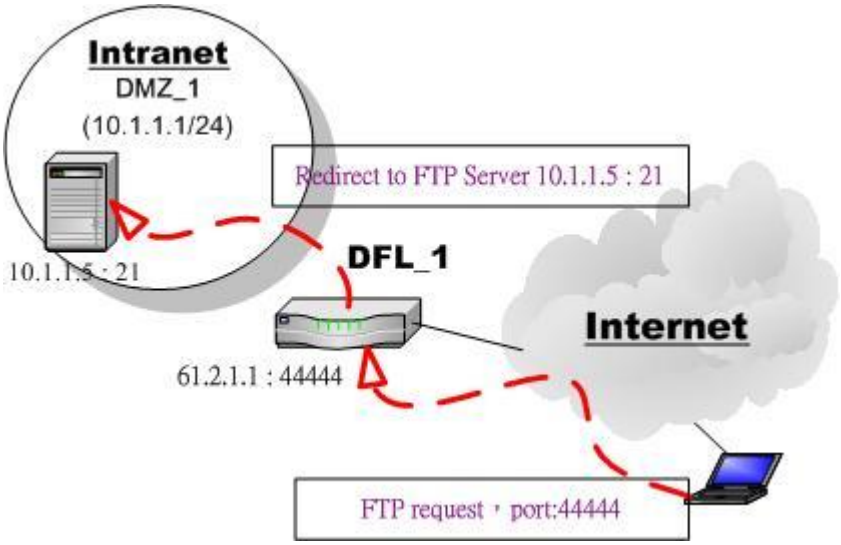
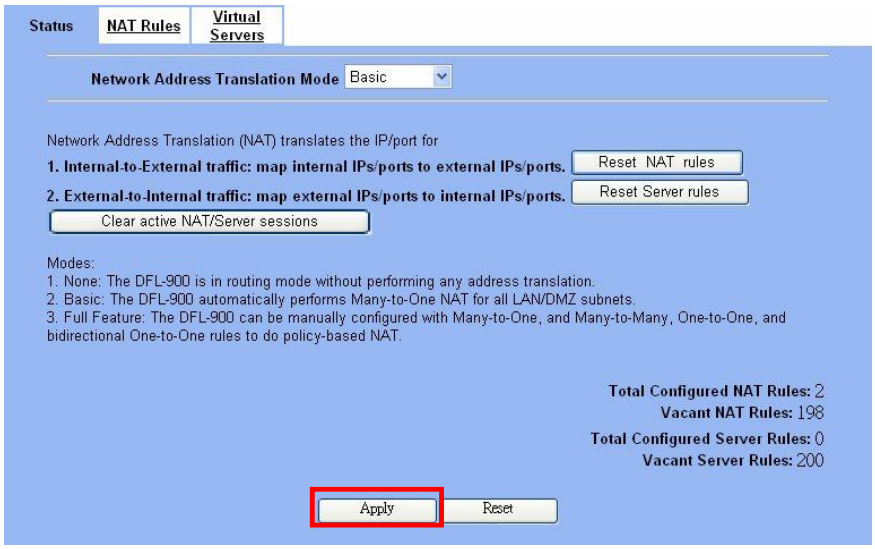


Figure 6-3 DFL-900 plays the role as Virtual Server

As the above Figure 6-3 illustrates, the server 10.1.1.5 provides FTP service. But it is located on the DMZ region behind DFL-900. And DFL-900 will act as a Virtual Server role which redirects the packets to the real server 10.1.1.5. And you can announce to the internet users that there exists a ftp server IP/port is 61.2.1.1/44444. So, all the internet users will just connect the 61.2.1.1/44444 to get ftp service.

6.4 Steps

6.4.1 Setup Many-to-one NAT rules

Step 1. Enable NAT	**ADVANCED SETTINGS > NAT > Status**
Select the Basic from the list of `Network Address Translation Mode`. Click `Apply`. Now the DFL-900 will automatically set the NAT rules for LAN/DMZ zones. Namely, all internal networks can establish connections to the outside world if the WAN settings are correct.	

FIELD	DESCRIPTION	Range / Format	EXAMPLE
Network Address Translation Mode	Determine what NAT type you are using in your network topology. Refer more information in the section 6.5.5.	None / Basic / Full Feature	Basic
BUTTON	DESCRIPTION		
Reset NAT Rules	Reset NAT rules to the default status		
Reset Server Rules	Clear all the Virtual Server rules.		
Clear active NAT/Server sessions	Clear all the active NAT/Virtual Server sessions.		
Apply	Apply the settings which have been configured.		
Reset	Clean the filled data and restore the original.		

Table 6-1 Determine Network Address Translation Mode

Step 2. Check NAT Rules

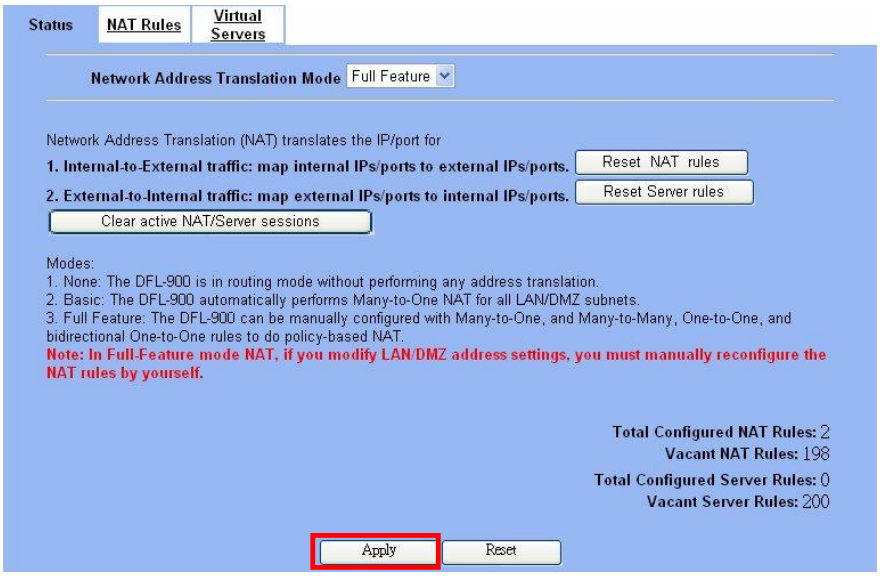
As described in the above, the DFL-900 has set the rules for the `LAN/DMZ` zones. They all belong to the `Many-to-One` (`M-1`) type that will map many private addresses to the automatically chosen public IP address. When the WAN interfaces change the IP, these rules do not require any manual modifications for the changed public IP addresses. The rules will reload the new settings automatically. Besides, you cannot insert/edit any rules under the Basic mode.

ADVANCED SETTINGS > NAT > NAT Rules

Step 3. Switch the NAT Mode

Select the `Full Feature` from the list of `Network Address Translation Mode`. Click `Apply`. After applying the setting, the page will highlight a warning saying that the rules are no more automatically maintained by the DFL-900. If you change the LAN/DMZ IP settings, you have to manually update related rules by yourself. Otherwise, hosts in your LAN/DMZ cannot establish connections to the hosts in the WAN side.

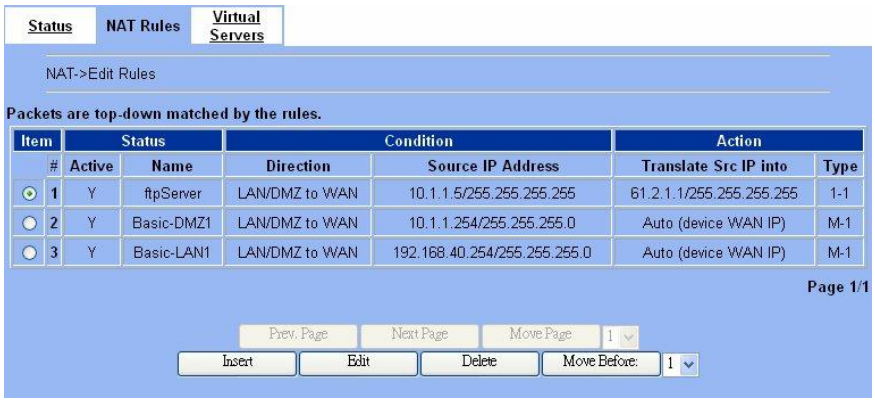
ADVANCED SETTINGS > NAT > Status



Step 4. Customize NAT Rules

In the full-feature mode, the rules can be further customized. Incoming packets from LAN/DMZ zones are top-down matched by the NAT rules. Namely, NAT implements first match. Select the rule item that you want to do with: `insert` a new rule before it; `delete` it; `move` it `before` the list-box chosen item.

ADVANCED SETTINGS > NAT > NAT Rules

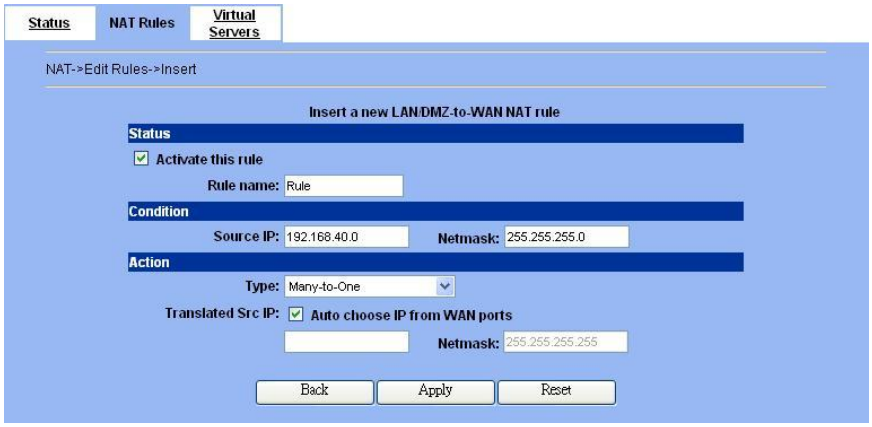


Step 5. Insert NAT Rule

Step 5.a — Insert an Many-to-One Rule

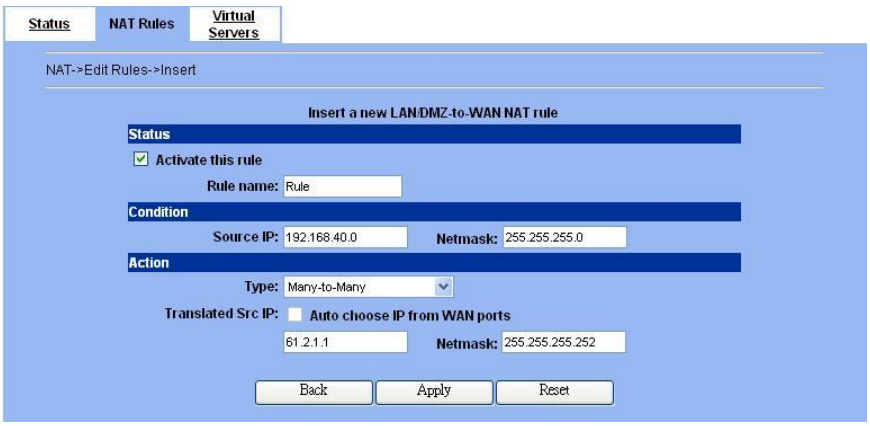
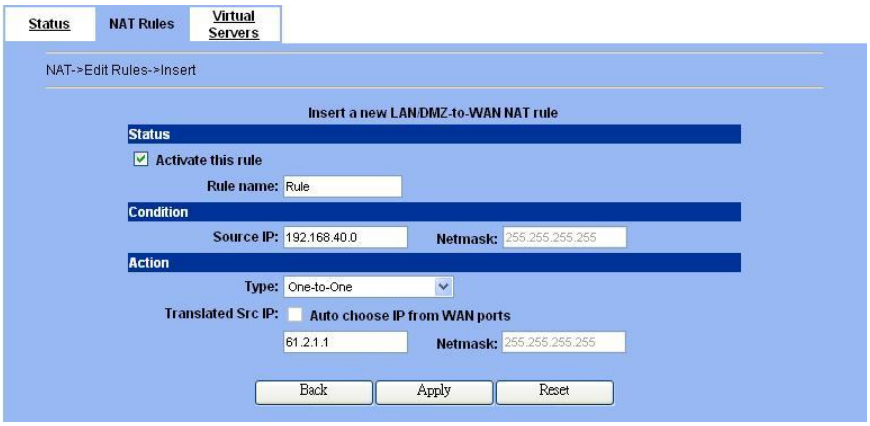
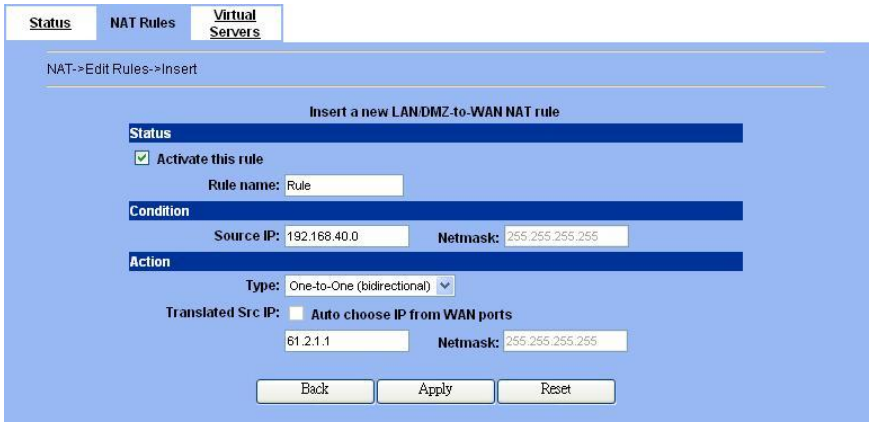
As described in the above, `Many-to-One` NAT is the default NAT rule type in the `Basic` mode. If you have other alias LAN/DMZ subnets, you can manually add a Many-to-One NAT rule for them. First select the `Type` as Many-to-One, check the `Activate this rule`, enter a `Rule name` for this rule, enter the private-IP subnet (an `IP address` with a `netmask`) to be translated, and enter the public `IP address` for being translated into. You can check the `Auto choose IP from WAN ports`. The DFL-900 will automatically determine which WAN IP is to be translated into.

ADVANCED SETTINGS > NAT > NAT Rules > Insert



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Status	Activate this rule	The NAT rule is enabled or not	Enabled / Disabled	Enabled
	Rule name	The NAT rule name	text string	Rule
Condition	Source IP / Netmask	Compared with the incoming packets, whether Source IP/Netmask is matched or not.	IPv4 format	192.168.40.0 / 255.255.255.0
Action	Type	Determine what NAT method you are using in the specified NAT rule. Refer more information in the section 6.5.	Many-to-One / Many-to-Many / One-to-One / One-to-One (bidirectional)	Many-to-One
	Translated Src IP (Auto choose IP from WAN ports)	Only work in Many-to-One type, the public IP address will be assigned by the wan link.	Enabled / Disabled	Enabled
	Space / Netmask	When NAT type is not Many-to-One, we must specify IP address / Netmask directly.	IPv4 format	N/A

Table 6-2 Add a NAT rule

Step 5.b — Insert an Many-to-Many Rule If your ISP has assigned a range of public IP to your company, you can tell DFL-900 to translate the private IP addresses into the pool of public IP addresses. The DFL-900 will use the first public IP until DFL-900 uses up all source ports for the public IP. DFL-900 will then choose the second public IP from the address pool. Select `Many-to-Many` from the `Type`. Enter the subnet with an `IP address` and a `netmask`. Other fields are the same with those of Many-to-One rules. However, the DFL-900 will no longer choose the device IP for you. It will choose the IP from the address pool you have entered.	**ADVANCED SETTINGS > NAT > NAT Rules > Insert** 
Step 5.c — Insert an One-to-One Rule Though you may have many public IP address for translation, you may want to make some private IP to always use a public IP. In this case, you can select `One-to-One` from the `Type`, and enter the private-public IP address pair in the `Source IP` and the `Translated Source IP` fields.	**ADVANCED SETTINGS > NAT > NAT Rules > Insert** 
Step 5.d — Insert a One-to-One (Bidirectional) Rule The above three modes allow LAN/DMZ-to-WAN sessions establishment but do not allow WAN-to-LAN/DMZ sessions. WAN-to-LAN/DMZ sessions are allowed by Virtual Server rules. You can make the One-to-One NAT in the above to incorporate the WAN-to-LAN/DMZ feature by selecting the `One-to-One (Bidirectional)` from the Type. Note that WAN-to-LAN/DMZ traffic will be blocked by the Firewall in default. You have to add a Firewall rule to allow such traffic. If you expect a LAN/DMZ host to be fully accessed by public Internet users, use this mode. Note that this mode is extremely dangerous because the host is fully exposed to the Internet and may be cracked. Always use Virtual Server rules first.	**ADVANCED SETTINGS > NAT > NAT Rules > Insert** 

6.4.2 Setup Virtual Server for the FtpServer1

Step 1. Device IP Address

Setup the `IP Address` and `IP Subnet Mask` for the DFL-900 of the DMZ1 interface.

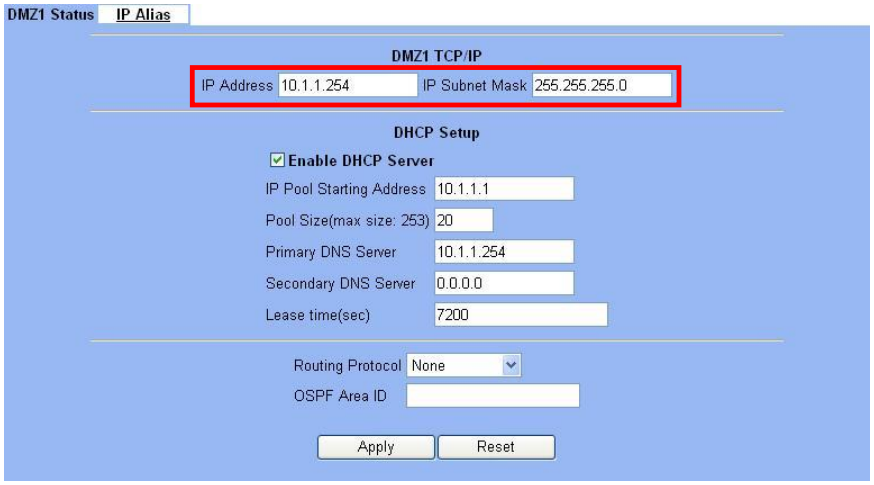
Step 2. Client IP Range

Enable the `DHCP server` if you want to use DFL-900 to assign IP addresses to the computers under DMZ1. Here we make the DHCP feature enabled.

Step 3. Apply the Changes

Click `Apply` to save your settings.

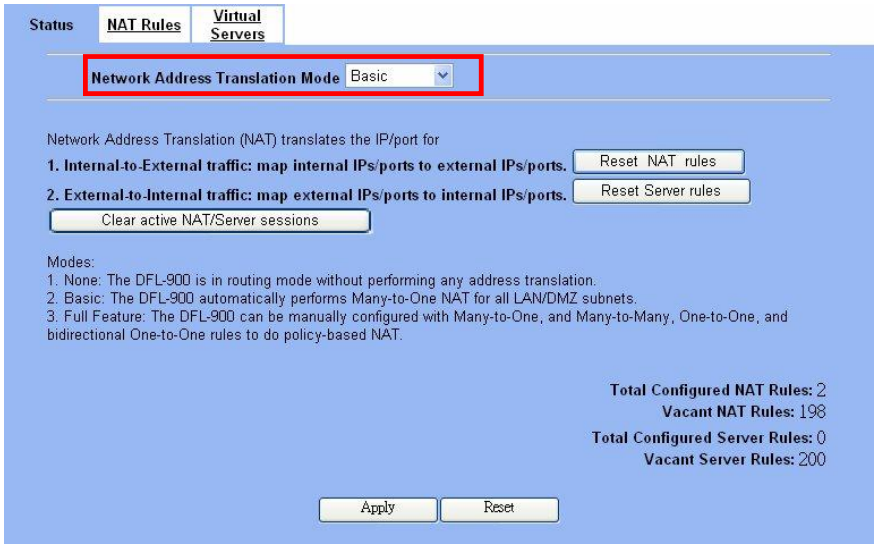
BASIC SETUP > DMZ Settings > DMZ1 Status



Step 4. Check NAT Status

The default setting of NAT is in `Basic` Mode. After applying the **Step 3**, the NAT is automatically configured with the rules to let all private-IP LAN/DMZ-to-WAN requests to be translated with the public IP assigned by the ISP.

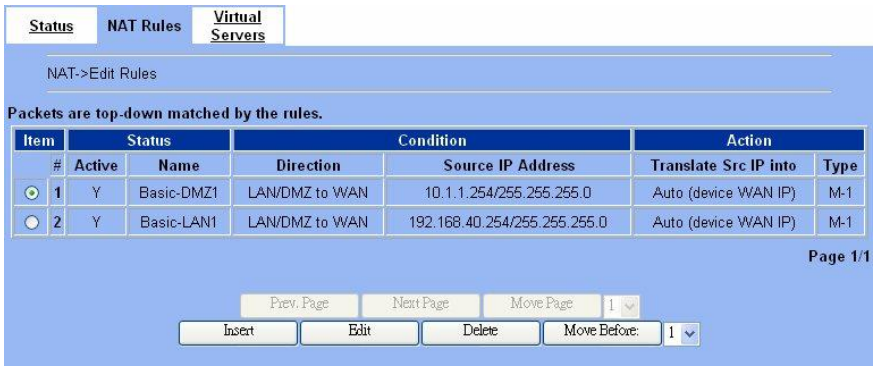
ADVANCED SETTINGS > NAT > Status



Step 5. Check NAT Rules

The DFL-900 has added the NAT rules automatically as right diagram described. The rule `Basic-DMZ1` (number 1) means that, when matching the condition (requests of `LAN/DMZ-to-WAN` direction with its source IP falling in the range of `10.1.1.254/255.255.255.0`), the request will be translated into a public-source-IP requests, and then be forwarded to the destinations.

ADVANCED SETTINGS > NAT > NAT Rules



Item		Status		Condition		Action	
	#	Active	Name	Direction	Source IP Address	Translate Src IP into	Type
⊙	1	Y	Basic-DMZ1	LAN/DMZ to WAN	10.1.1.254/255.255.255.0	Auto (device WAN IP)	M-1
○	2	Y	Basic-LAN1	LAN/DMZ to WAN	192.168.40.254/255.255.255.0	Auto (device WAN IP)	M-1

Step 6. Setup IP for the FTP Server

Assign an IP of 10.1.1.1/255.255.255.0 to the FTP server under DMZ1. Assume the FTP Server is at 10.1.1.5. And it is listening on the well-known port (21).

Step 7. Setup Server Rules

Insert a virtual server rule by clicking the `Insert` button.

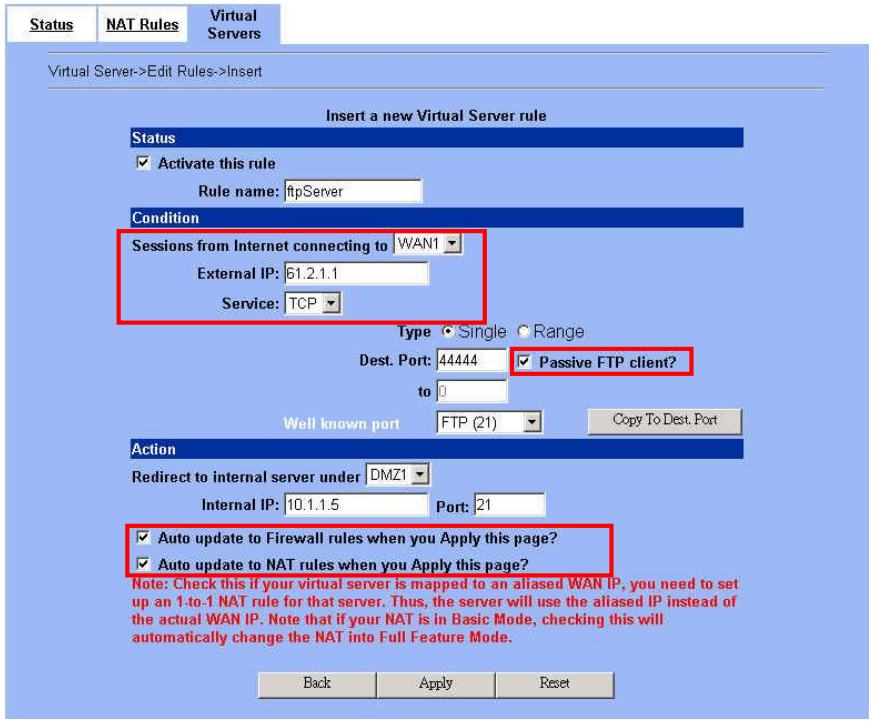
ADVANCED SETTINGS > NAT > Virtual Servers

Step 8. Customize the Rule

Customize the rule name as the `ftpServer`. For any packets with its destination IP equaling to the WAN1 IP (`61.2.1.1`) and destination port equaling to `44444`, ask DFL-900 to translate the packet's destination IP/port into `10.1.1.5/21`. Check the `Passive FTP client?` to maximize the compatibility of the FTP protocol. This is useful if you want to provide connectivity to passive FTP clients. For passive FTP clients, the server will return them the private IP address and the port number for them to connect back to do data transmissions. Since the private IP from them cannot be routed to our zone, the data connections would fail. After enabling this feature, the DFL-900 will translate the private IP/port into an IP/port of its own. Thus the problem is gracefully solved. Another point is to be sure to check "`Auto update to Firewall rules when you Apply this page?`" or "`Auto update to NAT rules when you Apply this page?`". Then, the virtual server rule will add a Firewall or NAT rules automatically. Click `Apply` to proceed.

ADVANCED SETTINGS > NAT > Virtual Servers > Insert

.



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Status	Activate this rule	The Virtual Server rule is enabled or not	Enabled / Disabled	Enabled
	Rule name	The Virtual Server rule name	text string	ftpServer
Condition	Sessions from Internet connecting to	Which interface does the connected session come from?	WAN interfaces	WAN1
	External IP	The public IP address of the Virtual Server.	IPv4 format	61.2.1.1

	Service	The service which is provided by the real server.	TCP / UDP	TCP
	Type	Port is Single or Range	Single / Range	Single
	Dest Port	The TCP/UDP port number which is provided by the real server.	1 ~65534	44444
	Passive FTP client	If the Passive FTP client is checked, it will connect to the internal DMZ FTP server of DFL-900 when FTP client uses passive mode. Otherwise, it will not work.	Enabled / Disabled	Enabled
Action	Redirect to internal server under	The subnet which is located the virtual server.	LAN / DMZ regions	DMZ1
	Internal IP	The IP address which is actually transferred to the internal DMZ	IPv4 format	10.1.1.5
	Port	The port number which is actually transferred to the internal DMZ. If you filled 0 in this field, it means that the real connected port is the same as the translated destination port.	0 ~ 65534	21
	Auto update to Firewall rules when you Apply this page?	If you checked this, it will add a Firewall rule automatically when you add a virtual server rule.	Enabled / Disabled	Enable
	Auto update to NAT rules when you Apply this page?	If you checked this, it will add a NAT rule automatically when you add a virtual server rule.	Enabled / Disabled	Enable

Table 6-3 Add a Virtual Server rule

Step 9. View the Result

Now any request towards the DFL-900's WAN1 IP (`61.2.1.1`) with port `44444` will be translated into a request towards `10.1.1.5` with port `21`, and then be forwarded to the `10.1.1.5`. The FTP server listening at port `21` in `10.1.1.5` will pick up the request.

ADVANCED SETTINGS > NAT > Virtual Servers

Step 10. View the NAT Rules

In the previous step 8, we have already checked "Auto update to Firewall/NAT rules when you Apply this page", so it will automatically add one NAT rule to transfer the IP address of virtual server when server responses packet back to the client.

ADVANCED SETTINGS > NAT > NAT Rules

Item	Status		Condition		Action	
#	Active	Name	Direction	Source IP Address	Translate Src IP into	Type
1	Y	ftpServer	LAN/DMZ to WAN	10.1.1.5/255.255.255.255	61.2.1.1/255.255.255.255	1-1
2	Y	Basic-DMZ1	LAN/DMZ to WAN	10.1.1.254/255.255.255.0	Auto (device WAN IP)	M-1
3	Y	Basic-LAN1	LAN/DMZ to WAN	192.168.40.254/255.255.255.0	Auto (device WAN IP)	M-1

Step 11. View the Firewall Rules

The same as Step 10. When we have checked "Auto update to Firewall/NAT rules when you Apply this page", it will automatically add one Firewall rule in the WAN1 to DMZ1 direction. This firewall rule will let the packets with dest. IP address/port be matched with virtual server rule in order to pass through DFL-900.

ADVANCED SETTINGS > Firewall > Edit Rules

Item	Status		Condition				Action	
#	Active	Name	Direction	Source IP Address	Dest. IP Address	Service	Action	Log
1	Y	ftpServer	WAN1 to DMZ1	Any	10.1.1.5/255.255.255.255	TCP:21	Forward	N
2	Y	Default	WAN1 to DMZ1	Any	Any	Any	Block	Y

6.5 NAT modes introduction

6.5.1 Many-to-One type

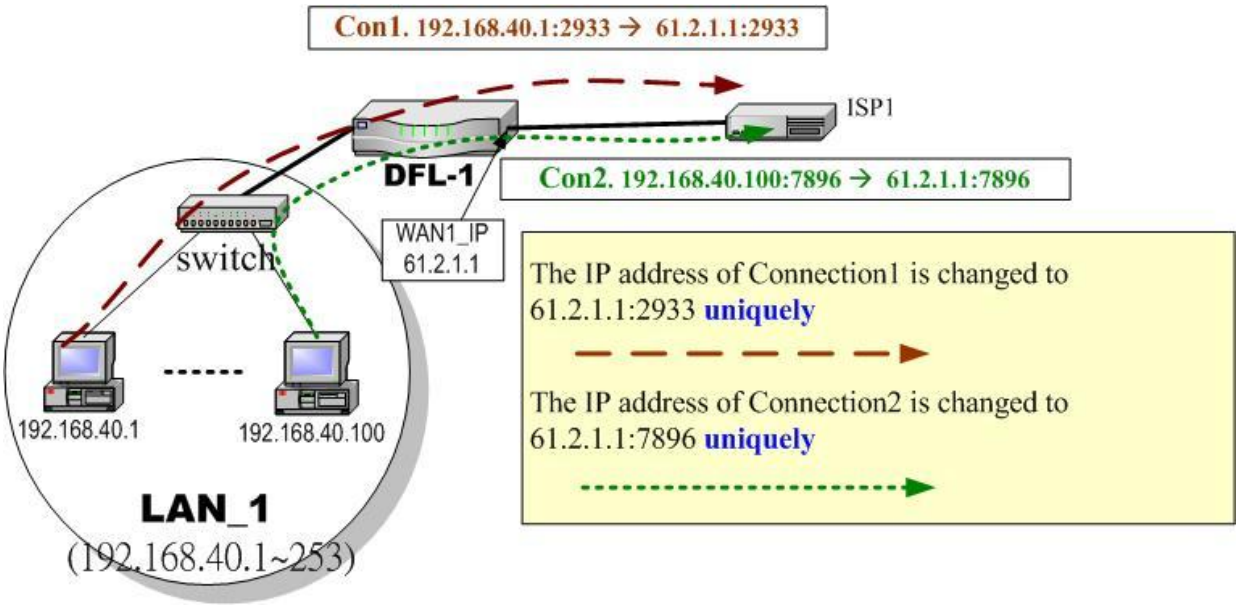


Figure 6-4 NAT Many-to-One type

As the above Figure 6-4 illustrated, NAT Many-to-One type means that many local PCs are translated into only one public IP address when the packets are forwarded out through the DFL-900. Take Connection1 for example. Its IP address and port are translated from 192.168.40.1:2933 to 61.2.1.1:2933. In the same way, when the packets of Connection2 are forwarded out, its IP address is still translated to the same public IP address (61.2.1.1:7896).

6.5.2 Many-to-Many type

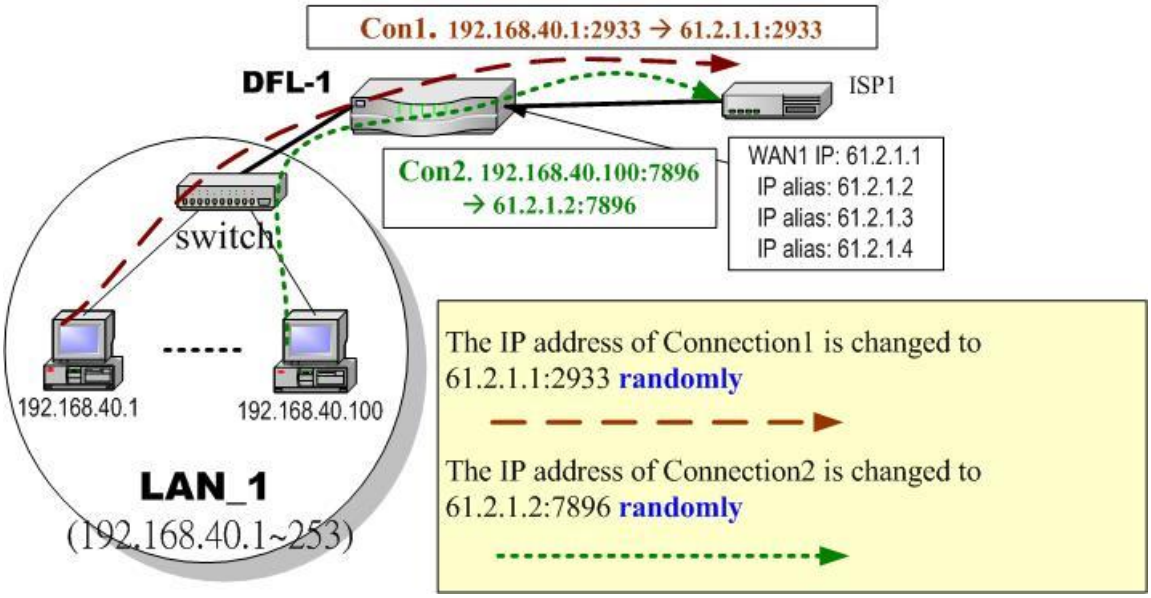


Figure 6-5 NAT Many-to-Many type

As the above Figure 6-5 illustrated, NAT Many-to-Many type means that many local PCs are translated into multiple public IP addresses when the packets are forwarded out through the DFL-900. Take Connection1 for example. Its IP address and port are translated from 192.168.40.1:2933 to 61.2.1.1:2933. Until DFL-900 uses out of all source ports of the public (61.2.1.1), DFL-900 will then choose the second public IP (such as 61.2.1.2) from the address pool. For example, Connection2 are forwarded out, the source IP address will be translated into the second public IP address (61.2.1.2) from the public IP address pools. So the translated IP address (61.2.1.2:7896) is different from Connection1 one (61.2.1.1:2933).

6.5.3 One-to-One type

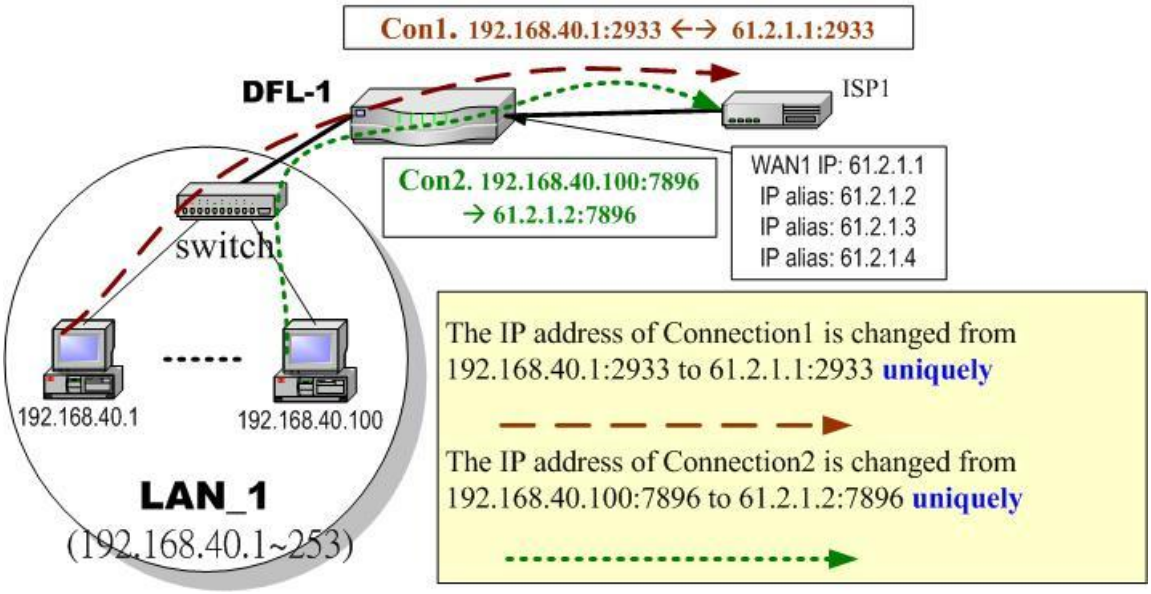


Figure 6-6 NAT One-to-One type

As the above Figure 6-6 illustrated, NAT One to One type means that each local PC is translated into a unique public IP address when the packets are forwarded out through the DFL-900. Take Connection1 for example. Its IP address and port are translated from 192.168.40.1:2933 to 61.2.1.1:2933. But, when the packets of Connection2 are forwards out, the source IP address is translated to another dedicated public IP address(61.2.1.2:7896).

6.5.4 One-to-One (bidirectional) type

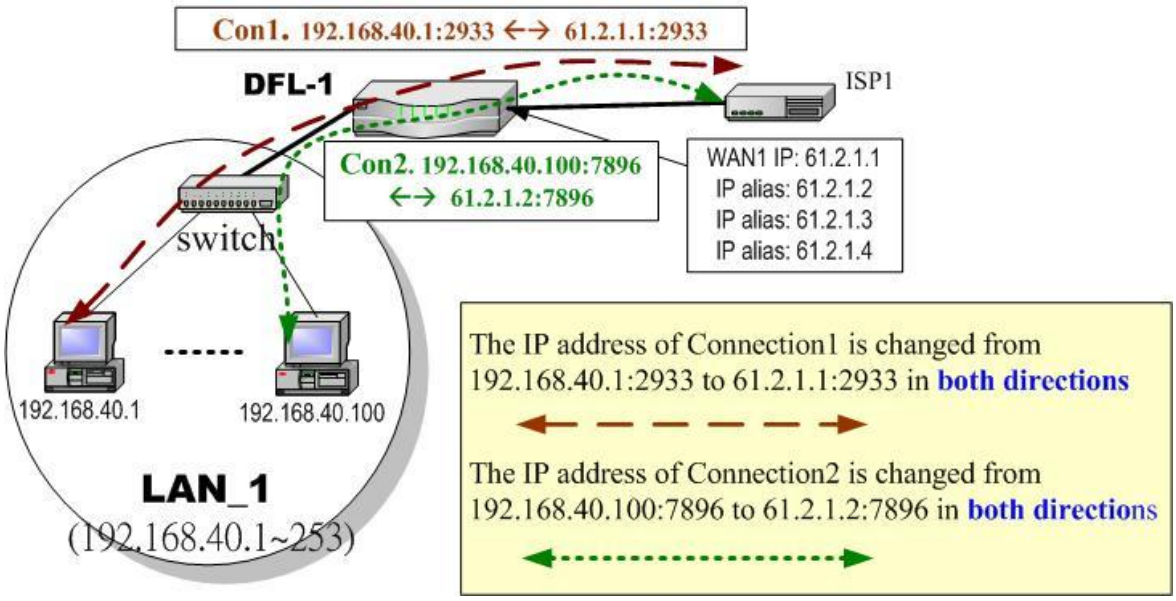


Figure 6-7 NAT One-to-One (bidirectional) type

As the above Figure 6-7 illustrated, NAT One to One (bidirectional) type means that each local PC is translated into a unique public IP address when the packets are forwarded out through the DFL-900. Besides when packets came from internet to LAN, they were

translated to the same private IP address too. Take Connection1 for example. Its IP address and port are translated from 192.168.40.1:2933 to 61.2.1.1:2933 in both ways. Accordingly, the source IP address and port of the Connection2 are translated from 192.168.40.100:7896 to 61.2.1.2:7896 in both ways.

6.5.5 NAT modes & types

The following three NAT modes are supported by DFL-900 now as the following Table 6-4.

NAT mode	Description
None	The DFL-900 is in routing mode without performing any address translation.
Basic	The DFL-900 automatically performs Many-to-One NAT for all LAN/DMZ subnets.
Full Feature	The DFL-900 can be manually configured with Many-to-One, and Many-to-Many, One-to-One, and bidirectional One-to-One rules to do policy-based NAT.

Table 6-4 NAT modes overview

If you choose Full Feature mode of NAT at Table 6-4, you may need to edit the rule by yourself. Then you must determine the NAT type in the NAT rule. What meaning does each NAT type represent? How to determine which NAT type is best choice for you. You can lookup the explanations and suggestions at Table 6-5.

Type	Description	Usage moment
Many-to-One	Map a pool of private IP addresses to a single public IP address chosen from the WAN ports.	If the public IP addresses of your company is insufficient, and you prefer to increase the node which can connect to the internet. You can just choose the Many-to-One type to fit your request.
Many-to-Many	Map a pool of private IP addresses to a subnet range of public IP addresses chosen from the WAN ports. Only when all ports of the first public IP are used, it will then use the next public IP address for transferring by all private IPs.	If the public IP address of your company is not only one node (ex. you have applied extra-one ISP). You may use the Many-to-Many type to make the multiple public addresses sharing the outbound bandwidth. So your inbound and outbound traffic will be more flexible.
One-to-One	Map a single private IP address to a single public IP address chosen from the WAN ports. This was useful when you have multiple public IPs in the WAN ports. And you intended to map each local server to a unique public IP on the WAN port.	If you wish to specify a unique internal IP address to transfer a fixed external IP address. You can specify the One-to-One type.
One-to-One (bidirectional)	An internal host is fully mapped to a WAN IP address. Notice that you must add a firewall rule to forward WAN to LAN/DMZ traffic.	If you wish to expose the local pc onto the internet, and open all internet services outside. You can specify the One-to-One (bidirectional) type. This will make the local pc you specified fully exposed to the internet. Additionally you must add a firewall rule to allow WAN to LAN (or DMZ) traffic forward. Then you can finish the settings. Be careful to use this type, or it will endanger your network security.

Table 6-5 The NAT type comparison

Chapter 7
Routing

This chapter introduces how to add static routing and policy routing entries

To facilitate the explanation on how DFL-900 implements routing and how to use it. We zoom in the left part of Figure 2-1 into Figure 7-1 and increase some devices for description.

7.1 Demands

1. There is only one local area (192.168.40.0/24) inside the LAN1 port. Now there is a new financial area (192.168.50.0/24) in the Figure 7-1. The financial area is connected with a router which is inside the LAN1 port of DFL-900. So we need to add the configurations for the financial department.

2. Refer to the Figure 7-1 description. The bandwidth subscribed from ISP1 is insufficient so that some important traffic, say the traffic from PCs belonging to the General-Manager-Room department (192.168.40.192/255.255.255.192), is blocked by the other traffic. We hope that the employees of General-Manager-Room can have a dedicated bandwidth to improve the quality of connecting internet.

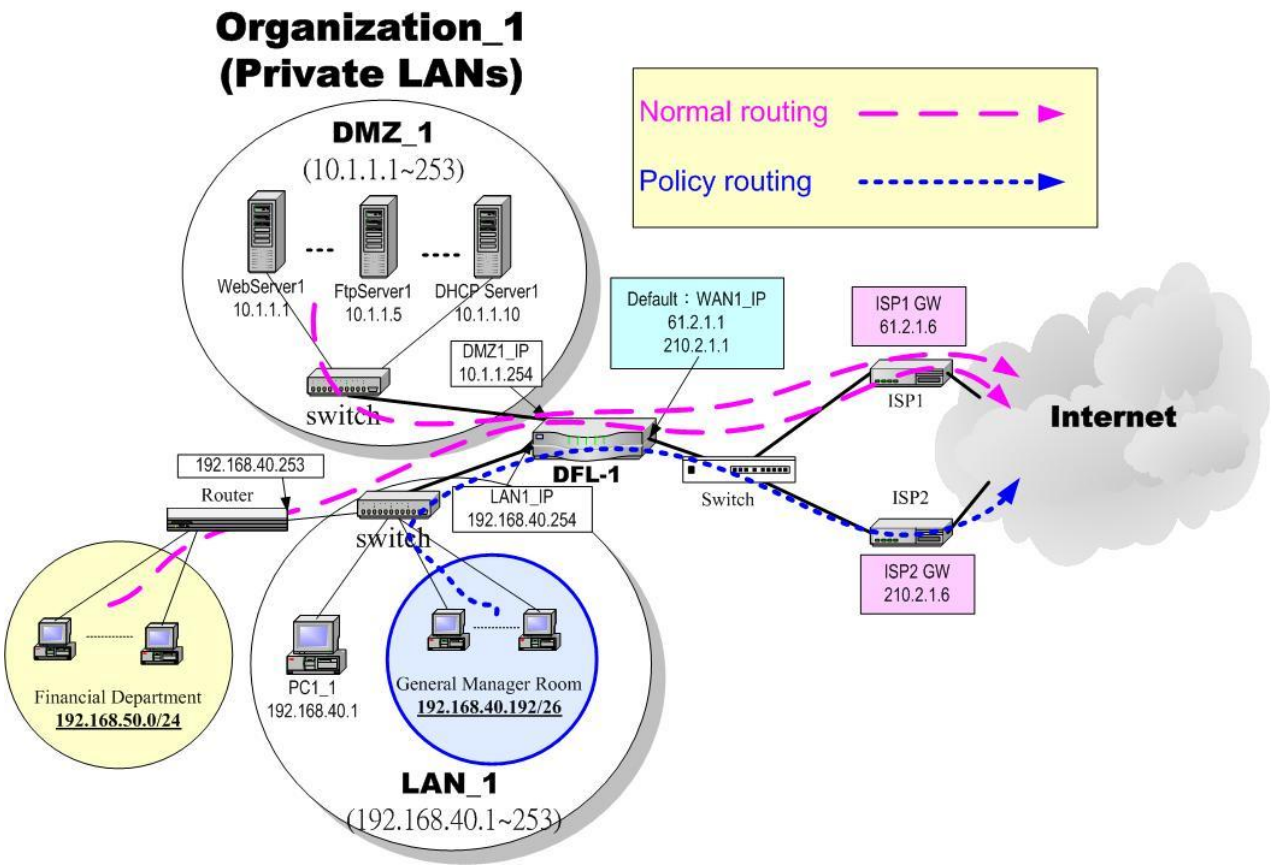


Figure 7-1 Add policy routing entry for the General-Manager-Room department

7.2 Objectives

1. We need to let DFL-900 knows how to forward the packets which is bound for financial department (192.168.50.0/24).

2. The network administrator plans to solve the problem by subscribing the second link (ISP2). He hopes that all the packets from the General-Manager-Room (192.168.40.192/26) will pass through the ISP2 link instead of the default ISP1 link.

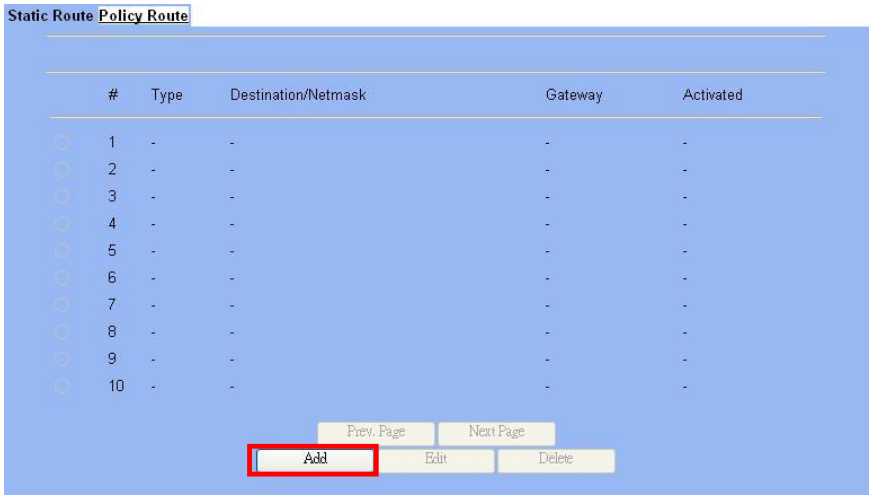
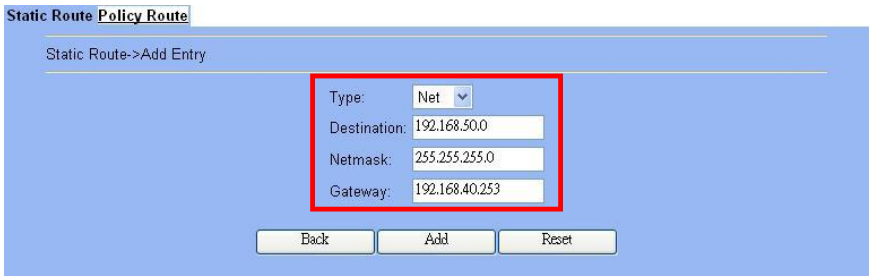
7.3 Methods

1. Add a static routing entry to direct the packets towards 192.168.50.0/24 through the router (192.168.40.253).

2. Add a policy routing entry for the packets coming from General-Manager-Room department (192.168.40.192 / 255.255.255.192) through the ISP2 link.

7.4 Steps

7.4.1 Add a static routing entry

Step 1. Add a static routing rule Click the `Add` button to the next process.	**Advanced Settings > Routing > Static Route** 
Step 2. Fill out the related field Fill in the `Destination` and the `Netmask` field with `192.168.50.0` and `255.255.255.0`. Assign the next hop `Gateway` as `192.168.40.253` (Router IP address). Click `Add` to proceed.	**Advanced Settings > Routing > Static Route > Add** 

FIELD	DESCRIPTION	Range / Format	EXAMPLE
Type	Determine this static routing entry record is multiple hosts (Net) or a single host (Host)。	Net / Host	Net
Destination	The destination IP address of this static routing entry record.	IPv4 format	192.168.50.0

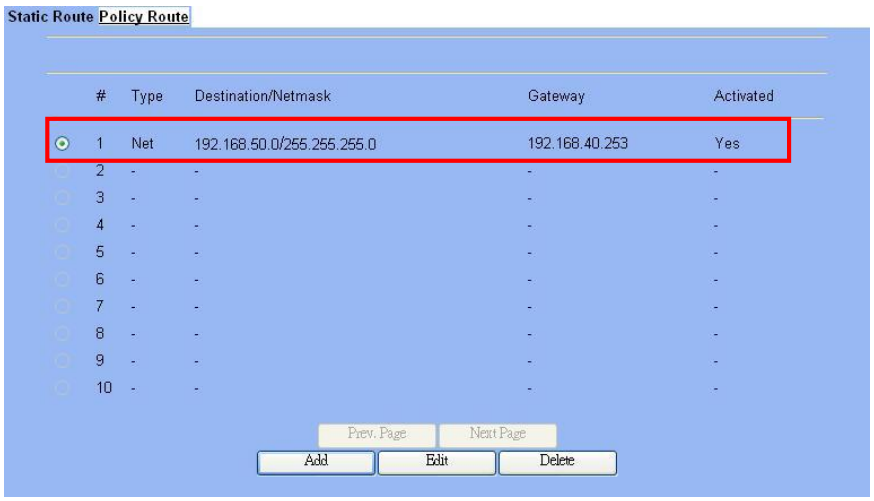
Netmask	The destination IP Netmask of this static routing entry record.	IPv4 format	255.255.255.0
Gateway	The default gateway of this static routing entry record.	IPv4 format	192.168.40.253

Table 7-1Add a static routing entry

Step 3. View the result

The static route has been stored. After filling data completely, view the static routing entries which have been set.

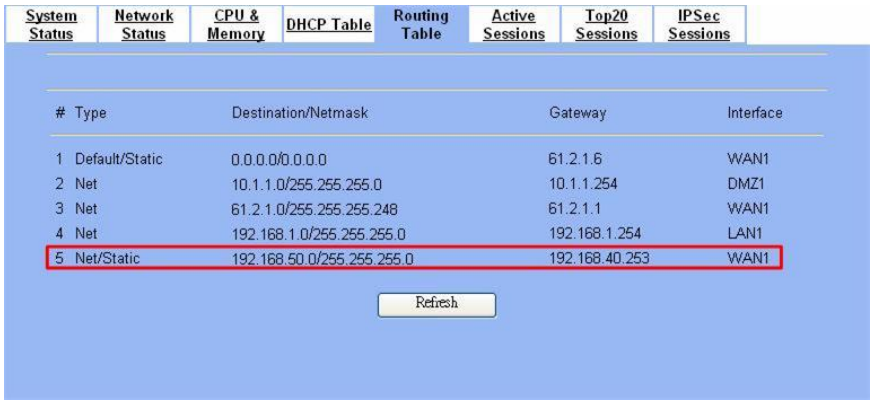
Advanced Settings > Routing > Static Route



Step 4. View the routing table

You can notice there is an extra routing entry in the routing table. The indicated routing entry as right diagram is produced by static routing rule.

Device Status > System Status > Routing Table

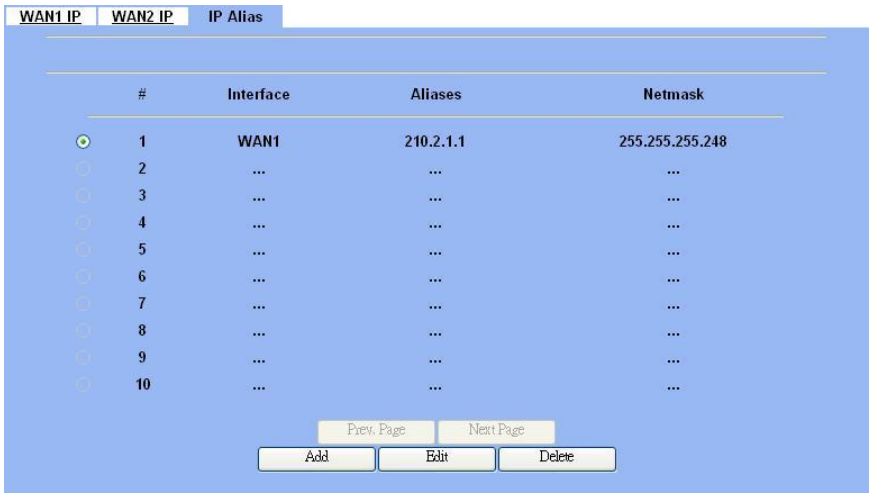


7.4.2 Add a policy routing entry

Step 1. Setup the ISP2 link

We must add an IP alias record to the WAN1 port because a new ISP link has been applied. So. See section 3.4.3 for the full procedures. Here we add an IP alias of WAN1 as 210.2.1.1/255.255.255.248.

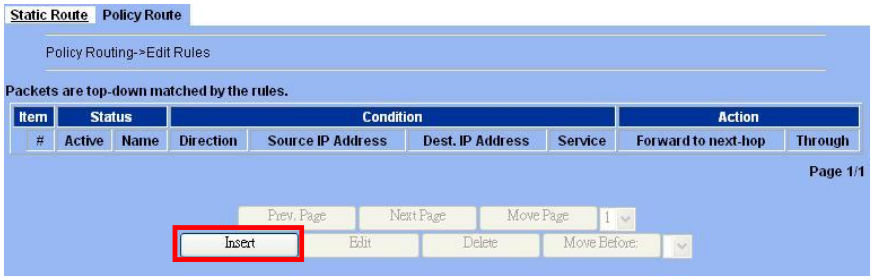
Basic Setup > WAN Settings > IP Alias



Step 2. Insert a policy routing entry

Click `Insert` button to add a policy routing entry.

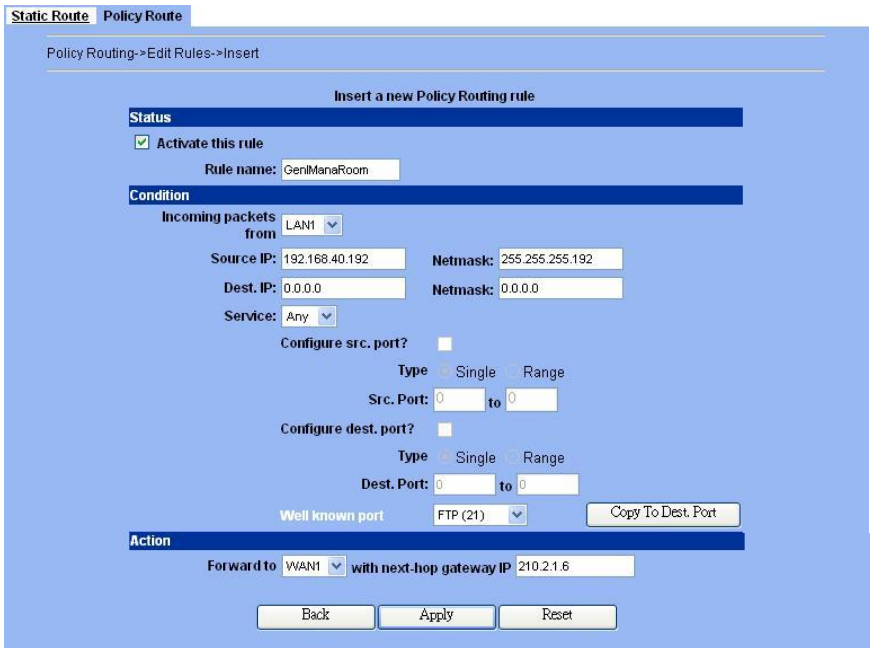
Advanced Settings > Routing > Policy Route



Step 3. Fill out the related field

For the General-Manager-Room department, we need to set an extra policy routing entry for them. So in the `Status` region, make sure the `Activate this rule` is enabled, and then fill in `GenlManaRoom` in the `Rule name` field. In the `Condition` region, we fill `192.168.40.192` in `Source IP` field. Fill `255.255.255.192` in the `Netmask` field. In the `Action` region, fill forward to `WAN1` with next-hop gateway `210.2.1.6`. After setting as above, the packets which match the condition, they will follow the predefined action to forward to the next hop.

Advanced Settings > Routing > Policy Route > Insert



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Status	Activate this rule	The policy routing rule is enabled or not.	Enabled / Disabled	Enabled
	Rule name	The policy routing rule name.	text string	GenlManaRoo m
Condition	Incoming packets from	Packets comes from which interface	LAN / DMZ regions	LAN1
	Source IP & Netmask	Verify if the incoming packets belong to the range of the Source IP/Netmask in the policy routing rule.	IPv4 format / IPv4 format	192.168.40.192 / 255.255.255.192
	Dest IP & Netmask	Verify if the incoming packets belong to the range of the Dest IP/Netmask in the policy routing rule.	IPv4 format / IPv4 format	0.0.0.0 / 0.0.0.0
	Service	Verify what is the service of this packet?	ANY / TCP / UDP / ICMP	Any
	Configure src. port? Type Src. port	If the service is TCP or UDP, we can choose to configure or not to configure source port.	Enabled / Disabled	No
	Type	If we decide to configure source port, we must choose the port to be single or range.	Single / Range	N/A
	Src. Port	If we select single at above field, we just have to fill a port in the first blank space. If we select range at above field, we need to fill the range of the ports.	1 ~ 65534	N/A
	Configure dest. port? Type Dest. port	If the service is TCP or UDP, we can choose to configure or not to configure destination port.	Enabled / Disabled	No
	Type	If we decide to configure destination port, we must choose the port to be single or range.	Single / Range	N/A
	Dest. Port	If we select single at above field, we just have to fill a port in the first blank space. If we select range at above field, we need to fill the range of the ports.	1 ~ 65534	N/A
Action	Forward to	If the packet is matched to this rule, which interface does this packet sent out to?	WAN interfaces	WAN1
	Nexthop gateway IP	The next gateway IP address of forwarding interface.	IPv4 format	210.2.1.6

Table 7-2 Add a policy routing entry

Step 4. View the result

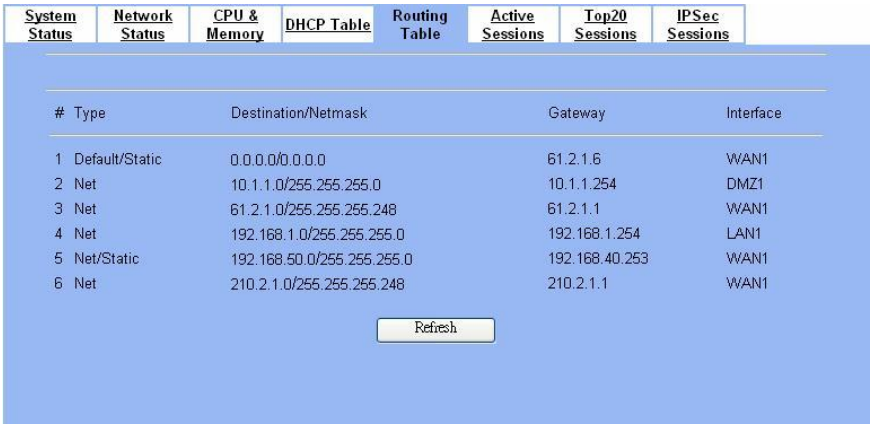
After filling data completely, view the policy routing entries which have been set.

Advanced Settings > Routing > Policy Route

Step 5. View the routing table

Finally click the "Routing Table" to see all the current routing table information.

Device Status > System Status > Routing Table



Chapter 8
Firewall

This chapter introduces firewall and explains how to implement it.

8.1 Demands

1. Administrators detect that PC1_1 in LAN_1 is doing something that may hurt our company and should instantly block his traffic towards the Internet.
2. A DMZ server was attacked by SYN-Flooding attack and requires the DFL-900 to protect it.

8.2 Objectives

1. Block the traffic from PC1_1 in LAN1 to the Internet in WAN1.
2. Start the SYN-Flooding protection.

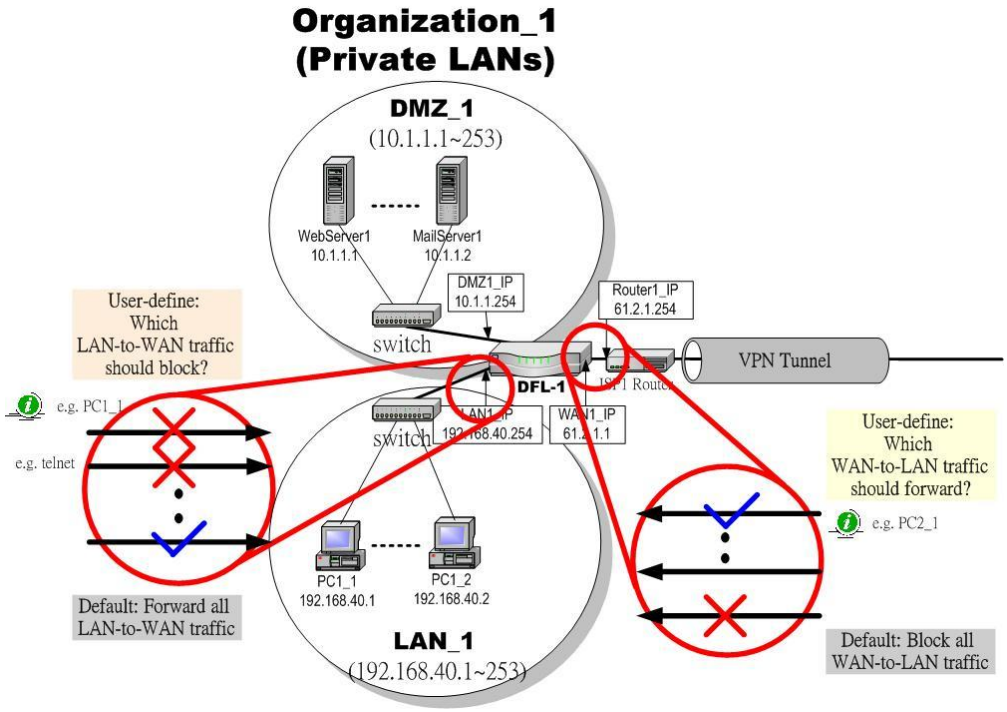


Figure 8-1 Setting up the firewall rule

8.3 Methods

1. Add a LAN1-to-WAN1 Firewall rule to block PC1_1.
2. Start the SYN-Flooding protection by detecting statistical half-open TCP connections.

8.4 Steps

8.4.1 Block internal PC session (LAN → WAN)

Step 1. Setup NAT

Check the `Enable Stateful Inspection Firewall` checkbox, and click the `Apply`.

ADVANCED SETTINGS > Firewall > Status

FIELD	DESCRIPTION	Range / Format	EXAMPLE
Enable Stateful Inspection Firewall	Enable Firewall feature of DFL-900	Enabled / Disabled	Enabled
Block all fragment packets	Enable this feature will block the fragmented packets by the firewall of DFL-900. Warning: Enable this feature will cause problem in some applications.	Enabled / Disabled	Disabled
BUTTON	DESCRIPTION		
Reset Rules	Reset Firewall rules to the default status		
Clear States	Clear all the active Firewall states		
Apply	Apply the settings which have been configured.		
Reset	Clean the filled data and restore the original.		

Table 8-1 Configure Firewall status

Step 2. Add a Firewall Rule

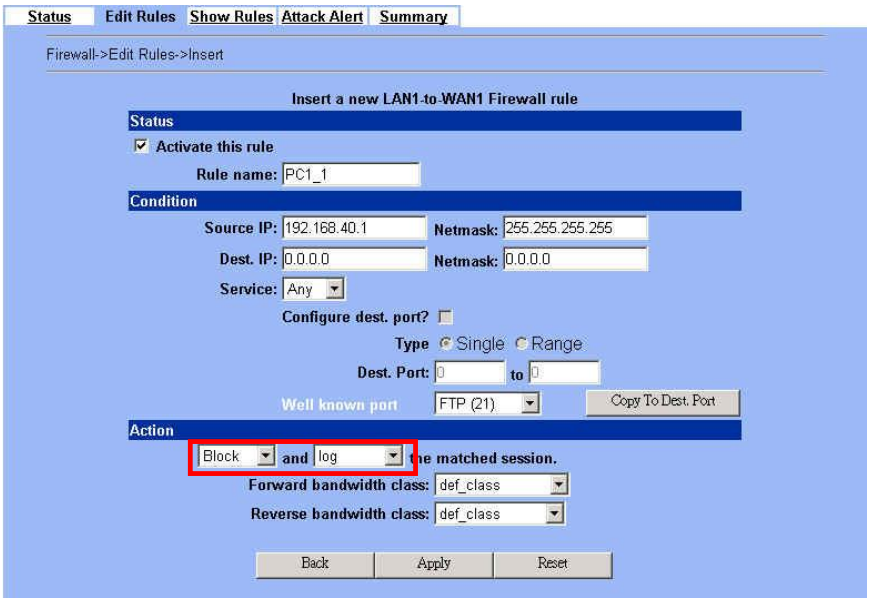
Select LAN1 to WAN1 traffic direction. The default action of this direction is to forward all traffic without logging anything. Click Insert to add a Firewall block rule before the default rule to stop the bad traffic.

ADVANCED SETTINGS > Firewall > Edit Rules

Step 3. Customize the rule

Check the `Activate this rule` checkbox. Enter the rule name as `PC1_1`, and enter the `IP address` of `PC1_1` (`192.168.40.1 / 255.255.255.255`). Select `Block` and `Log` to block and log the matched traffic. Click the `Apply` to apply the changes.

ADVANCED SETTINGS > Firewall > Edit Rules > Insert



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Status	Activate this rule	Enable the firewall rule for later using	Enabled / Disabled	Enabled
	Rule name	The name of the Firewall rule	text string	PC1_1
Condition	Source IP & Netmask	Compared with the incoming packets, whether Source IP/Netmask is matched or not.	IPv4 format / IPv4 format	192.168.40.1 255.255.255.255
	Dest IP & Netmask	Compared with the incoming packets, whether Dest IP/Netmask is matched or not.	IPv4 format / IPv4 format	0.0.0.0 0.0.0.0
	Service	Verified the service of incoming packet is belong to each TCP、UDP、ICMP.	TCP / UDP / ICMP	Any
	Configure dest. Port?	If the service is TCP or UDP, we can choose to configure or not to configure destination port.	Enabled / Disabled	Disabled
	Type	If we decide to configure destination port, we must choose the port to be single or range.	Single / Range	N/A
	Dest. Port	If we select single at above field, we just have to fill a port in the first blank space. If we select range at above field, we need to fill the range of the ports.	1 ~ 65534	N/A
Action	Forward / Block the matched session	If packet is matched the rule condition, Forward or Block this matched packet?	Forward / Block	Block
	Don't log / Log the matched session	If packet is matched the rule condition, Log or Don't log this matched packet?	Log / Don't log	Log
	Forward bandwidth class	Forward bandwidth class if any.	def_class	def_class

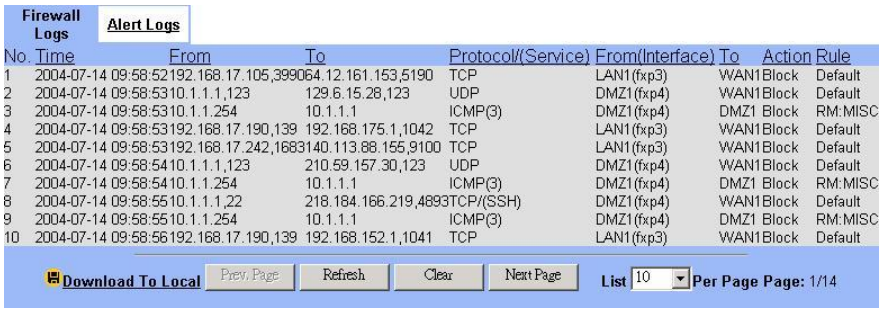
	Reverse bandwidth class	Reverse bandwidth class if any.	def_class	def_class

Table 8-2 Insert a Firewall rule

Step 4. View the Firewall Log

You can go to DEVICE Status>Firewall Logs >Firewall Logs to view the firewall logs. If you prefer to download these logs, please click the "Download To Local" button to save the logs to localhost.

DEVICE Status > Firewall Logs > Firewall Logs



FIELD	DESCRIPTION
No	The indicated firewall log sequence number.
Time	The record time of indicated firewall log.
From	The source IP address (include port) which the indicated log event come from.
To	The destination IP address (include port) for the indicated log event bound.
Protocol/(Service)	The recorded log is TCP, UDP or ICMP / which service it will be.
Direction	The firewall log direction is OUT or IN. The direction is based on the DFL-900. For example, "OUT" means the packet is forwarded out to the internet. "IN" means the packet is forwarded into intranet.
Action	The status of indicated firewall log is Block or Forward.
Rule	The log is produced by which firewall rule. "Default" means the default rule of the selected firewall direction. "RM XXX" means the log is produced by remote management function (Almost it is the illegal user who wants to use the Non-Opened remote management functions. Other condition, it will be marked at the rule number (ex. Rule0, Rule1 …).

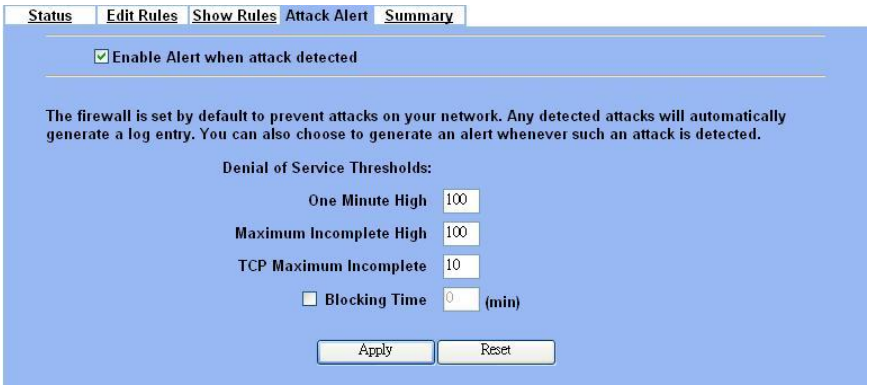
Table 8-3 Firewall log field description

8.4.2 Setup Alert detected attack

Step 1. Setup Attack Alert

With the Firewall enabled, the DFL-900 is already equipped with an Anti-DoS engine within it. Normal DoS attacks will show up in the log when detecting and blocking such traffic. However, Flooding attacks require extra parameters to recognize. Check the `Enable Alert when attack detected` checkbox. Enter `100` in the `One Minute High` means that DFL-900 starts to generate alerts and delete the half-open states if `100` half-open states are established in the last minute. Enter `100` in the `Maximum Incomplete High` means that DFL-900 starts to generate alerts and delete half-open states if the current number of half-open states reaches `100`. Enter `10` in the `TCP Maximum Incomplete` means that DFL-900 starts to generate alerts and delete half-open states if the number of half-open states towards a server (SYN-Flooding attack) reaches 10. Check the `Blocking time` if you want to stop the traffic towards the server. During this blocking time, the server can digest the loading.

ADVANCED SETTINGS > Firewall > Attack Alert



FIELD	DESCRIPTION	EXAMPLE
Enable Alert when attack detected	Enable the firewall alert to detect Denial of Service (DoS) attack.	Enabled
Denial of Service Thresholds		
One Minute High	This is the rate of new half –open sessions that causes the firewall to start deleting half open sessions. When the rate of new connection attempts rises above this number, the DFL-900 deletes half-open sessions as required to accommodate new connection attempts.	100
Maximum Incomplete High	This is the number of existing half-open sessions that causes the firewall to start deleting half-open sessions. When the number of existing half-open sessions rises above this number, the DFL-900 deletes half-open sessions as required to accommodate new connection requests.	100
TCP Maximum Incomplete	This is the number of existing half-open TCP sessions with the same destination host IP address that causes the firewall to start dropping half-open sessions to the same destination host IP address. Enter a number between 1 and 999. As a general rule, you should choose a smaller number for a smaller network, a slower system or limited bandwidth.	10
Blocking Time	When TCP Maximum Incomplete is reached you can choose if the next session should be allowed or blocked. If you check Blocking Time any new sessions will be blocked for the length of time you specified in the next field (min) and all old incomplete sessions will be cleared during this period. If you want strong security, it is better to block the traffic for a short time, as will give the server some time to digest the loading.	disabled

(min)	Enter the length of Blocking Time in minutes.	0

Table 8-4 Setup the Denial of Service Thresholds of attack alert

Part IV

Virtual Private Network

Chapter 9
VPN Technical Introduction

This chapter introduces VPN related technology

9.1 VPN benefit

If you choose to implement VPN technology in your enterprise, then it may bring the following benefits to your company.

1. Authentication

Ensure the data received is the same as the data that was sent and that the claimed sender is in fact the actual sender.

2. Integrity

Ensure that data is transmitted from source to destination without undetected alteration.

3. Confidentiality

Guarantee the intended recipients know what was being sent but unintended parties cannot determine what was sent. This is almost provided by data encryption.

4. Non-repudiation

The receiver being able to prove that the sender of some data did in fact send the data even though the sender might later desire to deny ever having sent that data.

9.2 Related Terminology Explanation

9.2.1 VPN

A VPN (Virtual Private Network) logically provides secure communications between sites without the expense of leased site-to-site lines. A secure VPN is a combination of encryption, tunneling, authentication, and access control used to transport traffic over the Internet or any insecure TCP/IP networks.

9.2.2 IPSec

Internet Protocol Security (IPSec) is a standard-based VPN that offers flexible solutions for secure data communications across a public network like the Internet. IPSec is built around a number of standardized cryptographic techniques to provide confidentiality, data integrity and authentication at the IP layer.

9.2.3 Security Association

A Security Association (SA) is an agreement between two parties indicating what security parameters, such as keys and algorithms they will use.

9.2.4 IPSec Algorithms

There are two types of the algorithms in the IPSec, including (1) Encryption Algorithms such as DES (Data Encryption Standard), and 3DES (Triple DES) algorithms, and (2) Authentication Algorithms such as HMAC-MD5 (RFC 2403), and HMAC-SHA1 (RFC 2404).

9.2.5 Key Management

Key Management allows you to determine whether to use IKE (ISAKMP) or manual key configuration in order to setup a VPN.

➢ IKE Phases

There are two phases to every IKE (Internet Key Exchange) negotiation – phase 1 (Authentication) and phase 2 (Key Exchange). A phase 1 exchange established an IKE SA and the second one uses that SA to negotiate SAa for IPSec.

In phase 1 you must：

- Choose a negotiation mode
- Authenticate the connection by entering a pre-shared key
- Choose an encryption algorithm
- Choose an authentication algorithm
- Choose a Diffie-Hellman public-key cryptography key group (DH1 or DH2).
- Set the IKE SA lifetime. This field allows you to determine how long IKE SA negotiation should proceed before it times out. A value of 0 means IKE SA negotiation never times out. If IKE SA negotiation times out, then both IKE SA and IPSec SA must be renegotiated.

In phase 2 you must：

- Choose which protocol to use (ESP or AH) for the IKE key exchange
- Choose an encryption algorithm
- Choose an authentication algorithm
- Choose whether to enable Perfect Forward Security (PFS) using Diffie-Hellman public-key cryptography
- Choose Tunnel mode or Transport mode
- Set the IPSec SA lifetime. This field allows you to determine how long IPSec SA setup should proceed before it times out. A value of 0 means IPSec SA never times out. If IPSec SA negotiation times out, then the IPSec SA must be renegotiated (but not the IKE SA).

➢ Negotiation Mode

The phase 1 Negotiation Mode you select determines how the Security Association (SA) will be established for each connection through IKE negotiations.

- Main Mode ensures the highest level of security when the communicating parties are negotiating authentication (phase 1). It uses 6 messages in three round trips (SA negotiation, Diffie-Hellman exchange and an exchange of nonces (a nonce is a random number)). This mode features identity protection (your identity is not revealed in the negotiation).
- Aggressive Mode is quicker than Main Mode because it eliminates several steps when the communicating parties are negotiating authentication (phase 1). However the trade-off is that fast speed limits its negotiating power and it also does not provide identity protection. It is useful in remote access situation where the address of the initiator is not known by the responder and both parties want to use pre-shared key authentication.

➢ Pre-Shared Key

A pre-shared key identifies a communicating party during a phase 1 IKE negotiation. It is called “pre-shared” because you have to share it with another party before you can communicate with them over a secure connection.

➢ Diffie-Hellman (DH) Key Groups

Diffie-Hellman (DH) is a public-key cryptography protocol that allows two parties to establish a shared secret over an unsecured communications channel. Diffie-Hellman is used within IKE SA setup to establish session keys. 768-bit (Group 1 – DH1) and 1024-bit (Group 2 – DH2) Diffie-Hellman groups are supported. Upon completion of the Diffie-Hellman exchange, the two peers have a shared secret, but the IKE SA is not authenticated. For authentication, use pre-shared keys.

➢ Perfect Forward Secrecy (PFS)

Enabling PFS means that the key is transient. The key is thrown away and replaced by a brand new key using a new Diffie-Hellman exchange for each new IPSec SA setup. With PFS enabled, if one key is compromised, previous and subsequent keys are not compromised, because subsequent keys are not derived from previous keys. The (time-consuming) Diffie-Hellman exchange is the trade-off for this extra security.

This may be unnecessary for data that does not require such security, so PFS is disabled (None) by default in the DFL-900. Disabling PFS means new authentication and encryption keys are derived from the same root secret (which may have security implications in the long run) but allows faster SA setup (by bypassing the Diffie-Hellman key exchange).

9.2.6 Encapsulation

➢ Transport Mode

Transport mode is used to protect upper layer protocols and only affects the data in the IP packets. In Transport mode, the IP packets contains the security protocol (AH or ESP) located after the original IP header and options, but before any upper layer protocols contains in the packet (such as TCP and UDP).

With ESP, protection is applied only to the upper layer protocols contained in the packet. The IP header information and options are not used in the authentication process. Therefore, the originating IP address cannot be verified for integrity against the data.

With the use of AH as the security protocol, protection is extended forward into the IP header to verify the integrity of the entire packet by use of portions of the original IP header in the hashing process.

➢ Tunnel Mode

Tunnel mode encapsulates the entire IP packet to transmit it securely. A Tunnel mode is required for gateway services to provide access to internal system. Tunnel mode is fundamentally an IP tunnel with authentication and encryption. This is the most common mode of operation. Tunnel mode is required for gateway to gateway and host to gateway communications. Tunnel mode communication have two sets of IP headers：

- Outside header： The outside IP header contains the destination IP address of the VPN gateway.
- Inside header： The inside IP header contains the destination IP address of the final system behind the VPN gateway. The security protocol appears after the outer IP header and before the inside IP header.

9.2.7 IPSec Protocols

The ESP and AH protocols are necessary to create a Security Association (SA), the foundation of an IPSec VPN. An SA is built from the authentication provided by AH and ESP protocols. The primary function of key management is to establish and maintain the SA between systems. Once the SA is established, the transport of data may commence.

➢ AH (Authentication Header) Protocol

AH protocol (RFC 2402) was designed for integrity, authentication, sequence integrity (replay resistance), and non-repudiation but not for confidentiality, for which the ESP was designed.

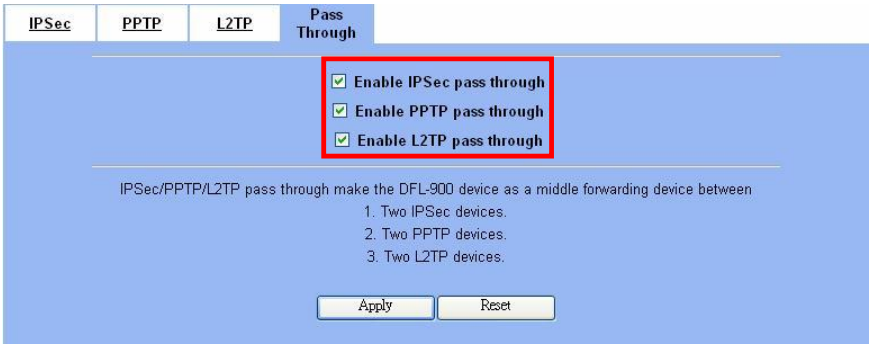
In applications where confidentiality is not required or not sanctioned by government encryption restrictions, an AH can be employed to ensure integrity. This type of implementation does not protect the information from dissemination but will allow for verification of the integrity of the information and authentication of the originator.

➢ ESP (Encapsulating Security Payload) Protocol

The ESP protocol (RFC 2406) provides encryption as well as some of the services offered by AH. ESP authenticating properties are limited compared to the AH due to the non-inclusion of the IP header information during the authentication process. However, ESP is sufficient if only the upper layer protocols need to be authenticated.

An added feature of the ESP is payload padding, which further protects communications by concealing the size of the packet being transmitted.

9.3 Make VPN packets pass through DFL-900

Step 1. Enable IPSec	ADVANCED SETTINGS > VPN Settings > Pass Through
If we need to setup DFL-900 between the existed IPSec / PPTP / L2TP connections. We need to open up the Firewall blocking port of DFL-900 in advance. Here we provide a simple way. You can through enable the `IPSec / PPTP / L2TP pass through` checkbox on this page. Then the VPN connections of IPSec / PPTP / L2TP will pass through DFL-900. As well as DFL-900 will play the middle forwarding device role.	

Chapter 10
Virtual Private Network – IPSec

This chapter introduces IPSec VPN and explains how to implement it.

As described in the Figure 2-1, we will extend to explain how to make a VPN link between LAN_1 and LAN_2 in this chapter. The following Figure 10-1 is the real structure in our implemented process.

10.1 Demands

1. When a branch office subnet LAN_1 wants to connect with another branch office subnet LAN_2 through the public Internet instead of the expensive private leased lines, VPN can provide encryption and authentication to secure the tunnel that connects these two LANs.

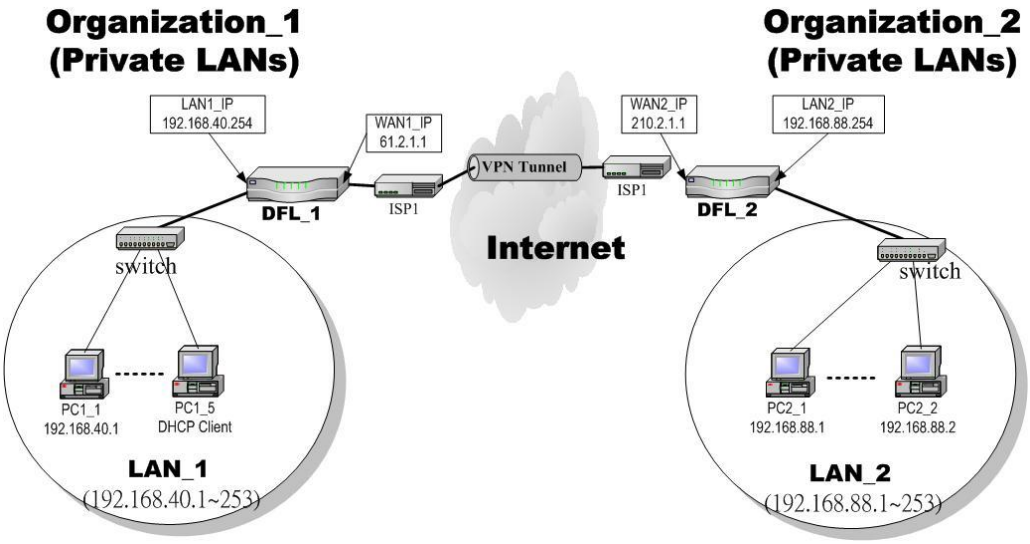


Figure 10-1 Organization_1 LAN_1 is making VPN tunnel with Organization_2 LAN_2

10.2 Objectives

1. Let the users in LAN_1 and LAN_2 share the resources through a secure channel established using the public Internet.

10.3 Methods

1. Separately configure DFL-1 and DFL-2 which are the edge gateways of LAN_1 and LAN_2 respectively. You have to determine a key management method between IKE (Internet Key Exchange) and Manual Key. The following table compares the settings between IKE and Manual Key. In the following, we will describe them separately.

	IKE	Manual Key
Same	"Local Address" means the local LAN subnet; "Remote Address" means the remote LAN subnet; "My IP Address" means the WAN IP address of the local VPN gateway while the "Peer's IP Address" means the WAN IP address of the other VPN gateway.	

Difference	The “Pre-Shared Key” must be the same at both DFL-900s.	The types and keys of “Encryption” and “Authenticate” must be set the same on both DFL-900s. However, the “Outgoing SPI” at DFL-1 must equal to “Incoming SPI” at DFL-2, and the “Outgoing SPI” at DFL-2 must equal to “Incoming SPI” at DFL-1.

Table 10-1 Compared IKE and Manual Key methods

10.4 Steps

In the following we will separately explain the ways to set up a secure DES/MD5 tunnel with IKE and Manual key.

➢ DES/MD5 IPSec tunnel: the IKE way

At DFL-1:

At the first, we will install the IPSec properties of DFL-1.

Step 2. Enable IPSec Check the `Enable IPSec` checkbox and click `Apply`.	**ADVANCED SETTINGS > VPN Settings > IPSec** 

FIELD	DESCRIPTION	EXAMPLE
Enable IPSec	Enable IPSec feature of DFL-900	Enabled
BUTTON	DESCRIPTION	
Apply	Apply the settings which have been configured.	

Table 10-2 Enable the IPSec feature

Step 3. Add an IKE rule Click the `IKE` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.	**ADVANCED SETTINGS > VPN Settings > IPSec > IKE** 

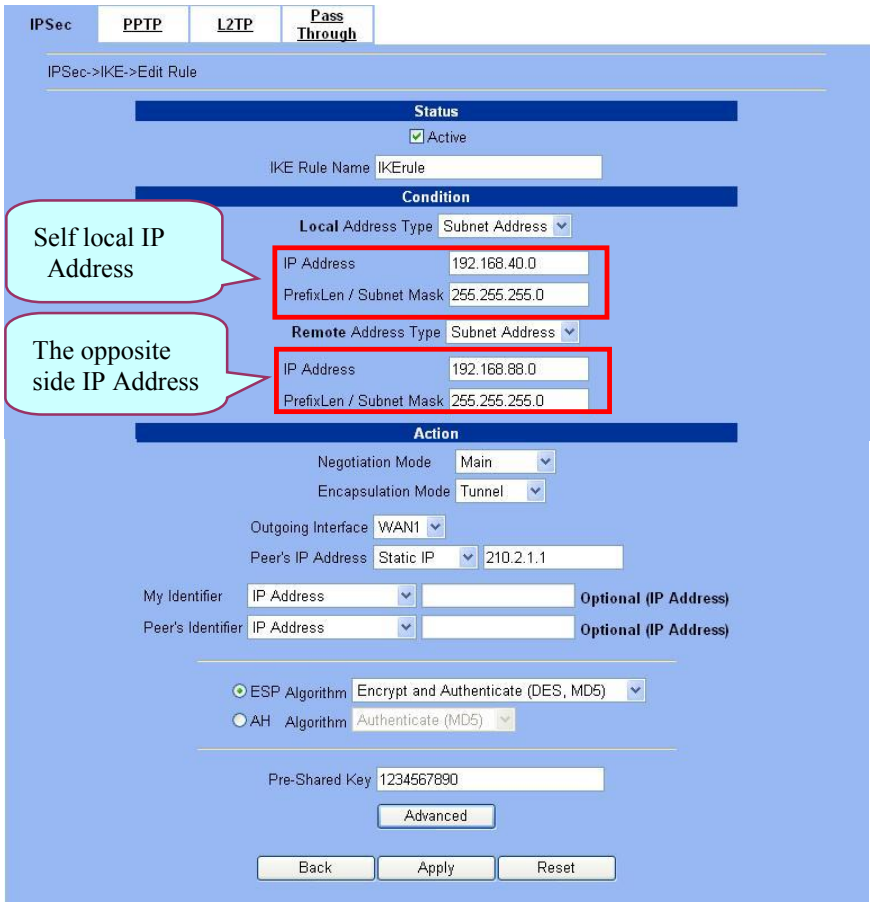
FIELD	DESCRIPTION	EXAMPLE
IKE	Use the IKE (Internet Key Exchange) method to negotiate the key used in building IPSec tunnel.	Selected
Manual Key	Use the key which you have been designated to build IPSec tunnel in peer VPN device.	Non selected
BUTTON	DESCRIPTION	
Prev. Page	If there are more than one action pages, you can press Prev. Page to back to the previous page.	
Next Page	If there are more than one action pages, you can press Next Page to go to the next page.	
Add	Insert a new IPSec rule.	
Edit	Edit the properties of the indicated IPSec rule.	
Delete	Delete the indicated IPSec rule.	

Table 10-3 Add an IPSec policy rule

Step 4. Customize the rule

Check the `Active` checkbox. Enter a name for this rule like `IKErule`. Enter the `Local IP Address` (`192.168.40.0/255.255.255.0`) and the `Remote IP Address` (`192.168.88.0/255.255.255.0`). Select the `Outgoing Interface` of this VPN/Firewall Router. Enter the public IP of the opposite-side VPN gateway (`210.2.1.1`) in the `Peer's IP Address`. Click the `ESP Algorithm` and select `Encrypt and Authenticate (DES, MD5)`. Enter the `Pre-Shared Key` as `1234567890`. Click the `Apply` button to store the settings. Note, In the Action region. It should choose either `ESP Algorithm` or `AH Algorithm`, or system will show error message. If you hope to set the detailed item of IKE parameter. Click the Advanced button in this page. Otherwise it is ok to just leave the value default.

ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Status	Active	This field will activate this IPSec policy rule	Enable/Disable	Enabled
	IKE Rule Name	The name of this IPSec policy	text string	IKErule
Condition	Local Address Type	Determine the method to connect to the remote side of VPN by using the local subnet or the local single host.	Subnet Address / Single Address	Subnet Address
	IP Address	The local IP address	IPv4 format	192.168.40.0
	Prefix Len/Subnet Mask	The local IP Netmask	IPv4 format	255.255.255.0
	Remote Address Type	Determine the method to connect to the local side of VPN by using the remote subnet or the remote single host.	Subnet Address / Single Address	Subnet Address
	IP Address	The remote IP address	IPv4 format	192.168.88.0
	Prefix Len/Subnet Mask	The remote IP Netmask	IPv4 format	255.255.255.0
Action	Negotiation Mode	Choose Main or Aggressive mode, see Chapter 9 for details.	Main / Aggressive	Main
	Encapsulation Mode	Choose Tunnel or Transport mode, see Chapter 9 for details.	Tunnel / Transport	Tunnel
	Outgoing Interface	The WAN interface you are going to build IPSec tunnel with.	WAN interfaces	WAN1
	Peer's IP Address	The IP address of remote VPN device. The IP address may be fixed (Static) or dynamic.	Static IP / Dynamic IP	Static IP 210.2.1.1
	My Identifier	Fill your information in this field. The filled information will be provided for the IPSec tunnel establishment.	IP Address / FQDN (domain name) / User FQDN (mail box)	IP Address
	Peer's Identifier	Fill the information of peer VPN device in this field. The filled information will be provided for the IPSec tunnel establishment.	IP Address / FQDN (domain name) / User FQDN (mail box)	IP Address

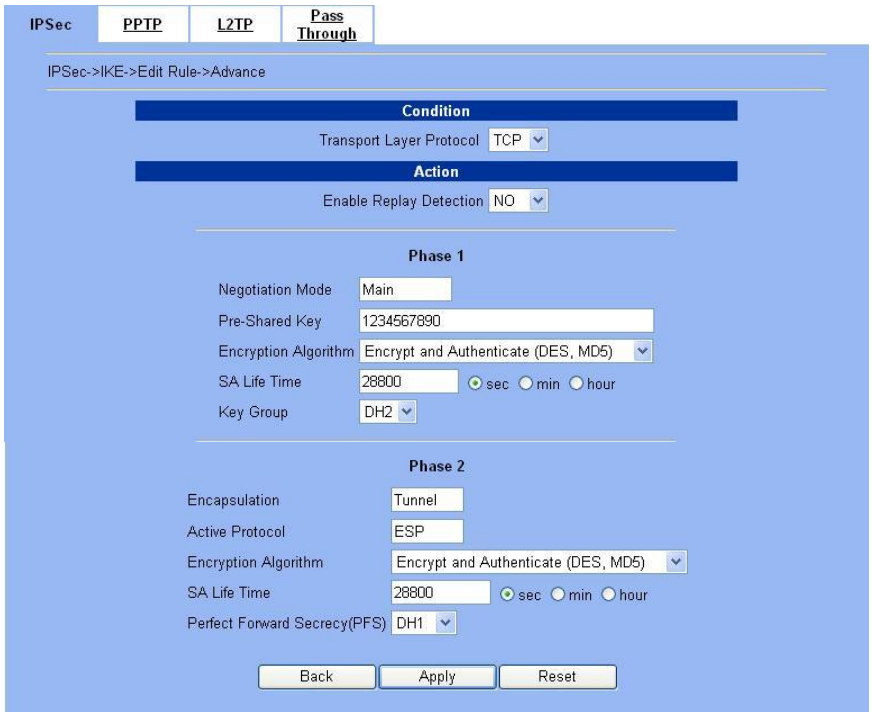
	ESP Algorithm	ESP Algorithm may be grouped by the items of the Encryption and Authentication Algorithms or execute separately. We can select below items, the Encryption and Authentication Algorithm combination or the below item Authentication Algorithm singly. Here Encryption Algorithms include DES(64 bits), 3DES(192 bits) and AES(128/192/256 bits) Authentication Algorithms include MD5(128 bits) and SHA1(160 bits)	Encrypt and Authenticate (DES, MD5) / Encrypt and Authenticate (DES, SHA1) / Encrypt and Authenticate (3DES, MD5) / Encrypt and Authenticate (3DES, SHA1) / Encrypt and Authenticate (AES, MD5) / Encrypt and Authenticate (AES, SHA1) / Encrypt only (DES) / Encrypt only (3DES) / Encrypt only (AES) / Authenticate only (MD5) / Authenticate only (SHA1)	Encrypt and Authenticate (DES, MD5)
	AH Algorithm	Select Authentication Algorithm	Authenticate (MD5) / Authenticate (SHA1)	Disabled
	Pre-Shared Key	The key which is pre-shared with remote side.	text string	1234567890

Table 10-4 Related field explanation of adding an IPSec policy rule

Step 5. Detail settings of IPSec IKE

In this page, we will set the detailed value of IKE parameter. Fill in the related field as Table 10-5 indicated to finish these settings.

ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add > Advanced



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Condition	Transport Layer Protocol	Utilize this field to select some packets which are specified protocol (ANY, TCP, UDP). If the packets are not the specified protocol will not be allowed to pass through IPSec tunnels.	ANY / TCP / UDP	TCP
Action	Enable Replay Detection	Whether is the “Replay Detection” enabled?	NO / YES	NO
	Phase1			
	Negotiation Mode	View only, it is set previously and can not be edited again.	Can not be edited	Main
	Pre-Shared Key	View only, it is set previously and can not be edited again.	Can not be edited	1234567890
	Encryption Algorithm	Choose a type of encryption and authentication algorithm combination.	Encrypt and Authenticate (DES, MD5) / Encrypt and Authenticate (DES, SHA1) / Encrypt and Authenticate (3DES, MD5) / Encrypt and Authenticate (3DES, SHA1)	Encrypt and Authenticate (DES、MD5)
	SA Life Time	Set the IKE SA lifetime. A value of 0 means IKE SA negotiation never times out. See Chapter 9 for details.	0 ~ 9999999999 sec/min/hour	28800 sec

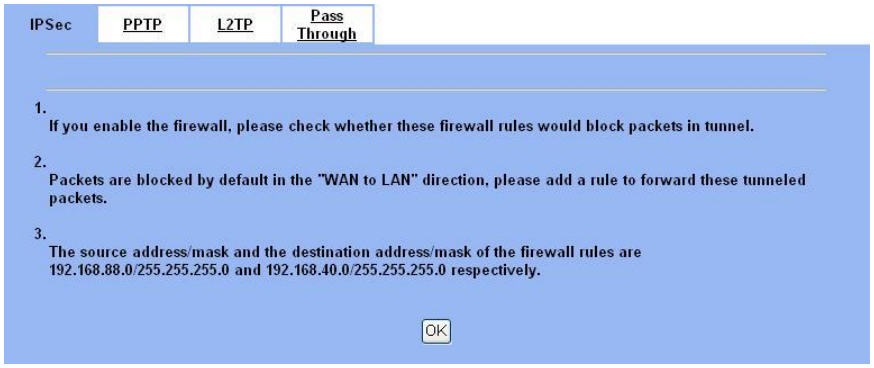
	Key Group	Choose a Diffie-Hellman public-key cryptography key group	DH1 / DH2 / DH5	DH2
	Phase2			
	Encapsulation	View only, it is set previously and can not be edited again.	Can not be edited	Tunnel
	Active Protocol	View only, it is set previously and can not be edited again.	Can not be edited	ESP
	Encryption Algorithm	Choose a type of encryption and authentication algorithm combination or singly.	Encrypt and Authenticate (DES, MD5) / Encrypt and Authenticate (DES, SHA1) / Encrypt and Authenticate (3DES, MD5) / Encrypt and Authenticate (3DES, SHA1) / Encrypt and Authenticate (AES, MD5) / Encrypt and Authenticate (AES, SHA1) / Encrypt only (DES) / Encrypt only (3DES) / Encrypt only (AES) / Authenticate only (MD5) / Authenticate only (SHA1)	Encrypt and Authenticate (DES、MD5)
	SA Life Time	Set the IPSec SA lifetime. A value of 0 means IKE SA negotiation never times out. See Chapter 9 for details.	0 ~ 9999999999 sec/min/hour	28800 sec
	Perfect Forward Secrecy(PFS)	Enabling PFS means that the key is transient. This extra setting will cause more security.	None / DH1 / DH2 / DH5	DH1

Table 10-5 Setup Advanced feature in the IPSec IKE rule

Step 6. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the OK button to add a firewall rule.

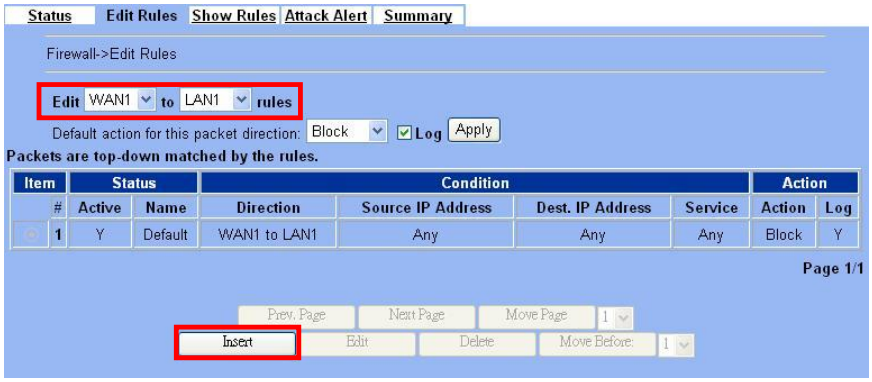
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 7. Add a Firewall rule

Beforehand, please make sure that the Firewall is enabled. Select `WAN1`-to-`LAN1` to display the rules of this direction. The default action of this direction is `Block` with `Logs`. We have to allow the VPN traffic from the WAN1 side to enter our LAN1 side. So we click the `Insert` button to add a Firewall rule before the default rule.

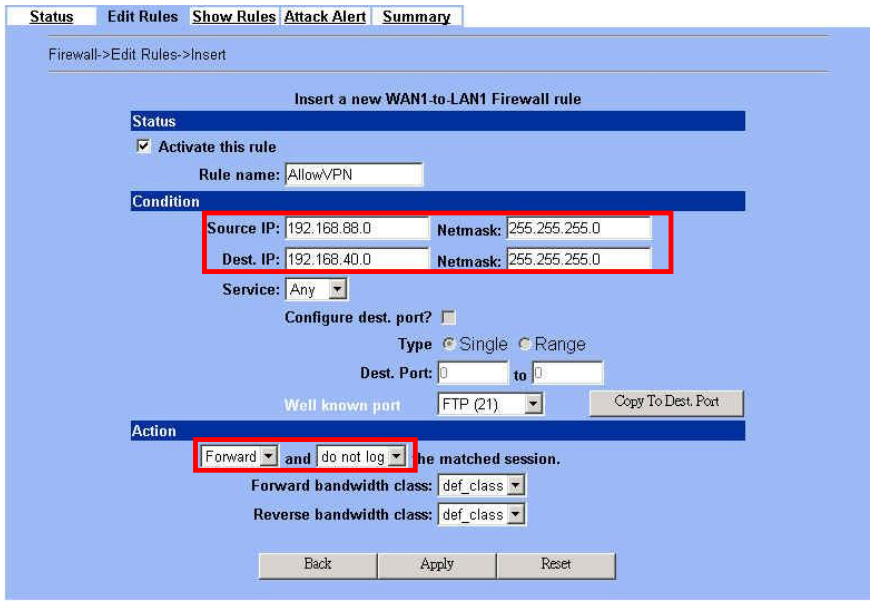
ADVANCED SETTINGS > Firewall > Edit Rules



Step 8. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowVPN`, `Source IP` as `192.168.88.0`, and `Dest. IP` as `192.168.40.0`. Click `Apply` to store this rule.

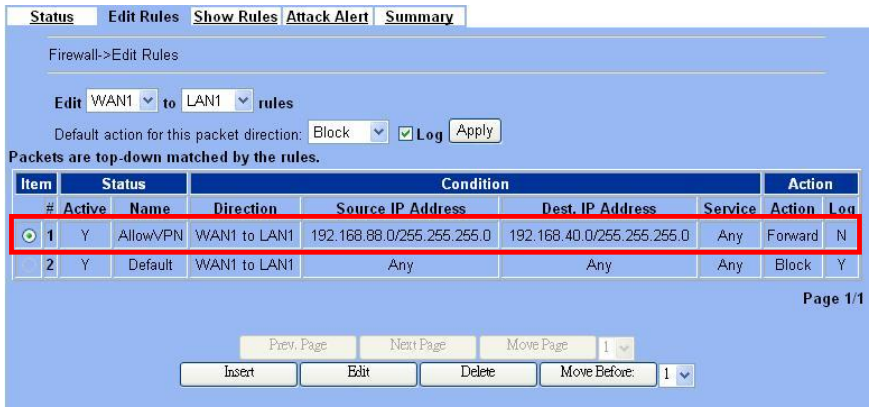
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 9. View the result

Here we have a new rule before the default firewall rule. This rule will allow packets from 192.168.88.0 / 255.255.255.0 pass through DFL-900. And accomplish the VPN tunnel establishment.

ADVANCED SETTINGS > Firewall > Edit Rules



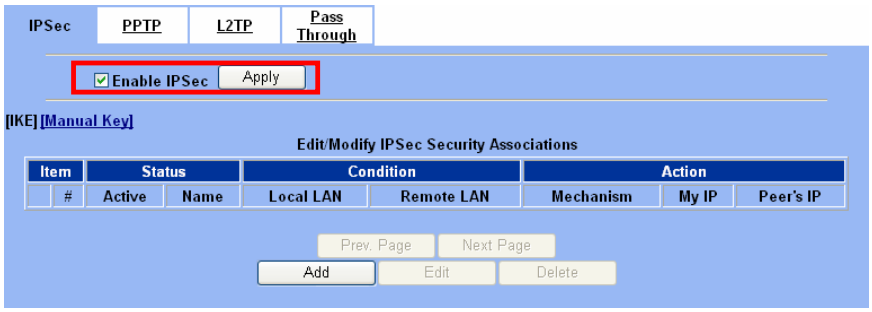
At DFL-2:

Here we will install the IPSec properties of DFL-2. Note that the "Local Address" and "Remote address" field are opposite to the DFL-1, and so are "My IP Address" and "Peer's IP Address" field.

Step 10. Enable IPSec

Check the `Enable IPSec` checkbox and click `Apply`.

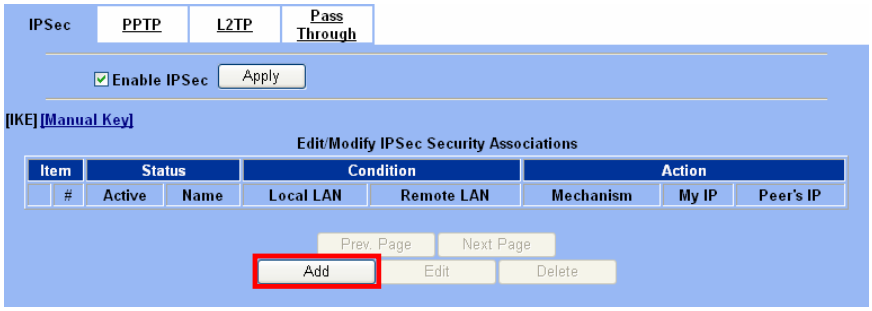
ADVANCED SETTINGS > VPN Settings > IPSec



Step 11. Add an IKE rule

Click the `IKE` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.

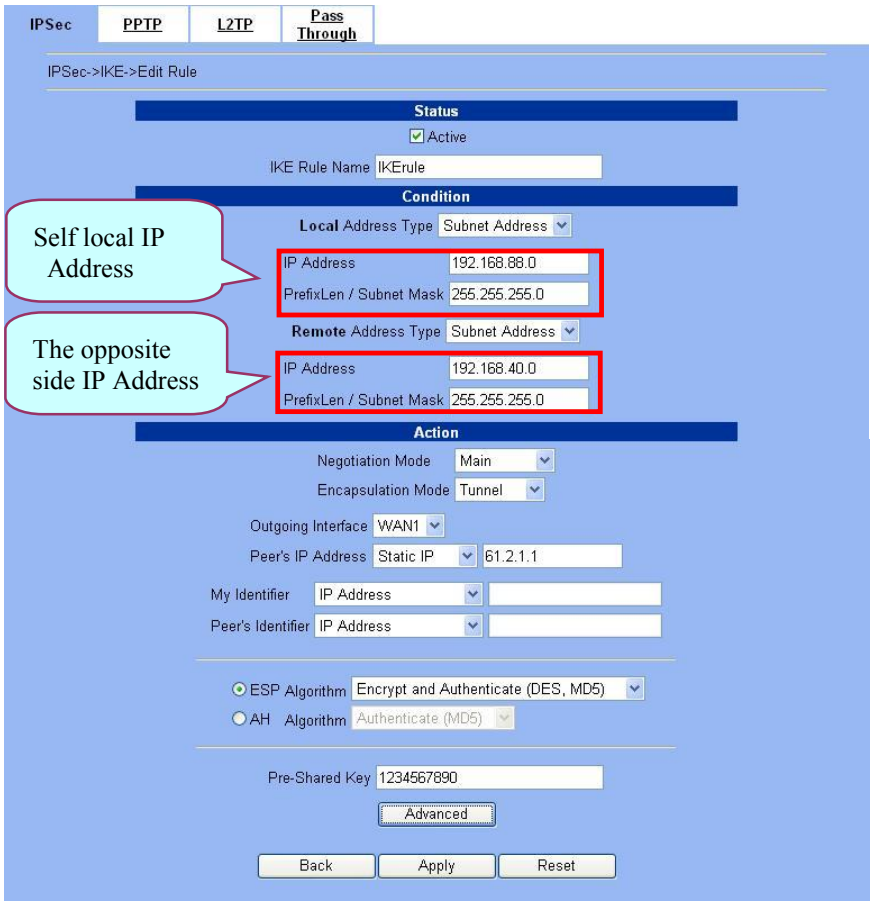
ADVANCED SETTINGS > VPN Settings > IPSec > IKE



Step 12. Customize the rule

Check the `Active` checkbox. Enter a name for this rule like `IKErule`. Enter the `Local IP Address` (`192.168.88.0/255.255.255.0`) and the `Remote IP Address` (`192.168.40.0/255.255.255.0`). Select the `Outgoing interface` of this VPN/Firewall Router. Enter the public IP of the opposite-side VPN gateway (`61.2.1.1`) in the `Peer's IP Address`. Click the `ESP Algorithm` and select `Encrypt and Authenticate (DES, MD5)`. Enter the `Pre-Shared Key` as `1234567890`. Click the `Apply` button to store the settings. Note, in the Action region, you should choose either ESP Algorithm or AH Algorithm, or system will show error message.

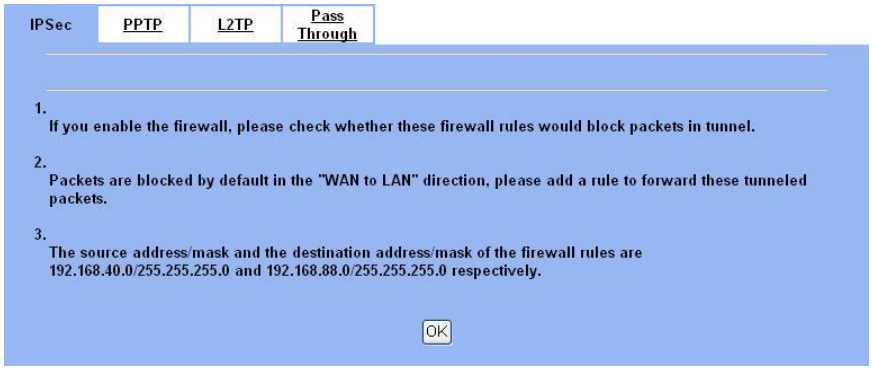
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 13. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the `OK` button to add a firewall rule.

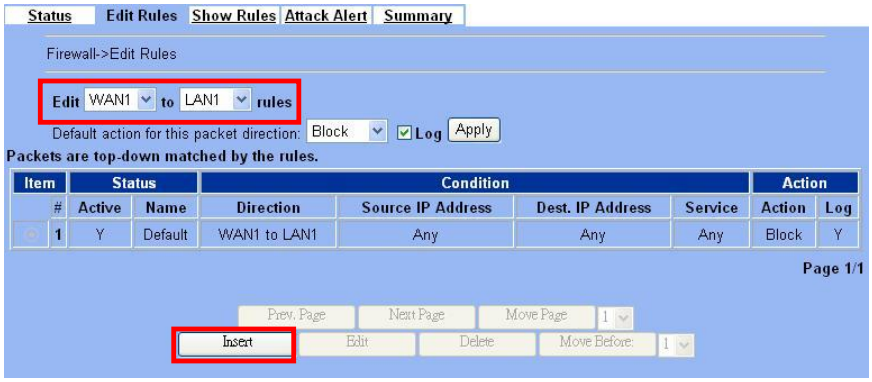
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 14. Add a Firewall rule

Same as at DFL-1. We need to add an extra firewall rule to allow IPSec packets to come from internet. So here we select `WAN1-to-LAN1` direction, and click `Insert` button.

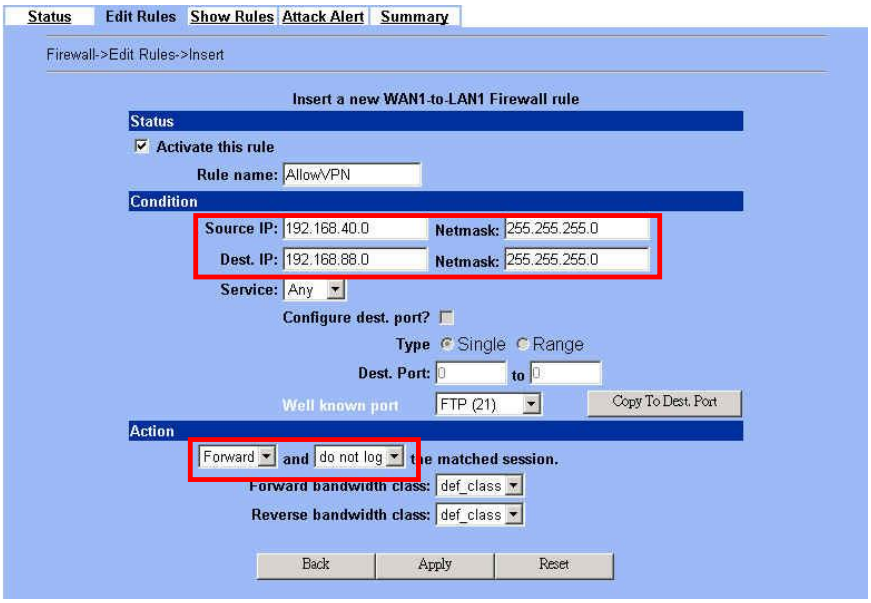
ADVANCED SETTINGS > Firewall > Edit Rules

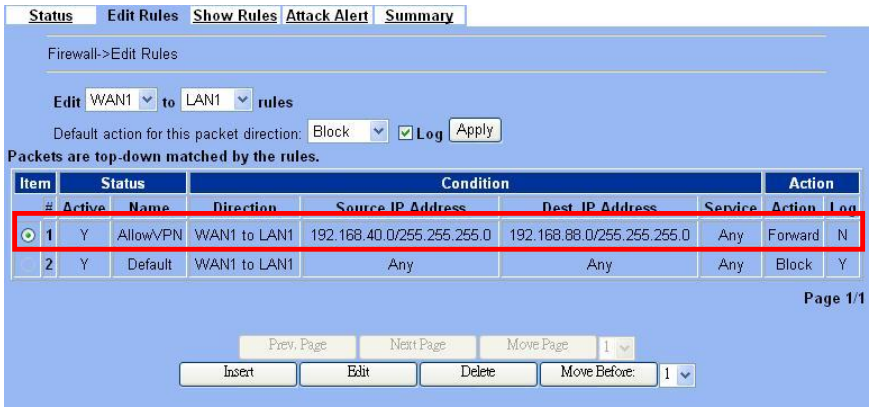


Step 15. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowVPN`, `Source IP` as `192.168.40.0`, and `Dest. IP` as `192.168.88.0`. Click `Apply` to store this rule.

ADVANCED SETTINGS > Firewall > Edit Rules > Insert



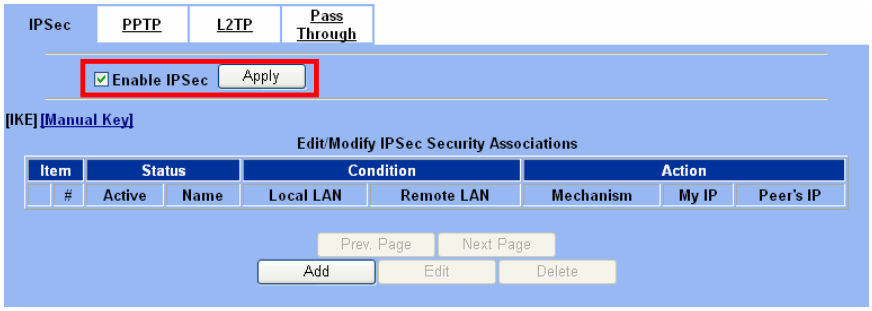
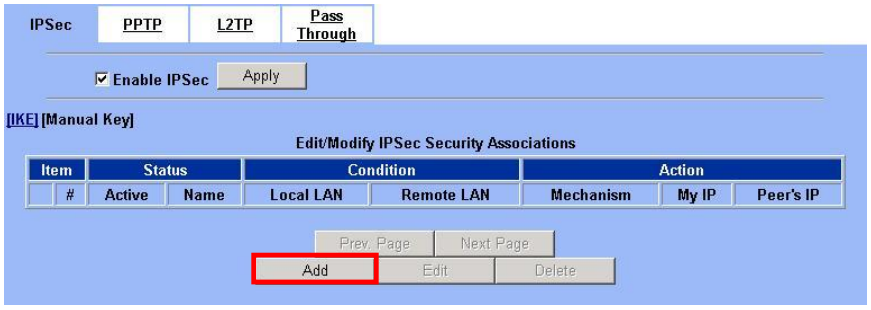
Step 16. View the result Now we have inserted a new rule before the default firewall rule. Any packets from `192.168.40.0/24` to `192.168.88.0/24` will be allowed to pass through the DFL-900 and successfully access the `192.168.88.0/24` through the VPN tunnel.	**ADVANCED SETTINGS > Firewall > Edit Rules** 

➢ DES/MD5 IPSec tunnel: the Manual-Key way

In the previous section, we have introduced IKE method. Here we will introduce another method using Manual-Key way instead of IKE to install DFL-1.

At DFL-1:

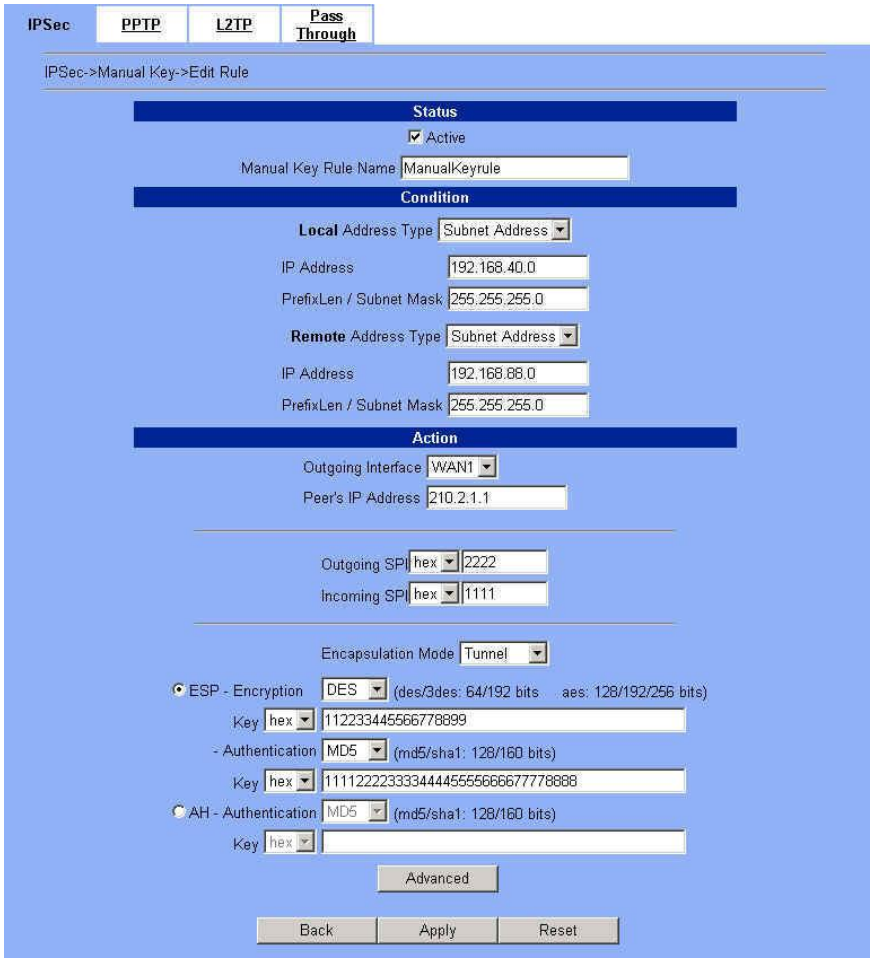
At the first, we will use the Manual-Key way to install the IPSec properties of DFL-1.

Step 1. Enable IPSec Check the `Enable IPSec` checkbox and click `Apply`.	**ADVANCED SETTINGS > VPN Settings > IPSec** 
Step 2. Add a Manual Key rule Click the `Manual Key` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.	**ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key** 

Step 3. Customize the rule

Same as those in IKE. But there is no pre-shared key in the manual-key mode. Enter the `Key` for encryption, such as `1122334455667788`. Enter the `Key` for authentication, such as `11112222333344445555666677778888`. Additionally, the `Outgoing SPI` and `Incoming SPI` have to be manually specified. Enter `2222` and `1111` respectively to the `Outgoing SPI` and the `Incoming SPI`. Click `Apply` to store the rule.

ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key > Add



	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Status	Active	This field will activate this IPSec policy rule	Enable / Disable	Enabled
	Manual Key Rule Name	The name of this IPSec policy	text string	ManualKeyrule
Condition	Local Address Type	Determine the method to connect to the remote side of VPN by using the local subnet or the local single host.	Subnet Address / Single Address	Subnet Address
	IP Address	The local IP address	IPv4 format	192.168.40.0
	PrefixLen / Subnet Mask	The local IP Netmask	IPv4 format	255.255.255.0
	Remote Address Type	Determine the method to connect to the local side of VPN by using the remote subnet or the remote single host.	Subnet Address / Single Address	Subnet Address
	IP Address	The remote IP address	IPv4 format	192.168.88.0
	PrefixLen / Subnet Mask	The remote IP Netmask	IPv4 format	255.255.255.0

Action	Outgoing Interface	The WAN interface you are going to build IPSec tunnel with.	WAN interfaces	WAN1
	Peer's IP Address	The IP address of remote site device, like DFL-900 VPN/Firewall Router.	IPv4 format	210.2.1.1
	Outgoing SPI	The Outgoing SPI (Security Parameter Index) value.	hex(600 ~ 600000) / dec(1500 ~ 6300000)	hex: 2222
	Incoming SPI	The Incoming SPI (Security Parameter Index) value.	hex(600 ~ 600000) / dec(1500 ~ 6300000)	hex: 1111
	Encapsulation Mode	Choose Tunnel or Transport mode, see Chapter 9 for details.	Transport / Tunnel	Tunnel
	ESP – Encryption / Authentication	Select the Encryption (DES, 3DES, AES or Null) and Authentication (MD5, SHA1 or NULL) Algorithm combination. And enter the key either hex or string form separately. Notice: You can not select both Encryption and Authentication "NULL" type.	Encryption: DES(64bits) / 3DES(192bits) / AES(128, 192, 256bits) / NULL Authentication: MD5(128bits) / SHA1(160bits) / NULL Input format: hex{0-9,a-f,A-F}/ str{text string}	ESP – Encryption (DES) / Authentication (MD5)
	AH - Authentication	Use the Authentication method only. And enter the key either hex or string form.	MD5(128bits) / SHA1(160bits) Input format: hex{0-9,a-f,A-F}/ str{text string}	Disabled

Table 10-6 Add a IPSec Manual Key rule

Step 4. Detail settings of IPSec Manual Key For the detailed setting in the Manual Key. We can press the `Advanced` button in the previous page. Then set the parameter separately.	**ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key > Add > Advanced** 

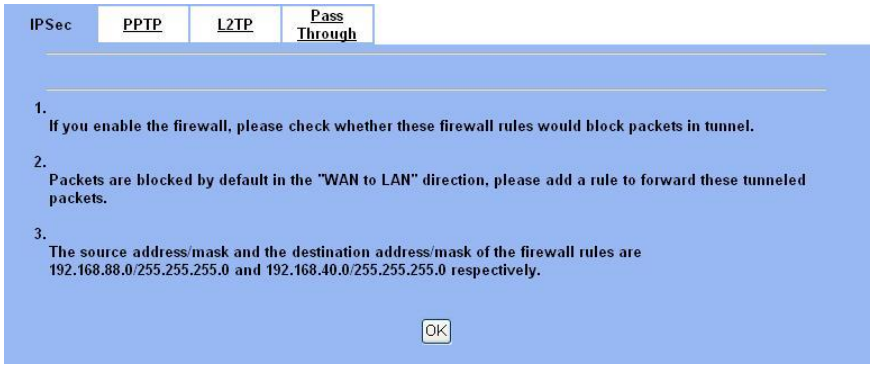
	FIELD	DESCRIPTION	Range / Format	EXAMPLE
Condition	Transport Layer Protocol	Utilize this field to select some packets which are specified protocol (ANY, TCP, UDP). If the packets are not the specified protocol will not be allowed to pass through IPSec tunnels.	ANY / TCP / UDP	ANY
Action	Enable Replay Detection	Whether is the "Replay Detection" enabled ?	NO / YES	NO

Table 10-7 Setup Advanced feature in the IPSec Manual Key rule

Step 5. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the `OK` button to add a firewall rule.

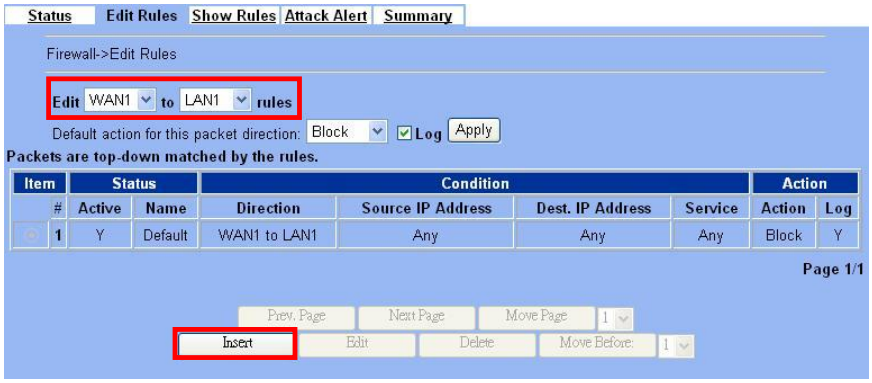
ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key > Add



Step 6. Add a Firewall rule

Same as that in IKE method. Please make sure that the Firewall is enabled. Select `WAN1`-to-`LAN1` to display the rules of this direction. The default action of this direction is `Block` with `Logs`. We have to allow the VPN traffic from the WAN1 side to enter our LAN1 side. So we click the `Insert` button to add a Firewall rule before the default rule.

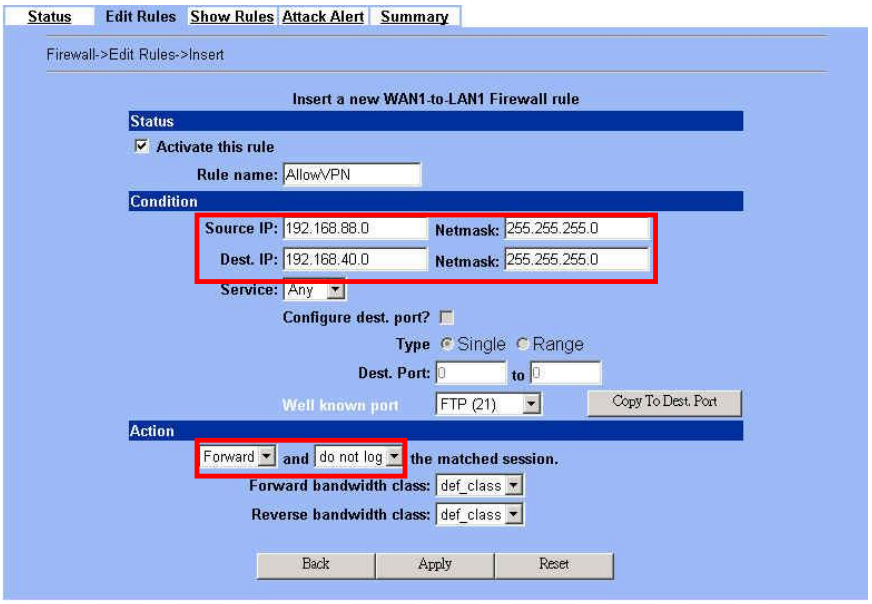
ADVANCED SETTINGS > Firewall > Edit Rules



Step 7. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowVPN`, `Source IP` as `192.168.88.0`, and `Dest. IP` as `192.168.40.0`. Click `Apply` to store this rule.

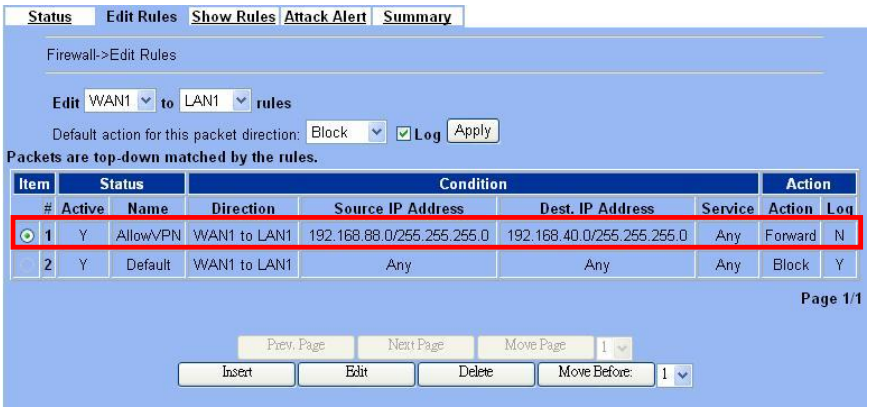
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 8. View the result

Here we have a new rule before the default firewall rule. This rule will allow packets from 192.168.88.0 / 255.255.255.0 pass through DFL-900. And accomplish the VPN tunnel establishment.

ADVANCED SETTINGS > Firewall > Edit Rules



At DFL-2:

Second, we will use the Manual-Key way to install the IPSec properties of DFL-1.

Step 1. Enable IPSec

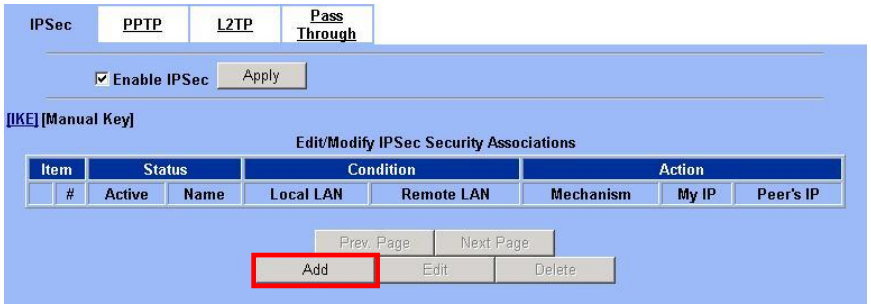
Check the `Enable IPSec` checkbox and click `Apply`.

ADVANCED SETTINGS > VPN Settings > IPSec

Step 2. Add a Manual Key rule

Click the `Manual Key` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.

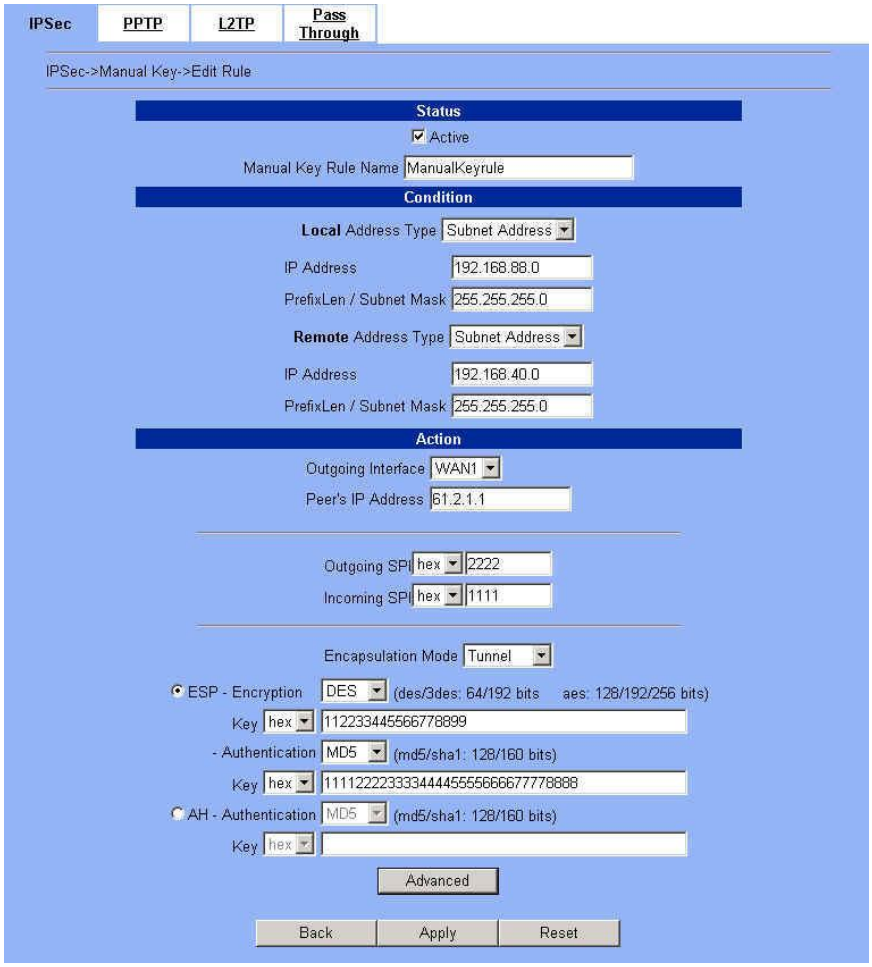
ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key



Step 3. Customize the rule

Similar to those in DFL-1, except that you should interchange the `Local IP Address` with `Remote IP Address` in the `Condition` part and the `Outgoing SPI` with the `Incoming SPI` in the `Action` part. `Besides, set` the `Peer's IP Address` with the WAN1 IP address of DFL-1.

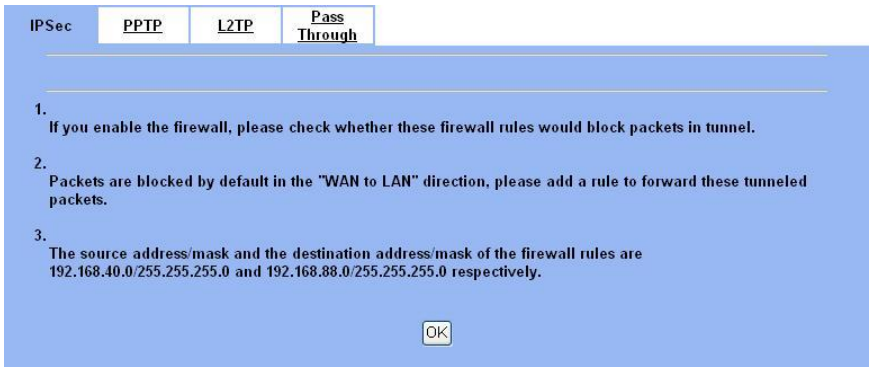
ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key > Add



Step 4. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the `OK` button to add a firewall rule.

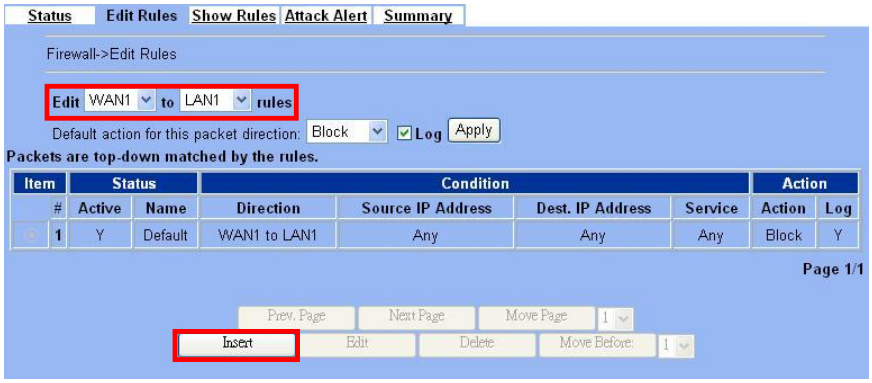
ADVANCED SETTINGS > VPN Settings > IPSec > Manual Key > Add



Step 5. Add a Firewall rule

Same as that in IKE method. Please make sure that the Firewall is enabled. Select `WAN1`-to-`LAN1` to display the rules of this direction. The default action of this direction is `Block` with `Logs`. We have to allow the VPN traffic from the WAN1 side to enter our LAN1 side. So we click the `Insert` button to add a Firewall rule before the default rule.

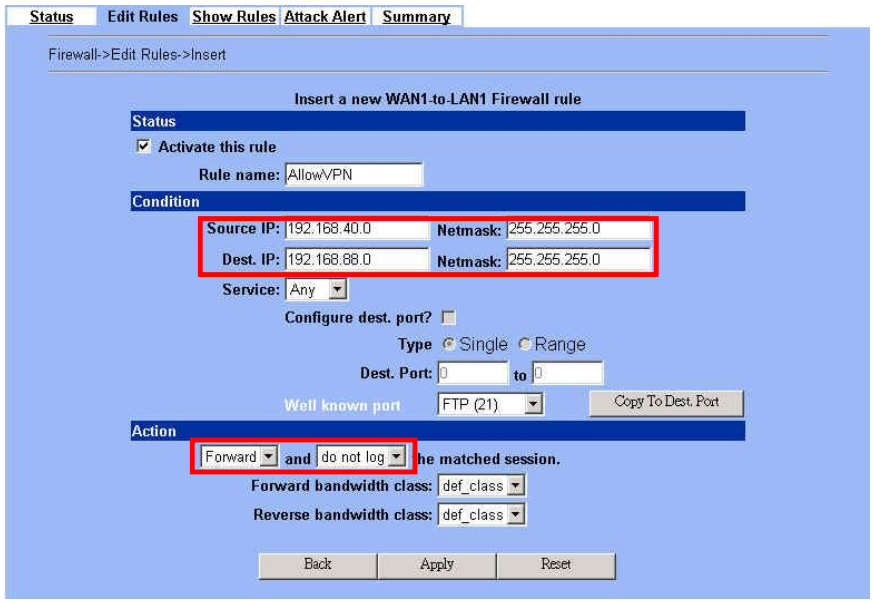
ADVANCED SETTINGS > Firewall > Edit Rules



Step 6. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowVPN`, `Source IP` as `192.168.40.0`, and `Dest. IP` as `192.168.88.0`. Click `Apply` to store this rule.

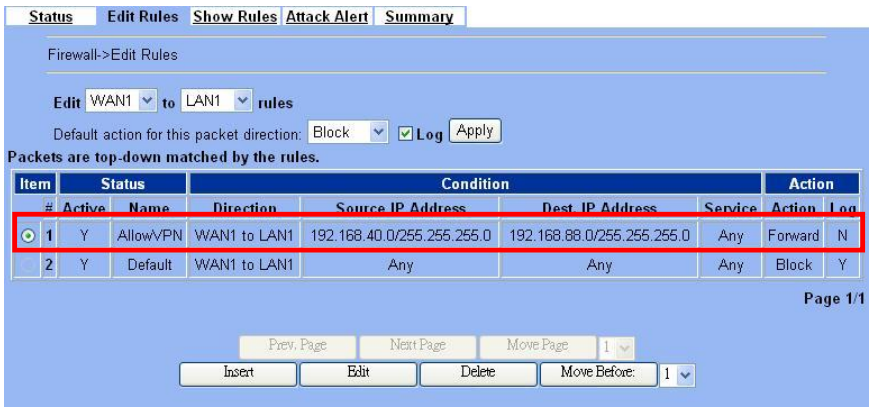
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 7. View the result

Now we have inserted a new rule before the default firewall rule. Any packets from `192.168.40.0/24` to `192.168.88.0/24` will be allowed to pass through the DFL-900 and successfully access the `192.168.88.0/24` through the VPN tunnel.

ADVANCED SETTINGS > Firewall > Edit Rules



Chapter 11
Virtual Private Network –Dynamic IPSec

This chapter introduces Dynamic IPSec VPN and explains how to implement it.

As described in the Figure 2-1, we will extend to explain how to make a dynamic VPN link between LAN_1 and LAN_2 in this chapter. The following Figure 11-1 is the real structure in our implemented process.

11.1 Demands

1. When a branch office subnet LAN_1 wants to connect with another branch office subnet LAN_2 through the public Internet instead of the expensive private leased lines, VPN can provide encryption and authentication to secure the tunnel that connects these two LANs. If the remote VPN peer has a dynamically assigned IP address (DHCP or PPPoE) like Organization_2, we have to use the Dynamic IPSec for the tunnel connection.

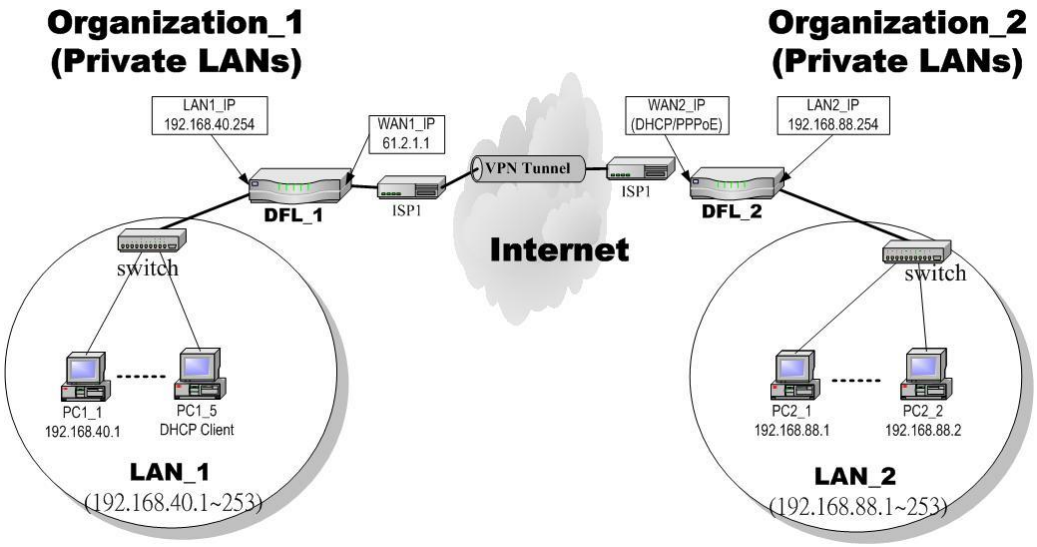


Figure 11-1 Organization_1 LAN_1 is making dynamic VPN tunnel with Organization_2 LAN_2

11.2 Objectives

1. Let the users in LAN_1 and LAN_2 share the resources through a secure channel established using the dynamic IPSec VPN.

11.3 Methods

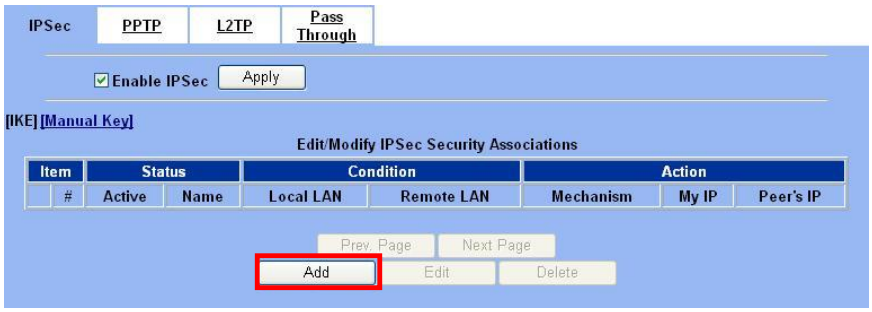
1. Separately configure DFL-1 and DFL-2 which are the edge gateways of LAN_1 and LAN_2 respectively.

11.4 Steps

In the following we will separately explain how to set up a secure DES/MD5 tunnel with the dynamic remote gateway IP address type.

At DFL-1:

At the first, we will install the IPSec properties of DFL-1. For the related explanation, please refer to Chapter 9 and Chapter 10.

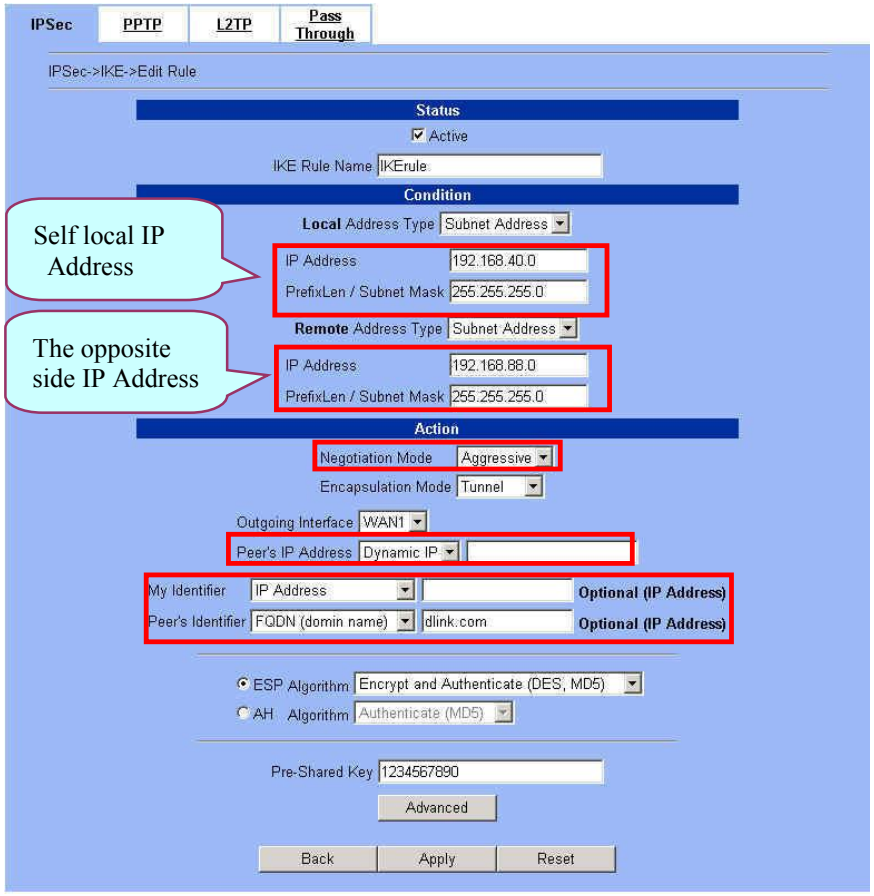
Step 1. Enable IPSec Check the `Enable IPSec` checkbox and click `Apply`.	**ADVANCED SETTINGS > VPN Settings > IPSec** 
Step 2. Add an IKE rule Click the `IKE` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.	**ADVANCED SETTINGS > VPN Settings > IPSec > IKE** 

Step 3. Customize the rule

Check the `Active` checkbox. Enter a name for this rule like `IKErule`. Enter the `Local IP Address` (`192.168.40.0/255.255.255.0`) and the `Remote IP Address` (`192.168.88.0/255.255.255.0`). Select the `Outgoing Interface` of this VPN/Firewall Router. Select `Dynamic IP` in the Peer's IP Address. Be sure to select `Aggressive` mode for the dynamic remote gateway address type. Click the `ESP Algorithm` and select `Encrypt and Authenticate (DES, MD5)`. Enter the `Pre-Shared Key` as `1234567890`. Click the `Apply` button to store the settings. Note, In the Action region. It should choose either `ESP Algorithm` or `AH Algorithm`, or system will show error message. If you hope to set the detailed item of IKE parameter. Click the Advanced button in this page. Otherwise it is ok to just leave the value default.

Note that `Peers Identifier` must NOT be IP Address type in the Dynamic IP type. So, you have to select `FQDN (domain name)` or `user FQDN (mailbox)` as the `Peer's Identifier`.

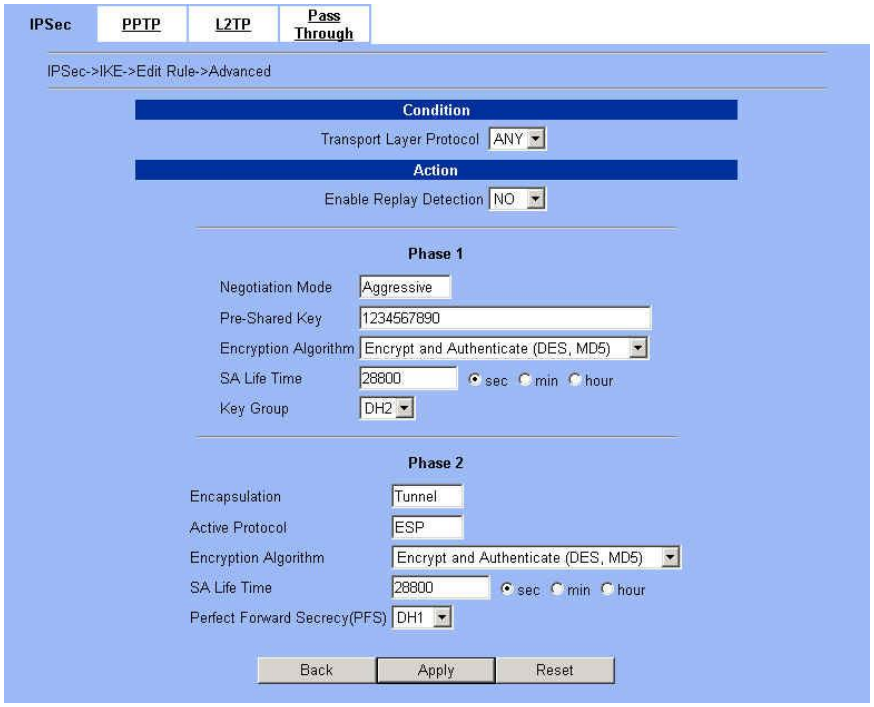
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 4. Detail settings of IPSec IKE

In this page, we will set the detailed value of IKE parameter. For the related field, please refer to Table 10-5 indicated.

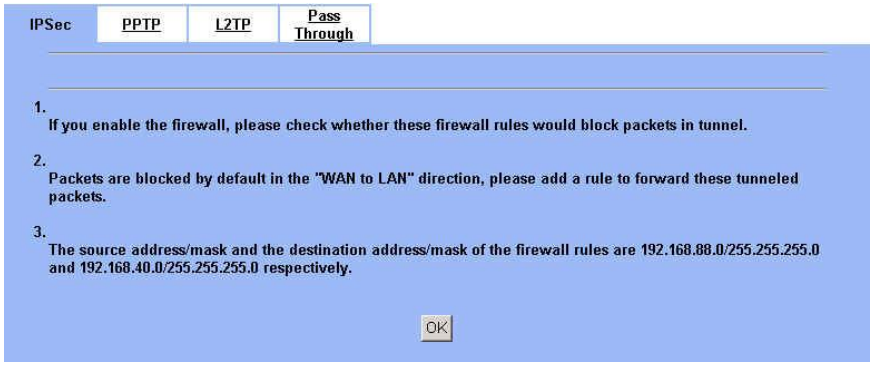
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add > Advanced



Step 5. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the `OK` button to add a firewall rule.

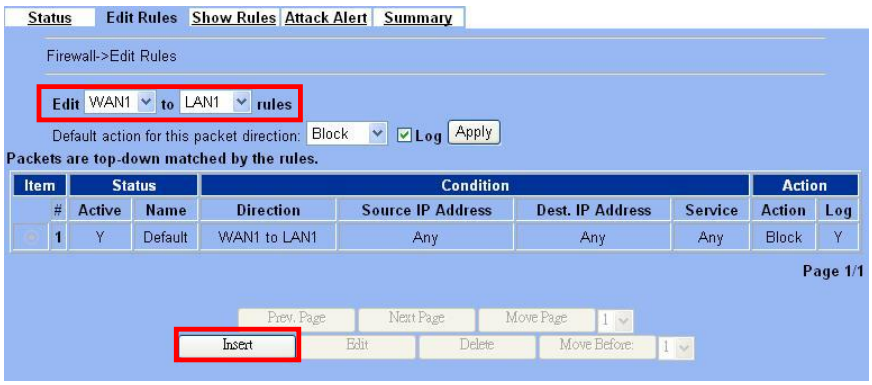
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 6. Add a Firewall rule

Beforehand, please make sure that the Firewall is enabled. Select `WAN1`-to-`LAN1` to display the rules of this direction. The default action of this direction is `Block` with `Logs`. We have to allow the VPN traffic from the WAN1 side to enter our LAN1 side. So we click the `Insert` button to add a Firewall rule before the default rule.

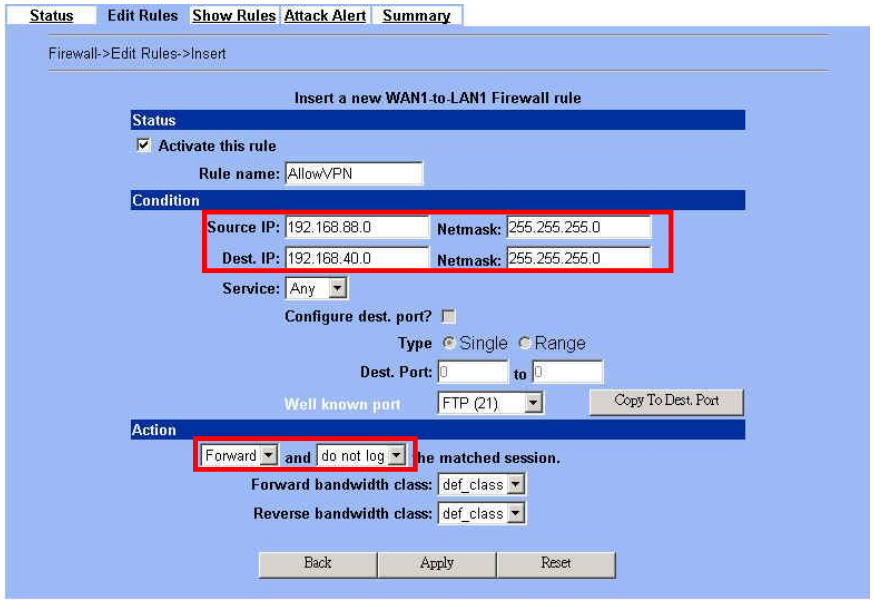
ADVANCED SETTINGS > Firewall > Edit Rules



Step 7. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowVPN`, `Source IP` as `192.168.88.0`, and `Dest. IP` as `192.168.40.0`. Click `Apply` to store this rule.

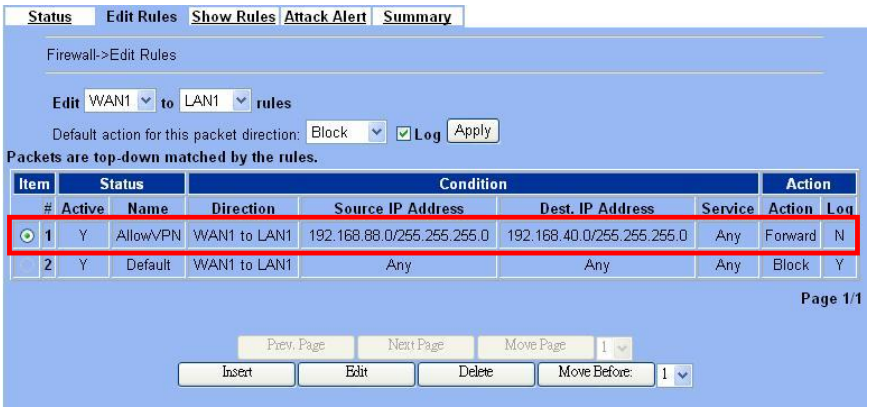
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 8. View the result

Here we have a new rule before the default firewall rule. This rule will allow packets from 192.168.88.0 / 255.255.255.0 pass through DFL-900. And accomplish the VPN tunnel establishment.

ADVANCED SETTINGS > Firewall > Edit Rules



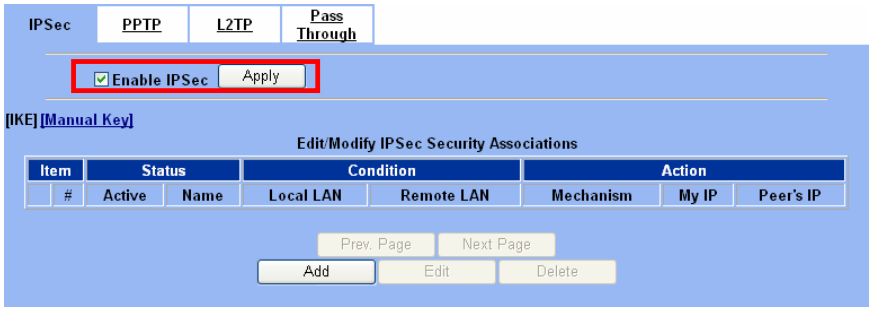
At DFL-2:

Here we will install the IPSec properties of DFL-2. Note that the "Local Address" and "Remote address" field are opposite to the DFL-1, and so are "My IP Address" and "Peer's IP Address" field.

Step 9. Enable IPSec

Check the `Enable IPSec` checkbox and click `Apply`.

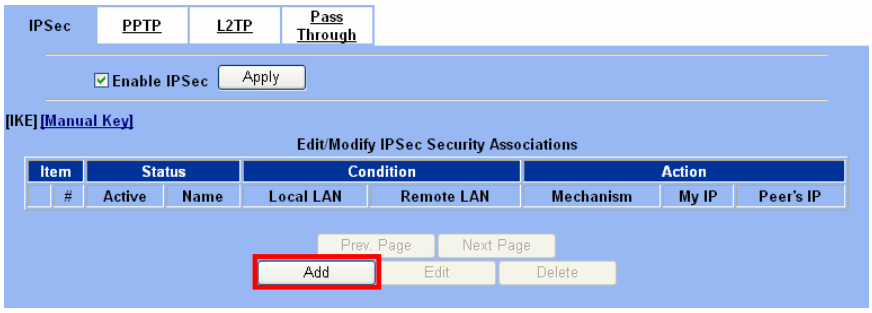
ADVANCED SETTINGS > VPN Settings > IPSec



Step 10. Add an IKE rule

Click the `IKE` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.

ADVANCED SETTINGS > VPN Settings > IPSec > IKE

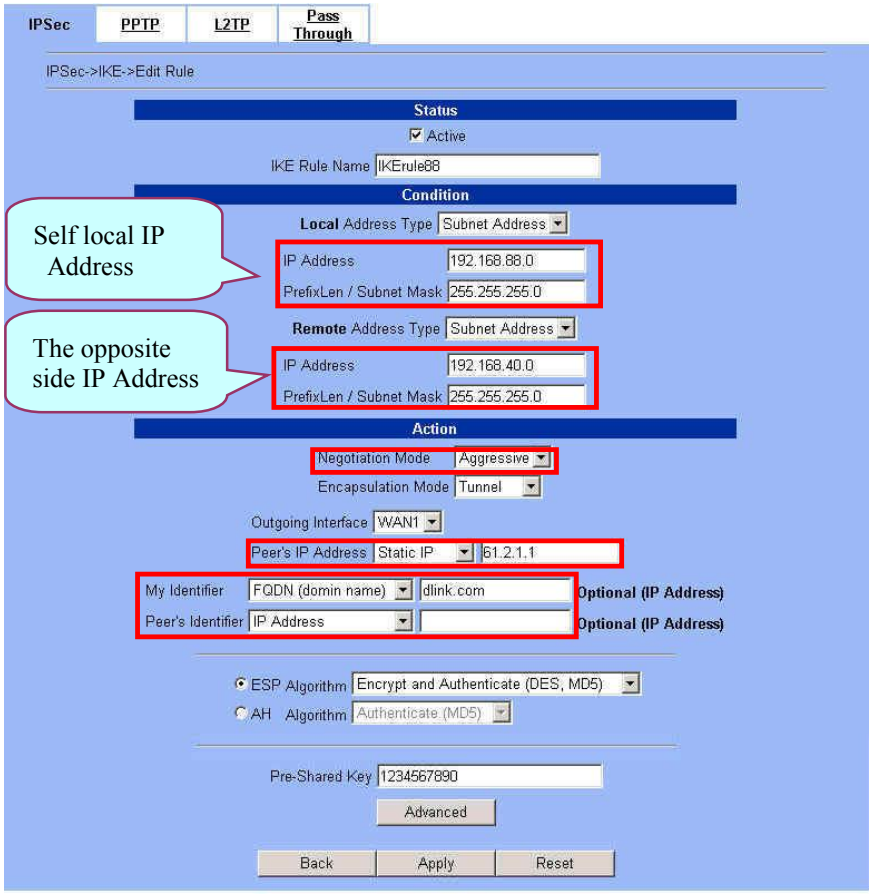


Step 11. Customize the rule

Check the `Active` checkbox. Enter a name for this rule like `IKErule`. Enter the `Local IP Address` (`192.168.88.0/255.255.255.0`) and the `Remote IP Address` (`192.168.40.0/255.255.255.0`). Be sure to select `Aggressive` mode to match the DFL-1 settings. Select the `Outgoing interface` of this VPN/Firewall Router. Enter the public IP of the opposite-side VPN gateway (`61.2.1.1`) in the `Peer's IP Address`. Click the `ESP Algorithm` and select `Encrypt and Authenticate (DES, MD5)`. Enter the `Pre-Shared Key` as `1234567890`. Select `User FQDN (mailbox)` and enter `dlink.com` in My Identifier field. Click the `Apply` button to store the settings. Note, in the Action region, you should choose either ESP Algorithm or AH Algorithm, or system will show error message.

Note that one of the Peer's IP Addresses is `Static IP`, and the other must be the `Dynamic IP` while using Dynamic IPSec VPN type to establish the VPN tunnel.

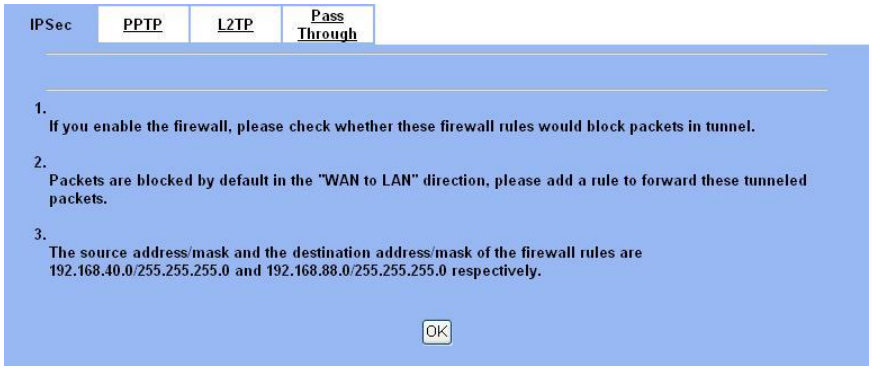
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 12. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the `OK` button to add a firewall rule.

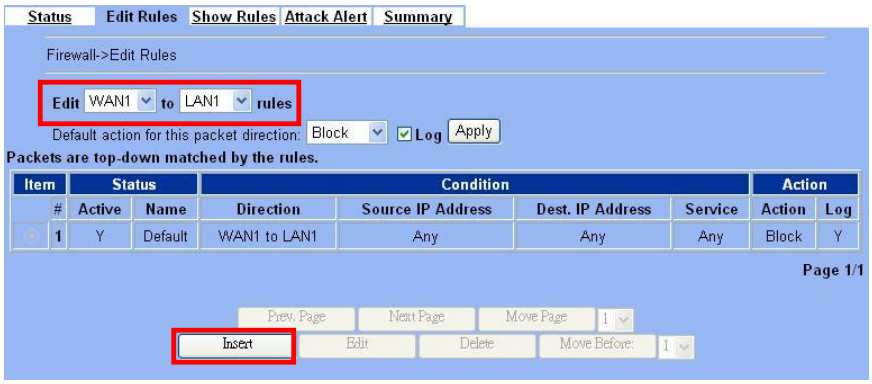
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 13. Add a Firewall rule

Same as at DFL-1. We need to add an extra firewall rule to allow IPSec packets to come from internet. So here we select `WAN1-to-LAN1` direction, and click `Insert` button.

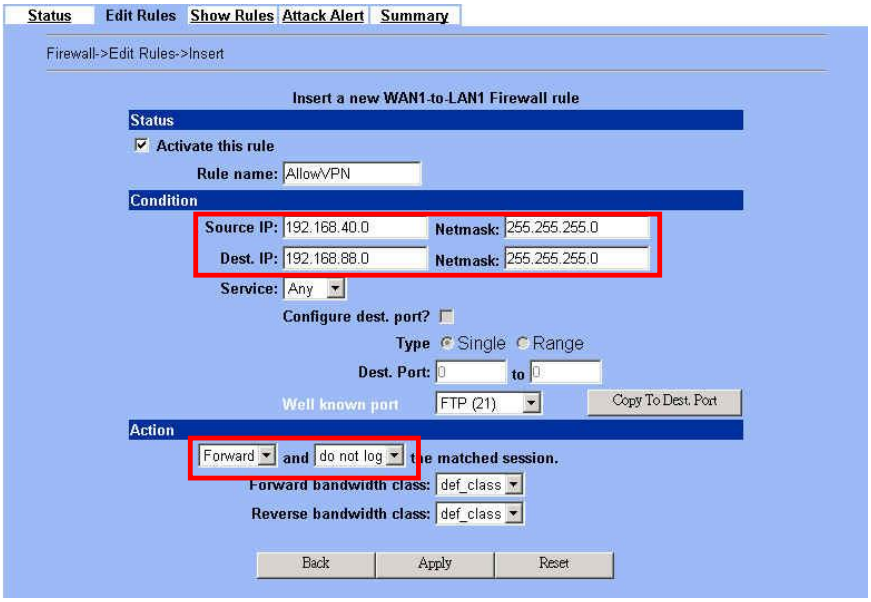
ADVANCED SETTINGS > Firewall > Edit Rules



Step 14. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowVPN`, `Source IP` as `192.168.40.0`, and `Dest. IP` as `192.168.88.0`. Click `Apply` to store this rule.

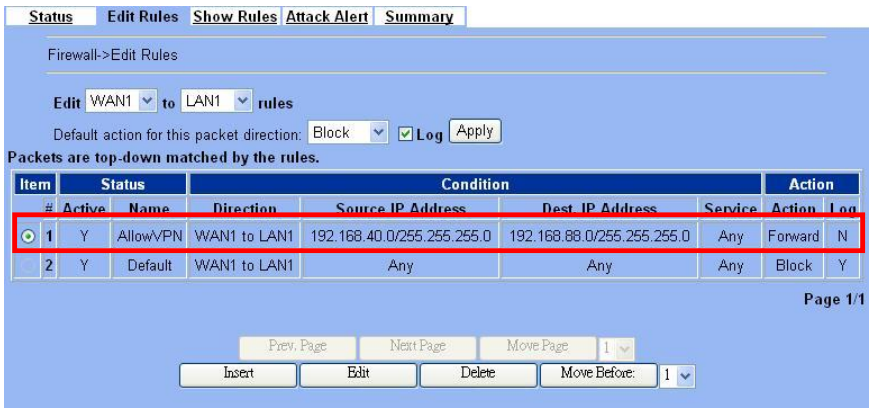
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 15. View the result

Now we have inserted a new rule before the default firewall rule. Any packets from `192.168.40.0/24` to `192.168.88.0/24` will be allowed to pass through the DFL-900 and successfully access the `192.168.88.0/24` through the VPN tunnel.

ADVANCED SETTINGS > Firewall > Edit Rules



Chapter 12
Virtual Private Network – DS-601 VPN client

This chapter introduces IPSec VPN using DS-601 VPN client and explains how to implement it.

As described in the Figure 2-1, we will extend to explain how to make a VPN link between LAN_1 and a remote client in this chapter. The following Figure 12-1 is the real structure in our implemented process.

12.1 Demands

1. When someone is on a business trip and need to connect back to the company by using VPN function. If he uses the DS-601 VPN client to make IPSec VPN tunnel with Organization_1 LAN_1, please refer to the following diagram to configure the settings.

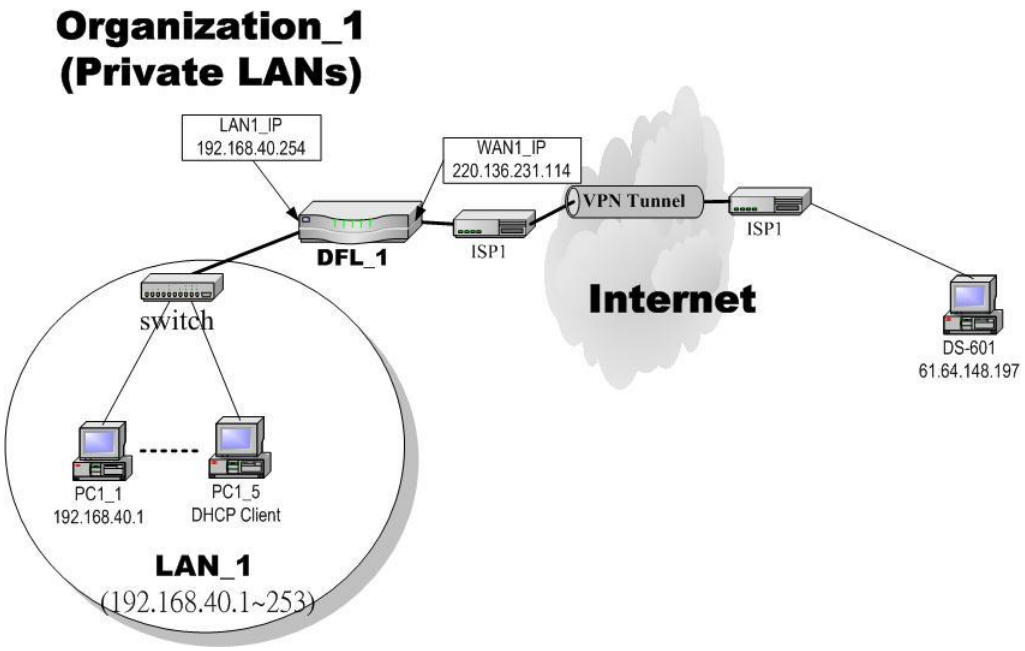


Figure 12-1 The client DS-601 is making IPSec VPN tunnel with Organization_1 LAN_1

12.2 Objectives

1. Let the users in LAN_1 and the client DS-601 share the resources through a secure channel established using the IPSec.

12.3 Methods

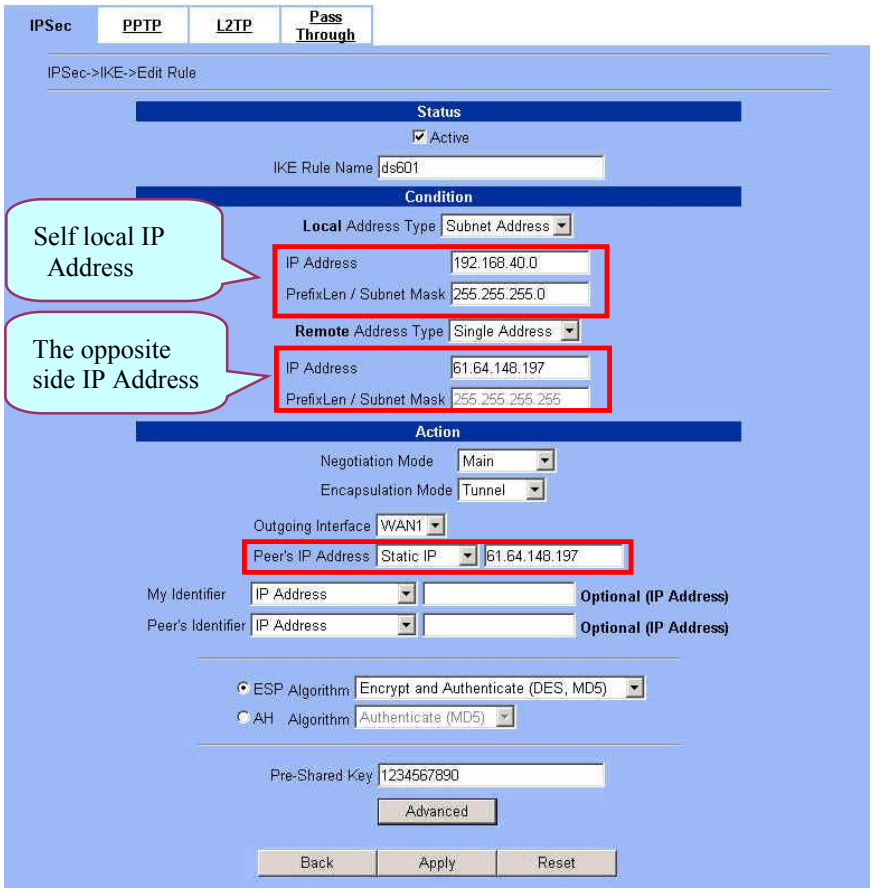
1. Separately configure DFL-1 and DS-601 VPN client to make IPSec VPN tunnel..

12.4 Steps

In the following, we will introduce you how to setup the IPSec between Organization_1 LAN_1 and DS-601 VPN client.

At DFL-1:

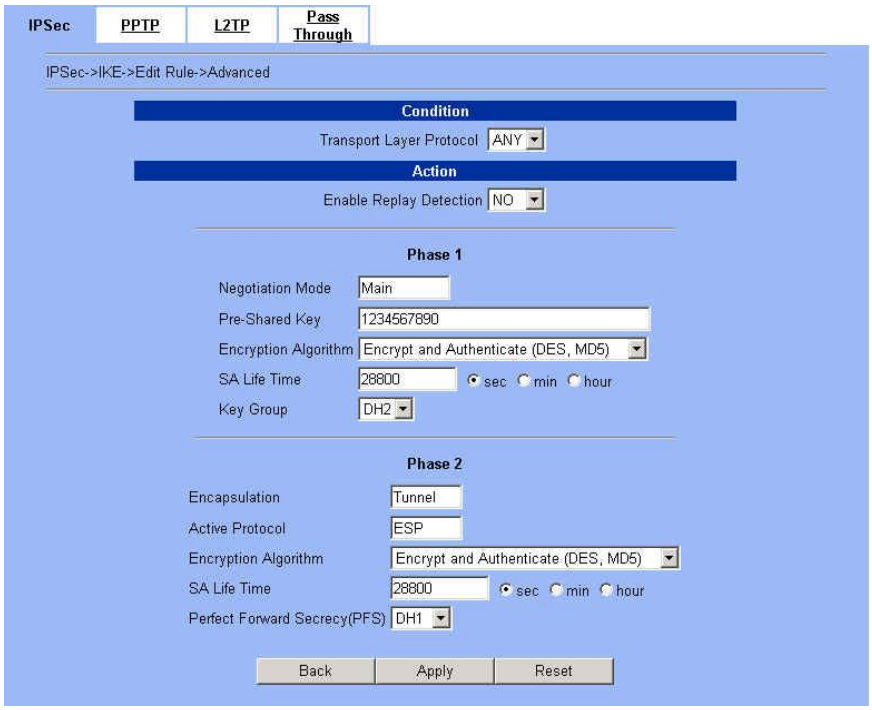
At the first, we will install the IPSec properties of DFL-1.

Step 1. Enable IPSec Check the `Enable IPSec` checkbox and click `Apply`.	**ADVANCED SETTINGS > VPN Settings > IPSec** 
Step 2. Add an IKE rule Click the `IKE` hyperlink and click `Add` to add a new IPSec VPN tunnel endpoint.	**ADVANCED SETTINGS > VPN Settings > IPSec > IKE** 
Step 3. Customize the rule Check the `Active` checkbox. Enter a name for this rule like `IKErule`. Enter the `Local IP Address` (`192.168.40.0/255.255.255.0`) and the `Remote IP Address` (`61.64.148.197/255.255.255.0`). Select the `Outgoing Interface` of this VPN/Firewall Router. Enter the public IP of the opposite-side VPN gateway (`61.64.148.197`) in the `Peer's IP Address`. Click the `ESP Algorithm` and select `Encrypt and Authenticate (DES, MD5)`. Enter the `Pre-Shared Key` as `1234567890`. Click the `Apply` button to store the settings. Note, In the Action region. It should choose either `ESP Algorithm` or `AH Algorithm`, or system will show error message. If you hope to set the detailed item of IKE parameter. Click the Advanced button in this page. Otherwise it is ok to just leave the value default.	**ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add** 

Step 4. Detailed settings of IPSec IKE

In this page, we will set the detailed value of IKE parameter.

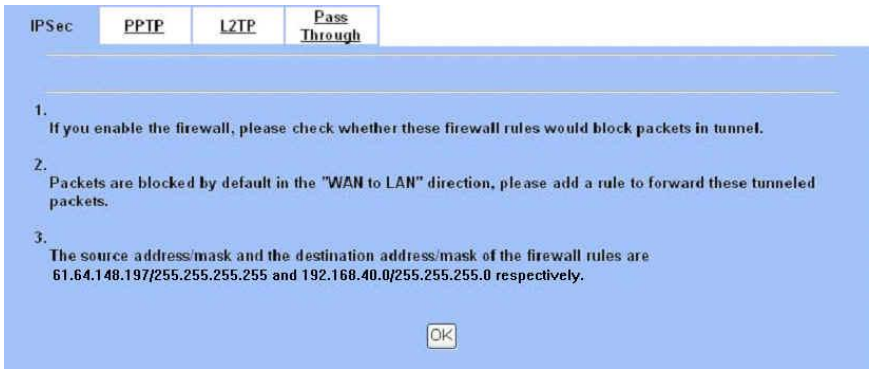
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add > Advanced



Step 5. Remind to add a Firewall rule

After finishing IPSec rule settings, we need to add a firewall rule. Here system shows a window message to remind you of adding a firewall rule. Just press the `OK` button to add a firewall rule.

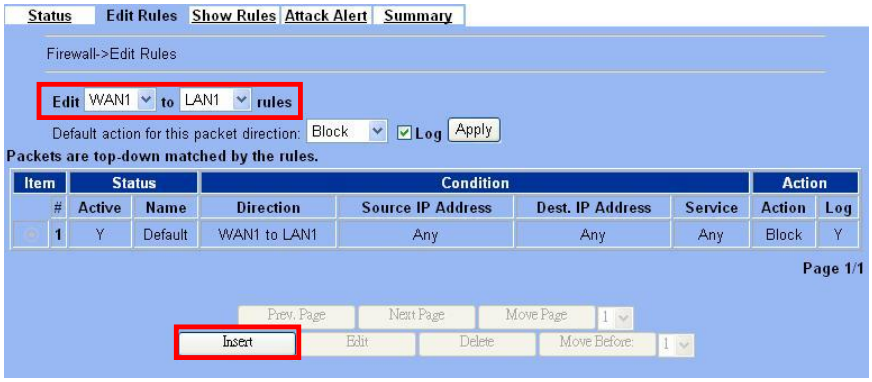
ADVANCED SETTINGS > VPN Settings > IPSec > IKE > Add



Step 6. Add a Firewall rule

Beforehand, please make sure that the Firewall is enabled. Select `WAN1`-to-`LAN1` to display the rules of this direction. The default action of this direction is `Block` with `Logs`. We have to allow the VPN traffic from the WAN1 side to enter our LAN1 side. So we click the `Insert` button to add a Firewall rule before the default rule.

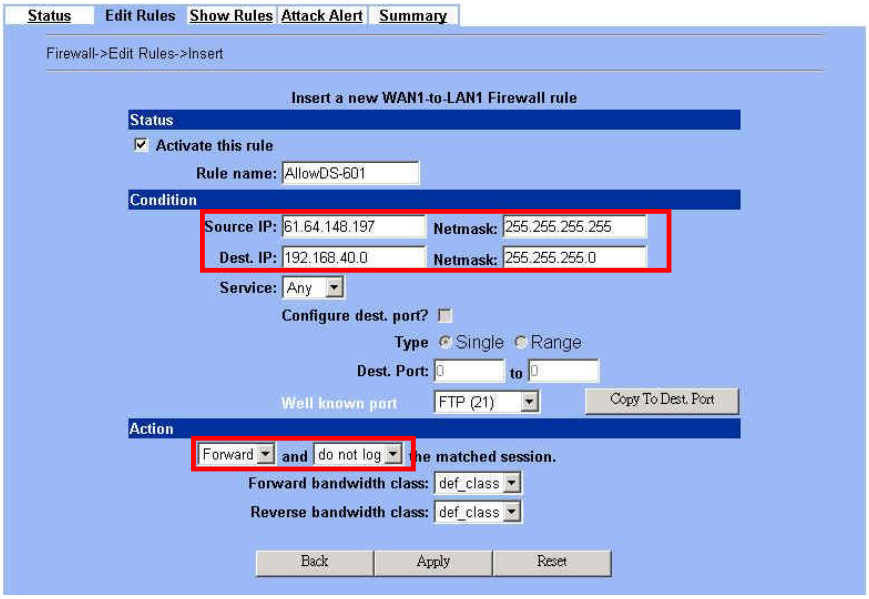
ADVANCED SETTINGS > Firewall > Edit Rules



Step 7. Customize the Firewall rule

Check the `Activate this rule`. Enter the `Rule Name` as `AllowDS-601`, `Source IP` as `61.64.148.197`, and `Dest. IP` as `192.168.40.0`. Click `Apply` to store this rule.

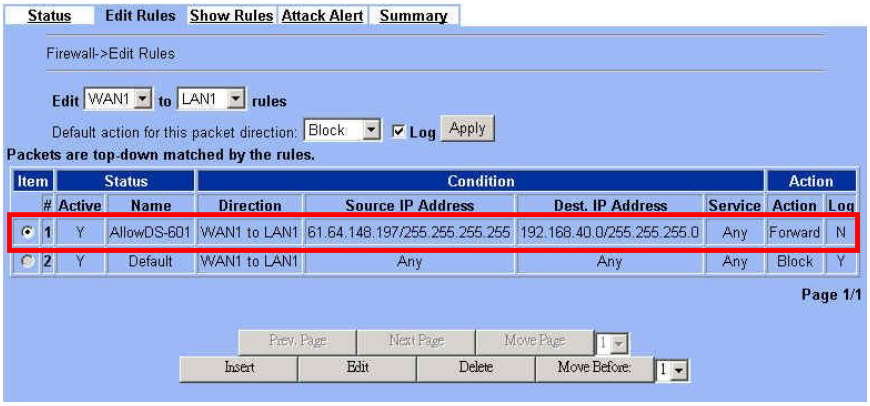
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 8. View the result

Here we have a new rule before the default firewall rule. This rule will allow packets from 61.64.148.197 / 255.255.255.255 pass through DFL-900. And accomplish the VPN tunnel establishment.

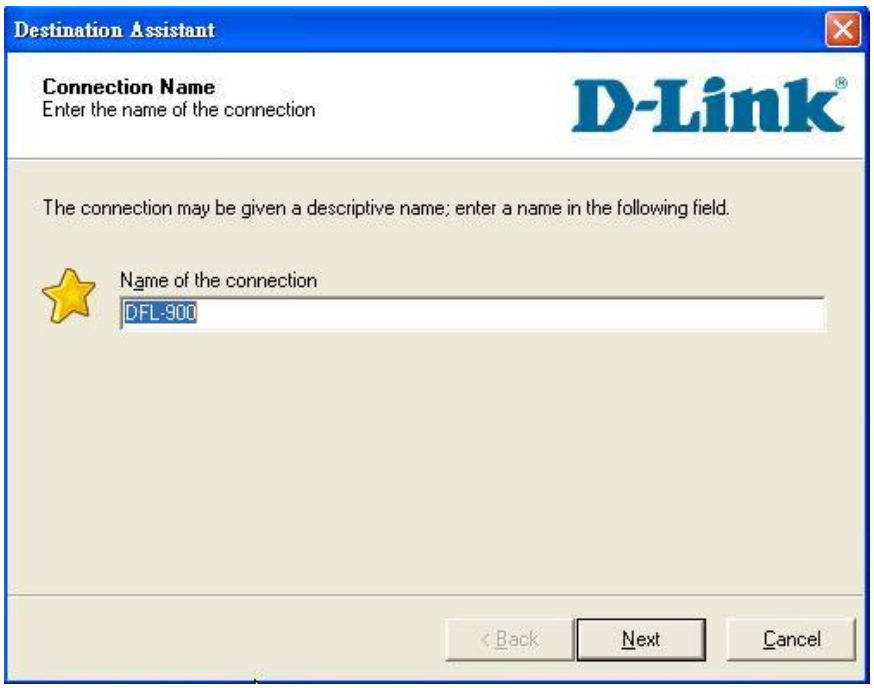
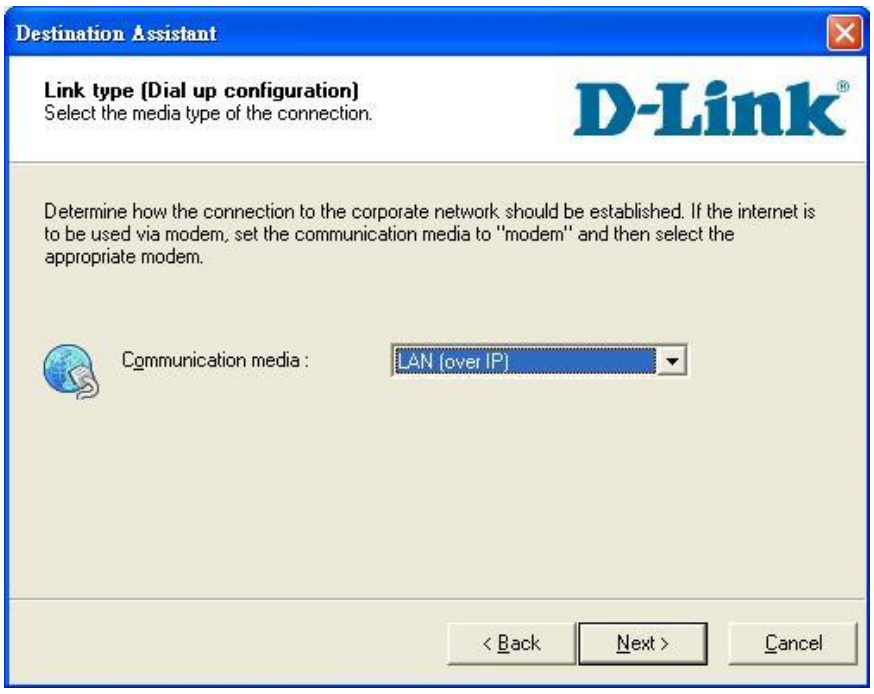
ADVANCED SETTINGS > Firewall > Edit Rules

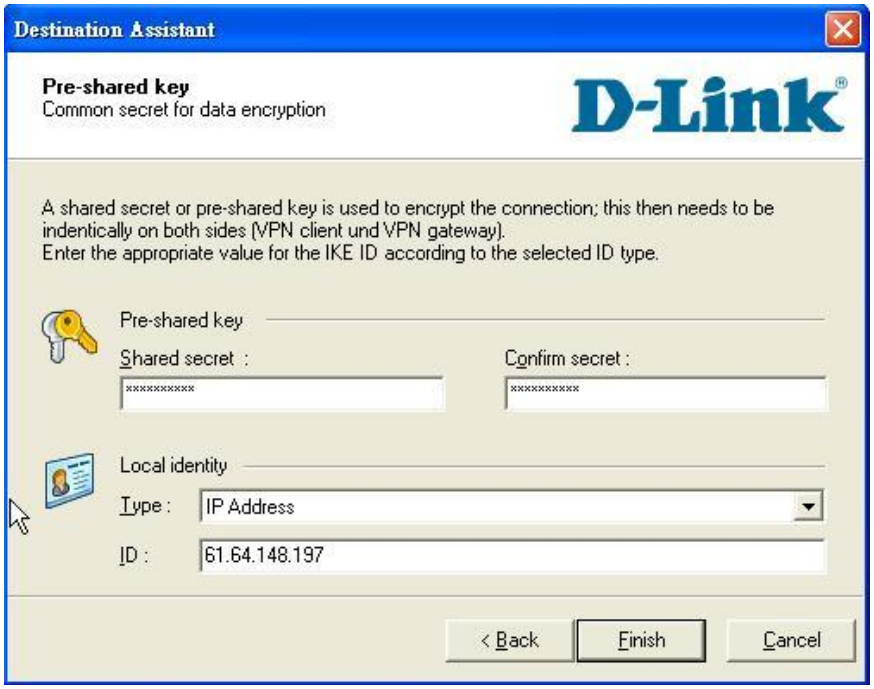


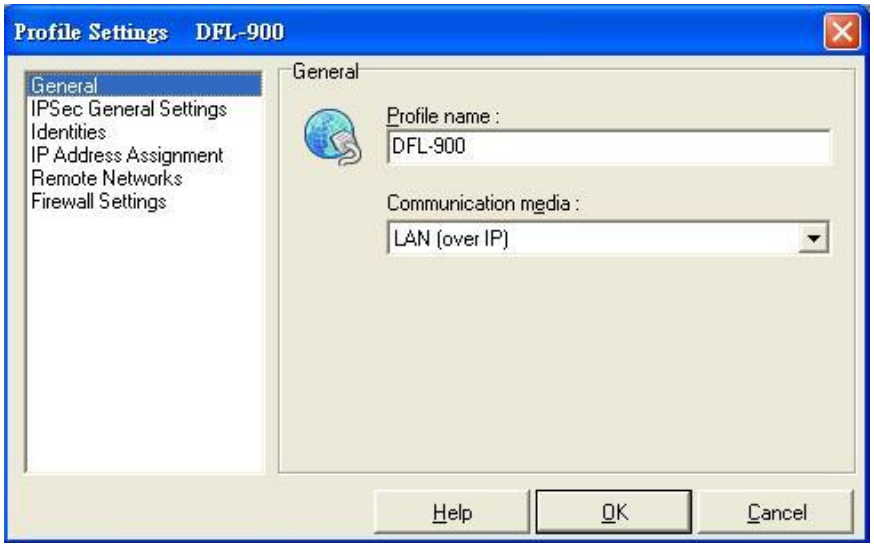
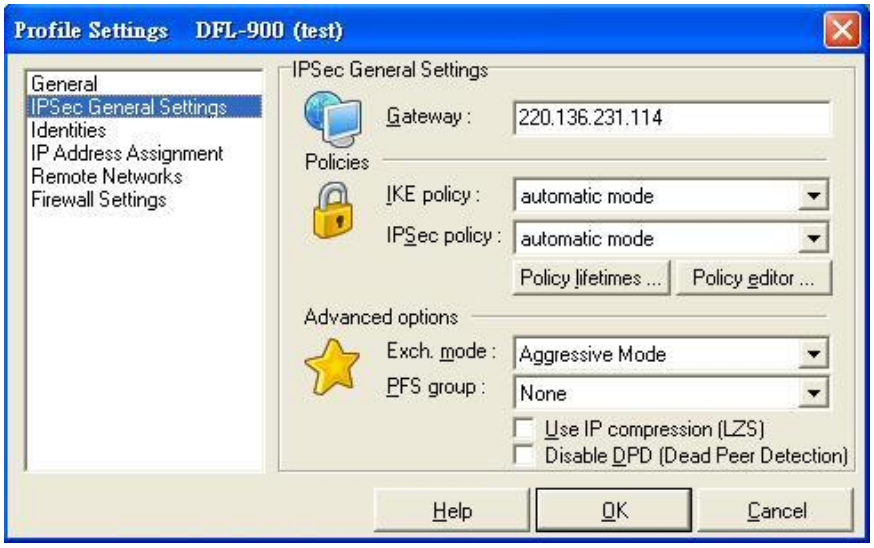
Item		Status		Condition				Action	
	#	Active	Name	Direction	Source IP Address	Dest. IP Address	Service	Action	Log
	1	Y	AllowDS-601	WAN1 to LAN1	61.64.148.197/255.255.255.255	192.168.40.0/255.255.255.0	Any	Forward	N
	2	Y	Default	WAN1 to LAN1	Any	Any	Any	Block	Y

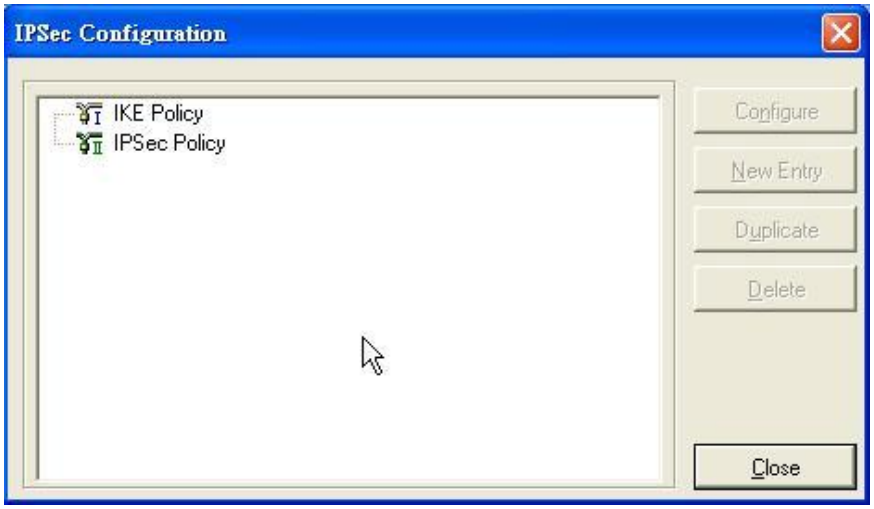
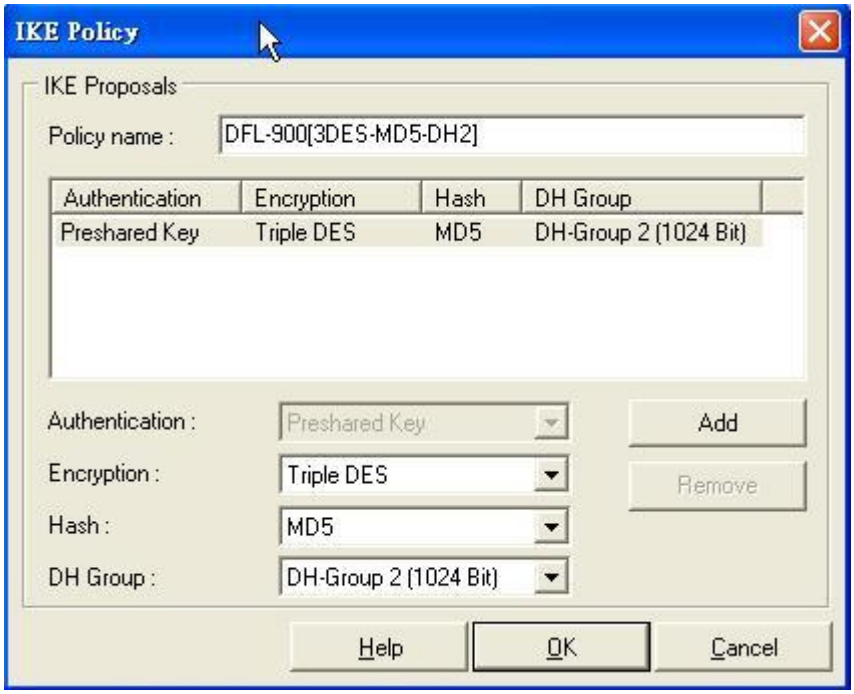
At DS-601 VPN client:

Here we will introduce you how to setup DS-601 VPN client properties. Before that, please install the DS-601 VPN client into the remote client first.

Step 1. Enter a Connection Name Enter `DFL-900` in the `Name of the connection` field and click `Next` to proceed.	**Configuration > Profile Settings > New Entry** 
Step 2. Select Link Type Select `LAN (over IP)` in the Communication media field and the click `Next` to proceed.	**Configuration > Profile Settings > New Entry** 

Step 3. Setup VPN gateway Enter the VPN gateway IP (`220.136.231.114`) which is also the DFL-1's WAN1 IP. Click `Next` to proceed.	**Configuration > Profile Settings > New Entry** 
Step 4. Pre-share Key Enter `1234567890` in the `Shared secret` field and retype it in the `Confirm secret field`. Select `IP Address` and enter `61.64.148.197` as the `Type` and `ID` in the Local identity area.	**Configuration > Profile Settings > New Entry** 

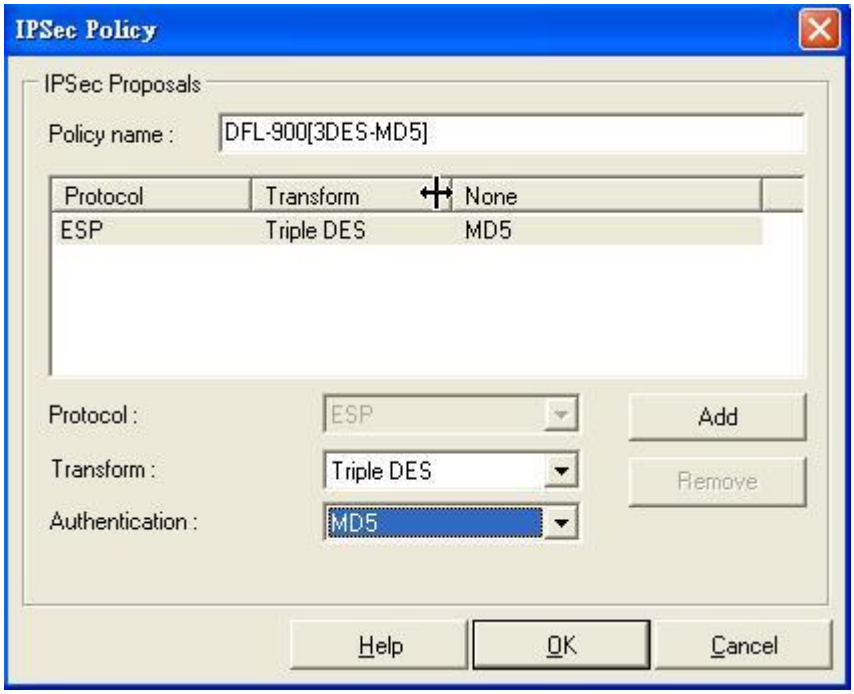
Step 5. General information After finishing the previous setting, we can view the general information here.	**Configuration > Profile Settings > Configure > General** 
Step 6. IPSec General Settings Check if the Gateway IP is correct, and then click the Policy editor to edit IKE and IPSec policy.	**Configuration > Profile Settings > Configure > IPSec General Settings** 

Step 7. Policy editor Click `IKE Policy` to edit the IKE policy.	**Configuration > Profile Settings > Configure > IPSec Geneneral Settings > Policy editor** 
Step 8. Setup IKE Policy Enter `DFL-900[3DES-MD5-DH2]` as the IKE `Policy name`. Select `Triple DES/MD5/DH-Group 2 [1024 Bit]` in the Encryption/Hash/DH Group field. Click `OK` to finish the settings.	**Configuration > Profile Settings > Configure > IPSec Geneneral Settings > Policy editor > IKE Policy** 

Step 9. Setup IPSec Policy

Enter `DFL-900[3DES-MD5]` as the IPSec `Policy name`. Select `Triple DES` and `MD5` in the `Transform` and `Authentication` field. Click `OK` to finish the settings.

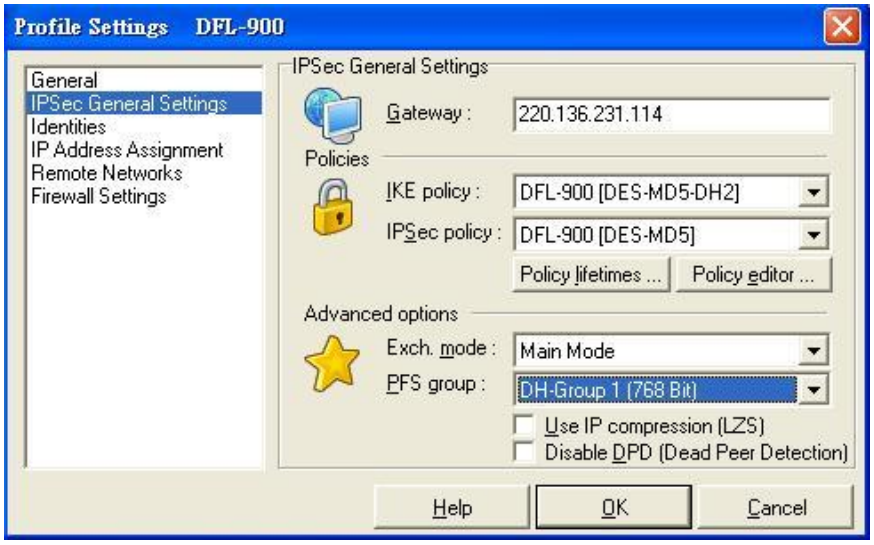
Configuration > Profile Settings > Configure > IPSec Geneneral Settings > Policy editor > IPSec Policy

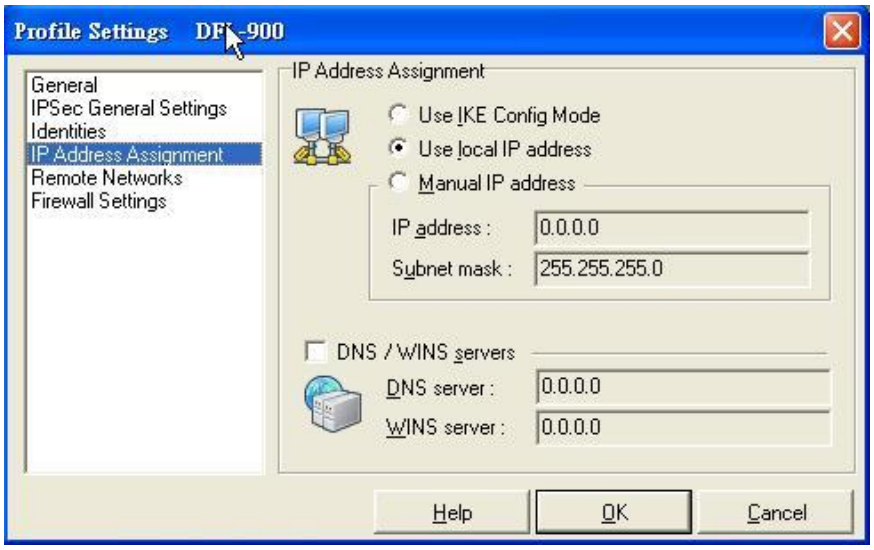


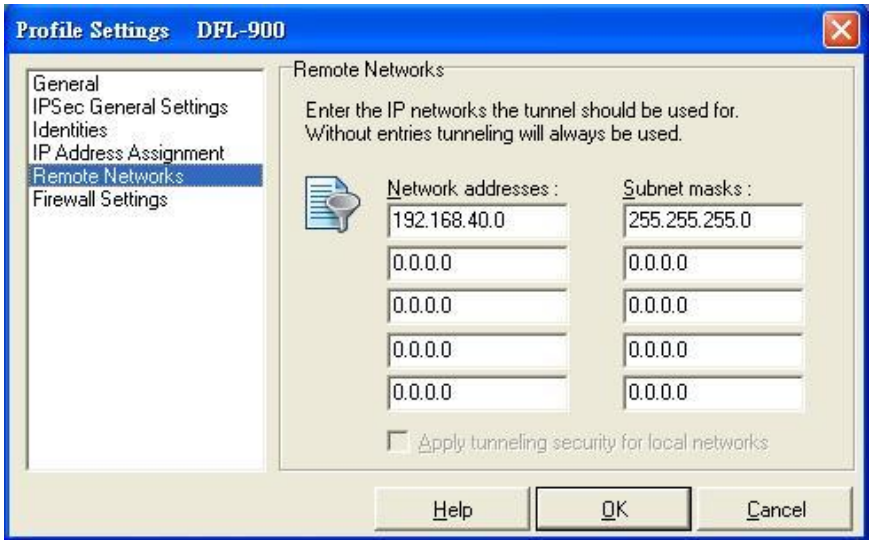
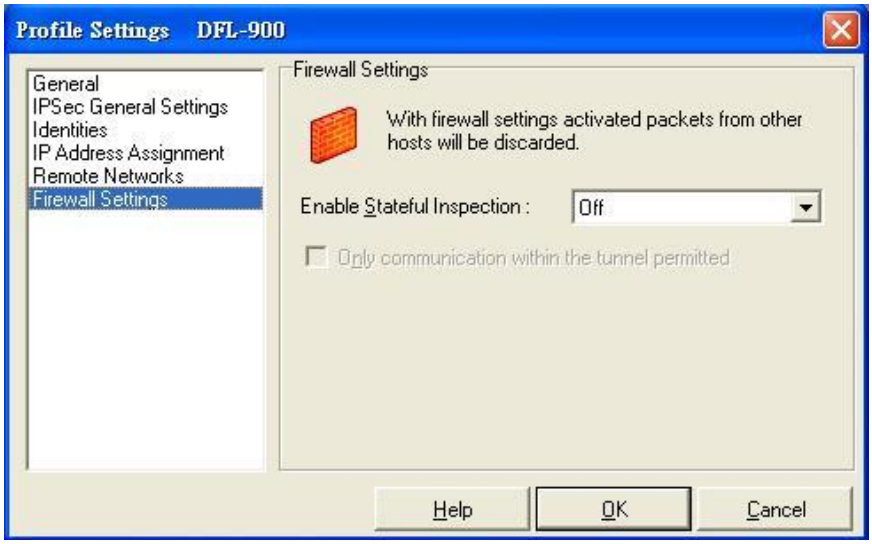
Step 10. IPSec advanced options

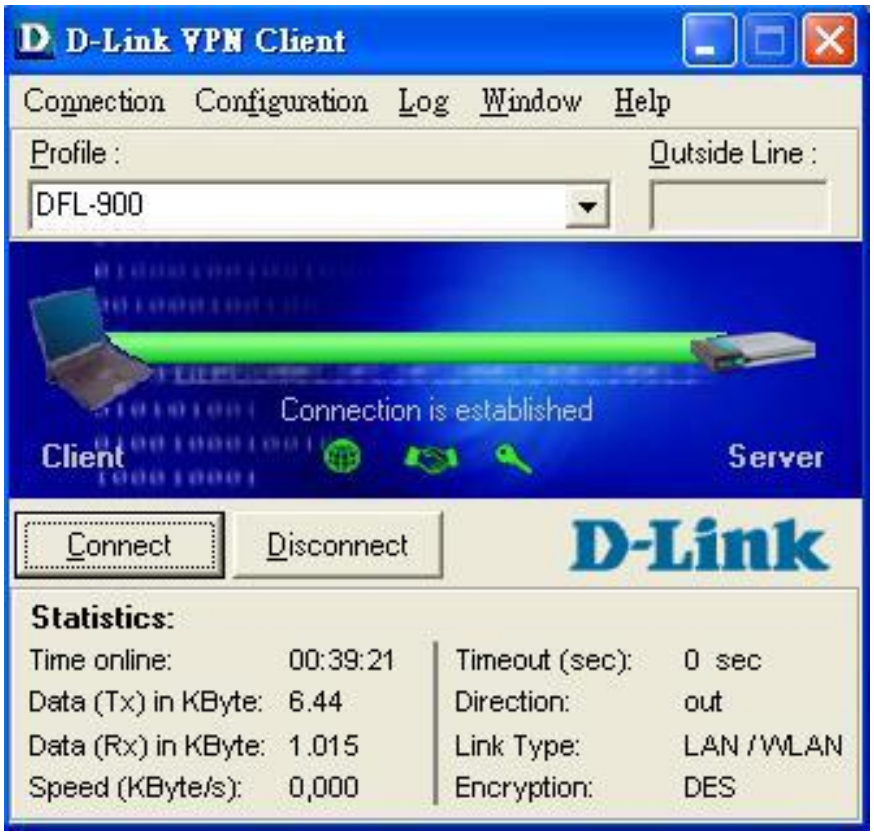
In the Advanced options area, please select `Main Mode` in the `Exch. mode` and `DH-Group 1 [768 Bit]` in the `PFS group`.

Configuration > Profile Settings > Configure > IPSec Geneneral Settings > Advanced Options



Step 11. View Identities Check if the `Local Identity` and the `Pre-shared key` are correct or not. If yes, click `OK` to finish the settings.	**Configuration > Profile Settings > Configure > Identities** 
Step 12. IP Address Assignment Select `Use local IP address` and then click `OK` to finish this settings.	**Configuration > Profile Settings > Configure > IP Address Assignment** 

Step 13. Setup Remote Networks Enter the IP network address `192.168.40.0` and subnet masks `255.255.255.0`, and then click `OK` to finish the settings.	**Configuration > Profile Settings > Configure > Remote Networks** 
Step 14. Firewall Settings In order to avoid any conflict, we recommend you to disable the Stateful Inspection.	**'Configuration > Profile Settings > Configure > Firewall Settings** 

Step 15. Connect the IPSec VPN Click `Connect` to establish the IPSec VPN tunnel with Orgainization_1 LAN_1. If connection is established, you can view it like right diagram.	**Connection > Connect** 

Chapter 13
Virtual Private Network – PPTP

This chapter introduces PPTP and explains how to implement it.

13.1 Demands

1. One employee in our company may sometimes want to connect back to our coporate network to work on something. His PC is PC1_1 in LAN_1 instead of DMZ_1 so he cannot directly access the host by simply with virtual server settings. This causes inconvenience for the employee to work remotely.
2. In our branch office, we need to provide PPTP connection methods to connect back to headquater for the internal company employees.

13.2 Objectives

1. With PPTP tunneling, emulate the mobile employee as a member in LAN1 after he dials in the corporate network. Then he can access all computers in LAN_1 just as if he stays in the office covered by LAN1.
2. Make sure every employee in the branch office can use the network resource in the headquater. Suppose they are in the same internal network, and keep the communication security.

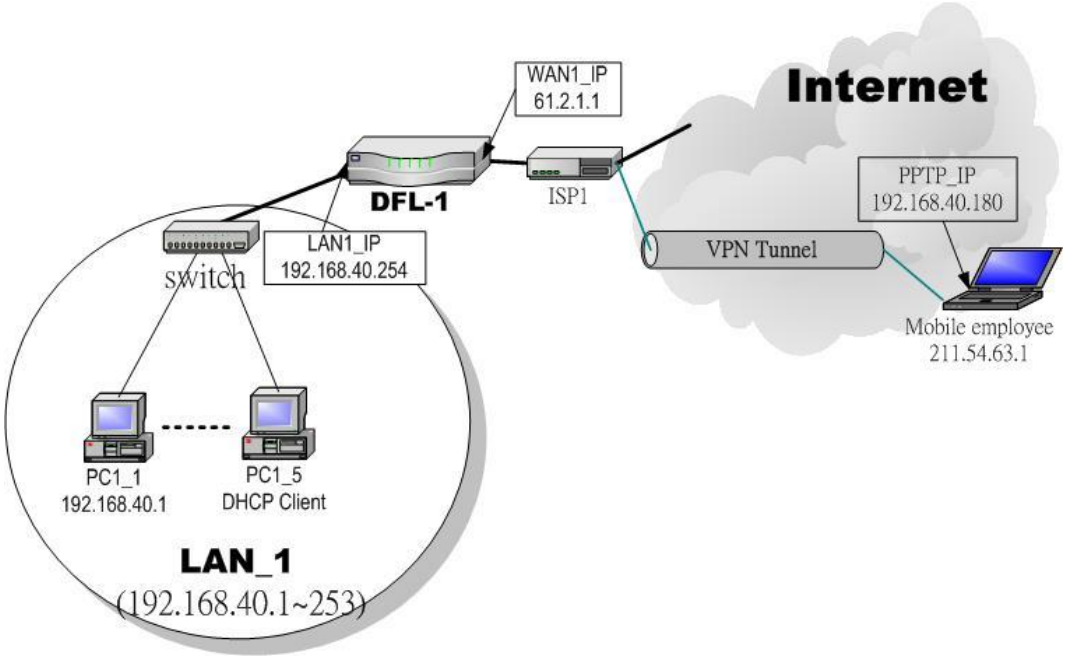


Figure 13-1 PPTP method connection

13.3 Methods

1. Setup the PPTP server at DFL-900. Setup the remote PC as the PPTP client. After dialing up to DFL-1, DFL-1 will assign a private IP which falls in the range of the settings in the PPTP server at DFL-1. Suppose the range is defined as 192.168.40.180 ~ 192.168.40.199, the remote host may get an IP of 192.168.40.180 and logically become a member in LAN1.

2. Setup the DFL-900 as the PPTP client. Let all the client PCs behind the DFL-900. They can connect to the network behind PPTP Server by passing through DFL-900. It sounds like no Internet exists but can connect with each other.

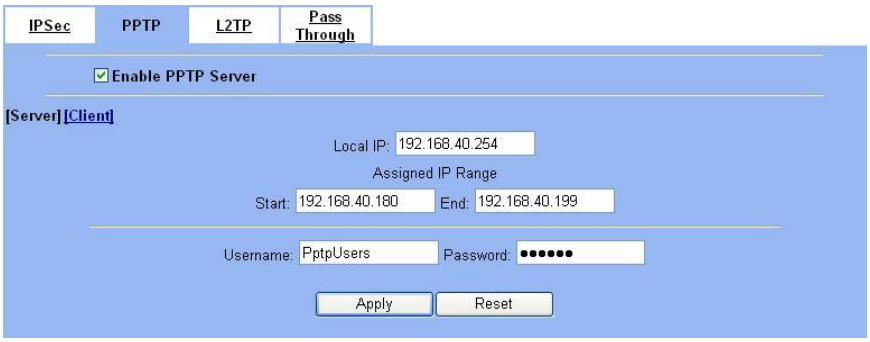
13.4 Steps

13.4.1 Setup PPTP Network Server

Step 1 – Enable PPTP Server

Check the `Enable PPTP` checkbox, enter the LAN1_IP of the DFL-1(192.168.40.254) in the `Local IP`, and enter the IP range that will be assigned to the PPTP clients in the `Start IP` and the `End IP` fields. Enter the `Username` and `Password` that will be used by the employees during dial-up. Click the `Apply` to finish configurations.

ADVANCED SETTINGS > VPN Settings > PPTP



FIELD	DESCRIPTION	EXAMPLE
Enable PPTP Server	Enable PPTP feature of the DFL-900	Enabled
Local IP	The Local IP is the allocated IP address in the internal Network after PPTP client dials in the DFL-900.	192.168.40.254
Start IP	The Start IP is the allocated starting IP address in the internal network after PPTP client dials in the DFL-900.	192.168.40.180
End IP	The End IP is the allocated ending IP address in the internal network after PPTP client dials in the DFL-900.	192.168.40.199
Username	The account which allow PPTP client user to dial in DFL-900.	PptpUsers
Password	The password which allow PPTP client user to dial in DFL-900.	Dif3wk

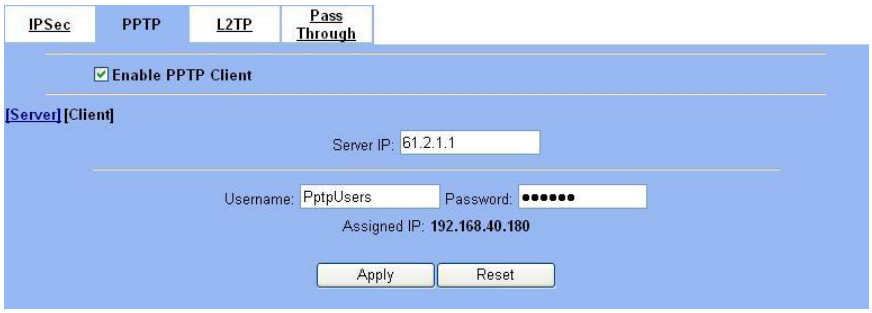
Table 13-1 Setup PPTP Server

Step 2 – Setup Windows XP/2000 PPTP clients	**<u>Configuring A PPTP Dial-Up Connection</u>** 1. Configuring a PPTP dial-up connection 2. Go to `Start` > `Control Panel > Network and Internet Connections > Make new connection.` 3. Select `Create a connection to the network of your workplace` and select `Next`. 4. Select `Virtual Private Network Connection` and select `Next`. 5. Give a `Name` the connection and select `Next`. 6. If the `Public Network` dialog box appears, choose the `Don't dial up initial connection` and select `Next`. 7. In the `VPN Server Selection` dialog, enter the `public IP` or `hostname` of the DFL-900 to connect to and select `Next`. 8. Set `Connection Availability` to `Only for myself` and select `Next`. 9. Select `Finish`.

	<u>Customize the VPN Connection</u>
	1. Right-click the icon that you have created.
	2. Select `Properties` > `Security > Advanced > Settings.`
	3. Select `No Encryption` from the `Data Encryption` and click `Apply`.
	4. Select the `Properties` > `Networking` tab.
	5. Select `PPTP VPN` from the `VPN Type`.
	Make sure the following are selected:
	`TCP/IP`
	`QoS Packet Scheduler`
	6. Select `Apply`.

	<u>Connecting to the PPTP VPN</u> 1. Connect to your ISP. 2. Start the dial-up connection configured in the previous procedure. 3. Enter your PPTP VPN `User Name` and `Password`. 4. Select `Connect`.

13.4.2 Setup PPTP Network Client

Step 1 – Enable PPTP Client Fill in the IP address of PPTP Server and allocates Username/Password. When connecting to the PPTP Server successfully, it will appear the allocated IP address for the PPTP client in the "Assigned IP" field.	**ADVANCED SETTINGS > VPN Settings > PPTP > Client** 

FIELD	DESCRIPTION	EXAMPLE
Enable PPTP Client	Enable PPTP Client feature of DFL-900	Enabled
Server IP	The IP address of PPTP server.	61.2.1.1
Username	The designed account which allows PPTP client to dial in.	PptpUsers
Password	The designed password which allows PPTP client to dial in.	Dif3wk
Assigned IP	The allocated IP address when PPTP client connects to the PPTP server.	192.168.40.180

Table 13-2 Setup PPTP Client settings

Chapter 14
Virtual Private Network – L2TP

This chapter introduces L2TP and explains how to implement it.

14.1 Demands

1. One employee in our company may sometimes want to connect back to our coporate network to work on something. His PC is PC1_1 in LAN1 instead of DMZ1 so he cannot directly access the host by simply with virtual server settings. This causes inconvenience for the employee to work remotely.

14.2 Objectives

1. With L2TP tunneling, emulate the mobile employee as a member in LAN_1 after he dials in the corporate network. Then he can access all computers in LAN_1 just as if he stays in the office covered by LAN_1.

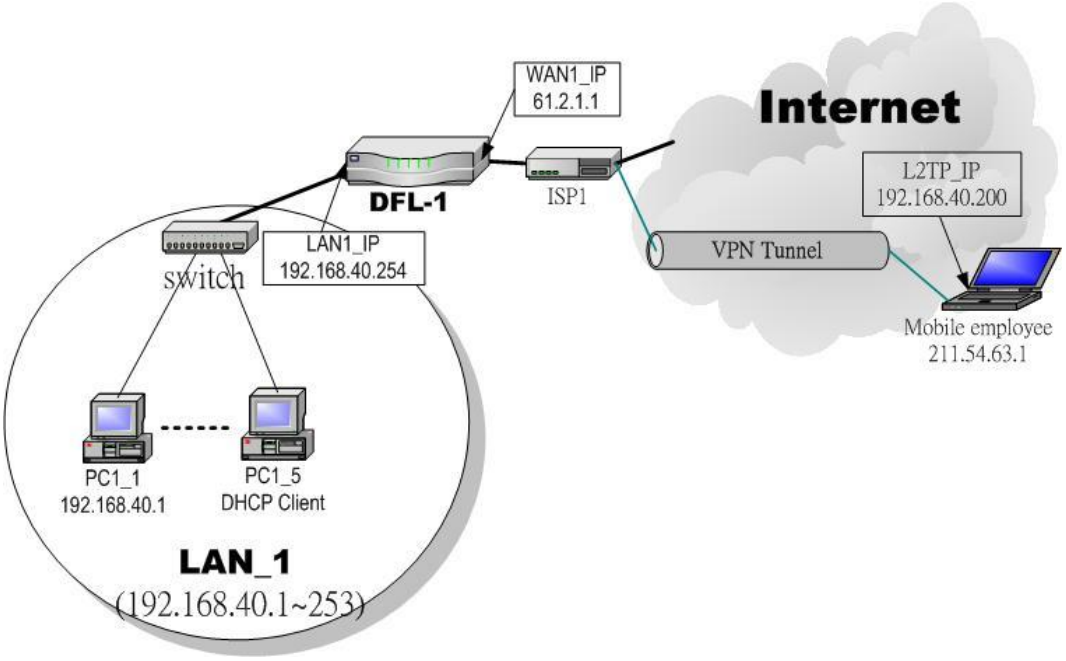


Figure 14-1 L2TP method connection

14.3 Methods

1. Setup the L2TP server at DFL-900 (LNS: L2TP Network Server). After dialing up to DFL-900, DFL-900 will assign a private IP which falls in the range of the settings in the L2TP server at DFL-900. Suppose the range is defined as 192.168.40.200 ~ 192.168.40.253, the remote host may get an IP of 192.168.40.200 and logically become a member in LAN_1.

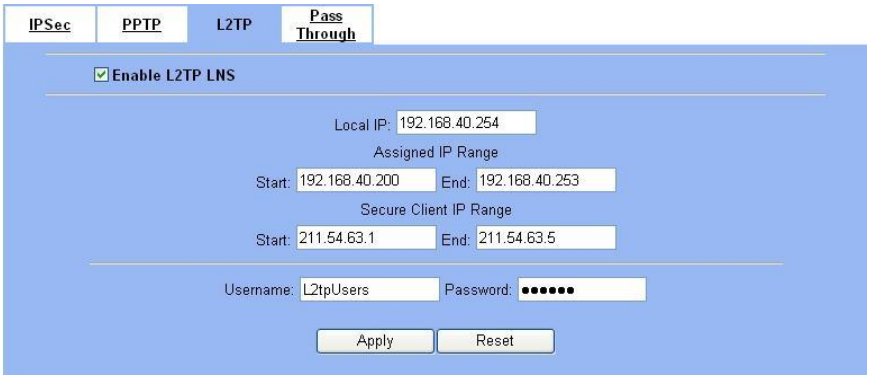
14.4 Steps

14.4.1 Setup L2TP Network Server

Step 1 – Enable L2TP LNS

Check the `Enable L2TP LNS` checkbox, enter the `LAN1_IP` of the `DFL-1` (`192.168.40.254`) in the `Local IP`, and enter the IP range that will be assigned to the L2TP clients in the `Start IP` and the `End IP` fields. Enter the IP range in the `LAC Start IP` and the `LAC End IP` that will cover the real IP of the remote users. In our case, since the employee uses `211.54.63.1` so we can fill `211.54.63.1~211.54.63.5` to cover `211.54.63.1`. Enter the `Username` and `Password` that will be used by the employees during dial-up. Click the `Apply` to finish configurations.

ADVANCED SETTINGS > VPN Settings > L2TP



FIELD		DESCRIPTION	EXAMPLE
Enable L2TP LNS		Enable L2TP LNS feature of DFL-900	Enabled
Local IP		The Local IP is the allocated IP address in the internal network after default gateway of L2TP client dials in the DFL-900.	192.168.40.254
Assigned IP Range	Start	The Start IP is the allocated starting IP address in the internal network after L2TP client dials in the DFL-900.	192.168.40.200
	End	The End IP is the allocated ending IP address in the internal network after L2TP client dials in the DFL-900.	192.168.40.253
Secure Client IP Range	Start	The IP address starting range which is allowed user to dial in LNS server by using L2TP protocol.	211.54.63.1
	End	The IP address ending range which is allowed user to dial in LNS server by using L2TP protocol.	211.54.63.5
Username		The account which allows L2TP client user to dial in DFL-900.	L2tpUsers
Password		The password which allows L2TP client user to dial in DFL-900.	Dif3wk

Table 14-1 Setup L2TP LNS Server settings

Step 2 – Setup Windows XP/2000 L2TP clients	**Configuring A L2TP Dial-Up Connection** 1. Configure a L2TP dial-up connection 2. Go to `Start` > `Control Panel > Network and Internet Connections > Make new connection.` 3. Select `Create a connection to the network of your workplace` and select `Next`. 4. Select `Virtual Private Network Connection` and select `Next`. 5. Give a `Name` the connection and select `Next`. 6. If the `Public Network` dialog box appears, choose the `Don't dial up initial connection` and select `Next`. 7. In the `VPN Server Selection` dialog, enter the `public IP` or `hostname` of the DFL-900 to connect to and select `Next`. 8. Set `Connection Availability` to `Only for myself` and select `Next`. 9. Select `Finish`.

	Customize the VPN Connection
	1. Right-click the icon that you have created.
	2. Select `Properties` > `Security > Advanced > Settings`.
	3. Select `No Encryption` from the `Data Encryption` and click `Apply`.
	4. Select the `Properties` > `Networking` tab.
	5. Select `L2TP VPN` from the `VPN Type`.
	Make sure the following are selected:
	`TCP/IP`
	`QoS Packet Scheduler`
	6. Select `Apply`.

	Editing Windows Registry The default Windows 2000 L2TP traffic policy does not allow L2TP traffic without IPSec encryption. You can disable default behavior by editing the Windows 2000 Registry as described in the following steps. Please refer to the Microsoft documentation for editing the Windows Registry. 1. Use the registry editor (regedit) to locate the following key in the registry: `HKEY_LOCAL_MACHINE \ System \ CurrentControlSet \ Services \ Rasman \ Parameters` 2. Add the following registry value to this key: • Value Name: `ProhibitIpSec` • Data Type: `REG_DWORD` • Value: `1` 3. Save your changes and restart the computer. You must add the `ProhibitIpSec` registry value to each Windows 2000-based endpoint computer of an L2TP or IPSec connection to prevent the automatic filter for L2TP and IPSec traffic from being created. When the `ProhibitIpSec` registry value is set to `1`, your Windows 2000-based computer does not create the automatic filter that uses CA authentication. Instead, it checks for a local or Active Directory IPSec policy.

	Connecting to the L2TP VPN 1. Connect to your ISP. 2. Start the dial-up connection configured in the previous procedure. 3. Enter your L2TP VPN `User Name` and `Password`. 4. Select `Connect`.

Part V

Content Filters

Chapter 15
Content Filtering – Web Filters

This chapter introduces web content filters and explains how to implement it.

15.1 Demands

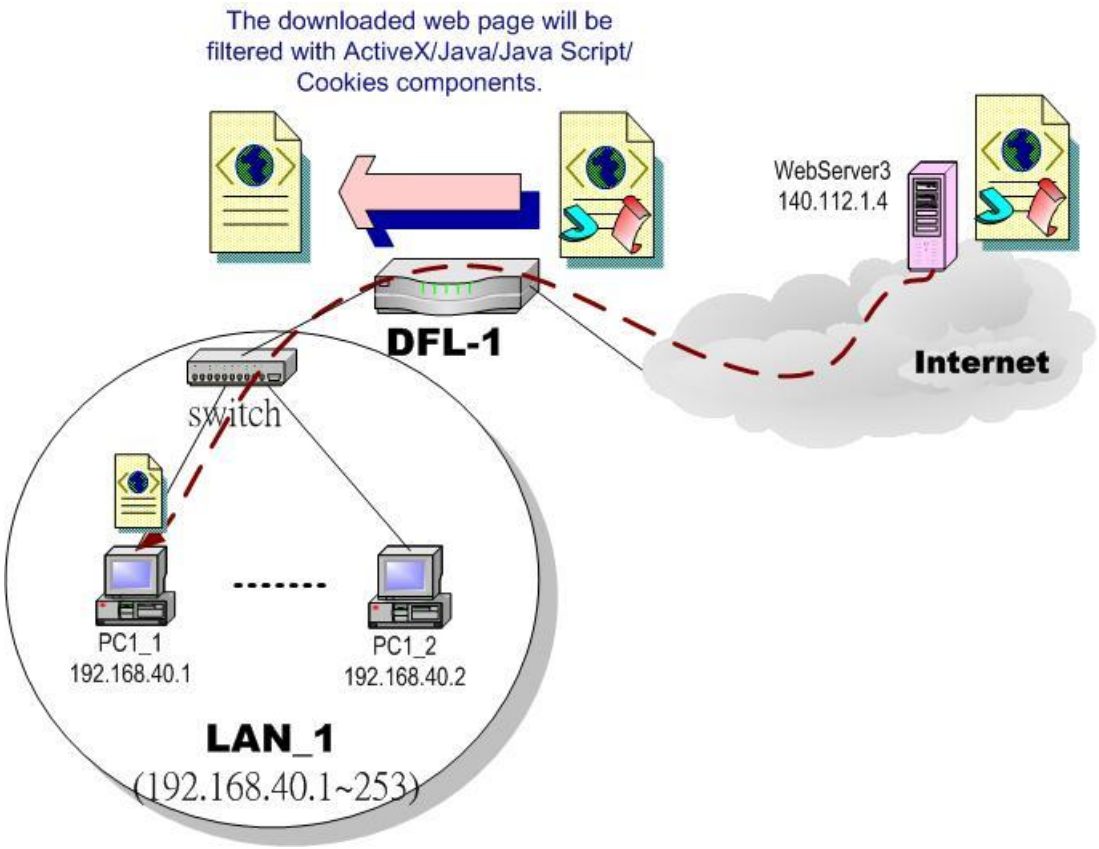


Figure 15-1 Use web filter functionality to avoid users browsing the forbidden web site

1. As the above Figure 15-1 illustrates, someone (PC1_1) is browsing the web pages at the WebServer3. The contents of the web pages may include cookies, Java applets, Java scripts or ActiveX objects that may contain malicious program of users' information. So, we wish to prohibit the user (PC1_1) from downloading the forbidden components.

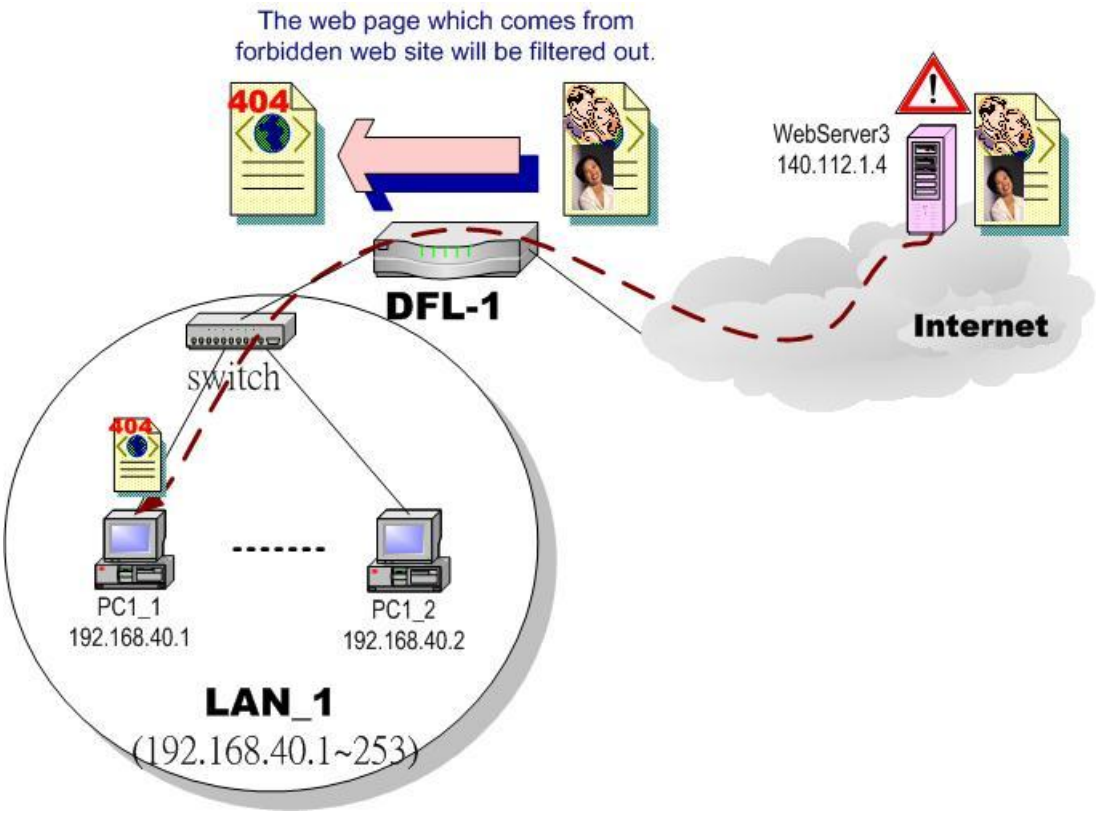


Figure 15-2 Use web filter functionality to avoid users view the forbidden web site

2. As the above Figure 15-2 illustrates, someone (PC1_1) is browsing forbidden web pages on office hours. The contents of the web pages may include stock markets, violence, or sex that will waste the bandwidth of the Internet access link while degrading the efficiency of normal working hours. So, we wish to prohibit the user (PC1_1) from viewing the page on the forbidden web site.

15.2 Objectives

1. Remove the cookies, Java applet, Java scripts, ActiveX objects from the web pages.
2. Prevent users from connecting to the forbidden sites.

15.3 Methods

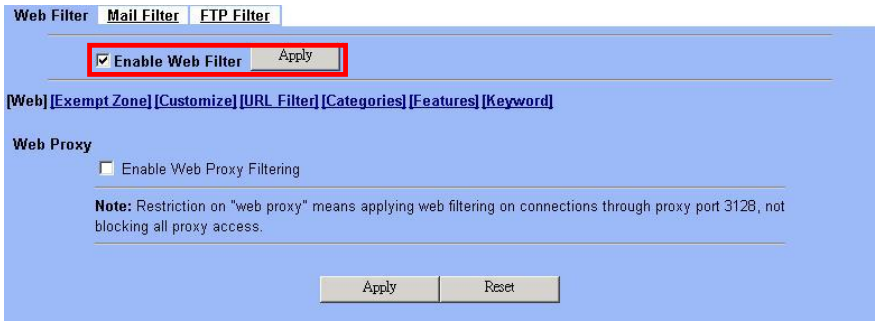
1. Setup content filtering for web objects such as cookies and Java applets.
2. Setup content filtering for URL requests. For each URL, check the pre-defined upgradeable URL database, self-entered forbidden domains, and self-entered keywords to check if the URL is allowed.

15.4 Steps

Step 1. Enable Web Filter

Check the `Enable Web Filter` checkbox and click the `Apply` right on the right side.

ADVANCED SETTINGS > Content Filters > Web Filter > Web



FIELD	DESCRIPTION	EXAMPLE
Enable Web Filter	Enable Web Filter feature of DFL-900	Enabled
Enable Web Proxy Filtering	If enabling this feature, all the web pages pass through proxy (**Only** port 3128) will also be verified by DFL-900. If disabling the "Web Proxy", all the web pages through will bypass the verification.	Disabled
BUTTON	DESCRIPTION	
Apply	Apply the settings which have been configured.	
Reset	Clean the filled data and restore the original.	

Table 15-1 Enable Web Filter

Step 2. Warning of Firewall

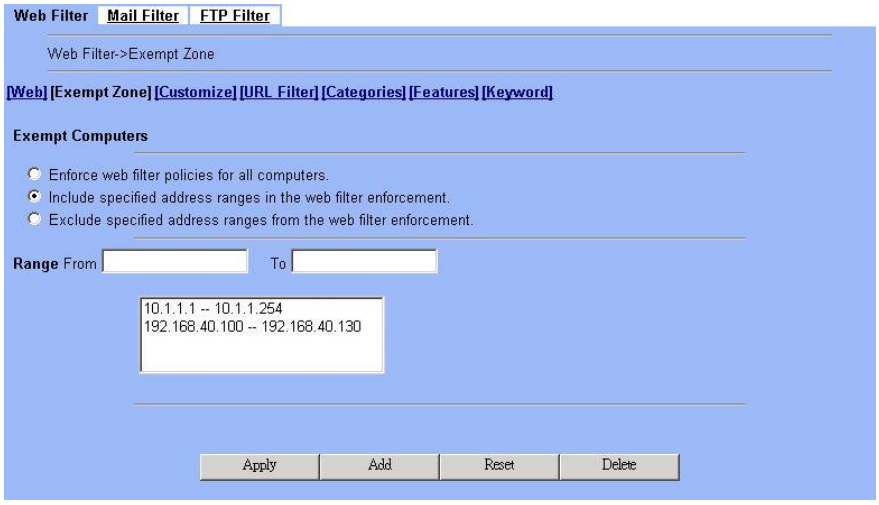
This is a warning saying that if you block any web traffic from LAN-to-WAN in Firewall, the access control is shift to the Web Filter. Namely, if you block someone to access the web at the WAN side, after enabling the web filter, he can resume accessing the web until you set a content filter rule to block it.

ADVANCED SETTINGS > Content Filters > Web Filter > Web

Step 3. Further Customize the local zones

You can configure to what range the filters will apply to the local zones. By default, the web filters apply to all computers so the "`Enforce web filter policies for all computers`" is selected, and the range is `0.0.0.0 – 255.255.255.255`. Delete the default range by clicking the range item and the `Delete` button. Enter the IP range in the `Range` fields followed by a click of the `Add` button to add one address range to the web filter. Click "`Include.....` " and `Apply` if you want web filters to only apply to the specified ranges. Click "`Exclude.....`" and `Apply` if you want web filters to apply to all computers except those specified ranges.

ADVANCED SETTINGS > Content Filters > Web Filter > Exempt Zone



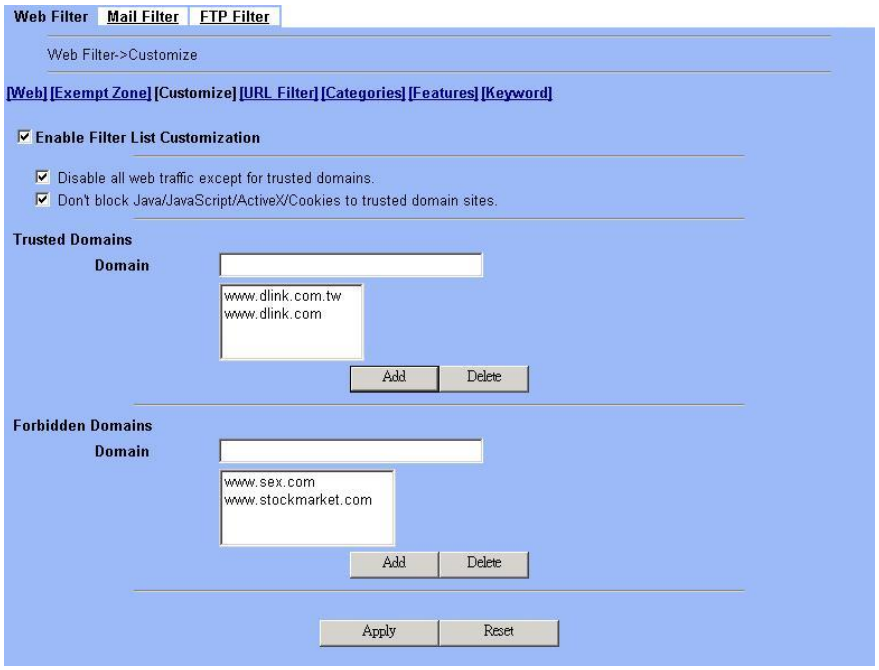
FIELD	DESCRIPTION	EXAMPLE
Exempt Computers	Determine which IP range will exempt the verification by the web filter	
Enforce web filter policies for all computers	Web filter actives at all the computers, not limit range of the IP addresses	disabled
Include specified address ranges in the web filter enforcement	Web filter will only active at below specified computers.	Enabled
Exclude specified address ranges from the web filter enforcement	Except below specified IP address ranges. All the other IP address range, Web filter will active totally.	disabled
Range From	Here we can setup the IP address range, for the above Exempt Computers to use.	10.1.1.1 – 10.1.1.254 192.168.40.100 – 192.168.40.130
BUTTON	DESCRIPTION	
Apply	Apply the above selected "Exempt Computers" radius button.	
Add	Add the specified IP range which filled in the above "Range From" field.	
Reset	Clean the filled data and restore the original one.	
Delete	Delete the specified IP range which filled in the above "Range From" field.	

Table 15-2 Web Filter Exempt Zone setting page

Step 4. Customize the specified sites

Check the `Enable Filter List Customization` to allow all accesses to the `Trusted Domains` while disallowing all accesses to the `Forbidden Domains`. Check the `Disable all web traffic except for trusted domains` if you want to only allow the access to the Trusted Domains. However, if the web objects are set to be blocked by the DFL-900 in step 3, these allowed accesses will never be able to retrieve these objects. Check the "`Don't block` …" to allow the objects for these trusted domains. The domains are maintained by enter the address in the `Domain` field with a click of the `Add` button. To delete a domain, click the domain with a click of the `Delete` button.

ADVANCED SETTINGS > Content Filters > Web Filter > Customize



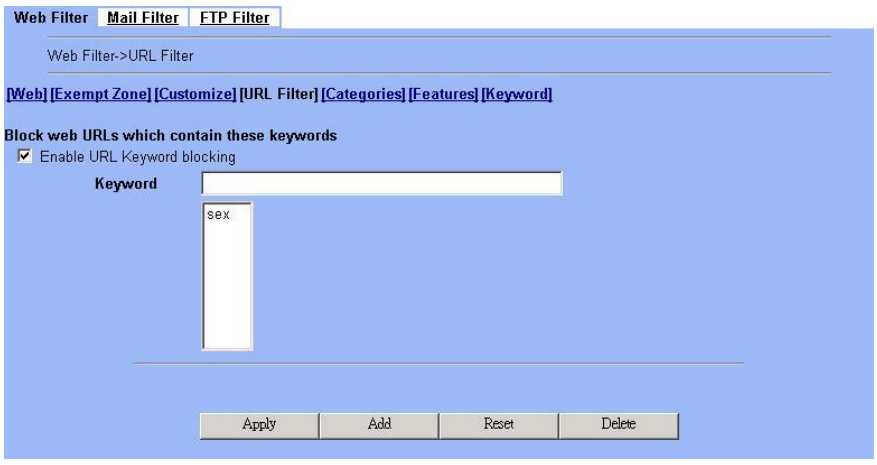
FIELD	DESCRIPTION	EXAMPLE
Enable Filter List Customization	Enable the Filter List Customization feature of web filter. If you only enable it, all the domains in the `Trusted Domains` will be allowed to pass through DFL-900. Contrarily, all the domains in the `Forbidden Domain` will be blocked by the DFL-900.	Enabled
Disable all web traffic except for trusted domains	Except the following specified domain range specified by the trusted domain. All the other URL domain IP addresses are all blocked access.	Enabled
Don't block Java/Java Script/ActiveX/Cookies to trusted domain sites	In the following domain range of the trusted domains. If there are include Java/ Java Script/ActiveX/Cookies components in the web page, the action is setting not to block.	Enabled
Trusted Domains Domain	Here we can specify the Trusted Domains for the above item using. You can enter either domain name or IP address. Note: if the domain name can not be resolved by the DNS server, the domain name entry will be ignored. Another issue is that if there are a lot of domain names in Customize area, name resolving will take longer time on Web Filter starting up.	www.dlink.com.tw www.dlink.com
Forbidden Domains Domain	Here we can specify the Forbidden Domains for the above item using. You can enter either domain name or IP address. Note: if the domain name can not be resolved by the DNS server, the domain name entry will be ignored. Another issue is that if there are a lot of domain names in Customize area, name resolving will take longer time on Web Filter starting up.	www.sex.com www.stockmarket.com
BUTTON	DESCRIPTION	
Add	Add the Trusted/Forbidden Domains IP range to the list.	
Delete	Delete the Trusted/Forbidden Domains IP range from the list.	
Apply	Apply the setting which configured on the checkbox.	
Reset	Clean the filled data and restore the original one.	

Table 15-3 Web Filter Customize setting page

Step 5. Setup URL keyword blocking

Check the `Enable Keyword Blocking` to block any URLs that contains the entered keywords. Add a key word by entering a word in the `keyword` field followed by a click of `Add`.

ADVANCED SETTINGS > Content Filters > Web Filter > URL Filter



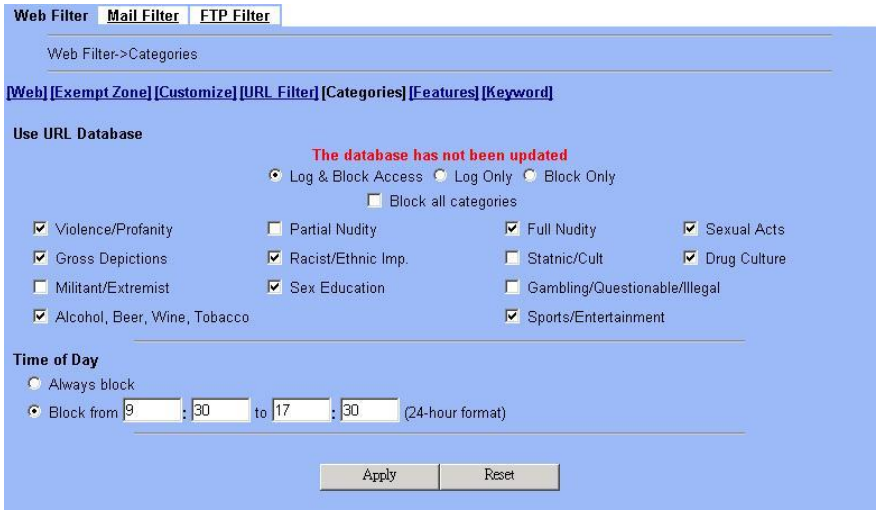
FIELD	DESCRIPTION	EXAMPLE
Enable URL Keyword blocking	Enable URL keyword blocking feature of web filter	Enabled
Keyword	If the Keyword appears in the URL when connect to the Internet using browser. The contents about the URL will be block.	sex
BUTTON	DESCRIPTION	
Apply	Apply the setting which configured on the checkbox.	
Add	Add the Keyword to the list.	
Reset	Clean the filled data and restore the original one.	
Delete	Delete the selected keyword from the list.	

Table 15-4 Web Filter Domain Name setting page

Step 6. Customize Categories

With the built-in URL database, DFL-900 can block web sessions towards several pre-defined `Categories` of URLs. Check the items that you want to block or log. Simply click the `Block all categories` will apply all categories. Click `Log & Block Access` if you want to block and log any matched traffic. You can customize the `Time of Day` to allow such traffic after the office hours, such as `9:30` to `17:30`.

ADVANCED SETTINGS > Content Filters > Web Filter > Categories



FIELD	DESCRIPTION	EXAMPLE
Use URL Database	Determine how to deal with the URL types in this page (Log & Block Access, Log Only, Block Only)	Log & Block Access
Block all categories	Make all categories below enabled	disabled
Violence/Profanity, Gross Depictions, Militant/Extremist ,etc. items	Check the categories you would like to enable	Enable the checked ones
Time of Day	The time which was set for Web Filter.	9:30 ~ 17:30
BUTTON	DESCRIPTION	
Apply	Apply the settings which have been configured.	
Reset	Clean the filled data and restore the original.	

Table 15-5 Web Filter Categories setting page

Step 7. Customize Objects

Check the objects of `Restricted Features` to block the objects. Click the `Apply` button at the bottom of this page. After finish settings, you can use PC1_1 to browse the web page to see if the objects are blocked. If the objects still exist, the objects may be cached by the browser. Please clear the cache in the web browser, close the browser, reopen the browser, and connect to the web page again.

ADVANCED SETTINGS > Content Filters > Web Filter > Features

FIELD	DESCRIPTION	EXAMPLE
Restricted Features	Select the below items that will verified by Web Filter of DFL-900.	
ActiveX	filter the web page that includes ActiveX	Enabled
Java	filter the web page that includes Java applet	Enabled
Java Script	filter the web page that includes Java Script	Enabled
Cookies	filter the web page that includes Cookies	Enabled
MSN over HTTP	filter MSN application which is through http proxy	Disabled
BUTTON	DESCRIPTION	
Apply	Apply the settings which have been configured.	
Reset	Clean the filled data and restore the original.	

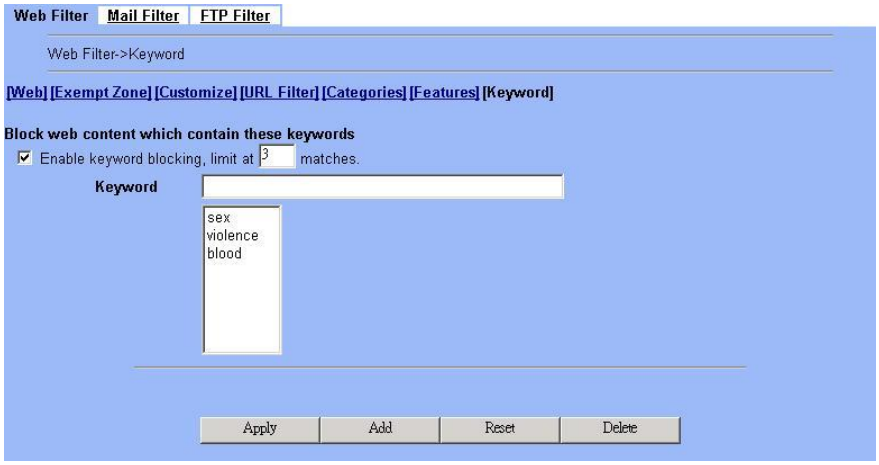
Table 15-6 Web Filter setting page

Step 8. Setup contents keyword blocking

Check the `Enable Keyword Blocking` to block any Web pages that contain the entered keywords. Add a key word by entering a word in the `Keyword` field and then click Add to proceed.

Note that you can add the keywords as many as you like.

ADVANCED SETTINGS > Content Filters > Web Filter > Keyword



FIELD	DESCRIPTION	EXAMPLE
Enable keyword blocking, limit at __ matches	Check Enable keyword blocking, and then the web pages will be blocked if the keywords below you have added are appeared in the pages. "Limit at 3 matches" means that the webpages will be blocked as long as any of the added keywords appear equal or more than three times.	Enabled 3 matches

Keyword	Specify the keyword that you want to block.	sex violence blood
BUTTON	DESCRIPTION	
Apply	Apply the settings which have been configured.	
Add	Add the Keyword to the list.	
Reset	Clean the filled data and restore the original one.	
Delete	Delete the Keyword from the list.	

Table 15-7 Web Filter Content Keywords setting page

15.5 Setting priorities

The function priority of web filter is shown as the following Figure 15-3 illustrated. From the left feature (Exempt Zone) to the right feature (Keyword). Their priority is high to low.

Notice: The Restricted features of /Web Filter/Web page is lowest priority, but it is located at the most left side.

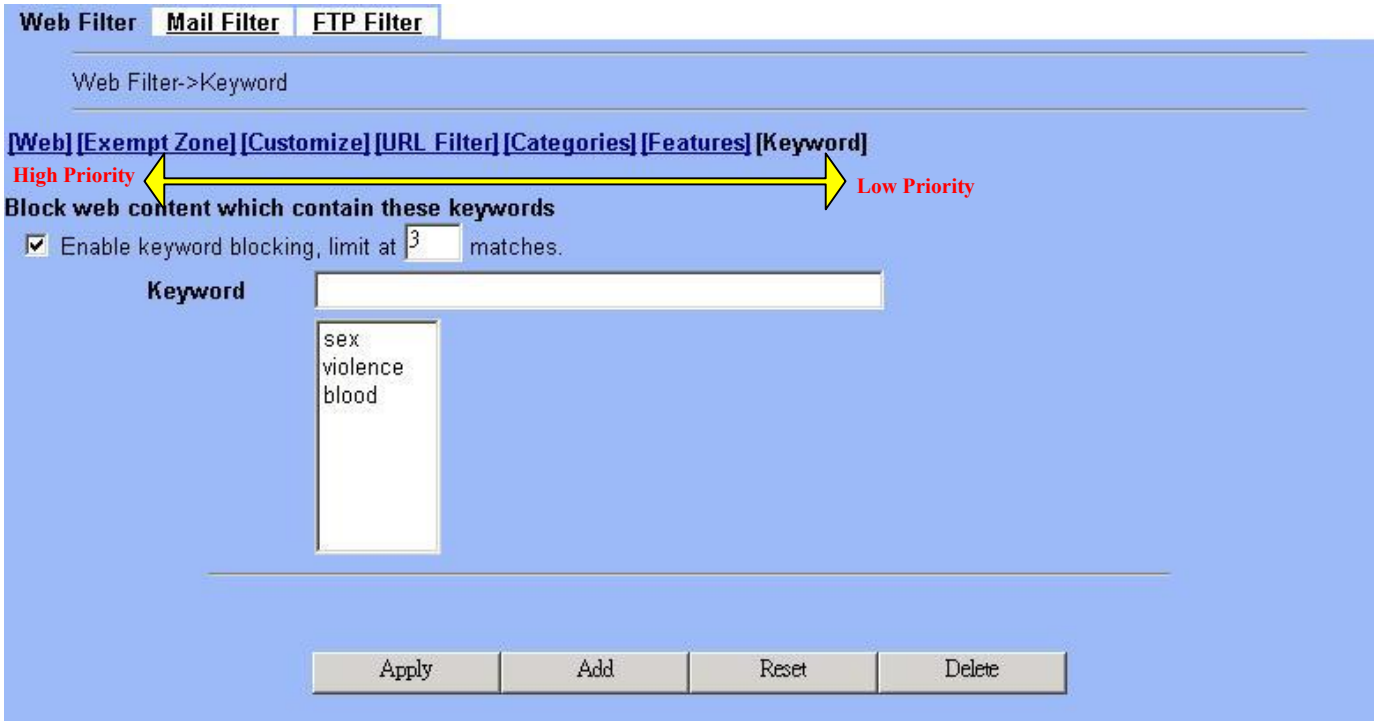


Figure 15-3 web filter features priority (from High to Low)

According to the priorities of web filter, we have the guiding principle to setup the web filter now. As we know, there are many choices according to your requirement in the web filter settings. Here we list the setting priorities for your reference. As the following Table 15-8 indicates, the smaller priority sequence would be executed first when running web filter.

Priority sequence	Selected item	Description	Restricted Region
1.	Web Filter > Exempt zone	Select which LAN region will apply the web filter settings. There are three items to choose (enforce all computers, include specified computers, and exclude specified computers)	LAN
2.	Web Filter > Customize	We can use the Customize domain to indicate the Trusted/Forbidden destination. There are two items for your choice. We can specify which URL domain names are trusted, and which ones are forbidden separately. Warning: Customize will not work on the proxy connections.	Internet web server
3.	Web Filter > URL_Filter	When an URL contains any keywords listed in the domain name, it will be blocked.	Internet web server
4.	Web Filter > Categories	We can use Database Update to update the latest URL database and then the Categories will be updated at the same time. The URL which user request will be blocked if it matches the categories in the URL Database.	Internet web server
5.	Web Filter > Features Web Filter > Keyword	If the web page contains the components included activex/java/javascript/cookie which indicated in "`Web Filter > Features`", or the keywords indicated in "`Web Filter > Keyword`". The forbidden components will be taken off from the web page by web filter.	Web page contents

Table 15-8 web filter features priority

Chapter 16
Content Filtering – Mail Filters

This chapter introduces SMTP proxies and explains how to implement it.

16.1 Demands

Sometimes there are malicious scripts like *.vbs that may be attached in the email. If the users accidentally open such files, their computers may be infectious with virus.

16.2 Objectives

Modify the filename extension of the suspicious email attachments so that email receivers may notice that the file cannot be directly opened by the operating system because of the unrecognized filename extension.

16.3 Methods

1. Setup SMTP filters for outgoing emails from PC_1 (in LAN1) towards the mail server (in DMZ1 or in WAN1) to append a ".bin" to all vbs attachments. Use PC1_1 to send an email with vbs attachments to test the configuration.

2. Setup POP3 filters for incoming emails from a mail server (in WAN1 or in DMZ1) to PC_1 (in LAN1) to append a ".bin" to all vbs attachments. Use PC1_1 to retrieve an email with vbs attachments to test the configuration.

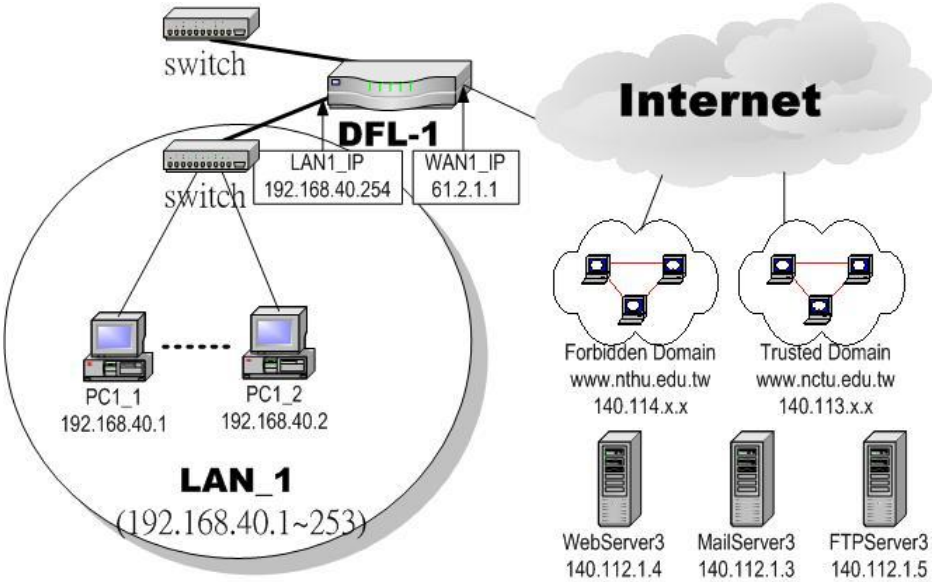


Figure 16-1 Use SMTP / POP3 filter functionality to avoid some sensitive e-mail directly opened

16.4 Steps for SMTP Filters

Step 1 – Enable SMTP Filters

Check the `Enable SMTP Proxy` checkbox and click `Apply`.

ADVANCED SETTINGS > Content Filters > Mail Filters > SMTP

FIELD	DESCRIPTION	EXAMPLE
Enable SMTP Proxy	Enable SMTP Proxy feature of DFL-900	Enabled
Append ".bin" to E-mail attachments whose	➢ Filename extension When the filename extension of attachment file matches “Filename extension”, add the “.bin” extension to the attachment file. ➢ Exact filename When the whole filename of attachment file matches “Exact filename”, add the “.bin” extension to the attachment file.	Filename extension

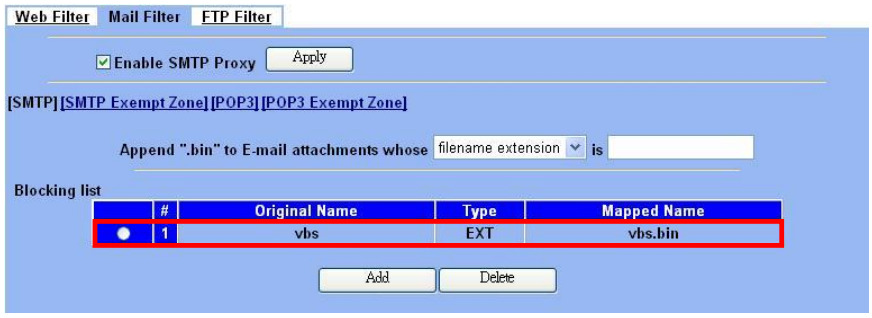
Table 16-1 Mail Filter SMTP setting page

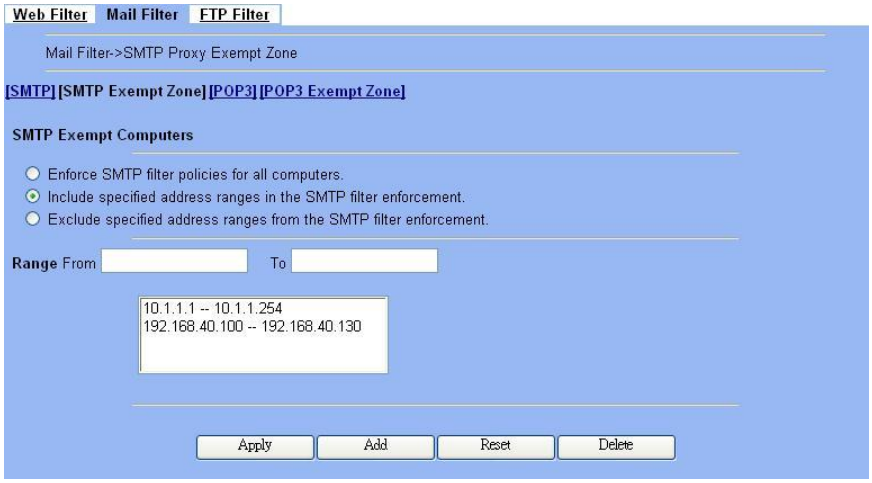
Step 2 – Add a SMTP Filter

Select `filename extension`, enter `vbs`, and click `Add` to add a rule. This rule will apply to all LAN-to-DMZ/WAN SMTP connections. All such SMTP traffic will be examined to change the filename extension from `vbs` to `vbs.bin`.

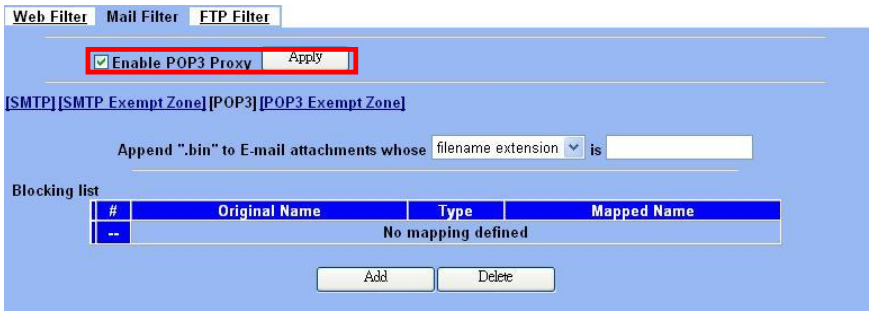
Note that the filename to block cannot contain the marks such as “ /, \, *, ?, “, <, >, | ”.

ADVANCED SETTINGS > Content Filters > Mail Filters > SMTP



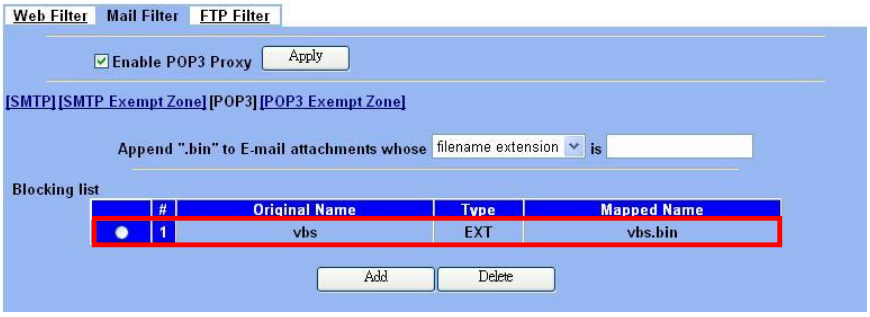
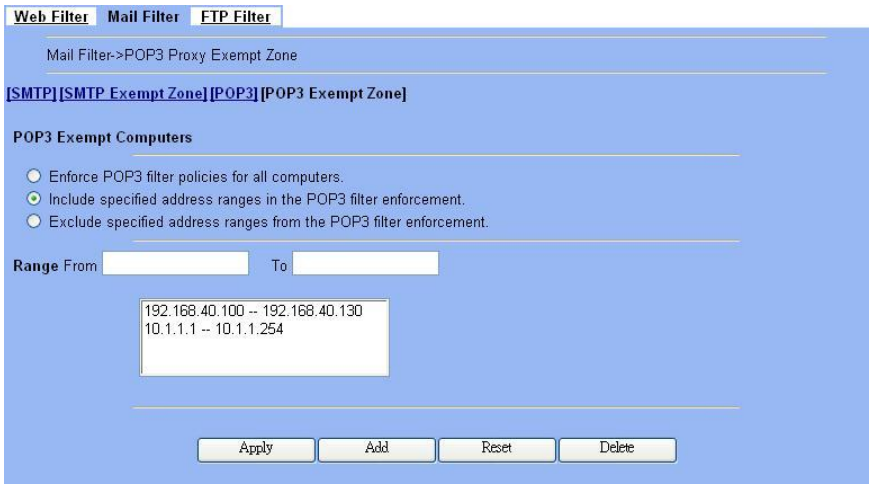
Step 3 – Customize the local zones	**ADVANCED SETTINGS > Content Filters > Mail Filters > SMTP Exempt Zone**
You can configure to what range the filters will apply to the local zones. By default, the web filters apply to all computers so the "`Enforce SMTP filter policies for all computers`" is selected, and the range is `0.0.0.0 – 255.255.255.255`. Delete the default range by clicking the range item and the `Delete` button. Enter the IP range in the `Range` fields followed by a click of the `Add` button to add one address range to the web filter. Click "`Include.....` " and `Apply` if you want web filters to only apply to the specified ranges. Click "`Exclude.....`" and `Apply` if you want web filters to apply to all computers except those specified ranges.	

16.5 Steps for POP3 Filters

Step 1 – Enable POP3 Filters	**ADVANCED SETTINGS > Content Filters > Mail Filters > POP3**
Check the `Enable POP3 Proxy` checkbox and click `Apply`.	

FIELD	DESCRIPTION	EXAMPLE
Enable POP3 Proxy	Enable POP3 Proxy feature of DFL-900	Enabled
Append ".bin" to E-mail attachments whose	➢ Filename extension When the filename extension of attachment file matches "Filename extension", add the ".bin" extension to the attachment file. ➢ Exact filename When the whole filename of attachment file matches "Exact filename", add the ".bin" extension to the attachment file.	Filename extension

Table 16-2 Mail Filter SMTP setting page

Step 2 – Add a POP3 Filter Select `filename extension`, enter `vbs`, and click `Add` to add a rule. This rule will apply to all DMZ/WAN-to-LAN POP3 connections. All such POP3 traffic will be examined to change the filename extension from `vbs` to `vbs.bin`. Note that the filename to block cannot contain the marks such as " /, \, *, ?, ", <, >, | ".	**ADVANCED SETTINGS > Content Filters > Mail Filters > POP3** 
Step 3 – Customize the local zones You can configure to what range the filters will apply to the local zones. By default, the web filters apply to all computers so the "`Enforce POP3 filter policies for all computers`" is selected, and the range is `0.0.0.0 – 255.255.255.255`. Delete the default range by clicking the range item and the `Delete` button. Enter the IP range in the `Range` fields followed by a click of the `Add` button to add one address range to the web filter. Click "`Include.....` " and `Apply` if you want web filters to only apply to the specified ranges. Click "`Exclude.....`" and `Apply` if you want web filters to apply to all computers except those specified ranges.	**ADVANCED SETTINGS > Content Filters > Mail Filters > POP3 Exempt Zone** 

Chapter 17
Content Filtering – FTP Filtering

This chapter introduces FTP proxies and explains how to implement it.

17.1 Demands

1. Some users in LAN1 use FTP to download big MP3 files and cause waste of bandwidth.

17.2 Objectives

1. Forbid PC1_1 from downloading MP3 files with FTP.

17.3 Methods

1. Setup the filename extension of the forbidden types of file that are not allowed to be transmitted using standard FTP port.

2. Let PC1_1 download a MP3 file from the FTPServer3 to see if the session is blocked.

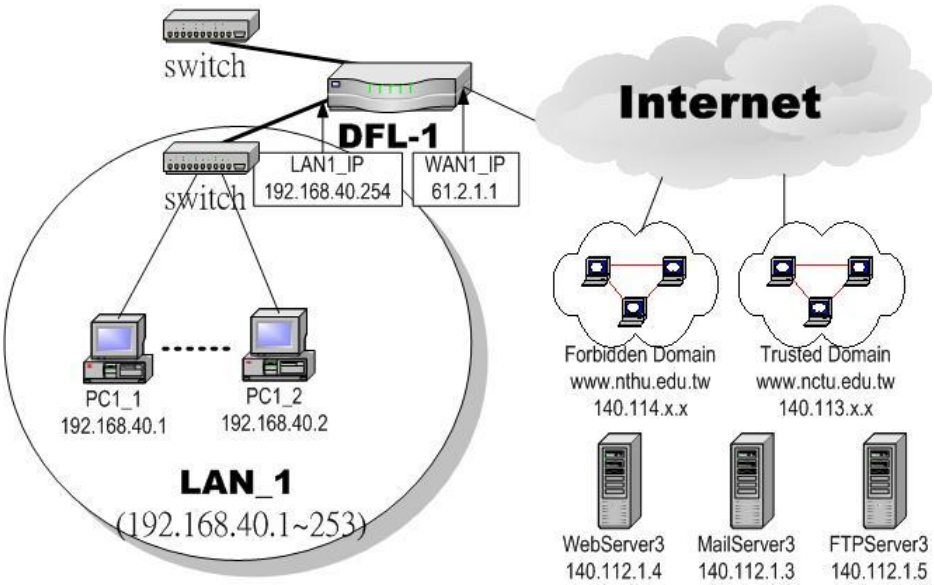


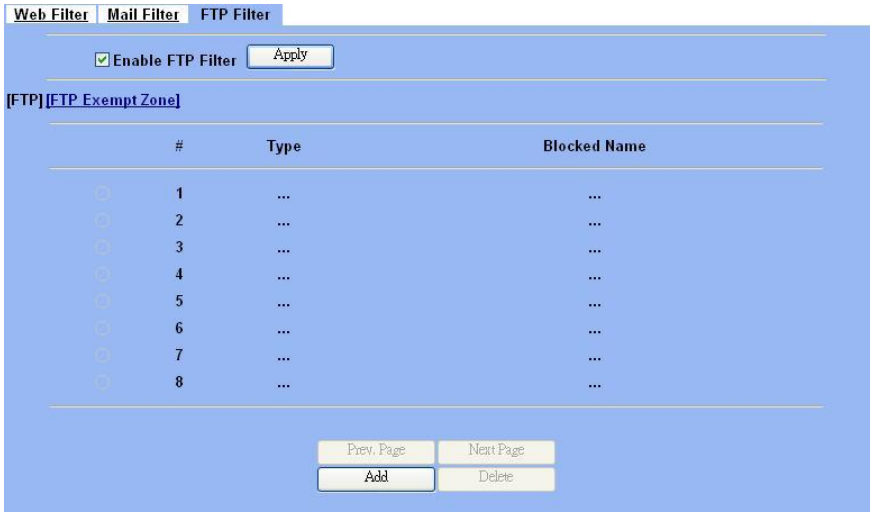
Figure 17-1 Use FTP filter functionality to avoid user download forbidden file type

17.4 Steps

Step 1. Enable FTP Filter

Check the `Enable FTP Filter` checkbox and click the nearby `Apply` button to enable this feature. Click the `Add` button to add a new FTP filter.

ADVANCED SETTINGS > Content Filters > FTP Filter > FTP



FIELD	DESCRIPTION	EXAMPLE
Enable FTP Filter	Enable FTP Filter feature of DFL-900	Enabled

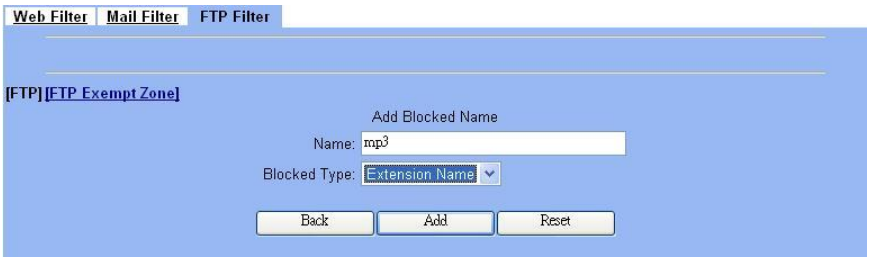
Table 17-1 FTP Filter FTP setting page

Step 2. Add an FTP Filter

Enter `mp3` in the `Name` field and select `Extension Name` in the `Blocked Type` field. Click the `Add` button to apply the change. Now users in LANs can never download any mp3 files.

Note that the filename to block cannot contain the marks such as " /, \, *, ?, ", <, >, | ".

ADVANCED SETTINGS > Content Filters > FTP Filter > FTP > Add



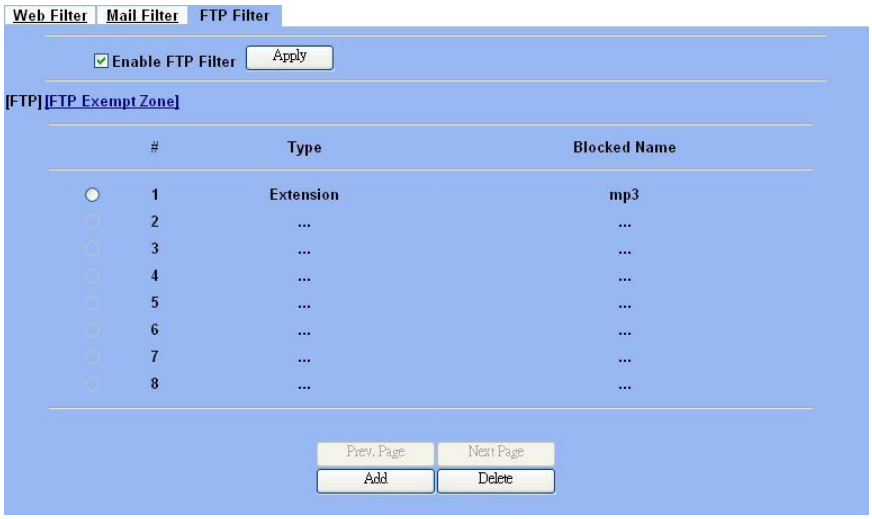
FIELD	DESCRIPTION	EXAMPLE
Name	Fill in the file extension or exact filename.	mp3
Blocked Type	➢ Extension Name When the extension filename of download file is matching, the action is blocked download from FTP server. ➢ Full Name When the exact filename of download file is matching, the action is blocked download from FTP server.	Extension Name

Table 17-2 FTP Filter FTP adding filter entry

Step 3. View the result

We can see the specified record in this page.

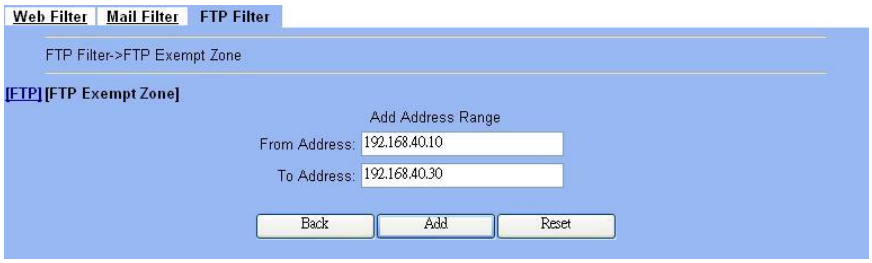
ADVANCED SETTINGS > Content Filters > FTP Filter > FTP



Step 4. Add an Exempt Zone

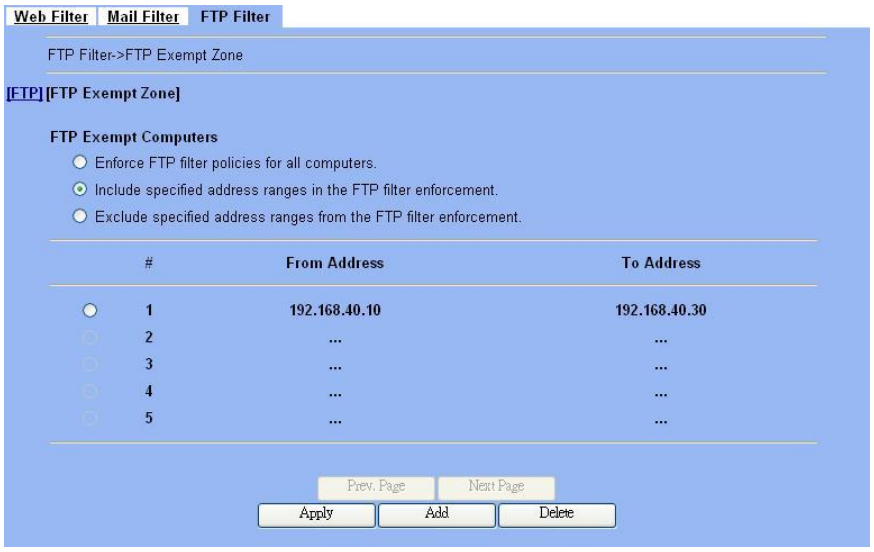
Add a new Exempt Zone record. It's IP address range is between 192.168.40.10 to 192.168.40.30.

ADVANCED SETTINGS > Content Filters > FTP Filter > FTP Exempt Zone > Add



FIELD	DESCRIPTION	EXAMPLE
From Address	Exempt zone record IP address from	192.168.40.10
To Address	Exempt zone record IP address to	192.168.40.30

Table 17-3 FTP Filter add an exempt zone entry

Step 5. Show the Exempt Zones	ADVANCED SETTINGS > Content Filters > FTP Filter > FTP Exempt Zone
Here we can discover that new added Exempt Zone record is appeared.	

Part VI

Intrusion Detection System

Chapter 18
Intrusion Detection Systems

This chapter introduces Intrusion Detection System (IDS) and explains how to implement it.

18.1 Demands

Although Firewall settings are correct, there may still be some crackers intrude our system. Crackers hack into our system through Firewall-allowed channels with sophisticated skills. Most often, they attack specific application servers such as SNMP, Web, and FTP services in your DMZ.

18.2 Objectives

1. Detect any attacks towards our DMZ servers.

2. Instantly notify our network administrators what attacks have been detected.

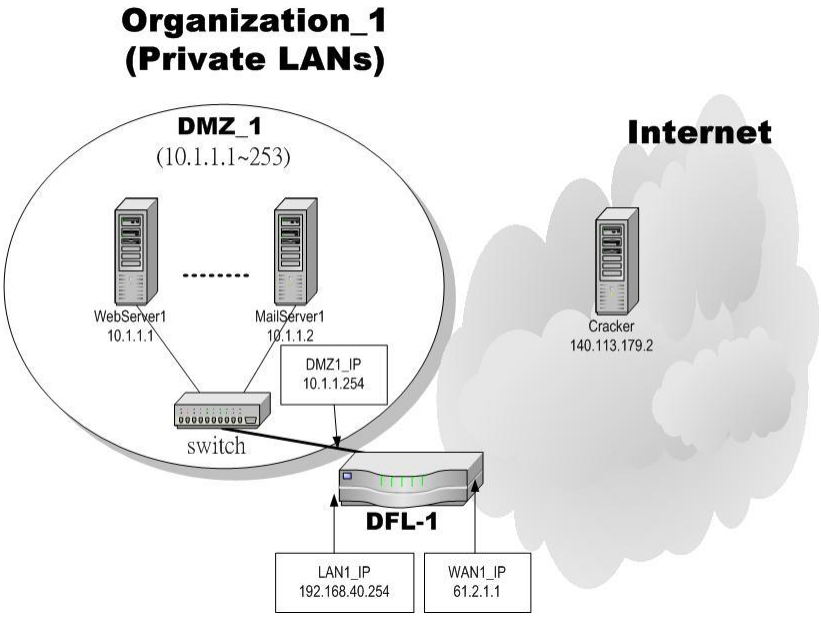


Figure 18-1 Some cracker in the Internet would try to hack our company

18.3 Methods

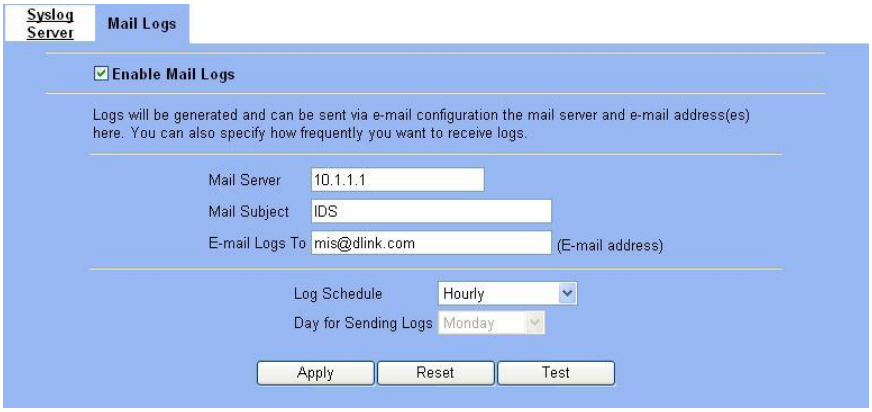
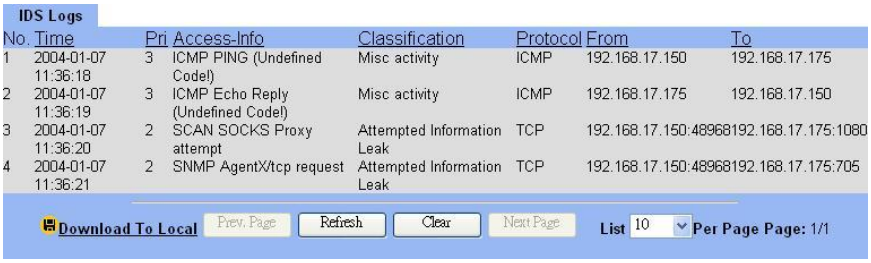
1. Specify where our Web server is located to let the IDS on the DFL-900 focus more on the attacks.
2. Setup logs to email to the specified email address when the log is full. You can also set daily/weekly emails to periodically monitor the IDS logs.

18.4 Steps

Step 1 – Enable IDS Check the `Enable IDS` checkbox, and click the `Apply` button.	**ADVANCED SETTINGS > IDS > IDS Status** 

FIELD	DESCRIPTION	EXAMPLE
Enable IDS	Enable IDS feature of DFL-900. When enabled, the built-in IDS detect more than 2000 application-level attacks from the default WAN link. The attack signatures can be periodically updated.	Enabled

Table 18-1 IDS option list explanation

Step 2 – Setup Logs Enter the `Mail Server IP Address`, `Mail Subject`, and the `email address` that you want to receive from. Select the `Log Schedule` of emailing the logs to your email server.	**DEVICE STATUS > Log Config > Mail Logs** 
Step 3 – View logs If there are attacks towards the WAN port from the public Internet, there will be logs describing the details.	**DEVICE STATUS > IDS Logs** 
Step 4 – Update Attack Patterns IDS attack patterns require frequent updates because there are many new attacks every week. Please go to SYSTEM TOOLS > Database Update > Update to update IDS attack patterns. The DFL-900 will connect to `fwupdate.dlinktw.com.tw` to fetch any new signatures.	**SYSTEM TOOLS > Database Update > Update**

	Update Status : URL database : v1.40601 [2004/07/16 17:14] Update IDS signatures: v1.40601 [2004/07/16 17:14] Update Auto Update : Update Center fwupdate.dlinktw.com.tw Update Schedule On Sunday 0 0 Auto URL update ☑ Auto IDS update ☑ Apply Reset

Part VII

Bandwidth Management

Chapter 19
Bandwidth Management

This chapter introduces bandwidth management and explains how to implement it.

19.1 Demands

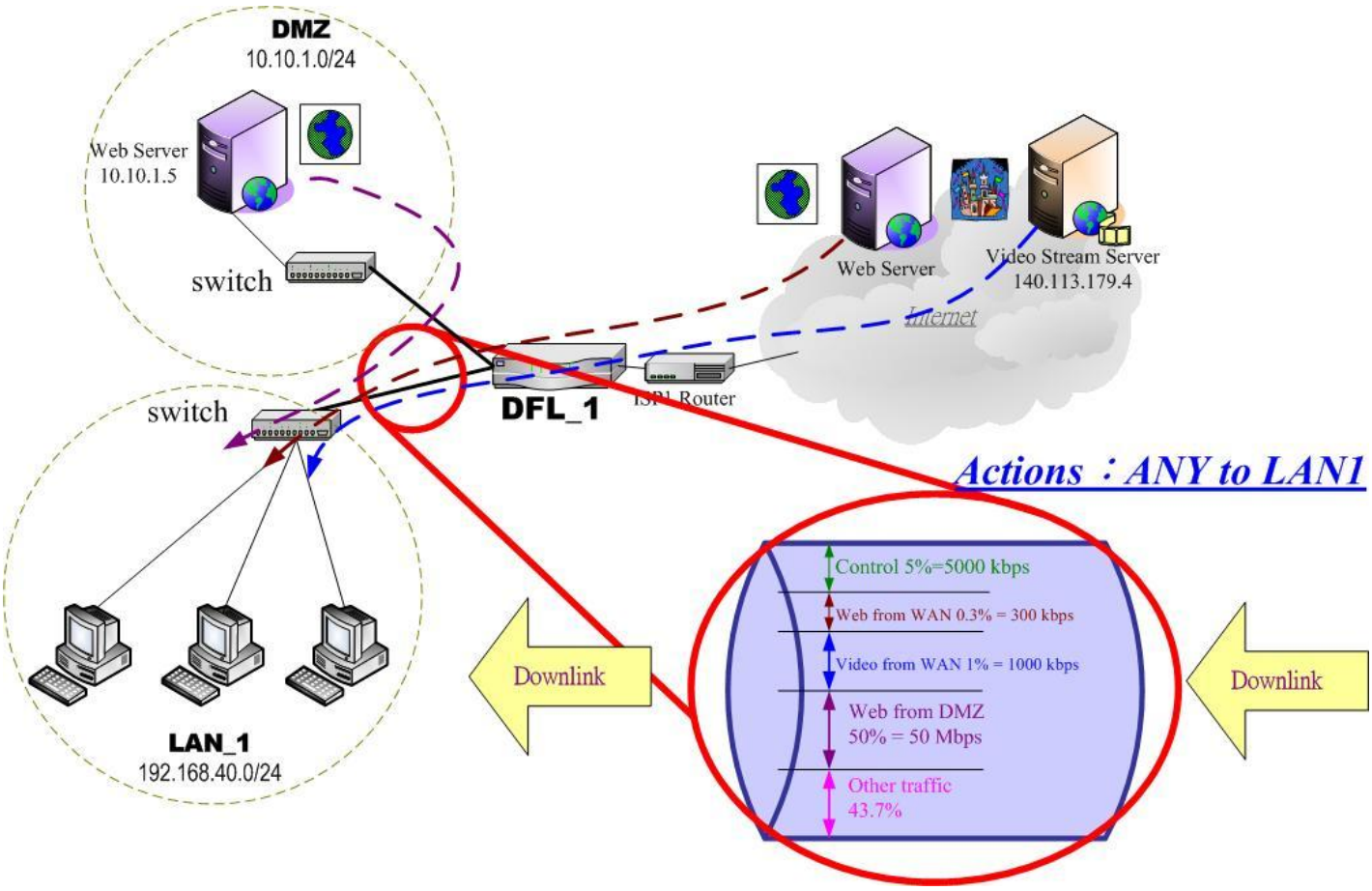


Figure 19-1 Use bandwidth management mechanism to shape the data flow on the downlink direction

1. As the above Figure 19-1 illustrated, we hope LAN_1 users can watch the Video Stream Server smoothly. Besides, we hope LAN_1 users can access the web server located at DMZ region more faster

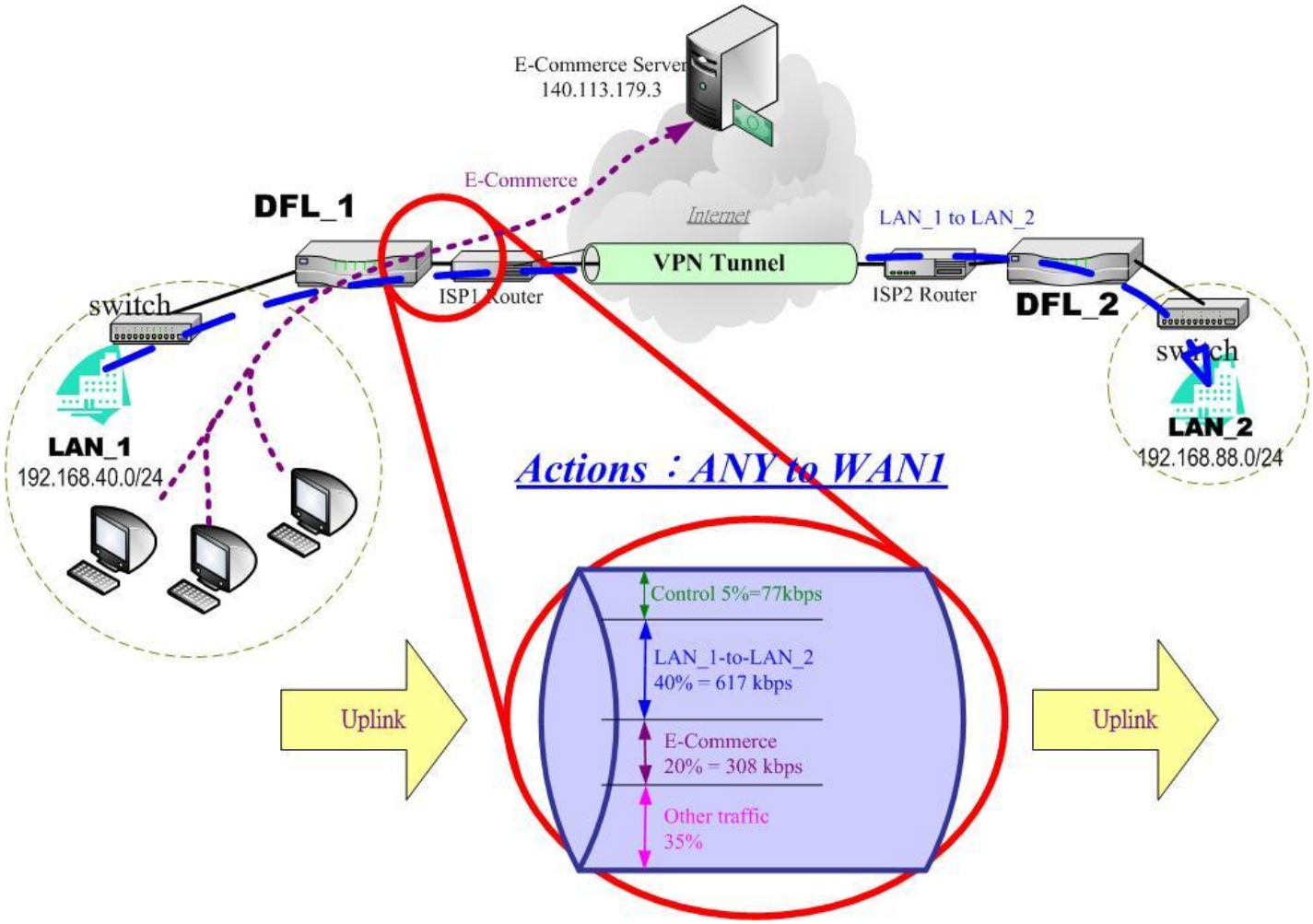


Figure 19-2 Use bandwidth management mechanism to shape the data flow on the uplink direction

2. As the above Figure 19-2 illustrated, LAN_1 PCs are using the E-Commerce service from the E-Commerce Server (140.113.79.3), causing the blocking of the VPN transfer from LAN_1 to LAN_2. So we want to make sure that the VPN tunnel links is reserved at least 600 kbps speed rate. And the free bandwidth will raise the transmission bandwidth of LAN_1 PCs access the E-Commerce service.

19.2 Objectives

1. As the above diagram Figure 19-1 illustrates, LAN_1 PCs are browsing the web pages from the Web Server of Internet. This occupies the bandwidth of PCs who are watching the video provided by the Video Stream Server (140.113.179.4), causing the video to be blocked and to have poor quality. So we hope to guarantee the video quality of the LAN_1 PCs which are accessing Video Stream Server.

   The total bandwidth of ANY to LAN1 direction is 100 Mbps (The bandwidth of LAN1 interface is 100 Mbps). Here we will make sure that PCs of LAN_1 have the smooth stream quality that must have at least 1% of LAN1 total bandwidth (1000 kbps) speed rate.

   Besides, we have another web server located at DMZ region. Because the web server is located at local area, so we can assign larger bandwidth for this direction (web traffic from DMZ → LAN).

The remaining bandwidths are named Other traffic. They are reserved for other ANY to LAN1 data transmission which don't list in the above Figure 19-1 diagram.

2. Reserve at least 600kbps for the LAN_1 to LAN_2 transfer. The LAN_1 PCs can share about 20% (308kbps) for using E-Commerce Services. However, when the LAN_1 to LAN_2 traffic less then 40% (617kbps), the E-Commerce service can occupy the free bandwidth from LAN_1-toLAN_2 and the remaining bandwidth from default class.

19.3 Methods

1. As the following Table 19-1 listed, partition the inbound bandwidth (total 100Mbps) into three classes, web_from_WAN, video_from_WAN and web_from_DMZ class. The remaining bandwidth is assigned to other services which are not listed here.

Service	Goal	Assigned bandwidth	Borrow bit status
Web from WAN	limited bandwidth (MAX. 300kbps)	0.3% = 300kbps	Disabled
Video from WAN	guaranteed bandwidth (At least 1000kbps)	1% = 1000kbps	Enabled
Web from DMZ	guaranteed bandwidth (At least 50Mbps)	50% = 50Mbps	Enabled

Table 19-1 Bandwidth management action assignment from ANY to LAN1

2. As the following Table 19-2 listed. Partition the outbound bandwidth (total 1.544Mbps) into two classes, the LAN_1-to-LAN_2 (40% 617 kbps) and the E-commerce (20% 308kbps) classes. Besides, set the E-Commerce to be able to borrow from other bandwidth if any bandwidth is available.

Service	Goal	Assigned bandwidth	Borrow bit status
LAN_1 to LAN_2	limited bandwidth (MAX. 617kbps)	40% = 617kbps	Disabled
E-Commerce	guaranteed bandwidth (At least 308kbps)	20% = 308kbps	Enabled

Table 19-2 Bandwidth management action assignment from ANY to WAN1

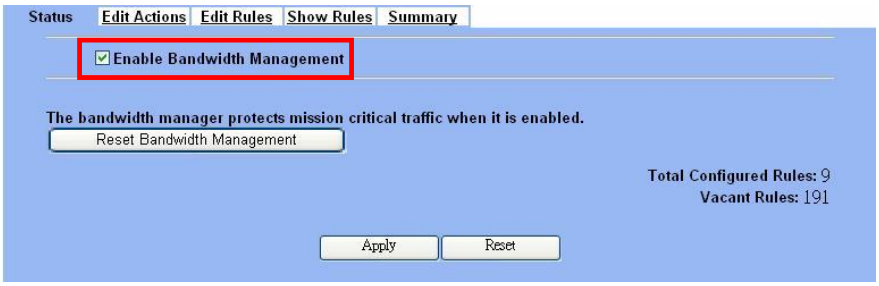
19.4 Steps

19.4.1 Inbound Traffic Management

Step 1. Enable Bandwidth Management

Check the `Enable Bandwidth Management` checkbox, click the `Apply`.

ADVANCED SETTINGS > Bandwidth Mgt. > Status



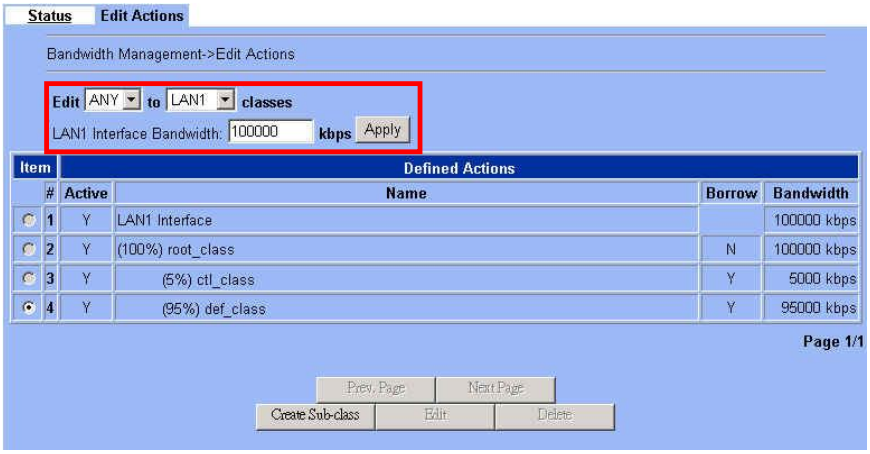
FIELD	DESCRIPTION	Range/Format	EXAMPLE
Enable Bandwidth Management	Enable Bandwidth Management feature of DFL-900	Enable/Disable	Enabled
BUTTON	DESCRIPTION		
Reset Bandwidth Management	Reset all the bandwidth management rules to default status.		
Apply	Apply the settings which have been configured.		
Reset	Clean the filled data and restore the original one.		

Table 19-3 Setup status page of Bandwidth Management

Step 2. Setup the LAN1 Link

Select `ANY` to `LAN1` to setup traffic that will be transmitted by the LAN1 interface. Enter the LAN1 interface bandwidth as `100000`kbps (100Mbps). Click the `Apply` button to enforce the LAN1 link bandwidth to be specified bandwidth. In the table, the `root` class represents the whole bandwidth of the link. By default the link is partitioned into two classes: control class (`ctl_class`) and default class (`def_class`). The control class reserves bandwidth for control protocols such as ICMP, TCP ACKs. The default class is the default action of non-matched packets. The default class can be recursively partitioned into more classes. The classes are organized as a tree. Click `Create Sub-Class` to partition the default class.

ADVANCED SETTINGS > Bandwidth Mgt. > Edit Actions



FIELD	DESCRIPTION	Range/Format	EXAMPLE
Edit __ to __ classes	Select the direction of action which you are going to configure one.	ANY to WAN/LAN/DMZ	Edit ANY to LAN1 classes

LAN1 Interface Bandwidth __ kbps	Fill the real bandwidth which is located in the upper direction.	10 to 100000 kbps	100000 kbps
BUTTON	DESCRIPTION		
Prev. Page	If there are more than one action pages, you can press Prev. Page to back to the previous page.		
Next Page	If there are more than one action pages, you can press Next Page to go to the next page.		
Create-Sub-class	Create a sub class from the indicated class.		
Edit	Edit the properties of the existent class.		
Delete	Delete the indicated class.		

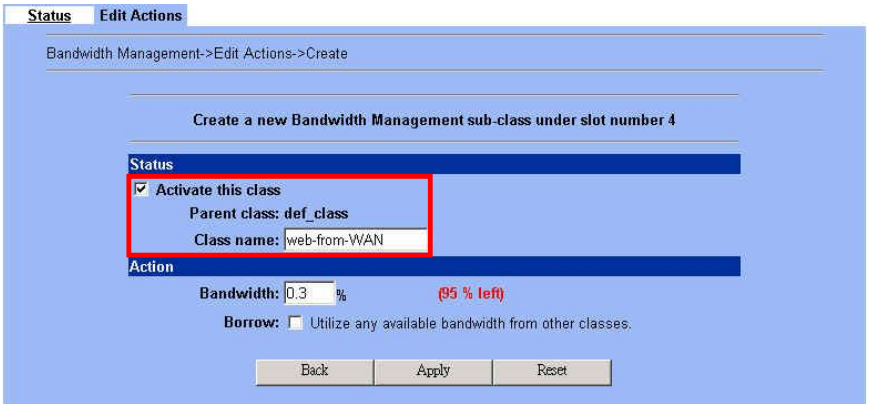
Table 19-4 Setup edit actions page of Bandwidth Management

Step 3. Add new classes

Create a sub-class named `web-from-WAN` from the default class. Enter `0.3%` in the `bandwidth` field. Make sure that `Borrow` button is unchecked and then web-from-WAN class will not enlarge the bandwidth from borrowing other unused bandwidth. Finally, click `Apply` button. See the steps in the right diagram.

Subsequently, we will continue to setup another two classes, such as video-from-WAN class and web-from-DMZ class. Select the default class and click the `Create Sub-Class` to create these two classes. The setting procedure is the same as the web-from-WAN class described.

ADVANCED SETTINGS > Bandwidth Mgt. > Edit Actions > Create Sub-class



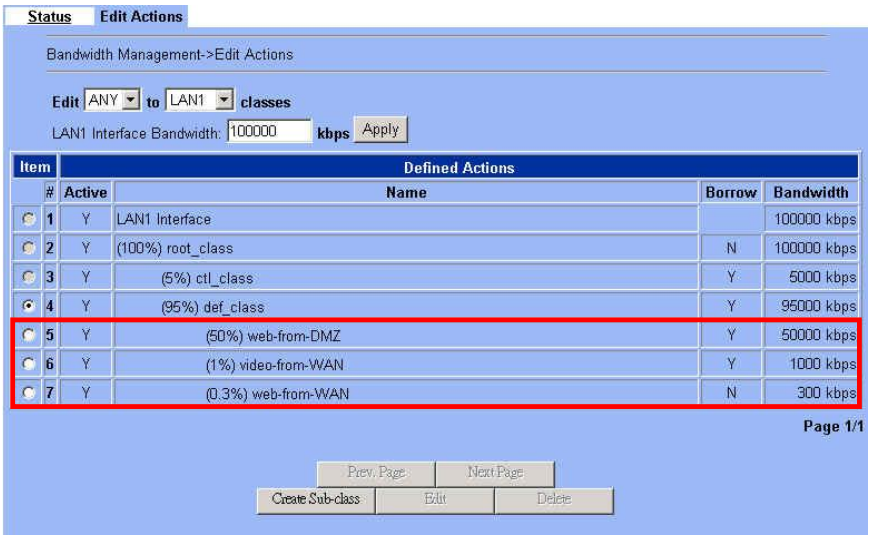
FIELD	DESCRIPTION	Range/Format	EXAMPLE
Activate this class	Enable the bandwidth management class for later using	Enable/Disable	Enabled
Class name	Bandwidth management class name	text string	web-from-WAN
Bandwidth	How many percentage does this class occupy higher class?	0.1 ~ Max Value (as red text described)	0.3
Borrow	When the bandwidth of other class is idle, it will use the bandwidth of other class to increase bandwidth temporarily.	Enable/Disable	Disabled
BUTTON	DESCRIPTION		
Back	back to previous configuration page.		
Apply	Apply the settings which have been configured.		
Reset	Clean the filled data and restore the original one.		

Table 19-5 Add new class in the bandwidth management feature

Step 4. Partition into Classes

Now there are three actions under the default action.

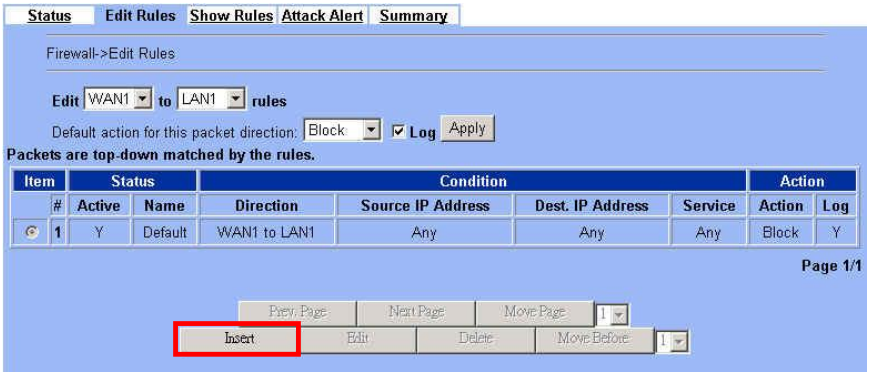
ADVANCED SETTINGS > Bandwidth Mgt. > Edit Actions > Create Sub-Class



Step 5. Setup WAN1-to-LAN1 Rules

Select `WAN1 to LAN1` to display the rules. There is a pre-defined rule that matches all traffic into the default class. Click `Insert` to insert a rule before the default rule.

ADVANCED SETTINGS > Firewall > Edit Rules



FIELD	DESCRIPTION	Range/Format	EXAMPLE
Edit __ to __ rules	Select the rule direction of rule which you are going to configure.	WAN/LAN/DMZ to WAN/LAN/DMZ	Edit WAN1 to LAN1 rules
BUTTON	DESCRIPTION		
Prev. Page	If there are more than one rule pages, you can press Prev. Page to back to the previous page.		
Next Page	If there are more than one action rules, you can press Next Page to go to the next page.		
Move Page __	Move to the indicated page.		
Insert	Insert a new rule.		
Edit	Edit the properties of the existent rule.		
Delete	Delete the indicated rule.		
Move Before __	Move the selected rule to the front of the indicated rule number.		

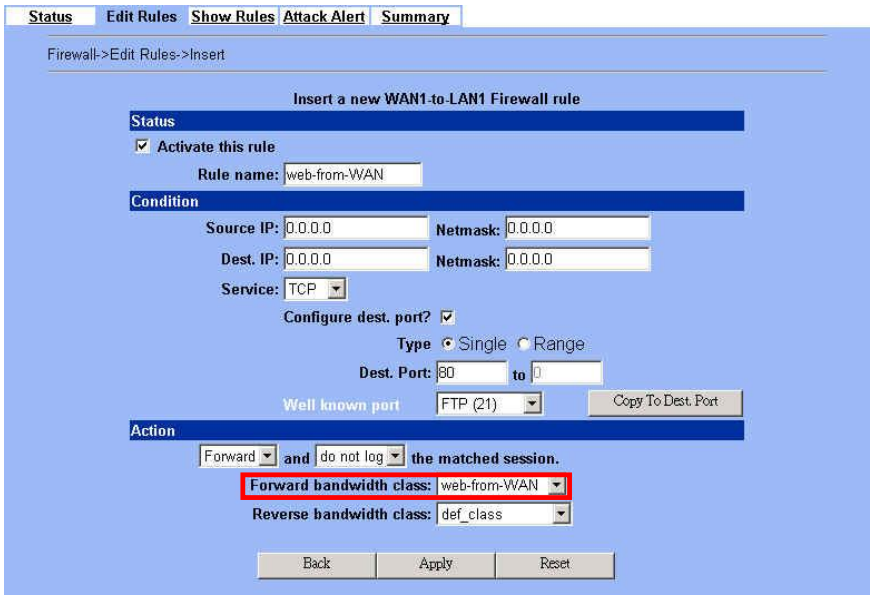
Table 19-6 Setup edit rules page of Bandwidth Management

Step 6. Customize the Rule

Enter a rule name such as `web-from-WAN`, enter the `Source IP/Netmask` as `0.0.0.0 / 0.0.0.0`. Enter the `Dest. IP/Netmask` as `0.0.0.0 / 0.0.0.0`. Besides, make sure the source port is TCP port 80 because of this is web service. Select the action to be `web-from-WAN`. In this way. All inbound web traffic from WAN1 will be put into the `web-from-WAN` queue and scheduled out at 300kbps bandwidth. Click `Apply` to store the changes.

Repeat the same procedure for the `video-from-WAN` class.

ADVANCED SETTINGS > Firewall > Edit Rules > Insert



	FIELD	DESCRIPTION	Range/Format	EXAMPLE
Status	Activate this rule	Enable this firewall rule	Enable/Disable	Enabled
	Rule name	The firewall rule name	text string	web-from-WAN
Condition	Source IP & Netmask	When source IP address of incoming packets conforms the "Source IP/Netmask" settings, do the "Action".	IPv4 format	0.0.0.0 / 0.0.0.0
	Dest. IP & Netmask	When destination IP address of incoming packets conforms the "Dest IP/Netmask" settings, do the "Action".	IPv4 format	0.0.0.0 / 0.0.0.0
	Service	Verify if the service of packet belongs to TCP, UDP, or ICMP type.	ANY/TCP/UDP/ICMP	TCP
	Configure src. port?	If the service is TCP or UDP, we can choose to configure or not to configure source port.	Enable/Disable	Enabled
	Type	If we decide to configure source port, we must choose the port to be single or range.	Single/Range	Single
	Src. Port	If we select single at above field, we just have to fill a port in the first blank space. If we select range at above field, we need to fill the range of the ports.	1 ~ 65534	80
	Configure dest. port?	If the service is TCP or UDP, we can choose to configure or not to configure destination port.	Enable/Disable	Disabled
	Type	If we decide to configure destination port, we must choose the port to be single or range.	Single/Range	N/A

	Dest. Port	If we select single at above field, we just have to fill a port in the first blank space. If we select range at above field, we need to fill the range of the ports.	1 ~ 65534	N/A
Action	Forward / Block the matched session	If packet is matched the rule condition, Forward or Block this matched packet?	Forward / Block	Forward
	Don't log / Log the matched session	If packet is matched the rule condition, Log or Don't log this matched packet?	log / do not log	do not log
	Forward bandwidth class	Forward bandwidth class if any.	def_class web-from-DMZ video-from-WAN web-from-WAN	Web-from-WAN
	Reverse bandwidth class	Reverse bandwidth class if any.	def_class E-Commerce LAN_1-to-LAN_2	def_class

BUTTON	DESCRIPTION
Back	Back to previous configuration page.
Apply	Apply the settings which have been configured.
Reset	Clean the filled data and restore the original one.

Table 19-7 Add a new Bandwidth Management rule

Step 7. View the rules

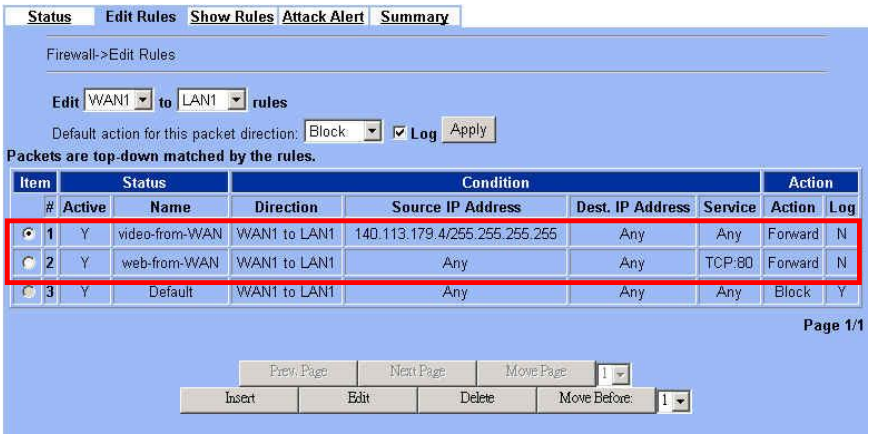
Now we can see that there are existed two customized rules in the queue of WAN1 to LAN1 direction.

In the No. 1 rule. The DFL-900 is configured to direct video-from-WAN packets into the video-from-WAN queue (300kbps).

In the No. 2 rule. The DFL-900 will direct web-from-WAN packets into the web-from-WAN queue (1000kbps).

In the No. 3 rule. The other traffic will be put into the def_class queue (any available bandwidth).

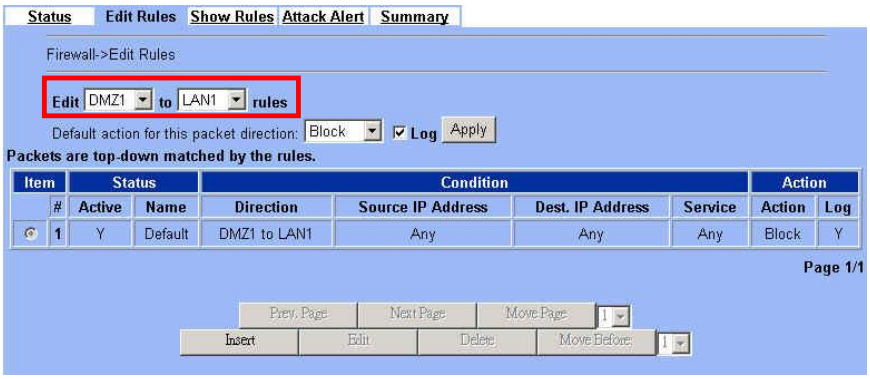
ADVANCED SETTINGS > Firewall > Edit Rules



Step 8. Add DMZ to LAN1 rule

Here we will add another rule (web from DMZ). Select DMZ1 to LAN1 direction.

ADVANCED SETTINGS > Firewall > Edit Rules

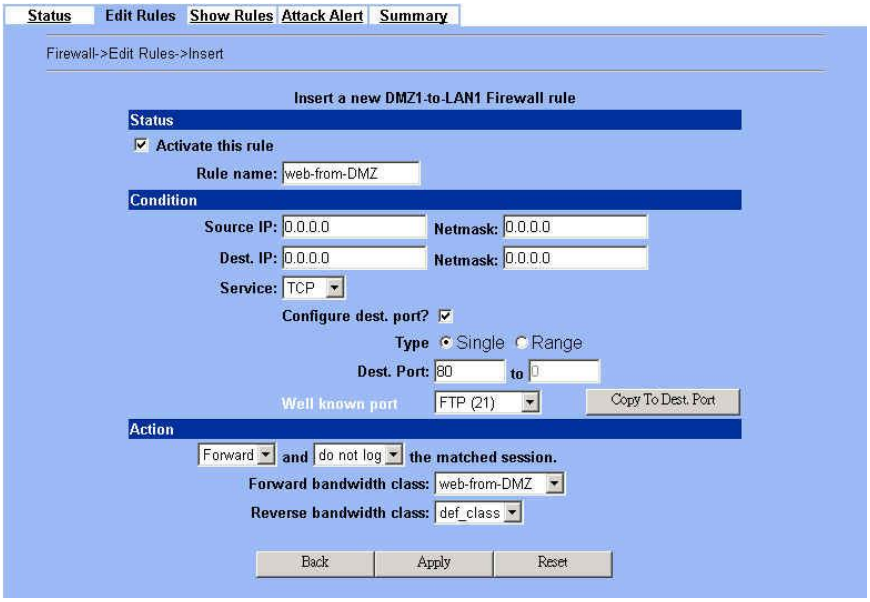


Step 9. Customize the rule

Setup the web-from-DMZ rule. Here we fill four 0.0.0.0 values in the `Source IP / Netmask / Dest. IP / Netmask` field. It means that if the packets come from DMZ and targeted LAN1 region, we do not need to care about its source / dest IP. If the packets request for web traffic (source port 80), it will be put into the `web-from-DMZ` queue by DFL-900 bandwidth management feature.

Not: In the `Action` region, the `web-from-DMZ` class was edited in the previous Step 4 before.

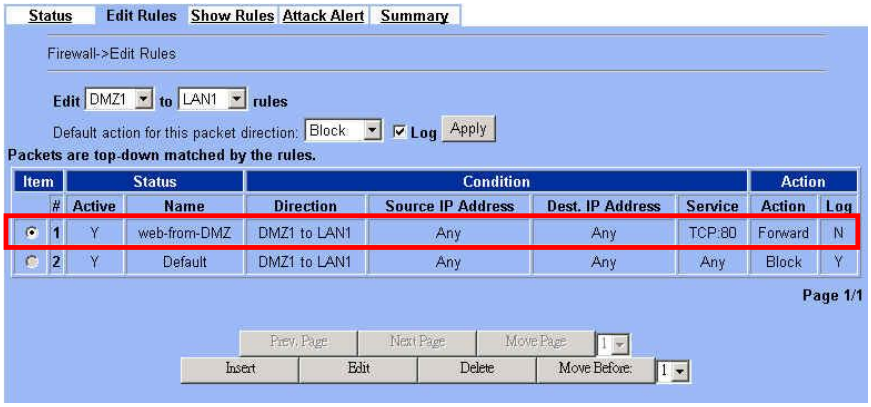
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 10. View the results

We can see the result of our settings at the DMZ-to-LAN rule direction.

ADVANCED SETTINGS > Firewall > Edit Rules

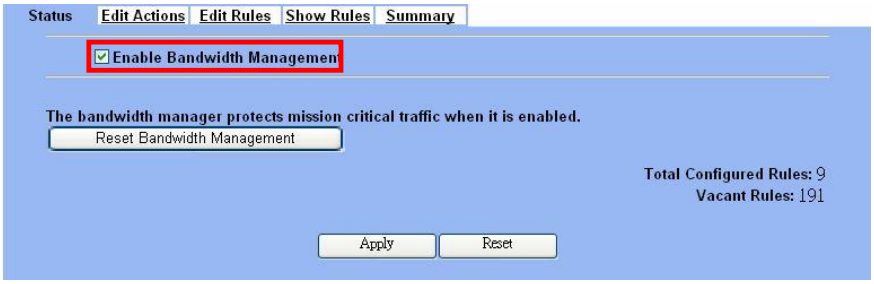


19.4.2 Outbound Traffic Management

Step 1. Enable Bandwidth Management

Check the `Enable Bandwidth Management` checkbox, click the `Apply`.

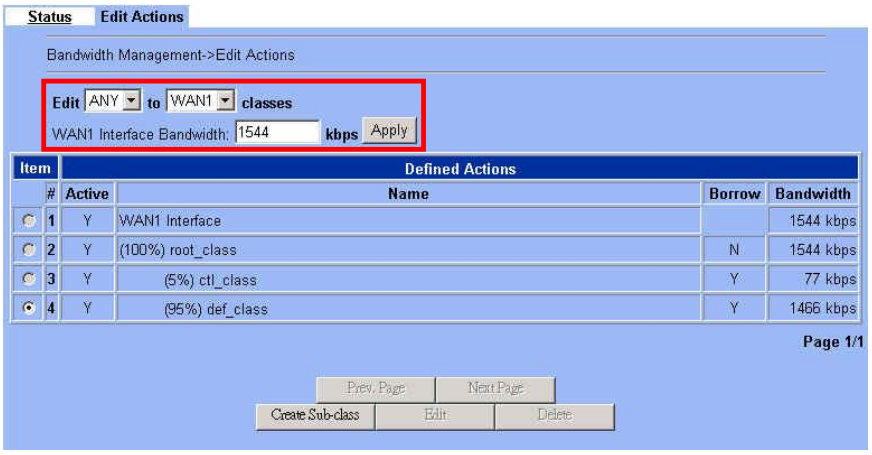
ADVANCED SETTINGS > Bandwidth Mgt. > Status



Step 2. Setup the WAN1 Link

Select `ANY` to `WAN1` to setup traffic that will be transmitted by the WAN1 interface. Enter the WAN1 interface bandwidth as `1544`kbps. Click the `Apply` button to enforce the WAN1 link bandwidth to be 1544kbps. Then click `Create Sub-Class` to partition the default class.

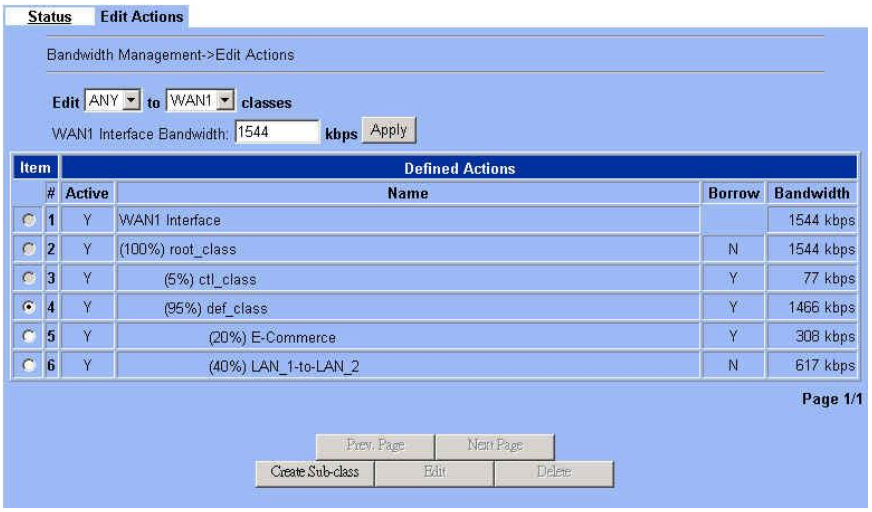
ADVANCED SETTINGS > Bandwidth Mgt. > Edit Actions



Step 3. Partition into Classes

Create a sub-class named `LAN_1-to-LAN_2` from the default class. Enter 40% in the bandwidth field, uncheck the `Borrow` button, and click `Apply`. Select the default class and click the Create Sub-Class to create another sub-class named `E-Commerce` from the default class. Enter `20`% in the bandwidth field, check the `Borrow` button and click `Apply`. Now there are two actions under the default action. They are separately `LAN_1-to-LAN_2` and `E-Commerce` class as the right diagram.

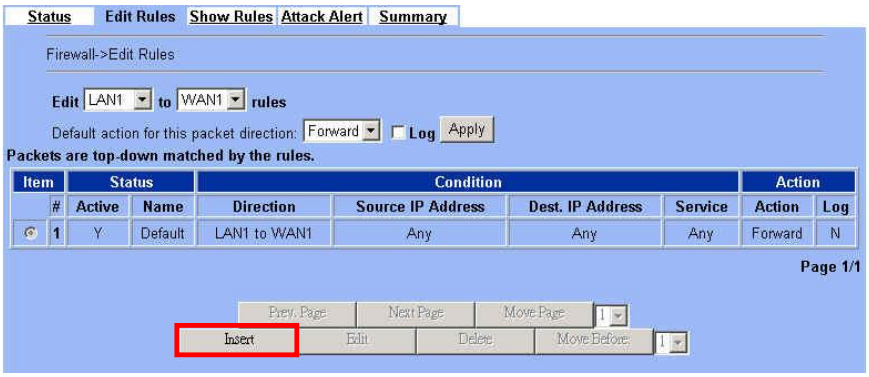
ADVANCED SETTINGS > Bandwidth Mgt. > Edit Actions > Create Sub-Class



Step 4. Setup LAN1-to-WAN1 Rules

Select `LAN1 to WAN1` to display the rules. There is a pre-defined rule that matches all traffic into the default class. Click `Insert` to insert a rule before the default rule.

ADVANCED SETTINGS > Firewall > Edit Rules

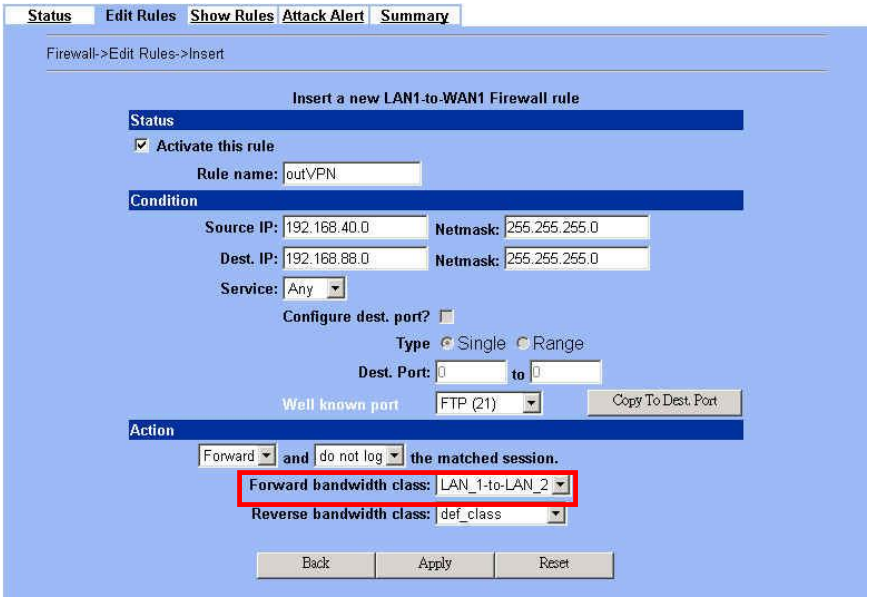


Step 5. Customize the Rules

Enter a rule name such as `outVPN`, enter the Source IP as `192.168.40.0` and the `netmask` as `255.255.255.0`. Enter the `Dest. IP` as `192.168.88.0` and the `netmask` as `255.255.255.0`. Select the action to be `LAN_1-to-LAN_2`. In this way, all outbound packets to the LAN_2 area will be put into the `LAN_1-to-LAN_2` queue and scheduled out at 617 kbps bandwidth. Click `Apply` to store the changes.

Repeat the same procedure for the outE-Commerce rule.

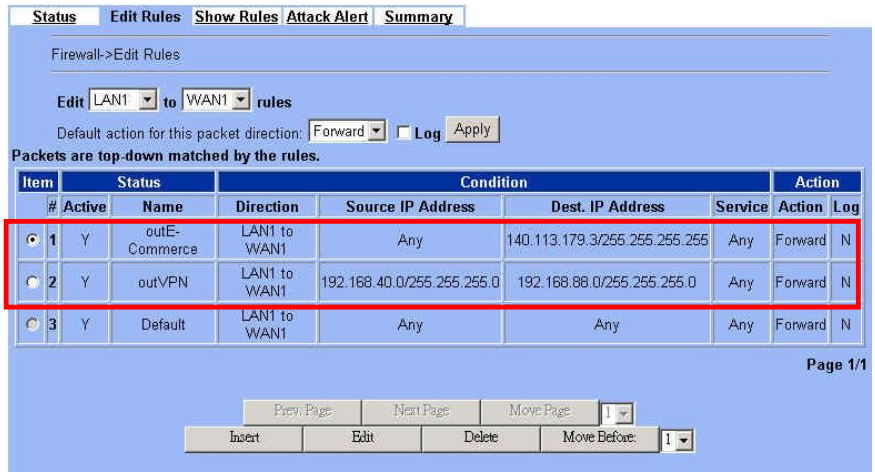
ADVANCED SETTINGS > Firewall > Edit Rules > Insert



Step 6. View the rules

The DFL-900 is configured to direct outE-Commerce matched packets into the E-Commerce queue (308 kbps), outVPN matched packets into the LAN_1-to-LAN_2 queue (617 kbps). Here we reserve 40% WAN1 bandwidth for the LAN_1 to LAN_2 VPN data, to guarantee the data communication between VPN. The other traffic will be put into the def_class queue (any available bandwidth).

ADVANCED SETTINGS > Firewall > Edit Rules



Part VIII

System Maintenance

Chapter 20
System Status

20.1 Demands

1. Since we have finished the settings of DFL-900, we need to gather the device information quickly. Then we can have a overview of the system status.

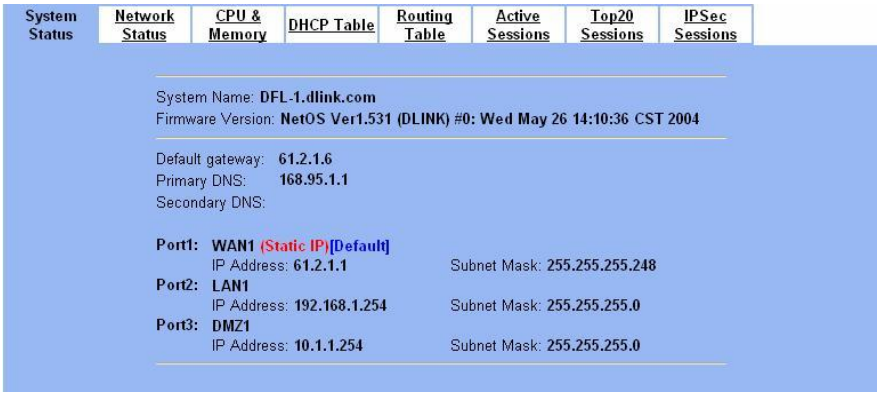
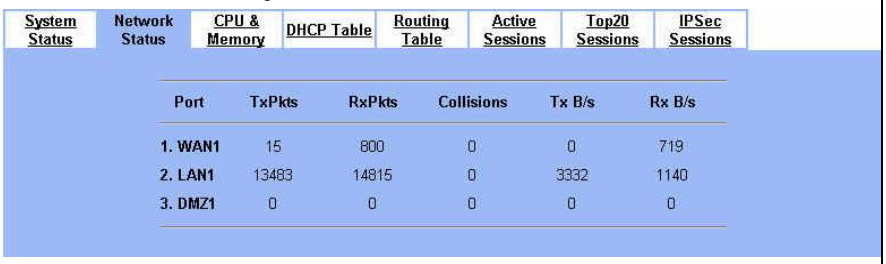
20.2 Objectives

1. We can know the current situation easily through an integrated interface.

20.3 Methods

1. Through DEVICE STATUS > System Status path, we can get the needed information.

20.4 Steps

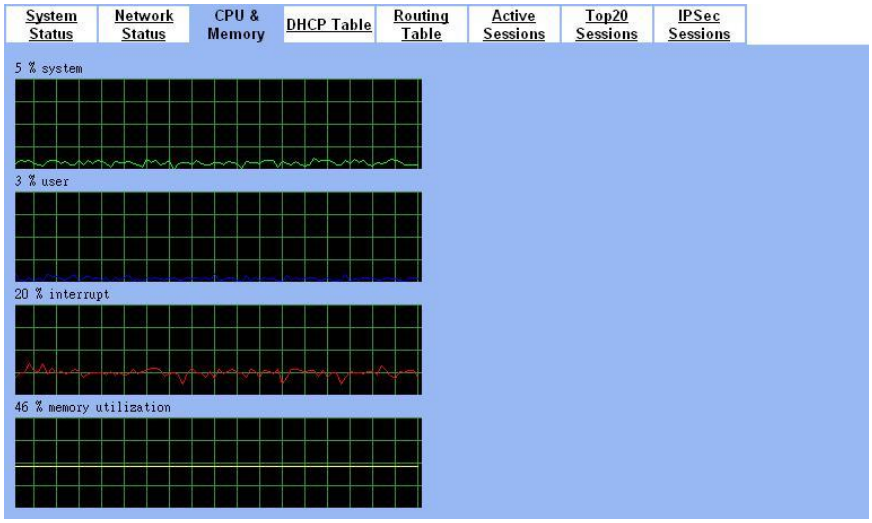
Step 1. System Status Here we can see the system information (include system name, firmware version), and the full list of each port settings.	**DEVICE STATUS > System Status > System Status** 
Step 2. Network Status We can know the port status here, whether the port is up or down, and view the amount of the transmitted packets or received packets in each port.	**DEVICE STATUS > System Status > Network Status** 

Step 3. CPU & Memory

We can know the device information (include system, user, interrupt and memory utilization) through the graphic interface.

Note: If you can not view the graphic correctly, the situation may result from that you don't install the java virtual machine (JVM) onto your browser. Simply go to the following link, http://java.sun.com/j2se/1.4.2/download.html. And then, download the Java 2 Platform, Standard Edition (JRE) to your platform (ex. windows). After installing JRE properly, you will see the CPU & Memory graphic as right side.

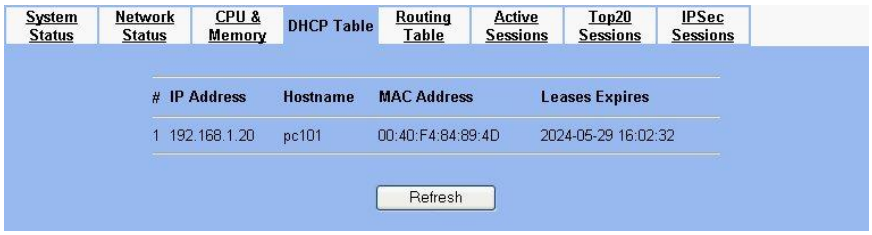
DEVICE STATUS > System Status > CPU & Memory



Step 4. DHCP Table

Through the DHCP Table, we can recognize which IP has been allocated by the DHCP server. And know which pc (MAC address) has been leased this IP address.

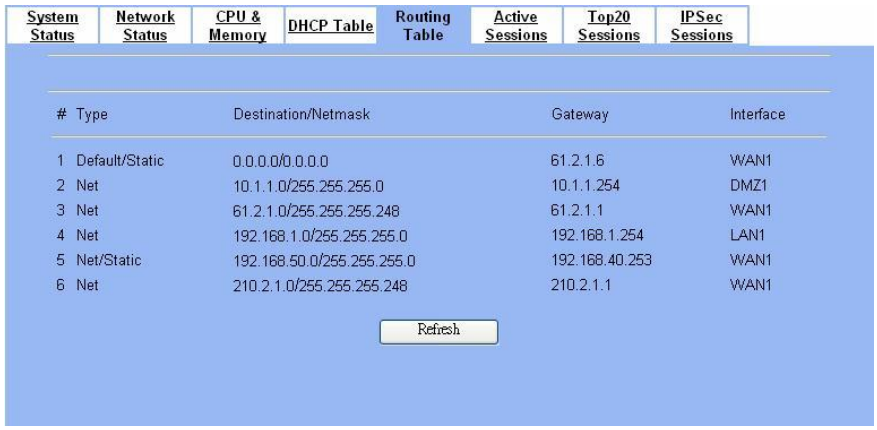
DEVICE STATUS > System Status > DHCP Table



Step 5. Routing Table

Click the `Routing Table` to see the routing table information of DFL-900.

DEVICE STATUS > System Status > Routing Table



Step 6. Active Sessions

Click the `Active Sessions` to see all the current sessions of DFL-900. The `Active Sessions` include all the outbound and inbound sessions.

DEVICE STATUS > System Status > Active Sessions

System Status | Network Status | CPU & Memory | DHCP Table | Routing Table | Active Sessions | Top20 Sessions | IPSec Sessions

Refresh Clear

Current Sessions: 9 Page 1/1

Item		Local Client		Remote Server		Traffic Statistics
	#	IP Address	Port	IP Address	Port	Bytes
	1	192.168.17.188	6222	211.78.4.48	80	1116
	2	192.168.17.188	6221	211.78.4.48	80	1106
	3	192.168.17.188	6220	211.78.4.48	80	3438
	4	192.168.17.188	6219	211.78.4.48	80	5636
	5	192.168.17.188	6218	211.78.4.1	80	7922
	6	192.168.17.188	6217	211.78.4.70	80	2080
	7	192.168.17.188	6216	211.78.4.1	80	130086
	8	203.69.36.107	0	140.112.20.199	0	124
	9	192.168.17.105	1023	168.95.1.1	53	465

Current Sessions: 9 Page 1/1

Prev. Page Next Page Move Page 1

Step 7. Top20 Sessions

Click the `Top20 Sessions` to see the front-20 sessions of transmitted bytes amount. These front-20 sessions were sorted by the amount of transmitted bytes.

DEVICE STATUS > System Status > Top20 Sessions

System Status | Network Status | CPU & Memory | DHCP Table | Routing Table | Active Sessions | Top20 Sessions | IPSec Sessions

Refresh Clear

Current Sessions: 15 Page 1/1

Item		Local Client		Remote Server		Traffic Statistics
	#	IP Address	Port	IP Address	Port	Bytes
	1	192.168.17.188	6250	211.79.36.245	80	80800
	2	192.168.17.188	6251	211.79.36.245	80	80720
	3	192.168.17.55	3712	207.46.107.194	1863	66068
	4	192.168.17.55	3743	202.39.162.230	80	57116
	5	192.168.17.55	3713	65.54.183.198	443	8654
	6	192.168.17.55	3714	61.219.38.89	80	1828
	7	192.168.17.55	3011	168.95.1.1	53	1772
	8	192.168.17.213	3844	10.1.1.1	110	898
	9	203.69.36.107	0	140.112.20.199	0	744
	10	10.1.1.1	514	192.168.17.190	514	714
	11	192.168.17.105	1023	168.95.1.1	53	465
	12	168.95.192.156	32941	10.1.1.1	53	367
	13	192.168.17.141	1929	10.1.1.1	53	351
	14	168.95.192.144	33184	10.1.1.1	53	307
	15	168.95.192.158	32972	10.1.1.1	53	307

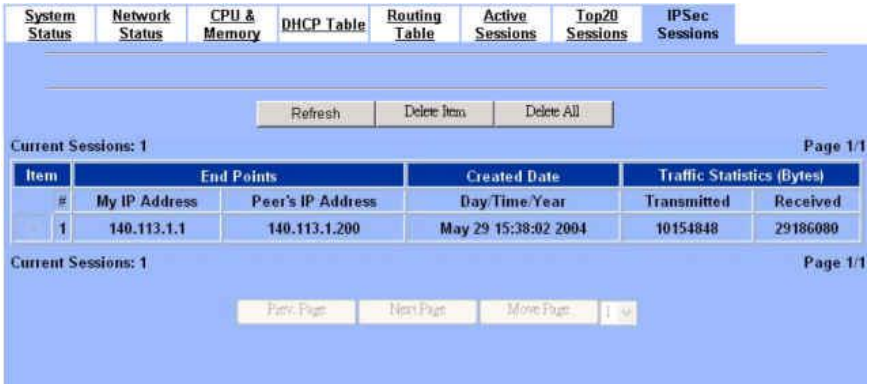
Current Sessions: 15 Page 1/1

Prev. Page Next Page Move Page 1

Step 8. IPSec Sessions

If we use the IPSec to establish VPN with other device, then we can view the IPSec tunnel information in this page.

DEVICE STATUS > System Status > IPSec Sessions



Chapter 21
Log System

21.1 Demands

1. The System Administrator wants to know all the actions of administration in the past. So it can avoid illegal system administration.
2. The System Administrator needs to check the logs of VPN, IDS, Firewall, and Content Filter everyday. But he / she feels inconvient to verify the DFL-900 logs. He / She hopes to decrease the checking procedure.

21.2 Objectives

1. The System Administrator wants to know all actions of administration in the past.
2. The System administrator would like to view the daily log report of DFL-900.

21.3 Methods

1. Through tracking the system logs, you can distinguish which administrated action is valid or not.
2. Use the syslog server to receive mail, or edit the "Mail Logs" page of DFL-900. Make the log mailed out automatically every periodic time.

21.4 Steps

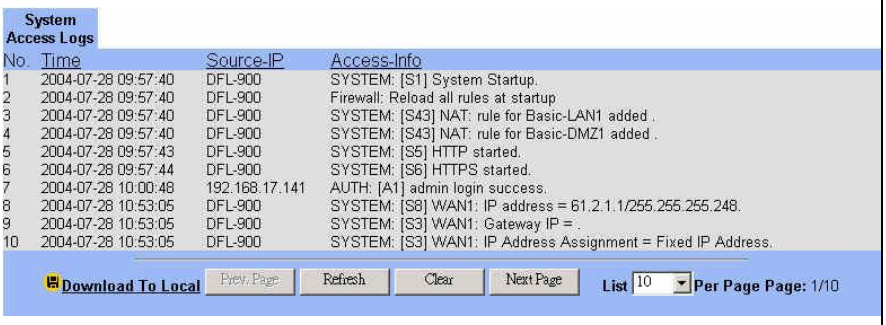
21.4.1 System Logs

Step 1. View System Logs

All the system administrated actions will be log in this page.

For the detailed information of System Logs, please refer Appendix C.

DEVICE STATUS > System Logs



FIELD	DESCRIPTION
NO	system logs sequence number
Time	The time which is occurred by the specified system event.
Source-IP	A type of the specified system events.
Access--Info	The description of the system log. Include `Component Type`, `Log ID`, `Log Description` and `Event ID` (optional).

Table 21-1 System log description

21.4.2 Syslog & Mail log

Step 1. Setup Syslog Server

Setup Syslog Server by checking the `Enable Syslog Server. It` will let DFL-900 send logs to the Syslog Server specified in the "`Syslog Server IP Address`" field.

Notice: If the logs were sent out to the syslog server, they will still keep a copy in the DFL-900.

DEVICE STATUS > Log Config > Syslog Server

FIELD	DESCRIPTION	EXAMPLE
Enable Syslog Server	Enable the Syslog Server feature of DFL-900	Enabled
Syslog Server IP Address	The IP Address which Syslog Server located.	10.1.1.20
BUTTON	DESCRIPTION	
Apply	Apply the configuration in this page	
Reset	Restore the original configuration in this page	

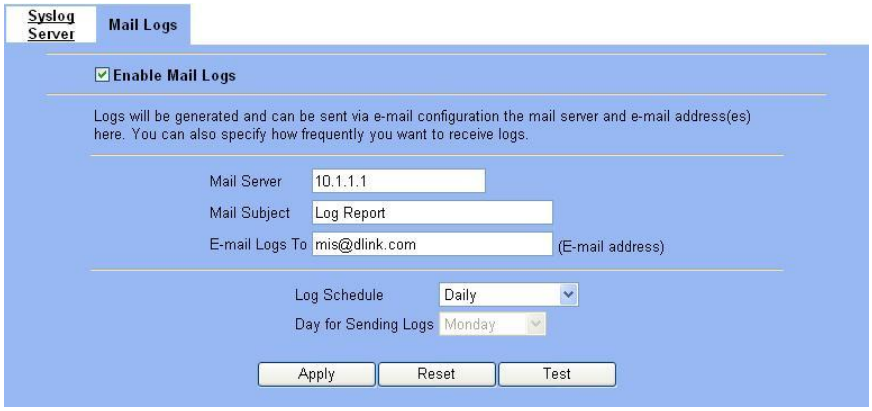
Table 21-2 Setup the Syslog Server

Step 2. Setup Mail Log method

Fill in the IP address of the `Mail Server` and `Mail Subject`. Also fill your `E-Mail address` for receiving logs. Select the preferred Log Schedule to mail out logs. Click the `Apply` button to finish the settings.

Notice: If the logs were sent out to the mail server, they will be deleted by the DFL-900.

DEVICE STATUS > Log Config > Mail Logs



FIELD	DESCRIPTION	EXAMPLE
Enable Mail Logs	Enable the Mail Logs Server feature of DFL-900	Enabled
Mail Server	The IP Address of Mail Server which will send out the logs.	10.1.1.1
Mail Subject	The subject of log mail	Log Report
E-mail Logs To	E-Mail address of receiver	mis@dlink.com
Log Schedule	The schedule which the mail logs will be sent out.	Daily
Day for Sending Logs	When selecting Weekly in the "Log Schedule" field, we have to choose which day the mail logs will be sent out in the "Day for Sending Logs" field.	Monday

BUTTON	DESCRIPTION
Apply	Apply the configuration in this page
Reset	Restore the original configuration in this page
Test	test the mail logs configuration in this page

Table 21-3 Setup the Mail Logs

Chapter 22
System Maintenance

This chapter introduces how to do system maintenance.

22.1 Demands

1. DFL-900 is designed to provide upgradeable firmware and database to meet the upcoming dynamics of the Internet. New features, new attack signatures, new forbidden URLs, and new virus definitions require timely updates to the DFL-900. This chapter introduces how to upgrade your system with TFTP and Web UI respectively.

2. Sometimes one may want to reset the firmware to factory default due to loss of password, firmware corrupted, configuration corrupted. Since DFL-900 does not have a reset button to prevent careless pressing of it, factory default has to be set with web GUI or console terminal. Of course, when you loss the password, you have to use CLI only because you can never enter the web GUI with the lost password.

3. Another issue is that after setup the DFL-900 properly, we might want to keep the current configuration to avoid the unknown accident. Then we can recover the original state from the previous reserved configuration.

22.2 Steps for TFTP Upgrade

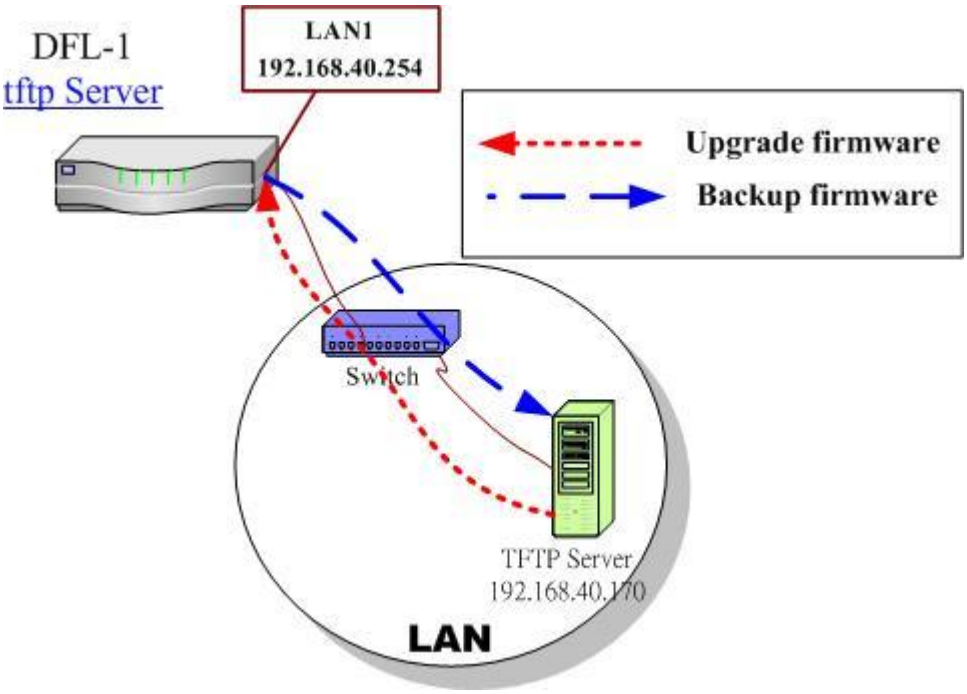
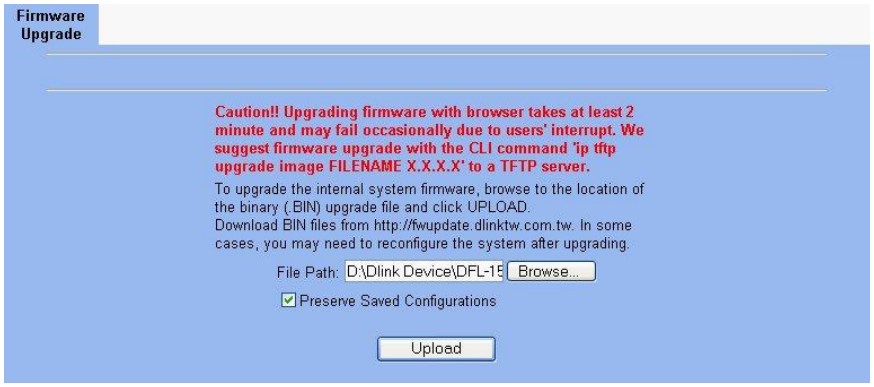


Figure 22-1 Upgrade/Backup firmware from TFTP server

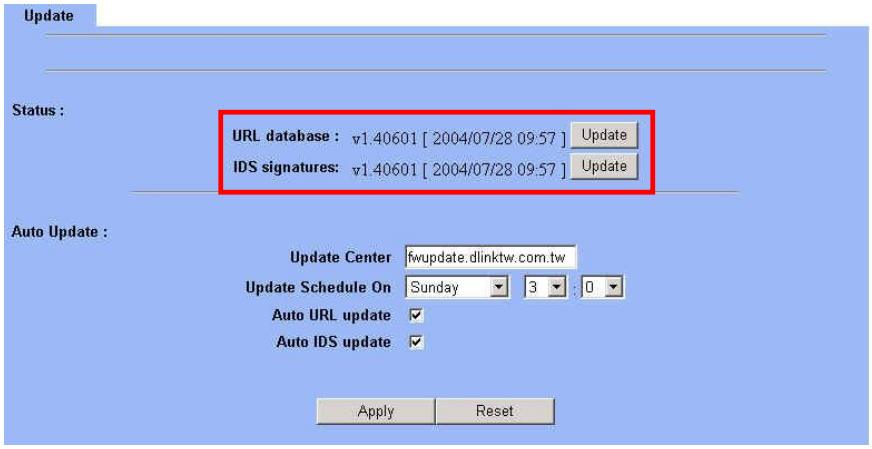
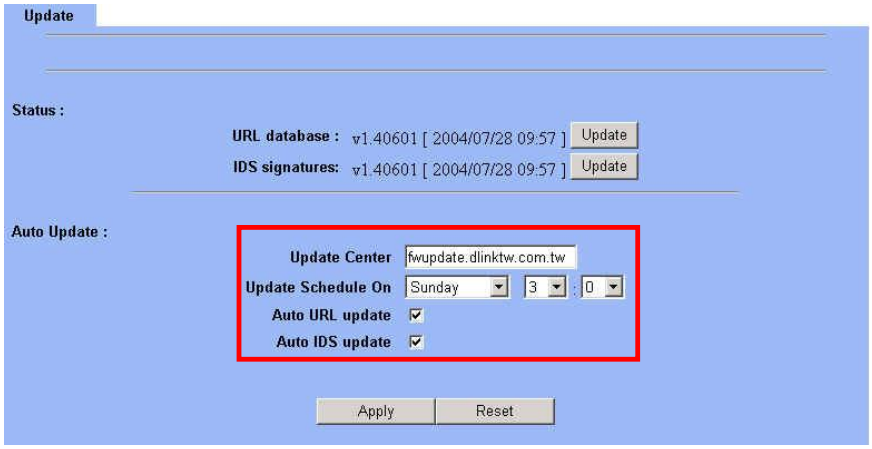
Step 1. Setup TFTP server Place the TFTP server `TftpServer` in the `c:\` directory and double click to run it. Place all `bin` files in the `c:\` as well. Set the PC to be 192.168.40.x to be in the same subnet with the DFL-900's LAN1. Login to DFL-900's console. Enter `en` to enter privileged mode. Configure the LAN1 address so that the DFL-900 can connect to the TFTP server. The CLI command to configure LAN1 interface is ip `ifconfig INTF1 192.168.40.254 255.255.255.0.`	**NetOS/i386 (DFL-900) (tty00)** **login: admin** **Password:** **Welcome to DFL-900 VPN/Firewall Router!** **DFL-900> en** **DFL-900# ip ifconfig INTF1 192.168.40.254 255.255.255.0** **DFL-900#**
Step 2. Upgrade firmware Enter `IP tftp upgrade image 192.168.40.x DFL-900-<ver>.bin.` After this procedure, DFL-900 device will reboot automatically. Notice: if you want to preserve the previous configuration, add the "`preserve`" keyword to the end. Refer Appendix A for the details.	**DFL-900# ip tftp upgrade image DFL-900-1.530p5-ALL.bin 192.168.40.170 preserve** **Fetching from 192.168.40.170 for DFL-900-1.530p5-ALL.bin** **tftp> tftp> Verbose mode on.** **tftp> getting from 192.168.40.170:DFL-900-1.530p5-ALL.bin to DFL-900-1.530p5-ALL.bin [octet]**
Step 3. Check if OK Check whether the system status is working properly or not.	DFL-900> sys st ========== System Name: DFL-900 Firmware Version: NetOS Ver1.600 (DFL-900) #1: Tue Jul 27 19:05:09 CST 2004 ========== Default Gateway: Primary DNS: Secondary DNS: Default WAN Link (Gateway/DNS): WAN1 ==== ========= ========== ========== ========== Port Interface IP Address Netmask Type ---- --------- ---------- ---------- ---------- 1 WAN1 61.2.1.1 255.255.255.248 (Static IP) 2 LAN1 192.168.40.254 255.255.255.0 3 DMZ1 10.1.1.254 255.255.255.0 ==== ========= ========== ========== ========== 10:55AM up 58 mins, 1 user, load averages: 0.17, 0.14, 0.09 DFL-900>

22.3 Steps for Firmware upgrade from Web GUI

Step 1. Download the newest firmware from web site If a new firmware issued, we can download it from the web site (fwupdate.dlinktw.com.tw) to the local computer.	Firmware upgrade site： http://fwupdate.dlinktw.com.tw/

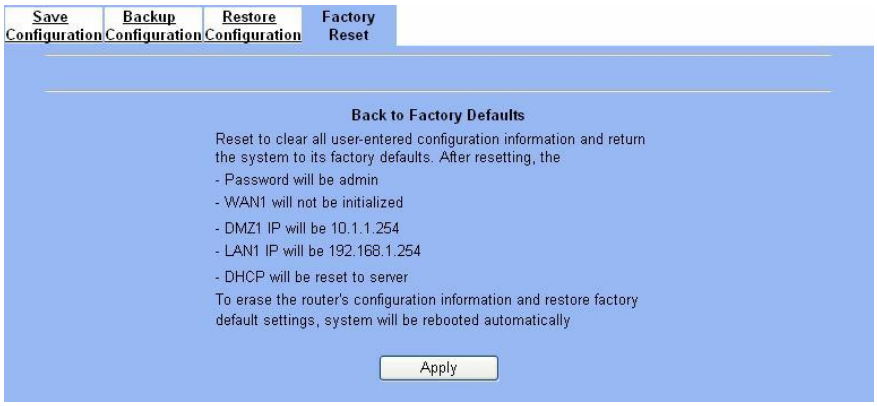
Step 2. Upgrade firmware In the System Tools / Firmware Upgrade page. Select the path of firmware through `Browse` button, and check the `Preserve Saved Configurations` to reserve original settings. Click the `Upload` button to upgrade firmware.	**SYSTEM TOOLS > Firmware Upgrade > Firmware Upgrade** 

22.4 Steps for Database Update from Web GUI

Step 3. Update database manually If a new firmware issued, we can download it by clicking the `Update` button. Then we will see the database version shown on the left side.	
Step 4. Auto Update We can also update database automatically. Fill the database server in the `Update Center` field. Choose what date/time we would like to update the database, and then check which databases we would like to update. Click `Apply` button to finish the settings.	**SYSTEM TOOLS > Firmware Upgrade > Firmware Upgrade** 

22.5 Steps for Factory Reset

22.5.1 Step for factory reset under web GUI

Step 1. Factory reset In the Web GUI mode. Follow the path of right side. We can make DFL-900 configuration restored to the factory defaults with simply clicking the `Apply` button. Warning: Be careful to use this function. It will make all your present configurations disappear. And the configuration will restore to the factory default.	**SYSTEM TOOLS > System Utilities > Factory Reset** 

22.5.2 Step for NORMAL factory reset

Step 1. Factory reset In the CLI mode. Enter `sys resetconf now` to reset the firmware to factory default. Then the system will reboot automatically.	**NetOS/i386 (DFL-900) (tty00)** **login: admin** **Password:** **Welcome to DFL-900 VPN/Firewall Router** **DFL-900> en** **DFL-900# sys resetconf now** **Resetting Configuration to default... DONE** **System will reboot now** **syncing disks... done** **rebooting...**

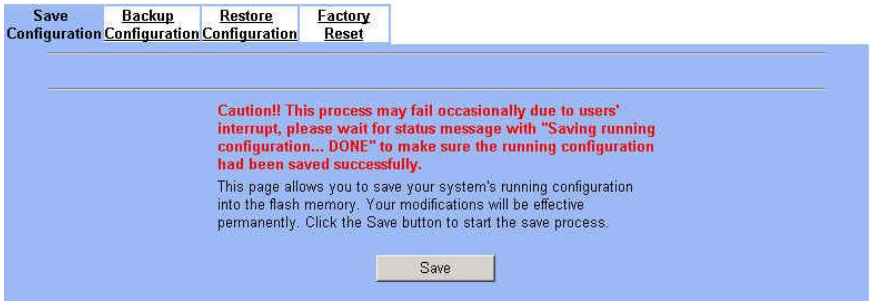
22.5.3 Steps for EMERGENT factory reset

Step 1. Enter the boot loader If the original firmware is damaged, you may need to recover the firmware with the factory default. Press `<tab>` or `<space>` during the 2-second countdown process.	**>> NetOS Loader (i386), V1.5 (Fri Feb 20 10:25:11 CST 2004)** **Press <TAB> to prompt - starting in 0** **Type "boot rescue" to load safe-mode kernel to** **(1) rescue corrupted firmware** **(2) reset password for admin** **type "?" or "help" for help.** **>**

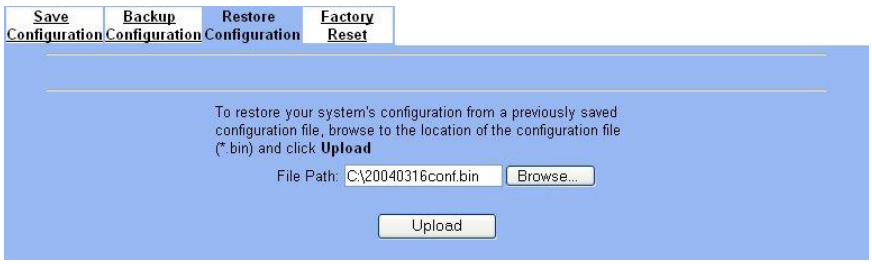
Step 2. Enter the Safe Mode
Enter `boot rescue` to enter the emergency kernel. In this kernel, you can use tftp to fetch another firmware to install, or reset the configuration to default even though you lost the password.
	`> boot rescue`
	`652762+7888436+358016=0x87dc4c`
	`NetOS Ver1.530 (RESCUE) #3: Sun Apr 25 03:07:34 CST 2004`
	`cpu0: Intel Pentium III (Coppermine) Celeron (686-class), 852.00 MHz`
	`total memory = 255 MB`
	`avail memory = 228 MB`
	`Ethernet address 00:0d:88:17:0b:a7`
	`Ethernet address 00:0d:88:17:0b:a6`
	`Ethernet address 00:0d:88:17:0b:a5`
	`wd0: drive supports PIO mode 4`
	`Software Serial Number: [54623734431016644466]`
	
	`Tips: Type "?" anytime when you need helps. Tips: To recover from corrupted fi rmware, setup IP address and use tftp to install the new firmware.`
	`DFL-900>`

Step 3. Factory reset Enter `sys resetconf now` to reset the firmware to factory default. Then system will reboot automatically.	**`DFL-900> en`** **`DFL-900# sys resetconf now`** **`System will reboot now`** **`syncing disks... done`** **`rebooting...`**

22.6 Save the current configuration

Step 1. Backup the current configuration After finishing the settings of DFL-900, be sure to Press the `Save` button in this page to keep the running configuration.	**SYSTEM TOOLS > System Utilities > Save Configuration** 

22.7 Steps for Backup / Restore Configurations

Step 1. Backup the current configuration Before backup your current configuration, make sure you have saved your current configurations as described in Section 22.6. Then select page in the page of /System Tools /System Utilities /Backup Configurations, click `Backup` button to backup configuration file to local disk.	**SYSTEM TOOLS > System Utilities > Backup Configuration** 
Step 2. Restore the previous saving configuration In the page of System Tools / System Utilities / Restore Configuration, click the `Browse` button to select configuration file path first, and then click `Upload` button to restore configuration.	**SYSTEM TOOLS > System Utilities > Restore Configuration** 

22.8 Steps for Reset password

Step 1. Enter the boot loader If you forget the password, you can use the following way to reset the password. Press `<tab>` or `<space>` during the 2-second countdown process.	**>> NetOS Loader (i386), V1.5 (Fri Feb 20 10:25:11 CST 2004)** **Press <TAB> to prompt - starting in 0** **Type "boot rescue" to load safe-mode kernel to** **(1) rescue corrupted firmware** **(2) reset password for admin** **type "?" or "help" for help.** **>**
Step 2. Get the Initial Key Enter `boot -I` command as right side. When screen shows “Enter Initial Key”, you can consult with your local technical supporter to get the Initial Key. You will need to tell the local technical supporter **`all the MAC address`** value. Then you will get the Initial Key. To reset admin password.	> boot -I 1002649+10753864+560236 [74+86272+64825]=0xbe50c8 NetOS Ver1.530 (DLINK) #0: Sun Apr 25 02:48:17 CST 2004 cpu0: Intel Pentium III (Coppermine) Celeron (686-class), 852.01 MHz total memory = 255 MB avail memory = 224 MB ASIC IPSec Enabled Ethernet address 00:0d:88:17:0b:a7 Ethernet address 00:0d:88:17:0b:a6 Ethernet address 00:0d:88:17:0b:a5 wd0: drive supports PIO mode 4 IPSec: Initialized Security Association Processing. Enter Initial Key:

Appendix

Appendix A
Command Line Interface (CLI)

You can configure the DFL-900 through the web interface (http/https) for the most time. Besides you can use another method, console/ssh/telnet method to configure the DFL-900 in the emergency. This is known as the Command Line Interface (CLI). By the way of CLI commands, you can effectively set the IP addresses, restore factory reset, reboot/shutdown system etc. Here we will give you a complete list to configure the DFL-900 using the CLI commands.

A.1 Enable the port of DFL-900

If you prefer to use CLI commands, you can use it through console/ssh/telnet methods. For using ssh/telnet feature, you must enable the remote management first. Enable the specified port, so that you can login from the configured port.

Step 1. Enable remote management / TELNET Check the selected port located in the telnet function. And customize the server port which is listened by telnet service.	**SYSTEM Tools > Remote Mgt. > TELNET** 
Step 2. Enable remote management / SSH Check the selected port located in the ssh function. And customize the server port which is listened by ssh service.	**SYSTEM Tools > Remote Mgt. > SSH** 

A.2 CLI commands list (Normal Mode)

Subsequently, we can use the console/ssh/telnet to connect the DFL-900. After logining the system successfully, we can use the CLI commands to configure DFL-900. The complete CLI commands are described as follows.

Non-privileged mode

Main commands	Sub commands	Example	Command description
?		?	Show the help menu
enable (en)		enable	Turn on privileged mode command
exit (ex)		exit	Exit command shell
ip			Configure IP related settings
	ping	ip ping 202.11.22.33	Send ICMP echo request messages
	traceroute	ip traceroute 202.11.22.33	Trace route to destination address or hostname
sys			Configure system parameters

	status (st)	sys status	Show system and network status
	version (ver)	sys version	Show DFL-900 firmware version

Table A-1 Non-privileged mode of normal mode

Note: If you don't know what parameter is followed by the commands, just type "?" following the command. Ex "ip ?". It will show all the valid suffix parameters from "ip".

Privileged mode

Main commands	Sub commands	Example	Command description
?		?	Show the help menu
disable (dis)		disable	Turn off privileged mode command
exit (ex)		exit	Exit command shell
ip			Configure IP related settings
	arp	ip arp status	Show the ip/MAC mapping table
	dns	ip dns query www.yam.com.tw	Show the IP address of the www.yam.com.tw.
	ifconfig	ip ifconfig INTF1 192.168.1.100 255.255.255.0	Configure the ip address of each port
	ping	ip ping 202.11.22.33	Send ICMP echo request messages
	tftp upgrade/backup	ip tftp upgrade image <FILENAME> 192.168.1.170.	Upgrade/Backup firmware/configuration from/to tftp server. About the full description, please refer to Section A-3.
	traceroute	ip traceroute 202.11.22.33	Trace route to destination address or hostname.
sys			Configure system parameters
	halt	sys halt now	Shutdown system
	password	sys password	Change administrator password
	reboot	sys reboot now	Reboot system
	resetconf	sys resetconf now	Reset system configuration to default settings
	saveconf (sa)	sys saveconf	Save running configuration
	status (st)	sys status	Show system and network status
	tcpdump (tc)	sys tcpdump INTF0 host 10.1.1.1	Capture the information of specified packets which pass through the indicated interface.
	version (ver)	sys version	Show DFL-900 firmware version

Table A-2 Privileged mode of normal mode

The Full tftp commands are described in the following Table A-3.

Prefix command	2th command	3th command	Postfix command	Example	Command description
ip tftp	upgrade	config	FILENAME WORD	ip tftp upgrade config conf-0101 192.168.1.170	Upgrade configuration file image from tftp server.
		image	FILENAME WORD (preserve)	ip tftp upgrade image <FILENAME> 192.168.1.170 preserve	Upgrade system image from tftp server.
	backup	config	WORD	ip tftp backup config 192.168.1.170	Backup configuration file image to tftp server.
		image	WORD	ip tftp backup image 192.168.1.170	Backup system image to tftp server.

Table A-3 ip tftp commands description

In the Postfix command, the meanings of keywords are listed here.

WORD: tftp server IP address

FILENAME: Upgrade configuration file image name

(preserve): string "preserve", this is optional

A.3 CLI commands list (Rescue Mode)

If the original firmware was damaged by some accidents, you may need to recover it with the factory reset process in the rescue mode. Boot the DFL-900 and press <tab> or <space> during the 2-second countdown process. You may refer Section 22.5.3 for details.

Non-privileged mode

Main commands	Sub commands	Example	Command description
?		?	Show the help menu
enable (en)		enable	Turn on privileged mode command
exit (ex)		exit	Exit command shell
ip			Configure IP related settings
	ping	ip ping 202.11.22.33	Send ICMP messages
sys			Configure system parameters
	status (st)	sys status	Show the mode name and firmware version.
	version (ver)	sys version	Show the firmware version

Table A-4 Non-privileged mode of rescue mode

Note: If you don't know what parameter is followed by the commands, just type "?" following the command. Ex "ip ?". It will show all the valid suffix parameters from "ip".

Privileged mode

Main commands	Sub commands	Example	Command description
?		?	Show the help menu
disable (dis)		disable	Turn off privileged mode command
exit (ex)		exit	Exit command shell
ip			Configure IP related settings
	arp	ip arp status	Show the ip/MAC mapping table
	dns	ip dns query www.yam.com.tw	Show the IP address of the www.yam.com.tw.
	ifconfig	ip ifconfig INTF1 192.168.1.100 255.255.255.0	Configure the ip address of each port
	ping	ip ping 202.11.22.33	Send ICMP echo request messages
	tftp	ip tftp upgrade image <FILENAME> 192.168.1.170.	Upgrade firmware from tftp server.
sys			Configure system parameters
	halt	sys halt now	Shutdown system
	reboot	sys reboot now	Reboot system
	resetconf	sys resetconf now	Reset system configuration to default settings
	status (st)	sys status	Show the mode name and firmware version.
	version (ver)	sys version	Show the firmware version

Table A-5 Privileged mode CLI commands

Appendix B
Trouble Shooting

1. If the power LED of DFL-900 is off when I turn on the power?

Ans：Check the connection between the power adapter and DFL-900 power cord. If this problem still exists, contact with your sales vendor.

2. How can I configure the DFL-900 if I forget the admin password of the DFL-900？

Ans：You can gather all the MAC addresses values of DFL-900, and contact the local technical supporter. Then we will give you an initial key. Please refer to the Section 22.8 described to reset the admin password.

3. I can't access DFL-900 via the console port？

Ans：Check the console line and make sure it is connected between your computer serial port and DFL-900 Diagnostic RS-232 port. Notice whether the terminal software parameter setting as follows. No parity, 8 data bits, 1 stop bit, baud rate 9600 bps. The terminal type is VT100.

4. I can't ping DFL-900 WAN1 interface successfully？ Why？

Ans：Follow below items to check if ready or not

a. Check Basic Setup > WAN Settings > WAN1 status fields. Verify whether any data is correctly.
b. Check Device Status > System Status > Network Status WAN1 status is "UP". If the status is "DOWN", check if the network line is connectionless？
c. Check System Tools > Remote Mgt. > MISC > WAN1. Verify if WAN1 port checkbox is enabled. The default enabled port is only LAN port.
d. Check whether virtual server rule (Dest. IP : WAN1 IP address, port : 1~65535) exists or not. If existing any virtual server rule like this type, it will make all the connections from WAN1 port outside relay to another server. Actually what you have pinged is another server, not DFL-900.
e. Check whether NAT One-to-One(bidirectional) rule (Translated Src IP : WAN1 IP address, port : 1~65535) exists or not. If existing any virtual server rule like this type, it will make all the connections from WAN1 port outside relay to another server. Actually what you have pinged is another server, not DFL-900.
f. If all the above items have checked, try to change a new network line. This is almost resulting from the network line problem. Please neglect the LED status, because it will confuse your judgment sometimes.

5. I have already set the WAN1 ip address of DFL-900 the same subnet with my pc, but I can't use https to login DFL-900 via WAN1 port from my pc all the time, why？

Ans：

a. Be sure that you can ping the WAN1 port, please check the procedure as question 4 description.
b. Make sure that the WAN1 IP address of DFL-900 is not duplicated with other existent IP address. You can take off the network line connected on the WAN1 port. Then try to ping the IP address which setup on the WAN1 port. If it is still successful, the IP address which setup on the WAN1 port is duplicated with the existent IP address.
c. Notice that you must check System Tools > Remote Mgt. > HTTPS > WAN1. The default enabled port is only LAN port.

6. I can't build the VPN – IPSec connection with another device at the another side all the time, why？

Ans：Please make sure if you follow the setting method as follows.

a. Check your IPSec Setting. Please refer to the settings in the Section 10.4- Step 3.

b. Make sure if you have already added a WAN to LAN policy in the Advanced Settings/Firewall to let the IPSec packets pass through the DFL-900. (The default value from WAN to LAN is block.).

When you add a Firewall rule, the `Source IP and Netmask` are the `IP address, PrefixLen/Subnet Mask` in the pages of the Remote Address Type. And the `Dest IP and Netmask` are the `IP Address, PrefixLen/Subnet Mask` in the pages of the Local Address Type.

The following Figure B-1, Figure B-2 indicated the DFL_A IPSec and Firewall setting. The Figure B-3, Figure B-4 indicated the opposite side DFL_B IPSec and Firewall setting. When you configure an IPSec policy, please be sure to add a rule to let the packets of the IPSec pass from WAN to LAN. For the IP address of firewall rules, please refer to the Figure B-2, Figure B-4.

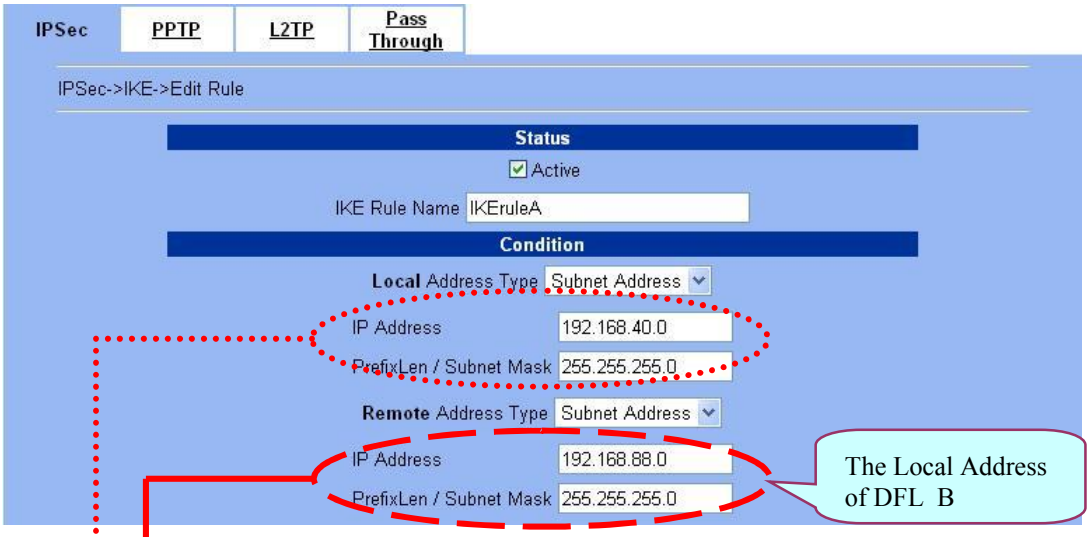


Figure B-1 DFL_A - Inset a new IPSec policy

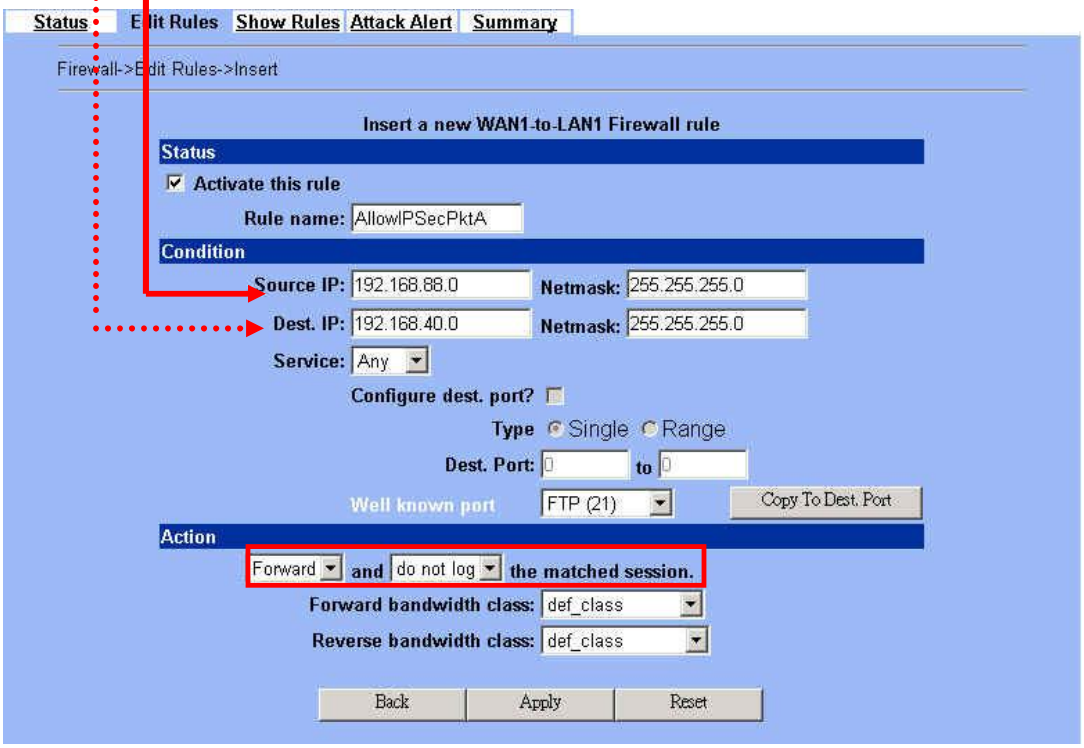


Figure B-2 DFL_A - Insert a new firewall rule in WAN to LAN

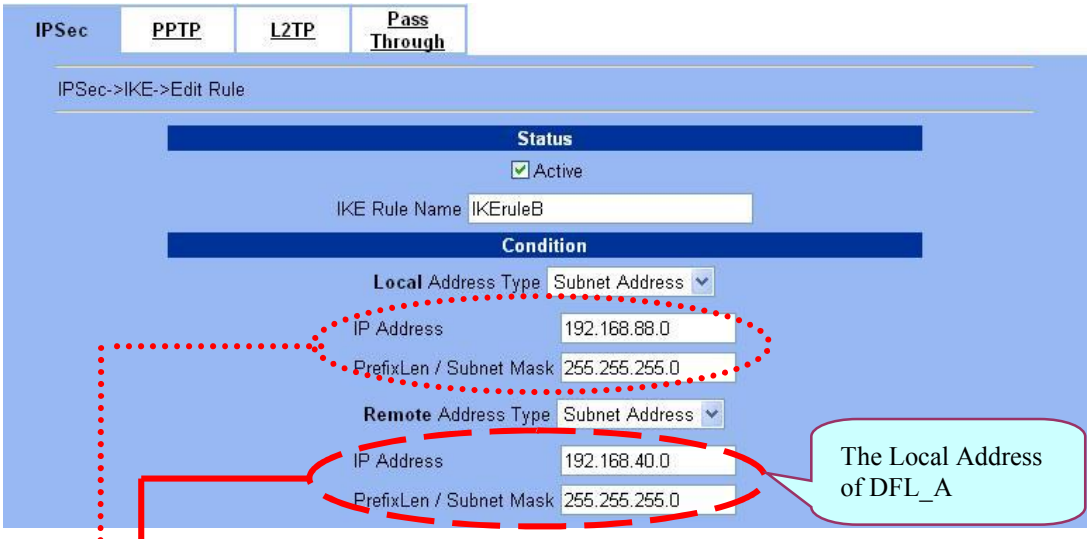


Figure B-3 DFL_B - Inset a new IPSec policy

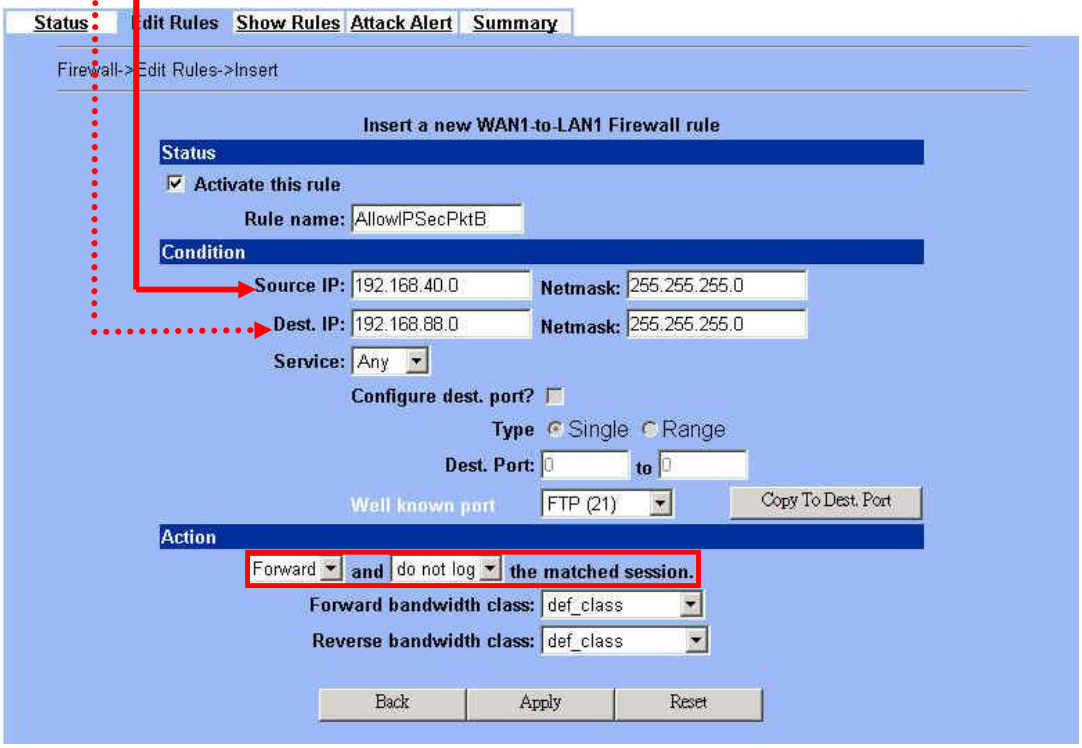


Figure B-4 DFL_B - Insert a new firewall rule in WAN to LAN

7. Why does it always show the message as Figure B-5 indicated when I try to enable bandwidth management feature of DFL-900?

Status: Bandwidth management will support PPPoE in the future release.

Figure B-5 Bandwidth management feature can not cooperate with PPPoE feature

Ans：For the present design, you can not turn on bandwidth management in the PPPoE enabled condition. If you need to enable bandwidth management, please choose the WAN connection method (ex. DHCP, fixed IP).

8. Why the Source-IP field of System Logs is blank?

Ans：One reason is that you may enter Host Name and following by a space like “DFL-900 “. And enter the Domain Name string like “dlink.com” in the firmware version 1.391B. Then the System Name will present as “DFL-900 .dlink.com”. After upgrading firmware to upper version (ex. 1.50R). It will appear blank in the Source-IP field of System Logs.

9. When I ping the internet host from LAN/DMZ. I can’t always finish the ping successfully. Sometimes it is work. But sometimes it fails to ping the outside host.

Ans：This may cause there are more than one host in the LAN/DMZ pinging the same host at the same time. If one host (Lan-A) is pinging internet host A(ex. 140.106.100.1), and at the same time, Lan-B is also pinging 140.106.100.1. Then the pinging action of the Lan-A and Lan-B may fail. But when each host (Lan-A or Lan-B) is finish pinging, the other host can continue the pinging action.

10. While I am upgrading firmware from local disk, the download is not complete but the network has been disconnected. What will it happen in such situation?

Ans：Under this circumstance, the DFL-900 will automatically reboot and all configurations will still remain as before.

11. While I am upgrading firmware from local disk, the download is complete. After md5 checks, the screen appears “Upgrading kernel image”. What will it happen if the power is off suddenly?

Ans：Almost all the cases will not cause firmware fail. The DFL-900 will automatically reboot and all configurations will still remain as before. But sometimes it will make firmware fail. If the firmware fails, DFL-900 will automatically enter rescue mode when it reboots. You may need to do the factory reset, and then restore your original configuration to DFL-900. Refer to the factory reset procedure of DFL-900 as Section 22.5. About restoring configuration procedure, please refer to Section 22.7.

12. While finishing the Content Filters > Web Filter settings, if I try to use browser to test, why does not the web page result match with the web filter configuration?

Ans：Be sure that you have cleaned all the file cache in the browser, and try to connect the internet web server. If the web page result still does not match with the web filter configuration, you may close your browser and reopen it.

13. While finishing the edition of DFL-900 settings and pressing apply button, the LAN/DMZ to WAN network connection (telnet, ssh, ftp, msn..) fails, why?

Ans：This is a normal situation. When you finish the following settings, all the active network connection will be disconnected. So, you must reconnect it again.

a. SYSTEM TOOLS > Remote Mgt.
b. ADVANCED SETTINGS > VPN Settings > IPSec
c. ADVANCED SETTINGS > VPN Settings > PPTP > Client
d. ADVANCED SETTINGS > VPN Settings > Pass Through
e. ADVANCED SETTINGS > NAT

Appendix C
System Log Syntax

In the DFL-900, all the administration action will be logged by the system. You can refer all your management process through System log (DEVICE STATUS > System Logs > System Access Logs). Besides, all the system log descriptions are following the same syntax format.

In the below diagram, you can view the example of system log. The amplified system log example can be divided into 4 parts. The first part is **Component type**, second part is **Log ID**, third part is **log description** and final part is **Event ID**. When you applied each setting in the DFL-900, you had been issued an Event. So the same `Event ID` may have many different Log IDs because you may change different settings in the same apply action. The `Event ID` is a sequence number. It means that the same `Log ID` would not be assigned the same `Event ID` every time.

So if you apply any button while setting DFL-900 every time, an "Event" will occur immediately. And the "Event" will be displayed in the System log.

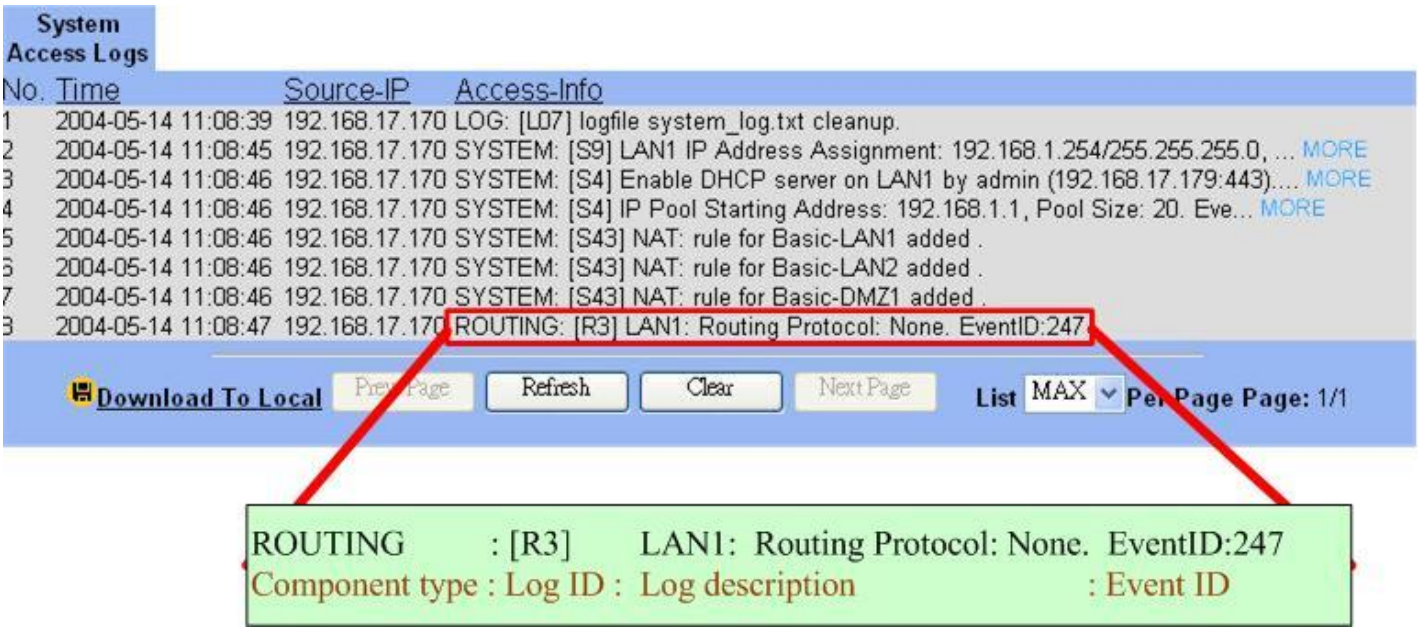


Figure D-1 All the system log descriptions are following the same format as above

In the following table, we list all the system logs for reference.

Component type	Log ID	Log description	Example
AUTH	A01	User Login	AUTH: [A01] admin login success (192.168.17.102:443).
			AUTH: [A01] admin login fail, miss password (192.168.17.102:443).
			AUTH: [A01] admin login fail, configuration is locked by administrator from Console (192.168.17.102:443).
			AUTH: [A01] admin login fail, configuration is locked by another user from 192.168.17.100 (192.168.17.102:443).
	A02	User Logout	AUTH: [A02] admin logout (192.168.17.102:443).

	A03	Change Password	AUTH: [A03] admin change system password (192.168.17.102:443).
BANDWIDTH	B01	Enable/Disable Bandwidth Management	BANDWIDTH: [B01] Enable bandwidth management by admin (192.168.17.100:443).
			BANDWIDTH: [B01] Disable bandwidth management by admin (192.168.17.100:443).
			BANDWIDTH: [B01] WAN1 Disable bandwidth management with PPPoE connection.
CONTENT	C01	Web filter categories configuration updated	CONTENT: [C01] Web filter categories configuration update by admin (192.168.17.100:443). EID=6
	C02	Web filter added trusted host	CONTENT: [C02] Web filter add trusted host by admin (192.168.17.100:443). EID=6
	C03	Web filter deleted trust host	CONTENT: [C03] Web filter deleted trust host by admin (192.168.17.100:443). EID=6
	C04	Web filter added forbidden domain	CONTENT: [C04] Web filter added forbidden domain by admin (192.168.17.100:443). EID=7
	C05	Web filter deleted forbidden domain	CONTENT: [C05] Web filter deleted forbidden domain by admin (192.168.17.100:443). EID=8
	C06	Enable web-filter access control	CONTENT: [C06] Enable web-filter access by admin (192.168.17.100:443). EID=9
	C07	Disable web-filter access control	CONTENT: [C07] Disable web-filter access control by admin (192.168.17.100:443). EID=10
	C08	Web filter URL keyword added	CONTENT: [C08] Web filter URL keyword added by adimin (192.168.17.100:443). EID=11
	C09	Web filter URL keyword deleted	CONTENT: [C09] Web filter URL keyword deleted by admin (192.168.17.100:443). EID=12
	C10	Enable web filter url matching	CONTENT: [C10] Enable web filter url matching by admin (192.168.17.100:443). EID=13
	C11	Disable web filter url matching	CONTENT: [C11] Disable web filter url matching by admin (192.168.17.100:443). EID=14
	C12	Updated web filter exempt zone configuration	CONTENT: [C12] Updated web filter exempt zone configuration by admin (192.168.17.100:443). EID=15
	C13	Web filter exempt zone added range	CONTENT: [C13] web filter exempt zone added range from 140.126.1.1 to 140.126.100.255 by admin (192.168.17.100:443). EID=16
	C14	Updated ftp filter exempt zone configuration	CONTENT: [C14] Updated ftp filter exempt zone configuration by admin (192.168.17.100:443). EID=17
	C15	FTP filter exempt zone added range	CONTENT: [C15] FTP filter exempt zone added range from 140.126.1.1 to 140.126.255.255 by admin (192.168.17.100:443). EID=18
	C16	Updated ftp filter blocked file configuration	CONTENT: [C16] Updated ftp filter blocked file configuration by admin (192.168.17.100:443). EID=19
	C17	FTP Filter blocking list updated	CONTENT: [C17] FTP Filter blocking list updated by admin (192.168.17.100:443). EID=20

	C18	Web filter keyword added	CONTENT: [C18] Web filter keyword added by admin (192.168.17.100:443). EID=21
	C19	Web filter keyword deleted	CONTENT: [C19] Web filter keyword deleted by admin (192.168.17.100:443). EID=22
	C20	Enable web filter keyword matching	CONTENT: [C20] Enable web filter keyword matching by admin (192.168.17.100:443). EID=23
	C21	Disable web filter keyword matching	CONTENT: [C21] Disable web filter keyword matching by admin (192.168.17.100:443). EID=24
	C22	Updated POP3 filter exempt zone configuration	CONTENT: [C22] Updated POP3 filter exempt zone configuration by admin (192.168.17.100:443). EID=25
	C23	POP3 filter exempt zone added range	CONTENT: [C23] POP3 filter exempt zone added range from 140.126.1.1 to 140.126.1.255 by admin (192.168.17.100:443). EID=26
	C24	Enable POP3 filter	CONTENT: [C24] Enable POP3 filter by admin (192.168.17.100:443). EID=27
	C25	Disable POP3 filter	CONTENT: [C25] Disable POP3 filter by admin (192.168.17.100:443). EID=28
	C26	POP3 Filter blocking list updated	CONTENT: [C26] POP3 Filter blocking list updated by admin (192.168.17.100:443). EID=29
	C27	Updated SMTP exempt zone configuration	CONTENT: [C27] Updated SMTP exempt zone configuration by admin (192.168.17.100:443). EID=30
	C28	SMTP filter exempt zone added range from	CONTENT: [C28] SMTP filter exempt zone added range from by admin (192.168.17.100:443). EID=31
	C29	Enable SMTP filter	CONTENT: [C29] Enable SMTP filter by admin (192.168.17.100:443). EID=32
	C30	Disable SMTP filter	CONTENT: [C30] Disable SMTP filter by admin (192.168.17.100:443). EID=33
	C31	SMTP Filter blocking list updated	CONTENT: [C31] SMTP Filter blocking list updated by admin (192.168.17.100:443). EID=34
	C32	Enable SMTP AntiVirus	CONTENT: [C32] Enable SMTP AntiVirus by admin (192.168.17.100:443). EID=35
	C33	Disable SMTP AntiVirus	CONTENT: [C33] Disable SMTP AntiVirus by admin (192.168.17.100:443). EID=36
	C34	AntiVirus module cannot download signatures	CONTENT: [C34] AntiVirus: cannot download signatures by admin (192.168.17.100:443). EID=37
	C35	AntiVirus signatures updated	CONETNT: [C35] AntiVirus signatures updated by admin (192.168.17.100:443). EID=38
	C36	Enable WEB filter	CONTENT: [C36] Enable WEB filter by admin (192.168.17.100:443). EID=39
	C37	Disable WEB filter	CONTENT: [C37] Disable WEB filter by admin (192.168.17.100:443). EID=40
FIREWALL	F01	Enable/Disable Firewall	FIREWALL: [F01] Activated firewall by admin (192.168.17.102:443). FIREWALL: [F01] Deactivated firewall by admin (192.168.17.102:443).

	F02	Edit Firewall Rules	
	F03	Attack Alert Setup	FIREWALL: [F03] Enable Alert when attack detected by admin (192.168.17.102:443). FIREWALL: [F03] Disable Alert when attack detected by admin (192.168.17.102:443).
	F04	Reload Firewall Rules	FIREWALL: [F04] WAN1 Reload all NAT/Firewall rules for new WAN IP
LOG	L01	Logfile is Full	LOG: [L01] logfile is full.
	L02	Mail Log	LOG: [L02] mail logfile to tom@hotmail.com.
	L03	Remote Syslog Server offline	
	L04	Enable/Disable Syslog Forward to Remote Syslog Server	LOG: [L04] Enable syslog server at 192.168.17.100 by admin (192.168.17.102:443). LOG: [L04] Disable syslog server by admin (192.168.17.102:443).
	L05	Enable/Disable Mail Log	LOG: [L05] Enable mail logs to tom@hotmail.com by admin (192.168.17.102:443). LOG: [L05] Disable mail logs by admin (192.168.17.102:443).
	L06	Send Mail Log	LOG: [L06] mail logfile to tom@hotmail.com
	L07	Log Cleanup	LOG: [L07] logfile is cleanup.
	L08	Mail Log Configuration Update	LOG: [L08] Mail configuration updated by admin (192.168.17.102:443).
	L09	Log Half-Clean	LOG: [L09] logfile half-clean.
NAT	N01	Set NAT Mode	NAT: [N01] Disable WAN NAT feature.
	N02	NAT Rules	NAT: [N02]
	N03	Virtual Server	
ROUTING	R01	Static Route	
	R02	Policy Route	
	R03	Changing Routing Protocol	ROUTING: [R03]
		OSPF Area ID	ROUTING: [R3] WAN1: OSPF Area ID = 15. EventID:15
		Routing Protocol: OSPF	ROUTING: [R3] WAN1: Routing Protocol: OSPF. EventID:15
		Routing Protocol: RIPv2/In+Out	ROUTING: [R3] WAN1: Routing Protocol: RIPv2/In+Out. EventID:15
		Routing Protocol: RIPv1/In+Out	ROUTING: [R3] WAN1: Routing Protocol: RIPv1/In+Out. EventID:15
		Routing Protocol: RIPv2/In	ROTUING: [R3] WAN1: Routing Protocol: RIPv2/In. EventID:15
		Routing Protocol: RIPv1/In	ROUTING: [R3] WAN1: Routing Protocol: RIPv1/In. EventID:15
		Routing Protocol: None	ROUTING: [R3] WAN1: Routing Protocol: None. EventID:15
SYSTEM	S01	Wall Startup	SYSTEM: [S01] Wall Startup.
	S02	Wall Shutdown	SYSTEM: [S02] Wall Shutdown.

	S03	Interface Configuration	SYSTEM: [S03] WAN1: IP Address Assignment = Get IP Automatically by admin (192.168.17.102:443). SYSTEM: [S03] WAN1: IP Address Assignment = Fixed IP Address by admin (192.168.17.102:443). SYSTEM: [S03] WAN1: Got PPPoE IP Address F63/255.255.255.0.
	S04	Startup/Shutdown DHCP Server	SYSTEM: [S04] Enable DHCP server on LAN1 by admin (192.168.17.102:443) SYSTEM: [S04] Disable DHCP server on LAN1.
	S05	Startup/Shutdown HTTP Server	SYSTEM: [S05] HTTP started. SYSTEM: [S05] HTTP stopped.
	S06	Startup/Shutdown HTTPS Server	SYSTEM: [S06] HTTPS started.
	S07	Startup TELNET Server	
	S08	Set Interface IP Address	SYSTEM: [S08] WAN1: IP Address: 192.168.17.102/255.255.255.0. (192.168.17.102:443).
	S09	IP Alias	SYSTEM: [S09] LAN1: Add IP address alias 192.168.1.2/255.255.255.0 by admin (192.168.17.102:443). SYSTEM: [S09] LAN1: Delete IP address alias 192.168.1.2/255.255.255.0 by admin (192.168.17.102:443). SYSTEM: [S09] LAN1: Change IP address alias 192.168.1.2/255.255.255.0 to 192.168.1.3/255.255.255.0 by admin (192.168.17.102:443).
	S10	Set Host Name	SYSTEM: [S10] HostName:DFL-900, set by admin (192.168.17.102:443).
	S11	Set Domain Name	SYSTEM: [S11] Domain Name: dlink.com, set by admin (192.168.17.102:443).
	S12	Enable/Disable DDNS	SYSTEM: [S12] Enable Dynamic DNS with hostname wall.adsldns.org on WAN1 by admin (192.168.17.102:443). SYSTEM: [S12] Disable Dynamic DNS on WAN1 by admin (192.168.17.102:443).
	S13	Enable/Disable DNS Proxy	SYSTEM: [S13] Enable DNS proxy by admin (192.168.17.102:443). SYSTEM: [S13] Disable DNS proxy by admin (192.168.17.102:443).
	S14	Enable/Disable DHCP Relay	SYSTEM: [S14] Enable DHCP relay by admin (192.168.17.102:443). SYSTEM: [S14] Disable DHCP relay by admin (192.168.17.102:443).
	S15	Set Date/Time	SYSTEM: [S15] System time update with NTP server tock.usno.navy.mil, set by admin (192.168.17.102:443). SYSTEM: [S15] System time update to 2003-10-10 13:33:25, set by admin (192.168.17.102:443).
	S16	Set System Auto Timeout Lifetime	SYSTEM: [S16] System auto timeout changed to 45 minutes by admin (192.168.17.102:443).

	S17	Interface PORTS Configuration (WAN/LAN/DMZ)	
	S18	Backup Configuration	SYSTEM: [S18] Backup configuration file by admin (192.168.17.102:443).
	S19	Restore Configuration	SYSTEM: [S19] Restore configuration file by admin (192.168.17.102:443).
	S20	Factory Reset	SYSTEM: [S20] Factory Reset to default settings by admin (192.168.17.102:443)
	S21	Firmware Upgrade	SYSTEM: [S21] Firmware upgraded by admin (192.168.17.102:443)
	S22	Setup TELNET Server	
	S23	Setup SSH Server	
	S24	Setup WWW Server	
	S25	Setup HTTPS Server	
	S26	Setup SNMP Server	
	S27	MISC Setup	
	S28	Enable/Disable SNMP	SYSTEM: [S28] Enable SNMP by admin (192.168.17.104:443) SYSTEM: [S28] System Location: Building-A. SYSTEM: [S28] Contact Info: +886-2-28826262. SYSTEM: [S28] Disable SNMP.
	S29	Configure SNMP server	
	S30	File System Full	
	S31	Update remote management settings.	SYSTEM: [S31] Update remote management TELNET Server settings by admin (192.168.17.102:443).
	S32	Set Gateway	SYSTEM: [S32] WAN1: Gateway IP: 192.167.17.254 SYSTEM: [S32] WAN1: Got PPPoE Gateway IP 210.58.28.91.
	S33	Set DNS IP Address	SYSTEM: [S33] WAN1: Clear DNS IP Address. SYSTEM: [S33] WAN1: DNS IP Address: 168.95.1.1. SYSTEM: [S33] WAN1: Get DNS Automatically.
	S34	Syslog Reload	SYSTEM: [S34] Syslogd stop. SYSTEM: [S34] Syslogd start. SYSTEM: [S34] Syslogd restart.
	S35	Enable/Disable Ipmon	SYSTEM: [S35] Enable Ipmon. SYSTEM: [S35] Disable Ipmon.
	S36	System Checksum Update	
	S37	Disable Multicast Update Multicast	SYSTEM: [S37] Disable Multicast on interface WAN1
			SYSTEM: [S37] Update Multicast on interface WAN1 to xxx
			SYSTEM: [S37] Update Multicast on interface WAN1 to xxx
	S38	Update WAN NAT settings	SYSTEM: [S38] Update WAN NAT settings to FULL feature
		Update WAN NAT settings	SYSTEM: [S38] Update WAN NAT settings to Basic operation

		Disable WAN NAT feature	SYSTEM: [S38] Disable WAN NAT feature
VPN	V1	Update pass-through settings	VPN: [V1] Update pass-through settings
	V2	Deactivated IPSec Activated IPSec	VPN: [V2] Deactivated IPSec

Table D-1 All the System Log descriptions

Appendix D
Glossary of Terms

CF (Content Filter) –

A content filter is one or more pieces of software that work together to prevent users from viewing material found on the Internet. This process has two components.

DHCP (Dynamic Host Configuration Protocol) –

Provides a framework for passing configuration information to hosts on a TCP/IP network. DHCP is based on BOOTP, adding the capability of automatic allocation of reusable network addresses and additional configuration options. DHCP captures the behavior of BOOTP relay agents, and DHCP participants can interoperate with BOOTP participants.

DHCP consists of two components: a protocol for delivering host-specific configuration parameters from a DHCP server to a host and a mechanism for allocation of network addresses to hosts.

DMZ (Demilitarized Zone) –

From the military term for an area between two opponents where fighting is prevented. DMZ Ethernets connect networks and computers controlled by different bodies. They may be external or internal. External DMZ Ethernets link regional networks with routers.

Firewall –

A device that protects and controls the connection of one network to another, for traffic both entering and leaving. Firewalls are used by companies that want to protect any network-connected server from damage (intentional or otherwise) by those who log in to it. This could be a dedicated computer equipped with security measures or it could be a software-based protection.

IPSec (IP Security) –

IPSec provides security for transmission of sensitive information over unprotected networks such as the Internet. IPSec acts at the network layer, protecting and authenticating IP packets between participating IPSec devices ("peers").

L2TP (Layer 2 Tunneling Protocol) –

Layer Two Tunneling Protocol (L2TP) is an extension of the Point-to-Point Tunneling Protocol (PPTP) used by an Internet Service Provider (ISP) to enable the operation of a Virtual Private Network (VPN) over the Internet. L2TP merges the best features of two other tunneling protocols: PPTP from Microsoft and L2F from Cisco Systems. The two main components that make up L2TP are the L2TP Access Concentrator (LAC), which is the device that physically terminates a call and the L2TP Network Server (LNS), which is the device that terminates and possibly authenticates the PPP stream.

NAT (Network Address Translation) –

By the network address translation skill, we can transfer the internal network private address of DFL-900 to the public address for the Internet usage. By this method, we can use a large amount of private addresses in the enterprise.

POP3 (Post Office Protocol 3) –

POP3 (Post Office Protocol 3) is the most recent version of a standard protocol for receiving e-mail. POP3 is a client/server protocol in which e-mail is received and held for you by your Internet server. Periodically, you (or your client e-mail receiver) check your mail-box on the server and download any mail.

PPTP (Point-to-Point Tunneling Protocol) –

PPTP extends the Point to Point Protocol (PPP) standard for traditional dial-up networking. PPTP is best suited for the remote access applications of VPNs, but it also supports LAN internetworking. PPTP operates at Layer 2 of the OSI model.

OSPF (Open Shortest Path First) –

Open Shortest Path First (OSPF), is a routing protocol used to determine the correct route for packets within IP networks. It was designed by the Internet Engineering Task Force to serve as an Interior Gateway Protocol replacing RIP.

SMTP (Simple Mail Transfer Protocol) –

SMTP (Simple Mail Transfer Protocol) is a TCP/IP protocol used in sending and receiving e-mail. However, since it's limited in its ability to queue messages at the receiving end, it's usually used with one of two other protocols, POP3 or Internet Message Access Protocol, that let the user save messages in a server mailbox and download them periodically from the server.

VPN (Virtual Private Network) –

The key feature of a VPN, however, is its ability to use public networks like the Internet rather than rely on private leased lines. VPN technologies implement restricted-access networks that utilize the same cabling and routers as a public network, and they do so without sacrificing features or basic security.

Appendix E
Index

Appendix F
Hardware

Item	Feature	Detailed Description
2.2.1	**Chassis**	
2.2.1.1	Look & feel	D-Link style
2.2.1.2	Chassis	Rack mount 1U size
2.2.2	**Key Components**	
2.2.2.1	CPU	Intel Celeron 850 MHZ
2.2.2.2	10/100M Ethernet MAC and PHY	RTL 8139C+
2.2.2.3	PCI bridge	Intel 815E
2.2.2.4	SDRAM	256 M Byte
2.2.2.5	FLASH memory	32 M Byte
2.2.2.6	Security processor	Safenet 1141 (VPN accelerator board)
2.2.3	**Port functions**	
2.2.3.1	WAN port	1. 1 port for connecting to outbound WAN 2. RJ-45 connector 3. IEEE 802.3 compliance 4. IEEE 802.3u compliance 5. Support Half/Full-Duplex operations 6. Support backpressure at Half-Duplex operation. 7. IEEE 802.3x Flow Control support for Full-Duplex mode
2.2.3.2	LAN port	1. 1 port for connecting inbound LAN 2. RJ-45 connector 3. IEEE 802.3 compliance 4. IEEE 802.3u compliance 5. Support Half/Full-Duplex operations 6. Support backpressure at Half-Duplex operation. 7. IEEE 802.3x Flow Control support for Full-Duplex mode
2.2.3.3	DMZ port	1. 1 port for connecting to server. 2. RJ-45 connector 3. IEEE 802.3 compliance 4. IEEE 802.3u compliance 5. Support Half/Full-Duplex operations 6. Support backpressure at Half-Duplex operation. 7. IEEE 802.3x Flow Control support for Full-Duplex mode
2.2.3.4	Console port	▪ DB-9 female connector with RS-232 interface ▪ Asynchronous serial DTE ▪ No hardware handshaking such as RTS/CTS

2.2.3.5	LED definition	For system Power ▪ Solid Orange: System ready ▪ Blinking Green: System under power-on self test Per Ethernet port Speed ▪ Green: Operate at 100Mbps ▪ Off: Operate at 10Mbps Link/Act ▪ Green: Link up ▪ Blinking Green: Transmitting or receiving packets ▪ Off: Link down

Appendix G
Version of Software and Firmware

DFL-900 VPN/Firewall Router

Version of Components:

Firmware: v. 1.600

Appendix H
Customer Support

D-Link Offices

Australia

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1 Giffnock Avenue, North Ryde, NSW 2113,
Sydney, Australia
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Denmark

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Egypt

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7 Assem Ebn Sabet Street, Heliopolis, Cairo, Egypt
TEL: 202-245-6176 FAX: 202-245-6192
URL: www.dlink-me.com
E-MAIL: support@dlink-me.com & fateen@dlink-me.com

Finland

D-Link Finland
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D-Link France
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78330 Fontenay-le-Fleury, France
TEL: 33-1-3023-8688 FAX: 33-1-3023-8689
URL: www.dlink-france.fr
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BBS: 49-(0) 6192-971198 (ISDN)
INFO: 00800-7250-0000 (toll free)
HELP: 00800-7250-4000 (toll free)
REPAIR: 00800-7250-8000 E-MAIL: info@dlink.de

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FAX: 91-022-652-8914/8476
URL: www.dlink-india.com & www.dlink.co.in
E-MAIL: service@dlink.india.com & tushars@dlink-india.com

Italy **D-Link Mediterraneo Srl/D-Link Italia**
Via Nino Bonnet n. 6/B, 20154, Milano, Italy
TEL: 39-02-2900-0676 FAX: 39-02-2900-1723
URL: www.dlink.it E-MAIL: info@dlink.it

Japan **D-Link Japan**
10F, 8-8-15 Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan
TEL: 81-3-5434-9678 FAX: 81-3-5434-9868
URL: www.d-link.co.jp E-MAIL: kida@d-link.co.jp

Netherlands **D-Link Benelux**
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TEL: 31-40-2668713 FAX: 31-40-2668666
URL: www.d-link-benelux.nl & www.dlink-benelux.be
E-MAIL: info@dlink-benelux.nl & info@dlink-benelux.be

Norway **D-Link Norway**
Waldemar Thranesgate 77, 0175 Oslo, Norway
TEL: 47-22-99-18-90 FAX: 47-22-20-70-39 SUPPORT: 800-10-610
URL: www.dlink.no

Russia **D-Link Russia**
Michurinski Prospekt 49, 117607 Moscow, Russia
TEL: 7-095-737-3389 & 7-095-737-3492
FAX: 7-095-737-3390 URL: www.dlink.ru
E-MAIL: vl@dlink.ru

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1 International Business Park, #03-12 The Synergy,
Singapore 609917
TEL: 6-6774-6233 FAX: 6-6774-6322
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South Africa **D-Link South Africa**
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TEL: 27-12-665-2165 FAX: 27-12-665-2186
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