

D-Link DFL-1100

Network Security Firewall

Manual

D-Link[®]

Building Networks for People

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LIMITED WARRANTY

Introduction

The DFL-1100 provides four 10/100MB Ethernet network interface ports, which are (1) Internal/LAN, (1) External/WAN, (1) DMZ port and (1) port that can be configured as High Availability Sync port or as ETH4 port. It also provides easily operated software WebUI that allows users to set system parameters or monitor network activities using a web browser.

Features and Benefits

- **Firewall Security**
- **VPN Server/Client Supported**
- **Content Filtering**
- **High Availability**
- **Bandwidth Management**
DFL-1100 features an extensive Traffic Shaper for bandwidth management.
- **Web Management**
Configurable through any networked computer's web browser using Netscape or Internet Explorer.
- **Access Control supported**
Allows you to assign different access rights for different users. Like Admin or Read-Only User.

Introduction to Firewalls

A firewall is a device that sits between your computer and the Internet that prevents unauthorized access to or from your network. A firewall can be a computer using firewall software or a special piece of hardware built specifically to act as a firewall. In most circumstances, a firewall is used to prevent unauthorized Internet users from accessing private networks or corporate LAN's and Intranets.

A firewall watches all of the information moving to and from your network and analyzes each piece of data. Each piece of data is checked against a set of criteria that the administrator configures. If any data does not meet the criteria, that data is blocked and discarded. If the data meets the criteria, the data is passed through. This method is called packet filtering.

A firewall can also run specific security functions based on the type of application or type of port that is being used. For example, a firewall can be configured to work with an FTP or Telnet server. Or a firewall can be configured to work with specific UDP or TCP ports to allow certain applications or games to work properly over the Internet.

Introduction to Local Area Networking

Local Area Networking (LAN) is the term used when connecting several computers together over a small area such as a building or group of buildings. LAN's can be connected over large areas. A collection of LAN's connected over a large area is called a Wide Area Network (WAN).

A LAN consists of multiple computers connected to each other. There are many types of media that can connect computers together. The most common media is CAT5 cable (UTP or STP twisted pair wire.) On the other hand, wireless networks do not use wires; instead they communicate over radio waves. Each computer must have a Network Interface Card (NIC), which communicates the data between computers. A NIC is usually a 10Mbps network card, or 10/100Mbps network card, or a wireless network card.

Most networks use hardware devices such as hubs or switches that each cable can be connected to in order to continue the connection between computers. A hub simply takes any data arriving through each port and forwards the data to all other ports. A switch is more sophisticated, in that a switch can determine the destination port for a specific piece of data. A switch minimizes network traffic overhead and speeds up the communication over a network.

Networks take some time in order to plan and implement correctly. There are many ways to configure your network. You may want to take some time to determine the best network set-up for your needs.

LEDs & Physical Connections



WAN, LAN, DMZ & ETH4/Sync: Ethernet Link port indicators, Green. The Act LED flickers when the ports are sending or receiving data.

Power: A solid light indicates a proper connection to the power supply.

Status: System status indicators, flashes to indicate an active system. If the LED has a solid light the unit is defective.

Console: Serial access to the firewall software, 9600, 8bit, None Parity, 1Stop bit.

External Port (WAN): Use this port to connect to the external router, DSL modem, or Cable modem.

Internal Ports (LAN): Use this port to connect to the internal network of the office.

DMZ Port: Use this port to connect to the company's server(s), which needs direct connection to the Internet (FTP, SNMP, HTTP and DNS).

ETH4/Sync Port: Use this port to as an extra LAN or DMZ port, or when using High Availability as Sync interface.

Package Contents



Contents of Package:

- **D-Link DFL-1100 Firewall**
- Manual and CD
- Quick Installation Guide
- Power cord

If any of the above items are missing, please contact your reseller.

System Requirements

- Computer with a Windows, Macintosh, or Unix based operating system with an installed Ethernet adapter
- Internet Explorer or Netscape Navigator, version 6.0 or above, with JavaScript enabled.

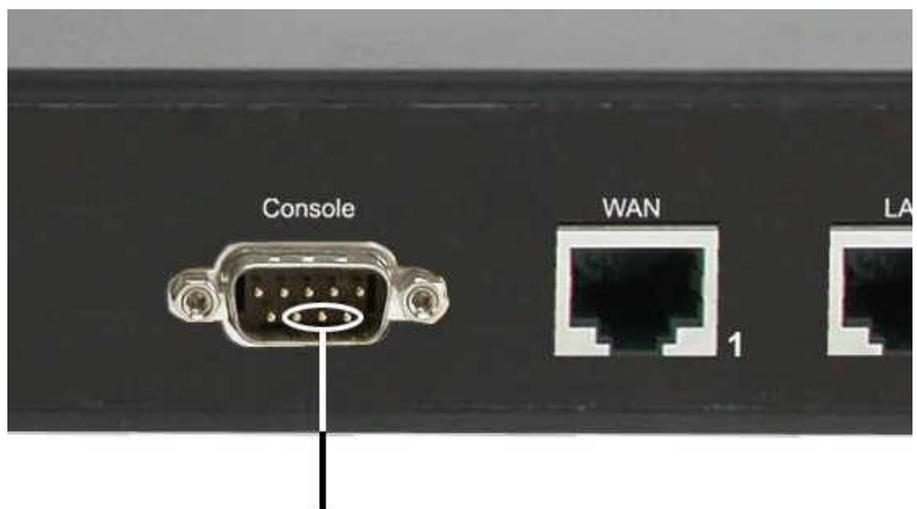
Managing D-Link DFL-1100

When a change is done to the configuration a new icon named **Activate Changes** will appear. When all changes and administrator would like to do is done the changes need to be saved and activated to take effect, this is done by clicking on the Activate Changes button on the Activate Configuration Changes page. What will happen is that the firewall will save the configuration and reload it, letting the new changes take effect. But for the changes to become permanent the admin need to login again. This have to be done before a configurable timeout has been reached, this can be set on the Activate Configuration Changes page, by choosing the time from the dropdown menu.



Resetting the DFL-1100

To reset the DFL-1100 to factory default settings you must shorten pin 7 and 9 (it's also possible to shorten 7, 8 and 9) of the serial-console port directly after powering on the unit. You will first hear one beep, which will indicate that the unit has started to boot. Keep the pins shortened in until you hear two consecutive beeps. After this you can release the shortened pins and the DFL-1100 will continue to load and startup in default mode, i.e. with 192.168.1.1 on the LAN interface.



Administration Settings

Administrative Access

Administration Settings

Select the interface / user you wish to edit from the below list.

Note that both the user settings and the interface settings limit what a user can do, so if e.g. a full admin user logs on via an interface that only allows "read-only" access, the user will be allowed to log on, but will receive read-only access only.

Administrative users

Admin: [admin](#) [\[Add\]](#)
Read-only: [auditor](#) [\[Add\]](#)

Administrative access via LAN interface [\[Edit\]](#)

Ping: 1.0.0.0 - 223.255.255.255
Admin: 1.0.0.0 - 223.255.255.255 (HTTPS only)
Read-only: 1.0.0.0 - 223.255.255.255 (HTTP + HTTPS)
SNMP: 1.0.0.0 - 223.255.255.255
Read Community: "MySecretCommunity"

Administrative access via DMZ interface [\[Edit\]](#)

Ping: 1.0.0.0 - 223.255.255.255
SNMP: 1.0.0.0 - 223.255.255.255
Read Community: "public"

Add administrative access via:

Interface: [WAN](#)
VPN Tunnel: [lantolan1](#), [lantolan2](#), [roamingusers](#)

Ping – If enabled, specifies who can ping the interface IP of the DFL-1100. Default if enabled is to allow anyone to ping the interface IP.

Admin – If enabled allows all users with admin access to connect to the DFL-1100 and change configuration, can be **HTTPS** or **HTTP and HTTPS**.

Read-Only – If enabled allows all users with read-only access to connect to the DFL-1100 and look at the configuration, can be **HTTPS** or **HTTP and HTTPS**. If there is no Admin access specified on an interface and only read-only, admin users can still connect but will be in read-only mode.

SNMP – Specifies if SNMP should be allowed or not on the interface, the DFL-1100 only supports read-only access.

Add ping access to an interface

To add ping access click on the interface you would like to add it to.

Follow these steps to add ping access to an interface.

Step 1. Click on the interface you would like to add it to.

Step 2. Enable the **Ping** checkbox.

Step 3. Specify what networks are allowed to ping the interface, for example 192.168.1.0/24 for a whole network or 172.16.0.1 – 172.16.0.10 for a range.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Example:

Ping - standard ICMP echo to the IP address of the interface

Networks:

Add Admin access to an interface

To add admin access click on the interface you would like to add it to. Only users with the administrator rights can login on an interfaces where there is only admin access enabled.

Follow these steps to add admin access to an interface.

Step 1. Click on the interface you would like to add it to.

Step 2. Enable the **Admin** checkbox.

Step 3. Specify what networks are allowed to ping the interface, for example 192.168.1.0/24 for a whole network or 172.16.0.1 – 172.16.0.10 for a range.

Step 4. Specify protocol used to access the DFL-1100 from the dropdown menu, either HTTP and HTTPS (Secure HTTP) or only HTTPS.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Example:

Admin - Full access to web-based management

Networks:

Protocol:

Add Read-only access to an interface

To add read-only access click on the interface you would like to add it to, note that if you only have read-only access enable on an interface all users only get read-only access, even if they are administrators.

Follow these steps to add read-only access to an interface.

Step 1. Click on the interface you would like to add it to.

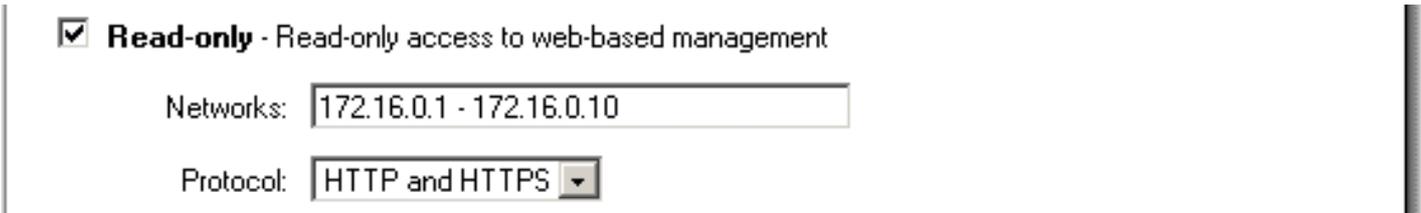
Step 2. Enable the **Read-only** checkbox.

Step 3. Specify what networks are allowed to ping the interface, for example 192.168.1.0/24 for a whole network or 172.16.0.1 – 172.16.0.10 for a range.

Step 4. Specify protocol used to access the DFL-1100 from the dropdown menu, either HTTP and HTTPS (Secure HTTP) or only HTTPS.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Example:



Read-only - Read-only access to web-based management

Networks:

Protocol:

Enable SNMP access to an interface

Follow these steps to add read-only SNMP access to an interface.

Step 1. Click on the interface you would like to add it to.

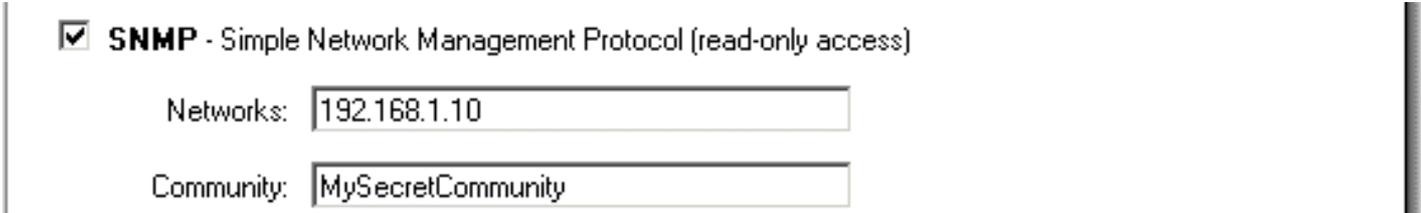
Step 2. Enable the **Read-only** checkbox.

Step 3. Specify what networks are allowed to ping the interface, for example 192.168.1.0/24 for a whole network or 172.16.0.1 – 172.16.0.10 for a range.

Step 4. Specify the community string used to authenticate against the DFL-1100.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Example:



SNMP - Simple Network Management Protocol (read-only access)

Networks:

Community:

System

Interfaces

Click on **System** in the menu bar, and then click **interfaces** below it.

Change IP of the LAN, DMZ or ETH4 interface

Follow these steps to change the IP of the LAN or DMZ interface.

Step 1. Choose which interface to view or change under the Available interfaces list.

Step 2. Fill in the IP address of the **LAN, DMZ** or **ETH4** interface.

These are the address that will be used to ping the firewall, remotely control it and use as gateway for the internal hosts or DMZ hosts.

Step 3. Choose the correct Subnet mask of this interface from the drop down menu.



The screenshot shows a configuration window titled "Interface Settings" for editing the LAN interface. It contains two input fields: "IP Address" with the value "192.168.0.1" and "Subnet Mask" with the value "255.255.255.0" and a dropdown menu showing "256 hosts (/24)".

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

WAN Interface Settings – Using Static IP

If you are using **Static IP** you have to fill in the IP address information provided to you by your ISP. All fields are required except the Secondary DNS Server. You should probably not use the numbers displayed in these fields, they are only used as an example.

- **IP Address** – The IP address of the **WAN** interface. This is the address that may be used to ping the firewall, remotely control it and be used as source address for dynamically translated connections.
- **Subnet Mask** – Size of the external network.
- **Gateway IP** – Specifies the IP address of the default gateway used to reach for the Internet.
- **Primary and Secondary DNS Server** – The IP addresses of your DNS servers, only the Primary DNS is required.

Interface Settings

Edit settings of the **WAN** interface:

Change WAN Type:

Static WAN interface configuration is most commonly used in dedicated-line internet connections. Your ISP usually provides this information to you.

IP Address:

Subnet Mask: - 256 hosts (/24)

Gateway IP:

Primary DNS Server:

Secondary DNS Server: (optional)

WAN Interface Settings – Using DHCP

If you are using **DHCP** there is no need to enter any values in any of fields.

Interface Settings

Edit settings of the **WAN** interface:

Change WAN Type:

Regular ethernet connection with DHCP-assigned IP addresses is used in many DSL and cable modem networks. Everything is automatic.

WAN Interface Settings – Using PPPoE

Use the following procedure to configure the DFL-1100 external interface to use PPPoE (Point-to-Point Protocol over Ethernet). This configuration is required if your ISP uses PPPoE to assign the IP address of the external interface. You will have to fill the username and password provided to you by your ISP.

- **Username** – The login or username supplied to you by your ISP.
- **Password** – The password supplied to you by your ISP.
- **Service Name** – When using PPPoE some ISPs require you to fill in a Service Name.
- **Primary and Secondary DNS Server** – The IP addresses of your DNS servers, these are optional and are often provided by the PPPoE service.

Interface Settings

Edit settings of the **WAN** interface:

Change WAN Type:

PPP over Ethernet connections are used in many DSL and cable modem networks. After authenticating, everything is automatic.

Username:

Password:

Retype Password:

Service Name:

[Some ISPs require the Service Name to be filled out.]

Most PPPoE services provide DNS server information. A few do not. If this is the case, you can fill out their IP addresses yourself.

Primary DNS Server: (optional)

Secondary DNS Server: (optional)

WAN Interface Settings – Using PPTP

PPTP over Ethernet connections are used in some DSL and cable modem networks.

You need your account details, and possibly also IP configuration parameters of the actual physical interface that the PPTP tunnel runs over. Your ISP should supply this information.

- **Username** – The login or username supplied to you by your ISP.
- **Password** – The password supplied to you by your ISP.
- **PPTP Server IP** – The IP of the PPTP server that the DFL-1100 should connect to.

Interface Settings

Edit settings of the **WAN** interface:

Change WAN Type:

PPTP over Ethernet connections are used in some DSL and cable modem networks. You need account details, and possibly also IP configuration parameters of the actual physical interface that the PPTP tunnel runs over. Your ISP should supply this information.

PPTP tunnel parameters:

Username:

Password:

Retype Password:

PPTP Server IP:

Physical interface parameters:

DHCP - automatic configuration

Everything is automatic.

Static IP - manual configuration

Your ISP should provide this information to you.

IP Address:

Subnet Mask: - 256 hosts (/24)

Gateway IP:

This may or may not be necessary, depending on the ISP.

Before PPTP can be used to connect to you ISP the physical (WAN) interface parameters need to be supplied, it's possible to use either **DHCP** or **Static IP**, this depends on the type of ISP used and this information should be supplied by them.

If using static IP, this information need to be filled in.

- **IP Address** – The IP address of the **WAN** interface. This IP is used to connect to the PPTP server.
- **Subnet Mask** – Size of the external network.
- **Gateway IP** – Specifies the IP address of the default gateway used to reach for the Internet.

WAN Interface Settings – Using BigPond

The ISP Telstra BigPond uses BigPond for authentication; the IP is assigned with DHCP.

- **Username** – The login or username supplied to you by your ISP.
- **Password** – The password supplied to you by your ISP.

Interface Settings

Edit settings of the **WAN** interface:

Change WAN Type:

Regular ethernet connection with DHCP-assigned IP address, plus authentication via a special protocol. Used by the ISP Telstra BigPond.

Username:

Password:

Retype Password:

Traffic Shaping

Traffic shaping - interface speed limits

In order to do traffic shaping beyond simple limits, such as guarantees and priorities, the traffic shaper needs to know what the maximum bandwidth is. Throughput through this interface will be limited to these speeds. If the limits are set too high, traffic shaping will not work.

Upstream bandwidth: kbit/s

Downstream bandwidth: kbit/s

When **Traffic Shaping** is enabled and the correct maximum up and downstream bandwidth is specified it's possible to control which policies have the highest priority when large amounts of data are moving through the DFL-1100. For example, the policy for the web server might be given higher priority than the policies for most employees' computers.

You can use traffic shaping to guarantee the amount of bandwidth available through the firewall for a policy. Guarantee bandwidth to make sure that there is enough bandwidth available for a high-priority service. You can also use traffic shaping to limit the amount of bandwidth available through the firewall for a policy. Limit bandwidth to keep less important services from using bandwidth needed for more important services.

Note: If the limit is set too high, i.e. higher than your Internet connection, the traffic shaping will not work at all.

MTU Configuration

Manual Interface MTU Configuration - maximum size of packets sent via this interface

Normally, you do not need to change the MTU settings. By default, the interface uses the maximum size that the physical media supports.

MTU: bytes. Upper limit:

To improve the performance of your Internet connection, you can adjust the maximum transmission unit (MTU) of the packets that the DFL-1100 transmits from its external interface. Ideally, you want this MTU to be the same as the smallest MTU of all the networks between the DFL-1100 and the Internet. If the packets the DFL-1100 sends are larger, they get broken up or fragmented, which could slow down transmission speeds.

Trial and error is the only sure way of finding the optimal MTU, but there are some guidelines that can help. For example, the MTU of many PPP connections is 576, so if you connect to the Internet via PPPoE, you might want to set the MTU size to 576. DSL modems may also have small MTU sizes. Most ethernet networks have an MTU of 1500.

Note: If you connect to your ISP using DHCP to obtain an IP address for the external interface, you cannot set the MTU below 576 bytes due to DHCP communication standards.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

VLAN

Click on **System** in the menu bar, and then click **VLAN** below it, this will give a list of all configured VLANs, it will look something like this:

VLAN Interfaces

Pick a VLAN interface to edit from the below list:

Help

Available VLAN interfaces

Name	Physical	VLAN ID
vlan1	LAN	1

[Edit]

[Add new]

Add a new VLAN

Follow these steps to add a new route.

Step 1. Go to **System** and **VLAN**.

Step 2. Click on **Add new** in the bottom of the routing table.

Step 3. Choose the interface that the VLAN should be on from the dropdown menu.

Step 4. Specify the 801.2Q VLAN ID.

Step 5. Fill in the IP address of the **VLAN** interface. This is the address that will be used to ping the firewall, remotely control it and use as gateway for hosts on that VLAN.

Step 6. Choose the correct Subnet mask of this interface from the drop down menu.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Remove a VLAN

Follow these steps to add a remove a route.

Step 1. Go to **System** and **VLAN**.

Step 2. Take **Edit** after the VLAN you would like to remove.

Step 3. Check the checkbox named **Delete this VLAN**.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Routing

Click on **System** in the menu bar, and then click **Routing** below it, this will give a list of all configured routes, it will look something like this:

Routing table				
Interface	Network	Gateway	Additional IP	Proxy ARP
WAN	194.1.2.0/24			[Edit]
LAN	192.168.1.0/24			[Edit]
WAN	0.0.0.0/0	194.1.2.254		[Edit]
LAN	192.168.5.0/24		192.168.5.1	[Edit]
VPNTunnel1	192.168.2.0/24			Yes [Edit]
[Add new]				

The Routes configuration section describes the firewall's routing table. DFL-1100 uses a slightly different way of describing routes compared to most other systems. However, we believe that this way of describing routes is easier to understand, making it less likely for users to cause errors or breaches in security.

Interface – Specifies which interface packets destined for this route shall be sent through.

Network – Specifies the network address for this route.

Gateway – Specifies the IP address of the next router hop used to reach the destination network. If the network is directly connected to the firewall interface, no gateway address is specified.

Local IP Address – The IP address specified here will be automatically published on the corresponding interface. This address will also be used as the sender address in ARP queries. If no address is specified, the firewall's own interface IP address will be used.

Proxy ARP – Specifies that the firewall shall publish this route via Proxy ARP.

One advantage with this form of notation is that you can specify a gateway for a particular route, without having a route that covers the gateway's IP address or despite the fact that the route that covers the gateway's IP address is normally routed via another interface.

The difference between this form of notation and that most commonly used is that there, you do not specify the interface name in a separate column. Instead, you specify the IP address of each interface as a gateway.

Note: The firewall does not Proxy ARP routes on VPN interfaces.

Add a new Static Route

Follow these steps to add a new route.

Step 1. Go to **System** and **Routing**.

Step 2. Click on **Add new** in the bottom of the routing table.

Step 3. Choose the interface that the route should be sent through from the dropdown menu.

Step 4. Specify the Network and Subnet mask.

Step 5. If this network is behind a remote gateway enable the checkbox **Network is behind remote gateway** and specify the IP of that gateway

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Remove a Static Route

Follow these steps to add a remove a route.

Step 1. Go to **System** and **Routing**.

Step 2. Take **Edit** after the route you would like to remove.

Step 3. Check the checkbox named **Delete this route**.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

High Availability

D-Link High Availability works by adding a back-up firewall to your existing firewall. The back-up firewall has the same configuration as the primary firewall. It will stay inactive, monitoring the primary firewall, until it deems that the primary firewall is no longer functioning, at which point it will go active and assume the active role in the cluster. When the other firewall comes back up, it will assume a passive role, monitoring the now active firewall.

What High Availability will do for you

D-Link High Availability will provide a redundant, state-synchronized firewalling solution. This means that the state of the active firewall, i.e. connection table and other vital information, is continuously copied to the inactive firewall. When the cluster fails over to the inactive firewall, it knows which connections are active, and communication may continue to flow uninterrupted.

The failover time is typically about one second; well in the scope for the normal TCP retransmit timeout, which is normally over one minute. Clients connecting through the firewall will merely experience the failover procedure as a slight burst of packet loss, and, as TCP always does in such situations, retransmit the lost packets within a second or two, and go on communicating.

What High Availability will NOT do for you

Adding redundancy to your firewall setup will eliminate one of the single points of failure in your communication path. However, it is not a panacea for all possible communication failures.

Typically, your firewall is far from the only single point of failure. Redundancy for your routers, switches, and your Internet connection are also issues that need to be addressed.

D-Link High Availability clusters will not create a load-sharing cluster. One firewall will be active, and the other will be inactive.

Multiple back-up firewalls cannot be used in a cluster. Only two firewalls, a "master" and a "slave", are supported.

As is the case with all other firewalls supporting stateful failover, the D-Link High Availability will only work between two D-Link DFL-1100 Firewalls. As the internal workings of different firewalls, and, indeed, different major versions of the same firewall, can be radically different, there is no way of communicating "state" to something which has a completely different comprehension of what "state" means.

IP Addresses explained

For each cluster interface, there are three IP addresses:

- Two "real" IP addresses; one for each firewall. These addresses are used to communicate with the firewalls themselves, i.e. for remote control and monitoring. They should not be associated in any way with traffic flowing through the cluster; if either firewall is inoperative, the associated IP address will simply be unreachable.
- One "virtual" IP address; shared between the firewalls. This is the IP address to use when configuring default gateways and other routing related matters. It is also the address used by dynamic address translation, unless the configuration explicitly specifies another address.

There is not much to say about the real IP addresses; they will act just like firewall interfaces normally do. You can ping them or remote control the firewalls through them if your configuration allows it. ARP queries for the respective addresses are answered by the firewall that owns the IP address, using the normal hardware address, just like normal IP units do.

Note: You cannot use PPPoE/DHCP/L2TP on the external interface when using HA.

The shared IP address and the failover mechanism

Both firewalls in the cluster know about the shared IP address. ARP queries for the shared IP address, or any other IP address published via the ARP configuration section or through Proxy ARP, will be answered by the active firewall.

The hardware address of the shared IP address, and other published addresses for that matter, is not related to the hardware addresses of the firewall interfaces. Rather, it is constructed from the cluster ID, on the following form: 10-00-00-C1-4A-nn, where nn is the Cluster ID configured in the Settings section.

As the shared IP address always has the same hardware address, there will be no latency time in updating ARP caches of units attached to the same LAN as the cluster when failover occurs.

When a firewall discovers that its peer is no longer operational, it will broadcast a number of ARP queries for itself, using the shared hardware address as sender address, on all interfaces. This causes switches and bridges to re-learn where to send packets destined for the shared hardware address in a matter of milliseconds.

Hence, the only real delay in the failover mechanism is detecting that a firewall is no longer operational.

The activation messages (ARP queries) described above are also broadcast periodically to ensure that switches won't forget where to send packets destined for the shared hardware address.

Cluster heartbeats

A firewall detects that its peer is no longer operational when it can no longer hear "cluster heartbeats" from its peer.

Currently, a firewall will send five cluster heartbeats per second.

When a firewall has "missed" three heartbeats, i.e. after 0.6 seconds, it will be declared inoperative.

Cluster heartbeats have the following characteristics:

- The source IP is the interface address of the sending firewall
- The destination IP is the shared IP address
- The IP TTL is always 255. If a firewall receives a cluster heartbeat with any other TTL, it is assumed that the packet has traversed a router, and hence cannot be trusted at all.
- It is an UDP packet, sent from port 999, to port 999.
- The destination MAC address is the ethernet multicast address corresponding to the shared hardware address, i.e. 11-00-00-C1-4A-nn. Link-level multicasts were chosen over normal unicast packets for security reasons: using unicast packets would have meant that a local attacker could fool switches to route the heartbeats somewhere else, causing the peer firewall to never hear the heartbeats.

The synchronization interface

Both firewalls are connected to each other by a separate synchronization connection; the fourth port is dedicated solely for this purpose when the firewalls are configured as HA.

The active firewall continuously sends state update messages to its peer, informing it of connections that are opened, connections that are closed, state and lifetime changes in connections, etc. The configuration is also transferred between the nodes using the synchronization connection.

When the active firewall ceases to function, for whatever reason and for even a short time, the cluster heartbeat mechanism described above will cause the inactive firewall to go active. Since it already knows about all open connections, communication can continue to flow uninterrupted.

Setting up a High Availability cluster

First of all, the two DFL-1100 needs to be setup so far that you can manage them over the web interface. In this example the two units are configured as follow, the master DFL-1100 will be configured with 192.168.1.2 on its internal interface, and the slave DFL-1100 with 192.168.1.3. Later when the setup of the HA is done, the virtual or shared IP will be 192.168.1.1 on the LAN, this is the IP that clients on that network will use as gateway.

When both units are configured with the two individual IP's they should be connected with a crossover cable between the fourth interfaces on each unit, this interface (ETH4) will no longer be possible to use as an extra DMZ or LAN interface when running HA.

Login to the master firewall and click on **System** in the menu bar, and then click **HA** below it; in this screen you will click on **Configure additional HA parameters**. This will show the screen below; here you will fill in each Units own IP and the shared IP on each interface. **This Unit** means the master firewall, the one you should be configuring at the moment. **Other Unit** is the slave firewall, the other DFL-1100.

Interface IP Addresses

In addition to the unique IP addresses of the cluster members, you must also configure shared IP addresses for all interfaces.

- The **shared** address is the one that units on the network should use as gateway, as public IP in address mappings, etc.
- The **unique** addresses are mainly used for management and monitoring of the individual cluster members.

Interface	This Unit	Shared IP	Other Unit
LAN	<input type="text" value="192.168.1.2"/>	<input type="text" value="192.168.1.1"/>	<input type="text" value="192.168.1.3"/>
WAN	<input type="text" value="172.16.0.2"/>	<input type="text" value="172.16.0.1"/>	<input type="text" value="172.16.0.3"/>
DMZ	<input type="text" value="192.168.3.2"/>	<input type="text" value="192.168.3.1"/>	<input type="text" value="192.168.3.3"/>

You also need to configure the Cluster ID of the cluster, this have to be a number between 0 and 63, which must be the same on both firewalls in the cluster. This must be unique on your LAN if you are running more then one cluster.

Other parameters

Cluster ID: (0-63)

If there is more than one cluster on a network, each cluster needs a unique ID number.

Make note of the Cluster ID. You will need it when setting up the next cluster member.

When this is done you should click on **Apply**.

Now login to the slave firewall and click on **System** in the menu bar, and then click **HA** below it; in this screen you will click on **Receive configuration from first unit**. This will show the screen below; here you will fill in the cluster id configured on the first unit. When you click **Apply** the unit should transfer the configuration from the first unit and you HA cluster should be operating.

Interface Monitoring

When HA is configured it's possible to configure something called Interface Monitoring, this is used to monitor up to 6 IP addresses on each segment (LAN/WAN or DMZ) of the DFL-1100 cluster. If 50% of the listed addresses are unreachable for several seconds the active node will failover and the other unit will become active.

Interface Monitoring

For each interface, you can configure up to 6 IP addresses that the unit will continuously ping. If 50% of the listed addresses are unreachable for several seconds in a row, the cluster will fail over to the other unit.

IP addresses to monitor on the **LAN** interface

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

IP addresses to monitor on the **WAN** interface

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

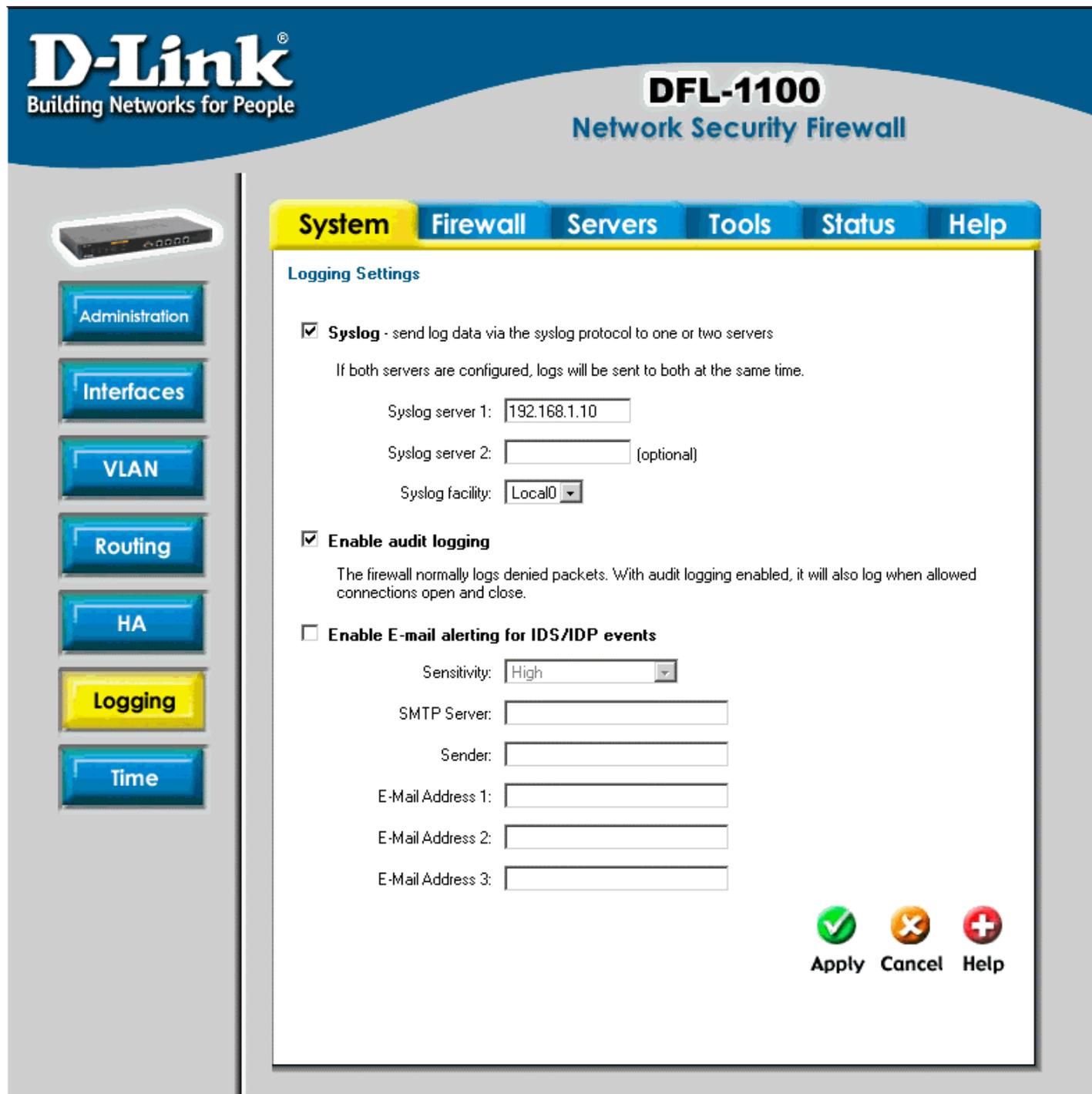
IP addresses to monitor on the **DMZ** interface

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

Logging

Click on **System** in the menu bar, and then click **Logging** below it.

Logging, the ability to audit decisions made by the firewall, is a vital part in all network security products. The D-Link DFL-1100 provides several options for logging its activity. The D-Link DFL-1100 logs its activities by sending the log data to one or two log receivers in the network.



The screenshot shows the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status', and 'Help'. The 'System' tab is selected, and the 'Logging Settings' page is displayed. On the left side, there is a vertical menu with buttons for 'Administration', 'Interfaces', 'VLAN', 'Routing', 'HA', 'Logging' (highlighted in yellow), and 'Time'. The main content area contains the following settings:

- Syslog** - send log data via the syslog protocol to one or two servers.
If both servers are configured, logs will be sent to both at the same time.
Syslog server 1:
Syslog server 2: (optional)
Syslog facility:
- Enable audit logging**
The firewall normally logs denied packets. With audit logging enabled, it will also log when allowed connections open and close.
- Enable E-mail alerting for IDS/IDP events**
Sensitivity:
SMTP Server:
Sender:
E-Mail Address 1:
E-Mail Address 2:
E-Mail Address 3:

At the bottom right, there are three buttons: 'Apply' (with a green checkmark icon), 'Cancel' (with a red X icon), and 'Help' (with a red plus icon).

All logging is done to Syslog recipients. The log format used for syslog logging is suitable for automated processing and searching.

The D-Link DFL-1100 specifies a number of events that can be logged. Some of those events, for instance, startup and shutdown events, are mandatory, and will always generate log entries. Others, for instance to log if when allowed connections are opened and closed, is

configurable. It's also possible to have E-mail alerting for IDS/IDP events to up to three email addresses.

Enable Logging

Follow these steps to enable logging.

Step 1. Enable syslog by checking the **Syslog** box.

Step 2. Fill in your first syslog server as **Syslog server 1**, if you have two syslog servers you have to fill in the second one as **Syslog server 2**. You must fill in at least one syslog server for logging to work.

Step 3. Specify what facility to use by selecting the appropriate syslog facility. Local0 is the default facility.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Enable Audit Logging

To start auditing all traffic through the firewall, follow the steps below and the firewall will start logging all traffic through the firewall, this is needed for running third party log analyzers on the logs and to see how much traffic different connections use.

Follow these steps to enable auditing.

Step 1. Enable syslog by checking the **Enable audit logging** box.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Enable E-mail alerting for IDS/IDP events

Follow these steps to enable E-mail alerting.

Step 1. Enable E-mail alerting by checking the **Enable E-mail alerting for IDS/IDP events** checkbox.

Step 2. Choose the sensitivity level.

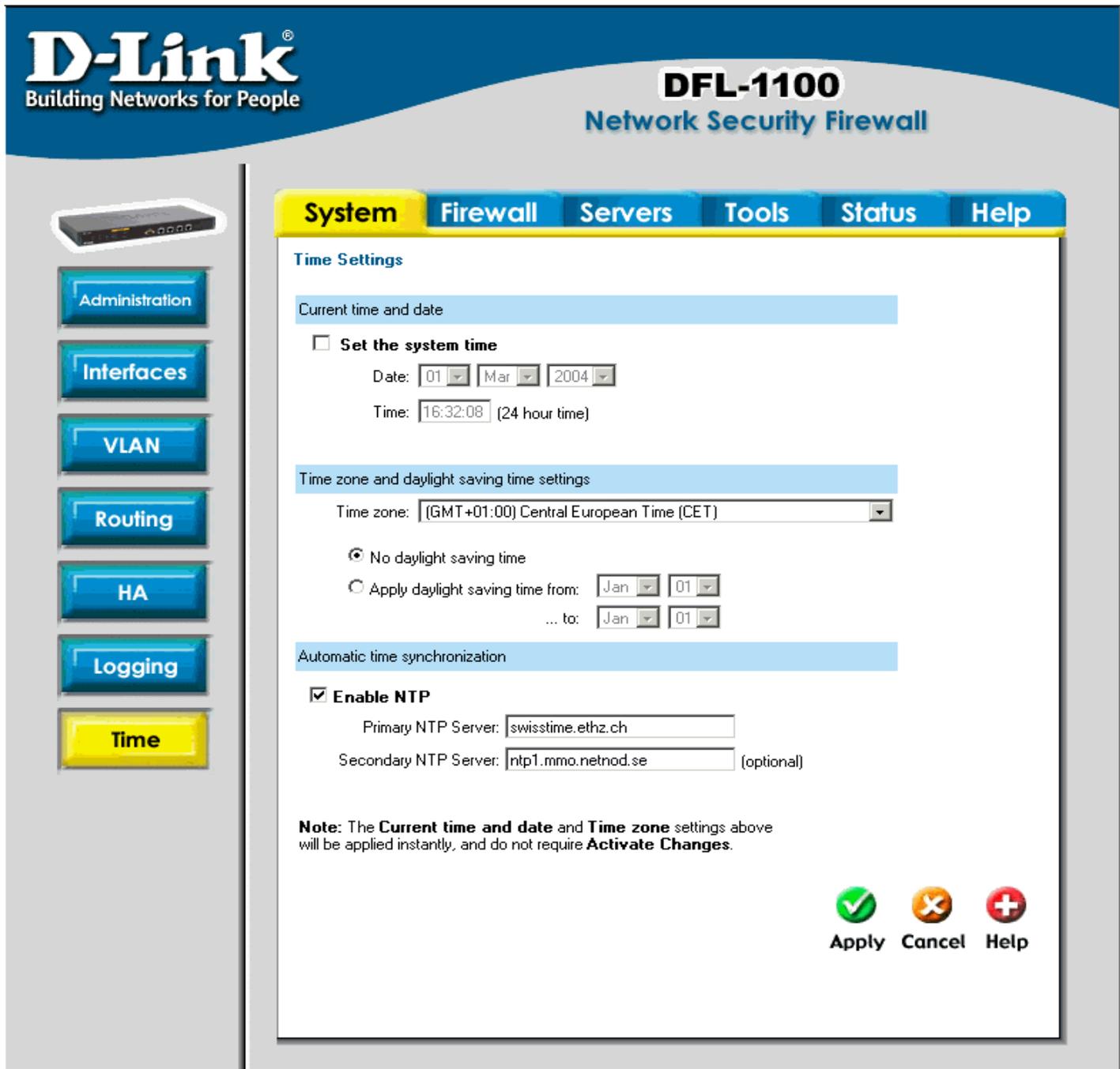
Step 3. In the **SMTP Server** field, fill in the SMTP server to which the DFL-1100 should send email.

Step 4. Specify up to three valid email addresses to receive the email alerts.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Time

Click on **System** in the menu bar, and then click **Time** below it. This will give you the option to either set the system time by syncing to an Internet Network Time Server (NTP) or by entering the system time by hand.



D-Link
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DFL-1100
Network Security Firewall

System Firewall Servers Tools Status Help

Time Settings

Current time and date

Set the system time

Date: 01 Mar 2004

Time: 16:32:08 (24 hour time)

Time zone and daylight saving time settings

Time zone: (GMT+01:00) Central European Time (CET)

No daylight saving time

Apply daylight saving time from: Jan 01 ... to: Jan 01

Automatic time synchronization

Enable NTP

Primary NTP Server: swisstime.ethz.ch

Secondary NTP Server: ntp1.mmo.netnod.se (optional)

Note: The **Current time and date** and **Time zone** settings above will be applied instantly, and do not require **Activate Changes**.

Apply Cancel Help

Changing time zone

Follow these steps to change the time zone.

Step 1. Choose the correct time zone in the drop down menu.

Step 2. Specify your daylight time or choose no daylight saving time by checking the correct box.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Using NTP to sync time

Follow these steps to sync to an Internet Time Server.

Step 1. Enable synchronization by checking the **Enable NTP** box.

Step 2. Enter the Server IP Address or Server name with which you want to synchronize.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Setting time and date manually

Follow these steps to set the system time by hand.

Step 1. Checking the **Set the system time** box.

Step 2. Choose the correct date.

Step 3. Set the correct time in 24-hour format.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Firewall

Policy

The Firewall Policy configuration section is the "heart" of the firewall. The policies are the primary filter that is configured to allow or disallow certain types of network traffic through the firewall. The policies also regulate how bandwidth management, traffic shaping, is applied to traffic flowing through the WAN interface of the firewall.

When a new connection is being established through the firewall, the policies are evaluated, top to bottom, until a policy that matches the new connection is found. The Action of the rule is then carried out. If the action is Allow, the connection will be established and a state representing the connection is added to the firewall's internal state table. If the action is Drop, the new connection will be refused. The section below will explain the meanings of the various action types available.

Policy modes

The first step in configuring security policies is to configure the mode for the firewall. The firewall can run in NAT or No NAT (Route) mode. Select NAT mode to use DFL-1100 network address translation to protect private networks from public networks. In NAT mode, you can connect a private network to the internal interface, a DMZ network to the dmz interface, and a public network, such as the Internet, to the external interface. Then you can create NAT mode policies to accept or deny connections between these networks. NAT mode policies hide the addresses of the internal and DMZ networks from users on the Internet. In No NAT (Route) mode you can also create routed policies between interfaces. Route mode policies accept or deny connections between networks without performing address translation. To use NAT mode select **Hide source addresses (many-to-one NAT)** and to use No NAT (Route) mode choose **No NAT**.

Action Types

Drop – Packets matching Drop rules will immediately be dropped. Such packets will be logged if logging has been enabled in the Logging Settings page.

Reject – Reject works in basically the same way as Drop. In addition to this, the firewall sends an ICMP UNREACHABLE message back to the sender or, if the rejected packet was a TCP packet, a TCP RST message. Such packets will be logged if logging has been enabled in the Logging Settings page.

Allow – Packets matching Allow rules are passed to the stateful inspection engine, which will remember that a connection has been opened. Therefore, rules for return traffic will not be required as traffic belonging to open connections is automatically dealt with before it reaches the policies. Logging is carried out if audit logging has been enabled in the Logging Settings page.

Source and Destination Filter

Source Nets – Specifies the sender span of IP addresses to be compared to the received packet. Leave this blank to match everything.

Source Users/Groups – Specifies if an authenticated username is needed for this policy to match. Either make a list of usernames, separated by , or write **Any** for any authenticated user. If it's left blank there is no need for authentication for the policy.

Destination Nets – Specifies the span of IP addresses to be compared to the destination IP of the received packet. Leave this blank to match everything.

Destination Users/Groups – Specifies if an authenticated username is needed for this policy to match. Either make a list of usernames, separated by , or write Any for any authenticated user. If it's left blank there is no need for authentication for the policy.

Service Filter

Either choose a predefined service from the dropdown menu or make a custom.

The following custom services exist:

All – This service matches all protocols.

TCP+UDP+ICMP – This service matches all ports on either the TCP or the UDP protocol, including ICMP.

Custom TCP – This service is based on the TCP protocol.

Custom UDP – This service is based on the UDP protocol.

Custom TCP+UDP – This service is based on either the TCP or the UDP protocol.

The following is used when making a custom service:

Custom source/destination ports – For many services, a single destination port is sufficient. The source port most often be all ports, 0-65535. The http service, for instance, is using destination port 80. A port range can also be used, meaning that a range 137-139 covers ports 137, 138 and 139. Multiple ranges or individual ports may also be entered, separated by commas. For instance, a service can be defined as having source ports 1024-65535 and destination ports 80-82, 90-92, 95. In this case, a TCP or UDP packet with the destination port being one of 80, 81, 82, 90, 91, 92 or 95, and the source port being in the range 1024-65535, will match this service.

Schedule

If a schedule should be used for the policy, choose one from the dropdown menu, these are specified on the **Schedules** page. If the policy should always be active, choose Always from the dropdown menu.

Intrusion Detection / Prevention

The DFL-1100 Intrusion Detection/Prevention System (IDS/IDP) is a real-time intrusion detection and prevention sensor that identifies and takes action against a wide variety of suspicious network activity. The IDS uses intrusion signatures, stored in the attack database, to identify the most common attacks. In response to an attack, the IDS protect the networks behind the DFL-1100 by dropping the traffic. To notify of the attack the IDS sends an email to

the system administrators if email alerting is converted. D-Link updates the attack database periodically. There is two modes that can be configured, either **Inspection Only** or **Prevention**. Inspection Only will only inspect the traffic and if the DFL-1100 sees anything it will log, email an alert (if configured) and pass on the traffic, if Prevention is used the traffic will be dropped and logged and if configured a email alert will be sent.

Traffic Shaping

The simplest way to obtain quality of service in a network, seen from a security as well as a functionality perspective, is to have the components in the network, not the applications, be responsible for network traffic control in well-defined choke points.

Traffic shaping works by measuring and queuing IP packets, in transit, with respect to a number of configurable parameters. Differentiated rate limits and traffic guarantees based on source, destination and protocol parameters can be created; much the same way firewall policies are implemented.

There are three different priorities when configuring the traffic shaping, **Normal**, **High** and **Critical**.

Limit works by limiting the inbound and outbound traffic to the specified speed. This is the maximum bandwidth that can be used by traffic using this policy. Note however that if you have other policies using limit; which in total is more then your total internet connection and have configured the traffic limits on the WAN interface this limit is sometimes lowered to allow traffic with higher priorities to have precedence.

By using **Guarantee**, you can traffic using a policy a minimum bandwidth, this will only work if the traffic limits for the WAN interface are configured correctly.

Policy Routing

Normal routing can be said to be a simple form of policy based routing; the "policy" is the routing table, and the only data that can be filtered on is the destination IP address of the packet. What is commonly referred to as policy based routing, is, simply put, an extension of what fields of the packet we look at to determine the routing decision. In the DFL-1100, each rule in the firewall policy can specify its own routing decision; in essence, we route according to the source and destination IP addresses *and* ports.

Policy based routing can for example be used to route certain protocols through transparent proxies such as web caches and anti-virus scanners, without adding another point of failure for the network as a whole. It's very important to know that the proxy must support this also for it to work.

There are two ways to configure Policy Routing; both include specifying the Gateway to send the traffic over. The first one, **Redirect via routing (make gateway next hop)**, will just reroute the traffic to the given gateway as if it was just another router. The second mode, **Via address translation (change destination IP)**, will change the destination IP in the IP header and then pass the packet on to the gateway, used for example in transparent squid-proxy setups.

Add a new policy

Follow these steps to add a new outgoing policy.

Step 1. Choose the **LAN->WAN** policy list from the available policy lists.

Step 2. Click on the **Add new** link.

Step 3. Fill in the following values:

Name: Specifies a symbolic name for the rule. This name is used mainly as a rule reference in log data and for easy reference in the policy list.

Action: Select **Allow** to allow this type of traffic.

Source Nets: – Specifies the sender span of IP addresses to be compared to the received packet. Leave this blank to match everything.

Source Users/Groups: Specifies if an authenticated username is needed for this policy to match. Either make a list of usernames, separated by , or write **Any** for any authenticated user. If it's left blank there is no need for authentication for the policy.

Destination Nets: Specifies the span of IP addresses to be compared to the destination IP of the received packet. Leave this blank to match everything.

Destination Users/Groups: Specifies if an authenticated username is needed for this policy to match. Either make a list of usernames, separated by , or write **Any** for any authenticated user. If it's left blank there is no need for authentication for the policy.

Service: Either choose a predefined service from the dropdown menu or make a custom.

Schedule: Choose what schedule should be used for this policy to match, choose Always for no scheduling.

Step 4. If using Traffic shaping fill in that information, if not skip this step.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes

Change order of policy

Follow these steps to change order of a policy.

Step 1. Choose the policy list you would like do change order in from the available policy lists.

Step 2. Click on the **Edit** link on the rule you want to delete.

Step 3. Change the number in the **Position** to the new line, this will after the apply button is clicked move this policy to this row and move the old policy and all after to one step down.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes

Delete policy

Follow these steps to delete a policy.

Step 1. Choose the policy list you would like do delete the policy in from the available policy lists.

Step 2. Click on the **Edit** link on the rule you want to delete.

Step 3. Enable the **Delete policy** checkbox.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes

Configure Intrusion Detection

Follow these steps to configure IDS on a policy.

Step 1. Choose the policy you would like have IDS on.

Step 2. Click on the **Edit** link on the rule you want to delete.

Step 3. Enable the **Intrusion Detection / Prevention** checkbox.

Step 4. Choose **Intrusion Detection** from the mode drop down list.

Step 5. Enable the alerting checkbox for email alerting.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes

Configure Intrusion Prevention

Follow these steps to configure IDP on a policy.

- Step 1.** Choose the policy you would like have IDP on.
- Step 2.** Click on the **Edit** link on the rule you want to delete.
- Step 3.** Enable the **Intrusion Detection / Prevention** checkbox.
- Step 4.** Choose **Prevention** from the mode drop down list.
- Step 5.** Enable the alerting checkbox for email alerting.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes

Port mapping / Virtual Servers

The Port mapping / Virtual Servers configuration section is where you can configure virtual servers like Web servers on the DMZ or similar. It's also possible to regulate how bandwidth management, traffic shaping, is applied to traffic flowing through the WAN interface of the firewall. It is also possible to use Intrusion Detection / Prevention and Traffic shaping on Port mapped services, these are done in the same way as on policies, so see that chapter for more information.

Mappings are read from top to bottom, and the first matching mapping is carried out.

Add a new mapping

Follow these steps to add a new mapping on the WAN interface.

Step 1. Choose the **WAN** policy list from the available policy lists.

Step 2. Click on the **Add new** link.

Step 3. Fill in the following values:

Name: Specifies a symbolic name for the rule. This name is used mainly as a rule reference in log data and for easy reference in the policy list.

Source Nets: Specify the source networks, leave blank for everyone (0.0.0.0/0).

Source Users/Groups: Specifies if an authenticated username is needed for this mapping to match. Either make a list of usernames, separated by , or write **Any** for any authenticated user. If it's left blank there is no need for authentication for the policy.

Destination Nets: Leave empty for the interfaces own IP or enter a new IP if using Virtual IP.

Service: Either choose a predefined service from the dropdown menu or make a custom.

Pass To: The IP of the server that the traffic should be passed to.

Schedule: Choose what schedule should be used for this mapping to match, choose Always for no scheduling.

Step 4. If using Traffic shaping fill in that information, if not skip this step.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes

Delete mapping

Follow these steps to delete a mapping.

Step 1. Choose the mapping list (WAN, LAN or DMZ) you would like to delete the mapping from.

Step 2. Click on the **Edit** link on the rule you want to delete.

Step 3. Enable the **Delete mapping** checkbox.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Administrative users

Click on **Firewall** in the menu bar, and then click **Users** below it. This will show all the users, and the first section is the administrative users.



The first column show the access levels, *Administrator* and *Read-only*. An *Administrator* user can add, edit and remove rules, change settings of the DFL-1100 and so on. The *Read-only* user can only look at the configuration. The second column shows the users in each access level.

Add Administrative User

Follow these steps to add a new administrative user.

Step 1. Click on **add** after the type of user you would like to add, Admin or Read-only.

Step 2. Fill in **User name**; make sure you are not trying to add one that already exists.

Step 3. Specify the password for the new user.

A screenshot of a web-based configuration interface titled "Administration Settings". Below the title, it says "Add new user:". There are four input fields: "User name:" with the text "newuser" entered; "Access level:" with a dropdown menu showing "Administrator"; "Password:" with "xxxxxx" entered; and "Retype password:" with "xxxxxx" entered. At the bottom right, there are three buttons: "Apply" with a green checkmark icon, "Cancel" with an orange 'x' icon, and "Help" with a red plus icon.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Note: The user name and password should be at least six characters long. The user name and password can contain numbers (0-9) and upper and lower case letters (A-Z, a-z). Special characters and spaces are not allowed.

Change Administrative User Access level

To change the access level of a user click on the user name and you will see the following screen. From here you can change the access level by choosing the appropriate level from the drop-down menu.

Access levels

- **Administrator** – the user can add, edit and remove rules and change all settings.
- **Read-only** – the user can only look at the configuration of the firewall.
- **No Admin Access** – The user is only used for user authentication.

Administration Settings

Edit administrative user **admin**:

User name:

Access level:

Change password

Password:

Retype password:

Delete user



Follow these steps to change Administrative User Access level.

Step 1. Click on the user you would like to change level of.

Step 2. Choose the appropriate level from the drop-down menu.

Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Change Administrative User Password

To change the password of a user click on the user name and you will see the following screen.

Follow these steps to change Administrative User password.

Step 1. Click on the user you would like to change level of.

Step 2. Enable the **Change password** checkbox.

Step 3. Enter the new password twice.

Administration Settings

Edit administrative user **admin**:

User name:

Access level:

Change password

Password:

Retype password:

Delete user



Click the **Apply** button below to apply the setting or click Cancel to discard changes.

Note: The password should be at least six characters long. The password can contain numbers (0-9) and upper and lower case letters (A-Z, a-z). Special characters and spaces are not allowed.

Delete Administrative User

To delete a user click on the user name and you will see the following screen.

Follow these steps to delete an Administrative User.

Step 1. Click on the user you would like to change level of.

Step 2. Enable the **Delete user** checkbox.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Note: Deleting a user is irreversible; once the user is deleted, it cannot be undeleted.

Administration Settings

Edit administrative user **admin**:

User name:

Access level:

Change password

Password:

Retype password:

Delete user

Apply Cancel Help

Users

User Authentication allows an administrator to grant or reject access to specific users from specific IP addresses, based on their user credentials.

Before any traffic is allowed to pass through any policies configured with username or groups, the user must first authenticate him/her-self. The DFL-1100 can either verify the user against a local database or passes along the user information to an external authentication server, which verifies the user and the given password, and transmits the result back to the firewall. If the authentication is successful, the DFL.1100 will remember the source IP address of this user, and any matching policies with usernames or groups configured will be allowed. Specific policies that deal with user authentication can be defined, thus leaving policies that not require user authentication unaffected.

The DFL-1100 supports the RADIUS (Remote Authentication Dial In User Service) authentication protocol. This protocol is heavily used in many scenarios where user authentication is required, either by itself or as a front-end to other authentication services.

The DFL-1100 RADIUS Support

The DFL-1100 can use RADIUS to verify users against for example Active Directory or Unix password-file. It is possible to configure up to two servers, if the first one is down it will try the second IP instead.

The DFL-1100 can use CHAP or PAP when communicating with the RADIUS server. **CHAP** (Challenge Handshake Authentication Protocol) does not allow a remote attacker to extract the user password from an intercepted RADIUS packet. However, the password must be stored in plaintext on the RADIUS server. **PAP** (Password Authentication Protocol) might be defined as the less secure of the two. If a RADIUS packet is intercepted while being transmitted between the firewall and the RADIUS server, the user password can be extracted, given time. The upside to this is that the password does not have to be stored in plaintext in the RADIUS server.

The DFL1100 uses a shared secret when connecting to the RADIUS server. The shared secret enables basic encryption of the user password when the RADIUS-packet is transmitted from the firewall to the RADIUS server. The shared secret is case sensitive, can contain up to 100 characters, and must be typed exactly the same on both the firewall and the RADIUS server.

Enable User Authentication via HTTP / HTTPS

Follow these steps to enable User Authentication.

Step 1. Enable the checkbox for User Authentication.

Step 2. Specify if HTTP and HTTPS or only HTTPS should be used for the login.

Step 3. Specify the idle-timeout, the time a user can be idle before being logged out by the firewall.

Step 4. Choose new ports for the management WebUI to listen on as the user authentication will use the same ports as the management WebUI is using..

Enable User Authentication via HTTP / HTTPS

HTTP Security: HTTP as well as HTTPS
 HTTPS only

Idle Timeout: 1 hour

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Enable RADIUS Support

Follow these steps to enable RADIUS support.

Step 1. Enable the checkbox for RADIUS Support.

Step 2. Fill in up to two RADIUS servers.

Step 3. Specified which mode to use, PAP or CHAP.

Step 3. Specify the shared secret for this connection.

Enable RADIUS Support

Primary Server: 192.168.1.10 port 1812

Secondary Server: port 1812

Mode: CHAP

Shared Secret: *****

Retype Secret: *****

RADIUS retry: 2 seconds

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Add User

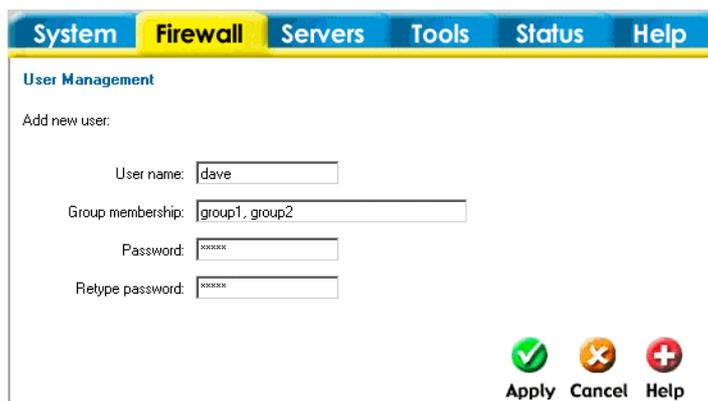
Follow these steps to add a new user.

Step 1. Click on **add** after the type of user you would like to add, Admin or Read-only.

Step 2. Fill in **User name**; make sure you are not trying to add one that already exists.

Step 3. Specified what groups the user should be a member of.

Step 3. Specify the password for the new user.



The screenshot shows the 'User Management' window with a menu bar (System, Firewall, Servers, Tools, Status, Help) and a title bar (User Management). The main content area is titled 'Add new user:' and contains four input fields: 'User name' (containing 'dave'), 'Group membership' (containing 'group1, group2'), 'Password' (containing 'xxxxx'), and 'Retype password' (containing 'xxxxx'). At the bottom right, there are three buttons: 'Apply' (with a green checkmark icon), 'Cancel' (with a red 'X' icon), and 'Help' (with a red plus icon).

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Note: The user name and password should be at least six characters long. The user name and password can contain numbers (0-9) and upper and lower case letters (A-Z, a-z). Special characters and spaces are not allowed.

Change User Password

To change the password of a user click on the user name and you will see the following screen.

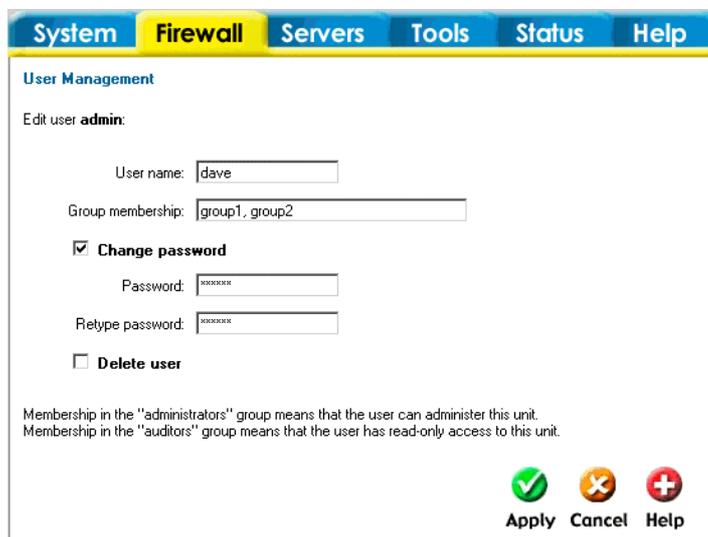
Follow these steps to change a users password.

Step 1. Click on the user you would like to change level of.

Step 2. Enable the **Change password** checkbox.

Step 3. Enter the new password twice.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.



The screenshot shows the 'User Management' window with a menu bar (System, Firewall, Servers, Tools, Status, Help) and a title bar (User Management). The main content area is titled 'Edit user admin:' and contains several elements: 'User name' (containing 'dave'), 'Group membership' (containing 'group1, group2'), a checked checkbox for 'Change password', 'Password' (containing 'xxxxx'), 'Retype password' (containing 'xxxxx'), and an unchecked checkbox for 'Delete user'. At the bottom, there is a note: 'Membership in the "administrators" group means that the user can administer this unit. Membership in the "auditors" group means that the user has read-only access to this unit.' At the bottom right, there are three buttons: 'Apply' (with a green checkmark icon), 'Cancel' (with a red 'X' icon), and 'Help' (with a red plus icon).

Note: The password should be at least six characters long. The password can contain numbers (0-9) and upper and lower case letters (A-Z, a-z). Special characters and spaces are not allowed.

Delete User

To delete a user click on the user name and you will see the following screen.

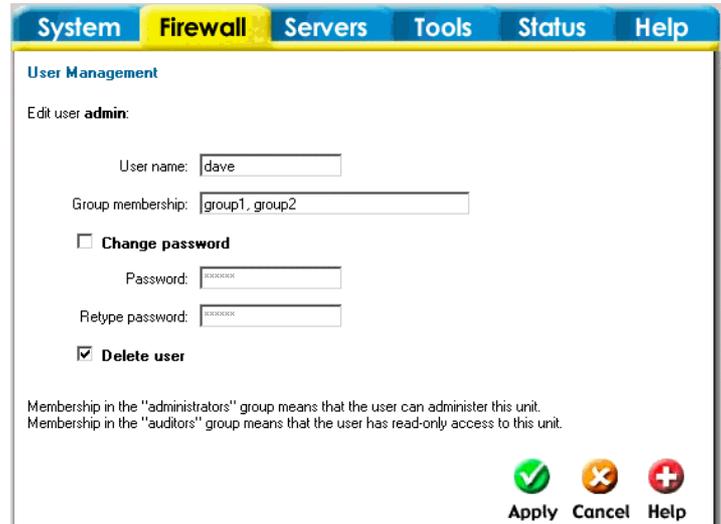
Follow these steps to delete a user.

Step 1. Click on the user you would like to change level of.

Step 2. Enable the **Delete user** checkbox.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Note: Deleting a user is irreversible; once the user is deleted, it cannot be undeleted.



The screenshot shows a web interface for 'User Management' with a navigation bar containing 'System', 'Firewall', 'Servers', 'Tools', 'Status', and 'Help'. The main content area is titled 'User Management' and shows 'Edit user admin:'. There are two input fields: 'User name:' with the value 'dave' and 'Group membership:' with the value 'group1, group2'. Below these are two sections: 'Change password' with an unchecked checkbox and two password input fields, and 'Delete user' with a checked checkbox. At the bottom, there is explanatory text about group memberships and three buttons: 'Apply' (green checkmark), 'Cancel' (orange X), and 'Help' (red plus).

Schedules

It is possible to configure a schedule for policies to take affect. By creating a schedule, the DFL-1100 is allowing the firewall policies to be used at those designated times only. Any activities outside of the scheduled time slot will not follow the policies and will therefore likely not be permitted to pass through the firewall. The DFL-1100 can be configured to have a start time and stop time, as well as creating 2 different time periods in a day. For example, an organization may only want the firewall to allow the internal

The screenshot shows the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status', and 'Help'. The 'Firewall' tab is active, and the 'Schedules' sub-tab is selected. The main content area is titled 'Manage Schedules' and contains the following elements:

- A 'Name:' text input field.
- 'Active from:' dropdowns for day (01), month (Mar), year (2004), and hour (16).
- 'Active to:' dropdowns for day (01), month (Mar), year (2008), and hour (16), with '(inclusive)' text.
- A checked checkbox for 'Recurring scheduling:'.
- A grid for selecting active times. The grid has columns for 06:00, 12:00, and 18:00, and rows for days of the week (Mo, Tu, We, Th, Fr, Sa, Su). Each cell contains a checkbox.
- 'Apply', 'Cancel', and 'Help' buttons with corresponding icons.
- A 'Defined schedules' table with columns for Name, Start, Stop, and Recurring. It contains one entry: '[Add new]'.

network users to access the Internet during work hours. Therefore, one may create a schedule to allow the firewall to allow traffic Monday-Friday, 8AM-5PM only. During the non-work hours, the firewall will not allow Internet access.

Add new recurring schedule

Follow these steps to add new recurring schedule.

Step 1. Go to Firewall and Schedules and choose Add new.

Step 2. Enable the checkbox named Recurring scheduling.

Step 3. Use the checkboxes to set the times this schedule should be active.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Add new one-time schedule

Follow these steps to add new recurring schedule.

Step 1. Go to Firewall and Schedules and choose Add new.

Step 2. Choose the starting and ending date and hour when the schedule should be active.

Step 3. Use the checkboxes to set the times this schedule should be active inside the specified timeframe.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Services

A service is basically a definition of a specific IP protocol with corresponding parameters. The service http, for instance, is defined as to use the TCP protocol with destination port 80.

Services are simplistic, in that they cannot carry out any action in the firewall on their own. Thus, a service definition does not include any information whether the service should be allowed through the firewall or not. That decision is made entirely by the firewall policies, in which the service is used as a filter parameter.

Adding TCP, UDP or TCP/UDP Service

For many services, a single destination port is sufficient. The http service, for instance, is using destination port 80. To use a single destination port, enter the port number in the destination ports text box. In most cases, all ports (0-65535) have to be used as source ports. The second option is to define a port range, a port range is inclusive, meaning that a range 137-139 covers ports 137, 138 and 139.

Multiple ranges or individual ports may also be entered, separated by commas. For instance, a service can be defined as having source ports 1024-65535 and destination ports 80-82, 90-92, 95. In this case, a TCP or UDP packet with the destination port being one of 80, 81, 82, 90, 91, 92 or 95, and the source port being in the range 1024-65535, will match this service.

Follow these steps to add a TCP, UDP or TCP/UDP service.

Step 1. Go to Firewall and Service and choose add new.

Step 2. Enter a Name for the service in the name field. This name will appear in the service list when you add a new policy. The name can contain numbers (0-9) and upper and lower case letters (A-Z, a-z), and the special characters - and _. No other special characters and spaces are allowed.

Step 3. Select TCP/UDP Service.

Step 4. Select the protocol (either TCP, UDP or both TCP/UDP) used by the service.

Step 5. Specify a source port or range for this service by typing in the low and high port numbers. Enter 0-65535 for all ports, or a single port like 80 for only one source port.

Step 6. Specify a destination port or range for this service by typing in the low and high port numbers. Enter 0-65535 for all ports, or a single port like 80 for only one destination port.

Step 7. Enable the Syn Relay checkbox if you want to protect the destination from SYN flood attacks.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Adding IP Protocol

When the type of the service is IP Protocol, an IP protocol number may be specified in the text field. To have the service match the GRE protocol, for example, the IP protocol should be specified as 47. A list of some defined IP protocols can be found in the appendix named “IP Protocol Numbers”.

IP protocol ranges can be used to specify multiple IP protocols for one service. An IP protocol range is similar to the TCP and UDP port range described previously; the range 1-4, 7 will match the protocols ICMP, IGMP, GGP, IP-in-IP and CBT.

Follow these steps to add a TCP, UDP or TCP/UDP service.

Step 1. Go to Firewall and Service and choose new.

Step 2. Enter a Name for the service in the name field. This name will appear in the service list when you add a new policy. The name can contain numbers (0-9) and upper and lower case letters (A-Z, a-z), and the special characters - and _. No other special characters and spaces are allowed.

Step 3. Select IP Protocol.

Step 4. Specify a comma-separated list of IP protocols.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Grouping Services

Services can be grouped in order to simplify configuration. Consider a web server using standard http as well as SSL encrypted http (https). Instead of having to create two separate rules allowing both types of services through the firewall, a service group named, for instance, Web, can be created, with the http and the https services as group members.

Follow these steps to add a group.

Step 1. Go to Firewall and Service and choose new.

Step 2. Enter a Name for the service in the name field. This name will appear in the service list when you add a new policy. The name can contain numbers (0-9) and upper and lower case letters (A-Z, a-z), and the special characters - and _. No other special characters and spaces are allowed.

Step 3. Select Group.

Step 4. Specify a comma-separated list of existing services.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Protocol-independent settings

Allow ICMP errors from the destination to the source – ICMP error messages are sent in several situations: for example, when an IP packet cannot reach its destination. The purpose of these error control messages is to provide feedback about problems in the communication environment.

However, ICMP error messages and firewalls are usually not a very good combination; the ICMP error messages are initiated at the destination host (or a device within the path to the destination) and sent to the originating host. The result is that the ICMP error message will be interpreted by the firewall as a new connection and dropped, if not explicitly allowed by the firewall rule-set. Now, allowing any inbound ICMP message to be able have those error messages forwarded is generally not a good idea.

To solve this problem, DFL-1100 can be instructed to pass an ICMP error message only if it is related to an existing connection. Check this option to enable this feature for connections using this service.

ALG – Like other stateful inspection based firewalls, DFL-1100 filters on information found in packet headers, for instance in IP, TCP, UDP and ICMP headers.

In some situations though, filtering on header data only is not sufficient. The FTP protocol, for instance, includes IP address and port information in the protocol payload. In these cases, the firewall needs to be able to examine the payload data and carry out appropriate actions. DFL-1100 provides this functionality using Application Layer Gateways, also known as ALGs.

To use an Application Layer Gateway, the appropriate Application Layer Gateway definition is selected in the dropdown menu. The selected Application Layer Gateway will thus manage network traffic that matches the policy using this service.

Currently, DFL-1100 supports two Application Layer Gateways, one is used to manage the FTP protocol and the other one is a HTTP Content Filtering ALG. For detailed information about how to configure the HTTP Application Layer Gateway, please see the Content Filtering chapter.

VPN

This chapter introduces IPsec, the method, or rather set of methods used to provide VPN functionality. IPsec, Internet Protocol Security, is a set of protocols defined by the IETF, Internet Engineering Task Force, to provide IP security at the network layer.

An IPsec based VPN, such as DFL-1100 VPN, is made up by two parts:

- Internet Key Exchange protocol (IKE)
- IPsec protocols (ESP)

The first part, IKE, is the initial negotiation phase, where the two VPN endpoints agree on which methods will be used to provide security for the underlying IP traffic. Furthermore, IKE is used to manage connections, by defining a set of Security Associations, SAs, for each connection. SAs are unidirectional, so there will be at least two SAs per IPsec connection. The other part is the actual IP data being transferred, using the encryption and authentication methods agreed upon in the IKE negotiation. This can be accomplished in a number of ways; by using the IPsec protocol ESP.

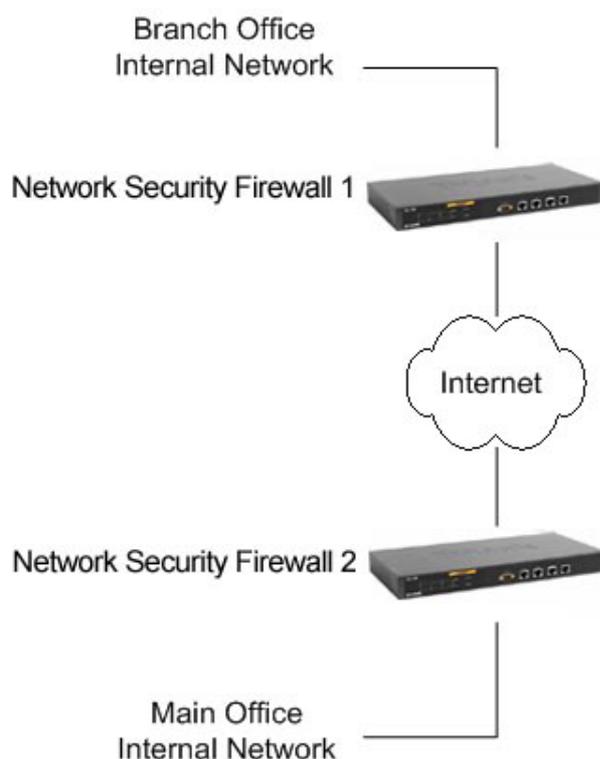
To set up a Virtual Private Network (VPN), you do not need to configure an Access Policy to enable encryption. Just fill in the following settings: VPN Name, Source Subnet (Local Net), Destination Gateway (If LAN-to-LAN), Destination Subnet (If LAN-to-LAN) and Authentication Method (Pre-shared key or Certificate). The firewalls on both ends must use the same Pre-shared key or set of Certificates and IPsec lifetime to make a VPN connection.

IPSec VPN between two networks

In the following example users on the main office internal network can connect to the branch office internal network vice versa. Communication between the two networks takes place in an encrypted VPN tunnel that connects the two DFL-1100 Network Security Firewall across the Internet. Users on the internal networks are not aware that when they connect to a computer on the other network that the connection runs across the Internet.

As shown in the example, you can use the DFL-1100 to protect a branch office and a small main office. Both of these DFL-1100s can be configured as IPSec VPN gateways to create the VPN that connects the branch office network to the main office network.

The example shows a VPN between two internal networks, but you can also create VPNs between an internal network behind one VPN gateway and a DMZ network behind another or between two DMZ networks. The networks at the ends of the VPN tunnel are selected when you configure the VPN policy.



Creating a LAN-to-LAN VPN Tunnel

Follow these steps to add LAN-to-LAN Tunnel.

Step 1. Go to Firewall and VPN and choose **Add new**.

Step 2. Enter a Name for the new tunnel in the name field. The name can contain numbers (0-9) and upper and lower case letters (A-Z, a-z), and the special characters - and _. No other special characters and spaces are allowed.

Step 3. Specify your local network, or your side of the tunnel, for example 192.168.1.0/255.255.255.0, in the Local Net field.

Step 4. Choose authentication type, either PSK (Pre-shared Key) or Certificate-based. If you choose PSK make sure both firewalls use exactly the same PSK.

Step 5. As Tunnel Type choose LAN-to-LAN tunnel and specify the network behind the other DFL-1100 as Remote Net also specify the external IP of the other DFL-1100, this can be an IP or a DNS name.

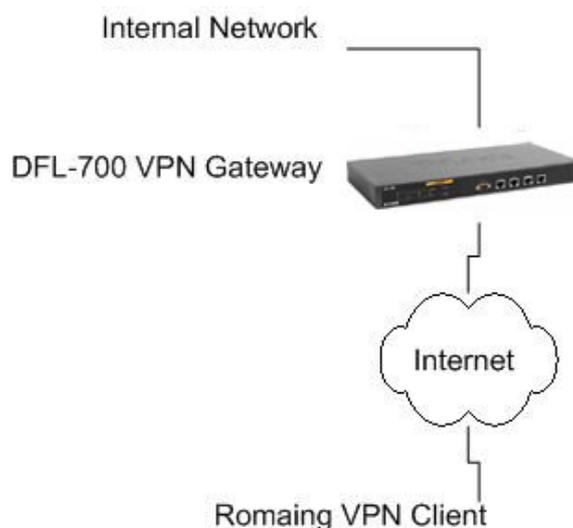
Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Repeat this on the firewall on the other site.

IPSec VPN between client and an internal network

In the following example users can connect to the main office internal network from anywhere on the Internet. Communication between the client and the internal network takes place in an encrypted VPN tunnel that connects the DFL-1100 and the roaming users across the Internet.

The example shows a VPN between a roaming VPN client and the internal network, but you can also create a VPN tunnel that uses the DMZ network. The networks at the ends of the VPN tunnel are selected when you configure the VPN policy.



Creating a Roaming Users Tunnel

Follow these steps to add a roaming users tunnel.

Step 1. Go to Firewall and VPN and choose **Add new**.

Step 2. Enter a Name for the new tunnel in the name field. The name can contain numbers (0-9) and upper and lower case letters (A-Z, a-z), and the special characters - and _. No other special characters and spaces are allowed.

Step 3. Specify your local network, or your side of the tunnel, for example 192.168.1.0/255.255.255.0, in the Local Net field. This is the network your roaming VPN clients should be allowed to connect to.

Step 4. Choose authentication type, either PSK (Pre-shared Key) or Certificate-based. If you choose PSK make sure the clients use exactly the same PSK.

Step 5. As Tunnel Type choose Roaming User.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

VPN – Advanced Settings

Advanced settings for a VPN tunnel is used when one need change some characteristics of the tunnel when using for example trying to connect to a third party VPN Gateway. The different settings to set per tunnel is the following:

Limit MTU

Whit this setting it's possible to limit the MTU (Max Transferable Unit) of the VPN tunnel.

IKE Mode

Specify if Main mode IKE or Aggressive Mode IKE should be used when establishing outbound VPN Tunnels. Inbound main mode connections will always be allowed. Inbound aggressive mode connections will only be allowed if this setting is set to aggressive mode.

IKE DH Group

Here it's possible to configure the Diffie-Hellman group to 1 (modp 768-bit), 2 (modp 1024-bit) or 5 (modp 1536-bit).

PFS – Perfect Forward Secrecy

If PFS, Perfect Forwarding Secrecy, is enabled, a new Diffie-Hellman exchange is performed for each phase-2 negotiation. While this is slower, it makes sure that no keys are dependent on any other previously used keys; no keys are extracted from the same initial keying material. This is to make sure that, in the unlikely event that some key was compromised; no subsequent keys can be derived.

NAT Traversal

Here it's possible to configure how the NAT Traversal code should behave.

Disabled - The firewall does not send the Vendor ID's that include NAT-T support when setting up the tunnel.

On if supported and need NAT - Will only use NAT-T if one of the VPN gateways is NATed.

On if supported - Always tries to use NAT-T when setting up the tunnel.

Keepalives

No keepalives – Keep-alive is disabled.

Automatic keepalives - The firewall will send ICMP pings to IP Addresses automatically discovered from the VPN Tunnel settings.

Manually configured IP addresses - Configure the source and destination IP addresses used when sending the ICMP pings

Proposal Lists

To agree on the VPN connection parameters, a negotiation process is performed. As the result of the negotiations, the IKE and IPsec security associations (SAs) are established. As the name implies, a proposal is the starting point for the negotiation. A proposal defines encryption parameters, for instance encryption algorithm, life times etc, that the VPN gateway supports.

There are two types of proposals, IKE proposals and IPsec proposals. IKE proposals are used during IKE Phase-1 (IKE Security Negotiation), while IPsec proposals are using during IKE Phase-2 (IPsec Security Negotiation).

A Proposal List is used to group several proposals. During the negotiation process, the proposals in the proposal list are offered to the remote VPN gateway one after another until a matching proposal is found.

IKE Proposal List

Cipher – Specifies the encryption algorithm used in this IKE proposal. Supported algorithms are AES, 3DES, DES, Blowfish, Twofish and CAST128.

Hash – Specifies the hash function used to calculate a check sum that reveals if the data packet is altered while being transmitted. MD5 and SHA1 are supported algorithms.

Life Times – Specifies in KB or seconds when the security associations for the VPN tunnel need to be re-negotiated.

IPsec Proposal List

Cipher – Specifies the encryption algorithm used in this IPsec proposal. Supported algorithms are AES, 3DES, DES, Blowfish, Twofish and CAST128.

HMAC – Specifies the hash function used to calculate a check sum that reveals if the data packet is altered while being transmitted. MD5 and SHA1 are supported algorithms.

Life Times – Specifies in KB or seconds when the security associations for the VPN tunnel need to be re-negotiated.

Certificates

A certificate is a digital proof of identity. It links an identity to a public key in a trustworthy manner. Certificates can be used to authenticate individual users or other entities. These types of certificates are commonly called end-entity certificates.

Before a VPN tunnel with certificate based authentication can be set up, the firewall needs a certificate of its own and that of the remote firewall. These certificates can either be self-signed certificates, or issued by a CA.

Trusting Certificates

When setting up a VPN tunnel, the firewall has to be told whom it should trust. When using pre-shared keys, this is simple. The firewall trusts anyone who has the same pre-shared key.

When using certificates, on the other hand, you tell the firewall that it can trust anyone whose certificate is signed by a given CA. Before a certificate is accepted, the following steps are taken to verify the validity of the certificate:

- Construct a certification path up to the trusted root CA.
- Verify the signatures of all certificates in the certification path.
- Fetch the CRL for each certificate to verify that none of the certificates have been revoked.

Local identities

This is a list of all the local identity certificates that can be used in VPN tunnels. A local identity certificate is used by the firewall to prove its identity to the remote VPN peer.

To add a new local identity certificate, click Add new. The following pages will allow you to specify a name for the local identity, and upload the certificate and private key files. This certificate can be selected in the Local Identity field on the VPN page.

This list also includes a special certificate called Admin. This is the certificate used by the web interface to provide HTTPS access.

Note: The certificate named Admin can only be replaced, not deleted or renamed. This is used for HTTPS access to the DFL-1100.

Certificates of remote peers

This is a list of all certificates of individual remote peers.

To add a new remote peer certificate, click Add new. The following pages will allow you to specify a name for the remote peer certificate and upload the certificate file. This certificate can be selected in the Certificates field on the VPN page.

Certificate Authorities

This is a list of all CA certificates. To add a new Certificate Authority certificate, click Add new. The following pages will allow you to specify a name for the CA certificate and upload the certificate file. This certificate can be selected in the Certificates field on the VPN page.

Note: If the uploaded certificate is a CA certificate, it will automatically be placed in the Certificate Authorities list, even if Add New was clicked in the Remote Peers list. Similarly, a non-CA certificate will be placed in the Remote Peers list even if Add New was clicked from the Certificate Authorities list.

Identities

This is a list of all the configured Identity lists. An Identity list can be used on the VPN page to limit inbound VPN access from this list of known identities.

Normally, a VPN tunnel is established if the certificate of the remote peer is present in the Certificates field in the VPN section, or if the remote peer's certificate is signed by a CA whose certificate is present in the Certificates field in the VPN section. However, in some cases it might be necessary to limit who can establish a VPN tunnel even among peers signed by the same CA.

The Identity list can be selected in the Identity List field on the VPN page.

If an Identity List is configured, the firewall will match the identity of the connecting remote peer against the Identity List, and only allow it to open the VPN tunnel if it matches the contents of the list.

If no Identity List is used, no identity matching is done.

Content Filtering

DFL-1100 HTTP content filtering can be configured to scan all HTTP content protocol streams for URLs or for web page content. If a match is found between a URL on the URL block the DFL-1100 blocks the web page.

You can configure URL blacklist to block all or just some of the pages on a website. Using this feature you can deny access to parts of a web site without denying access to it completely.

The HTTP content filtering can also be configured to strip contents like ActiveX, Flash and cookies.

There is also a URL whitelist for URLs that should be excluded from all Content Filtering.

Note: For HTTP URL filtering to work, all HTTP traffic needs to go through a policy using a service with the HTTP ALG.

Edit the URL Global Whitelist

Follow these steps to add or remove a url.

Step 1. Go to Firewall and Content Filtering and choose Edit global URL whitelist

Step 2. Add/edit or remove the URL that should never be checked with the Content Filtering.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.



The screenshot displays the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes tabs for System, Firewall (selected), Servers, Tools, Status, and Help. The main content area is titled "HTTP Content Filtering" and contains the following text:

Edit Destination URL Global Whitelist:

To allow access to a whole domain, use e.g. "*/safesite.com/*". Note the ending slash, which protects against someone setting up e.g. "www.safesite.com.dyndnsprovider.net" as an alias for an otherwise disallowed site.

Blank lines are ignored. Lines beginning with "#" are also ignored.

A text area contains the following entries:

```
# Access to these sites will always be allowed
#
*.d-link.com/*
*.dlink.com/*
*.dlink.com.tw/*
*.d-link.com.tw/*
```

At the bottom right of the text area are three buttons: Apply (with a green checkmark icon), Cancel (with a red X icon), and Help (with a red plus icon).

The left sidebar of the interface contains a vertical menu of buttons: Policy, Port Mapping, Users, Schedules, Services, VPN, Certificates, and Content Filtering (which is highlighted in yellow).

Edit the URL Global Blacklist

Follow these steps to add or remove a url.

Step 1. Go to Firewall and Content Filtering and choose Edit global URL blacklist

Step 2. Add/edit or remove the URL that should be checked with the Content Filtering.

Click the **Apply** button below to apply the change or click **Cancel** to discard changes.

Note: For HTTP URL filtering to work, all HTTP traffic needs to go through a policy using a service with the HTTP ALG.



The screenshot displays the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status', and 'Help'. The 'Firewall' tab is active, and the 'HTTP Content Filtering' section is selected. The page title is 'HTTP Content Filtering'. Below the title, it says 'Edit Destination URL Global Blacklist:'. A descriptive text explains that the URL blacklist can be used to deny access to complete sites, file types by extension, or to URLs with certain words in them. An example is provided: 'Use e.g. "example.org/" to disallow access to an entire site.' A note states 'Blank lines and lines beginning with "#" are ignored.' A large text area is provided for entering the blacklist entries. At the bottom right, there are three buttons: 'Apply' (with a green checkmark icon), 'Cancel' (with an orange 'X' icon), and 'Help' (with a red plus icon).

Active content handling

Active content handling can be enabled or disabled by checking the checkbox before each type you would like to strip. For example to strip ActiveX and Flash enable the checkbox named Strip ActiveX objects. It's possible to strip ActiveX, Flash, Java, JavaScript and VBScript, it's also possible to block cookies.

Note: For HTTP URL filtering to work, all HTTP traffic needs to go through a policy using a service with the HTTP ALG.

Servers

DHCP Server Settings

The DFL-1100 contains a DHCP server; DHCP (Dynamic Host Configuration Protocol) is a protocol that lets network administrators to automatically assign IP numbers to computers on a network. The DFL-1100 DHCP Server helps to minimize the work necessary to administer a network, as there is no need for another server running DHCP Server software.

The DFL-1100 DHCP Server only implements a subset of the DHCP protocol necessary to serve a small network, these are:

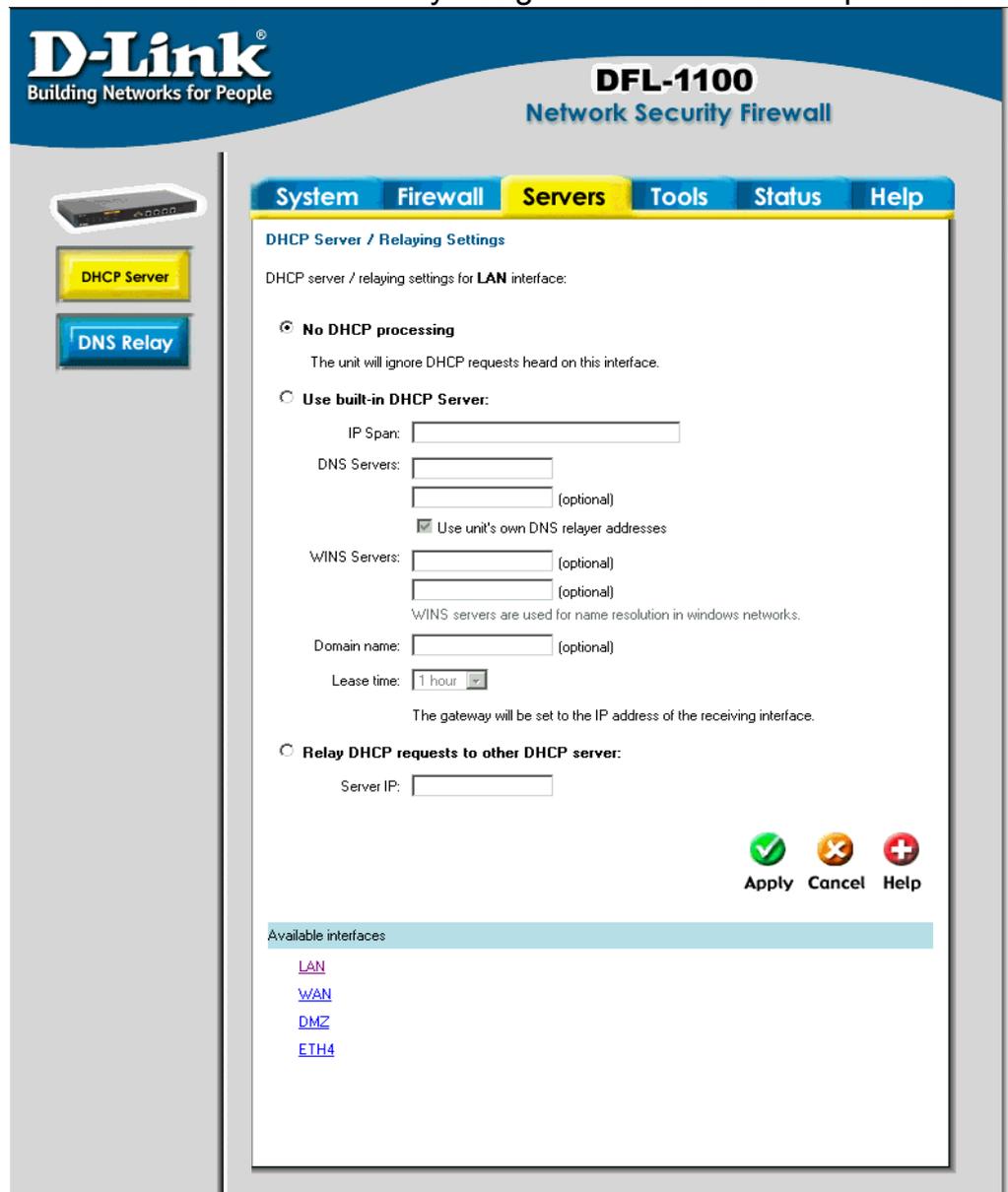
- IP address
- Netmask
- Subnet
- Gateway address
- DNS Servers
- WINS Servers
- Domain name

The DFL-1100 DHCP Server assigns and manages IP addresses from specified address pools within the firewall to the DHCP clients.

Note: Leases are remembered over a re-configure or reboot of the firewall.

The DFL-1100 also includes a DHCP Relay. A DHCP relayer is a form of gateway between a DHCP Server and its users. The relayer intercepts DHCP queries from the users and forwards them to a DHCP server while setting up dynamic routes based on leases. This enables the firewall to keep an accurate routing table based on active users and protects the DHCP server to some degree among other things.

Note: There can only be one DHCP Server or DHCP Relay configured per interface.



Enable DHCP Server

To enable the DHCP Server on an interface, click on **Servers** in the menu bar, and then click **DHCP Server** below it.

Follow these steps to enable the DHCP Server on the LAN interface.

Step 1. Choose the LAN interface from the Available interfaces list.

Step 2. Enable by checking the **Use built-in DHCP Server** box.

Step 3. Fill in the IP Span, the start and end IP for the range of IP addresses that the DFL-1100 can assign.

Step 4. Fill in the DNS servers DHCP server will assigns to the clients, at least one should be provided. If the DNS relay is configured the DHCP server can assign those.

Step 5. Optionally type in the WINS servers the DHCP server assigns to the clients.

Step 6. Optionally type in the domain that the DHCP server assigns to the clients.

Step 7. Choose for how long the DHCP server will give out leases before the client have to renew them.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes

Enable DHCP Relay

To enable the DHCP Relay on an interface, click on **Servers** in the menu bar, and then click **DHCP Server** below it.

Follow these steps to enable the DHCP Relay on the LAN interface.

Step 1. Choose the LAN interface from the Available interfaces list.

Step 2. Enable by checking the **Relay DHCP Requests to other DHCP server** box.

Step 3. Fill in the IP of the DHCP Server; note that it should be on another interface then where the DHCP request is coming from, i.e. a server on the DMZ.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes

Disable DHCP Server/Relayer

To disable the DHCP Server on an interface, click on **Servers** in the menu bar, and then click **DHCP Server** below it. Here click on the interface that you want to disable the DHCP server or relay on.

Follow these steps to disable the DHCP Server or Relay on the LAN interface.

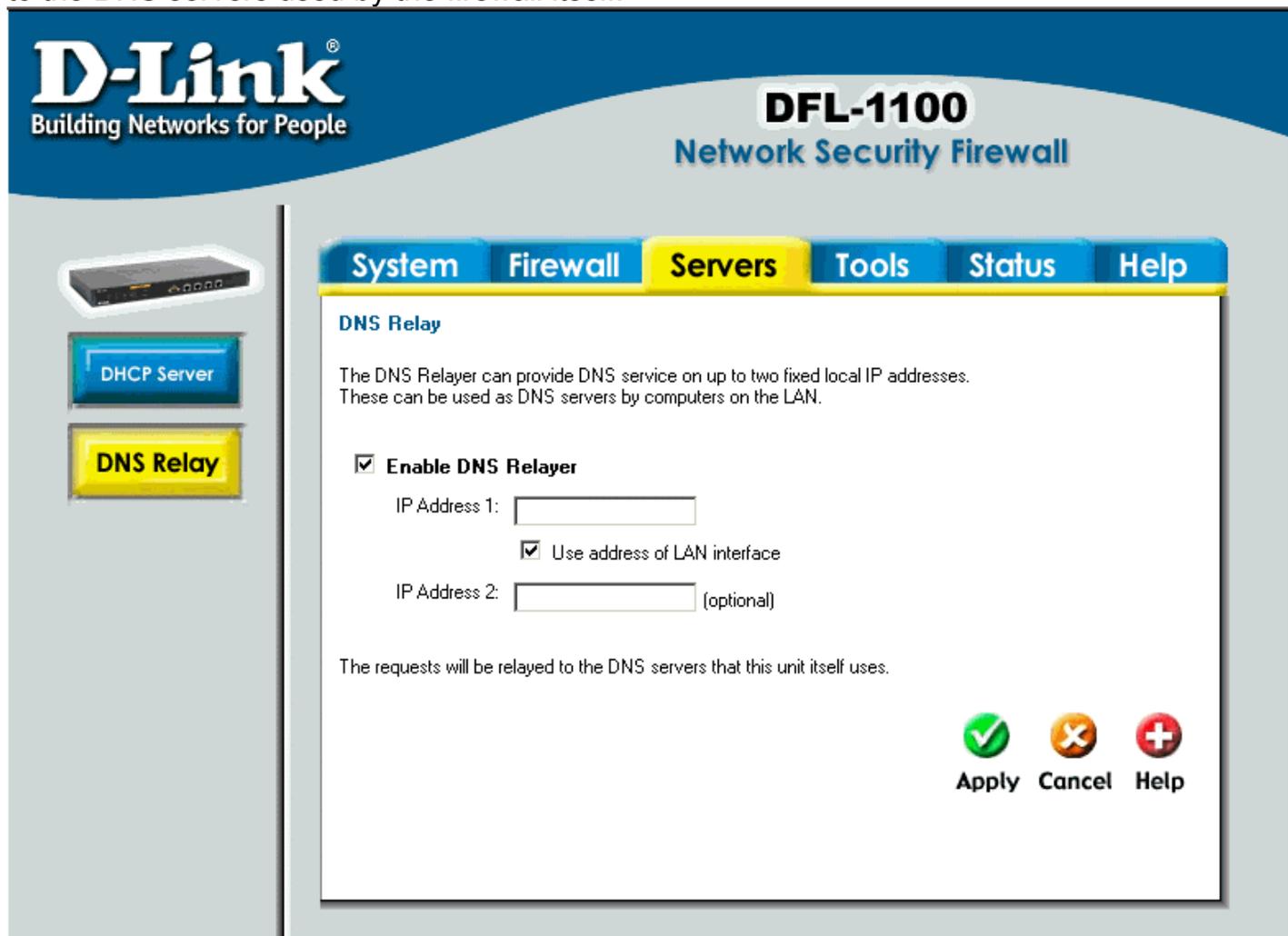
Step 1. Choose the LAN interface from the Available interfaces list.

Step 2. Disable by checking the **No DHCP processing** box.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes

DNS Relay Settings

Click on **Servers** in the menu bar, and then click **DNS Relay** below it. The DFL-1100 contains a DNS relay that you can be configured to relay DNS queries from the internal LAN to the DNS servers used by the firewall itself.



The screenshot shows the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status', and 'Help'. The 'Servers' tab is selected, and the 'DNS Relay' sub-tab is active. On the left sidebar, there is a 'DNS Relay' button highlighted in yellow. The main content area is titled 'DNS Relay' and contains the following text: 'The DNS Relay can provide DNS service on up to two fixed local IP addresses. These can be used as DNS servers by computers on the LAN.' Below this text, there is a checkbox labeled 'Enable DNS Relay' which is checked. Underneath, there are two input fields: 'IP Address 1:' and 'IP Address 2: (optional)'. A checkbox labeled 'Use address of LAN interface' is checked between the two input fields. At the bottom right of the main content area, there are three buttons: 'Apply' (with a green checkmark icon), 'Cancel' (with an orange 'X' icon), and 'Help' (with a red plus icon).

Enable DNS Relay

Follow these steps to enable the DNS Relay.

Step 1. Enable by checking the **Enable DNS Relay** box.

Step 2. Enter the IP numbers that the DFL-1100 should listen for DNS queries on.

Note: If “Use address of LAN interface” is checked, you don’t have to enter an IP in IP Address 1 as the firewall will know what address to use.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Disable DNS Relay

Follow these steps to disable the DNS Relay.

Step 1. Disable by un-checking the **Enable DNS Relay** box.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Tools

Ping

Click on **Tools** in the menu bar, and then click **Ping** below it. This tool is used to send a specified number of ICMP Echo Request packets to a given destination. All packets are sent in immediate succession rather than one per second. This behavior is the best one suited for diagnosing connectivity problems.

Ping

IP Address:

Number of packets:

Packet size:

Apply Cancel Help

- **IP Address** – Target IP to send the ICMP Echo Requests to.
- **Number of packets** – Number of ICMP Echo Request packets to send, up to 10.
- **Packet size** – Size of the packet to send, between 32 and 1500 bytes.

Ping Example

In this example, the **IP Address** is 192.168.10.1 the **Number of packets** is five, after clicking on **Apply** the firewall will start to send the ICMP Echo Requests to the specified IP. After a few seconds the result will be shown, in this example only four out of five packets was received back, a 20% packet loss, and the average time for the packets to travel to and from the specified IP was 57 ms.

Results of pinging 192.168.10.1

Seq	Roundtrip	TTL
1	50 ms	236
2	70 ms	236
3	60 ms	236
5	50 ms	236

5 packets transmitted, 4 packets received, **20%** packet loss.
Round trip time average: **57 ms**.

Dynamic DNS

The **Dynamic DNS** (require Dynamic DNS Service) allows you to alias a dynamic IP address to a static hostname, allowing your device to be more easily accessed by specific name. When this function is enabled, the IP address in Dynamic DNS Server will be automatically updated with the new IP address provided by ISP.

Click DynDNS in the Tools menu to enter Dynamic DNS configuration.

The firewall provides a list of a few predefined DynDNS service providers; users have to register with one of these providers before trying to use this function.

Add Dynamic DNS Settings

Follow these steps to enable Dynamic DNS.

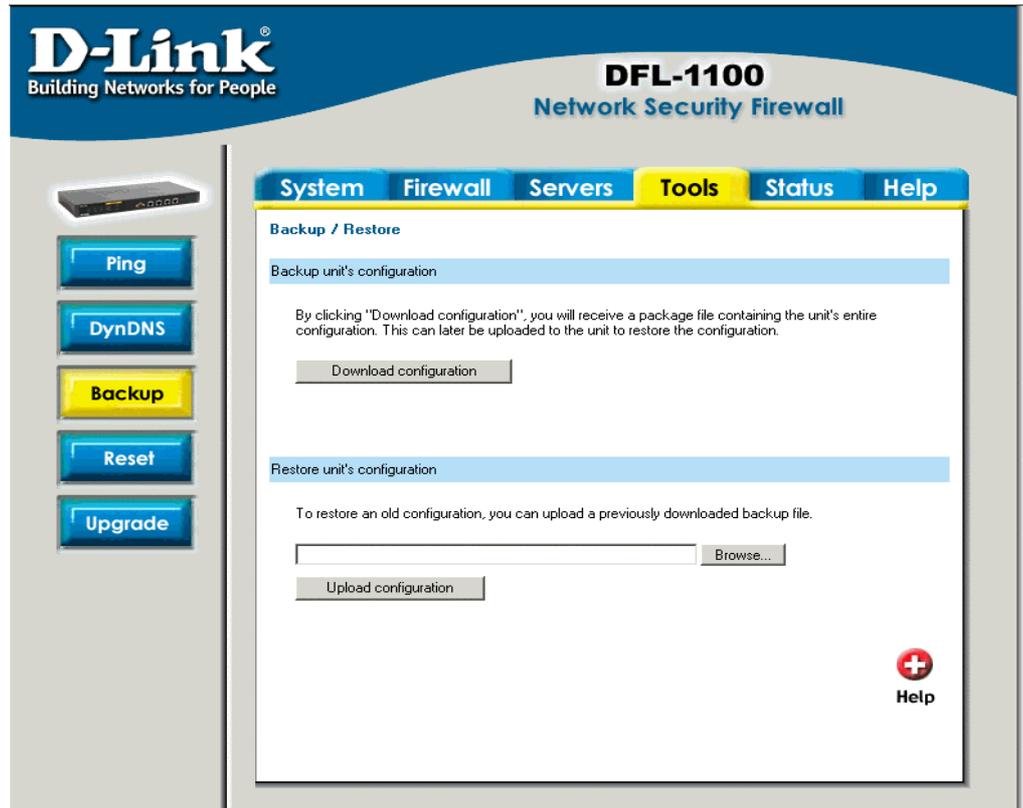
Step 1. Go to Tools and DynDNS.

Step 2. Choose what Dynamic DNS service you would like to use, and fill in the needed information, username and password in all cases and domains in all but cjb.net.

Click the **Apply** button below to apply the setting or click **Cancel** to discard changes.

Backup

Click on **Tools** in the menu bar, and then click **Backup** below it. Here a administrator can backup and restore the configuration. The configuration file stores system settings, IP addresses of Firewall's network interfaces, address table, service table, IPSec settings, port mapping and policies. When the configuration process is completed, system administrator can download the configuration file into local disc as a backup. System Administrators can restore the firewall's configuration file with the one stored on disc.



Exporting the DFL-1100's Configuration

Follow these steps to export the configuration.

Step 1. Under the **Tools** menu and the **Backup** section, click on the Download configuration button.

Step 2. When the File Download pop-up window appears, choose the destination place in which to save the exported file. The Administrator may choose to rename the file if preferred.

Restoring the DFL-1100's Configuration

Follow these steps to restore the configuration.

Step 1. Under the **Tools** menu and the **Backup** section, click on the **Browse** button next to the empty field. When the **Choose File** pop-up window appears, select the file to which contains the saved firewall settings, then click **OK**.

Step 2. Click **Upload Configuration** to import the file into the Firewall.

Restart/Reset

The screenshot displays the web management interface for a D-Link DFL-1100 Network Security Firewall. The top navigation bar includes tabs for System, Firewall, Servers, Tools (which is currently selected), Status, and Help. On the left sidebar, there are buttons for Ping, DynDNS, Backup, Reset (highlighted in yellow), and Upgrade. The main content area is titled "Restart / Reset" and is divided into two sections: "Restart" and "Reset to factory defaults".

Restart / Reset

Restart

- Quick restart** - reset interfaces and re-read configuration
- Full restart** - restart from power-on state

Restart unit

Reset to factory defaults

You can restore the unit to factory defaults. This means that all configuration parameters will be wiped, and all firmware upgrades removed.

On the next start-up, its LAN IP address will be 192.168.1.1, and the web GUI will begin with the setup wizard. It will not accept connections on any interface other than the LAN interface.

Reset to Factory Defaults

Help

Restarting the DFL-1100

Follow these steps restart the DFL-1100.

Step 1. Choose if you want to do a quick or full restart.

Step 2. Click **Restart Unit** and the unit will restart.

Restoring system settings to factory defaults

Use the following procedure to restore system settings to the values set at the factory. This procedure will possibly change the DFL-1100 firmware version to lower version if it has been upgraded.

This procedure deletes all of the changes that you have made to the DFL-1100 configuration and reverts the system to its original configuration including resetting interface addresses.

Follow these steps reset the DFL-1100 to factory default.

Step 1. Under the **Tools** menu and the **Reset** section, click on the **Reset to Factory Defaults** button.

Step 2. Click **OK** in the dialog to reset the unit to factory default, or press **Cancel** to cancel.

You can restore your system settings by uploading a previously downloaded system configurations file to the DFL-1100 if a backup of the device has been done.

Upgrade

The DFL-1100's software, IDS signatures and system parameters are all stored on a flash memory card. The flash memory card is re-writable and re-readable.

Upgrade Firmware

To upgrade the firmware first download the correct firmware image from D-Link. After having the newest version of software, please store it on the hard disk, then connect to the firewall's WebUI, enter **Upgrade** on the **Tools** menu, click **Browse** and choose the file name of the newest version of the firmware, then click **Upload firmware image**.

The updating process won't overwrite the system configuration, so it is not necessary but still a good idea to backup it before upgrading the software.

Upgrade IDS Signature-database

To upgrade the signature-database first download the newest IDS signatures from D-Link. After having the newest version of software connect to the firewall's WebUI, enter **Upgrade** on the **Tools** menu, click **Browse** in the **Upgrade Unit's signature-database** section and choose the file name of the newest version of the IDS signatures, then click **Upload signature database**.



The screenshot displays the D-Link DFL-1100 Network Security Firewall WebUI. The interface features a blue header with the D-Link logo and the product name. A navigation menu includes System, Firewall, Servers, Tools (highlighted), Status, and Help. On the left sidebar, there are buttons for Ping, DynDNS, Backup, Reset, and Upgrade (highlighted). The main content area is titled 'Upgrade' and contains two sections: 'Upgrade unit's firmware' and 'Upgrade unit's signature-database'. Each section includes instructions, a 'Browse...' button, and an 'Upload' button. A 'Help' icon is located in the bottom right corner.

Status

In this section, the DFL-1100 displays the status information about the Firewall.

Administrator may use Status to check the System Status, Interface statistics, VPN, connections and DHCP Servers.

System

Click on **Status** in the menu bar, and then click **System** below it. A window will appear providing some information about the DFL-1100.

Uptime – The time the firewall have been running, since the last reboot or start.

CPU Load – Percentage of cpu used.

Connections – Number of current connections trough the firewall.

Firmware version – The firmware version running on the firewall.

Last restart – The reason for the last restart.

IDS Signatures – The IDS signature versions.

There are also two graphs on this page, one showing the CPU usage during the last 24 hours. The other one is showing the state table usage during the last 24 hours.

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DFL-1100
Network Security Firewall

System Firewall Servers Tools **Status** Help

System Status

Uptime: 3 days, 22:53:19
Configuration: Version 3, last changed at 2004-03-17 17:47:50 by "admin" from 192.168.1.188
CPU Load: 0%
Connections: 5 out of 30000 (0.0%)
Firmware version: 1.01.00
Last restart: 2004-03-17 17:47:50: Configuration changed by admin (192.168.1.188)
IDS Signatures: Last changed at 2003-12-02 10:07:54

CPU load over the past 24 hours

100%
50%
0%
24 hrs ago now

State table usage over the past 24 hours

20
10
0
24 hrs ago now

Help

Interfaces

Click on **Status** in the menu bar, and then click **Interfaces** below it. A window will appear providing information about the interfaces in the DFL-1100. By default information about the **LAN** interface will be shown, to see another one click on that interface (**WAN** or **DMZ**).

Interface – Name of the interface shown, LAN, WAN or DMZ.

IP Address – IP address of the interface.

Link status – Displays what link the current interface has, the speed can be 10 or 100 Mbps and the duplex can be Half or Full.

MAC Address – MAC address of the interface.

Send rate – Current amount of traffic sent through the interface.

Receive rate – Current amount of traffic received through the interface.

There are also two graphs displaying the send and receive rate through the interfaces during the last 24 hours.

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System Firewall Servers Tools **Status** Help

Interface Status

Interface: [LAN](#) [WAN](#) [DMZ](#) [ETH4](#)

Interface: **LAN**
IP Address: 192.168.1.1
Link status: Unknown
MAC Address: 0080:c8ca:96c0
Send rate: 0 kbps
Receive rate: 0 kbps

Send rate over the past 24 hours

20 kbps
10 kbps
0 kbps
24 hrs ago now

Receive rate over the past 24 hours

20 kbps
10 kbps
0 kbps
24 hrs ago now

Help

HA

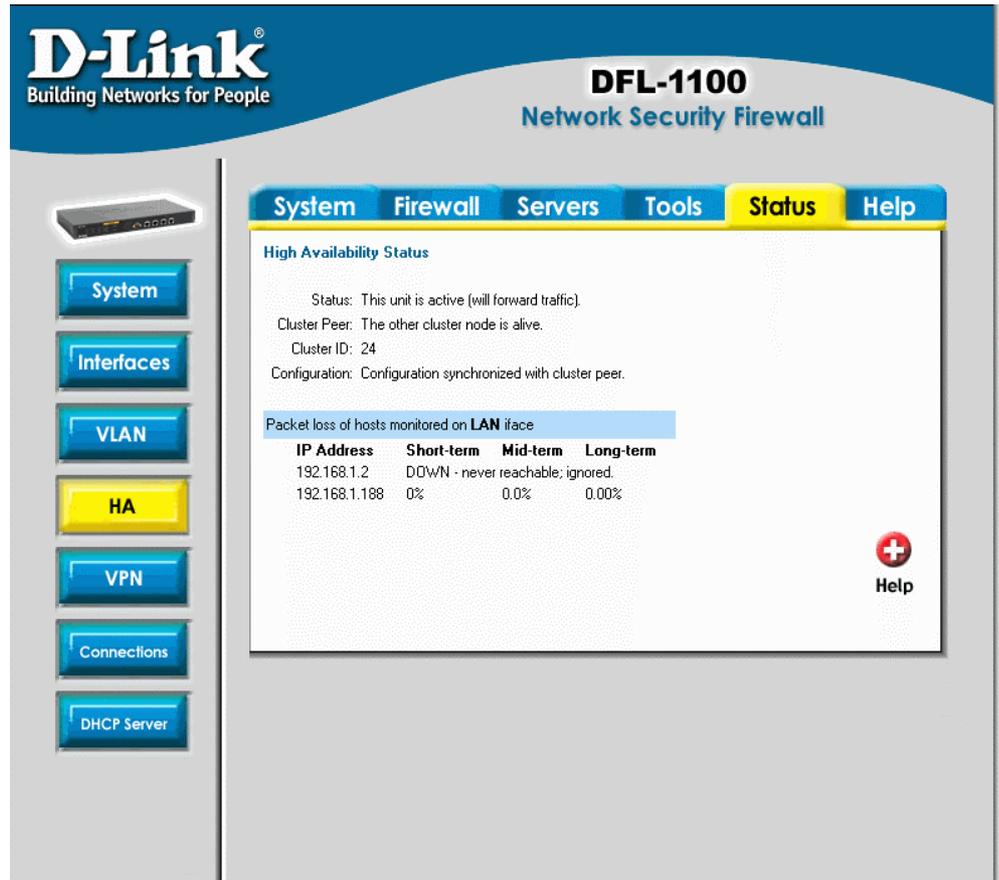
Click on **Status** in the menu bar, and then click **HA** below it. A window will appear providing information about the HA Cluster configured in the DFL-1100.

Status - Status of the cluster, will show if the unit is active or inactive.

Cluster Peer - Status of the other unit in the cluster.

Cluster ID - ID used for this cluster

Configuration – Status of the configuration synchronization, if both peers are using the same configuration or if it's in the process of being synchronized.



The screenshot shows the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status' (highlighted), and 'Help'. A sidebar on the left contains buttons for 'System', 'Interfaces', 'VLAN', 'HA' (highlighted), 'VPN', 'Connections', and 'DHCP Server'. The main content area displays the 'High Availability Status' page with the following information:

Status: This unit is active (will forward traffic).
Cluster Peer: The other cluster node is alive.
Cluster ID: 24
Configuration: Configuration synchronized with cluster peer.

Packet loss of hosts monitored on LAN iface

IP Address	Short-term	Mid-term	Long-term
192.168.1.2	DOWN - never reachable; ignored.		
192.168.1.188	0%	0.0%	0.00%

A red cross icon with the word 'Help' is located in the bottom right corner of the main content area.

VLAN

Click on **Status** in the menu bar, and then click **VLAN** below it. A window will appear providing information about the virtual interfaces configured in the DFL-1100.

VLAN Interface – Name of the virtual interface shown.

VLAN ID – ID assigned to the vlan.

IP Address – IP address of the virtual interface.

Send rate – Current amount of traffic sent through the interface.

Receive rate – Current amount of traffic received through the interface.

There are also two graphs displaying the send and receive rate through the interfaces during the last 24 hours.

The screenshot displays the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status' (highlighted), and 'Help'. A sidebar on the left contains buttons for 'System', 'Interfaces', 'VLAN' (highlighted), 'VPN', 'Connections', and 'DHCP Server'. The main content area is titled 'VLAN Interface Status' and shows the following details:

- VLAN Interface: [vlan1](#)
- VLAN Interface: **vlan1**
- Physical: LAN
- VLAN ID: 1
- IP Address: 192.168.3.1
- Send rate: 0 kbps
- Receive rate: 0 kbps

Below the details are two line graphs:

- Send rate over the past 24 hours:** A graph with a y-axis from 0 to 20 kbps and an x-axis from 24 hrs ago to now. The data line is flat at 0 kbps.
- Receive rate over the past 24 hours:** A graph with a y-axis from 0 to 20 kbps and an x-axis from 24 hrs ago to now. The data line is flat at 0 kbps.

A 'Help' button with a red cross icon is located in the bottom right corner of the main content area.

VPN

Click on **Status** in the menu bar, and then click **Interfaces** below it. A window will appear providing information about the VPN connections done in the DFL-1100. By default information about the first VPN tunnel will be show, to see another one click on that VPN tunnels name.

The two graphs display the send and receive rate trough the selected VPN tunnel during the last 24 hours.

On this example a tunnel named **RoamingUsers** is selected, this is a tunnel that allows roaming users. So under the IPsec SA listing each roaming user connected to this tunnel is shown.

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DFL-1100
Network Security Firewall

System Firewall Servers Tools **Status** Help

VPN Status

VPN Tunnels: [RoamVPN](#)

Send rate over the past 24 hours

20 kbps
10 kbps
0 kbps
24 hrs ago now

Receive rate over the past 24 hours

20 kbps
10 kbps
0 kbps
24 hrs ago now

Help

IPsec SAs for VPN tunnel **RoamVPN**: ([list IKE SAs](#))

Gateway	Local Net	Remote Net
---------	-----------	------------

Connections

Click on **Status** in the menu bar, and then click **Connections** below it. A window will appear providing information about the content of the state table.

Shows the last 100 connections opened through the firewall. Connections are created when traffic is permitted to pass via the policies.

Each connection has two timeout values, one in each direction. These are updated when the firewall receives packets from each end of the connection. The value shown in the **Timeout** column is the lower of the two values.

Possible values in the **State** column include: TCP_CLOSE, TCP_OPEN, SYN_RECV, FIN_RECV and so on.

The **Proto** column can have:

TCP - The connection is a TCP connection

PING - The connection is an ICMP ECHO connection

UDP - The connection is a UDP connection

RAWIP - The connection uses an IP protocol other than TCP, UDP or ICMP

The **Source** and **Destination** columns show from what ip and port on the source interface is the connection, and to what interface with what port number is the connection to.

The screenshot shows the D-Link DFL-1100 Network Security Firewall web interface. The top navigation bar includes 'System', 'Firewall', 'Servers', 'Tools', 'Status' (highlighted), and 'Help'. On the left sidebar, there are buttons for 'System', 'Interfaces', 'VLAN', 'VPN', 'Connections' (highlighted), and 'DHCP Server'. The main content area is titled 'State Table Contents' and includes a 'Filter state table display:' section with input fields for 'Source' and 'Destination' (IP Address, Interface, IP Protocol, Port). Below the filters is a table of state table contents (max 100 entries).

State	Proto	Source	Destination	Timeout
TCP_CLOSE	TCP	lan:192.168.1.5:1024	wan:172.16.77.88:80	83
TCP_OPEN	TCP	lan:192.168.1.5:1025	wan:172.16.77.88:80	299998

DHCP Server

Click on **Status** in the menu bar, and then click **DHCP Server** below it. A window will appear providing information about the configured DHCP Servers. By default information about the **LAN** interface will be show, to see another one click on that interface.

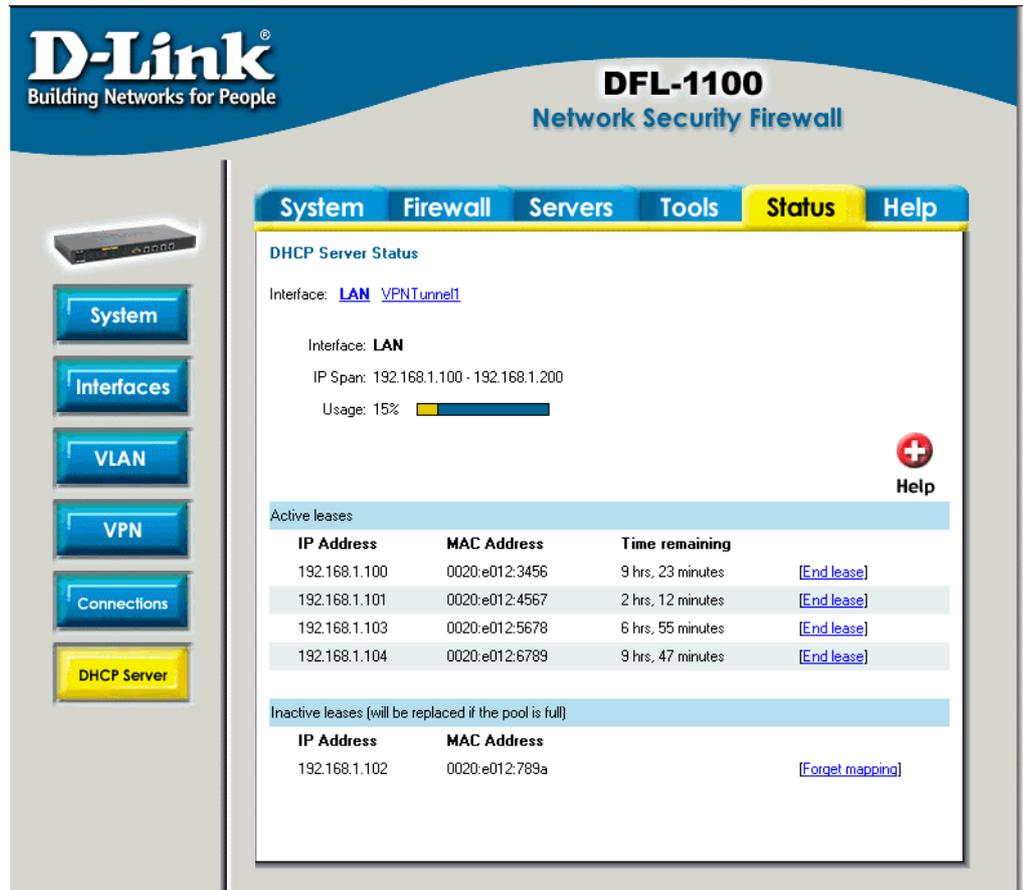
Interface – Name of the interface the DHCP Server is running on.

IP Span – Displays the configured ranges of IP's that are given out as DHCP leases.

Usage – Display how much of the IP range is give out to DHCP clients.

Active leases are the current computers using this DHCP server. It is also possible to end a computers lease from here by clicking on **End lease** after that IP.

Inactive leases are leases that are not currently in use but have been used by a computer before, that computer will get that lease the next time it is on the network. If there is no free IP in the pool these IP's will be used for new computers.



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DFL-1100
Network Security Firewall

System Firewall Servers Tools **Status** Help

DHCP Server Status

Interface: [LAN](#) [VPNTunnel1](#)

Interface: **LAN**

IP Span: 192.168.1.100 - 192.168.1.200

Usage: 15% 

 Help

Active leases

IP Address	MAC Address	Time remaining	
192.168.1.100	0020:e012:3456	9 hrs, 23 minutes	[End lease]
192.168.1.101	0020:e012:4567	2 hrs, 12 minutes	[End lease]
192.168.1.103	0020:e012:5678	6 hrs, 55 minutes	[End lease]
192.168.1.104	0020:e012:6789	9 hrs, 47 minutes	[End lease]

Inactive leases (will be replaced if the pool is full)

IP Address	MAC Address	
192.168.1.102	0020:e012:789a	[Forget mapping]

How to read the logs

Although the exact format of each log entry depends on how your syslog recipient works, most are very much alike. The way in which logs are read is also dependent on how your syslog recipient works. Syslog daemons on UNIX servers usually log to text files, line by line.

Most syslog recipients preface each log entry with a timestamp and the IP address of the machine that sent the log data:

```
Oct 20 2003 09:45:23 gateway
```

This is followed by the text the sender has chosen to send. All log entries from DFL-1100 are prefaced with "EFW:" and a category, e.g. "DROP:"

```
Oct 20 2003 09:45:23 gateway EFW: DROP:
```

Subsequent text is dependent on the event that has occurred.

USAGE events

These events are sent periodically and provide statistical information regarding connections and amount of traffic.

Example:

```
Oct 20 2003 09:45:23 gateway EFW: USAGE: conns=1174 if0=core ip0=127.0.0.1  
tp0=0.00 if1=wan ip1=192.168.10.2 tp1=11.93 if2=lan ip2=192.168.0.1 tp2=13.27 if3=dmz  
ip3=192.168.1.1 tp3=0.99
```

The value after conns is the number of open connections through the firewall when the usage log was sent. The value after tp is the throughput through the firewall at the time the usage log was logged.

DROP events

These events may be generated by a number of different functions in the firewall. The most common source is probably the policies.

Example:

```
Oct 20 2003 09:42:25 gateway EFW: DROP: prio=1 rule=Rule_1 action=drop recvif=wan  
srcip=192.168.10.2 destip=192.168.0.1 ipproto=TCP ipdatalen=28 srcport=3572 destport=135  
tcphdrLen=28 syn=1
```

In this line, traffic from 192.168.10.2 coming from the WAN side of the firewall, connecting to 192.168.0.1 on port 135 is dropped. The protocol used is TCP.

CONN events

These events are generated if auditing has been enabled.

One event will be generated when a connection is established. This event will include information about protocol, receiving interface, source IP address, source port, destination interface, destination IP address and destination port.

Open Example:

*Oct 20 2003 09:47:56 gateway EFW: CONN: prio=1 rule=Rule_8 conn=open
conniproto=TCP connrcvif=lan connsrrip=192.168.0.10 connsrripport=3179 conndestif=wan
conndestip=64.7.210.132 conndestport=80*

In this line, traffic from 192.168.0.10 on the LAN interface is connecting to 64.7.210.132 on port 80 on the WAN side of the firewall (internet).

Another event is generated when the connection is closed. The information included in the event is the same as in the event sent when the connection was opened, with the exception that statistics regarding sent and received traffic is also included.

Close Example:

*Oct 20 2003 09:48:05 gateway EFW: CONN: prio=1 rule=Rule_8 conn=close
conniproto=TCP connrcvif=lan connsrrip=192.168.0.10 connsrripport=3179 conndestif=wan
conndestip=64.7.210.132 conndestport=80 origsent=62 termsent=60*

In this line, the connection in the other example is closed.

Appendixes

Appendix A: ICMP Types and Codes

The Internet Control Message Protocol (ICMP) has many messages that are identified by a "type" field; many of these ICMP types have a "code" field. Here we list the types with their assigned code fields.

Type	Name	Code	Description	Reference
0	Echo Reply	0	No Code	RFC792
3	Destination Unreachable	0	Net Unreachable	RFC792
		1	Host Unreachable	RFC792
		2	Protocol Unreachable	RFC792
		3	Port Unreachable	RFC792
		4	Fragmentation Needed and Don't Fragment was Set	RFC792
		5	Source Route Failed	RFC792
		6	Destination Network Unknown	RFC792
		7	Destination Host Unknown	RFC792
		8	Source Host Isolated	RFC792
		9	Communication with Destination Network is Administratively Prohibited	RFC792
		10	Communication with Destination Host is Administratively Prohibited	RFC792
		11	Destination Network Unreachable for Type of Service	RFC792
		12	Destination Host Unreachable for Type of Service	RFC792
		13	Communication Administratively Prohibited	RFC1812
		14	Host Precedence Violation	RFC1812
		15	Precedence cutoff in effect	RFC1812
4	Source Quench	0	No Code	RFC792
5	Redirect	0	Redirect Datagram for the Network (or subnet)	RFC792

		1	Redirect Datagram for the Host	RFC792
		2	Redirect Datagram for the Type of Service and Network	RFC792
		3	Redirect Datagram for the Type of Service and Host	RFC792
8	Echo	0	No Code	RFC792
9	Router Advertisement	0	Normal router advertisement	RFC1256
		16	Does not route common traffic	RFC2002
10	Router Selection	0	No Code	RFC1256
11	Time Exceeded	0	Time to Live exceeded in Transit	RFC792
		1	Fragment Reassembly Time Exceeded	RFC792
12	Parameter Problem	0	Pointer indicates the error	RFC792
		1	Missing a Required Option	RFC1108
		2	Bad Length	RFC792
13	Timestamp	0	No Code	RFC792
14	Timestamp Reply	0	No Code	RFC792
15	Information Request	0	No Code	RFC792
16	Information Reply	0	No Code	RFC792
17	Address Mask Request	0	No Code	RFC950
18	Address Mask Reply	0	No Code	RFC950
30	Traceroute			RFC1393
31	Datagram Conversion Error			RFC1475
40	Photuris			RFC2521
		0	Bad SPI	RFC2521
		1	Authentication Failed	RFC2521
		2	Decompression Failed	RFC2521
		3	Decryption Failed	RFC2521
		4	Need Authentication	RFC2521
		5	Need Authorization	RFC2521

Source: <http://www.iana.org/assignments/icmp-parameters>

Appendix B: Common IP Protocol Numbers

These are some of the more common IP Protocols, for all follow the link after the table.

Decimal	Keyword	Description	Reference
1	ICMP	Internet Control Message	RFC792
2	IGMP	Internet Group Management	RFC1112
3	GGP	Gateway-to-Gateway	RFC823
4	IP	IP in IP (encapsulation)	RFC2003
5	ST	Stream	RFC1190, RFC1819
6	TCP	Transmission Control	RFC793
8	EGP	Exterior Gateway Protocol	RFC888
17	UDP	User Datagram	RFC768
47	GRE	General Routing Encapsulation	
50	ESP	Encapsulation Security Payload	RFC2406
51	AH	Authentication Header	RFC2402
108	IPComp	I IP Payload Compression Protocol	RFC2393
112	VRRP	Virtual Router Redundancy Protocol	
115	L2TP	Layer Two Tunneling Protocol	

Source: <http://www.iana.org/assignments/protocol-numbers>

LIMITED WARRANTY

D-Link provides this limited warranty for its product only to the person or entity who originally purchased the product from D-Link or its authorized reseller or distributor.

Limited Hardware Warranty: D-Link warrants that the hardware portion of the D-Link products described below (“Hardware”) will be free from material defects in workmanship and materials from the date of original retail purchase of the Hardware, for the period set forth below applicable to the product type (“Warranty Period”) if the Hardware is used and serviced in accordance with applicable documentation; provided that a completed Registration Card is returned to an Authorized D-Link Service Office within ninety (90) days after the date of original retail purchase of the Hardware. If a completed Registration Card is not received by an authorized D-Link Service Office within such ninety (90) period, then the Warranty Period shall be ninety (90) days from the date of purchase.

<i>Product Type</i>	<i>Warranty Period</i>
Product (excluding power supplies and fans)	One (1) Year
Power Supplies and Fans	One (1) Year
Spare parts and spare kits	Ninety (90) days

D-Link’s sole obligation shall be to repair or replace the defective Hardware at no charge to the original owner. Such repair or replacement will be rendered by D-Link at an Authorized D-Link Service Office. The replacement Hardware need not be new or of an identical make, model or part; D-Link may in its discretion may replace the defective Hardware (or any part thereof) with any reconditioned product that D-Link reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. The Warranty Period shall extend for an additional ninety (90) days after any repaired or replaced Hardware is delivered. If a material defect is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to repair or replace the defective Hardware, the price paid by the original purchaser for the defective Hardware will be refunded by D-Link upon return to D-Link of the defective Hardware. All Hardware (or part thereof) that is replaced by D-Link, or for which the purchase price is refunded, shall become the property of D-Link upon replacement or refund.

Limited Software Warranty: D-Link warrants that the software portion of the product (“Software”) will substantially conform to D-Link’s then current functional specifications for the Software, as set forth in the applicable documentation, from the date of original delivery of the Software for a period of ninety (90) days (“Warranty Period”), if the Software is properly installed on approved hardware and operated as contemplated in its documentation. D-Link further warrants that, during the Warranty Period, the magnetic media on which D-Link delivers the Software will be free of physical defects. D-Link’s sole obligation shall be to replace the non-conforming Software (or defective media) with software that substantially conforms to D-Link’s functional specifications for the Software. Except as otherwise agreed by D-Link in writing, the replacement Software is provided only to the original licensee, and is subject to the terms and conditions of the license granted by D-Link for the Software. The Warranty Period shall extend for an additional ninety (90) days after any replacement Software is delivered. If a material non-conformance is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to replace the non-conforming Software, the price paid by the original licensee for the non-conforming Software will be refunded by D-Link; provided that the non-conforming Software (and all copies thereof) is first returned to D-Link. The license granted respecting any Software for which a refund is given automatically terminates.

What You Must Do For Warranty Service:

Registration Card. The Registration Card provided at the back of this manual must be completed and returned to an Authorized D-Link Service Office for each D-Link product within ninety (90) days after the product is purchased and/or licensed. The addresses/telephone/fax list of the nearest Authorized D-Link Service Office is provided in the back of this manual. **FAILURE TO PROPERLY COMPLETE AND TIMELY RETURN THE REGISTRATION CARD MAY AFFECT THE WARRANTY FOR THIS PRODUCT.**

Submitting A Claim. Any claim under this limited warranty must be submitted in writing before the end of the Warranty Period to an Authorized D-Link Service Office. The claim must include a written description of the Hardware defect or Software nonconformance in sufficient detail to allow D-Link to confirm the same. The original product owner must obtain a Return Material Authorization (RMA) number from the Authorized D-Link Service Office and, if requested, provide written proof of purchase of the product (such as a copy of the dated purchase invoice for the product) before the warranty service is provided. After an RMA number is issued, the defective product must be packaged securely in the original or other suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. The packaged product shall be insured and shipped to D-Link, 17595 Mt. Herrmann Street Fountain Valley, CA 92708 USA, with all shipping costs prepaid. D-Link may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The product owner agrees to pay D-Link's reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by D-Link not to be defective or non-conforming.

What Is Not Covered:

This limited warranty provided by D-Link does not cover:

Products that have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed;

Initial installation, installation and removal of the product for repair, and shipping costs;

Operational adjustments covered in the operating manual for the product, and normal maintenance;

Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage; and

Any hardware, software, firmware or other products or services provided by anyone other than D-Link.

Disclaimer of Other Warranties: EXCEPT FOR THE LIMITED WARRANTY SPECIFIED HEREIN, THE PRODUCT IS PROVIDED "AS-IS" WITHOUT ANY WARRANTY OF ANY KIND INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IF ANY IMPLIED WARRANTY CANNOT BE DISCLAIMED IN ANY TERRITORY WHERE A PRODUCT IS SOLD, THE DURATION OF SUCH IMPLIED WARRANTY SHALL BE LIMITED TO NINETY (90) DAYS.

EXCEPT AS EXPRESSLY COVERED UNDER THE LIMITED WARRANTY PROVIDED HEREIN, THE ENTIRE RISK AS TO THE QUALITY, SELECTION AND PERFORMANCE OF THE PRODUCT IS WITH THE PURCHASER OF THE PRODUCT.

Limitation of Liability: TO THE MAXIMUM EXTENT PERMITTED BY LAW, D-LINK IS NOT LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY LOSS OF USE OF THE PRODUCT, INCONVENIENCE OR DAMAGES OF ANY CHARACTER, WHETHER DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF GOODWILL, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, LOSS OF INFORMATION OR DATA CONTAINED IN, STORED ON, OR INTEGRATED WITH ANY PRODUCT RETURNED TO D-LINK FOR WARRANTY SERVICE) RESULTING FROM THE USE OF THE PRODUCT, RELATING TO WARRANTY SERVICE, OR ARISING OUT OF ANY BREACH OF THIS LIMITED WARRANTY, EVEN IF D-LINK HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE SOLE REMEDY FOR A BREACH OF THE FOREGOING LIMITED WARRANTY IS REPAIR, REPLACEMENT OR REFUND OF THE DEFECTIVE OR NON-CONFORMING PRODUCT.

GOVERNING LAW: This Limited Warranty shall be governed by the laws of the state of California.

Some states do not allow exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the foregoing limitations and exclusions may not apply. This limited warranty provides specific legal rights and the product owner may also have other rights which vary from state to state.

Wichtige Sicherheitshinweise

1. Bitte lesen Sie sich diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den spätern Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie keine Flüssig- oder Aerosolreiniger. Am besten dient ein angefeuchtetes Tuch zur Reinigung.
4. Um eine Beschädigung des Gerätes zu vermeiden sollten Sie nur Zubehörteile verwenden, die vom Hersteller zugelassen sind.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sichern Stand zu achten. Ein Kippen oder Fallen könnte Verletzungen hervorrufen. Verwenden Sie nur sichere Standorte und beachten Sie die Aufstellhinweise des Herstellers.
7. Die Belüftungsöffnungen dienen zur Luftzirkulation die das Gerät vor Überhitzung schützt. Sorgen Sie dafür, daß diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim Anschluß an das Stromnetz die Anschlußwerte.
9. Die Netzanschlußsteckdose muß aus Gründen der elektrischen Sicherheit einen Schutzleiterkontakt haben.
10. Verlegen Sie die Netzanschlußleitung so, daß niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
11. Alle Hinweise und Warnungen die sich am Geräten befinden sind zu beachten.
12. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.

13. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. Elektrischen Schlag auslösen.
14. Öffnen Sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von autorisiertem Servicepersonal geöffnet werden.
15. Wenn folgende Situationen auftreten ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
 - a – Netzkabel oder Netzstecker sind beschädigt.
 - b – Flüssigkeit ist in das Gerät eingedrungen.
 - c – Das Gerät war Feuchtigkeit ausgesetzt.
 - d – Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
 - e – Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
 - f – Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
16. Bei Reparaturen dürfen nur Originalersatzteile bzw. den Originalteilen entsprechende Teile verwendet werden. Der Einsatz von ungeeigneten Ersatzteilen kann eine weitere Beschädigung hervorrufen.
17. Wenden Sie sich mit allen Fragen die Service und Reparatur betreffen an Ihren Servicepartner. Somit stellen Sie die Betriebssicherheit des Gerätes sicher.
18. Zum Netzanschluß dieses Gerätes ist eine geprüfte Leitung zu verwenden, Für einen Nennstrom bis 6A und einem Gerätegewicht größer 3kg ist eine Leitung nicht leichter als H05VV-F, 3G, 0.75mm² einzusetzen.

Trademarks

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FCC Warning

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

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

FCC Radiation Exposure Statement

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

The Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

International Offices

U.S.A

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Fax 866-743-4905
URL: www.dlink.com

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Oakville, Ontario, L6H 5W1
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URL: www.dlink.ca

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London NW9 5AB
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URL: www.dlink.co.uk

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FAX: 49-6196-7799300
URL: www.dlink.de

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78330 Fontenay le Fleury
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URL: www.dlink.dk

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FAX: 56-2-232-0923
URL: www.dlink.cl

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04578-000
TEL: (55 11) 550 39320
Fax: (55 11) 550 39321

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102-106 Witch-Hazel Avenue
Highveld Technopark
Centurion
Gauteng
Republic of South Africa
TEL: 27-12-665-2165
FAX: 27-12-665-2186
URL: www.d-link.co.za

Russia

Grafsky per., 14, floor 6
Moscow
129626 Russia
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FAX: 7-095-744-0099 #350
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Hsin-Tien, Taipei
Taiwan
TEL: 886-2-2916-1600
FAX: 886-2-2914-6299
URL: www.dlink.com.tw

Registration Card

Print, type or use block letters.

Your name: Mr./Ms _____

Organization: _____ Dept. _____

Your title at organization: _____

Telephone: _____ Fax: _____

Organization's full address: _____

Country: _____

Date of purchase (Month/Day/Year): _____

Product Model	Product Serial No.	* Product installed in type of computer (e.g., Compaq 486)	* Product installed in computer serial No.

(* Applies to adapters only)

Product was purchased from:

Reseller's name: _____

Telephone: _____ Fax: _____

Reseller's full address: _____

Answers to the following questions help us to support your product:

1. Where and how will the product primarily be used?

Home Office Travel Company Business Home Business Personal Use

2. How many employees work at installation site?

1 employee 2-9 10-49 50-99 100-499 500-999 1000 or more

3. What network protocol(s) does your organization use ?

XNS/IPX TCP/IP DECnet Others _____

4. What network operating system(s) does your organization use ?

D-Link LANsmart Novell NetWare NetWare Lite SCO Unix/Xenix PC NFS 3Com 3+Open

Banyan Vines DECnet Pathwork Windows NT Windows NTAS Windows '95

Others _____

5. What network management program does your organization use ?

D-View HP OpenView/Windows HP OpenView/Unix SunNet Manager Novell NMS

NetView 6000 Others _____

6. What network medium/media does your organization use ?

Fiber-optics Thick coax Ethernet Thin coax Ethernet 10BASE-T UTP/STP

100BASE-TX 100BASE-T4 100VGAnyLAN Others _____

7. What applications are used on your network?

Desktop publishing Spreadsheet Word processing CAD/CAM

Database management Accounting Others _____

8. What category best describes your company?

Aerospace Engineering Education Finance Hospital Legal Insurance/Real Estate Manufacturing

Retail/Chainstore/Wholesale Government Transportation/Utilities/Communication VAR

System house/company Other _____

9. Would you recommend your D-Link product to a friend?

Yes No Don't know yet

10. Your comments on this product?

PLEASE
PLACE STAMP
HERE

TO:

D-Link[®]