

SmartShare FairRouter

User Manual

300, 1000, and 5000 Series

Firmware: 1.20

Revision History

Revision	Date	Comments
1.15	2009-01-29	First document release using this template.
1.16	2009-04-16	Updates for firmware release 1.16.
	2009-05-13	Licensing Information style changed to normal. Added WEEE instructions for Danish End Customers.
1.17	2009-07-20	Updates for firmware release 1.17.
1.18	2009-11-09	Updates for firmware release 1.18.
1.19	2010-04-21	Updates for firmware release 1.19.
1.20	2010-06-21	Updates for firmware release 1.20.

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1. Installation Guide

Connect the FairRouter to the network

Connect the internet modem's LAN port to the WAN port on the FairRouter, using a straight Ethernet patch cable.

Connect the LAN port on the FairRouter to any Ethernet port on the local network switch, using a straight Ethernet patch cable. (The gray cable in the box is a straight Ethernet patch cable.)

1.1 **Turn on the FairRouter**

Connect the FairRouter to power and turn it on. Verify that the POWER LED on the FairRouter is on.

Verify that the LINK/ACT LEDs for both the WAN and LAN ports are on or blinking. (If one of the LINK/ACT LEDs stays off, use a crossed Ethernet cable on that port instead.)

Wait 2-5 minutes, while the FairRouter auto-configures. If the STATUS LED is not blinking green after five minutes, you must configure the WAN/internet connection manually.

You are now ready to enjoy the improved Quality of Experience provided by the SmartShare FairRouter™.

1.2 **Optional: Using the Web GUI to configure the WAN/internet connection manually**

Connect your PC to the Ext2 port on the FairRouter, using a crossed Ethernet cable. (The red cable in the box is a crossed Ethernet cable.)

The FairRouter will assign an IP address in the 192.0.2.0 subnet to your PC using DHCP.

If your PC does not get an IP address in this subnet, reboot your PC.

Use a web browser to access the Web GUI in the FairRouter.

- The Web GUI address is: **http://192.0.2.1/**
- The default administrator user name is: **admin**
- Password: **admin**

Please note that the Ext2 port only provides access to the FairRouter. Your PC can not access the internet through the Ext2 port.

Go to the WAN page and configure the IP address and connection speed.

The IP address information that must be entered on the WAN page must be obtained from the internet service provider (ISP). The ISP usually provides this information in a letter accompanying the confirmation of the internet subscription.

Click Confirm Changes, then go to the Save page and save and activate the new configuration.

2. The FairRouter WAN Optimization System

This section describes the FairRouter WAN optimization system in details, and is written for network experts only.

2.1 **User Load Balancing™**

Conventional routers and switches simply forward all packets to/from users in the same order the packets are sent to/from the users, so the users with a lot of packets get a larger share of the available bandwidth than the users with fewer packets.

With User Load Balancing, packets are forwarded to/from each user in turn, so each and every user is guaranteed the largest possible share of the available bandwidth.

2.1.1 User Identification

The FairRouter identifies individual users by their IP address presented to the LAN interface on the FairRouter. This also means that if a group of users in an apartment shares the apartment's network connection through a NAT router in the apartment, they will be treated as one single user, because that NAT router only presents one IP address to the FairRouter.

The FairRouter automatically detects which IP addresses are in use, so unused IP addresses, e.g. in a structured IP address plan, do not count.

Advanced administrators can use the User Groups to specify which IP address ranges are managed by the FairRouter. When specifying an address range, you have the option of choosing to identify all IP addresses from a /24 subnet as one user.

2.1.2 Excess Users

Additional IP addresses beyond the capacity of the specific FairRouter model are considered excess users, and will be bundled together and treated as a single virtual user by the FairRouter. This means that the excess users can access the internet, but the entire group of excess users will only get the bandwidth share of one single user.

There is no optimization within the group of excess users. A single heavy user in the group of excess users can consume all the bandwidth available for the entire group of excess users, and thus block the connection for the other excess users.

2.2 Download Optimizer™ and Upload Optimizer™

The FairRouter monitors the download and upload bandwidth, and while there is sufficient bandwidth and low latency, all users can use all the bandwidth they wish.

When the download bandwidth becomes scarce or delays are detected, the FairRouter activates the Download Optimizer™.

When the upload bandwidth becomes scarce or delays are detected, the FairRouter activates the Upload Optimizer™.

The Download and Upload Optimizers are designed to ensure that all users experience the lowest possible latency and the highest possible bandwidth. At minimum, each of N users is guaranteed 1/N of the available bandwidth.

Advanced administrators can use the User Groups to specify maximum download and upload rates per user in each group of users. Additionally, a weight per user can be specified, allowing some users to get a relatively larger share of the bandwidth.

2.3 Dynamic Quality of Service™

The FairRouter always prioritizes timing critical traffic flows, such as IP telephony and online gaming, over ordinary traffic flows.

The priority assignment is based on traffic pattern analysis of each flow. It is not based on the TCP/UDP port number, TOS precedence, DSCP or similar fields in the packet, because those properties can be manipulated by peer-to-peer applications or malicious users.

Dynamic QoS is an integral part of the FairRouter bandwidth optimization system, so it does not require any configuration or allocation of bandwidth.

The FairRouter typically recognizes and assigns high priority to a timing critical flow within one second.

2.4 Extra Shaping of Users with Many Flows (Optional)

Advanced administrators can use the User Groups to enable extra shaping of users with many flows.

When extra shaping is enabled, the bandwidth is reduced for users having more flows than allowed. The parameters are configurable.

In networks where the users have wireless access, reducing the bandwidth available to users with many flows may improve the general performance of the wireless network.

In networks where the use of peer-to-peer applications is unwanted or prohibited, a significant reduction of the bandwidth available to users with many flows may help limit the use of peer-to-peer applications.

2.5 **Flow Manager™**

The FairRouter contains a table where each flow is registered while established. Each entry in the flow table contains the public IP addresses and TCP/UDP port numbers of the flow and the corresponding IP address and TCP/UDP port number of the computer on the LAN. The flow table is also used for NAT routing in the FairRouter

The FairRouter flow table is large enough to handle the many flows that can be expected when many users are active. In addition to having a very large flow table, the Flow Manager handles excessive flows without crashing or freezing.

Just like the Download and Upload Optimizers prevent heavy users from eating up all the available internet bandwidth at the expense of other users, the FairRouter Flow Manager prevents heavy users from eating up all the available flows in the flow table at the expense of other users.

2.6 **LowLatency Network Overclocking® (Optional)**

When LowLatency is enabled, the TCP MTU is significantly reduced, and thus the packets become smaller. When the packets are smaller, the delay and jitter is decreased.

Modifying the TCP MTU is well known from PPPoE connections, where the MTU is slightly reduced to make room for the PPPoE header added to the packets.

As the name suggests, any Network Overclocking® may have unwanted side effects, and should be disabled if it causes problems.

Please note that enabling LowLatency reduces the effective bandwidth by up to 5%, because it requires more packets to convey the same amount of data, and the increased number of packet headers adds to the total overhead.

3. Status page

This page shows the current status of the internet connection.

3.1 **System**

This shows system status, such as the name, location and contact information, current time, time zone, the duration since the last time the FairRouter was powered on or rebooted, when the counters were last cleared, the current memory usage and the current (10 second sliding average) processor usage.

3.2 **Health Monitor™**

This shows details about the current problems found by the Health Monitor and the total number of problems found in the past by the Health Monitor.

The Health Monitor reports if any of the following problems are present:

- The number of users exceeds the capacity of the FairRouter model. If this happens, upgrading to a larger model is recommended.
- The connection speed is unknown, or the Bandwidth Optimizer is disabled.

- A rogue DHCP server, i.e. a DHCP server that should not be there, is detected on the network.
- A cable is not connected.
- A port is connected to equipment without Auto Negotiation. This may be OK, but usually indicates a configuration error in the other equipment.
- The WAN port has not been assigned an IP address (when configured for using DHCP or PPPoE).

Please note that if the WAN port is configured for using DHCP or PPPoE, it usually takes some time before it is assigned an IP address, and this will be reported as a problem.

3.3 **Anti Terror Logger (firmware option)**

3.3.1 **Log Servers**

This shows the overall status of the FTP servers where the FairRouter stores the ATL log files. The status can be: Initializing, OK, Warning or Error.

3.3.2 **SNMP Agents**

This shows the overall status of the SNMP agents in the switches and routers on the local network. The status can be: Initializing, OK or Error.

3.3.3 **Buffer Usage**

The FairRouter temporarily stores the ATL log files in a buffer until they are transferred to the FTP server. Buffer Usage shows the usage of this buffer.

3.3.4 **Flows Logged**

This shows how many flows have been logged by the FairRouter since the last time the FairRouter was powered on or rebooted.

3.4 **WAN**

This shows the status of the connection to the ISP and when the status changed, i.e. when the connection was established or lost or the cable was connected or disconnected.

When the WAN port has valid IP information (either manually configured or assigned by the ISP using DHCP or PPPoE), the IP information is shown.

The port's permanent MAC address, as well as the link speed and number of packets received into and transmitted out of the port is shown.

3.5 **LAN**

This shows the status of the connection to the local network and when the status changed, i.e. when the cable was connected or disconnected.

The configured IP addresses of the LAN port are shown.

The port's permanent MAC address, as well as the link speed and number of packets received into and transmitted out of the port is shown.

3.6 **Ext2**

The permanent IP address of the Ext2 port (for direct management) is shown.

The port's permanent MAC address, as well as the link speed and number of packets received into and transmitted out of the port are shown.

3.7 **Bandwidth Optimizer**

3.7.1 **Download and Upload Rates**

These show the current (10 second sliding average) bandwidth usage in kbit/s.

Please note: If the connection type has been set, these show the gross bandwidth usage (including framing overhead); otherwise they show the net bandwidth usage (excluding framing overhead). The same applies to the Virtual WAN interface MIB available via SNMP.

3.7.2 **Peak Download and Upload Rates**

These show the 1 second peak (within the last 10 seconds) bandwidth usage in kbit/s.

3.7.3 **Download and Upload Optimizer Status**

The FairRouter monitors the download bandwidth, and while there is plenty of bandwidth and no delays, all users can use all the bandwidth they like. In this situation, the Download Optimizer status is shown as READY.

When the download bandwidth becomes scarce or delays are detected, the FairRouter starts optimizing the download bandwidth to ensure the lowest possible latency and the highest possible bandwidth for each individual user. In this situation, the Download Optimizer status is shown as ACTIVE.

The FairRouter monitors the upload bandwidth, and while there is plenty of bandwidth and no delays, all users can use all the bandwidth they like. In this situation, the Upload Optimizer status is shown as READY.

When the upload bandwidth becomes scarce or delays are detected, the FairRouter starts optimizing the upload bandwidth to ensure the lowest possible latency and the highest possible bandwidth for each individual user. In this situation, the Upload Optimizer status is shown as ACTIVE.

3.7.4 **Download and Upload Available per User**

These show how much download and upload bandwidth is currently (10 second sliding average) available for any user.

The amount of bandwidth available for any user is calculated every second, and the value shown here is the average of these calculated values for the last 10 seconds.

3.7.5 **Active Users**

This shows how many users are currently (within the last 10 seconds) active, i.e. using bandwidth.

3.7.6 **Download and Upload Optimizer Active Time**

These show how many seconds the Download and Upload Optimizers have been active.

3.7.7 **Downloaded and Uploaded**

These show the total number of bytes transferred in each direction.

Please note: If the connection type has been set, these include the calculated framing overhead. The same applies to the Virtual WAN interface MIB available via SNMP.

3.8 **Flow Manager**

3.8.1 **Flows**

When analyzing the utilization of the internet connection, it is not only interesting to know the bandwidth usage, but also how many concurrent flows are established. Flows are sometimes called sessions or connections. A high number of concurrent flows means that the computers on the local net are connected to many servers on the internet, but it does not necessarily mean that packets are flowing and bandwidth is being used.

3.8.2 **Flow Rate**

This shows the rate of new flows established per second.

3.8.3 **Flows Processed**

This shows the total number of flows processed, including currently established flows.

3.9 **User Manager**

3.9.1 **User Capacity**

This shows how many users the FairRouter is licensed to manage. Refer to "User Identification".

If the number of users exceeds this number, the Quality of Experience for some users will be severely degraded, and the FairRouter should be upgraded to a larger model.

3.9.2 **Managed Users**

This shows how many users are managed by the FairRouter.

3.9.3 **Normal Users**

This shows how many of the managed users have a long duration of activity, and are normally being managed by the FairRouter.

3.9.4 **Aging Users**

This shows how many of the managed users have been idle for more than eight hours. The User Manager may discard statistical information about aging users to make room for new users.

3.9.5 **New Users**

This shows how many new users have been detected as candidates for being managed by the FairRouter. New users have only transmitted but not received traffic.

3.9.6 **Peak Users**

This shows how many users have been active.

If this number exceeds the capacity of the FairRouter, the Quality of Experience for some users will be severely degraded, and the FairRouter should be upgraded to a larger model.

3.9.7 **Required Minimum User Capacity**

This shows how many users have been active, taking into account that statistical information about aging users can be discarded to make room for new users.

In other words, this shows the absolute minimum user capacity required to manage the users, when discarding statistical information about the individual users is acceptable.

If this number exceeds the capacity of the FairRouter, the Quality of Experience for some users will be severely degraded, and the FairRouter should be upgraded to a larger model.

3.10 **DHCP Server**

This shows the number of IP addresses assigned and the number of ghosts detected by the built-in DHCP server.

4. Internet/WAN (Wide Area Network) configuration page

The internet service provider usually provides all the information that is needed to configure the WAN connection in a letter accompanying the confirmation of the internet subscription.

4.1 **IP Address**

The WAN can be configured for 3 different IP address types:

- DHCP Assigned
- Static Configuration
- PPPoE Assigned

The default configuration is: DHCP Assigned

4.1.1 **DHCP Assigned**

This type of connection is fully automatic. If the internet service provider (ISP) requires a hostname in the DHCP request, it can be set here.

4.1.2 **Static Configuration**

The following information is required:

- IP Address
- Subnet Mask
- Default Gateway (Router)
- Primary DNS Server

The following information is optional:

- Secondary DNS Server

4.1.3 **PPPoE Assigned**

The following information is required:

- PPPoE Username
- PPPoE Password

4.2 **Connection Speed**

The connection speed must be set correctly, or the Quality of Experience for the users will be degraded. For the best results, use the built-in connection speed test.

If the connection speed advertised by the internet service provider (ISP) contains two numbers, for example 1024/256; the download speed is normally the larger of the numbers and the upload speed is the lesser.

Please note that an advertised speed of 1 M usually means 1024 and 2 M usually means 2048, but 10 M usually means 10000 and 100 M always means 100000.

Many ISPs advertise the raw connection speed, which does not account for framing overhead, so the users will experience speeds slightly below the advertised speed. This is normal.

The amount of framing overhead depends on the connection type. In the worst case, a DSL connection has 165% overhead on small TCP ACK packets, because it requires 2 ATM cells of 53 bytes to carry a TCP ACK packet of only 40 bytes.

The FairRouter compensates for framing overhead if the connection type has been set (or measured by the automatic test).

4.2.1 **Automatic Test**

If Connection Speed is set to Automatic Test, the FairRouter automatically tests the connection speed when powered on, and sets the connection speed and type accordingly.

Click the Test Now button to start a new connection speed test. Please note that normal user traffic is temporarily blocked while the FairRouter is testing the connection speed.

4.2.2 **Static Configuration**

The following information is required:

- Download Rate in kbit/s
- Upload Rate in kbit/s
- Connection Type

The WAN optimization can be disabled by leaving the Download and Upload Rate fields empty.

Click the Test Now button in the Automatic Test area to start the built-in connection speed test. Please note that normal user traffic is temporarily blocked while the FairRouter is testing the connection speed.

5. LAN (Local Area Network) configuration page

5.1 **IP Address Range**

The IP address range used on the LAN must be set. In Basic mode, this is set automatically by choosing one of the pre-defined address ranges. In Advanced mode, the IP address and subnet mask of the FairRouter must be set.

The default IP address range is: 192.168.2.1-192.168.2.255 (172.16.0.1-172.16.255.255 for large models)

5.2 **Network Name**

The hostname must be set. Optionally a domain name can be set. This information is used by the system itself and by the built-in DHCP server (if enabled) to configure clients on the LAN using DHCP for automatic IP configuration.

The default router name is: fairrouter
The default domain name is: local

5.3 **Local DNS Servers (optional)**

If there are any DNS servers on the LAN, their IP addresses can be set. This information (in addition to the DNS server information from the WAN) is used by the system itself and by the built-in DHCP server (if enabled) to configure clients on the LAN using DHCP for automatic IP configuration.

The default configuration is: (empty)

6. DHCP (Dynamic Host Configuration Protocol) configuration page

6.1 **Built-in DHCP Server**

DHCP on the LAN can be configured for 3 different setups:

- No DHCP Server / Other DHCP Server
- Built-in DHCP Server
- Proxy for External DHCP Servers

The default configuration is: Built-in DHCP Server

6.1.1 **No DHCP Server / Other DHCP Server**

If DHCP is not used on the LAN, or if another DHCP server is connected to the LAN, select this type of setup.

6.1.2 **Built-in DHCP Server**

The built-in DHCP server can be used to configure DHCP clients on the LAN.

The IP address assignment range must be set.

6.1.3 **Proxy for External DHCP Servers**

If a DHCP server is not connected directly to the layer 2 LAN, and the built-in DHCP server is not used either, the DHCP proxy can be used to relay DHCP requests from DHCP clients on the LAN to remote DHCP servers via layer 3.

DHCP proxy is not available when the router mode is NAT Routing.

6.2 **Built-in DHCP Server Options**

If the built-in DHCP server is used, its default and maximum DHCP lease time can be changed from their default values.

The built-in DHCP server also supports the following DHCP options:

- WINS Server (DHCP option 44)
- TFTP Server and File Name (DHCP options 66 and 67)
- FTP Server and Directory (DHCP options 161 and 162)

The default lease time configuration is: 720 minutes (default) and 1440 minutes (max).

6.3 **Static IP Addresses**

These fields can be set to assign a specific IP address and optionally a hostname to a list of devices on the LAN, based on the MAC address of the device.

6.4 **IP Address Table**

This shows the status of each IP address controlled by the built-in DHCP server.

The status of each IP address can be:

- Assigned Static: This device, which has a static IP address configured, has been assigned this IP address.
- Unassigned Static: This device, which has this static IP address configured, has not yet been assigned the IP address, or it has released the IP address again.
- Ghost: This device (the "ghost") is using this IP address without permission from the built-in DHCP server.
- Assigned Dynamic: This device has been assigned this available dynamic IP address.
- Conflicting: This device (the "offender") has previously been assigned this dynamic IP address, and now another device, which has this static IP address configured (the "victim"), is waiting for the same IP address. The built-in DHCP server does not assign an IP address to the victim before the offender has released the IP address.
- Conflicting Ghost: This device (the "ghost") is using this IP address without permission from the built-in DHCP server, and now another device, which has this static IP address configured (the "victim"), is waiting for the same IP address. The built-in DHCP server does not assign an IP address to the victim before the ghost has disappeared.
- Negotiating: This device is about to be assigned this IP address.

7. **NAPT (Network Address and Port Translation) configuration page**

7.1 **Port Forwarding to Local Servers**

These fields can be set to make servers on the local network available from the internet.

If the port number of a local network device can not be set on the device, e.g. port 80 on a web-managed switch, the port numbers can be remapped by NAPT.

The default configuration is: (empty)

7.2 **Port Based Port Forwarding to Many Local Servers**

These fields can be set to make servers on the local network available from the internet by mapping a common port on each of the private IP addresses to a range of ports on the public IP address on the internet.

E.g. if 5 web-managed devices are installed on the LAN, using private IP addresses 10.0.0.1-10.0.0.5 (each one accessible on port 80), the IP addresses and port number can be remapped by NAPT to a range of ports, e.g. ports 8001-8005, on the public IP address on the internet. In this example, the first web-managed device (10.0.0.1 port 80) is accessible on port 8001 on the public IP address on the internet, the next web-managed device (10.0.0.2 port 80) is accessible on port 8002 on the public IP address on the internet, and so on.

The default configuration is: (empty)

7.3 **All Ports Forwarding to Local Servers**

These fields can be set to make servers on the local network available from the internet by mapping each of the private IP addresses to a public IP address on the internet.

The default configuration is: (empty)

8. **ATL (Anti Terror Logging) configuration page (firmware option)**

Please note: The ATL firmware option includes separate log file analysis tools for Linux and Windows and the UM0005 Anti Terror Logging User Manual with detailed descriptions of how to use the ATL feature.

8.1 **Log File Storage**

The FairRouter stores the ATL log files on an external FTP server.

If ATL is enabled, it is possible to configure up to two FTP servers for storing the ATL log files. When the FairRouter is ready to store an ATL log file, it will use the primary FTP server. Every time the primary FTP server fails to receive an ATL log file, the FairRouter will store it on the secondary FTP server instead.

FTP Server, User Name and Password are required fields; Directory Path is optional.
The Status field shows the result of the last FTP transfer.

8.2 **Local Network SNMP Agents**

The FairRouter uses the SNMP agents in the switches and routers on the local network to locate where each MAC address and IP address is connected, and thus identifies the users.

If ATL is enabled, it is possible to configure which SNMP agents are present on the local network. Information about each switch and router on the LAN should be set, so the FairRouter is able to poll them for the required information to identify the users.

IP Address and Community are required fields. The Status field shows the result of the last SNMP poll of the device.

8.2.1 **ATL Compatibility Requirements for the Local Network Equipment**

The local network equipment must support specific SNMP features in order to be ATL compatible. Layer 2 switches used in the network must support all of the following features:

- SNMP v2c (RFC3416 or RFC1905) or SNMP v1 (RFC1157)
- dot1dTpFdbTable of the Bridge MIB (RFC4188 or RFC1493)
- dot1dBasePortTable of the Bridge MIB (RFC4188 or RFC1493)
- ifTable of the Interfaces MIB (RFC2863, RFC2233, RFC1573 or RFC1213)

They may additionally support the following features, but it is not required:

- ifXTable of the Interfaces MIB (RFC2863, RFC2233 or RFC1573)

Layer 3 routers used in the network must additionally support all of the following features:

- ipNetToMediaTable of the Internet Protocol MIB (RFC4293, RFC2011 or RFC1213)

9. **Advanced configuration page**

9.1 **Remote Management**

The built-in Web GUI can be changed to a different port.
The built-in SNMP agent can be changed to a different port.

The default Web GUI port is: 80
The default SNMP agent port is: 161

9.2 **Router Mode**

If you want to use the FairRouter as a traditional IP router without NAT, select IP Routing.

The default router mode is: NAT Routing

9.3 **Special Features**

9.3.1 **VoIP Extra Priority**

Enabling VoIP Extra Priority has the following effects:

- VoIP will always have highest priority, even if it takes excessive bandwidth from the other users.

When using IP telephony through the WAN connection, enabling VoIP Extra Priority is recommended.

The default setting for VoIP Extra Priority is: Disabled

9.3.2 **LowLatency Network Overclocking**

Enabling LowLatency Network Overclocking has the following effects:

- The "ping time" in online games is lowered.
- The delay and jitter for IP telephony is minimized.

LowLatency Network Overclocking works by reducing the TCP MTU significantly, and may not be compatible with all web sites and internet services.

The default setting for LowLatency Network Overclocking is: Disabled

9.4 **System Time**

9.4.1 **Time Zone**

The FairRouter can show the time according to the local time zone and automatically adjust for Daylight Saving Time.

The default time zone is: UTC

9.4.2 **Preferred NTP Server**

The system time should be synchronized with an external NTP server, so the time is always correct. If the preferred NTP server is not set, the FairRouter will use the NTP server assigned by DHCP (if available, and if using a DHCP assigned IP address).

The default configuration is: ntp.smartsharesystems.com

9.5 **Provisioning**

The FairRouter can periodically report statistical usage information to a central provisioning server. For further information, refer to "Usage Information sent to SmartShare Systems".

If the WAN/internet connection is charged for traffic (i.e. it is not a flat rate subscription), this should be disabled. (Not applicable for Trial models.)

The default configuration is: Automatic

9.6 **Remote Logging**

All system events are logged in the system log, which is shown on the Log page. Additionally, they can be sent directly to a SYSLOG server or an email address.

9.6.1 **SYSLOG**

If you have a SYSLOG server, you can set these fields, and the FairRouter will send the events to your SYSLOG server too. Two independent SYSLOG servers can be set.

9.6.2 **Email**

If you want the events sent to your email address, the following fields must be set:

- To Email Address. Your email address, e.g. bob@example.com.
- From Email Address. The email address you want the FairRouter to insert as sender, e.g. smartshare@example.com.
- SMTP Server. Either your own SMTP server, which can receive emails to your email address, or the ISP's SMTP server, which can forward emails from the FairRouter.

9.7 **Outgoing SMTP Connections**

The FairRouter has 4 different modes for handling outgoing SMTP (TCP port 25) connections from the local network to the WAN:

- Allow All.
- Allow to External Server only.
- Redirect all to External Server.
- Allow from Local Mail Servers only.

The default configuration is: Allow All

9.7.1 **Allow All**

Allow all local users to connect to any SMTP server on the WAN.

9.7.2 **Allow to External Server only**

Allow all local users to connect to the specified SMTP server on the WAN only. Attempts to connect to other SMTP servers on the WAN will be rejected by the FairRouter.

9.7.3 **Redirect all to External Server**

Redirect all outgoing SMTP connections to the specified SMTP server on the WAN. In this mode, the packet headers of all outgoing SMTP connections are modified, so the connection is established to the specified SMTP server instead.

This mode is useful if the local users are only allowed to use a specific SMTP server, but are unable or unwilling to configure their email applications.

9.7.4 **Allow from Local Mail Servers only**

Allow the specified local mail servers to connect to any SMTP server on the WAN, and reject attempts from all other local users to connect to SMTP servers on the WAN.

9.8 **System Information**

System contact and location can be set. This is not used by the system itself. It is shown on the status web page, is available via SNMP, and is included in event log emails sent by the FairRouter.

9.9 **Fallback for Equipment without Auto Negotiation**

The Ethernet standard (IEEE 802.3) uses a protocol called Auto Negotiation to ensure that network ports automatically use the correct speed and duplex when the network cable is plugged in. Some old network equipment does not support this protocol.

If the FairRouter is connected to a network port without Auto Negotiation, it can sense the speed (10 or 100 Mbit/s), but the duplex must be set.

9.10 **DHCP Server Detector**

The FairRouter can detect rogue DHCP servers on the local network. If the IP address and/or MAC address of the authorized DHCP servers are entered, no false warnings are shown when these are detected.

9.11 **Extra Shaping of Users with Many Flows**

Extra Shaping can be used to reduce the bandwidth for users with many flows. Extra Shaping can be enabled per User Group. Refer to "User Groups".

In networks where the users have wireless access, reducing the bandwidth available to users with many flows may improve the general performance of the wireless network.

In networks where the use of peer-to-peer applications is unwanted or prohibited, a significant reduction of the bandwidth available to users with many flows may help limit the popularity of peer-to-peer applications.

The following can be set for the extra shaper:

- Threshold Flows. Each user is allowed to have this many concurrent flows.
- Threshold Duration. A user may exceed the allowed number of concurrent flows for this duration without being restricted by the extra shaper.
- Maximum Download and Upload Rates. The maximum bandwidth allowed for each user being restricted by the extra shaper.
- Release Delay. When a user is restricted by the extra shaper, and has not exceeded the allowed number of concurrent flows for this duration, the user is released from extra shaping.

9.12 **User Groups**

User Groups can be used to configure specific IP address ranges to be managed differently by the FairRouter. Maximum download and upload rates per user, the weight per user, and extra shaping of users with many flows can be set for each user group. A user group can also be set to have no WAN access, or set to be considered excess users.

The following can be set for each user group:

- IP address range defining the group.
- Group Type. Choose "One IP Address per User" for normal user identification, where each IP address identifies one user. Choose "One /24 Subnet per User" if you want all IP addresses within a /24 subnet to be identified as one single user. This can be used in routed networks, where each apartment (or office) is assigned a /24 subnet. Choose "Excess Users" for users that are considered excess. Choose "No Access to WAN" for users that should be denied access to the WAN. Attempts by those users to connect to the WAN will be rejected by the FairRouter.
- Maximum Download and Upload Rate per User (optional). This can be used to set the maximum bandwidth allowed for each user in the user group. If left blank, there will be no specific bandwidth limits; the users will participate normally in the management of all the available bandwidth.
- Weight per User (optional). This can be used to give users in the user group a larger share of the bandwidth than other users. E.g. users with a weight of 3 get three shares of the bandwidth each time another user gets one share of the bandwidth.
- Extra Shaping. This can be used to enable extra shaping of users (in the user group) with many flows. Refer to "Extra Shaping of Users with Many Flows".
- Description. This can be used to store an informative description of the user group.

The default configuration is: Disabled

9.13 **Routes to Additional LAN Subnets**

Routes in addition to the LAN subnet can be added here. Each route added can be a NAT route or an IP route.

9.13.1 Remote Route

A route to a subnet reachable through another router is added by entering the subnet information, i.e. Subnet, Subnet Mask and Next Hop Gateway (the other router's IP address in the LAN subnet).

9.13.2 Local Route

A route to a subnet directly connected to the LAN port is added by entering the subnet information and using an IP address within the subnet as next hop gateway. This will assign the IP address set in the Next Hop Gateway field as an extra IP address to the LAN port.

9.13.3 Users with Public IP Addresses (Proxy ARP)

In a switched network with NAT to the LAN, some users on the LAN can have public IP addresses by adding them to this table as follows:

- Set Subnet to the user's public IP address, set Subnet Mask to 255.255.255.255 (or wider, e.g. 255.255.255.240 for 16 public IP addresses), leave Next Hop Gateway empty and select IP Routing.
- On the user's PC, set the IP address to the public IP address and the Subnet Mask to 255.255.255.255 (or 255.255.255.252 if 255.255.255.255 is not accepted by the PC's operating system) and the Default Gateway to the any of the LAN IP addresses of the FairRouter, as shown on the Status page (e.g. 192.168.2.1).

10. Detailed Status page

This shows the list of managed users and their individual status. The list can be downloaded as a text file to the PC.

The following information about each user is shown:

- IP Address.
- Status: The management status of the user.
- Download Rate: The current (10 second sliding average) download rate in kbit/s.
- Upload Rate: The current (10 second sliding average) upload rate in kbit/s.
- Flows: Number of concurrent flows.
- Peak Flows: Peak number of concurrent flows.
- Flow Rate: Rate of new flows established per second.
- Downloaded: The total number of bytes downloaded.
- Uploaded: The total number of bytes uploaded.
- Flows Processed: The total number of flows processed, including currently established flows.

Please note: If the connection type is set, the download and upload rates and the bytes downloaded and uploaded show the gross values (including framing overhead); otherwise they show the net values (excluding framing overhead).

11. Charts page

This shows the following live charts:

- User Bandwidth Overview: Bandwidth available per user.
- Connection Bandwidth Overview: Bandwidth usage and status of the Download and Upload Optimizers.
- Flows Overview: Concurrent flows and flow rate.
- User Overview: Number of managed and active users.

The visible duration and the sampling interval are shown below the X axis. E.g. "5 minutes in 1 second intervals" means that the chart shows 5 minutes worth of samples, where each sample is measured in an interval of 1 second.

The most recent and the average value of the visible duration are shown below each legend. The value in parentheses is the average value of the visible duration.

High resolution data (1 second sampling interval) are available for the last 5 minutes; low resolution data (1 day sampling interval) are available for the last year. The resolutions in between vary according to the sampling period.

Please note: The web browser must support Java™ Standard Edition version 1.3.1 or later.

11.1 **Manipulating the Charts**

Use the following actions to manipulate the charts:

- Drag the chart area right or left to show older or newer data. When looking at older data, the chart stops automatically scrolling when new data are sampled.
- Drag the chart area all the way to the left to make it continuously scroll when new data are sampled.
- Left click inside the chart area to zoom in (i.e. change to a shorter sampling interval) around the point clicked.
- Right click inside the chart area to zoom out (i.e. change to a longer sampling interval) around the point clicked.
- Click the arrow on any Y axis to lock or unlock the Y axis range. When locked, the arrow is colored red.
- Click any legend to hide or show its values on the graph. When hidden, the legend is grayed out.

11.2 **User Bandwidth Overview**

This shows the following:

- Average Download Available per User: How much download bandwidth was available for any user in the sampling interval.
- Minimum Download Available per User: What was the minimum download bandwidth available for any user in the sampling interval.
- Average Upload Available per User: How much upload bandwidth was available for any user in the sampling interval.
- Minimum Upload Available per User: What was the minimum upload bandwidth available for any user in the sampling interval.

Please note: If the connection type is set, the download and upload rates show the gross values (including framing overhead); otherwise they show the net values (excluding framing overhead).

11.3 **Connection Bandwidth Overview**

This shows the following:

- Average Download Rate: The average download rate in the sampling interval.
- Peak Download Rate: The (1 second) peak download rate in the sampling interval.
- Average Upload Rate: The average upload rate in the sampling interval.
- Peak Upload Rate: The (1 second) peak upload rate in the sampling interval.
- Download Optimizer Active: How often was the Download Optimizer active during the sampling interval.
- Upload Optimizer Active: How often was the Upload Optimizer active during the sampling interval.

Please note: If the connection type is set, the download and upload rates show the gross values (including framing overhead); otherwise they show the net values (excluding framing overhead).

11.4 **Flows Overview**

This shows the following:

- Flows: Average number of concurrent flows in the sampling interval.
- Flow Rate: Average rate of new flows established per second in the sampling interval.

11.5 **User Overview**

This shows the following:

- Managed Users: Number of users managed by the FairRouter in the sampling interval.
- Active Users: Number of users active, i.e. using bandwidth, in the sampling interval.

Please note: It is a natural phenomenon that the number of active users grows when the sampling interval grows. E.g. in a network with 10 users, it is likely that very few use bandwidth in one particular second, while it is likely that many use bandwidth throughout one entire day.

12. Top Users page

This shows live pie charts of the currently most active users by different criteria:

- Current (10 second sliding average) bandwidth usage.
- Concurrent flows.
- Current (10 second sliding average) download rate.
- Current (10 second sliding average) upload rate.

Each pie chart shows a slice for each of the top 10 users, a slice for the sum of other users and a slice for the unused capacity. The charts automatically update every 5 seconds.

Please note: If the connection type is set, the bandwidth usage and download and upload rates show the gross values (including framing overhead); otherwise they show the net values (excluding framing overhead).

Please note: The web browser must support Java™ Standard Edition version 1.3.1 or later.

12.1 *Manipulating the Pie Charts*

Use the following actions to manipulate the pie charts:

- Click the Unused legend to exclude or include it in the data shown by the pie chart. When excluded, the legend is grayed out.

13. Log page

This shows the list of system events and time of occurrence. The list can be downloaded as a text file to the PC.

14. Save page

14.1 *Saved, Running and New Configuration*

The configuration stored in the built-in flash memory, and loaded at power-on (or reboot), is called the "Saved configuration".

The current configuration of the FairRouter is called the "Running configuration".

The configuration being built up using the Web GUI is called the "New configuration" until it is activated. (Then it becomes the Running configuration.)

14.2 *Modifying the Configuration*

Depending on configuration changes made, the Save page provides the following choices:

- Activate New Configuration: Replaces the Running configuration with the New configuration, i.e. effectuates the configuration changes immediately.
- Activate and Save New Configuration: Replaces both the Running configuration and the Saved configuration with the New configuration, i.e. effectuates the configuration changes immediately and saves the configuration to the flash memory, so it will be loaded every time the FairRouter is powered on (or rebooted).
- Save New Configuration and Reboot: Replaces the Saved configuration with the New configuration and reboots, i.e. saves the configuration changes to the built-in flash memory, so it will be loaded every time the FairRouter is powered on (or rebooted) and then reboots.

- **Revert to Running Configuration:** Replaces the New configuration with the Running configuration, i.e. discards the configuration changes.
- **Save Running Configuration:** Replaces the Saved configuration with the Running configuration, i.e. saves the current configuration to the built-in flash memory, so it will be loaded every time the FairRouter is powered on (or rebooted)

The following configuration changes require a reboot of the FairRouter:

- Selecting or de-selecting PPPoE as WAN IP Address Type.

Please note: To restore the factory default configuration, go to the **System** page.

15. System page

15.1 *Download Firmware*

The FairRouter firmware can be upgraded from the firmware server at SmartShare Systems or any other firmware server. Firmware upgrade is a two step process. First, enter the URL of the firmware to be downloaded, and click the Download Firmware button. Second, when the firmware has been downloaded, checked for validity and is ready for installation, you can choose to cancel the upgrade or to proceed with the installation of the downloaded firmware.

15.2 *Install Activation Code*

Features and capacity of the FairRouter can be changed by installing different activation codes. Enter the activation code and click the Install Activation Code button. After the activation code has been validated, the FairRouter must be rebooted to activate the new feature set.

15.3 *Trial Mode*

If a trial license is installed, the FairRouter can operate in a trial mode where the model type and optional features can be changed. This can be used for evaluation purposes.

An ongoing trial can be stopped at any time, and the FairRouter will revert to normal operation.

The trial time stop watch only runs while the FairRouter operates in a trial mode.

As long as trial time remains, new trials can be started.

When the trial expires, the FairRouter will reboot and revert to normal operation.

The available trial time is controlled by the installed license, and additional trial time can be installed with additional activation codes.

15.4 *Set System Date and Time*

Enter the Date and Time and click the Set Date and Time button to set the system clock.

15.5 *Download Configuration to PC*

The running configuration can be downloaded to a file on your PC.

The downloaded configuration file can be restored to the FairRouter later, or even installed on another FairRouter.

15.6 *Upload Configuration from PC*

You can prepare a new configuration for the FairRouter by uploading a previously downloaded configuration file from your PC.

When the new configuration has been uploaded, you can modify it in the Web GUI before you go to the **Save** page to activate it.

15.7 **Restore Factory Defaults**

Click this button if you wish to restore the factory default configuration.

15.8 **Reboot System**

Click this button if you wish to reboot the FairRouter. Rebooting the system does not clear the configuration.

16. **Managers configuration page**

Multiple users can manage and configure the FairRouter.

The following can be set for each manager:

- User Name (required).
- Password. Password for access to the Web GUI.
- Community. SNMP Community for access to the SNMP agent. If not set, access to the SNMP agent will not be allowed.
- Allow from First and Last IP Address (optional). If set, the manager is only allowed management access if he connects from a PC within the specified IP address range.
- Manager Level. This determines how much the manager has access to do.

The following Manager Levels are available:

- Blocked. No access.
- User. Access to the Status page only.
- Installer. Full access.

The factory default administrator user name is: **admin** and password: **admin**

The factory default community is: (empty)

17. **Logout page**

Log out and return to the login page.

18. **Using the Serial Port**

The serial port can be used with any terminal emulator, such as Hyperterm or Tera Term Pro, as a fallback solution if the LAN connection has been lost.

The speed is: 115200 8N1 (115200 baud, 8 bits, No parity, 1 stop bit).

The following commands are available:

- ? – Show help.
- info – Show configuration information.
- stop trial – Stop the ongoing trial.
- reboot – Reboot the FairRouter.
- restore – Restore configuration to factory default.
- license – Show hardware MAC and license ID.
- activation=xxxxx – Install activation code.
- password bypass – Enable factory default administrator user name: **admin** and password: **admin** for 5 minutes.

The serial port is not password protected.

19. **Using the Ext2 Port for Management**

The Ext2 port can be used for accessing the Web GUI. It contains a DHCP server, so a PC can be easily connected.

Use a web browser on a PC connected via a crossed Ethernet cable to the Ext2 port to access the Web GUI in the FairRouter.

The Web GUI address is: **http://192.0.2.1/**

The default administrator user name is: **admin** and password: **admin**

Please note: No traffic is routed to/from the Ext2 port, so the PC must be connected directly to the Ext2 port, using a crossed Ethernet cable or via a switch.

20. Security Considerations

20.1 Physical Access

The FairRouter should be installed in a locked patch panel. Anyone with physical access to the FairRouter can power it off, disconnect it or change the configuration via the Serial and Ext2 ports.

20.2 Password Protection

The FairRouter Web GUI is password protected. Keep your password safe.

The FairRouter is delivered with a default password, which is very common and easy to guess. The password should be changed during installation.

20.3 SNMP Community

Access to the FairRouter SNMP agent is protected by a "community", which is the SNMP equivalent of a password.

The FairRouter is delivered with a default SNMP community, which is very common and easy to guess. The SNMP community should be changed during installation.

20.4 Firewall

When using NAT Routing, the FairRouter firewall prevents potential intruders on the internet from accessing computers on the local network.

The firewall does not prevent users on the local network from downloading virus or other malware from the internet to their computers. Users on the local network should protect their computers with anti-virus software.

The firewall does not prevent intruders connected on the local network from accessing other computers on the local network. Switches and wireless access points in the local network should prevent intruders and other users on the local network from accessing each other's computers. For further information, please refer to the chapter about protecting local users from each other.

20.5 Protecting Local Users from Each Other

When installing and configuring the local network infrastructure, i.e. switches and wireless access points, it should be considered if the local network should be open (where all local users can connect to each other and share files etc.) or protected (where all local users are separated from each other, and each user only has access to the internet and local servers).

User separation has different names, depending on equipment and vendor. In switches, look for "source-port filters" (HP ProCurve terminology), "Private VLANs" (Cisco terminology) or similar. In wireless access points, look for "AP isolation", "client isolation" or similar.

User separation does not affect the FairRouter, and the FairRouter works equally well with both open and protected networks.

21. Usage Information sent to SmartShare Systems

When provisioning is set to Automatic, statistical usage information is periodically reported to a central provisioning server hosted by SmartShare Systems.

Please note that provisioning cannot be disabled in Trial mode.

21.1 **Bandwidth Usage**

The central provisioning server is contacted approximately once per hour, and ca. 100 KB is transferred each time.

21.2 **Information Sent**

The information sent identifies the FairRouter and contains statistical data about its environment and utilization.

The following information is sent:

- Product identification: Hardware ID (MAC Address), License ID, Product model, Firmware version.
- Trial information (Trial models only): Trial model, Remaining trial time.
- General system information: Uptime, Time, Time Zone.
- System performance statistics: Memory and Processor usage.
- Feature usage information: Which configuration parameters are changed (the values are not sent; only whether each parameter has its default value or not).
- Connection Speed and Speed Test information: Download and Upload Speed, Connection Type, Test Server used, Server Location, Round Trip Time, Confidence.
- Connection usage statistics: Number of Downloaded and Uploaded bytes, Number of Flows Processed.
- Optimization and Health statistics: Download and Upload Optimizer Active Time, Extra Shaper Active Time, Number of Current and Past Problems detected by the Health Monitor.
- User activity and experience statistics: Number of Active Users, Active User Time (measured in user seconds), Average and Minimum Download and Upload Bandwidth Available per User, User Experience Improved Time (measured in user seconds).
- User Manager statistics: User Capacity, Number of Managed Users, Number of New and Aging Users, Peak Number of Users, Required Minimum User Capacity.

21.3 **Privacy Considerations**

The information sent identifies the specific FairRouter by its unique Hardware ID, so the information can be analyzed in a historical perspective.

The information sent does not identify individual users, and it does not contain any information about individual users.

22. **Troubleshooting and FAQ**

Q: How to verify that the FairRouter is active.

A: Test the Download Optimizer by downloading from a very fast server on the internet from two PCs simultaneously. Go to the **Status** page and check that the Download Optimizer status changes from READY to ACTIVE while the download connection is saturated.

Test the Upload Optimizer by uploading to a very fast server on the internet from two PCs simultaneously, while monitoring the Upload Optimizer status.

Q: The FairRouter does not have any effect on the user experience.

A: Verify that the FairRouter is installed correctly, especially that the connection speed is configured according to the actual connection bandwidth.

Q: After the FairRouter was installed, some of the computers on the local network can no longer access the internet.

A: This is probably because the computers still have the old configuration from the previous internet router. Reboot the computers to get the new configuration.

Q: There is no connectivity from the LAN to the WAN after the LAN has been configured on the FairRouter.

A: The LAN can not use the same IP address range as the WAN. Verify that the configuration does not conflict.

Q: After powering on the FairRouter, the WAN connection to the ISP is not established.

A: First, verify that everything is correctly connected. It may take a few minutes for the WAN connection to the ISP to stabilize; if it isn't established after a few minutes, verify that the configuration in the WAN page is correct. If using ADSL, the ADSL modem may need to be powered off and on again when connecting new equipment or replacing an existing router. If it still doesn't work, call the ISP's hotline.

Q: The administrator password for the FairRouter is lost.

A: Use the Ext2 port to change the password. Refer to "Using the Ext2 Port for Management". Alternatively, use the Serial port to enable the default username and password for 5 minutes, then login via the Web GUI and set a new password. Refer to "Using the Serial Port".

Q: The FairRouter cannot be accessed any more.

A: Use the Serial port to restore the factory default settings. Refer to "Using the Serial Port".

Q: Some of the computers on the local network can not access the internet.

A: If a device with a DHCP server is wrongly connected to the LAN, the computers on the LAN may get an incorrect configuration from the unauthorized DHCP server. Most routers and wireless access points have a DHCP server on their LAN ports. Use the Rogue DHCP Server Detector to determine if any rogue DHCP servers are connected to the LAN. Locate the device and disconnect it from the LAN.

Q: A user needs a public IP address, but the FairRouter is in NAT Routing mode.

A: Public IP addresses can be added using the "Routes to Additional **LAN Subnets**" feature.

23. LED Indicators

The two LEDs for each **LAN/WAN/Ext1/Ext2** Ethernet port indicate as follows:

LINK/ACT = Off	No connection.
LINK/ACT = On, 10/100 = Off	10 Mbit/s link to other device established.
LINK/ACT = On, 10/100 = On	100 Mbit/s link to other device established.
LINK/ACT = Blink	Link is active with transmissions.

The **POWER** LED indicates as follows:

POWER = Off	Power is off.
POWER = On	Power is on.

The **STATUS** LED indicates as follows:

STATUS = Green Light	The FairRouter is booting.
STATUS = Green Blink Slow	Connection to ISP is established. Download and Upload Optimizers are ready.
STATUS = Green Blink Fast	Connection to ISP is established. Download and/or Upload Optimizer is active.
STATUS = Red Blink Slow	Bandwidth Optimizer is disabled, or connection to ISP is broken or not established yet.
STATUS = Red Blink Fast	Error requiring manual intervention.
STATUS = Red and Green	Defect requiring factory repair.

24. Power Consumption

	300 Series	1000 Series	5000 Series
Typical	12 Watt	24 Watt	24 Watt
Maximum	15 Watt	35 Watt	35 Watt
Typical annual power consumption	105 kWh	210 kWh	210 kWh

The table above shows the power consumption at the primary side of the power supply, i.e. at the 110-240V plug. The annual cost of electricity for the FairRouter can be estimated by multiplying the price of electricity (per kWh) with the typical annual power consumption of the installed FairRouter.

25. Environmental Requirements

Power	100 – 240 V, 50 – 60 Hz
Temperature	0 – 40 °C
Humidity	5 – 95 %RH, non-condensing

26. Compliance Statement

The product complies with directive 2006/95/EC (LVD) and 2004/108/EC (EMC).

The product complies with the following requirements:

Electrical Safety	UL 60950 CSA 60950 EN 60950 IEC 60950
EMC Emission	FCC Part 15, Subpart B Class A IC ICES-003 Class A EN 55022 Class A CISPR 22 Class A
EMC Susceptibility	EN 55024 CISPR 24
CE Mark	Yes

26.1 Model Type Labels

300 Series products are labeled model DT.

1000 Series, 2000 Series, 3000 Series and 5000 Series products are labeled model RM.

27. Glossary

ATL	Anti Terror Logger (or Anti Terror Logging)
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DQoS™	Dynamic Quality of Service™
DSCP	Differentiated Services Code Point
FTP	File Transfer Protocol
GUI	Graphical User Interface
IP	Internet Protocol
ISP	Internet Service Provider
LAN	Local Area Network
LED	Light Emitting Diode
MIB	Management Information Base
MTU	Maximum Transmission Unit
NAT	Network Address Translation
NAPT	Network Address and Port Translation
NTP	Network Time Protocol
QoE	Quality of Experience
QoS	Quality of Service
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SPI	Stateful Packet Inspection
TOS	Type Of Service
ULB™	User Load Balancing™
VoIP	Voice over IP
WAN	Wide Area Network

28. Licensing Information

This product is licensed under the following licensing terms.

28.1 END USER LICENSE AGREEMENT

PLEASE READ THIS END USER LICENSE AGREEMENT ("EULA") CAREFULLY BEFORE DOWNLOADING, INSTALLING OR USING THE SOFTWARE.

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This EULA is effective until terminated. Customer may terminate this EULA at any time by returning the Equipment, and destroying all copies of Software including any documentation. This EULA will terminate immediately without notice from SmartShare Systems if Customer fails to comply with any provision of this EULA. Upon termination, Customer must destroy all copies of the Software.

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Entire agreement

This EULA constitutes the entire EULA between the parties with respect to the use of the Software.

28.2 Third Party Software Components

The third party software components that may be included in the Software are individually licensed according to the following license agreements:

- GNU General Public License v. 2.0
- GNU Library GPL version 2.0
- GNU Lesser GPL version 2.1
- COPYING file dated 2004 for lighttpd (revised BSD license)
- PHP License version 3.01
- Zend Engine License version 2.00

The content of these individual licenses can be found at SmartShare Systems' website (<http://smartsharesystems.com/en/support/licenses>).

28.2.1 Acknowledgements for third party software components

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"This product includes PHP software, freely available from <<http://www.php.net/software/>>"

"This product includes the Zend Engine, freely available at <http://www.zend.com>"

28.2.2 Open Source Software Components

The Software may contain Open Source Software Components, i.e. software components licensed with the requirement that its source code can be obtained from the distributor of the software component.

The source code for Open Source Software Components that may be included in the Software can be obtained directly from SmartShare Systems (<http://smartsharesystems.com/en/support/licenses>).

Please note that only the source code for the Open Source Software Components is provided. Although all SmartShare Systems' modifications of the Open Source Software Components are included in the source code, as required by their respective licenses, the Open Source Software Components are only a small part of the Software.

29. Safety Instructions

The FairRouter is intended for use in a computer network to improve the overall network performance for the users of the network.

In case your product is equipped with a detachable power cord, beware of the following:

Do not attempt to modify or use a supplied AC power cord if it is not the exact type required. If a power cord supplied with the device is not compatible with the AC wall outlet in your region, get one that meets the following criteria. The cord must be rated for the available AC voltage and have a current rating that is at least 125% of the current rating of the device. The connector that plugs into the wall outlet must be a grounding-type male plug designed for your region. It must have the certification marks showing certification by an agency acceptable in your region. The connector that plugs into the AC receptacle on the device must be an IEC 60320 C13, type female connector.

- For 1000 and 5000 Series models:
Do not attempt to modify or use a supplied AC power cord if it is not the exact type required. If a power cord supplied with the device is not compatible with the AC wall outlet in your region,

get one that meets the following criteria. The cord must be rated for the available AC voltage and have a current rating that is at least 125% of the current rating of the device. The connector that plugs into the wall outlet must be a grounding-type male plug designed for your region. It must have the certification marks showing certification by an agency acceptable in your region. The connector that plugs into the AC receptacle on the device must be an IEC 60320 C13, type female connector.

- For 300 Series models:

Do not attempt to modify or use a supplied AC power cord if it is not the exact type required. If a power cord supplied with the device is not compatible with the AC wall outlet in your region, get one that meets the following criteria. The cord must be rated for the available AC voltage and have a current rating that is at least 125% of the current rating of the device. The connector that plugs into the wall outlet must be a male plug designed for your region. It must have the certification marks showing certification by an agency acceptable in your region. The connector that plugs into the AC receptacle on the device must be an IEC 60320 C6/C8, type female connector.

29.1 **Warning**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

29.2 **Product Disposal**

Electrical and electronic products, accessories and batteries should not be disposed of with normal household waste. Please consult your local municipality or your national SmartShare Systems distributor for advice on how to dispose of these items.

