

*open-e*

Open-E NAS  
ENTERPRISE

Manual (Ver. 1.88)  
May 19, 2006

# TABLE OF CONTENTS

<b>1</b>	<b>BEFORE YOU GET STARTED</b>	<b>4</b>
1.1	CONTENT OF THIS PACKAGE	4
1.2	SYSTEM REQUIREMENTS	4
1.3	SUPPORTED CLIENTS	5
1.4	SUPPORTED NETWORK PROTOCOLS	5
1.5	SUPPORTED NETWORK FILE PROTOCOLS	5
1.6	REQUIRED TOOLS	5
1.7	SAFETY PRECAUTIONS	5
1.7.1	<i>Personal safety</i>	5
1.7.2	<i>Safety for your data</i>	5
1.7.3	<i>ESD precautions</i>	5
<b>2</b>	<b>FEATURES</b>	<b>6</b>
2.1	WHAT IS NAS?	6
2.2	DESCRIPTION OF THE FUNCTIONS	6
2.3	WHY OPEN-E NAS?	7
2.4	RAID TYPES	7
<b>3</b>	<b>HARDWARE INSTALLATION</b>	<b>8</b>
3.1	GETTING READY	8
3.2	INSTALLING OPEN-E NAS	8
<b>4</b>	<b>CONFIGURATION</b>	<b>10</b>
4.1	THE BASIC CONFIGURATION OF THE NAS COMPUTER	10
4.2	FIRST-TIME OPERATION OF OPEN-E NAS	10
4.3	LOGGING INTO OPEN-E NAS ENTERPRISE	11
4.4	ADDING RAID-ARRAYS	13
4.5	CREATING NAS SHARES	13
4.5.1	<i>Access to Windows Shares</i>	14
4.5.2	<i>Access NAS Shares under Linux</i>	19
<b>5</b>	<b>DESCRIPTION OF FUNCTIONS</b>	<b>20</b>
5.1	FUNCTIONS OF THE CONSOLE DISPLAY	20
5.2	FUNCTIONS OF OPEN-E NAS VIA BROWSER ACCESS	21
5.2.1	<i>Menu "Resources"</i>	21
5.2.1.1	Shares	22
5.2.1.2	User	26
5.2.1.3	Groups	29
5.2.2	<i>Setup</i>	30
5.2.2.1	Server	30
5.2.2.2	Network	37
5.2.2.3	Administrator	40
5.2.2.4	UPS	45
5.2.2.5	Disk Manager	45
5.2.2.6	GUI	52
5.2.3	<i>Maintenance</i>	52
5.2.3.1	Shutdown	52
5.2.3.2	Snapshot	54
5.2.3.3	Miscellaneous Resources	55
5.2.3.4	Software Update	57
5.2.3.5	Backup	58
5.2.4	<i>Status</i>	61
5.2.4.1	Network	61
5.2.4.2	Share Volume	61
5.2.4.3	Connections	62
5.2.4.4	Hardware	63
5.2.5	<i>RAID</i>	64
5.2.6	<i>Help</i>	66
<b>6</b>	<b>TROUBLESHOOTING GUIDE</b>	<b>68</b>

7 APPENDIX A ----- 72  
8 APPENDIX B ----- 74

## **Copyright**

(c) 2004 Open-E GmbH. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form, by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Open-E GmbH, Lindberghstr. 5, 82178 Puchheim, Germany.

## **Trademarks**

Open-E and Open-E NAS logos are all registered trademarks of Open-E GmbH. Windows ((R)), Microsoft ((R)) and Apple ((R)) are registered trademarks in the United States and other countries. Pentium ((R)) and Intel ((R)) are registered trademarks in the United States and other countries. All other trademarks herein are property of their respective owners.

## **Disclaimer**

Open-E GmbH assumes no responsibility for errors or omissions in this document, and Open-E GmbH does not make any commitment to update the information contained herein.

# 1 Before you get started

Congratulations on purchasing Open-E NAS ENTERPRISE, the ideal solution for network-based storage management. This manual will assist you as you install and configure the hardware.

In order to quickly reach the desired configuration, please read the following pages thoroughly. The time invested is well spent - after all, you have purchased this solution for your invaluable data.

## 1.1 Content of this package

Before you begin installing Open-E NAS ENTERPRISE, make sure that the package contains the following items:

- Open-E NAS flash module,
- Power adapter,
- Quick Start brochure,
- A CD containing the manual (this document), brochures, images and additional information material,
- Source CD.

If something is, indeed, missing, please contact your dealer.

## 1.2 System requirements

- x86-compatible PC (Pentium IV),
- at least 256 MB main memory,
- Hardware RAID Controller,
- IDE port
- One or several suitable hard drives,
- Network Interface Card (NIC).

Open-E NAS ENTERPRISE contains its own operating system, meaning that no additional software is required.



***Note: In order to generate maximum performance, we recommend using a network card with 100 MBit/s or more, as well as a processor with at least 1,4 GHz. If several computers are accessing the NAS system, we recommend 512 MB main memory or more.***

## 1.3 Supported clients

- Microsoft Windows (all versions)
- Linux
- Mac OS 8.0, 9.0 and OS X

## 1.4 Supported network protocols

- TCP/IP
- NetBEUI
- SNMP

## 1.5 Supported network file protocols

- SMB / CIFS / Samba
- Apple Talk
- FTP/sFTP

## 1.6 Required tools

- Grounding strap or mat in order to avoid electrostatic discharge (ESD)
- Tools for opening the computer's enclosure (typically, a screwdriver)

## 1.7 Safety precautions

### 1.7.1 Personal safety



**Caution:** *High voltages may occur inside computer equipment. Before removing the enclosure, please turn off the power switch and disconnect the power cords.*

### 1.7.2 Safety for your data

If you are not using new hard drives for operating Open-E NAS, please backup all important data prior to installation. Adding a hard drive to Open-E NAS goes hand in hand with complete formatting of the hard drive, which can possibly delete existing data.

### 1.7.3 ESD precautions

In order to avoid damage to your computer or to Open-E NAS, please ensure you are grounded before opening the PC or the ESD package that contains Open-E NAS. Using grounding straps or mats is the best way to ensure this safety. If you don't have grounding equipment handy, please make sure you are grounded before working with Open-E NAS, for instance, by touching a heater.

- Avoid unnecessary touching of the components inside the PC
- Please touch Open-E NAS only on the edges

## 2 Features

### 2.1 What is NAS?

Network Attached Storage (NAS) solutions are defined as storage systems that are directly hooked up to a network infrastructure. Also, they operate independently and do not have to be connected to a server via a controller or host adapter. The term “storage” here generally refers to all systems that either provide data storage or actually store or organize data. Currently, data storage is the most common and most widespread type of NAS systems.

NAS solutions are based on a separate operating system (and often also on special hardware), which operates independently from the servers on a network. Typically, this operating system is software that is optimized for providing data (file server).

NAS solutions allow users to add additional storage to existing networks quickly, easily, and cost-efficiently.

### 2.2 Description of the functions

Open-E NAS is one of the easiest ways of implementing an NAS server in your network. Through its simple architecture – in principal, it is a flash memory with IDE interface and Open-E NAS as its operating system – Open-E NAS can be used with all x86 PCs containing an IDE controller and additional RAID Controller. Older computers may also be used.

To start working with Open-E NAS, all you need to do is assign an IP address to the NAS server – either automatically through an existing DHCP server or by assigning it manually. All other settings are handled via a web front-end which can comfortably be accessed via the IP address of Open-E NAS using the encrypted https protocol.

Open-E NAS allows users to create so-called shares (i.e., resources within a network that numerous users or user groups have certain access too). The access rights to the shares are controlled through the user and user group settings.

## 2.3 Why Open-E NAS?

Often, storage in network environments is expanded the following way: File servers have to be shut down in order to install additional drives. In the next step, they need to be reconfigured. In tedious work, data often has to be copied manually onto larger drives, consuming a lot of time and causing costs.

With Open-E NAS, you can add storage to your existing network quickly, easily, and, most important, cost-efficiently. Expensive hardware is, therefore, no longer necessary. Take any computer – a new rack server or an old desktop PC – and exchange the system drive for the Open-E NAS flash module. To store data, Open-E NAS uses IDE (ATA) and SATA hard drives.

Within a few minutes, you will have up to several hundred gigabytes available on your network – without much effort and any downtime.

## 2.4 RAID types

This manual is not intended to replace your RAID controller manual. But we want to provide you with an overview of common RAID types so that you can make an informed decision on which type to choose. Depending on whom you ask, RAID means either Redundant Array of Independent Disks or Redundant Array of Inexpensive Disks. Both are correct. In essence, you combine the capacity, speed and security of several disks into one.

**RAID 0** forms one large hard disk by concatenating stripes from each member drive. Stripe size is configurable roughly between 64 KB and 1 MB. The result is a lightning-fast RAID, but with no added security. One failing drive may ruin the entire RAID.

**RAID 1** mirrors hard drives. By writing identical data onto more than one drive, security is enhanced. A completely defective drive does not cause any loss of data. The drawback is reduced performance and capacity.

**RAID 5** combines data striping from RAID 0 with parity checking, therefore combining speed and improved security. The loss of one drive is tolerable.

**RAID 10** is a combination of RAID 1 and 0, hence the name. Data is written in a striped and mirrored configuration, providing high performance and robust security.

## 3 Hardware installation

### 3.1 Getting ready

Switch off the computer, remove the power supply, and open the PC's enclosure. In tower cases, the side parts often can be removed individually (on the backside of the enclosure you just need to remove a few screws). Many machines have U- or O-shaped covers that have to be pulled off (either towards the front or the back). Should you need any assistance, please contact your dealer.

Now localize the IDE connectors on your motherboard:

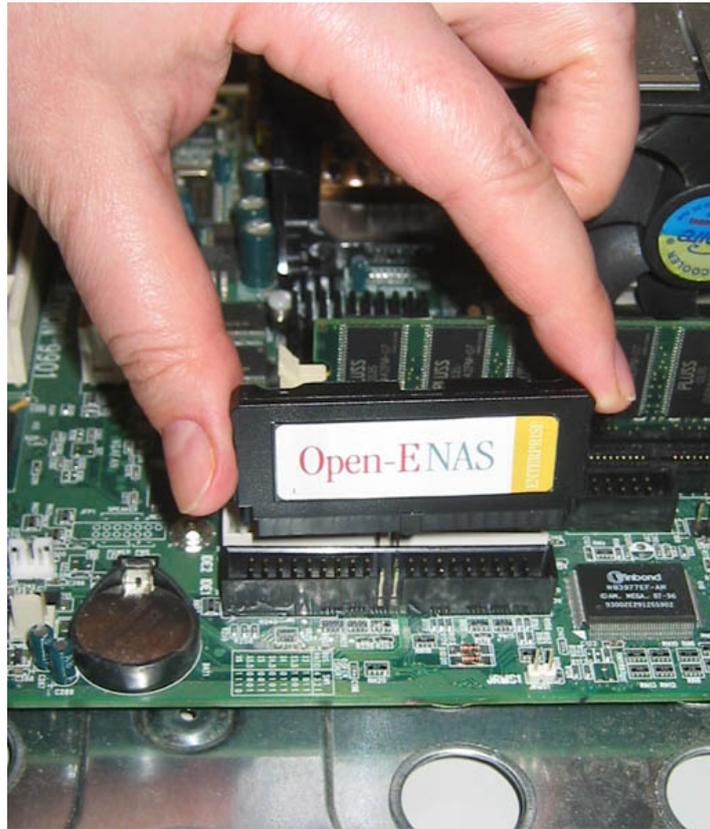


Every motherboard has at least two such ports. To install Open-E NAS, you have to use the first (primary) port.

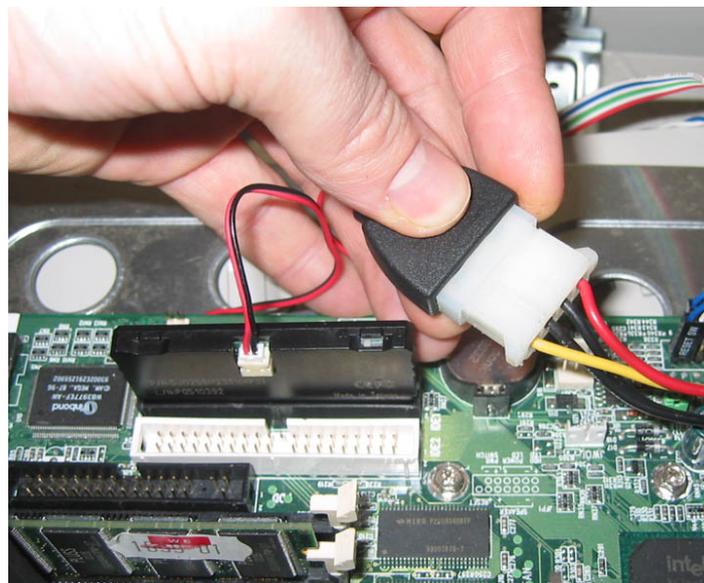
Often, the labeling on the IDE connectors may be tiny, but it is always there, on each and every board. Preferably look for "IDE 0" If this connector does not exist, the first port is called "IDE 1" (with the second connector being 2).

### 3.2 Installing Open-E NAS

If necessary, remove the flat band cable which, so far, connected your hard drive with the controller. Open-E NAS is now carefully inserted into the connector. As IDE ports can have a notch on one side, you can only insert the connector at the preset position.



In the package you will find an adapter cable which provides Open-E NAS with electricity. The little white plug corresponds with the matching connector on Open-E NAS. In a final step, the adapter has to be connected to the white power-supply plug (see photo):



That already concludes the installation! Before putting the enclosure on your computer again, do not forget to connect your hard drives to the RAID controller. If you have a CD or DVD drive, you can remove it, as Open-E NAS does not support optical hard drives, but if you want to make an ISO update it is not necessary to remove the CD drives (see 5.2.3.4).

## 4 Configuration

### 4.1 The basic configuration of the NAS computer

Connect your keyboard and a monitor to the NAS computer. You will only need those devices for the basic or extended maintenance configuration.



**Note:** *You may have to change the function “Halt On: All Errors” in your PC’s BIOS, so that the system starts even without the keyboard. The correct configuration is “Halt On: All But Keyboard.”*

### 4.2 First-time operation of Open-E NAS

Now start your system. After booting is complete, Open-E NAS will provide you with information on the current software version and the network settings:

```
Welcome to Open-E NAS                                     (Press F1 for Help)
-----

Model:           Open-E NAS ENTERPRISE
Version:         1.88.E00000001.1811
Release date:    2006-05-19
S/N:            1357186427

Network settings:
interface 1:     eth0      ip: 192.168.0.220
interface 2:     eth1      ip: 192.168.1.220

Https settings:
                port      443
                allow from all
```

If the network has a DHCP server, Open-E NAS should gain access to the IP settings automatically. If that is the case, you can proceed at 4.3. If your network does not have a DHCP server, Open-E NAS will start with the default settings: IP address 192.168.0.220 and subnet mask 255.255.255.0.

You can change these values again by typing in the following key combination: left CTRL, left ALT and N. You can select a different IP address now. All other available functions on of the console will appear after pressing F1 key (see below).

```
----- Help -----
You can use below key sequences (C-means 'Left Ctrl',A-'Left Alt'):
C-A-N   - to edit static IP addresses
C-A-P   - to restore default factory administrator settings
C-A-I   - to restore default factory IP configuration
C-A-T   - to run console tools
C-A-X   - to display extended tools
C-A-H   - to display hardware and drivers info
F2      - to display all network interface
F5      - to refresh console info
C-A-S   - to shutdown the system
----- (100 %) -----
< EXIT >
```

After a connection has been established, all settings can also be changed remotely via the web browser. If your network require, the address of the standard gateway and the broadcast address can be changed.



**Note:** *For additional information, please read the chapter “Functions of the console display”*

### 4.3 Logging into Open-E NAS ENTERPRISE

You can establish a connection to Open-E NAS from every network computer. To establish this connection, use a browser (e.g. Microsoft Internet Explorer) and enter the IP address or the name of the computer hosting the NAS server into the URL entry line: <https://192.168.0.220> (standard address) or <https://ancom> (this name can be changed in the installation of Open-E NAS).

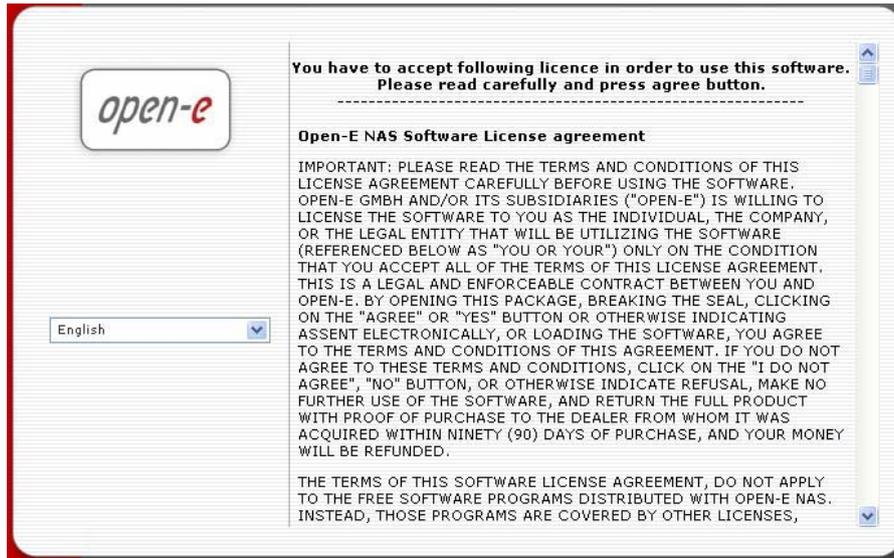


**Notes:** *For security reasons, Open-E NAS uses the encrypted SSL protocol (https).*

You will now be asked for verification of the encryption certification. Since Open-E NAS does not allow for creating shares on the Internet but only on the Intranet, there is no need for global certification by an authorized body. You can accept the certificate for the session only, but also for all future use.

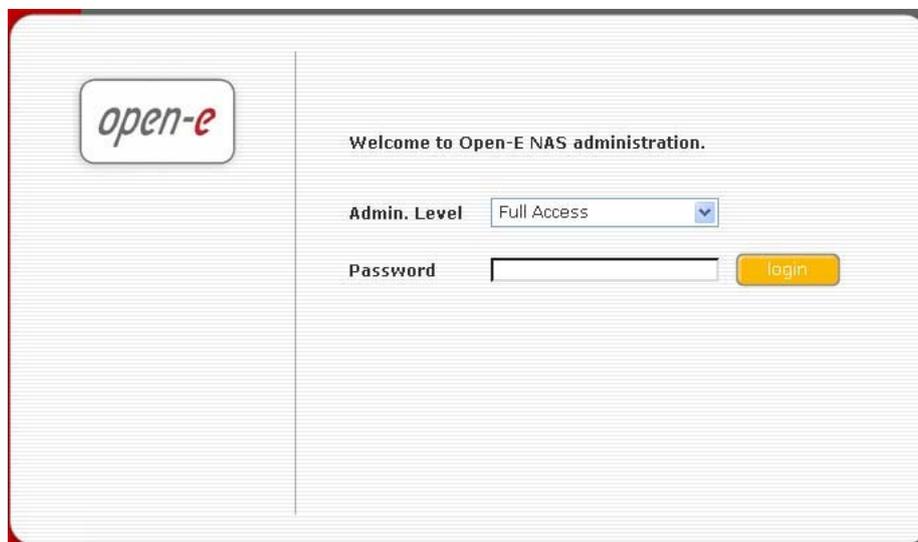
Now you have to accept license in order to use software Open-E NAS and you can choose language.





**Notes:** *Page with software agreement and available language option will be shown after first launching Open-E NAS. Later language you can change using Language Settings, which are located in server available through Setup.*

After accepting License agreement you can log into Open-E NAS using the standard password “ancom” (this can be changed later). In order to start working, you can now set all server parameters.



**Notes:** *Password checking is case-sensitive. If you cannot log into Open-E NAS, please check the status of the Shift and Caps Lock keys.*

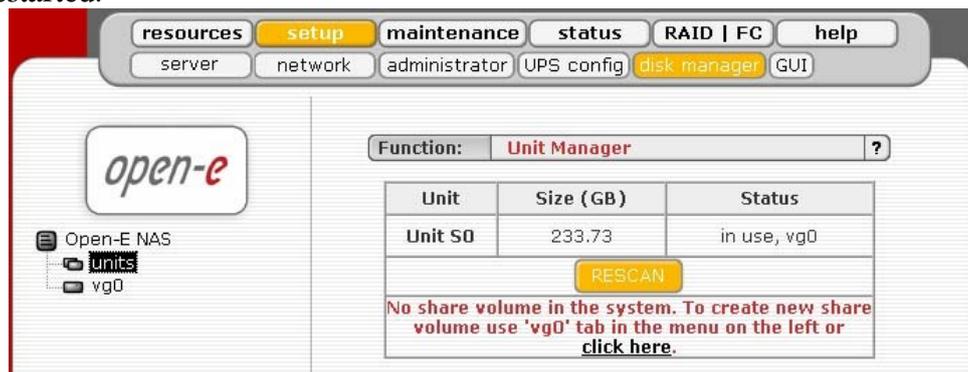


**Notes:** *In case your web browser will show something different then expected, please delete the cache & cookies in settings menu of your web browser.*

## 4.4 Adding RAID-Arrays

Please select “Setup” and then “Disk Manager”. After selecting “Disk Manager” you’ll find a list of all logical units (i.e. RAID array). To add a new unit to the NAS, please click “Add”. After the necessary formatting procedure, the status of the unit will change from the “Add” button into “In use”.

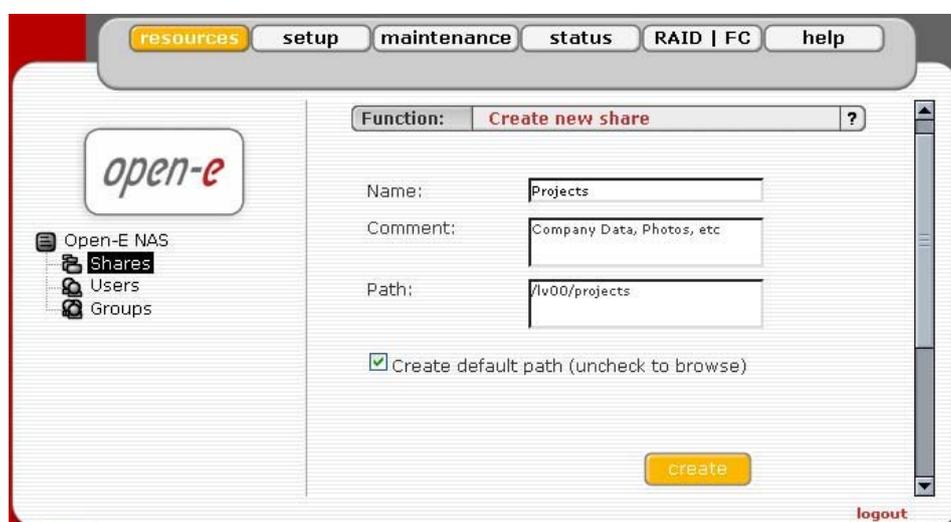
Please note that you can expand the storage capacity by adding new RAID arrays. In the “Unit Manager” Open-E NAS will show both ‘in use’ and new, unformatted units. In order to add a new unit to the Volume Group (vg0), please simply click ‘Add’ after which Open-E NAS page will be restarted.



Next, by clicking on the branch “vg0” you can add disk volume to new LV, or increase size on existing LV’s (you can’t decrease LV size). To set needed LV size just use scrollbar, next to which, on the right side is shown size available to use. This function can be also used to reserve disk space for “snapshots”. Usually for “snapshots” you need about 10% of new Logical Volume.

## 4.5 Creating NAS shares

In the menu, please select “Setup,” followed by “server.” Here, you select the type of authentication. In smaller networks, this should be done via the used workgroup name, which has to correspond with the workgroup name of the client PC.



In the menu “Resources,” select “Shares” on the right-hand side of the tree diagram. Now create the first share.



**Notes:** *The workgroup/domain name that was configured in Open-E NAS has to match with the network settings. Otherwise, the configured shares are not visible in the network environment.*

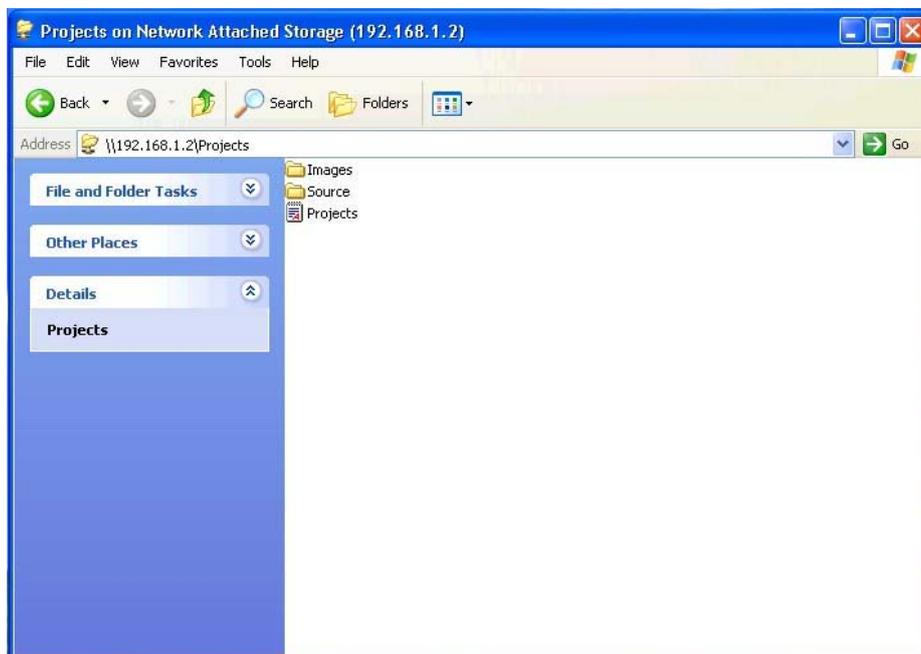


**Notes:** *If you made changes to the workgroup and server name in Open-E NAS configuration, it can take some time until each workstation computer in the Windows network detects the new name.*

#### 4.5.1 Access to Windows Shares

The access to newly created shares is generated via the Windows Explorer. After entering the IP address of your Open-E NAS (in this example \\192.168.1.2), all visible shares should be available immediately. Please keep in mind that sometimes it takes a few minutes for the new shares or changes to become accessible.

When accessing invisible shares, you need to know beforehand the corresponding share name and attach it to the IP address with a backslash (\):



Open-E supports Windows ACL (Access Control List) for read, write and execute options, but based on the POSIX standard written by SGI.

Some examples how to use ACL (with ADS or PDC authentication):

1. Deny access to a Directory for every user (group):
  - a. Create a new folder or select one of your existing folders (you must be the owner or superuser to set ACL permissions)\*
  - b. Go to the “directory properties” (right mouse click on the directory then choose "Properties")
  - c. Select a the “security” tab
  - d. Choose the group "Everyone"
  - e. Click the "Remove" button – only you and your group will have access to the selected directory \*\*
  - f. Click the "Apply" button

Now only you have permissions to access this directory.
2. Allow full access for a group "WORK" to this Directory:
  - a. Make sure that the group WORK is created
  - b. In the security window click the "Add" button
  - c. Click the "Remove" button (point 1)
  - d. Select the group "WORK" (Advanced->Find Now will show you all users and groups) and click OK
  - e. Enable Full Control in the “Allow” column
  - f. Click the "Apply" button
3. Set “read only” permissions to the file for everyone:
  - a. Create a new file (you must be the owner or superuser to set permissions)\*
  - b. Go to the permissions window
  - c. Select the “Everyone” group
  - d. Leave only a ”read” permission in "Allow" column
  - e. Click the "Apply" button
  - f. Make the same for your group and yourself

Now the group “Everyone” has "read only" permissions to this file.
4. Changing the directory owner:
  - a. On Open-E web interface go to resources->shares
  - b. In the "Set Superuser" function select your user and restart connection (maintenance ->shutdown->Function Connections reset) or wait about 15 minutes
  - c. Go to the directory/file properties (right mouse click->properties on the directory and click the "security" tab)
  - d. Click the "Advanced" button
  - e. Select the Owner tab
  - f. Click the "Other Users or Group" button and select the user that will be a new owner (Advanced->Find Now will show all users and groups), click OK\*\*\*
  - g. Select the user from the list and click OK and the "Apply" button
  - h. Click OK and re-open this window to refresh owner.
5. Allow a full access for the user "BIG BOSS" to this Directory
  - a. Make sure that the "BIG BOSS" exists

- b. In the security window click the "Add" button
  - c. Select the user "BIG BOSS" (Advanced->Find Now will show you all users and groups) and click OK
  - d. Enable Full Control in the Allow column
  - e. Click the "Apply" button
6. Allow "read" access for a group "COMPANY" to this directory
- a. Make sure that the group "COMPANY" exists
  - b. In security window click the "Add" button
  - c. Select the group "COMPANY" (Advanced->Find Now will show you all users and groups) and click OK
  - d. Enable "Read & Execute" in the Allow column
  - e. Click the "Apply" button
7. Make "read only" directory with a full access subdirectories for the group "ALL" (using inheriting permissions)
- a. Create a folder "ROOT"
  - b. Go to the security window
  - c. Remove both "Everyone" and "Your" group
  - d. Click the "Advanced" button and then the "Add" button
  - e. Select the "ALL" group and click OK
  - f. Change "Apply onto" to "This folder only"
  - g. In permissions leave only "Traverse Folder / Execute File" and "List Folder / Read Data". Click OK
  - h. Click once again the "Add" button and add ALL group
  - i. This time select "Apply onto" to "Subfolders and files only" (this step will submit any inherited permissions)
  - j. Select "Full Control" and OK
  - k. Click "Apply" to save permissions.

With these settings users from the group "ALL" cannot remove the "ROOT" folder or make any changes to its contents. All new files/folders will be created based on the access given by inherited permissions.

Example:

- file /ROOT/some\_file.txt can be changed but can not be removed
- directory /ROOT/directory can not be removed but a users from the group ALL can create folders and files in this directory.
- file /ROOT/directory/my\_file.txt can by removed and changed by the group ALL (if inherited permissions wasn't changed)

## 8. Inherited permissions

If the file or directory has inherited permissions, all newly created subfolders will inherit the main folder permissions. All permissions can be changed. Please keep in mind that changing permissions in the main folder will trigger the same changes to the inherited permissions of any subfolder within.

9. UNIX Rights in Windows:  
Folders permissions

Permissions	--x	r--	-w-	r-x	rw-	-wx	rwX
Traverse Folder / Execute File	√			√		√	√
List Folder / Read Data		√		√	√		√
Read Attributes	√	√		√	√	√	√
Read Extended Attributes		√		√	√		√
Create Files / Write Data			√		√	√	√
Create Folders / Append Data			√		√	√	√
Write Attributes			√		√	√	√
Write Extended Attributes			√		√	√	√
Delete Subfolders and Files							√
Delete							√
Read Permissions	√	√	√	√	√	√	√
Change Permissions							√
Take Ownership							√

10. Example application of ACL permission in a small company.

The company has 10 users

Name	Group	Position	Rights
Chris	Firma	Director	All rights for everything
Robert	Firma	Manager	All rights for everything besides Directors home directory
Jennifer	Firma	Secretary	Read access to "DOCUMENTS" directory
Clint	Firma Developers	Main Developer	Read and write to "DEVELOPERS" directory read and write to "CHANGES" directory
Brad	Firma Developers	Developer	Read in „DEVELOPERS“ Read and write in „Changes“
Johnny	Firma Developers	Developer	Read in „DEVELOPERS“ Read and write in „Changes“
Tom	Firma Developers	Developer	Read in „DEVELOPERS“ Read and write in „Changes“
John	Firma Graphics	Graphic Designer	Read in „GRAPHICS“ Read and write in „Changes“
Ben	Firma Graphics	Graphic Designer	Read in „GRAPHICS“ Read and write in „Changes“
Bill	Firma	Cleaner	Only access to his home directory

First create users and groups in Your Domain:

- a) Run Menu Start->Programs->Administrative Tools->Active Directory Users and Computers
- b) Right mouse click on your domain name and select New->User
- c) Enter all necessary fields to create user Chris.
- d) Create all users (back to point 2).
- e) Click with right mouse click on your domain name and select New->Group
- f) Create groups: Developers, Graphics, and Company.
- g) Add users to groups - right mouse click on group Developers. In Members tab click Add. Add users to groups (groups Company, Developers, Graphics)

Connection to windows domain:

- a) Go to Open-E NAS Web interface setup->server
- b) Select ADS or PDC (depends on your system - if you have NT4 Domain or Windows 2003 (with no Kerberos\*\*\*\* fix) then select PDC, else select ADS).
- c) Enter your domain name - in PDC this will be the number IP and administrator password in ADS enter the full domain name (example. COMPANY.COM.DE).
- d) Enter your domain/Kerberos server IP
- e) Enter the name and password of an existing Administrator user account on your domain.
- f) Click the "Apply" button to join the domain.

Creation of shares and set permissions:

- a) Create a Company share (Open-E NAS web interface->Resources->Shares).
- b) Set permissions for all or select only Company groups.
- c) Go to share \\YOUR\_NAS\_SERVER\_NAME\\Company
- d) Create folders "WORK", "HOME" and "FORALL".
- e) Set permissions for the folder WORK - right mouse click ->properties->security.
- f) Deny access for everyone (point 1), change the owner to Chris user (point 4) with a full access and add Robert with a full access.
- g) In the folder WORK create folders DEVELOPER, GRAPHIC, DOCUMENTS and CHANGES.
- h) Change the owner of the DEVELOPER directory to Clint (with full rights). Add group Developers with a "read only" access.
- i) Add group Graphics with a full access to the directory GRAPHIC.
- j) Change the owner of the CHANGES directory to Clint (with full rights). Add groups Graphics and Developers with full rights.
- k) Add a secretary to the DOCUMENTS directory with a "read only" access.
- l) In the home directory create own private directory for each user, change user (make that the owner and the directory name are the same). Remove an access for the Company group (point 1).
- m) Add the group Company with a full access to the directory "FOR ALL".

- \* If you use the SUPERUSER all files and directories will be created as a local ROOT user.
- \*\* New directories with no inherited permissions do not have ACL permissions at the beginning - they have only standard UNIX permissions 0777 (Windows 2003 shows - in a normal view in the security window - every special permission. Windows 2000 does not show any permission in normal view - only in the advanced view). To enable ACL for this directory, first select "Full Access" for everyone and click the "Apply" button. Subsequently do the same for your group and your user. Subdirectories created in this directory should have ACL permissions inherited from the parent. If permissions are inherited then the "ALLOW" column is grey. To disable permission just use the "Deny" column.  
If you change ACL permissions always check that a new set of permissions for one group does not interfere with permissions for the other user/groups or any connections between these accounts. Windows 2003 handles much better such changes than Windows 2000.
- \*\*\* This function is available in Windows 2003 - in other Windows versions only your user can be selected.
- \*\*\*\* Kerberos is a server for distributing security keys. Normally it is only on the domain but it can be on some external server. In Windows 2003 this server is ignoring specified key types, and authorization works only when entering IP not the NAS name.

#### 4.5.2 Access NAS Shares under Linux

Please use following line to mount an NFS share:

```
mount -t nfs 192.168.0.220:/nfs /mnt/nfs
```

where 192.168.0.220 is the Open-E NAS IP and /mnt/nfs your local mount point

Please use following line to mount an SMB share:

In a shell:

```
mount -t smbfs -o username=root,password=12345 //192.168.0.220/test /mnt-smb
```

where 'test' is the share name

In X-windows: Smb://root@192.168.0.220/

## 5 Description of functions

### 5.1 Functions of the console display

While Open-E NAS can be fully administered remotely through a secure Web interface, but some of the functions you can also on the console. Open-E NAS constantly displays following basic parameters:

- IP address
- Https settings

#### CTRL+ALT+n

If you press the left CTRL key + the left ALT key + n, you will be asked for the new IP address and the subnet mask. The DHCP server will be shut down.

#### CTRL+ALT+p

If you press the left CTRL key + the left ALT key + p, the access restrictions are lifted by entering the administrator password (in addition, there is a reset to the standard https port 443).

#### CTRL+ALT+i

By pressing a combination of left CTRL key, left ALT key and i, you can reset the original IP address (192.168.0.220) and the subnet settings (255.255.255.0). In this process, the DHCP server support is turned on.

#### CTRL+ALT+t

By pressing a combination of left CTRL key, left ALT key and t, you can run Console Tools. The menu will appear, with choice of following functions: Ping, DHCP Ping, Hardware info, Memory info, Time configuration and DNS configuration.

#### CTRL+ALT+h

By pressing the left CTRL key, left ALT key and h, it will display hardware and driver information.

#### CTRL+ALT+x

By pressing the left CTRL key, left ALT key and x, it will display extended tools.

#### F1, F2 and F5

Function key F1 is available to display help information while F5 will reset the console display to default. If you press F2 key all network interface will be displayed.

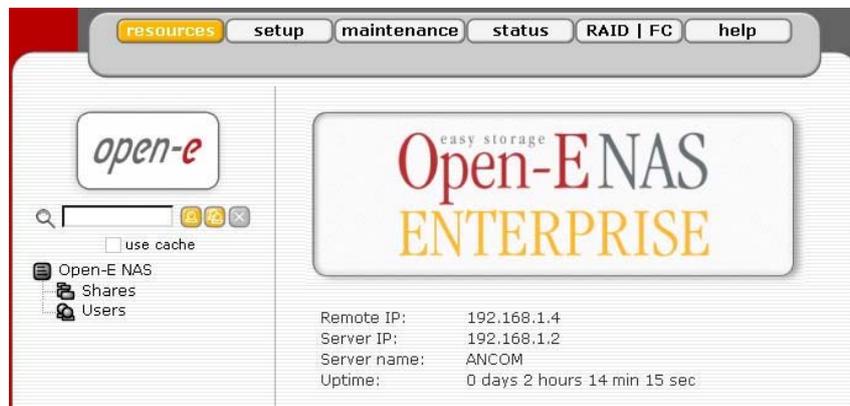
#### Shutting down and restarting

With Ctrl + ALT + DEL the Open-E NAS host computer will be shut down and restart, while CTRL + ALT + S shut it down. Please be careful with this option when users are connected.

## 5.2 Functions of Open-E NAS via browser access

On the following pages, we will thoroughly describe every function of Open-E NAS. The functions are divided by menu options, which are located at the top part of the screen.

### 5.2.1 Menu “Resources”



Here, you can find important data status (IPs, server name, uptime), and you can configure NAS operations. All that may be accomplished by using tree diagrams on the left side. This will help you manage all shares, users, user groups in a structured manner and in addition control search.

The search control can be enabled in the Open-E NAS menu->setup->GUI in the Search preferences Function.

The search control allows to lookup users or groups in the remote or local user database that NAS server is currently attached to. To apply a criterion put a string into the 'search' textbox and click on the play button. All found entries, containing the search string typed-in, would be listed. Note that the first time you use the search facility, your query will be sent back to the server for processing. All the subsequent searches will access only the locally cached data to save the time. To query the database directly again, set out the 'use cache' checkbox.

You can use regular expressions to look for users, for example:

- to lookup users' ID beginning with the word 'beg' type ^beg,
- similarly, append '\$' to the string if you want to lookup entries ending with that text,
- to lookup users or groups ending with 'frog' type-in frog\$.



**Notes:** *By default the search textbox is empty which does not impose any criteria as to what groups or users are shown in the tree. After you hit the play button the first found users/groups will be shown (up to the limit given).*

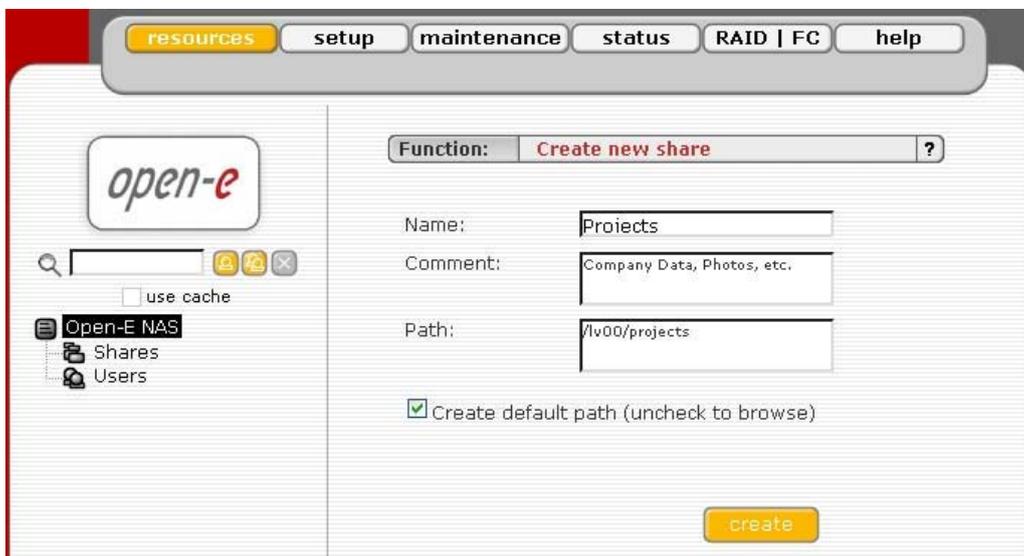
Adding elements to the tree can be a time consuming task – especially when the criteria are not tight enough and limit is set up to more than 300 entries. To cancel the operation before it is finished, click on the stop button.

### 5.2.1.1 Shares

Here, all shares on your Open-E NAS are listed. By clicking on the branch “Shares,” with Function “Create new share” you can define a new share or comment it (optional) or set the path. Organized below, you will find all existing shares, which you can edit with a simple click. With the exception of the name, you may alter all parameters. If, however, you must change a name, delete it and assign a new name.

Windows users will see the name of the share in the folders of their network environment when they click on the icon for the NAS server. The comment is only visible if the users take a look at the share properties, or if shares are listed in detail.

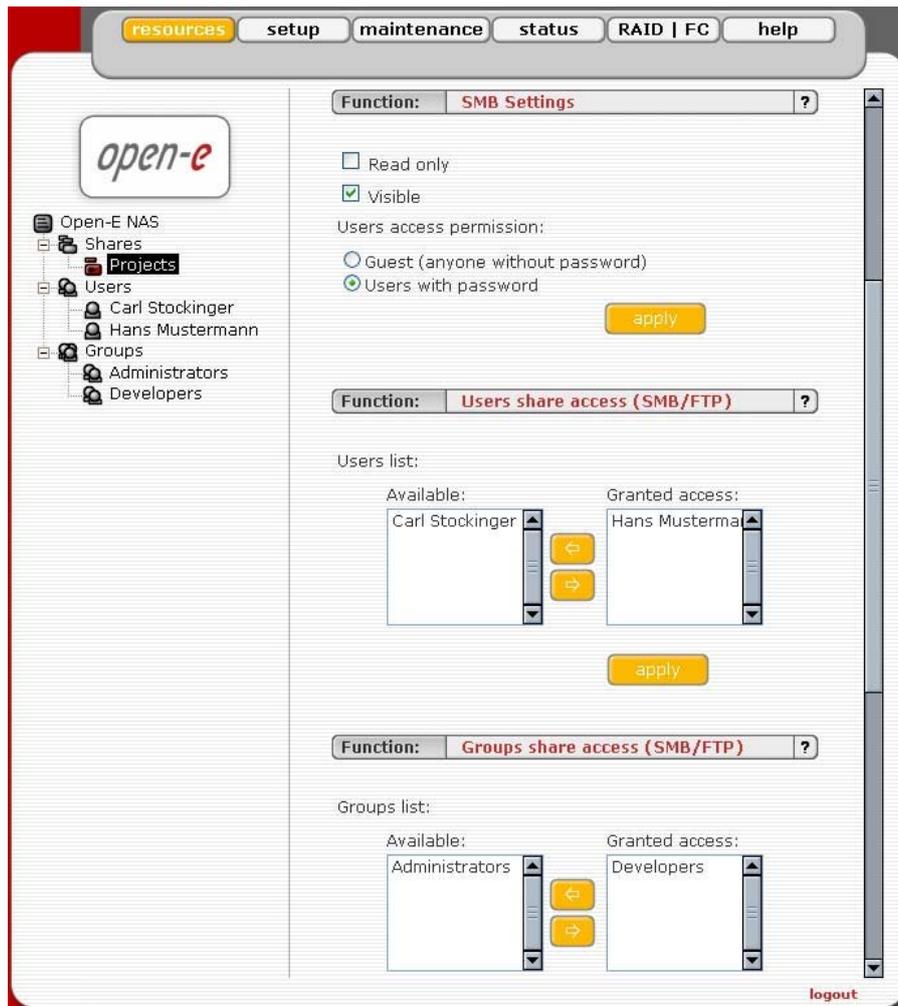
The path represents the physical location of the data on the share volume of the NAS server. The user does not know this information. In order to simplify navigation through the directories, you can use the browser function.



After clicking “create” button on left page, below on branch shares, will appear the name of earlier established share, in this case “Projects”. Then by clicking on name “Project”, you will see all available functions helpful for setting the share:

#### Function “SMB Settings Function”

Shares can be marked as “Read only,” and they can also be hidden (see below). Invisible shares are not displayed in the network environment, but they may still be used. The last parameter is “User access permission”. Either all users can be granted access (even without a password for enabling access to public folders) or only registered users with password. Please note that the entered users (user and password) have to correspond with the Windows login data.



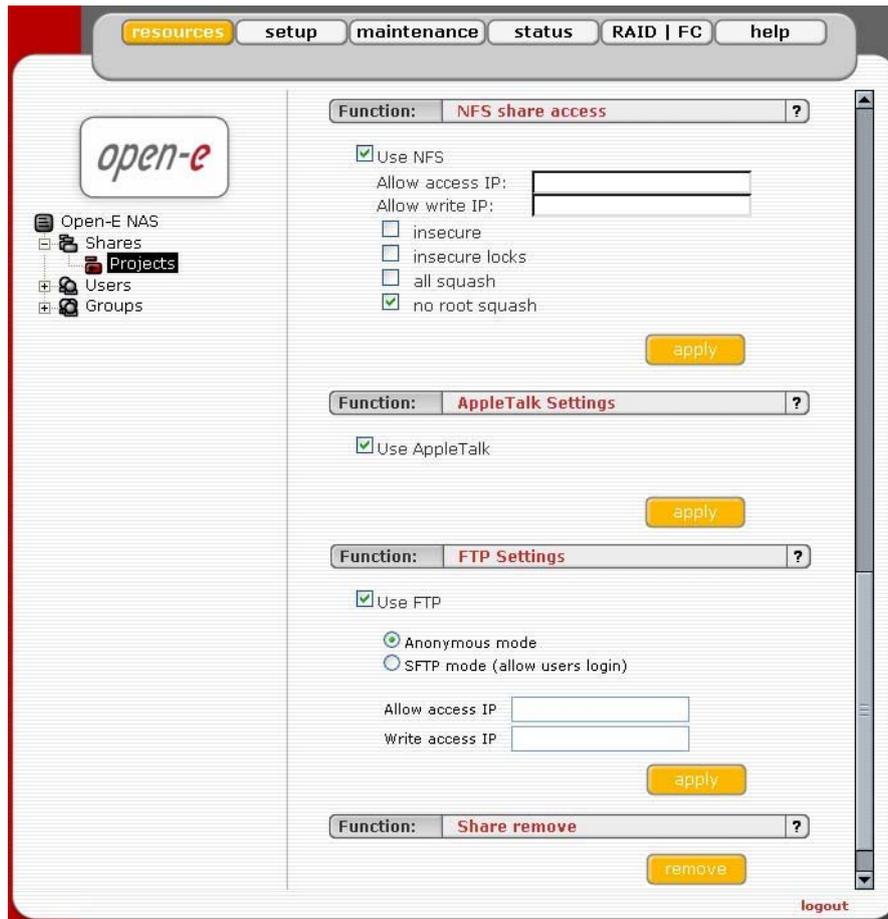
In Functions “Users share access (SMB/FTP)” and “Groups share access (SMB/FTP)” you can set the access to the shares to available users and/or groups.

### Function: “NFS share access”

Using this function you activate access to particular share via NFS. In order activate NFS on NAS server, you must enable usage of NFS in menu setup->NAS server in Function NFS settings.

In order to mount this share via NFS, please use following syntax:

- `mount -t nfs IP_addr:/share/share_name /local_mount_point`



You can fill-in the NFS options fields:

- **Allow access IP:** Please enter an IP or address range that is allowed to access NFS. You can enter single IP or multiple IP separated with semicolon or IP address range. IP addresses that will not be added to allow write list will have read only access.
- **Allow write IP:** Please enter an IP or address range that is allowed to write to NFS. You can enter single IP or multiple IP separated with semicolon or IP address range.



**Notes:** *When you leave allow access IP and allow write IP fields blank, then all computers in subnet will have write access to NFS. When you set allow access and leave allow write IP field blank, then specified computers will have read only access and none will have write access. When you set allow write IP without allow access IP, then specified IPs will have write access and all computers in the subnet will have read only access.*

- XXX.XXX.XXX.XXX
- XXX.XXX.XXX.XXX;XXX.XXX.XXX.XXX; ....
- XXX.XXX.XXX.XXX/network\_prefix\_length.

For example:

192.168.0.1/24 will set range from 192.168.0.1 to 192.168.0.254

192.168.0.1/28 will set range from 192.168.0.1 to 192.168.0.14

192.168.0.100/29 will set range from 192.168.0.97 to 192.168.0.102 you can easily calculate the network IP range using an IP Address Calculator like: [http://www.camtp.uni-mb.si/books/Internet-Book/IP\\_AddressCalculator.html](http://www.camtp.uni-mb.si/books/Internet-Book/IP_AddressCalculator.html)

- **insecure:** allows incoming connection to originate from ports > 1024.
- **insecure locks:** disables authorization of locking requests.
- **all squash:** map all users id to nobody user and all groups id to nogroup group.
- **no root squash:** select this option to grant user root from a client machine, the same level of access to the files on the NAS server. Otherwise user root from a client machine will be mapped to user nobody on the NAS server.

### Function: “FTP Settings”

Open-E NAS allows sharing files over FTP and SFTP protocols. FTP sends users' IDs, passwords and files over the network as a raw, not encrypted data. SFTP is encrypted FTP and therefore it is much more secure. SFTP allows passwords and files encryption (depending on ftp client configuration).

How to share files over FTP?

First enable the ftp server. To enable FTP go to “setup->server->Function: FTP settings”, check “Use FTP” and click the apply button.

Next, create/select share that will be accessible over the FTP protocol.

Go to the share configuration in “Function: FTP settings” and check “Use FTP” – Anonymous and SFTP modes will appear.

1. Selecting Anonymous mode will enable FTP sharing with anonymous user. For all IPs the access is set to READ+WRITE by default. To change that, activate “Allow access IP” and “Write access IP” options. Clicking apply will make the share available over FTP.

To connect to this share FTP client software is required – i.e. Internet Explorer has the FTP support. To connect from IE, enter address ftp://<NAS IP>/pub/, (e.g. ftp://192.168.0.220/pub/).

Many FTP client programs need a user name and a password to establish connection. In the Anonymous mode the user name is “anonymous” and there is no password (empty field).

All anonymous shares are in the “pub” directory. Any user connecting from the IP without a full access will see all shares but will not be able to see any directories that are prohibited.

**Hint: *Anonymous user will see only files and directories that he owns.***

2. Selecting SFTP mode will enable secure FTP sharing with the user and password authorization. Only few FTP clients support SFTP, and even fewer SFTP clients support SSL/TLS encryptions.

Here is a list of the tested software:

- CoreFTP (Windows)
- FileZilla (Windows)
- IgloFTP (Windows and Linux)
- SSLFTP (linux console client)

When SFTP is enabled, the user has the access to the share through the authorized user name and password.

**Hint: *If the NAS server uses Windows domain authorization then a short name of the domain must precede a user name – connected with a plus sign, i.e. “DOMAIN+Administrator”.***

To connect to a share via SFTP in the selected encryption, type in SFTP client NAS support SSL and TLS explicit encryption. All SFTP shares are in the “shares” directory. Users see only the allowed shares.

**Hint: *Most FTP clients have bookmarks allowing setting up IP, port home directory, etc. Suggested home directory for the Anonymous is “pub” and for SFTP is “shares”.***

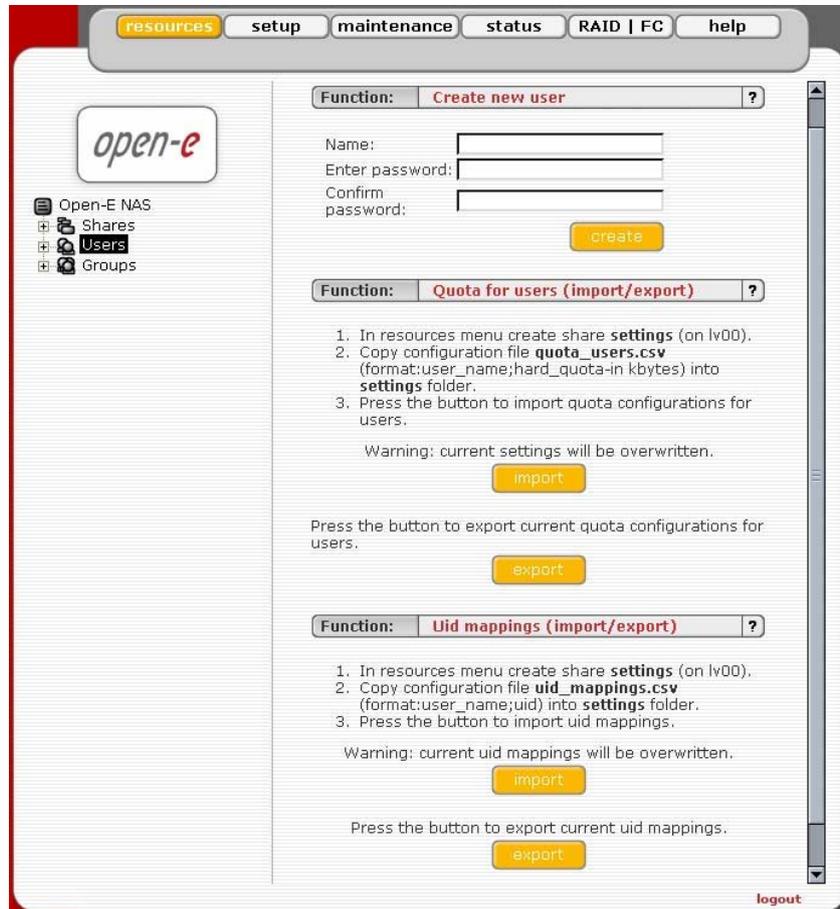
#### 5.2.1.2 User

In the mode “Workgroup internal LDAP” the category “Users” serves as data entry mask for user accounts. In principal, the process is the same as when you create shares. Enter new users here and assign each of them a name and a password. For security reasons, you have to enter the passwords twice.



**Notes: *If users forget their password, there is no way to retrieve it. You can only set a new password.***

As with all other functions, you open the entire list and select a certain user. In addition, you can remove certain users from the list. In the mode “Windows (PDC)” all users are automatically synchronized with the external server.



If you want detailed control over which shares users are allowed to access, simply assign the corresponding privileges, or add those users to an already existing user group holding the rights you want to assign to that person.

### Function: Quota for users (import/export)

This function provides administrator import/export settings of Quota for users.

#### Import

In order to import the actual Quota's settings on NAS server prepare: “**settings**” directory on lv00 volume, then copy there the previously prepared configuration file “quota\_users.csv” (see example below). Next click “Import” button – which is available in import/export function (settings will be loaded for actually existing users – in case of any errors there will be generated file with logs “quota\_users\_import.log”)

Exemplary configuration file (format:user\_name;hard\_quota\_in\_kbytes):

```
--cut--
```

```
user1;1000000
user2;200000
user9;1500000
--cut--
```

The results:

name	quota(MB)
user1	1000
user2	200
user9	1500

## Export

In order to get for users the actual Quota's settings just click on "export" button – there will be generated (ready to get) file "quota\_users.scv"

## Function: Uid mappings (import/export)

This function allows you to import and export uids (users IDs). Using this function you are able to change a lot of users ids at one time.

To import uids:

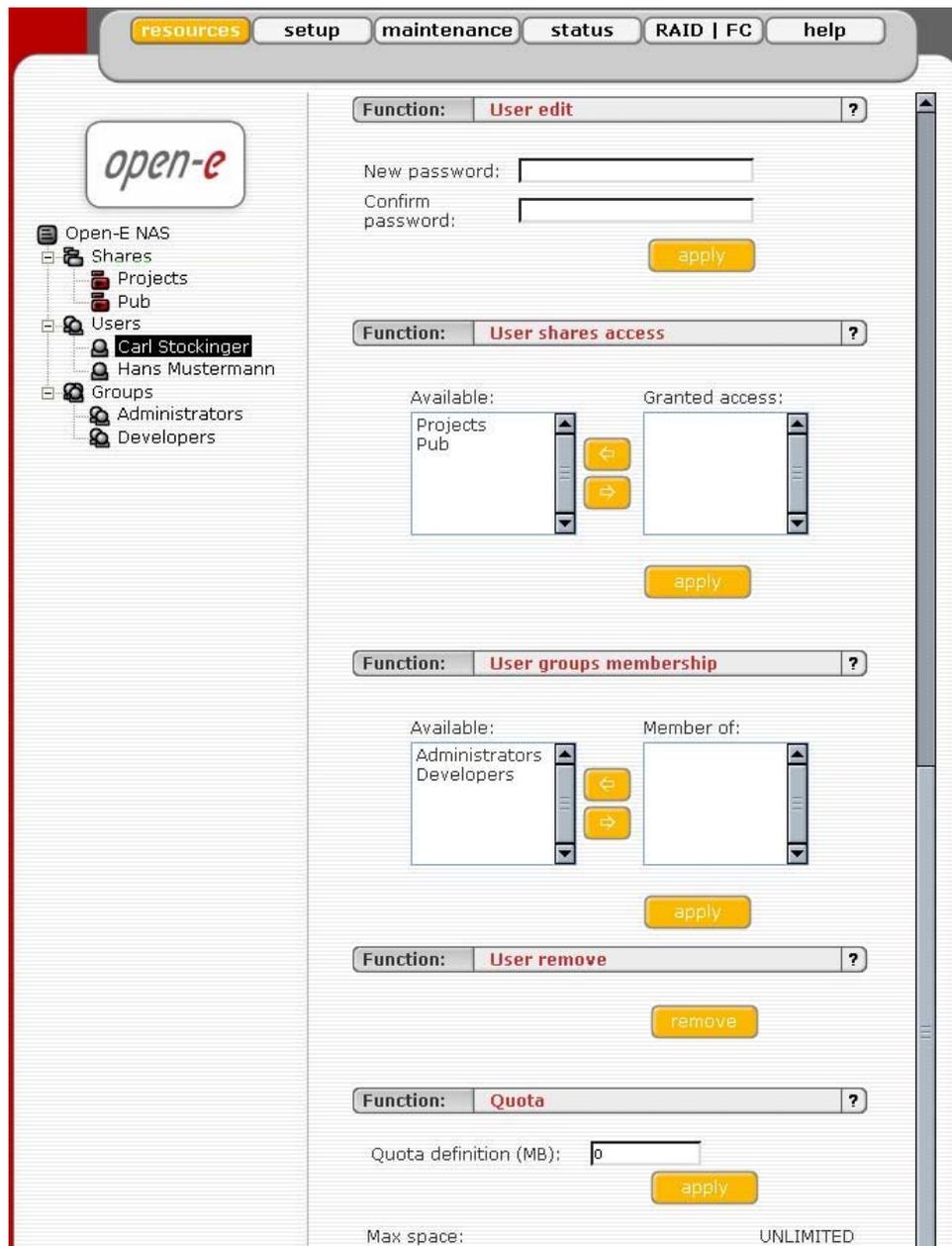
1. In resources menu create share **settings** (on lv00).
2. Copy configuration file **uid\_mappings.csv** (format:user\_name;uid) into **settings** folder.
3. Press "import" button to import uid mappings.
4. If there will be some errors while importing uids please read **uid\_mappings\_import.log** file in **settings** share



**Note: Warning: current uid mappings will be overwritten.**

To export uids:

1. Press "export" to download uid\_mappings.csv



### 5.2.1.3 Groups

In the mode “Workgroup internal LDAP,” you can define entire groups consisting of different users. In addition, you can assign these groups certain access rights. By clicking on “Groups,” a data entry mask opens up, allowing you to create a new group. Assigning the access rights is done the same way as for users (see 5.2.1.2.).

In the modes “Workgroup (external LDAP)” and “Windows (PDC)” and “Windows (ADS)” the groups are automatically synchronized with the external server.

## 5.2.2 Setup

In this menu option, you will find the following sub-functions: Server, Network, Administrator and Disk Manager.

### 5.2.2.1 Server

This is a key component of the setup menu, as some of the most crucial parameters are defined here.

The screenshot shows the 'open-e' setup interface. At the top, there is a navigation bar with tabs for 'resources', 'setup', 'maintenance', 'status', 'RAID | FC', and 'help'. Below this, there are sub-function tabs: 'server', 'network', 'administrator', 'UPS config', 'disk manager', and 'GUI'. The main content area is divided into sections for 'NAS Server name', 'Authentication method', 'Clock settings', and 'Set time'. Each section has an 'apply' button. The 'NAS Server name' section has fields for 'Server name' (ANCOM) and 'Comment' (Network Attached Storage). The 'Authentication method' section has radio buttons for 'Workgroup (internal LDAP)', 'Workgroup (external LDAP)', 'Windows (PDC)', 'Windows (ADS)', and 'Workgroup (NIS Server)', with 'Workgroup (internal LDAP)' selected. There is also a 'Workgroup' field with 'WORKGROUP' entered. The 'Clock settings' section has a field for 'NTP Servers' (ntp0.fau.de), a checkbox for 'Continuous adjusting using NTP', and a 'Time zone' dropdown set to 'Europe/Berlin'. The 'Set time' section has radio buttons for 'Manual', 'Use this PC time', and 'NTP server', with 'NTP server' selected. There are also fields for 'New time' (21:35:28) and 'New date' (2005-06-29). A 'logout' button is visible in the bottom right corner.

#### Function „NAS Server name“

Select a server name that clearly identifies your new server. In the field “Comment,” you can add text describing the function and the location of the PC.

#### Function “Authentication method”

You have to select a type of authentication. Options are “Workgroup (internal LDAP)”, “Windows (PDC)” and “Windows (ADS)”. The former is the easiest option – it is suited for beginners or useful for simple storage solutions (e.g. backup servers).

The administrator has to create all users in the menu “Resources” and grant them access to the desired shares. Via “Windows (PDC)” and “Windows (ADS)”, the user database is imported from the active directory of a Windows server (with access data provided and with the necessary access rights). The administrator has to fill out the following entry fields:

Domain name: Entry of the NetBIOS domain name  
Server IP: Entry of the Windows server’s IP address  
Name: Entry of a user name with administrator rights  
Password: Entry of a password corresponding to the user



**Notes:** *Changing the authentication method can be a security risk. It is only safe to do that before permissions, quotas and owners are set. In other case, permissions like access to shares, quotas, ACL, can be mixed between users and groups.*

#### On NT 4.0 server add NAS Server to Domain

- a) Run Server Manager program from Menu Start->Programs->Administrative Tools (Common)->Server Manager
- b) From Server Manager menu select Computer->Add to Domain  
WARNING: If NAS Server is already added, you must remove it
- c) In Computer Name field enter NAS Server-Name (NetBIOS name)
- d) Click Add button

#### Set Windows (PDC) in Open-E NAS

- a) From Open-E NAS web interface choice Setup-> NAS-Server-Setup
- b) In Function - Authentication method choose Windows (PDC) option
- c) In Server IP field enter NT server IP address
- d) In Name & Password fields enter administrator account name and password of NT server
- e) Click apply button  
WARNING: If connection fails, the next try you must restart from point a (setting NT)

#### Function: “Clock settings”

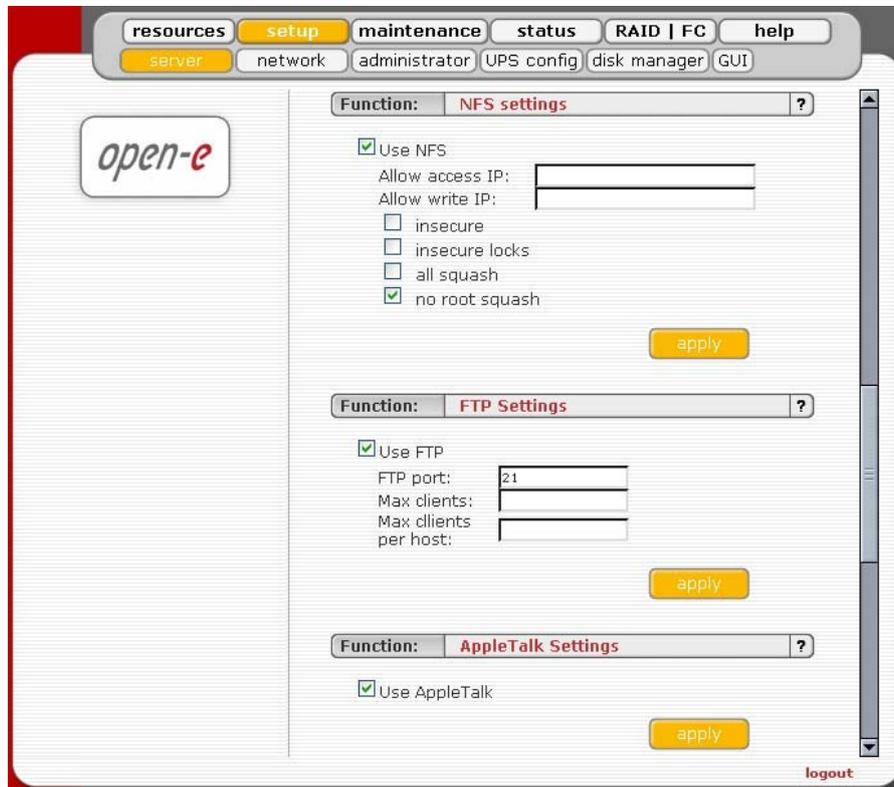
Here, you define an NTP server (Network Time Protocol) to synchronize your Open-E NAS with a time server on the Internet.



**Notes:** *Time and date display are static. What is shown are the time and date at which the setup menu was accessed.*

## Function “Set time”

With this function, date and time can be entered manually. Alternatively, take the route via an NTP server, which has to be defined in the previous function.



## Function „NFS settings“

In NFS settings you can define the NFS options for entire Open-E server.

Once you have activated NFS here, system will enable the option to activate NFS access to every share created in resources menu.

To enable NFS access to the shares created in the resources menu, you need to activate NFS for every single share separately.

Additionally, you can use an extra storage space only for NFS access and separately from other storage space used by shares created in resources menu and accessed via SMB/CIFS, FTP and AppleTalk.



**Notes:** *In order to mount NFS exclusive storage space, please use following syntax:*

```
- mount -t nfs IP_addr:/nfs /local_mount_point
```

***In order to mount the space belongs to a share created in resources menu, please use following syntax:***

- mount -t nfs IP\_addr:/share/share\_name /local\_mount\_point

The IPs-settings (addresses or networks) and other options are defined in Function NFS share access (see in 5.2.1.1)

### Function “FTP settings”

The option to also access NAS via FTP (File Transfer Protocol) offers additional flexibility, as users can access storage either from the Intranet or from the Internet. An FTP client is ideal (e.g., SmartFTP), but the Internet Explorer or a similar browser are also suitable.



***Note: Please know that the FTP feature is completely independent from the NAS shares you may have set up.***

To establish a connection, the FTP client needs several pieces of data:

IP address:	192.168.0.220 (this is the standard address)
Port:	21
User:	anonymous
Password:	123

In Open-E NAS, the allocation of access rights is done via the IP address of the PC currently in the process of accessing. A read access is, therefore, granted with these generally typical and anonymous login data. As a standard, the NAS server for FTP uses port 21, which can be changed in the configuration menu (under “Setup → NAS Server”).

If you use the Internet Explorer when accessing, you need to enter the following data into the entry line:

ftp://192.168.0.220

You are not prompted to enter the user name and password, as the Internet Explorer first establishes an anonymous connection. If you changed the FTP port, add this information to the entry line the following way:

ftp://192.168.0.220:4711 (in this example, 4711 represents the new port number).

In order to also grant specific computers write access to the FTP area, enter the desired IP addresses into the line “IP address complete access” (IP addresses should be separated by semicolons):

192.168.0.1; 192.168.0.2; 192.168.0.222; etc.

In order to assign the entire address area between 192.168.0.1 and 192.168.0.254 writing privileges enter:  
192.168.0.0/24

In order to assign the entire address area between 192.168.0.1 and 192.168.255.254 writing privileges enter:  
192.168.0.0/16

You may find details on IP calculation in internet. Just search for "ipcalc".

### Function "AppleTalk Settings"

Here you may activate the AppleTalk protocol in the network.

How to use AppleTalk with the Open-E NAS server:

Using the Open-e WEB interface:

- a. In the "NAS" Server Setup enable AppleTalk.
- b. In Resources select a share that you want to be shared with Apple Talk.
- c. Enable AppleTalk for this share.

How to connect to the NAS AppleTalk server:

#### 1. In MAC OS 9

- a. Open the Chooser (APPLE MENU->Chooser)
- b. Click on AppleShare
- c. If the Server "NAS" does not appear in the fileserver list click "Server IP address" and enter the Open-E NAS server IP
- d. Click "OK" and choose a login type. Enter a user name and password if you want to login as a specified user.
- e. From available options select shares that you want to mount.
- f. The icon of the mounted share will appear on the desktop.
- g. To open the share click on its icon.
- h. To unmount the share drop its icon onto the trash.

#### 2. In MAC OSX 10.3.

- a. Click on the MAC HD, then Applications then Utilities.
- b. From the Directory Access check if AppleTalk is active; if not -> activate it.
- c. If the server "NAS" does not appear in the Network list, open a web browser and enter the IP address of the AppleTalk server.

afp://192.168.1.3 (very important --> "afp://" )

- d. Choose a login type. Enter a user name and password when you want to login as a specific user.

- e. If you can not log in, click on the Directory Access/Authentication and change the path to search for authentication information.
- f. From available shares select all you want to mount.
- g. The icon of any mounted share will appear on the desktop.

or second example is:

- a. Click on "Connect to server" from the Finder (GO submenu).
- b. Enter: `afp://address_ip`
- c. You can add a link to the afp server by clicking on the "+" sign. This adds a link to the computer in the Favorite Servers field.
- d. Choose a login type, enter a password if you want to login as a specific user.
- e. From available shares select all you want to mount.
- f. The icon of the mounted share will appear on the desktop.



### Function „SMB settings“

With this function you can edit SMB protocol specific parameters. There are several options you can change:

- **Wins server IP:** If you have a WINS server on your network then you should set this to the WINS server's IP,
- **Superuser:** Superuser is a user, who has permission to take ownership of directory and files which belong to other users. It can be useful when administrator want to change access right ( ACL) for directory or file established by other users,

- **Simple and protected negotiation:** Simple and Protected NEGOTiation (SPNEGO) is a negotiation protocol. If you use PDA Device to access shares on NAS please uncheck it,



**Note:** *For connect to your PDA Device use netbiosname, not IP address.*

- **Store dos attributes (uses xattrs):** This option enables preserving all MS-DOS attributes using Linux xattrs attributes. It cannot be set when you are using option Preserve hidden file attributes or Preserve system file attributes,
- **Preserve hidden file attributes and Preserve system file attributes:** These options enable preserving of MS-DOS attributes: hidden and system. These attributes are mapped to x (EXECUTE) attributes for group and for others in Linux POSIX ACL. Windows ACL permissions are also mapped to Linux attributes. In order to avoid attribute mismatch, it is strongly recommended to disable these options. They cannot be set when you are using Store dos attributes option.
- **Synchronize UID and GID database with NIS server** this option allows synchronization UIDs/GIDs between NAS Server and NIS Domain. To have an properly working synchronization please fill: NIS serverdomain name, NIS server IP and Synchronize interval. With Windows systems this authentication requires PLAIN PASSWORD which can be set in the Windows registry. Please search the key HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\lanmanworkstation\parameters\ and change its Dword from 'enableplaintextpassword' to '1'.



**Note:** *This solution will the lower security. Enabling plain password will always decrease security, so please use other authentication method if there is a requirement of higher security*

## Function “Backup Client”

Here you may choose common backup software out of the drop down list in order to enable users to backup Open-E NAS-Servers with existing solutions within your network. Currently, Veritas, Retroclient and BrightStor are supported.

### Veritas:

Here you need to provide an IP address of a server running the Backup Exec. The “Directory Pass” is a password that the Backup Exec might prompt for.

### Backup:

- In Veritas Backup Exec set a user in the menu Network-> Logon Account Management,
- Next enter the password such as earlier provided in the NAS Server function “Backup client setting”,
- By choosing “Backup” a “Backup Job Properties” window will appear,
- A list of network shares will be shown in that window,
- By clicking on the „Remote Selections” branch, and next on “Unix Agents”, a NAS server name will appear (eg. Ancom),

- f. After clicking the server „Ancom/share volume”, a window „Logon Account Selection” will be displayed where you need to choose the same user name as in the point “a”.



**Note:** *In some settings, the window „Logon Account Selection” will not appear automatically. In this case you must right mouse click on the name „Ancom/share\_volume”, and then in the context menu choose „Connect As...”. Only then the „Logon Account Selection” window will appear.*

- g. After choosing a user, the „Logical Volume” and NAS server shares will appear. By selecting the correct share and clicking the „Run Now” button, selected shares will be backed-up.

#### **Restore:**

- a. By choosing „Restore”, a “Restore Job Properties” window will appear.
- b. On the left side of the window, in Properties->Source click „Selection”, and the name of the NAS server which shares were earlier backed-up will be displayed.
- c. Choose a folder you want to be restored from the correct backup file.
- d. From the Source->Resource Credentials menu choose a user account for the NAS Ancom/share\_volume server and click the „Run Now” button.

**Hint:** *In order to use an Incremental method, choose it from the Setting -> General-> Backup Method menu. Please use method “Incremental – Using modified time” (Reset Archive bit – does not work on the XFS partition types).*

#### **BrightStor:**

“Allow IP or Network IP”: Please enter the Backup server’s IP address in order to grant access to Open-E NAS (please refer to the last caption “FTP Settings” for syntax details). If you leave this field empty, all BrightStor backup servers in the network will have access to the NAS server.

#### **User:**

By providing a user name, only this BrightStor user will have access to Open-E NAS. If left empty, all users will be able to access the NAS server.

#### **Function “Language Settings”**

English and German are supported.

#### 5.2.2.2 Network

#### **Function “IP address”**

If you want to select an address instead of assigning an IP address automatically via DHCP, you can do it here.

It is strongly recommended to use static IP for the server (please uncheck *Use DHCP* box). If you set new IP address, during activation, you will lose your connection to the server and you will have to log in again. In the URL entry line of your browser, please enter the new IP address. If you do not get access, please try the console to set new IP address. In order to access servers in another subnet, you need to enter the address of a router as *Gateway*.



**Notes:** *In case you use NTP server to maintain proper time & date, please make sure you have proper Gateway and DNS settings.*

The screenshot displays the Open-E web administration interface. At the top, there is a navigation bar with tabs for 'resources', 'setup', 'maintenance', 'status', 'RAID | FC', and 'help'. Below this, a sub-navigation bar includes 'server', 'network', 'administrator', 'UPS config', 'disk manager', and 'GUI'. The 'network' tab is selected. The main content area is divided into three sections:

- Function: IP address**: This section allows configuring network parameters for the selected interface (eth0). It includes a checkbox for 'Use dhcp' (unchecked), and input fields for IP (192.168.1.2), Netmask (255.255.255.0), Broadcast (192.168.1.255), Gateway, and DNS (192.168.1.1). An 'apply' button is located below these fields.
- Function: NIC assignments**: This section allows assigning network services to the selected interface (eth0). It features checkboxes for 'www' and 'smb', both of which are checked. An 'apply' button is located below these options.
- Function: Create ethernet team**: This section allows creating a network team. It includes a 'Team name' field (team0), a dropdown for 'AFT', and checkboxes for 'eth0' and 'eth1' with associated priority dropdowns (both set to 'no\_priority'). A 'Virtual interface' field (vth0) and a 'create' button are also present.

A 'logout' link is visible in the bottom right corner of the interface.

### Function „NIC assignments“

Using this function you can disable access to the “Open-E NAS WEB administration”, for NICs in the Open-E NAS system. If a “www” option is inactive, it is not possible to launch the “Open-E WEB administration” on the selected network card (e.g. “eth0”). If the option SMB is in an active mode, the access to the network shares with LDAP, ADS or PDC authentication will not be possible.



**Notes:** *The access to WEB GUI can also be blocked, by setup->Administrator in the function „Administrator access“. If in the “Open-E NAS” system there is only one network card installed, the “www” option must remain active.*

## Function “Create ethernet team”

Function “Create ethernet team” include failover protection, increased bandwidth through aggregation, and balancing of traffic among team members. Ethernet team modes are AFT, SFT, ALB, RLB, SLA and 802.3ad.

Ethernet team modes:

- **Adapter Fault Tolerance (AFT)**  
Allows mixed models and mixed connection speeds as long as there is at least one Intel® PRO server adapter in the team. A 'failed' Primary adapter will pass its MAC and Layer 3 address to the failover (secondary) adapter. All adapters in the team should be connected to the same hub or switch with Spanning Tree (STP) set to Off.
- **Switch Fault Tolerance (SFT)**  
Uses two (total) adapters connected to two switches to provide network availability of a second switch and adapter if the first adapter, its cabling or the switch fail. Do not put clients on the link partner switches, as they will not pass to the partner switch at fail. Spanning Tree (STP) must be On.



**Note: SFT uses only one team. Only 802.3ad DYNAMIC mode allows failover between teams.**

- **Adaptive Load Balancing (ALB)**  
Offers increased network bandwidth by allowing transmission over 2÷8 ports to multiple destination addresses, and also incorporates Adapter Fault Tolerance. Only the primary receives incoming traffic. Only the primary transmits broadcasts/multicasts and none routed protocols. The ANS software load balances transmissions, based on Destination Address, and can be used with any switch. Simultaneous transmission only occurs at multiple addresses. This mode can be connected to any switch.
- **Receive Load Balancing (RLB)**  
Offers increased network bandwidth by allowing reception over 2÷8 ports from multiple addresses. Can only be used in conjunction with ALB. Only the adapters connected at the fastest speed will be used to load balance incoming TCP/IP traffic. The primary, regardless of speed, will receive all other RX traffic. Can be used with any switch. Any failover will increase network latency until ARPs are re-sent. Simultaneous reception only occurs from multiple clients. On NetWare servers, If using NetWare Load Balancing, you can use ALB but not RLB.



**Note: Adaptive Load Balancing (ALB) and Receive Load Balancing (RLB) are supported for Intel NIC's only !**

- **SLA option - Intel Link Aggregation (LA), Cisco\* Fast EtherChannel™ (FEC) and Gig EtherChannel™ (GEC)**  
Supports Fast EtherChannel standard. All adapters in the team can transmit and

receive. All adapters appear to share a single MAC and L3 address. The load is balanced based on Source/Destination Address Pairs and simultaneous transmission only occurs to multiple addresses. Reception load balancing is determined by the switch. Capable of aggregating 2÷8 ports (based on switch capabilities). Please see Cisco standards for FEC/GEC. Must be used with Cisco FEC/GEC capable switches or Intel switches capable of Link Aggregation or switches capable of 802.3ad.



**Note:** *For EC/LA and 802.3ad modes be sure to check your switch's actual capabilities and requirements.*

- **IEEE 802.3ad**

This standard has been implemented in two ways:

- **Static** mode (the majority of switches on the market) is equivalent to Ether Channel/Intel's Link Aggregation and adapter teams should be set up in FEC/LA/3ad mode. Must be used with an 802.3ad, FEC/GEC/ or Intel Link Aggregation capable switch. (For additional information see Fast EtherChannel above.) This is the 802.3ad available in 8.x software.
- **DYNAMIC** mode requires 802.3ad DYNAMIC capable switches (limited availability). Active aggregators in software determine team membership between the switch and the ANS software (or between switches). This is available only in some versions of Intel(R) ANS software. There is a maximum of 2 aggregators per server and you must choose either maximum bandwidth or maximum adapters.

Both 802.3ad modes include adapter fault tolerance and load balancing capabilities. However in DYNAMIC mode load balancing is within only one team at a time.

### 5.2.2.3 Administrator

#### Function “Administrator Password”

Using this function, you can change the passwords for Open-E NAS administration accounts. For security reasons, please make sure you change the standard password and select a new one. Three accounts are available by default: Administration (limited access), Maintenance (Enhanced) and Full Access (Maximum Access).



**Note:** *Password-checking is case-sensitive. For security reasons, the password you enter will not be displayed. Please check the status of the Shift and Caps Lock keys.*

## Function “Administrator Access”

Use this function to restrict access to the server administration.

- **Set port:** you can change https port (default 443)
- **IP address:** you can assign IP addresses (separated by a semicolon) that are allowed to access the Open-E iSCSI Web administration. This field left blank means no restriction.
- **Lock console without password:** disables access to the console
- **Lock console with password:** to get access to the console you need to type in a password. Note that this password should be exactly 8 characters long and include only 1-4 digits.
- **Unlock console:** the unrestricted access to the console



**Notes:** *Please exercise caution with this function when all computers in the network have assigned IP addresses via DHCP: any current IP can be replaced by a new one only after the lease ends. Please use Lock console feature carefully – in case of any erroneous IP address settings you will not be able to reset default administrator access*

*from the console. To restore default settings you have to re-update software in the Open-E NAS module or contact technical support.*

## Function “E-mail notification”

In case of significant events, critical errors, warnings, etc., system can send an email to the administrator. Please enter administrator email address.



**Notes:** *When SMTP server receiving mail, uses the monitoring function of IP numbers, it compares IP number from SMTP server (for example open-e.com) with IP number of a computer from which email was sent. This email may be treated as “spam” and will not be accepted. To avoid the above problem, use different SMTP server then the computer currently uses. The best solution for a correct email distribution is to use your local mail server.*

The screenshot shows the Open-E web interface with a navigation bar at the top containing tabs for resources, setup, maintenance, status, RAID | FC, and help. Below the navigation bar are sub-tabs for server, network, administrator, UPS, disk manager, and GUI. The main content area is divided into three sections:

- Function: SSL Certificate Authority**: Includes a link to download the SSL certificate for the browser ([SSLCert.crt](#)).
- Function: SNMP Settings**: Includes input fields for Community (public), Password, Confirm password, Contact (your mail), and Location (your location), with an apply button.
- Function: Remote Access**: Includes a checked checkbox for "Remote access set", and input fields for Allow IP, Set port (22222), Password, and Confirm password, with an apply button.

A "logout" link is visible in the bottom right corner of the interface.

## Function “SSL Certificate Authority”

If you want to install Certificate Authority (CA) to your web browser, click on the [SSLCert.crt](#) link. Download CA on Desktop, click on it and "Install Certificate". Browser will show you warning, that CA is not trusted and it is normal. Following the instructions, you will install CA to your web server.



**Notes:** *If you want to delete or view CA go to: Tools->Internet Preferences ->Content->Certificates->Trusted Root Certification Authorities and OPEN-E GMBH which should be there.*

## Function “SNMP Settings”

Simple Network Management Protocol (SNMP) is a protocol for monitoring a network and computer equipment. You can monitor:

- ethernet bandwidth,
- used memory,
- used swap,
- CPU load,
- SYSTEM load,
- Uptime,
- MAC addresses of network card.

Default SNMP community is "public" and here you can change it. The community you are setting can be max up to 20 characters. It is for your better security. System location and system contact are only for your information, for example when you connect from SNMP client, you will see your location and name. SNMP is used for synchronization too.



**Notes: For better security use only SNMP 3 version! This version provides login, password and encrypted transmission.**

How to retrieve information from SNMP ?

From Linux:

- snmpwalk --> it is command-line tool from snmp-package.

You can get information by:

```
snmpwalk -v 3 -u public -l AuthNOPriv -A MD5 -A public123 adres_ip SysUpTime
```

- v 3 --> use only 3 version

- u public --> community name

- A MD5 --> encrypted by MD5

- A public123 --> password

address\_IP --> IP of NAS server

SysUpTime --> OID with system uptime information

To use SNMP from command line you have to know OID's, for example:

ssCpu (processor load), mem (memory info), Location.

But it is not the best choice to retrieve info from command line. You have to install SNMP client, so you can easily read any information you want.

From MS Windows you can use following Windows Clients: PRTG, MIB Browser Professional, SNMP MIB Query Manager and INFTRAF.



**Notes:** *If you can't retrieve information from SNMP client, you can check [NAS\\_ip/check\\_sys/index.html](#). There are SystemLoad, CPU, Memory, Swap and Uptime.*

### Function “Remote Access”

Using this function, you can administrate console tools remotely by ssh protocol (secure shell). Default user is 'cli' and you cannot change it, but password can be change.

#### **Allow IP:**

You can assign IP addresses (separated by a semicolon) that are granted to server remote access. The field left blank means no restriction.

#### **Set port:**

Default port is 22222 for security reasons, because high ports are invisible for port scanners. You can change it only from range 1024-65535 except ports already used.

#### **Password:**

Length of password is minimum 8 characters. Be sure to use strong passwords.

#### **Confirm password.:**

Please retype your new password.

Password cannot contain:

- characters: ' " ` ^ & \$ # [ ] \ | \*
- spaces.

To connect to server from Linux/MacOSX systems use:

```
ssh -2 -p 22222 -l cli address_ip
```

- option: -2 is a version of ssh protocol used for connection.
- option: -p is a port for Remote Access.
- option: -l is a user (In our product the user must be "cli").
- option: address\_ip is a address of server you want to connect to.

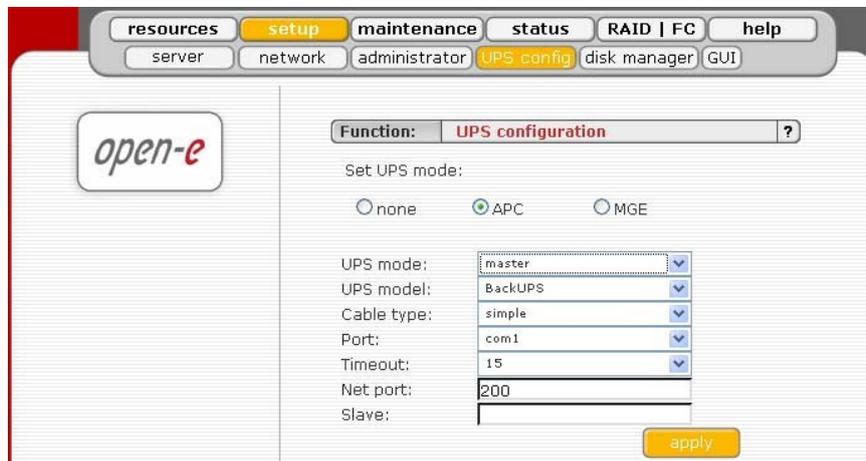
You will be ask for a password you entered on server for Remote Access.

To connect to server from Microsoft Windows, download free ssh client Putty ([www.putty.nl](http://www.putty.nl)). For PuTTY here is mini-how to:

- In Host Name (or IP address) field please enter IP address of the NAS
- In Port field please enter same port as in the NAS GUI (default 22222)
- In Protocol please choose SSH
- In Category: Connection - Auto-login-username please enter: cli
- In Terminal-Keyboard-The Functions Keys and keypad please select VT100+

Go back to category session and click on Save button. Then click on “open” and enter the password. (In case you did not enter Auto-login-username it will prompt for username, so please enter: cli)

#### 5.2.2.4 UPS



In the UPS menu you can select a UPS device desired (Uninterrupted Power Supply). For the connection of the UPS device to the NAS server, the USB port is most frequently used. In the settings you can select the UPS model, cable type, connection port and the length of the time out. The time-out defines the time between a power failure and the moment the system will shut down. UPS support 3 modes:

**Simple** means, that Open-E NAS is the only system attached to this UPS and that there is no action necessary to do remote shutdown for other systems in the network.

**Master** means, that Open-E NAS is connected to the UPS and sends a signal through the network to shutdown other systems in the network.

**Slave** means, that Open-E NAS is reacting on a "power down-signal" from an UPS master.

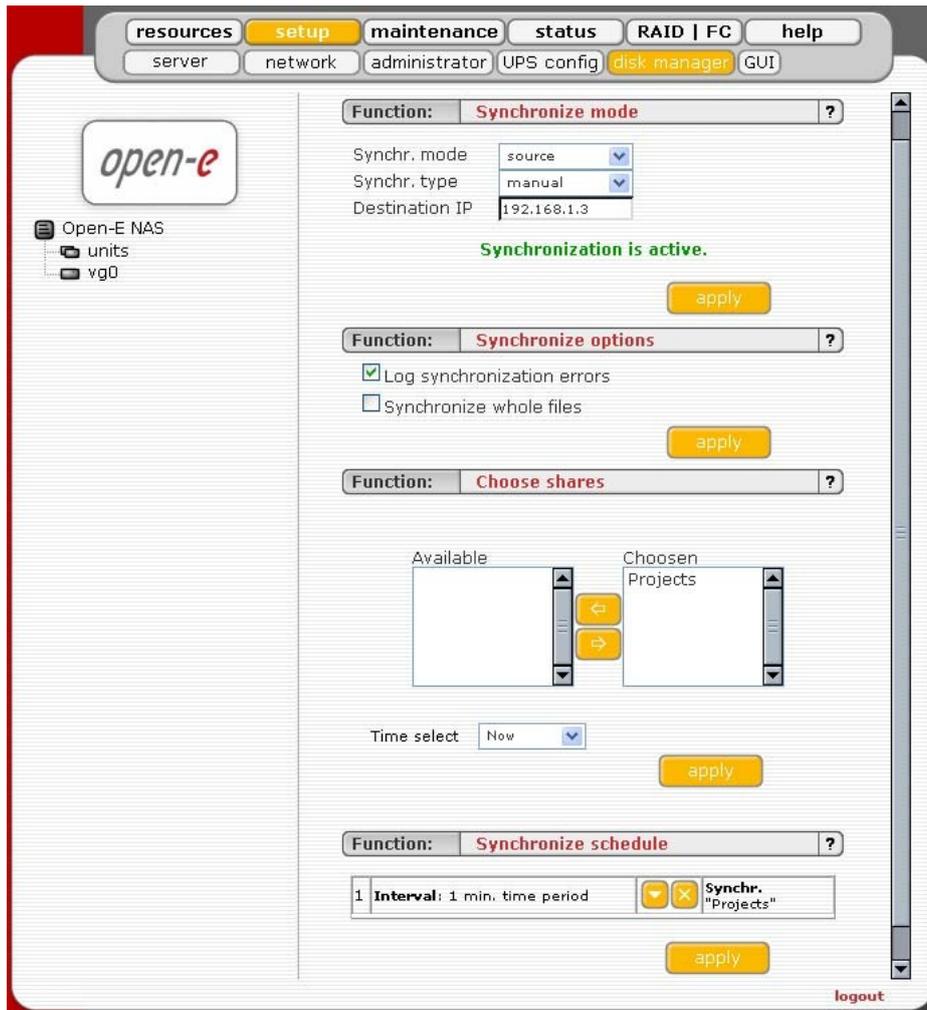


**Notes:** *During a power failure you cannot log into the Open-E NAS server. Users who are connected to the Open-E NAS server during the UPS-time remain full access to all files on the NAS server.*

#### 5.2.2.5 Disk Manager

If more than two Open-E NAS servers are in use, you have the option to synchronize shares between them. Please configure the shares, providing NAS server as “source” and pick the desired shares by adding them to the right window. Then type the IP address of the NAS server into the corresponding field and pick a synchronization interval. Please consider that choosing small intervals can increase network traffic considerably.

The destination machine needs to be configured as “destination” using the “Synch. Mode” drop-down. Again, you need to provide the IP access of the source NAS server.



**Notes:** *The synchronization has to be started by clicking “apply” with both the source and the destination NAS server.*

To configure a source mode:

1. Select "source" from “Synchr. mode” to choose the role of the source for this node.
2. Give the IP address of the destination node in the "Destination IP" field.
3. If your destination NAS is in version 1.71 or above you can choose "automatic" synchronize type, otherwise please choose "manual".
4. Click apply

If this node acts as a destination:

If your source NAS is in version 1.71 or above and you have chosen "automatic" synchronize type on source NAS, then you do not need to configure destination NAS!

1. Select "Synchr. mode" to destination
2. Type in the address of source node.
3. If your source NAS is in version lower than 1.71 please choose "manual" destination synchronize type.
4. Click apply



**Note:** *To add shares to synchronize use function "Choose shares"*

### Futures of automatic type of synchronization

- operates at port 22122 instead of port 22 in "manual" version
- there is no need to set manually the destination NAS, all will be done automatically
- support for acls
- there is possibility to synchronize shares on all logical volumes

Operation of synchronization process requires you to define at least one snapshot for each volume group from which shares you want to synchronize. When using "manual" type of synchronization it is enabled by clicking "apply" on both the source and the destination mode and precisely in that order.

To disable any synchronization scheme set "synch. mode" to "none" and click "apply"

### Function: "Synchronize options"

This function allows you to set additional parameters for synchronize. Available settings are:

- **Log synchronization errors:** If you enable this feature every synchronization error will be logged. If you will also enable sending logs via e-mail they will be also sent by e-mail. This feature is enabled by default.
- **Synchronize whole files:** If you enable this feature each changed file will be send whole not only the changed part of file. This can fasten synchronization when using 1 Gb or 10 Gb network cards. This feature is disabled by default.

### Function: Choose shares

This function allows you to add shares to synchronize with remote NAS. It is available only when this NAS is in synchronize "source" mode.

- To add new shares to synchronize please select shares from left side and click on 
- You can start synchronization immediately by selecting "Now" from "Time select" combo box or add to schedule.



**Note:** *When using "automatic" synchronization type you can choose from all shares but synchronization will work only for shares which logical volume is present also at destination NAS. In "manual" synchronization type you can choose shares located on lv00 only.*

## Function: Synchronize schedule

This function allows you to edit previously saved synchronize schedules. There are available 2 types of schedule: weekly and interval.

- **Interval:** Synchronization will be made every "selected time". Example if you choose interval 1 h. - each one hour share will be synchronized.
- **Weekly:** Synchronization will be made in selected days at specified time.

To edit properties of schedule please click at 

To delete schedule please click at 

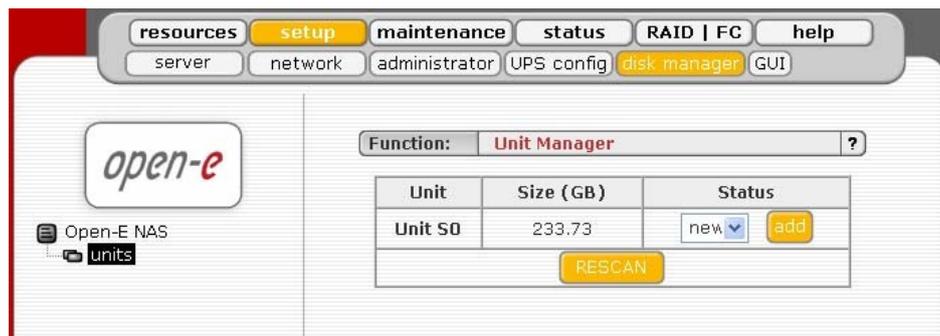
You can also delete a schedule by setting interval to "not set" or deselecting all days and unset time when using weekly schedule.



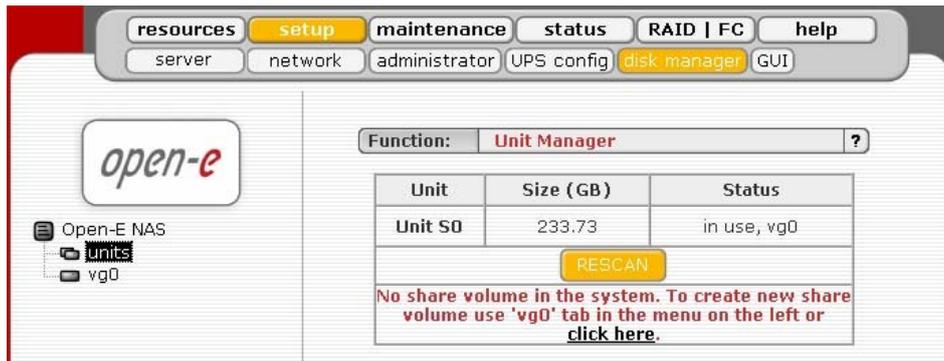
- Notes:**
1. *It is possible to edit time of synchronization. If you want to edit shares to synchronize please delete this schedule and add new.*
  2. *It is possible to perform one synchronization at once. If you schedule a few synchronizations at the same time, only one will be done.*

## Function "Unit Manager"

After clicking on the branch "units" in the left part of page you will find a list of all available units (raid-arrays) with entire disk size. In order to integrate available units into the share volume (volume group), just use the "add" button, after which the unit will be formatted.



Next, the page will be reloaded (see below), and status field will show your units as "in use" and with new group e.g. "vg0". The Volume Group is the equivalent of a physical disk from the system point of view. It is also possible to combine two (or more) units into one Volume Group by choosing one of actually existing groups like "vg0", or by choosing "new" option which will create new group "vg1" after using "add" button.



**Notes:** *When the added unit is integrated, it cannot be remove in Web management. You need to use extended tools in console.*

### Function “Units Assigned “

Here listed units assigned to current volume group.



### Function “Share Volume/Logical Manager“

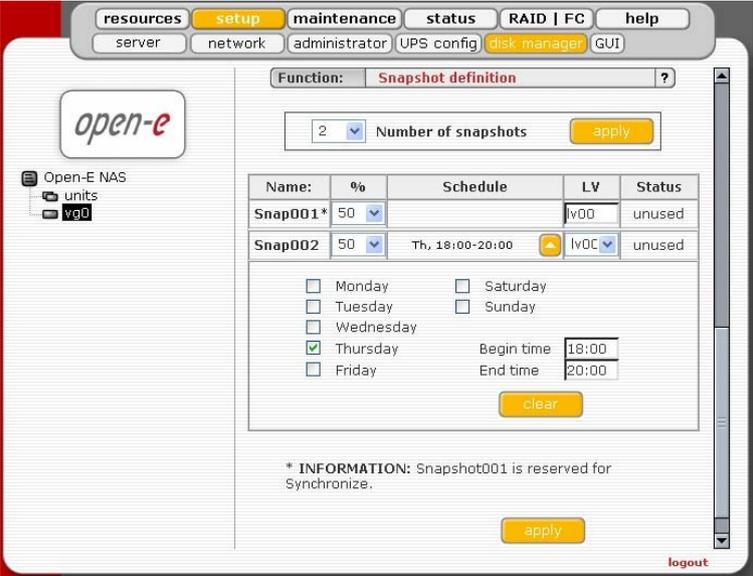
Using this function you can create a Logical Volume (lv) inside one Volume Group. The Logical Volume is the equivalent of partitions, which this storage space is available for network shares. You can increase capacity of existing Logical Volume.

Depending on needed capacity administrator can add more capacity to particular Logical Volume. Using Share Volume/Logical Manager function you can add disk space to new lv, or increase size on existing lv's (you can't decrease lv size). To set needed lv size use scrollbar, next to which, on the right side is shown size available to use.

This function can be also used to reserve disk space for “snapshots” and “swap”. Usually for “snapshots” you need about 10% of new Volume Group.

The SWAP is an additional disk space used by the system to temporarily release some amount of used RAM memory. So, one can reserve some shared disk space for the system SWAP memory. Last time we have added a lot of new features consuming in total some amount of additional memory, so in some cases e.g. 512MB would not be enough and some processes might stop working - the SWAP would prevent.

Function “Snapshot definition”



This feature takes so-called snapshots of the file system. The Snapshot function of Open-E NAS enables the system administrator to freeze the data content of the network drive unnoticed from the users at a certain time. From this moment on, the users work on a virtual data volume, all changes to the volume are stored in a different partition. The storage of all changes is independent of the file-system Open-E NAS uses on block-level. Only when the snapshot is deleted / removed the changes are permanently transferred to the actual data volume. Through a separate share, which is only available for the administrator (or backup administrator), a complete backup of the dataset can be done. With the snapshot technology even a database can be backed up while the users are working on it.

Another application is the acquisition of changes in very serious environments. Subject to the condition that enough system resources are offered, up to 100 snapshots can be stored for a long history of the dataset. This option is used at lawyers, notary or software development.

The Snapshot function is perfectly transparent for the users in the network. Only the administrator can work with the Snapshots.



**Note:** Please be generous, when you are calculating the space reserved for snapshots. If you delete 3 GB of files and restore them, this is handled as 2 actions and 6GB of snapshot space is used up. You should reserve at least 3 times the space of changes you expect per snapshot. When you run out of space in the snapshot folder, the snapshot is deleted / removed immediately. You do not lose data in that case, just the

***dataset, which is virtual for the users at the moment, will be written to the data volume. The old dataset, which has been frozen with the snapshot, is not available any longer.***

Snapshots can be activated/deactivated manually or automatically. In the schedule options "Begin time" and "End time" and day of week are used for automatic snapshots: this is the time of automatic activation and deactivation (syntax is "him"). When snapshot start is set, the snapshot will be deactivated and activated again at the given time.

Alternatively, snapshots can be taken manually in the Maintenance->Snapshot menu even if snapshots are automatically created under "Snapshot Definition". Button remove all can be useful for removing all snapshot at one time.

Snapshots are shared via SMB/CIFS protocol, but for authenticated users only. Access to snapshots can be granted in Maintenance->Snapshot.

Recommendation: Use only as many active snapshots as really needed – a large count of active snapshots can slow down the system considerably.



***Notes: The snapshot will become inactive if the content exceeds the snapshot capacity. Also, please take into account that changing the amount of snapshots will automatically reset the whole snapshot configuration!***

Configuration example:

Snapshot	Res. %	Begin	End
Snapshot02	50%	6:45	N.A.
Snapshot03	5%	10:00	10:30
Snapshot04	10%	13:00	13:40
Snapshot05	10%	15:00	16:00
Snapshot06	1%	16:00	22:00

This example is suitable for companies that start working at 7 am and end around 3 pm. Every morning - before everybody starts working - snapshot02 will be created (refreshed). This snapshot is designed to hold data from the beginning of working day untouched to the end of the day. This will enable simple access to files changed at the same day in order to look at previous file version.

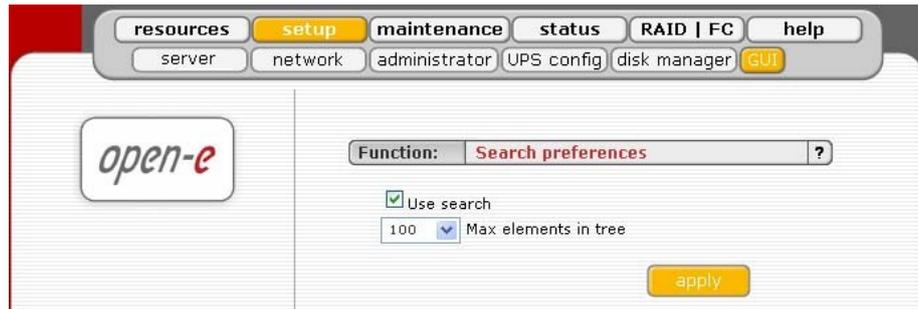
After three hours of work, the second snapshot (03) will be created and will stay active for 30 minutes. At this time, the backup server (Brightstor, for example) will connect to clients that are running Open-e NAS and backup all data. This same situation repeats at 1 pm and 3 pm - but with one difference - at this time, there is much greater activity (many more files are written), because at 3 pm all changes are stored in expectation of leaving off work.

The last snapshot with only 1% reserved space is forerunning backups on a tape device with a backup server. This backup takes much more time as backing up one single hard drive.

## 5.2.2.6 GUI

### Function; „Search preferences“

With this function you can enable or disable searching option in “resources” menu. Also you can set up to 500 elements in tree of users or groups



## 5.2.3 Maintenance

This page accessed with the Maintenance tab contains settings and functions pertaining to general management operations.

### 5.2.3.1 Shutdown

#### Function „System shutdown“

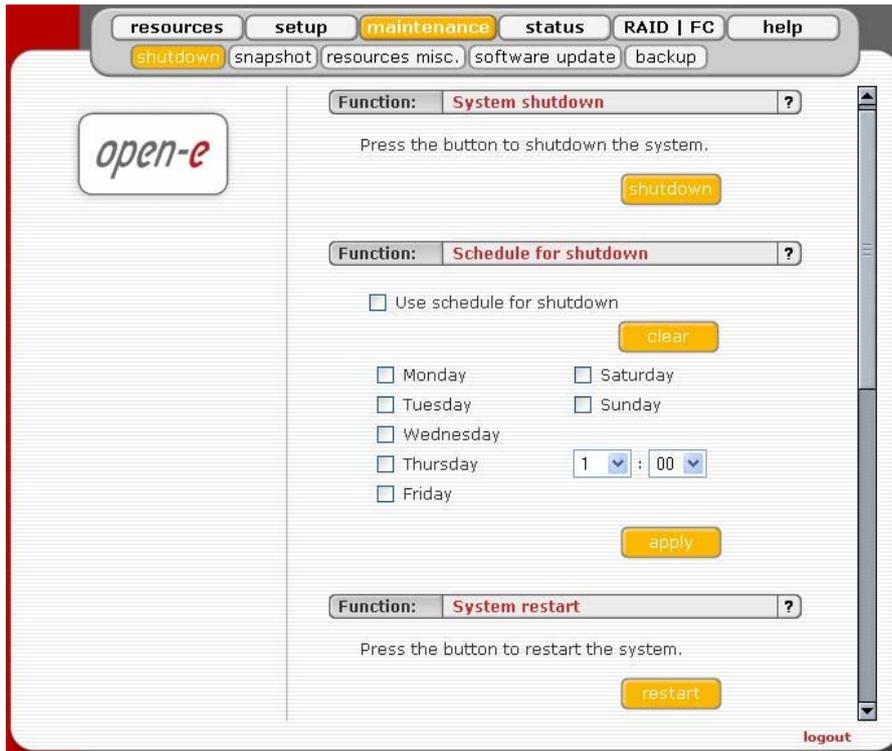
When using this function, you can shut down the NAS server. If any of your users are currently connected, you will be asked to confirm the shutdown. If no users are connected, the process will be executed immediately without any delay.



**Notes:** *The NAS server can only be turned on again manually.*

#### Function „Schedule for shutdown“

Here you can set more specific information like the time and day of a week for the shutdown.

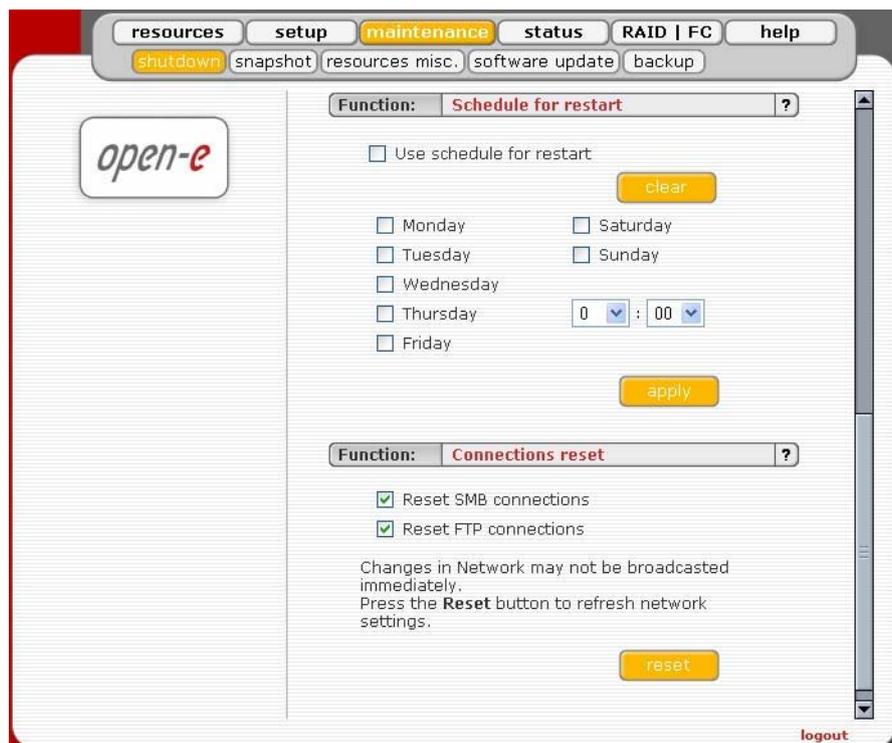


### Function “System Restart”

This function is self-explanatory: It allows restarting the system.

### Function “Schedule for Restart”

This control lets specify a time the planned system restart will be taking place.



## Function “Connection Reset”

When using this function, you can update all network settings including all changes previously made. This function also allows informing all clients directly about any changes made to shares and access rights. All clients will receive the update immediately. Otherwise, it may take several minutes before all clients are informed about any changes.

You can choose to reset SMB and/or FTP connection.



**Caution:** *Disconnecting your users while any files are open may lead to data loss.*

### 5.2.3.2 Snapshot

Here you can instantly create and remove snapshots without going to the “Snapshot definition” in “setup->disk manager”. This can be useful if you need to make considerable changes to your data while you don’t know if these changes are supposed to be permanent.

### Function “Snapshot access”

This tool enables adding and removing users who have access to snapshot images.

To grant access to snapshot images select a user from the column "Available" and click the appropriate arrow sign.

To revoke access to snapshot images from a user select the user from the column "Granted access" and click the appropriate arrow sign.

The screenshot shows the 'open-e' maintenance interface. At the top, there are navigation tabs: 'resources', 'setup', 'maintenance' (selected), 'status', 'RAID | FC', and 'help'. Below these are sub-tabs: 'shutdown', 'snapshot' (selected), 'resources misc.', 'software update', and 'backup'. The main content area features a table with columns: Name, %, Auto, Status (creation date), LV, and Operation.

Name	%	Auto	Status (creation date)	LV	Operation
Snap001*	33	manual	unused	lv00	not avail.
Snap002	33	manual	active (2005-08-01 23:44:28)	lv00	remove
Snap003	33	manual	unused	lv00	create

Below the table is a 'Remove all snapshots' button with a 'remove' sub-button. An information note states: '\* INFORMATION: Snapshot reserved for Synchronize.' The 'Function:' dropdown is set to 'Snapshot access'. There are two lists: 'Available:' containing 'Carl Stockinger' and 'Hans Musterma', and 'Granted access:' which is empty. Arrows between the lists allow moving users. An 'apply' button is at the bottom. The 'Function:' dropdown is also set to 'NFS snapshot access'. There is a checked 'Use NFS' checkbox, an 'Allow access IP:' input field, and an unchecked 'insecure' checkbox. Another 'apply' button is at the bottom. A 'logout' link is in the bottom right corner.

### Function “NFS snapshot access”

With this function you can activate access to the snapshots via NFS.

In order to mount snapshot via NFS, please use following syntax:

- `mount -t nfs IP_addr:/snapshot/xxx/nas /local_mount_point`

Where **xxx** is the snapshot number e.g. **002** for Snap002

You can fill-in the NFS options fields:

- **IP Addr:** Please enter an IP or address range that is allowed to access NFS. You can enter single IP or multiple IP separated with semicolon or IP address range.
  - `xxx.xxx.xxx.xxx`
  - `xxx.xxx.xxx.xxx;xxx.xxx.xxx.xxx; ....`
  - `xxx.xxx.xxx.xxx/network_prefix_length.`

For example:

192.168.0.1/24 will set range from 192.168.0.1 to 192.168.0.254

192.168.0.1/28 will set range from 192.168.0.1 to 192.168.0.14

192.168.0.100/29 will set range from 192.168.0.97 to 192.168.0.102

you can easily calculate the network IP range using an IP Address Calculator like:

[http://www.camtp.uni-mb.si/books/Internet-Book/IP\\_AddressCalculator.html](http://www.camtp.uni-mb.si/books/Internet-Book/IP_AddressCalculator.html)

- **insecure:** allows incoming connection to originate from ports > 1024

### 5.2.3.3 Miscellaneous Resources

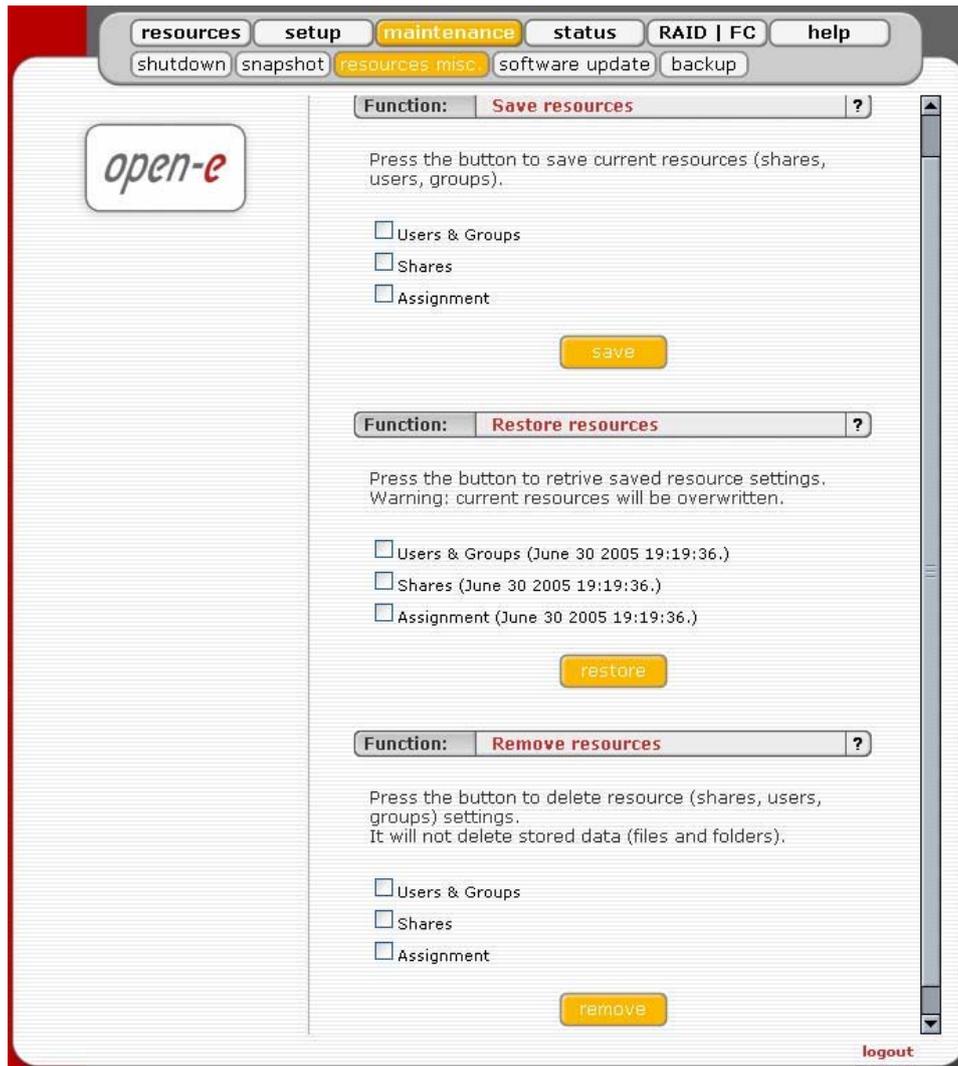
The next menu option is “Miscellaneous Resources.” This function allows you to save shares, users and groups, to retrieve them, and to remove them.

#### Function “Save”

With this function you easily store the settings of your resources.

#### Function “Restore”

With this function you restore your settings.



### Function “Remove”

With “Remove Resources” you remove all resources (shares, users and groups). That’s why this function should only be used with extreme caution. At the same time it is important to point out that this function will not delete other data such as your files or folders. After you have selected the remove function you will be prompted to confirm your choice. That is a safety mechanism to ensure you didn’t hit the key by accident.



**Caution:** *The “Remove” button irrevocably deletes all users and resources. Please only use this function if you really want to delete all users and resources, because the data loss cannot be reversed.*

## 5.2.3.4 Software Update



### With ISO-image-update option:

The ISO-Files includes update file which must be burned on a CD with your favorite Burning software (for example: Nero Burning ROM - option: “Burn Image”, etc.).

In order to re-flash the module, please install CD-ROM as Secondary-Master and DOM (disk-on-module) as Primary-Master.

Please set the BIOS to boot from CD-ROM drive. Then boot from the ISO-CD and wait until prompt: “Update complete, Please Remove CD and restart” After re-flashing, please reset the BIOS to boot from Primary-master HDD. Updating the system may take about 10 minutes.

Before updating please do:

- write down the actual NAS server IP address and NAS server name. After having updated Open-E NAS, please re-enter both,
- write down authorization settings,
- save “User”, “Groups”, “Shares” and “Assignments” under Menu: “Maintenance” → “Resources Misc.” → “Save resources”,
- download and save NAS Server Logs: Menu “Status” → “Hardware” in Function Logs click on “Download”, then save on your local HDD.

### With update-file option:

With “Update-file” you can install the most up-to-date version of the Open-E NAS software. Copy the new software to the /update directory of Open-E NAS and then update it. The new version will be installed immediately.



**Notes:** *When you create the share “update” use small characters only!*

### 5.2.3.5 Backup

#### Function “Local backup”

This function allows backing up shares on logical volumes of the Open-e NAS server. Before starting a local backup procedure, you must choose the “source lv”, snapshot, destination and share source. Choosing the “incremental backup” will copy files that have been changed since the last backup or will make a new backup.

Shares included in the right window (see the image below), are automatically backed up by clicking the “apply” button.



**Notes: Choosing Destination: “dynamic” will automatically execute the rescan process and it will take a few seconds to complete.**

The screenshot displays the Open-e NAS web interface with the 'maintenance' tab selected. The 'backup' sub-tab is active, showing three main sections:

- Local backup:** Includes dropdowns for Source lv (lv00), Snapshot (Snap002), and Destination (lv00). It features two share selection windows: 'Available' (containing 'Pub') and 'Chosen' (containing 'Projects'). Backup options include 'full backup' (selected), 'Add date and time to backup file name', and 'incremental backup (file name with timestamp)'. A 'Time select' dropdown is set to 'Now'. An 'apply' button is present.
- Local backup schedule:** Shows a single schedule entry: '1 Weekly: Fr, at 12:00'. A 'Backup' dropdown is set to '"Projects" to lv00 full'. An 'apply' button is present.
- Restore from local backup:** Includes dropdowns for Source lv (lv00), Backup file (backup;Projects;.tar.gz), and Dest. share (Projects). An 'apply' button is present.

The interface also features a top navigation bar with tabs for resources, setup, maintenance, status, RAID | FC, and help. A 'logout' link is located in the bottom right corner.

#### Function “Local backup schedule”

This function allows you to edit previously saved local backup schedules. There are available 2 types of schedule: weekly and interval.

- **Interval:** Backup will be made every "selected time". E.g. if you choose interval 1 h. - each one hour share will be backed up.
- **Weekly:** Backup will be made in selected days at specified time.

To edit properties of schedule please click at 

To delete schedule please click at 

You can also delete a schedule by setting interval to "not set" or deselecting all days and unset time when using weekly schedule.



**Notes:** *1. It is possible to edit time of backups. If you want to edit shares to backup or other backup options please delete this schedule and add new.*

*2. It is possible to perform one backup at once. If you schedule few backup at the same time, only one will be done.*

### Function “Restore from local backup”

In order to restore shares from a local backup you must set the required parameters like: source lv, backup file and destination share. Choosing the apply function will commence the restore process automatically.

### Function “Tape Backup Function”

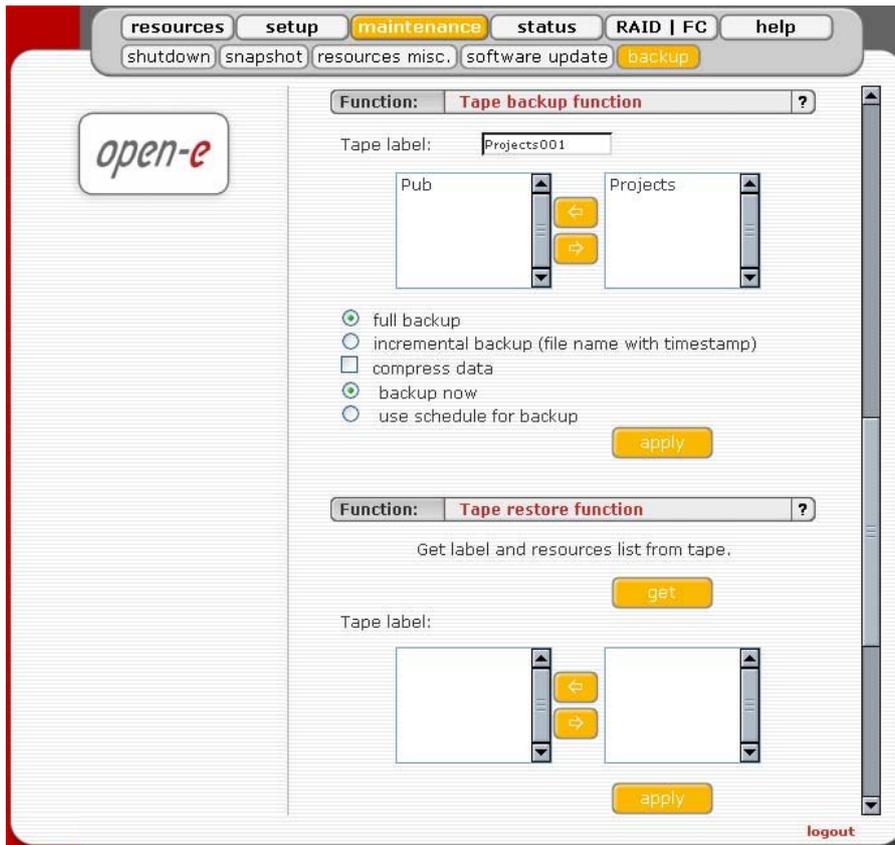
This feature allows logical disks to be added to the Open-E NAS’ tape backup support. However, it will only work when a compatible streamer with a tape inserted is installed.

The shares included in the right window (see the image above) are automatically accounted for when pressing the “apply” button to start the backup procedure. Choosing “incremental backup” will only copy files that have been changed since the last backup.

Try to use tape labels (max. 50 alphanumeric characters), this will considerably help to distinguish your tapes later.

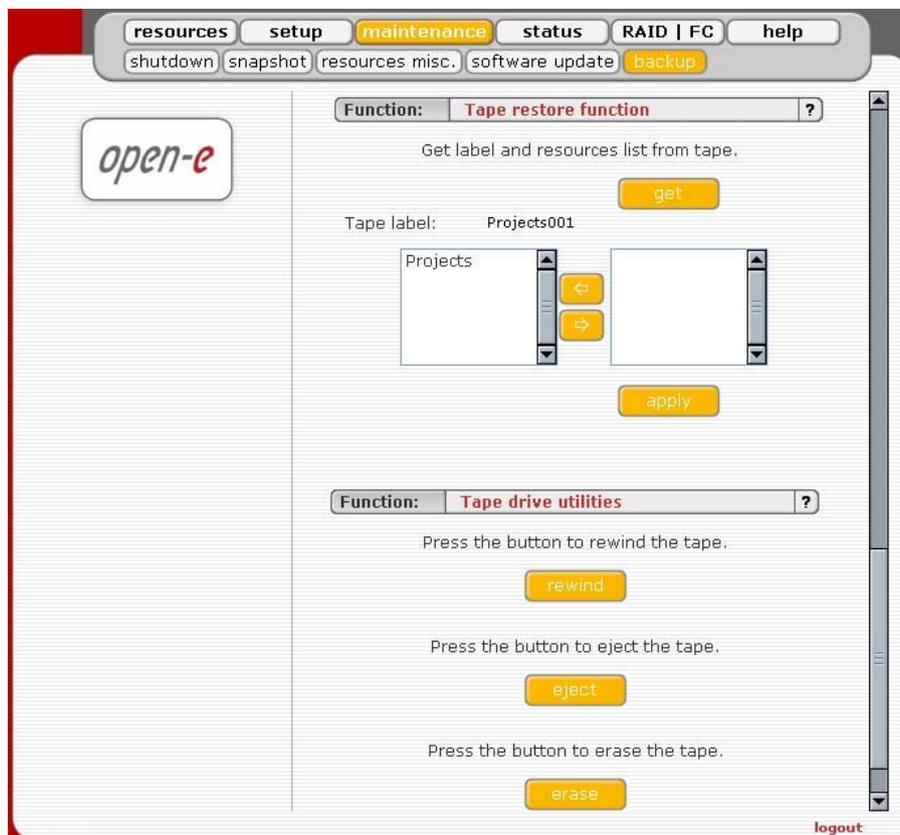
### Function “Tape Restore Function”

Restoring works pretty much like the backup function. Start with providing the streamer tape you want to use for the recovery process, check the shares demanded to be restored and press apply. The restore process will commence automatically right away.



### Function “Tape drive utilities”

This function gives access to various utilities specific to installed tape streamers hardware.

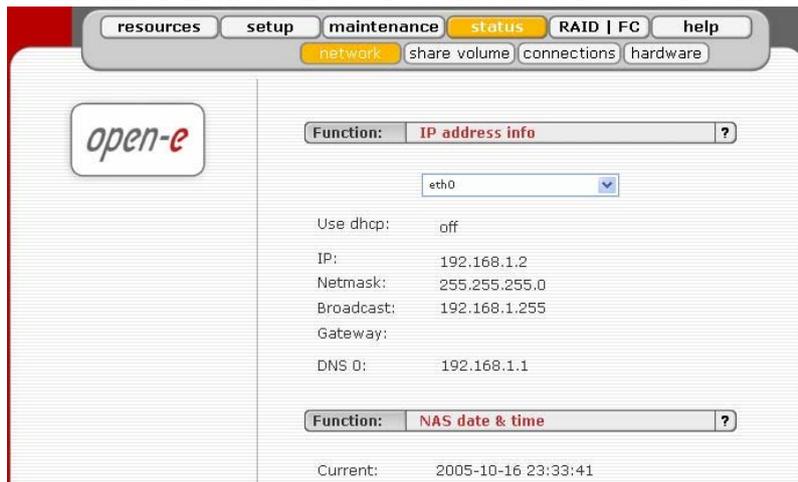


## 5.2.4 Status

This function provides a quick overview of the most important system parameters of your Open-E NAS. The corresponding sub-functions are network, share volume, connections, and hardware.

### 5.2.4.1 Network

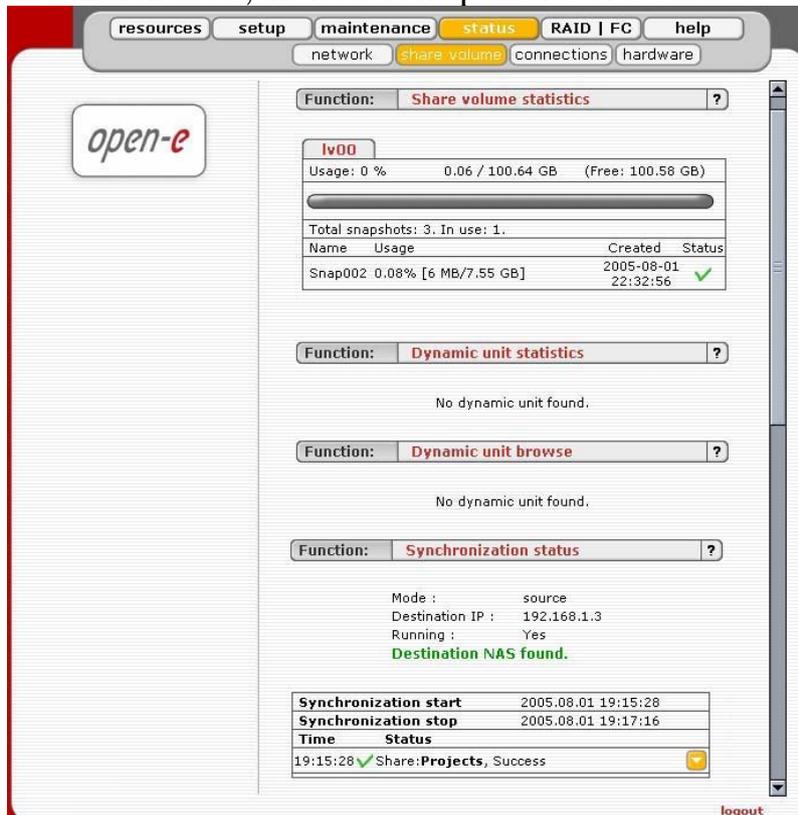
This function gives information on the IP address and the NAS date and time.



The screenshot shows the Open-E NAS web interface. The top navigation bar includes 'resources', 'setup', 'maintenance', 'status' (highlighted), 'RAID | FC', and 'help'. Below this, a sub-navigation bar shows 'network' (highlighted), 'share volume', 'connections', and 'hardware'. The main content area features the 'open-e' logo on the left and a 'Function: IP address info' dropdown menu on the right. Below the dropdown, a list of network parameters is displayed: 'Use dhcp: off', 'IP: 192.168.1.2', 'Netmask: 255.255.255.0', 'Broadcast: 192.168.1.255', 'Gateway:', and 'DNS 0: 192.168.1.1'. A second dropdown menu shows 'Function: NAS date & time', with the current date and time '2005-10-16 23:33:41' displayed below it.

### 5.2.4.2 Share Volume

This function contains any statistical data on the share volume, dynamic unit statistic and browse, the synchronization status, the local backup and restores status.

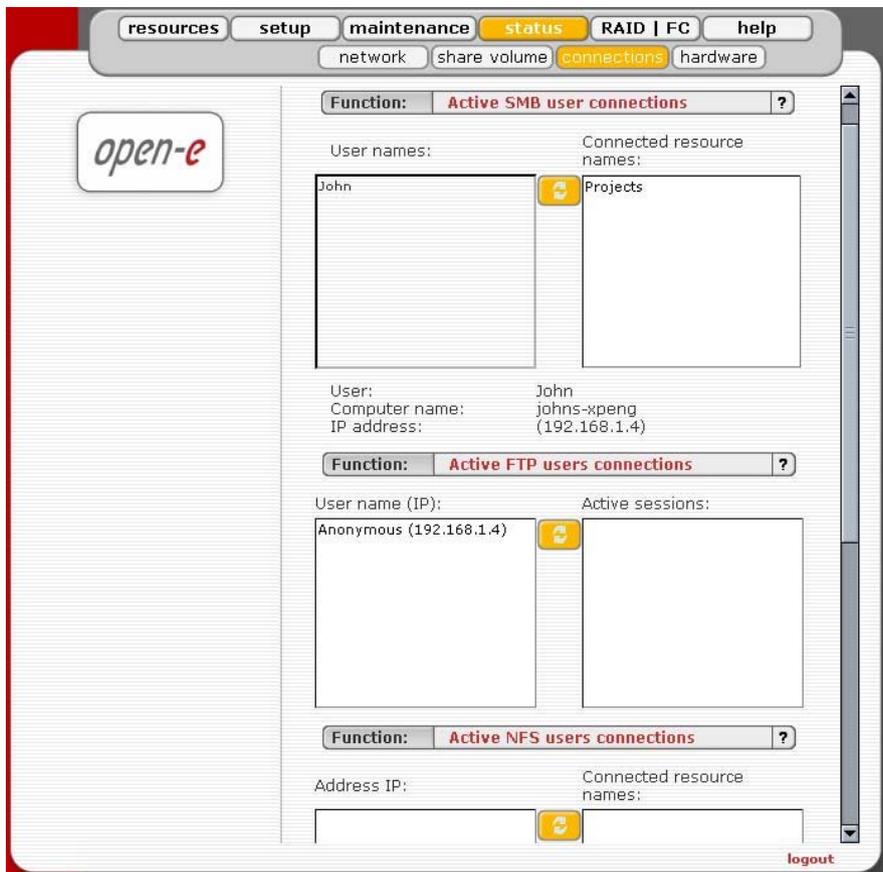


The screenshot shows the Open-E NAS web interface for the 'Share volume' sub-function. The top navigation bar is the same as in the previous screenshot. The sub-navigation bar highlights 'share volume'. The main content area features the 'open-e' logo on the left and a 'Function: Share volume statistics' dropdown menu on the right. Below the dropdown, a table shows usage statistics for 'lv00': 'Usage: 0 %', '0.06 / 100.64 GB', and '(Free: 100.58 GB)'. A progress bar is shown below the table. Below the progress bar, a table lists snapshots: 'Total snapshots: 3. In use: 1.' and a table with columns 'Name', 'Usage', 'Created', and 'Status'. The table contains one entry: 'Snap002', '0.08% [6 MB/7.55 GB]', '2005-08-01 22:32:56', and a green checkmark. Below this, two dropdown menus show 'Function: Dynamic unit statistics' and 'Function: Dynamic unit browse', both displaying 'No dynamic unit found.'. A third dropdown menu shows 'Function: Synchronization status', displaying 'Mode: source', 'Destination IP: 192.168.1.3', 'Running: Yes', and 'Destination NAS found.'. Below this, a table shows 'Synchronization start' and 'Synchronization stop' times. At the bottom, a table shows 'Time' and 'Status' for a synchronization event: '19:15:28', 'Share:Projects, Success'. A 'logout' link is visible in the bottom right corner.



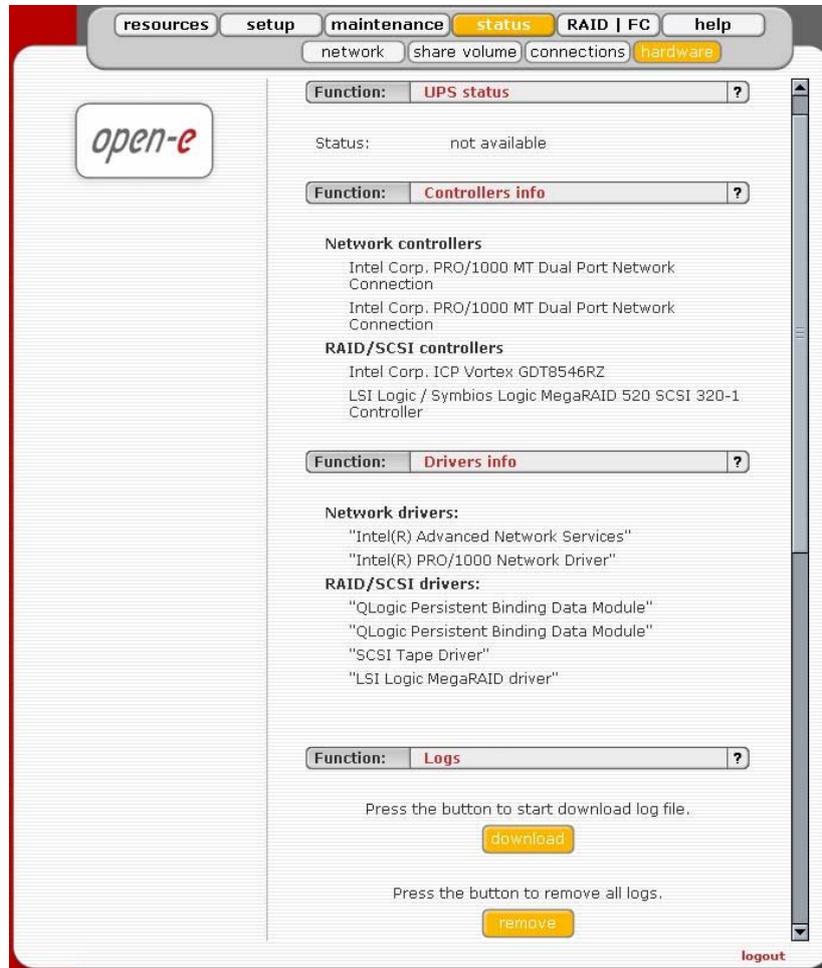
### 5.2.4.3 Connections

This function displays what user connections are currently active.

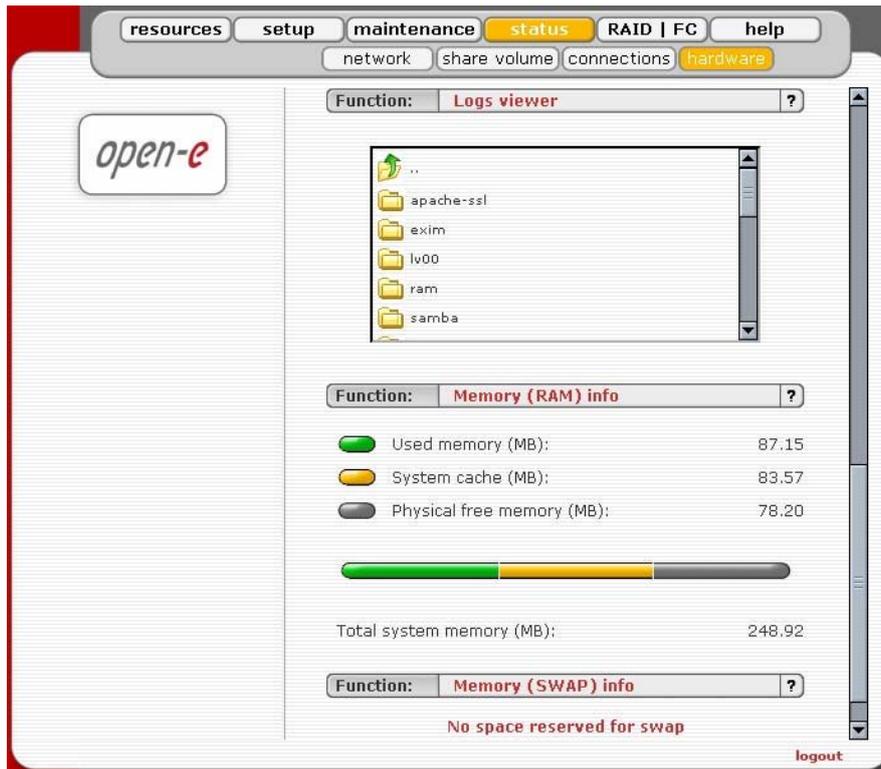


## 5.2.4.4 Hardware

The “Hardware” option provides you with information on storage and network controllers and the drivers (e.g. network driver and RAID driver).



In addition, you may also download the latest Open-E NAS log files, to view specified log file without downloading all log files in compressed form and check memory (RAM) and (SWAP) info usage.



## 5.2.5 RAID



Please note that the RAID controller should be supported by the Open-E NAS software. In case 3ware controller installed, by clicking on RAID in the menu the 3ware web base will be started automatically.

With INTEL / ICP Vortex RAID controllers you can select users that will be allowed to configure the RAID Controller in this menu. Please use the original INTEL/ICP Vortex console utility for this configuration. Example below shows how to choose users with different authentications.

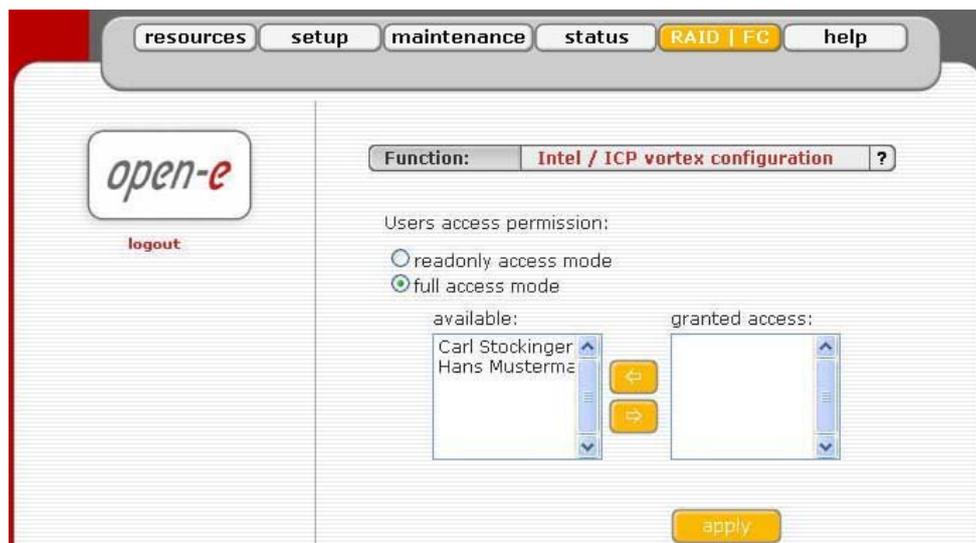
In LDAP users

- a. Create a user in the resources tab
- b. Go to the RAID tab
- c. Set the users access permission:
  - check 'read only' access mode or full access mode
- d. Move selected users from window 'available' to window 'granted access'

- e. Accept it by clicking the apply button
- f. On your local computer run “storcon” application. To get the ICP-VORTEX software go to [http://www.icp-vortex.com/english/download/rz\\_neu\\_e.htm](http://www.icp-vortex.com/english/download/rz_neu_e.htm)
- g. Select the TCP/IP Sockets interface
- h. Set the remote machine IP
- i. Type in the ID and password for each user
- j. Now you have access to the RAID controller tools

**In Microsoft Primary Domain Controller (PDC, ADS) and NIS authentication**

- a. Run storcon application on your local computer. To get the ICP-VORTEX software go to [http://www.icp-vortex.com/english/download/rz\\_neu\\_e.htm](http://www.icp-vortex.com/english/download/rz_neu_e.htm)
- b. Select the TCP/IP Sockets interface
- c. Set the remote machine IP
- d. Set the "raid-admin" and password "admin" for users with a full access or
- e. Set the "raid" and password "raid" for users with a 'read only' access mode
- f. Now you have access to the Intel RAID controller tools

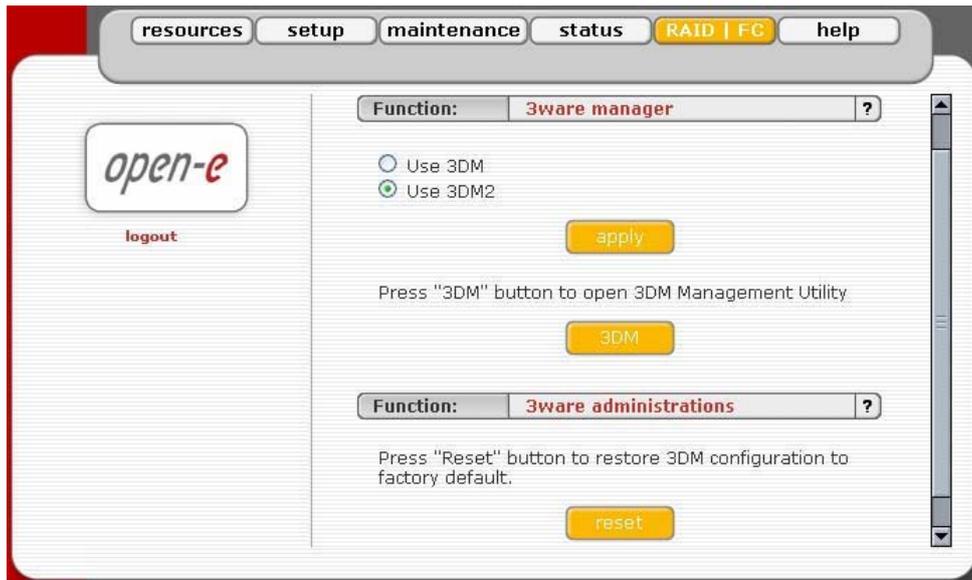


**Function “3ware administrations”**

This function will reset the 3DM password to factory default.  
(Default 3DM/3DM2 password: 3ware)

**Function “3ware manager”**

In case of controller 7000/8000 is installed, you can choose 3ware RAID manager 3DM or 3DM2.

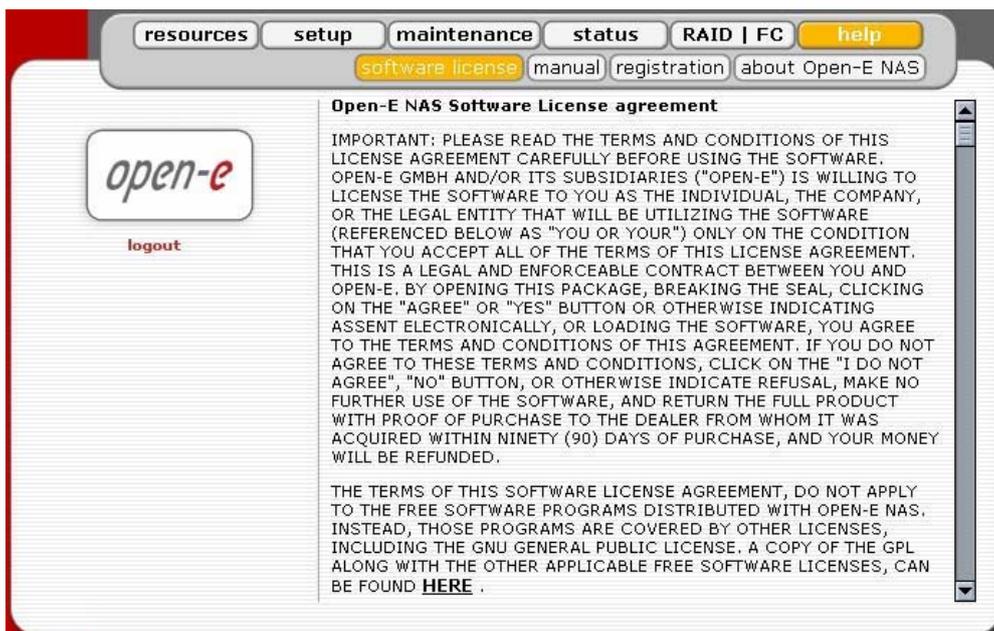


**Notes:** If you choose 3DM2 option for controller 7000/8000, the scheduling tasks will be not supported.

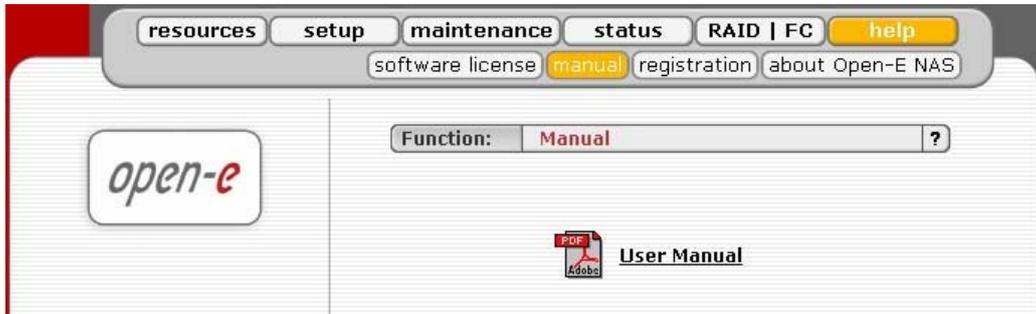
Support remote management is used for 3ware & Intel RAID controllers only. In case of Adaptec & LSI Logic, the RAID Manager is available on the NAS console only. Once LSI RAID is installed you have access to RAID management via hot keys: CTRL+ALT+R and then ENTER. You may press F1 for help to display it on the console screen.

## 5.2.6 Help

When accessing Help - "Software License" you can get acquainted with license for software included in Open-E NAS ENTERPRISE.



You can download a PDF version of this manual. In order to read the manual, you need a PDF viewer such as the Acrobat Reader (<http://www.adobe.com>).



By clicking on “Registration” in the “Help” menu you can register yourself at <http://www.open-e.com>.



“About Open-E NAS” indicates which system version you are currently working with. In addition you find contact information regarding Open-E NAS; for instance how you can reach Open-E’s technical hotline if you should have problems.



You log out by closing the browser window.

## 6 TROUBLESHOOTING GUIDE

Here is a list of common error messages and their meanings as well as corresponding tips on how to resolve the underlying problem. If your error message is not listed here please contact Open-E's support and service team (see section “help” above). Our staff will help you find a solution.

### **Open-E NAS does not boot, keyboard LEDs are flashing**

This problem arises when you installed Open-E NAS into the secondary IDE slot by mistake. Open-E NAS is configured for and will only run in the primary IDE connector. Shut down the computer, remove Open-E NAS from secondary and place it into primary. That solves the problem. Also, it is important that you use the master plug on your power adapter.

### **Error: user already exists**

There cannot be more than one user with the same name. You cannot create a user twice. Check your spelling. Remember, user names are not case-sensitive. You can check existing user names by expanding the tree diagram on the left.

### **Error: values are not valid**

You have entered an invalid parameter. IP addresses have the form aaa.bbb.ccc.ddd: All four parameters range between 0 and 255 and are always separated by periods.

### **Error: resource already exists**

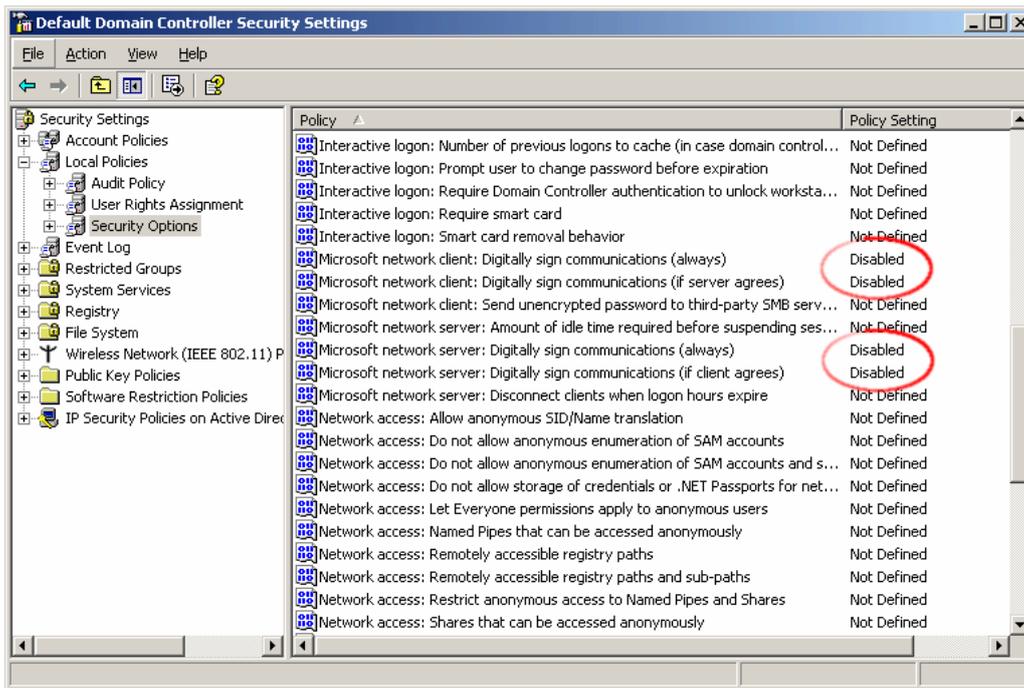
You cannot create more than one resource with the same name. You cannot create a resource twice. Check your spelling. Remember that resource names are not case-sensitive. You can check existing resource names by expanding the tree diagram to the left.

### **Error: passwords do not match**

Make sure that you type the same password in each entry field. For safety reasons, the passwords are not displayed. Type slowly. Check the status of the Shift, Caps Lock, Control, and Alt-keys.

### **Error: Open-E NAS cannot import the user database from a Windows Server 2003 domain.**

In this case the following setting within the local security guideline may solve this problem:



### Error: Update file not found

You instructed Open-E NAS to perform a systems update, but did not supply a valid Open-E NAS ENTERPRISE update file. Download the latest Open-E NAS update file from the [www.open-e.com](http://www.open-e.com) Web site. Next, copy the upgrade file into your "update" folder (please spell upgrade lower case). Finally, select "update" from the menu.

### Error: No share volume

You must create a volume for file sharing before you can create any resource shares or search for shares. Look into the "Getting Started" section of this manual for instructions on creating a share volume.

### Error: No share volume to browse

You must create a volume for file sharing before you can browse it in order to create resource shares.

### Error: Invalid user name!

User name cannot:

- (1) Contain characters: ~ ! @ # \$ ^ & ( ) + [ ] { } \* ; : ' " . , % | < > ? / \ = `
- (2) Begin or end with a space

The use of the SMB (Server Message Block) protocol from Windows, also known as CIFS or Samba, places some restrictions on the use of special characters. These restrictions have historical reasons, but are still binding today. User names must not contain any of the above mentioned characters.

### **Error: invalid user password**

A user password cannot begin or end with a space.

Spaces are not legitimate characters at the beginning and end of a password. Maybe you inadvertently hit the space bar during password entry. Please reenter your password.

### **Error: invalid administrator password**

Administrator password cannot begin or end with a space.

Spaces are not legitimate characters at the beginning and end of a password. Maybe you inadvertently hit the space bar during password entry. Reenter your password.

### **Error: invalid resource name**

Resource name cannot:

- (1) Contain characters: \* : " | < > ? / \ ` # \$ & ( ) + ; ' .
- (2) Begin or end with a space

The use of the SMB (Server Message Block) protocol from Windows, also known as CIFS or Samba, lays some restrictions on the use of special characters. These restrictions have historical reasons, but are still binding today. Resource names cannot contain any of the above mentioned characters. Note that the list of invalid characters is slightly different than that for other name fields.

### **Error: invalid workgroup name**

Workgroup name cannot:

- (1) Contain characters: ~ ! @ # \$ ^ & ( ) + [ ] { } \* ; : ' " . , % | < > ? / \ = `
- (2) Begin or end with a space

The use of the SMB (Server Message Block) protocol from Windows, also known as CIFS or Samba, lays some restrictions on the use of special characters. These restrictions have historical reasons, but are still binding today. Workgroup names cannot contain any of the characters listed above. Note that the list of invalid characters is slightly different than that for other name fields.



**Notes:** *The invalid characters for workgroup names are different than the ones for other fields.*

### **Error: invalid server name**

Server name cannot contain:

- (1) Characters: ~ ! @ # \$ ^ & ( ) + [ ] { } \* ; : ' " . , % | < > ? / \ = `
- (2) Spaces
- (3) Digits only

The use of the SMB (Server Message Block) protocol from Windows, also known as CIFS or Samba, lays some restrictions on the use of special characters. These restrictions have historical reasons, but are still binding today. Server names cannot contain any of the above mentioned characters. Note that the list of invalid characters is slightly different than that for

other name fields. In addition, server names cannot be constructed from numbers only, they must contain alpha characters.

**Error: invalid resource comment**

Resource comment cannot be longer than 256 characters

Resource comments have a limit of 256 characters, a limit which cannot be exceeded. Use a shorter comment.

**Error: invalid directory name**

Directory name cannot:

(1) Contain characters: \* : " | < > ? / \ ` # \$ & ( ) + ; ' .

(2) Begin or end with a space

The internal operating system of Open-E NAS does not allow certain characters to be used for directories. The above mentioned characters are invalid, just as trailing or leading spaces. Choose a different name.

## 7 Appendix A

### **Open-E NAS Software License agreement**

**IMPORTANT: PLEASE READ THE TERMS AND CONDITIONS OF THIS LICENSE AGREEMENT CAREFULLY BEFORE USING THE SOFTWARE. OPEN-E GMBH AND/OR ITS SUBSIDIARIES ("OPEN-E") IS WILLING TO LICENSE THE SOFTWARE TO YOU AS THE INDIVIDUAL, THE COMPANY, OR THE LEGAL ENTITY THAT WILL BE UTILIZING THE SOFTWARE (REFERENCED BELOW AS "YOU OR YOUR") ONLY ON THE CONDITION THAT YOU ACCEPT ALL OF THE TERMS OF THIS LICENSE AGREEMENT. THIS IS A LEGAL AND ENFORCEABLE CONTRACT BETWEEN YOU AND OPEN-E. BY OPENING THIS PACKAGE, BREAKING THE SEAL, CLICKING ON THE "AGREE" OR "YES" BUTTON OR OTHERWISE INDICATING ASSENT ELECTRONICALLY, OR LOADING THE SOFTWARE, YOU AGREE TO THE TERMS AND CONDITIONS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THESE TERMS AND CONDITIONS, CLICK ON THE "I DO NOT AGREE", "NO" BUTTON, OR OTHERWISE INDICATE REFUSAL, MAKE NO FURTHER USE OF THE SOFTWARE, AND RETURN THE FULL PRODUCT WITH PROOF OF PURCHASE TO THE DEALER FROM WHOM IT WAS ACQUIRED WITHIN NINETY (90) DAYS OF PURCHASE, AND YOUR MONEY WILL BE REFUNDED.**

The terms of this software license agreement, do not apply to the Free Software Programs distributed with Open-E NAS. Instead, those programs are covered by other licenses, including the GNU General Public License.

A copy of the GPL along with the other applicable Free Software Licenses, can be found in Appendix B.

### **Ownership and Copyright**

The Open-E NAS software is non-exclusive licensed and sold to you for use only as permitted by this License Agreement. Open-E GmbH reserves any rights not expressly granted to you. Copying of the software is prohibited by law unless specifically authorized in writing by Open-E GmbH. You may not use copy, modify, sell, lease, sublease or otherwise transfer Open-E NAS software in whole or in part.

### **Intellectual Property Rights**

The Open-E NAS software contains intellectual property rights, and in order to protect them, you may not decompile, reverse engineer, disassemble or otherwise reduce the Open-E NAS software to a human perceivable form.

### **Termination**

This license will be automatically terminated without notice from Open-E GmbH if you fail to comply with any term or condition of this agreement. If you do not agree to be bound by these terms and conditions, you may not use the Open-E NAS or any of its software components.

### **Disclaimer of Warranties**

Open-E NAS software are licensed "as is" without warrantee of any kind. Open-E GmbH hereby disclaims all warranties express and implied, relating to Open-E NAS, the installation

utilities and the embedded software including, without limitation, any implied warranty of merchantability, fitness for a particular purpose or non-infringement.

### **Limitation of Liability**

In no event will Open-E GmbH liability under this agreement exceed the price that you paid for your Open-E NAS. Furthermore, in no event will Open-E GmbH be liable for any lost profits, lost data, cost of procurement of substitute goods or services, or any special consequential, incidental, indirect or punitive damages arising out of or under this agreement.

The limitation of liability set forth in this paragraph will apply, whether or not Open-E GmbH was advised of the possibility of the loss, liability or damages and notwithstanding any failure of essential purpose of any limited remedy.

### **Waiver**

No delay or failure of Open-E GmbH to exercise any right under neither this agreement nor any partial exercise thereof shall be deemed to constitute a waiver or any rights granted hereunder or under law.

### **Unlawful Provisions**

If any provision of the agreement is held to be unenforceable for any reason, all other provisions of this agreement shall nevertheless be deemed valid and enforceable to the fullest extent possible.

### **Entire Agreement**

This agreement constitutes the sole and exclusive agreement between the parties concerning the subject matter hereof.

### **LIMITED WARRANTY**

Open-E warrants that the media on which the software is distributed will be free from defects for a period of ninety (90) days from the date of delivery of the software to you. Your sole remedy in the event of a breach of this warranty is that Open-E will, at its option, replace any defective media returned to Open-E within the warranty period, or refund the money you paid for the software. Open-E does not warrant that the software will meet your requirements, that operation of the software will be uninterrupted, or that the software will be error-free.

### **Authorized Service**

Only an authorized service representative can service Open-E NAS. Failure to comply with this requirement will void the warranty.

### **Applicable Law**

This agreement shall be governed by German law. You agree to jurisdiction and venue in the courts located in Munich, Germany for all claims, disputes and litigation arising under or related to this agreement.

## 8 Appendix B

### GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.  
59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

#### Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

## **GNU GENERAL PUBLIC LICENSE**

### **TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION**

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:
  - a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
  - b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

- c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such
- d) interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:
  - a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
  - b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
  - c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.
5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.
6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.
7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.
9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

#### **NO WARRANTY**

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED

WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

## END OF TERMS AND CONDITIONS

### How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

*<one line to give the program's name and a brief idea of what it does.>*

*Copyright (C) <year> <name of author>*

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

Gnomovision version 69, Copyright (C) year name of author

Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.

This is free software, and you are welcome to redistribute it under certain conditions; type ``show c'` for details.

The hypothetical commands ``show w'` and ``show c'` should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than ``show w'` and ``show c'`; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program ``Gnomovision'` (which makes passes at compilers) written by James Hacker. *<signature of Ty Coon>*, 1 April 1989  
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

## The PHP License,

Version 3.0

Copyright (c) 1999 - 2004  
The PHP Group. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name "PHP" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact [group@php.net](mailto:group@php.net).
4. Products derived from this software may not be called "PHP", nor may "PHP" appear in their name, without prior written permission from [group@php.net](mailto:group@php.net). You may

indicate that your software works in conjunction with PHP by saying "Foo for PHP" instead of calling it "PHP Foo" or "phpfoo"

5. The PHP Group may publish revised and/or new versions of the license from time to time. Each version will be given a distinguishing version number. Once covered code has been published under a particular version of the license, you may always continue to use it under the terms of that version. You may also choose to use such covered code under the terms of any subsequent version of the license published by the PHP Group. No one other than the PHP Group has the right to modify the terms applicable to covered code created under this License.
6. Redistributions of any form whatsoever must retain the following acknowledgment: "This product includes PHP, freely available from <<http://www.php.net/>>".

THIS SOFTWARE IS PROVIDED BY THE PHP DEVELOPMENT TEAM ``AS IS'' AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE PHP DEVELOPMENT TEAM OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

This software consists of voluntary contributions made by many individuals on behalf of the PHP Group.

The PHP Group can be contacted via Email at [group@php.net](mailto:group@php.net).

For more information on the PHP Group and the PHP project, please see <<http://www.php.net/>>.

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

## **GNU LESSER GENERAL PUBLIC LICENSE**

Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.  
59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

## Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

## **GNU LESSER GENERAL PUBLIC LICENSE**

### **TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION**

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:
  - a) The modified work must itself be a software library.
  - b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
  - c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
  - d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed

when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6.

Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

- a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must

be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions).

- b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.
- c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

- 7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:
  - a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

- b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.
8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.
  9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.
  10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.
  11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of

that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.
13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

#### **NO WARRANTY**

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.
16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL

DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

## END OF TERMS AND CONDITIONS

### How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

*<one line to give the library's name and a brief idea of what it does.>  
Copyright (C) <year> <name of author>*

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details.

You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

*<signature of Ty Coon>*, 1 April 1990  
Ty Coon, President of Vice

That's all there is to it!