PePLink Surf
User's Manual

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Table of Content

1 Copyright **3**

2 Disclaimer **3**

3 Product Description **4**

3.1 Features 4

3.2 Hardware Setup 5

3.3 LED Description 6

4 Using the PePLink Surf **7**

4.1 First Time Setup 8

4.2 Settings Details 11

4.3 Advanced Settings: Port Forward 13

4.4 WPA/WPA2 with 802.1x Authentication 14

4.5 Test the Setup 17

4.6 Firmware Upgrade 18

4.7 Debug Page 19

4.8 Restore to Factory Defaults 20

4.9 System Settings 21

5 Appendix - Demo CA and Server Certification Generation Instructions **26**

5.1 Prerequisite 26

5.2 Create your own Certificate Authority (CA) 26

5.3 Create a server certificate request from your servers 27

5.4 Sign the server certificate with your own CA 28

1 Copyright

2 Disclaimer

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3 Product Description

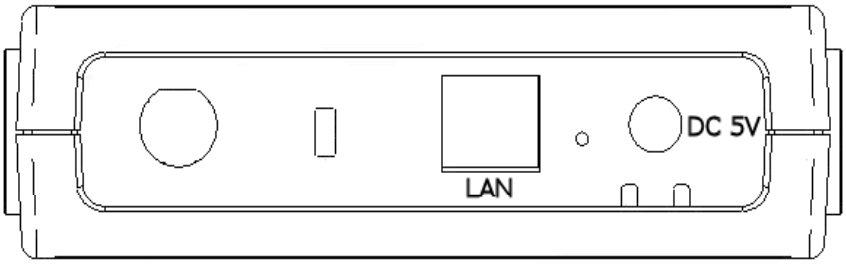
PePLink Surf, formerly known as MANGA Surf, is a Wi-Fi Station Mode (Client) Router with WPA, WPA2 and 802.1x supplicant support. It is designed to act as a Wireless router which connects to Wireless Broadband Internet Service and allows LAN users to access the Internet via it.

It associates to a service provider and authenticates using 802.1x (if needed) on start up. Upon successful association and authentication, it will acquire an IP address from the service provider using DHCP. A DHCP server is built-in on its LAN port. Network Address Translation is performed for all outbound connections. Thus it supports multiple terminals to access the Internet simultaneously.

3.1 Features

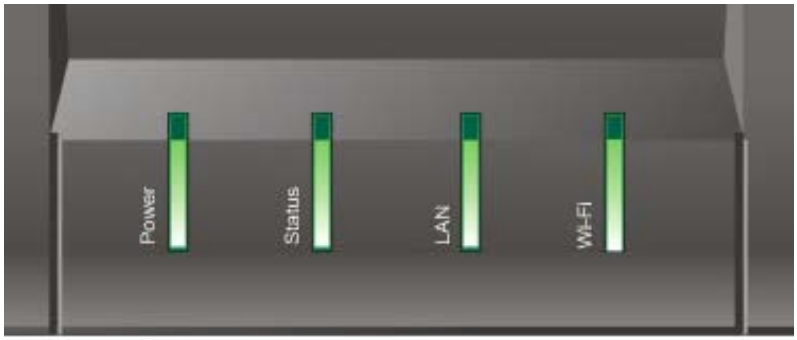
- 10/100 Ethernet interface with auto-crossover detection
- Reset button for restoring settings to factory defaults
- Signal strength LED for showing the current signal strength
- WPA/WPA2-Personal and WPA/WPA2-Enterprise support
- Network Address Translation (NAT) routing
- Built-in DHCP server
- Inbound port range forwarding

3.2 Hardware Setup



1. Attach the provided antenna to the left most antenna connector
2. Connect the LAN port to the computer's Ethernet port with an Ethernet cable.
3. Connect the end of the included power adapter to the power socket (labeled "DC 5V") on PePLink Surf.
4. Power on the power adaptor.

3.3 LED Description



LED	Color	Status	Description
Power	Green	On	Power is on
		Off	Power is off
Status	Green	Solid	Received signal is Excellent, Very Good and Good
	Green	Blinking	Received signal is Low
	Amber	Blinking	Received signal is Very Low
	Amber	Solid	No wireless signal is detected
		Off	Booting up / Upgrading firmware
LAN	Green	On	Ethernet is connected
	Green	Blinking	Sending/Receiving data
		Off	Ethernet is not connected
Wi-Fi	Green	On	Associated with an access point
	Green	Blinking	Sending/Receiving data
		Off	Not associated with any access point

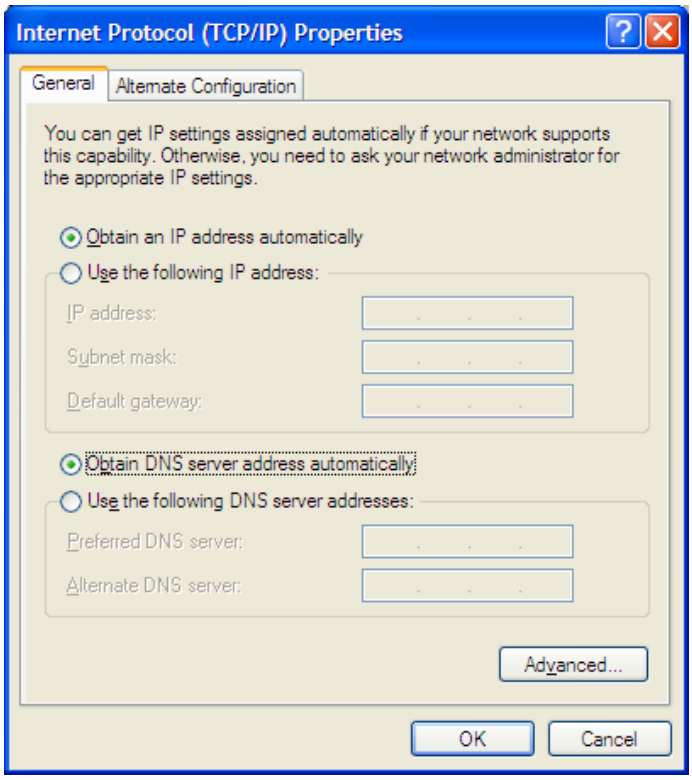
This is the Signal Strength and Status LED state conversion table.

Received Signal Strength	Status LED	Indication on the web based power meter
> -70	Solid Green	Excellent
-70 to -74	Solid Green	Very good
-75 to -79	Solid Green	Good
-80 to -84	Blinking Green	Low
-85 to -87	Blinking Amber	Very Low
-87 to -89	Blinking Amber	Very Low
-89 <	Blinking Amber	Very Low

4 Using the PePLink Surf

You should set up your computer's LAN interface to obtain an IP address automatically. If you do so, you should have set it up correctly.

In order to do so, select the "Start" menu, "Control Panel" and then "Network Connections". Right click on the "Local Area Connection" icon, choose "Properties", double click on the item "Internet Protocol (TCP/IP)" from the list. On the screen, just set it as follows:



Click the "OK" button to confirm the change.

4.1 First Time Setup

On your PC, start a web browser, e.g. Internet Explorer, Mozilla Firefox, etc. Visit an Internet web site. If you are not associated to an access point, you should be redirected to a logon page. Or you can go also go to this URL

`http://192.168.20.1/`

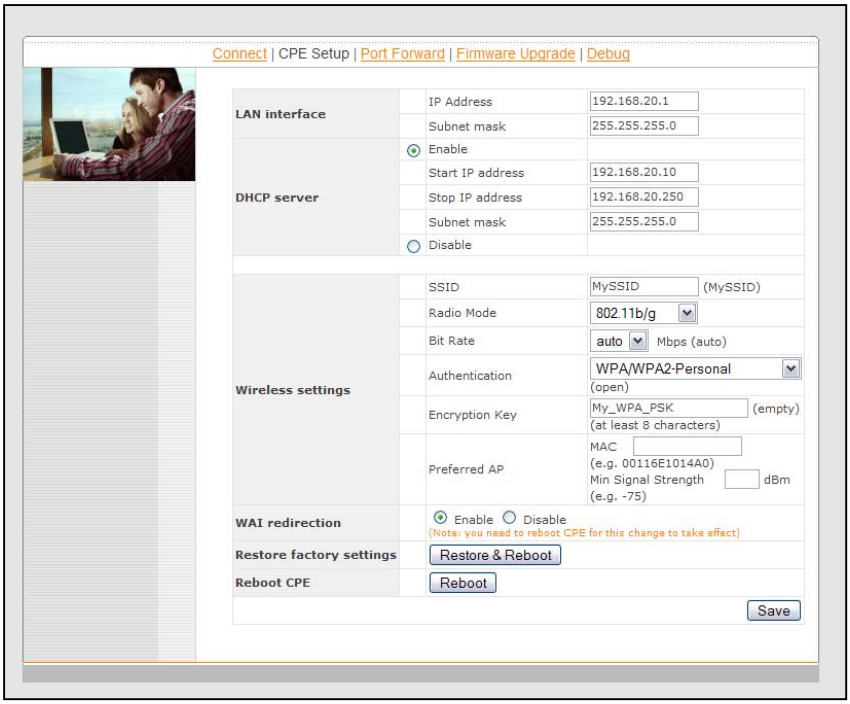
The page will look like this.

Once it is associated to an access point, you can also access the page from this URL:

`https://wan.ip.addr.here:8000/`

Login ID and password are "`admin`" and "`MSurf000`".

Click the "Advanced Config" button to enter the parameters of the access point to associate to. You should see this screen:



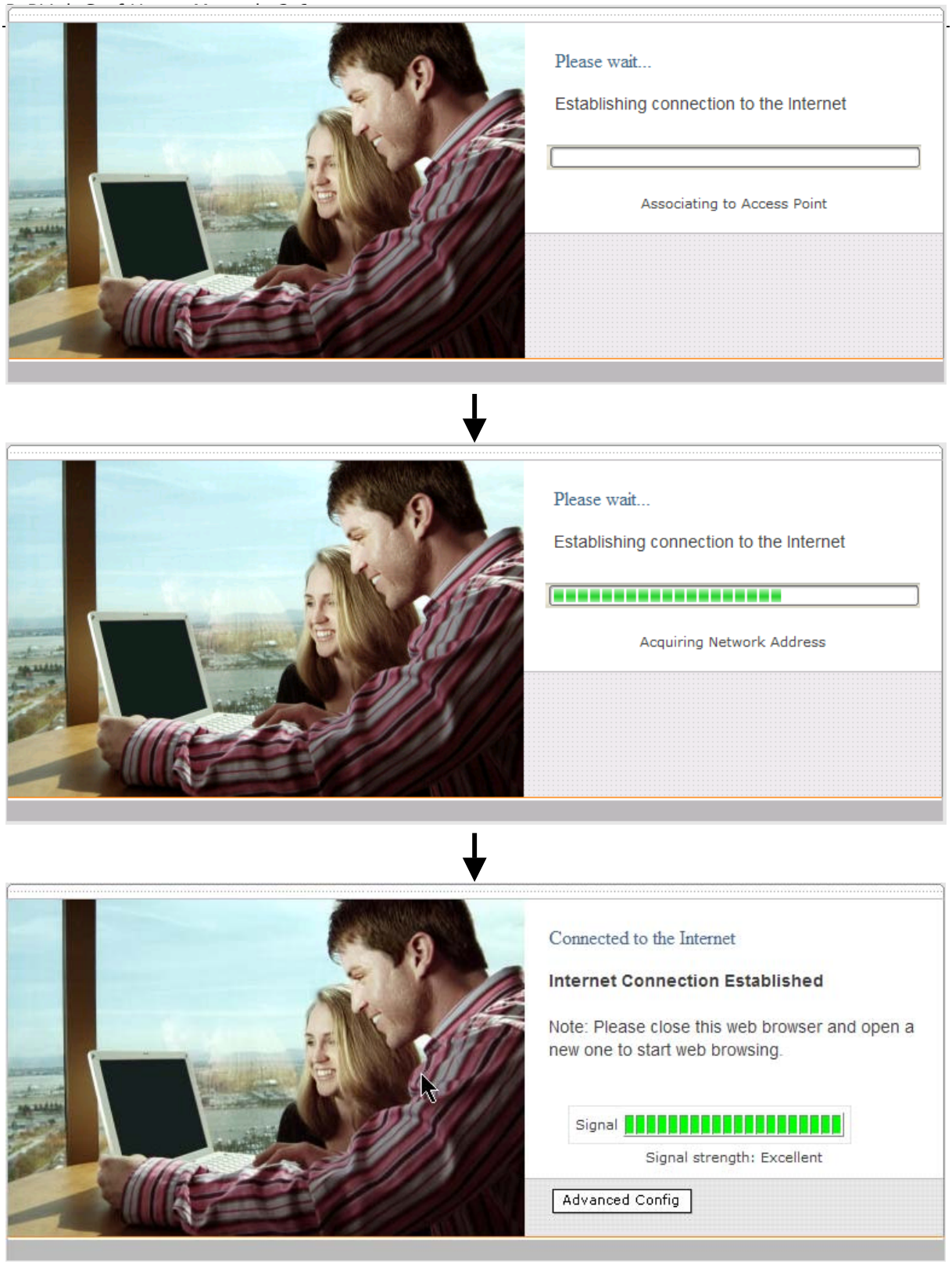
In the field "SSID" under Wireless Settings, input the access point's SSID (sometimes it is called "network name"). According to the setting of the Access Point you are associating to, you may choose different "Authentication setting".

If "Static WEP key" or "WPA/WPA2-Personal" is selected, input the Encryption Key field as well.

Click the "Save" button at the bottom to complete.

You can now click the "Connect" link on the top bar and then click the "Connect" button to associate with the access point.

There are also options of "802.1x with dynamic WEP key" and "WPA/WPA2-Enterprise". For their details, please refer to chapter 4.4 .



At this point, you are associated with the access point. You may now close the web browser and open a new one to start web browsing.

4.2 Settings Details

LAN interface		IP Address	192.168.20.1
		Subnet mask	255.255.255.0
DHCP server	◉	Enable	
		Start IP address	192.168.20.10
		Stop IP address	192.168.20.250
		Subnet mask	255.255.255.0
	○	Disable	

LAN Interface: To configure the LAN interface's IP address and subnet mask.

DHCP Server: To configure to enable the built-in DHCP server or not. If enabled, the IP address range can be configured.

Wireless settings		SSID	MySSID (MySSID)
		Radio Mode	802.11b/g
		Bit Rate	auto Mbps (auto)
		Authentication	WPA/WPA2-Personal Open Static WEP Key 802.1x with dynamic WEP key WPA/WPA2-Enterprise WPA/WPA2-Personal
		Encryption Key	
		Preferred AP	Min Signal Strength dBm (e.g. -75)

Wireless Settings:

SSID: To configure the SSID / ESSID / Network Name of the wireless network to associate to.

Radio Mode: It allows the user to choose between radio modulations support. E.g. 802.11b/g, 802.11g only, 802.11b, etc. The available settings depend on the Wi-Fi module installed on the device.

> Note: Under 802.11g only mode, 802.11b rates are used during access point association.

Bit Rate: To fix the 802.11 transmit bit rate. Available options depend on the Radio Mode chosen. If "auto" is chosen, the device will choose the best bit rate dynamically and automatically.

Authentication: Available options are Open, Static WEP Key, 802.1x with dynamic WEP key, WPA/WPA2-Enterprise and WPA/WPA2-Personal. The selection should be according to the setting of the access point you are associating to. Data transferred are encrypted under all modes except the Open mode. When Static WEP Key or WPA/WPA2-Personal is chosen, you should enter an encryption key in the Encryption Key field. For 802.1x and WPA/WPA2-Enterprise options, please refer to chapter 4.4 .

Preferred AP: The MAC address of a preferred access point can be entered here. When the preferred access point is found and its signal strength is higher than the "Min Signal Strength", it will connect to this preferred access point, no matter the other access points are found even they have higher signal strength or the same SSID.

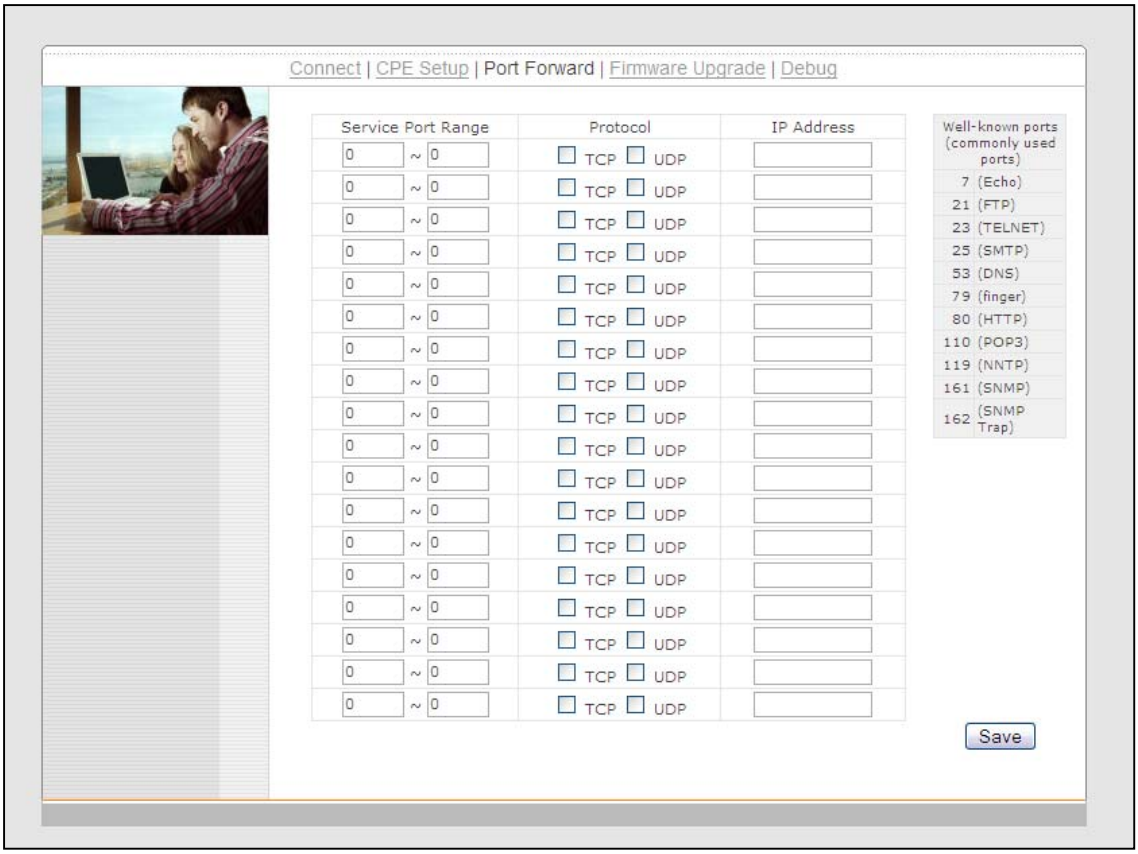
WAI redirection: If the device is not connected to an access point, and the user is accessing an Internet web site, the settings control whether to redirect the web access to the web admin interface page or not. If this is disabled and the device is not connected, the browser will then show web access error. The user can still access the web admin interface by accessing to the device's LAN IP address. By default, it's http://192.168.20.1 .

Restore factory settings: To restore the device to factory default settings. After clicked, the settings will be restored to factory defaults and the device will be restarted.

Reboot: To restart the device.

4.3 Advanced Settings: Port Forward

The PePLink Surf supports forwarding inbound TCP and UDP connections to servers on the LAN.



For example, if your PC is hosting a web server and you want to let Internet users access it, you should define a rule on a role. Enter "80" and "80" for the Port Range. Select "TCP" for the protocol. Enter the PC's IP address to the "IP Address" field.

Click the "Save" button to save and apply the changes.

4.4 WPA/WPA2 with 802.1x Authentication

The PePLink Surf supports authentication and encryption methods of "802.1x with dynamic WEP key encryption" and WPA/WPA2-Enterprise. A radius server can be used to perform authentication based on the IEEE standard 802.1x with EAP-TTLS.

To set it up, you have to configure the PePLink Surf, the access point and a radius server.

By default, EAP-TTLS/CHAP is used as the EAP authentication method. You can change this setting in the System Settings page. Please refer to chapter 4.9.3 .

4.4.1 Configure the PePLink Surf

To enable the 802.1x authentication, you can go to the CPE Setup page, choose "WPA" for the Authentication setting and leave the WEP key setting empty.

Certificate checking

By default, the PePLink Surf does not verify the radius server's certificate. If you would like to check the certificate, you can use a command-line based FTP client to upload your certificate to the PePLink Surf.

1. ftp to the PePLink Surf (default IP is 192.168.20.1)
2. Type the login ID and password: "`root`" and "`MSurf000`"
3. cd /etc/1x
4. put root.pem
5. bye

4.4.2 Access Point

Access point set up procedure is different from one brand to the others. Here are some necessary configuration parameters to be configured in the access point:

- Enable WPA2 with 802.1x authentication
- Enter the radius server IP address, port number and the secret (for the provided radius server config mentioned in 4.4.3 , the secret is "`testing123`")

4.4.3 Radius Server

The commercial radius server, Radiator, is used in the set up. It is a product of Open System Consultants Pty Ltd.

Radiator version 3.9 is known to be interoperable. Any version above 3.9 should work too. Just follow the server's installation guide to install it on a server.

After installed, you should put the root cert file and server cert file to a directory, update radiator's configuration file and the users files.

A demo CA cert file (`cacert.pem`), a server cert file (`server_cert.pem`) and a server key file (`/etc/radiator/server_key.pem`) are pre-generated and attached. You can generate them by yourself by following the instructions in the Appendix. Put the files to the directory `/etc/radiator`.

A sample Radiator configuration file is as follows. Save it as `radius.cfg` and put it under `/etc/radiator`.


```
AuthPort        1812
AcctPort        1813
LogDir          /var/log/radius
DbDir           /etc/radiator
Trace          4
<Client DEFAULT>
        Secret testing123
        DupInterval 0
</Client>
<Realm DEFAULT>
        <AuthBy FILE>
                Filename /etc/radiator/users
                EAPType TTLS
                EAPTLS_CAFile /etc/radiator/cacert.pem
                EAPTLS_CertificateFile /etc/radiator/server_cert.pem
                EAPTLS_CertificateType PEM
                EAPTLS_PrivateKeyFile /etc/radiator/server_key.pem
                EAPTLS_RandomFile /dev/urandom
                EAPTLS_PrivateKeyPassword demoserver
                EAPTLS_MaxFragmentSize 1000
                AutoMPPEKeys
        </AuthBy>
        AcctLogFileName /etc/1x/radius_detail
</Realm>
```

To change user login name and password, just edit the file `/etc/radiator/users`. A sample user entry is like this:

```
demoid1 User-Password=demopass1
        Service-Type = Framed-User
```

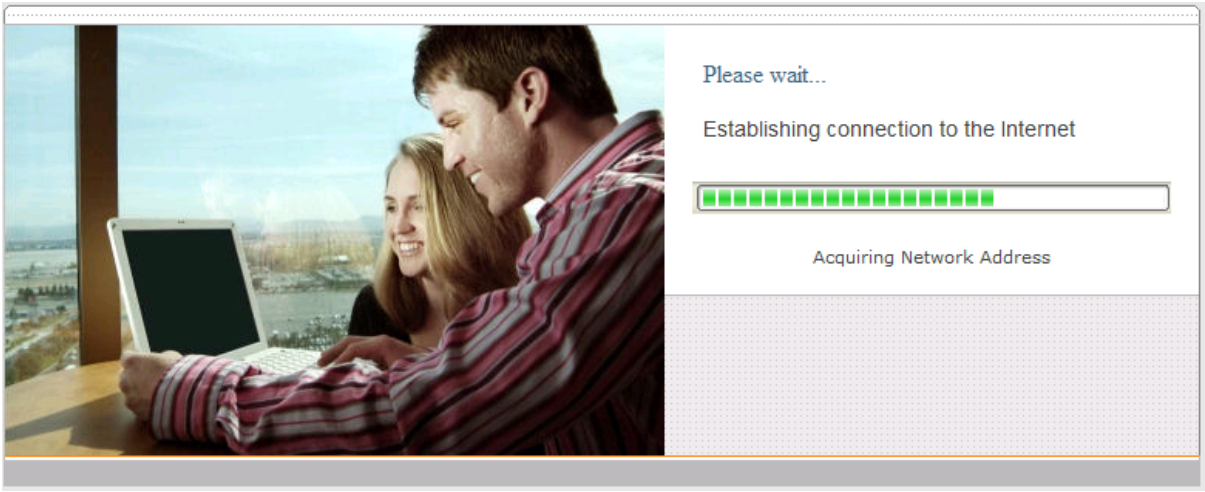
Then start the radius server by executing this:

```
/usr/bin/radiusd -config_file /etc/radiator/radius.cfg
```

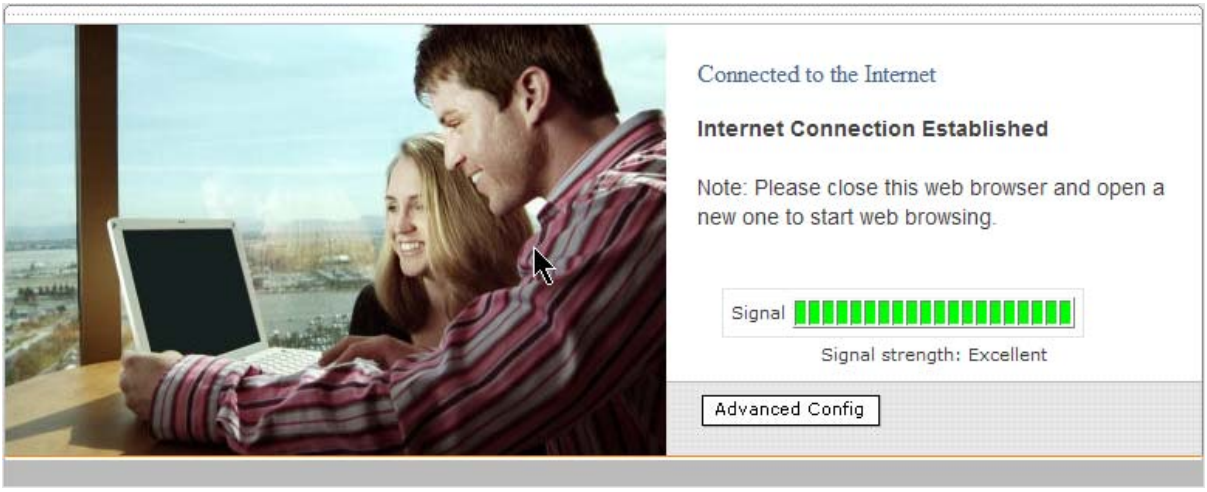
Now the Radiator server's setup completed.

4.5 Test the Setup

To test to setup, you can now go to the PePLink Surf's Main page, enter the user name and password. The realm (the text box next to the "@" sign) value can be left empty. Then click the Connect button.

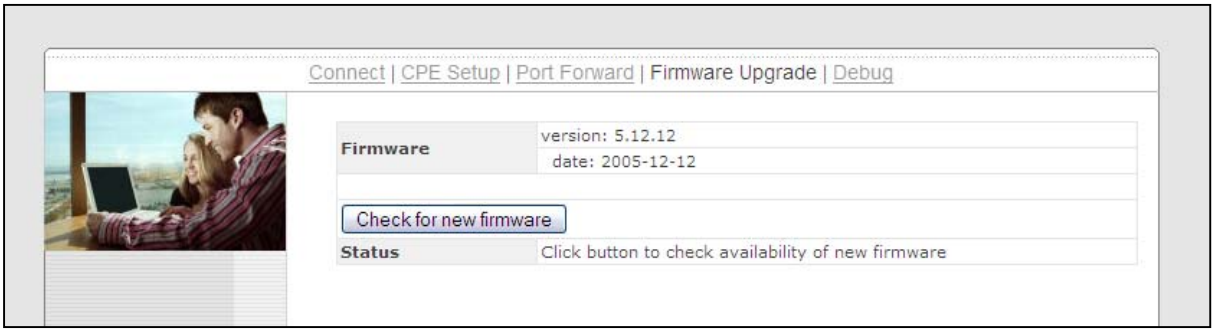


After connected, you should see:



4.6 Firmware Upgrade

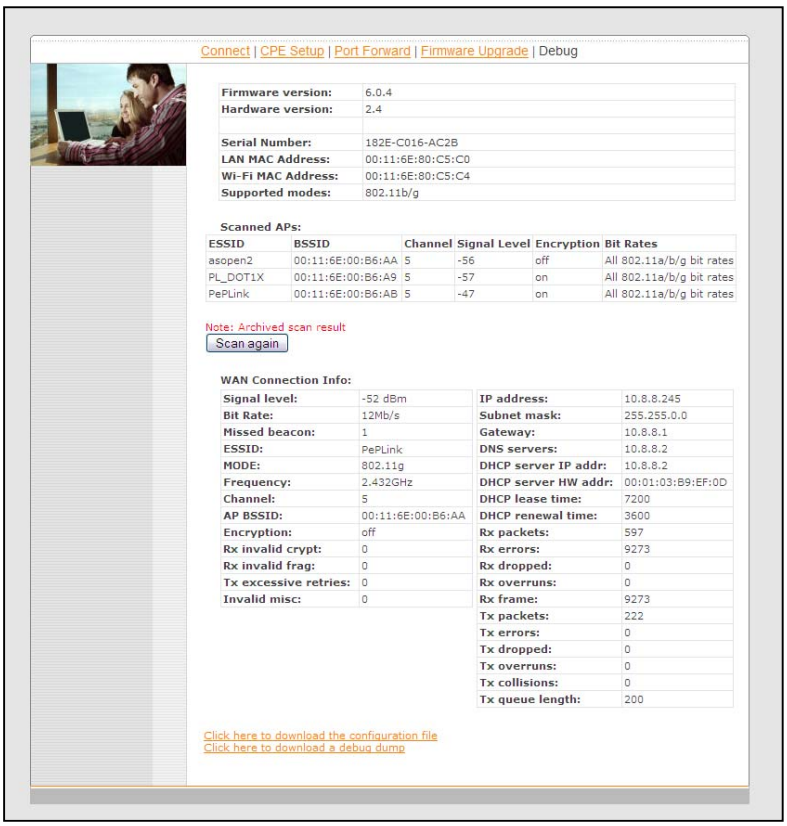
The PePLink Surf is able to check whether a newer firmware (the software running on the PePLink Surf) is available. To do so, click the link "Firmware Upgrade" on the top bar. You will see this screen:



Click the "Check for new firmware" on the screen. If there is a firmware available, you can simply click a "Download and Upgrade" button.

During an upgrade, please do not interrupt the process.

4.7 Debug Page



A debug page is provided for advanced network troubleshooting.

This page shows the unit's firmware version, hardware version, serial number, LAN MAC address, Wi-Fi MAC address, supported Wi-Fi modes, scanned access points' information and WAN connection information.

For the Scanned AP section, the scanned result may not be up to date. You can click the "Scan again" button to update the scanned AP list. But note that, while it is connected to an AP, clicking the button may drop the connection.

On the page bottom, you are allowed to download a debug dump file and configuration file. In case you need to contact PePLink for technical support, you can send the debug dump file to support@peplink.com.

4.8 Restore to Factory Defaults

To restore the PePLink Surf to factory defaults, there are two methods.

If you are able to access the web admin interface, go to the "CPE Setup" page, and click the "Restore and Reboot" button.

Otherwise, you can also power up the unit and wait for about 1 min. Then press the Reset button at the rear side of the unit using a pin and then hold it for 5 secs. The unit will restore the settings to factory defaults and reboot.

4.9 System Settings

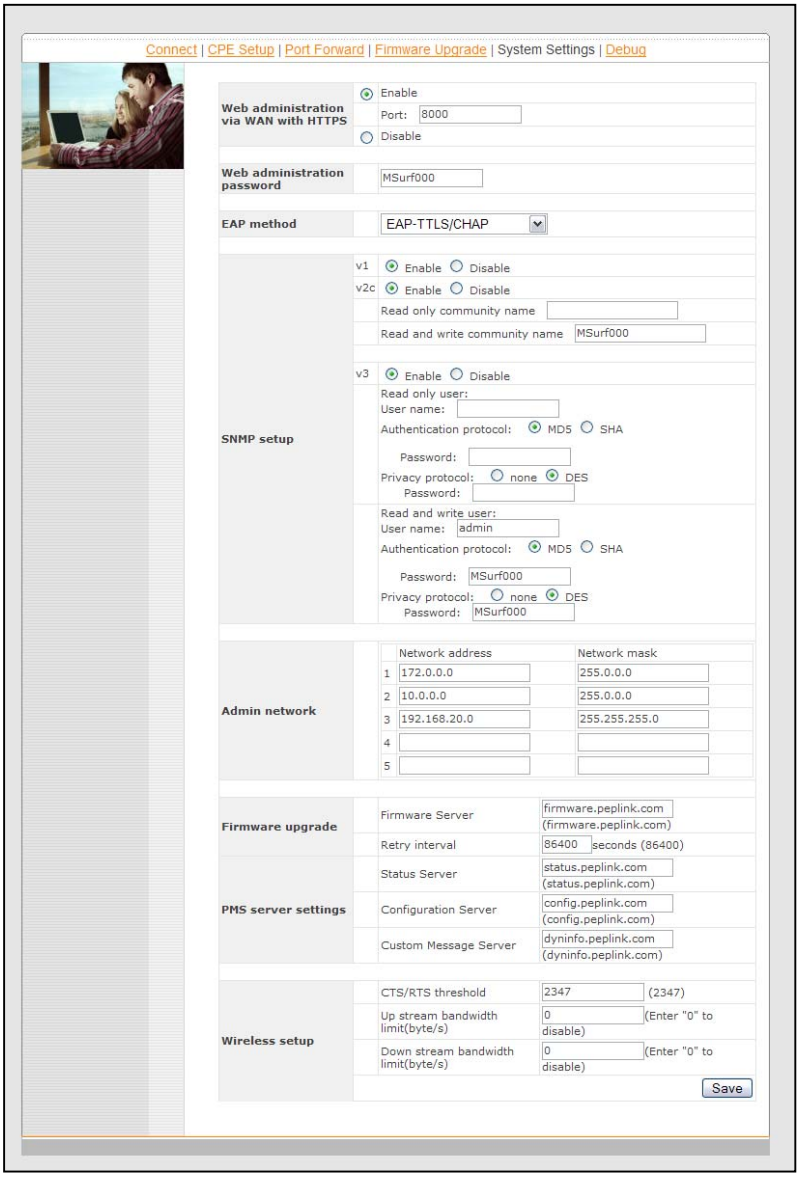
Some system settings are hidden from the end users. They are for the service provider to change some system specific settings

To access the page, type this URL on your browser:

`http://192.168.20.1/ss/`

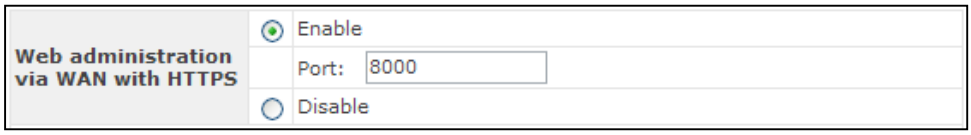
The page's login ID and password are "`admin`" and "`MSurf000`".

The page is like this:



4.9.1 Web via WAN with HTTPS

This is to enable or disable the secure web administration server to be accessible from WAN (wireless side) or not. If enabled, the HTTPS port number is entered here. It must be between 1024 and 65535. The default port number is 8000.

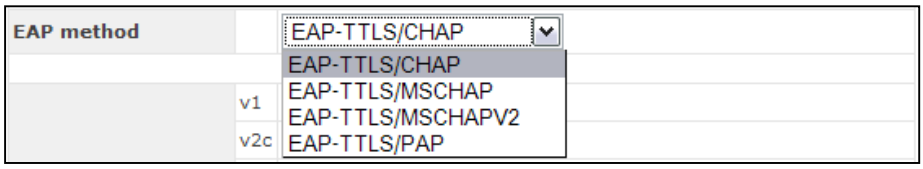


4.9.2 Web Administration Password

This is to change the web administration interface's access password when accessing to `http://ip.addr/ss/` (from LAN) or `https://wan.ip.addr/` (from WAN). The login name is "`admin`".

4.9.3 EAP Types

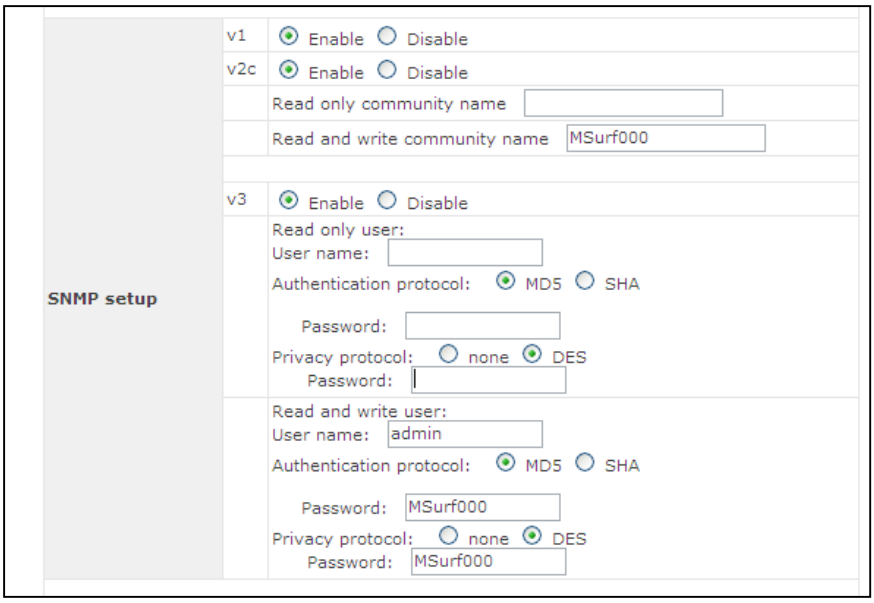
For the authentication methods "802.1x with dynamic WEP key" and "WPA/WPA2-Enterprise", the EAP type can be chosen here. Available options are CHAP, MSCHAP, MSCHAPV2 and PAP.



4.9.4 SNMP Settings

The unit has a built-in SNMP agent. It allows the administrator to get some basic system information and to toggle the unit's Status LED for troubleshooting. The agent can only be accessed from administration network only. Please refer to chapter 4.9.5 .

This section is for configure the SNMP agent's access permission.



Toggling the LED

The unit's Status LED can be toggled by using SNMP. The purpose is for customer officer to remotely control a

4.9.5 Admin Network Settings

		Network address	Network mask
Admin network	1	172.0.0.0	255.0.0.0
	2	10.0.0.0	255.0.0.0
	3	192.168.20.0	255.255.255.0
	4		
	5		

This section is for configuring which network's IP addresses are allowed to access the ssh server and the SNMP agent.

4.9.6 PePLink Management System settings

Firmware upgrade	Firmware Server	firmware.peplink.com (firmware.peplink.com)
	Retry interval	86400 seconds (86400)
PMS server settings	Status Server	status.peplink.com (status.peplink.com)
	Configuration Server	config.peplink.com (config.peplink.com)
	Custom Message Server	dyninfo.peplink.com (dyninfo.peplink.com)

The Surf units can be managed by the PePLink Management System (PMS). The PMS is divided into several sub systems. This section is for configuring which sub system the Surf should communicate to. They include Firmware server, Status Server, Configuration Server and Custom Message Server.

4.9.7 Wireless Settings

Wireless setup	CTS/RTS threshold	2347	(2347)
	Up stream bandwidth limit(byte/s)	0	(Enter "0" to disable)
	Down stream bandwidth limit(byte/s)	0	(Enter "0" to disable)
			Save

The CTS/RTS threshold value 2347 means this setting is disabled. If the packet that the Surf is transmitting is larger than the threshold, it will initiate the CTS/RTS function.

The up stream and down stream bandwidth are for controlling the maximum up link and down link bandwidth that the user can consume. The unit is bit per second. Setting them to "0" will disable the bandwidth control. The default value is "0".

5 Appendix - Demo CA and Server Certification Generation Instructions

5.1 Prerequisite

OpenSSL v0.9.7a or above

Note: The illustration below is based on Linux.

5.2 Create your own Certificate Authority (CA)

1. Create a working directory (e.g. ~/demoCA)

```
mkdir ~/demoCA
chmod 700 ~/demoCA
cd ~/demoCA
mkdir private certs newcerts
echo -n 01 > serial
touch index.txt
```

2. Create a private key for your CA, for example:

```
openssl genrsa -des3 -passout pass:democa -out private/cakey.pem 2048
```

(A CA private key called "cakey.pem" is then created in the directory "private". This is a 2048bit RSA private key with pass phrase 'democa'.)

3. Create the server certificate for your CA, for example:

```
openssl req -new -x509 -days 8000 -key private/cakey.pem -passin pass:democa
-out cacert.pem
```

Then a series of questions will be asked:

```
You are about to be asked to enter information that will be incorporated into
your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
```



```
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [GB]:US
State or Province Name (full name) [Berkshire]:US
Locality Name (eg, city) [Newbury]:US
Organization Name (eg, company) [My Company Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (eg, your name or your server's hostname) []:demoCA
Email Address []:
```

(The CA server certificate is now generated in "`cacert.pem`")

4. In some applications (e.g. Microsoft Windows), DER version of server certificate is needed:

```
openssl x509 -outform DER -in cacert.pem -out cacert.der
```

(The CA server certificate in DER format is now ready in "`cacert.der`")

5.3 Create a server certificate request from your servers

1. Create your working directory (e.g. ~/myCert)

```
mkdir ~/myCert
chmod 700 ~/myCert
cd ~/myCert
```

2. Create the private key of your server, for example:

```
openssl genrsa -des3 -passout pass:demoserver -out server_key.pem 2048
```

(The private key for CA called "server_key.pem" is then created.

This is 2048bit RSA private key with pass phrase 'demoserver'.)

3. Create the certificate singing request of your server, for example:

```
openssl req -new -key server_key.pem -passin pass:demoserver -out server_req.pem
```

Then a series of questions will be asked:

```
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [GB]:US
State or Province Name (full name) [Berkshire]:US
Locality Name (eg, city) [Newbury]:US
Organization Name (eg, company) [My Company Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (eg, your name or your server's hostname) []:myserver.com
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

(Your server certificate request for "`myserver.com`" is now generated in "`server_req.pem`")

5.4 Sign the server certificate with your own CA

Assume server request is also in the same server's ~/`myCert/server_req.pem`


```
openssl ca -policy policy_anything -passin pass:democa -in ~/myCert/server_req.pem -days 8000 -out ~/myCert/server_cert.pem
```

Then a series of questions will be asked (details will vary in your case):

```
Using configuration from /usr/share/ssl/openssl.cnf
Check that the request matches the signature
Signature ok
Certificate Details:
        Serial Number: 1 (0x1)
        Validity
            Not Before: Aug 24 04:58:01 2005 GMT
            Not After : Jul 20 04:58:01 2027 GMT
        Subject:
            countryName               = US
            stateOrProvinceName       = US
            localityName              = US
            organizationName          = My Company Ltd
            commonName                = myserver.com
        X509v3 extensions:
            X509v3 Basic Constraints:
            CA:FALSE
            Netscape Comment:
            OpenSSL Generated Certificate
            X509v3 Subject Key Identifier:
            0E:D5:E9:F6:A5:B6:88:51:EB:22:8C:ED:C3:AA:17:A1:A8:FC:EC:92
            X509v3 Authority Key Identifier:
            keyid:85:B5:08:F3:21:1B:99:5D:E1:4B:D1:57:2C:EC:9C:00:A2:F4:24:9B
            DirName:/C=US/ST=US/L=US/O=My Company Ltd/CN=demoCA
            serial:00

Certificate is to be certified until Jul 20 04:58:01 2027 GMT (8000 days)
Sign the certificate? [y/n]:y


1 out of 1 certificate requests certified, commit? [y/n]y
Write out database with 1 new entries
Data Base Updated
```

(The signed server certificate is now in "~/myCert/server_cert.pem")

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

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

Caution:

Changes or modifications to this unit not expressly approved by the party responsible for compliance will void the user's authority to operate the equipment. Any change to the equipment will void FCC grant.

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

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

Modifications not authorized by the manufacturer may void users authority to operate this device.

