AREDN Setup

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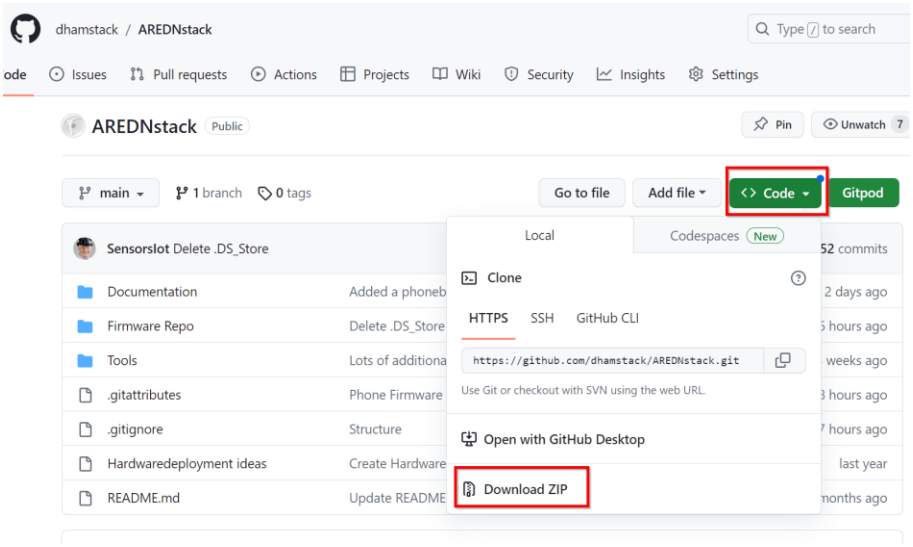
Content

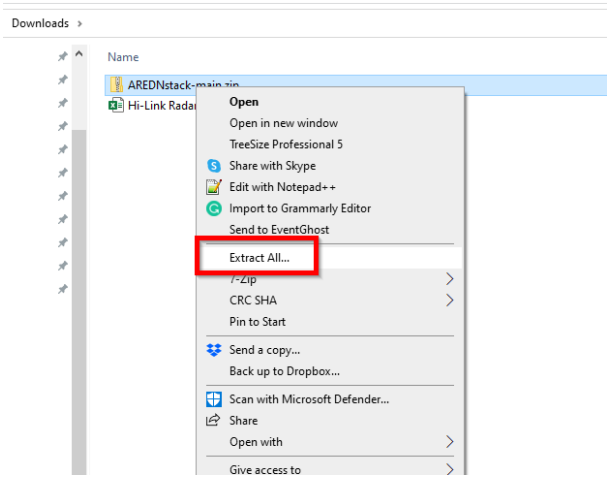
Preparation

You can find all relevant files on GitHub (https://github.com/dhamstack/AREDNstack)

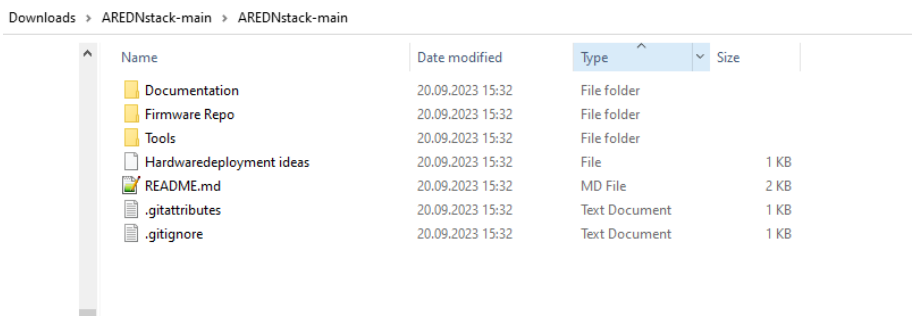
Press "code" and "Download ZIP". The file is quite big (>500M):



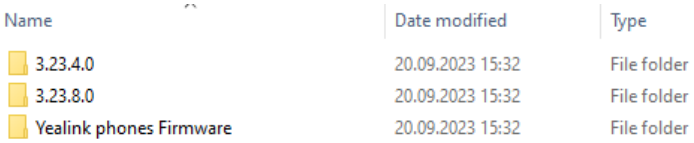
Extract the ZIP file:



Now you should have all needed files in your Downloads/AREDNstack-main/ folder:

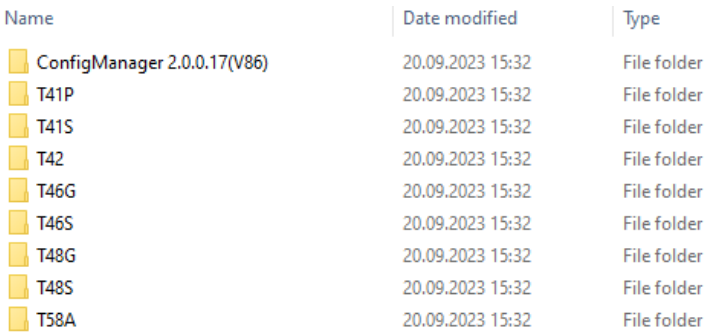


In the Firmware Repo folder, you will find files for two versions of AREDN: The current and the last:



Name	Date modified	Type
3.23.4.0	20.09.2023 15:32	File folder
3.23.8.0	20.09.2023 15:32	File folder
Yealink phones Firmware	20.09.2023 15:32	File folder

You also find firmware for our typical phones to flash with "free" firmware (not connected to a provider).

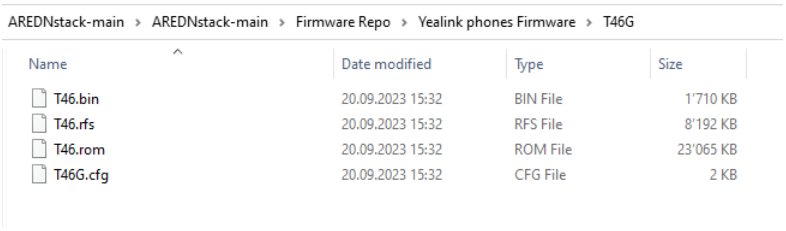


Name	Date modified	Type
ConfigManager 2.0.0.17(V86)	20.09.2023 15:32	File folder
T41P	20.09.2023 15:32	File folder
T41S	20.09.2023 15:32	File folder
T42	20.09.2023 15:32	File folder
T46G	20.09.2023 15:32	File folder
T46S	20.09.2023 15:32	File folder
T48G	20.09.2023 15:32	File folder
T48S	20.09.2023 15:32	File folder
T58A	20.09.2023 15:32	File folder

Yealink Phones

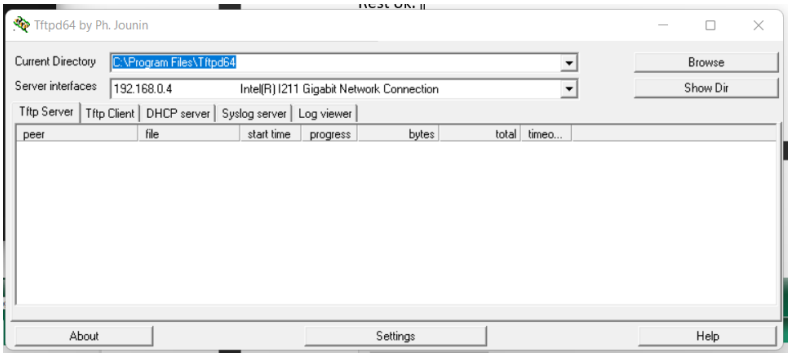
Flash the Phone

1. Download and unzip tftpd64.464.zip (the "run", not the setup version) (https://bitbucket.org/phjounin/tftpd64/downloads/)
2. Disconnect your computer from Wi-Fi and Ethernet and set a fixed IP address (e.g., 192.168.0.4)
3. Start tftp64.exe
4. Click the browse button to locate the TFTP root directory



   You should be able to see the files your phone will request during flashing.

5. Select the local IP address from the "Server Interface" drop-down menu.



   If you do not find your fixed IP, something is wrong, and you must start over.

6. Power the Yealink with the speaker button pressed until you see a selection(TFTP or USB) or the below screen. Press 1 for TFTP if presented.
7. Fill in the fields as shown. Make sure you use a free IP address for the telephone (e.g., 192.168.0.230):

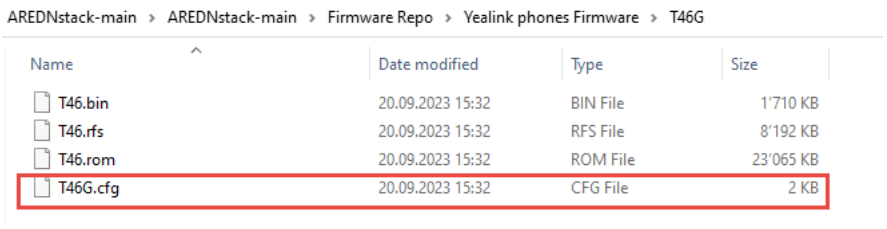
```
IP Addr: 192.168.0.230
Netmask: 255.255.255.0
Gateway: 192.168.0.1
TFTP IP: 192.168.0.4
```

8. Hit enter and wait. You should see in the tftp64 window that the phone fetches files from your computer. After boot, you should have a "free" Yealink.
9. Now, you must hold the OK button for 10 seconds to factory reset your phone.
10. Connect the phone to your hap router (port 2-4). After boot, you go to Menu→Info) to find its IP address.

Now, you are ready for the next step.

Phone Setup

With the firmware for your phone, you also find a file with the extension .CFG.



Edit this file and replace XXXXXX with the phone number you want for your phone. You can change the language by placing the # in the right place.

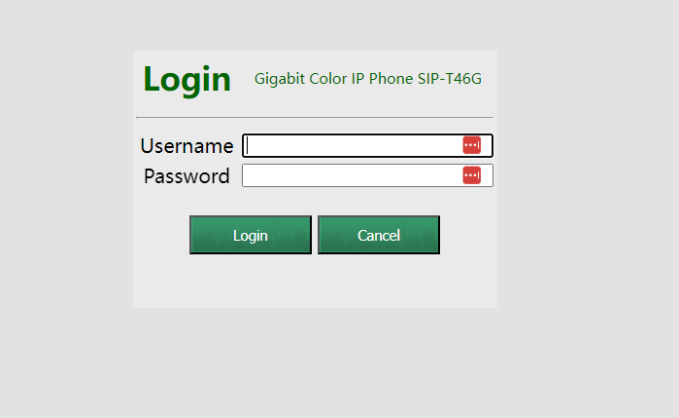
```
#!version:1.0.0.1

### This file is the exported MAC-all.cfg.

### For security, the following parameters with password haven't been display in this file.
account.1.password = admin
account.1.enable = 1
account.1.label = SOP
account.1.display_name = Test
account.1.user_name = XXXXXX
account.1.auth_name = XXXXXX
account.1.sip_server.1.address = localnode.local.mesh
features.remote_phonebook.flash_time = 3600
features.remote_phonebook.enable = 1
features.relog_offtime = 999
lang.gui = German
#lang.gui = French
#lang.gui = English
account.1.codec.pcmu.priority = 3
account.1.codec.pcma.priority = 4
account.1.codec.g729.priority = 1
account.1.codec.g722.priority = 2
local_time.time_zone = +1
local_time.time_zone_name = Germany(Berlin)
local_time.ntp_server1 = ch.pool.ntp.org
local_time.dhcp_time = 1
local_time.date_format = 1
local_time.manual_ntp_srv_prior = 1
###  Static Configuration  ###
static.auto_provision.power_on = 0
static.auto_provision.pnp_enable = 0
static.auto_provision.dhcp_option.enable = 0
static.network.dhcp_host_name = XXXXXX
remote_phonebook.data.1.url = http://localnode.local.mesh/arednstack/phonebook_generic_direct.xml
remote_phonebook.display_name = AREDN
remote_phonebook.data.1.name = Direct
remote_phonebook.data.2.url = http://localnode.local.mesh/arednstack/phonebook_generic_pbx.xml
remote_phonebook.data.2.name = PBX
features.remote_phonebook.enable = 1
features.direct_ip_call_enable = 1
#directory_setting.url = http://localnode.local.mesh/arednstack/favorite_setting.xml
#super_search.url = http://localnode.local.mesh/arednstack/super_search.xml
#super_search.recent_call = 1
#security.var_enable = 1
#web_item_level.url = http://localnode.local.mesh/AREDNstack/WebItemsLevel.cfg
```

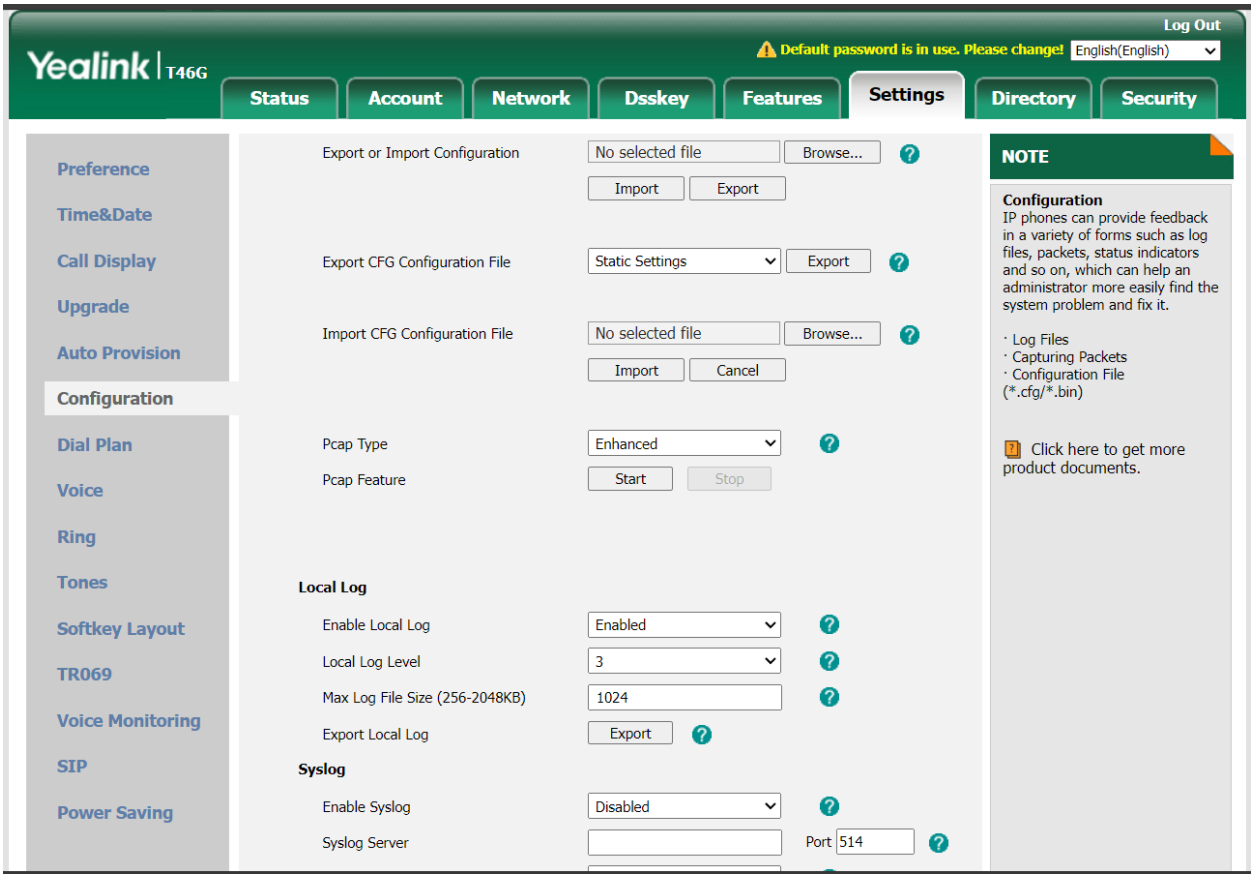
Replace the display.name if you want. Save it. SOP means Swiss Official Phonebook, BTW.

Go to a browser, type the IP address of your phone into the address, and login using admin/admin.



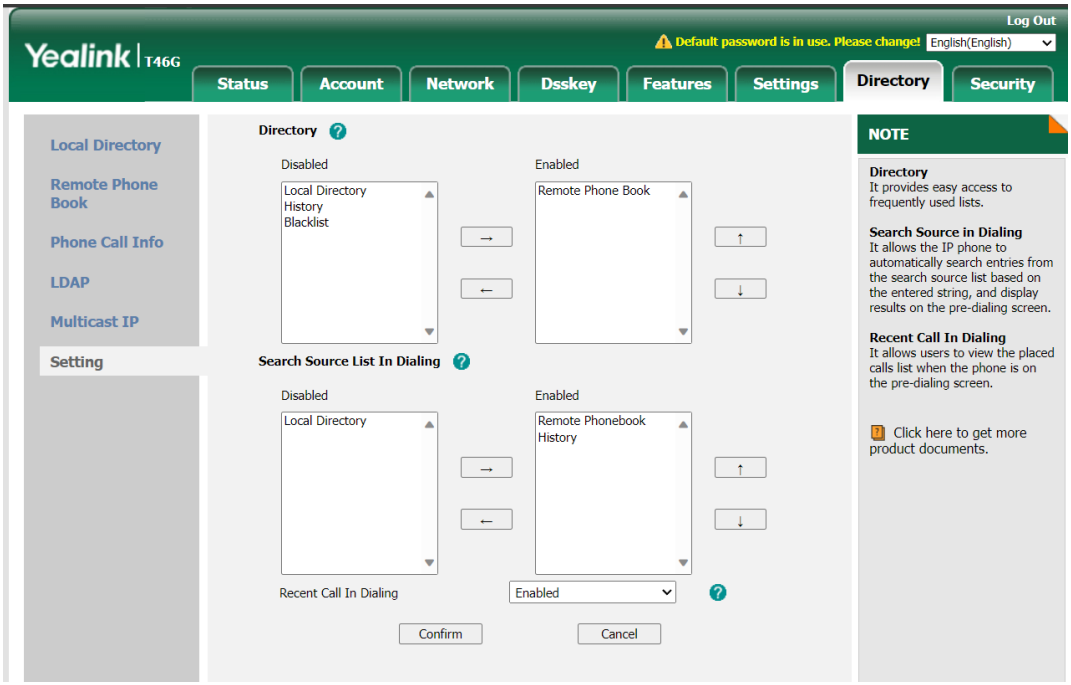
Change your password if you want.

Now go to Settings→ Configuration.



Go to "Import CFG configuration file and browse to the Txx.cfg file you edited before. Hit "Import" and wait till the phone rebooted.

After reboot, go to Directory → Setting and fill the fields like that:



Confirm

Now, you should see a small phone in your phone's display that shows it is ready for the AREDN network. You should also see a "direct" and "PBX" folder if you press the "Directory" button on your phone.

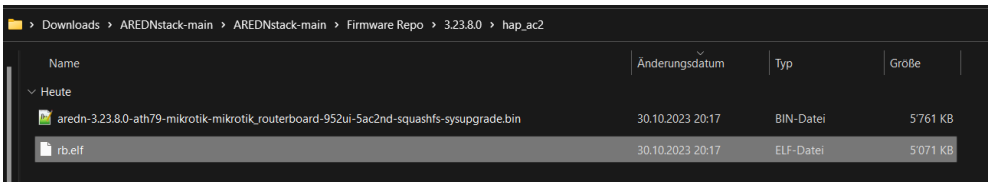
If your Mikrotik router already works with AREDN, you can skip the next step and install the phonebook and SIPserver. If not, continue with the next chapter.

Flash Mikrotik devices

Preparations

The small Mikrotik hap ac2 box or square Access PointSXTsq (AP) will hereafter be referred to as "target devices." Green are the notes for the AP.

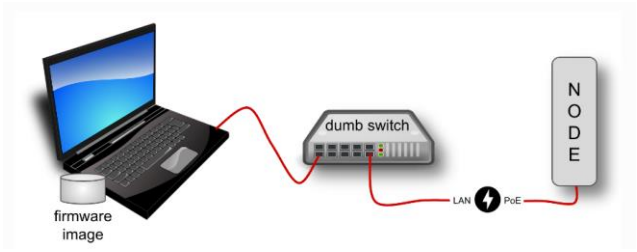
We assume you have downloaded the https://github.com/dhamstack/AREDNstack repository and unpackaged it to your download folder. It contains the two files of the newest release (we will need the rb.elf file in the next step:



Not needed:
Download the nightly build at your own risk if you wish (http://downloads.arednmesh.org/firmware/html/stable.html) and copy the files to the respective directory of the AREDNstack repo. Rename the kernel file file to rb.elf.

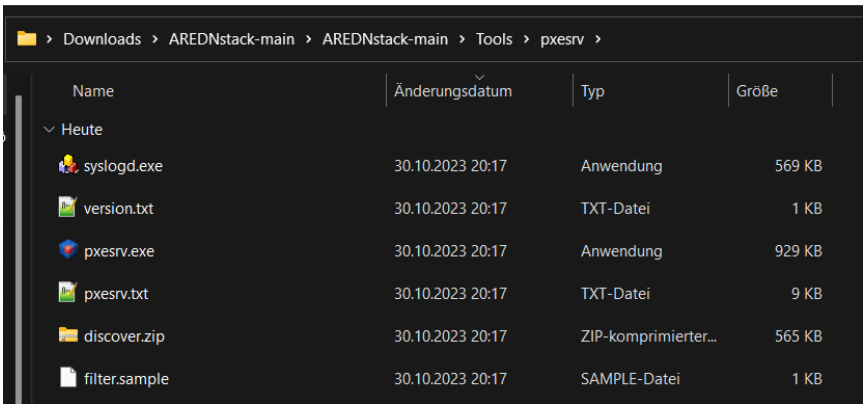
For all other devices go to Installing AREDN® Firmware — AREDN Documentation latest documentation (arednmesh.org) to get instructions on how to find and rename the files.

Connect your target device to a switch as shown below (connect the LAN cable to the “internet” port of the hap router):



Deactivate Wi-Fi on the PC and supply power to the dumb switch.

Then go to the Tiny PXE Server directory:



Its source is http://erwan.labalec.fr/tinypxeserver/pxesrv.zip.

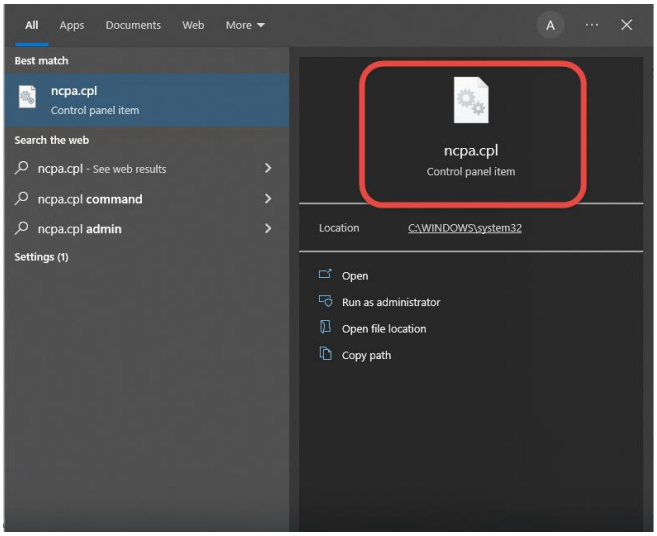
Copy the rb.elf file from before to the «Files» folder of the PXE server (overwrite if necessary). In our downloaded directory, this is already done.

Change PC to a fixed IP address

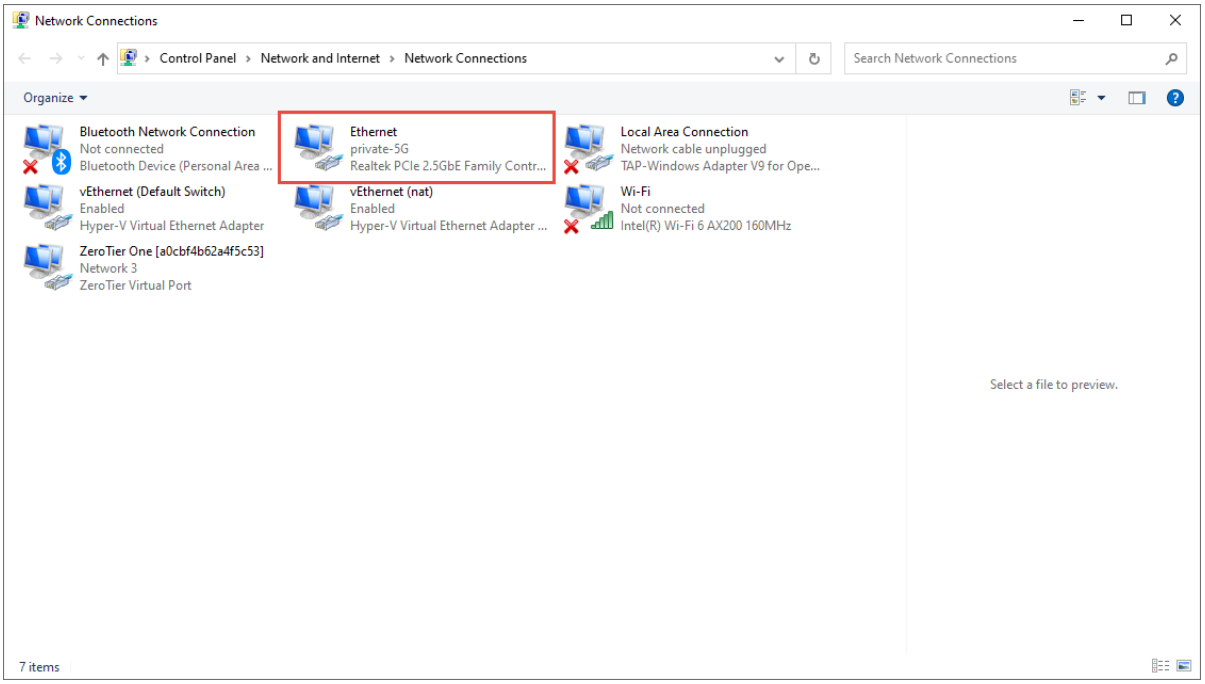
Type

```
ncpa.cpl
```

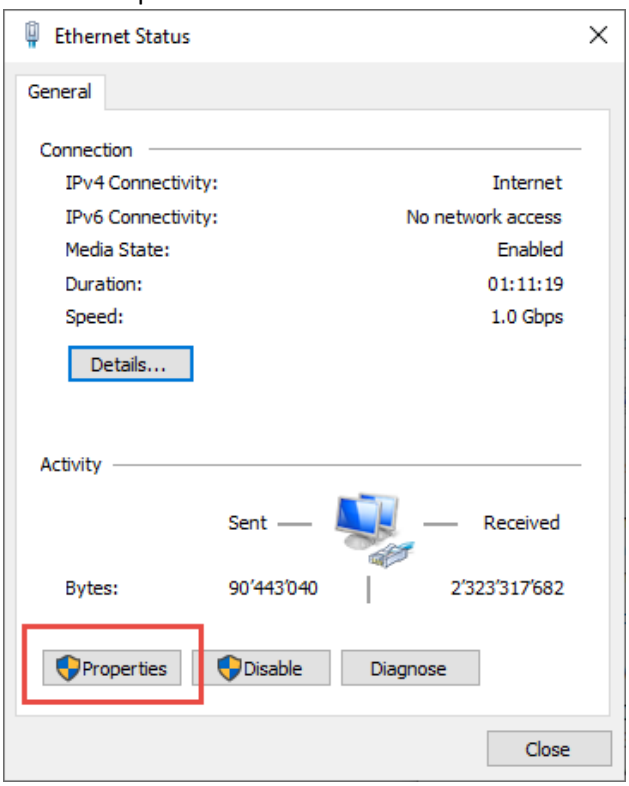
into Windows search



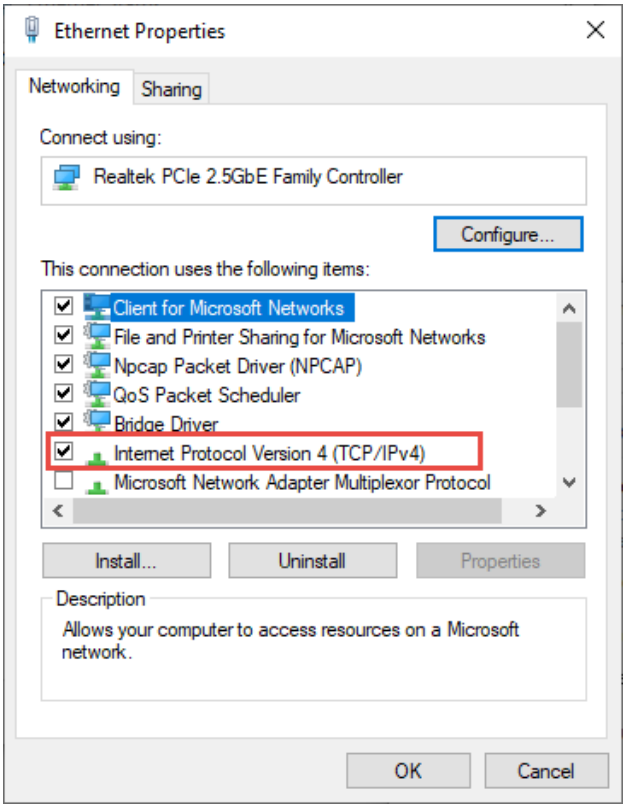
Select "Ethernet"



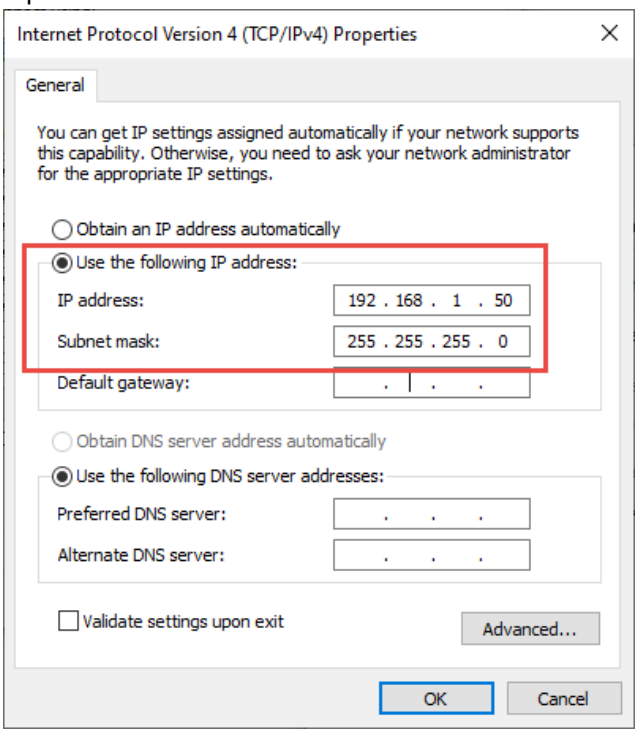
Select «Properties»:



Select IPV4:



Input IP address 192.168.1.50:



Press OK and Close

Flash elf file to target device

Check if the ethernet cable is connected to **port 1** of the hap router (labeled with Internet), supply the router with power and wait until the top red LED is off and the green LED above with the number 1 flickers. Possibly Windows detects a new network. Then a larger blue window will appear on the right side of the screen, mentioning the new network. Confirm with OK. The whole thing takes about 3 minutes.

Do the same with the AP. Use the PoE injector (Y-cable) for the power supply. The power supply unit of the router also works here (both are 24V).

Start Tiny PXE Server (double click on the pxesrv.exe file in the «pxesrv» directory). You might get this warning:

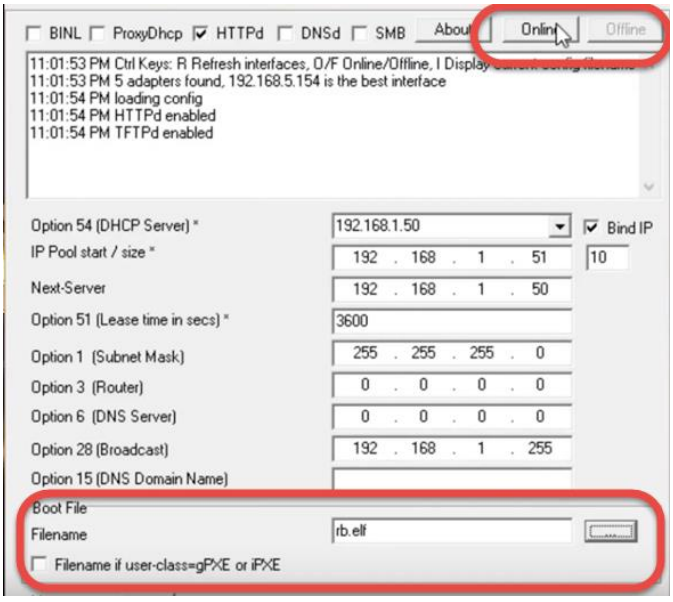
Press «More info» and let the program run.

Now pull the power of the target device.

In the Tiny PXE Server window, select the IP address entered on the Ethernet adapter from the drop-down box (192.168.1.50). If this IP address cannot be selected, close the Tiny PXE Server and start it again. If it still doesn't work, check the IP4 adapter settings and start again.

Find and select rb.elf in the «Boot File» section. This file can be found in the «…\pxesrv\files» folder.

Uncheck «Filename if user class...». No additional settings are necessary.



Now switch the Tiny PXE Server to «Online» in the upper right corner.

Then press the reset button in the target device with a pointed object (e.g., paper clip or toothpick) and then plug in the power cable to the target device. The USR LED will be on, flashing, and off (5 seconds each). Check the log window. Immediately after the bottom line says "Do ReadFile:rb.elf ……" release the reset button and switch the Tiny PXE Server to "Offline." This procedure takes about 20 seconds. The target device now boots with the AREDN firmware.

Don't keep the reset button pressed for too long, or you'll have to start over!

Keep the device powered, otherwise you have to start over!

Switch the Ethernet adapter on the PC back to the "automatic IP address." Plug the Ethernet cable into **port 2** on your router. After about two minutes, the process should be finished.

With the AP, the Ethernet cable remains in the only socket. The rest is the same

Optional: Check with ipconfig whether our PC has received «local.mesh».

Flash AREDN Firmware

Now open a browser and enter 192.168.1.1. The picture should look something like this.

If not, back to start

Now let's install the actual firmware on the target device. Click on setup and enter username/password:

```
User: root
Password: hsmm
```

The following view appears:

Now uncheck “Keep Existing Configuration Settings” and select the firmware.

Names of the files as discussed above (file names similar to «aredn-3.23.8.0-ath79-mikrotik-mikrotik_routerboard-952ui-5ac2nd-squashfs-sysupgrade.bin»):

Click «Upload.» The actual firmware is now loaded into the target device. The target device boots several times, and it takes about 10 minutes.

Once the software has been installed, Windows can again bring up a blue window on the right side of the screen.

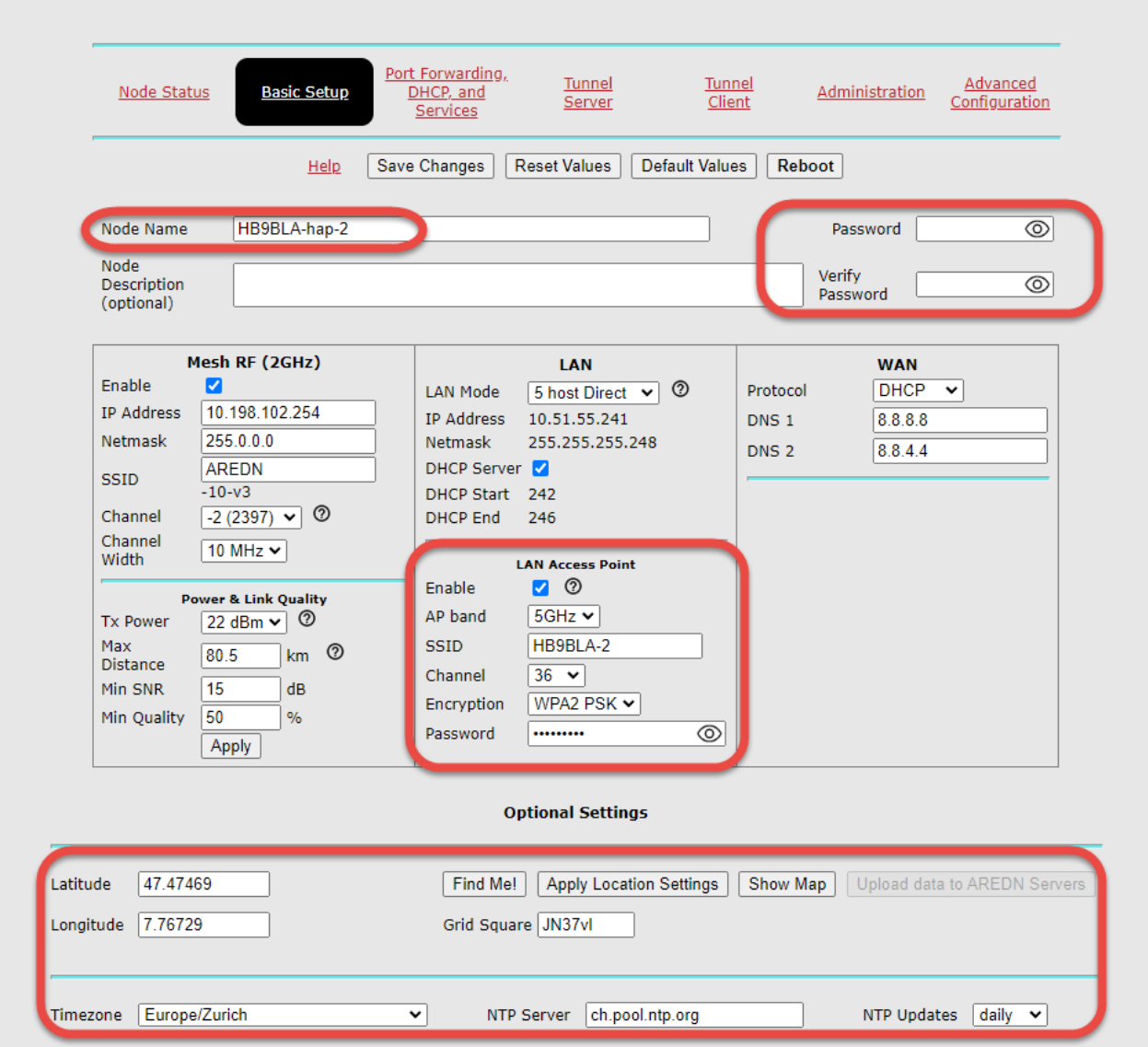
Configure AREDN

Open the browser and enter the following line http://localnode.local.mesh:8080 (or 192.168.1.1)

If there is no answer, the process is not yet complete. Try again and again. If you still can't connect after 15 minutes, go back and start again.

The necessary settings can be made under «Basic Setup.»

```
User: root
Password: hsmm
```



- A new password must be set before the first save. Otherwise, the changes will not be saved
- For the node name, please enter your call sign as shown above.

Only on the hap router:

- Also, enter your call sign for SSID, and set a password. Remember this SSID name and the password, you will need it later to connect the WLAN of the hap router. Tick «LAN Access Point»
- Fill in «Optional Settings»

Then reboot the target device.

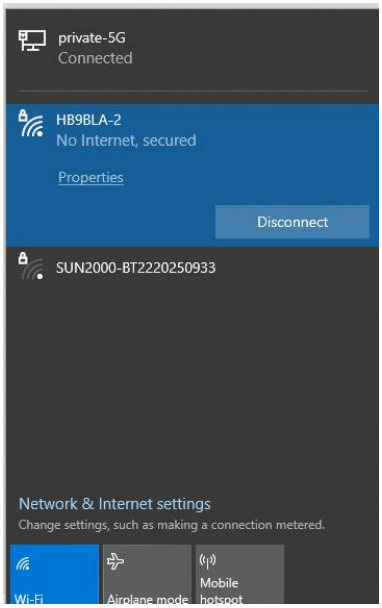
Set up a tunnel to the AREDN network

(only necessary if you connect via an Internet tunnel)

This chapter only applies to the hap router.

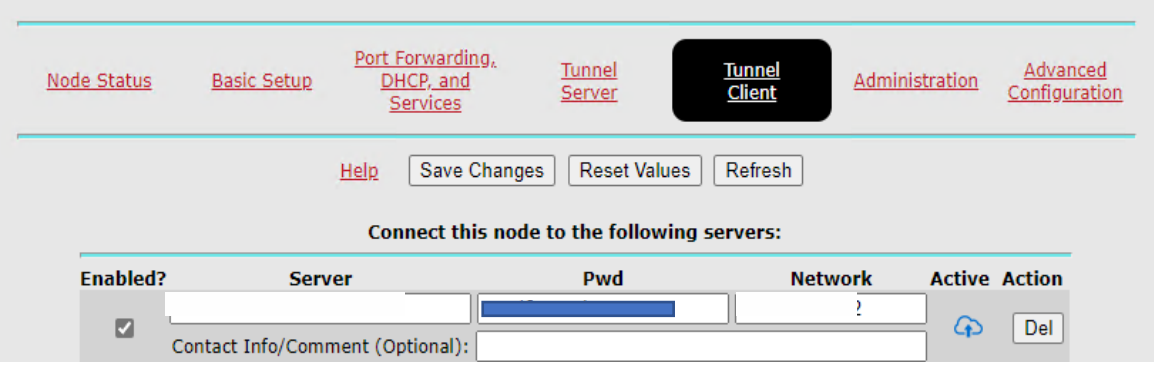
Connect port 1 (Internet) to the Internet.

From now on, you can access the router via Wi-Fi from your PC by looking for the right WLAN and connecting your PC to the router:



You should get the tunnel data from your tunnel server responsible:

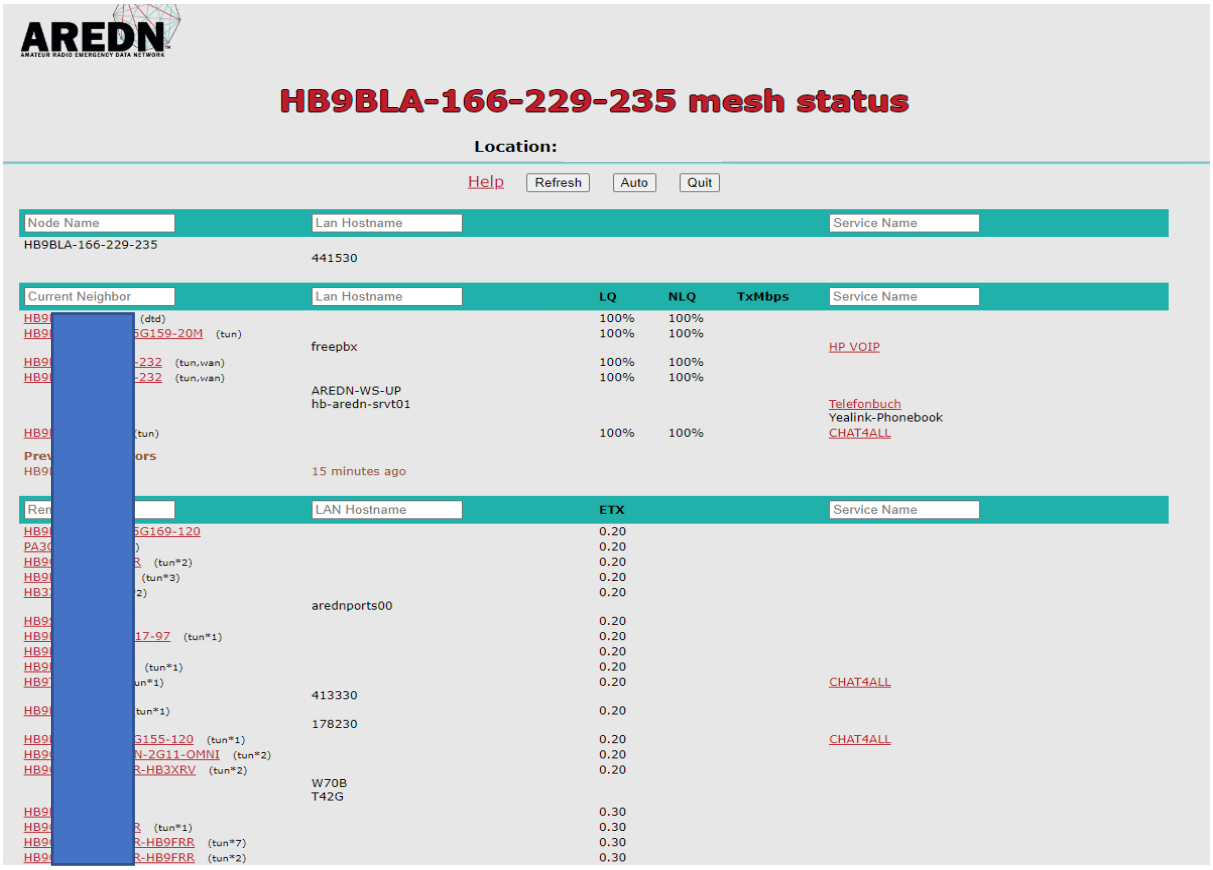
```
Server: his server address
PwD: The password he assigned to your tunnel
Network: The address of your tunnel
```



Tick «enable» and press «Save changes.»

Your tunnel should be active after a short time (blue cloud with an arrow).

You are now connected to the AREDN network. Go to «Node-Status» / «Mesh Status» and enjoy the success.



HB9BLA-166-229-235 mesh status

Location:

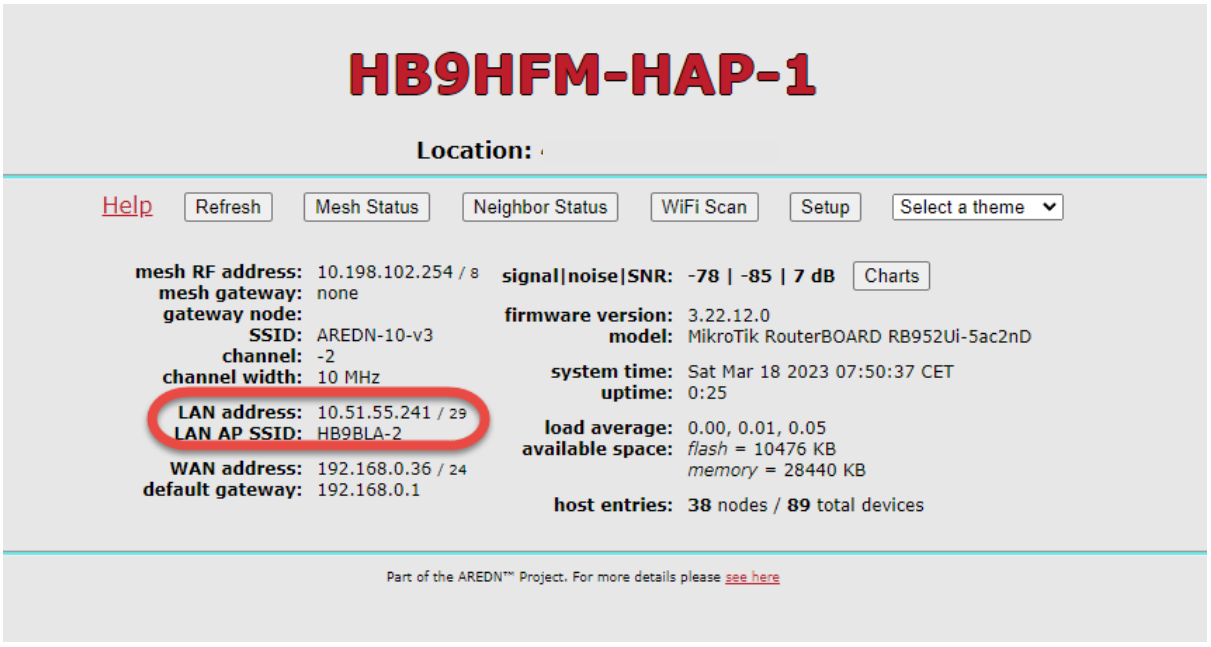
Help | Refresh | Auto | Quit

Node Name	Lan Hostname	Service Name
HB9BLA-166-229-235	441530	

Current Neighbor	Lan Hostname	LQ	NLQ	TxMbps	Service Name
HB9 (dtd)		100%	100%		
HB9 G159-20M (tun)		100%	100%		
	freepbx				HP VOIP
HB9 -232 (tun,wan)		100%	100%		
HB9 -232 (tun,wan)		100%	100%		
	AREDN-WS-UP hb-aredn-srvt01				Telefonbuch Yealink-Phonebook
HB9 (tun)		100%	100%		CHAT4ALL
Prev ors					
HB9	15 minutes ago				

Rem	LAN Hostname	ETX	Service Name
HB9 G169-120		0.20	
PA3)		0.20	
HB9 R (tun*2)		0.20	
HB9 (tun*3)		0.20	
HB3 2)		0.20	
	arednports00		
HB9		0.20	
HB9 17-97 (tun*1)		0.20	
HB9		0.20	
HB9 (tun*1)		0.20	
HB9 un*1)		0.20	CHAT4ALL
	413330		
HB9 tun*1)		0.20	
	178230		
HB9 G155-120 (tun*1)		0.20	CHAT4ALL
HB9 N-2G11-OMNI (tun*2)		0.20	
HB9 R-HB3XRV (tun*2)		0.20	
	W70B T42G		
HB9		0.30	
HB9 R (tun*1)		0.30	
HB9 R-HB9FRR (tun*7)		0.30	
HB9 R-HB9FRR (tun*2)		0.30	

Note the LAN address:



HB9HFM-HAP-1

Location:

Help | Refresh | Mesh Status | Neighbor Status | WiFi Scan | Setup | Select a theme

mesh RF address: 10.198.102.254 / 8
mesh gateway: none
gateway node:
SSID: AREDN-10-v3
channel: -2
channel width: 10 MHz
LAN address: 10.51.55.241 / 29
LAN AP SSID: HB9BLA-2
WAN address: 192.168.0.36 / 24
default gateway: 192.168.0.1

signal|noise|SNR: -78 | -85 | 7 dB Charts
firmware version: 3.22.12.0
model: MikroTik RouterBOARD RB952Ui-5ac2nD
system time: Sat Mar 18 2023 07:50:37 CET
uptime: 0:25
load average: 0.00, 0.01, 0.05
available space: *flash* = 10476 KB
memory = 28440 KB
host entries: **38** nodes / **89** total devices

Part of the AREDN™ Project. For more details please see here

Phonebook

This project aims to create a common Swiss AREDN telephone directory and distribute it to all participating AREDN phones in Switzerland. By storing its latest version on each router, we can make sure that, during an emergency, we have no single point of failure. Each phone can call all reachable phones without a (central) PBX.

Principle of operation

You can skip this chapter and go to "Installation" if you are not interested in how the telephone book works.

The "Official" Swiss AREDN phonebook (SOP) is on Google: https://docs.google.com/spreadsheets/d/1g33BHSXMC8T4Cmfz_Zq-XxtPP17dtEBexF2i4KKe_Mc/edit?usp=sharing. You can create a comment to add or change something or notify one of the administrators to do it for you.

Currently, we support Yealink telephones, and Cisco phones are in the test.

The telephones used for AREDN offer local phonebooks that can be automatically loaded from a remote location. The file format used for that process is XML.

AREDN is a mesh network, and we do not want to create a single point of failure. This is why the telephones get their phonebook files from the hap router they are connected to. So, a phone gets its phonebook as long as its router works.

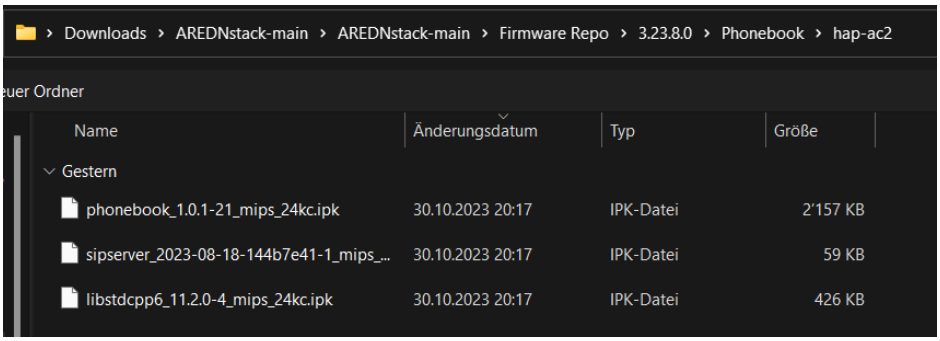
We use direct calling instead of a PBX to avoid a single point of failure for communication, reduce the latency time, and reduce the overload of single mesh segments. The address used for this case is an FQDN like 178230@178230.local.mesh. If you want or need to operate a PBX, the address is just a phone number like 178230. In Switzerland, we use the "Postleitzahl" of the city of the HAM plus a two-digit number in the range of 30-70. Lower numbers are reserved for official use.

To support direct calling and PBX, our phones get two phone books ("Direct" and "PBX").

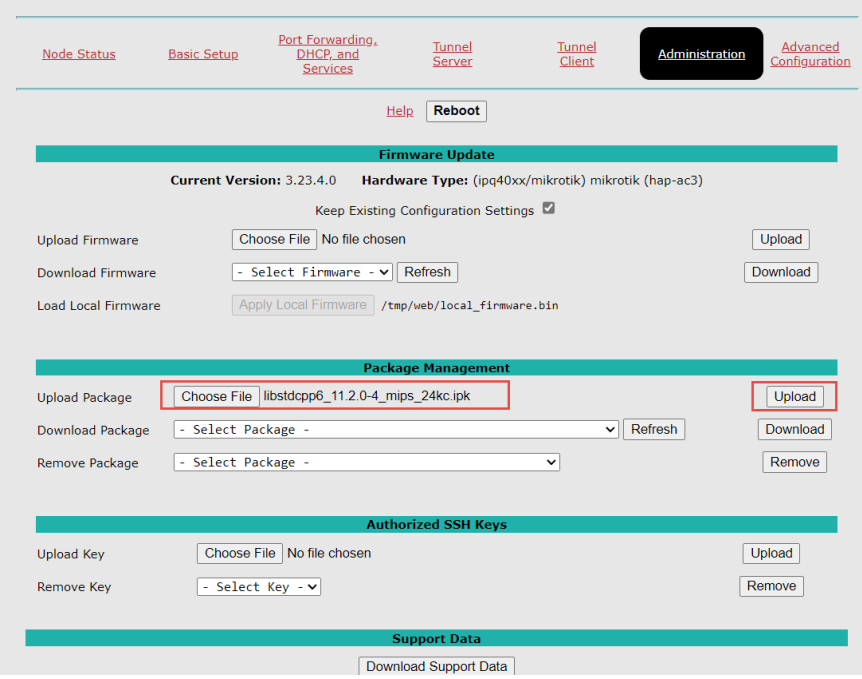
How is the information transferred from the Google Sheets to your hap router? The first step is to copy the .csv version of the sheet to a web server in the AREDN mesh. If Google is down, we could still edit this .csv file manually. This transfer is done every hour. An example job is in the repository.

Installation

On our router, we must install three packages (A library, SIPserver, and the phonebook itself).



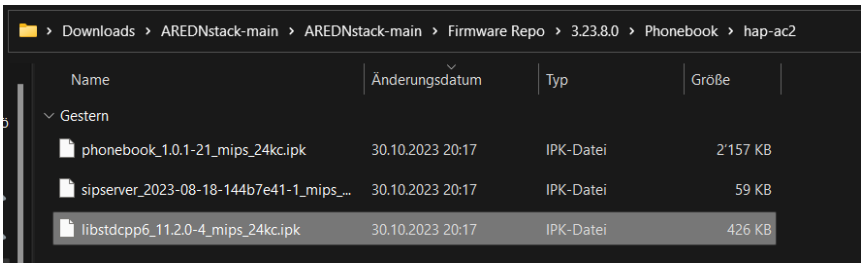
This can be done in the "Setup→Administration Tab of the AREDN GUI:



These packages are different for each AREDN release and each router (they have different chips inside). No nightly builds are supported (it still might run, but at your own risk).

Important: If you re-flash or upgrade your router, all three packages are erased and must be installed again.

Start with the libstdcpp6 package and continue with the rest.



Your router will confirm that it installed the packages.

Now reboot the router, and the little phone on your Yealink connected to your router should become green. Success.

You also should find an AREDN directory in the directory tab. It most probably will be empty. After about one hour, it should be populated.

If you are in a hurry, you have to log in to your router and issue these two commands:

```
/etc/cron.hourly/fetch_phonebook
/etc/cron.hourly/update_phonebook
```

Now your phonebooks should be populated. The names with an Asterisk are phones that are currently connected to the network. The ones without one are not connected. These asterisks are automatically downloaded to your phone every hour. You can press the "update" button to get a newer version (the check runs every 15 minutes).

The phonebooks are stored on your router, and your phone gets them also when it is powered off for a while (during power-up).

Now, reboot your router. Your small phone in the display should now turn green (your phone is registered), and you can call a fellow HAM for a test using the "direct" phonebook. You should see an "HD" sign in the display showing that your phones use the best available quality.

If you want to use a PBX, you must add a second account with the respective information given to you by the PBX operator.