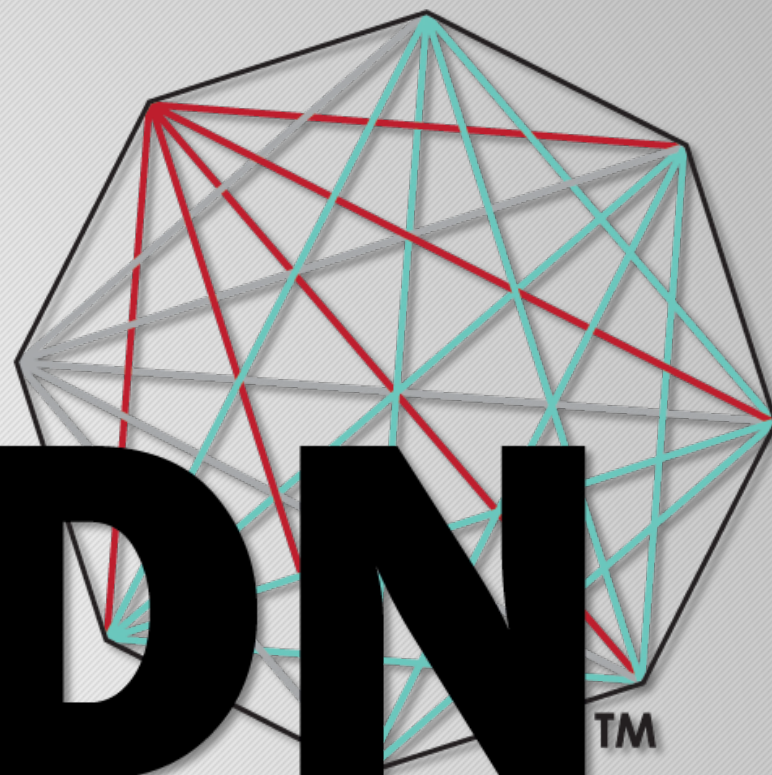
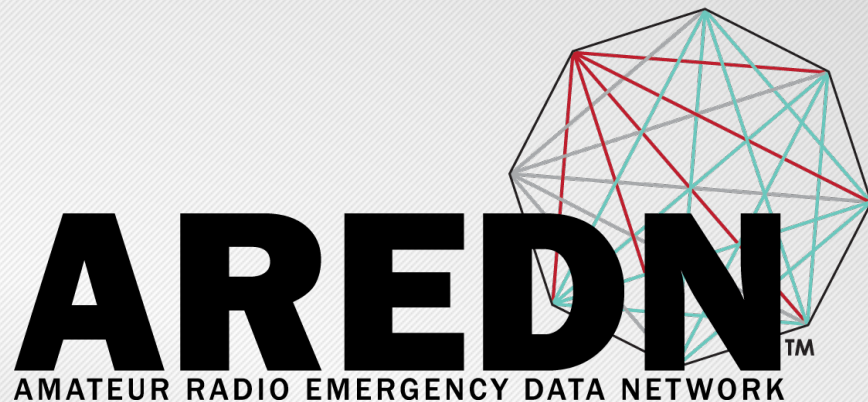


AREDN™

AMATEUR RADIO EMERGENCY DATA NETWORK





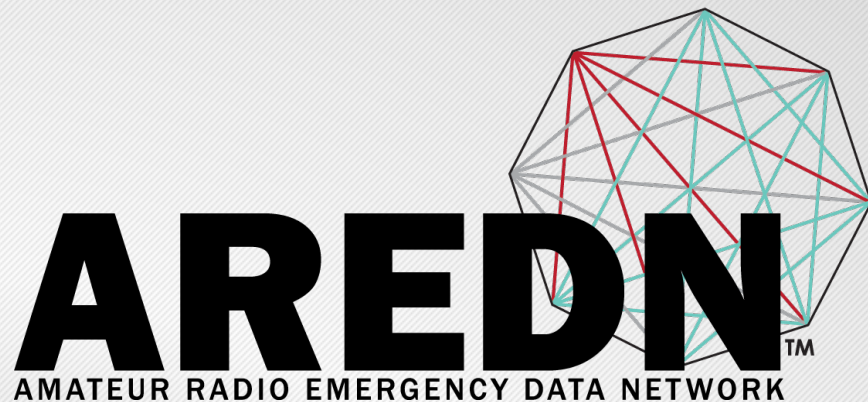
Installation Steps

FLARC Webinar

Randy Smith, WU2S

April 2019

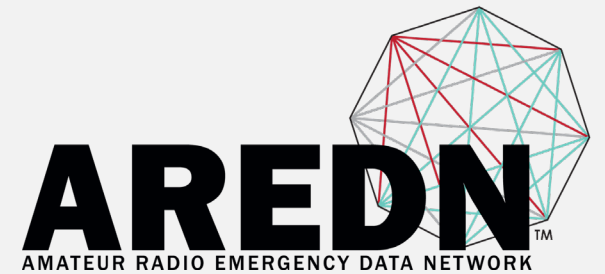
Annotated by W9PCI for newer HAPs
with Mikrotik factory "Routerboard" OS
on 192.168.88.1 instead of 192.168.1.1.



High-Speed Multi-Media Mesh Network

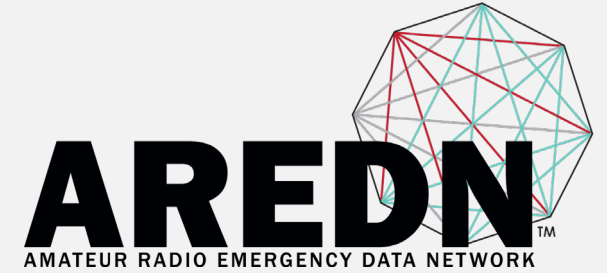
Keep your data moving when the lights go out

Video Conference Courtesy



Please leave your microphone on MUTE
Use the CHAT window to ask a question
Controls are at the bottom of the video window

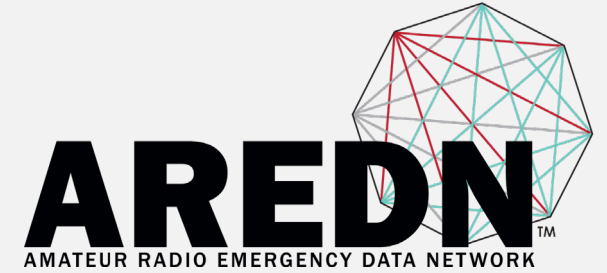
Firmware Installation



There are two cases for installing AREDN® firmware:

1. If you already have an existing version of AREDN® running on your device, then you can use your computer's web interface to navigate to **Setup > Administration > Firmware Update** to install your new firmware.
2. If you are installing AREDN® firmware on a device for the first time, each hardware platform may require a unique procedure.

Firmware Installation

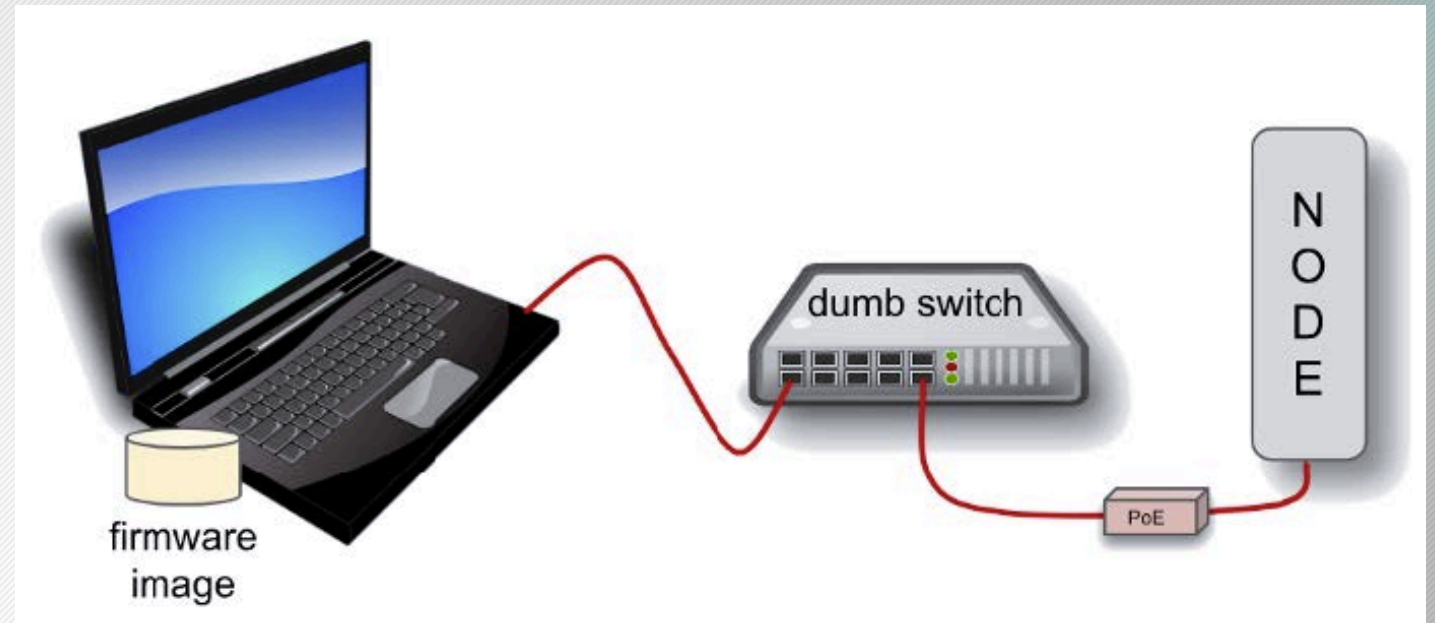


We will start with Case 2, the first-time installation of AREDN® firmware to replace the factory firmware.

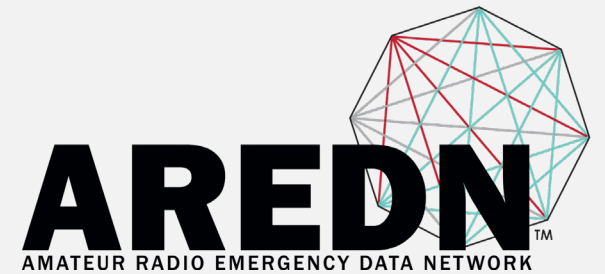
Initial Firmware Installation Prep



The diagram shows that your computer with the downloaded firmware image must be connected to the node using Ethernet cables in order to install the AREDN® image. It is strongly recommended to connect the computer and node through a simple Ethernet switch so that the switch can maintain the computer's link while the node is being rebooted.



Mikrotik Installation



Prerequisites

Preparation Steps

Install factory firmware replacement steps

Procedure is slightly different for Ubiquiti and TP-Link

Mikrotik hAP ac lite

Indoors only but very versatile



Model: RB952Ui-5ac2nD

Weight: 0.32 kg

Gain: 2 GHz = 1.5 dBi

5 GHz = 2 dBi

Current Price: = \$48

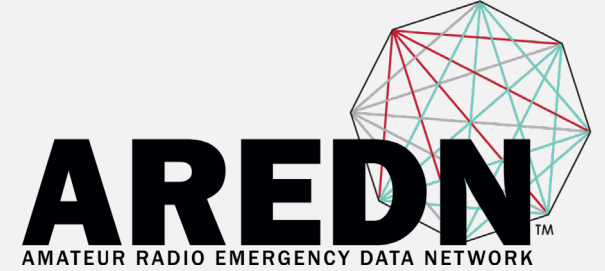
Memory: = 64 Mb

Power Output: 2 GHz = 22 dBm

5 GHz = 23 dBm



Mikrotik First Install Process Pre-Req

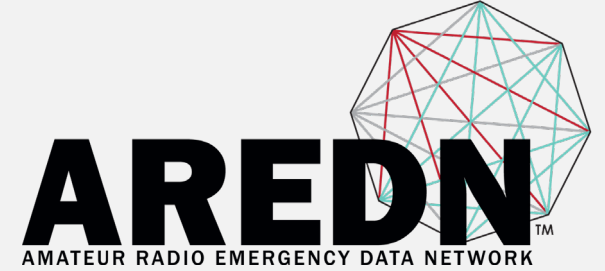


Download **BOTH** the appropriate factory file (.elf) **AND** the sysupgrade file (.bin) for your device by following the instructions in the **Downloading AREDN Firmware** section of the AREDN online documentation

-OR-

Follow the instructions on the AREDN software download page at <http://downloads.arednmesh.org/firmware/ubnt/html/stable.html>

Mikrotik First Install Process Pre-Req



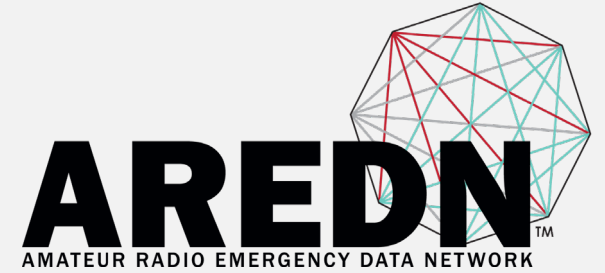
Your computer must run a TFTP/Bootp server in order to provide firmware images to Mikrotik nodes.

Mikrotik nodes require a two-part install process:

First, install and boot the factory (elf) file.

Second, use the in-memory-only AREDN® Administration UI to complete the installation of the sysupgrade (bin) file.

Windows TFTP Bootp Server Pre-Req



You will need Tiny PXE software on your Windows computer.
Download this software and extract it on your computer

Software is available from:

<http://reboot.pro/files/file/303-tiny-pxe-server/>

Documentation for Tiny PXE at:

http://mistyrebootfiles.altervista.org/documents/TinyPXEServer/files/pxesrv_about.htm

Mikrotik Preparation - Step 1

Windows Procedure



Download **BOTH** the appropriate Mikrotik factory and sysupgrade files.

Rename the factory file to **rb.elf** and keep the sysupgrade file available for later.

```
C:\AREDN>dir
Volume in drive C has no label.
Volume Serial Number is B0CF-DD6A

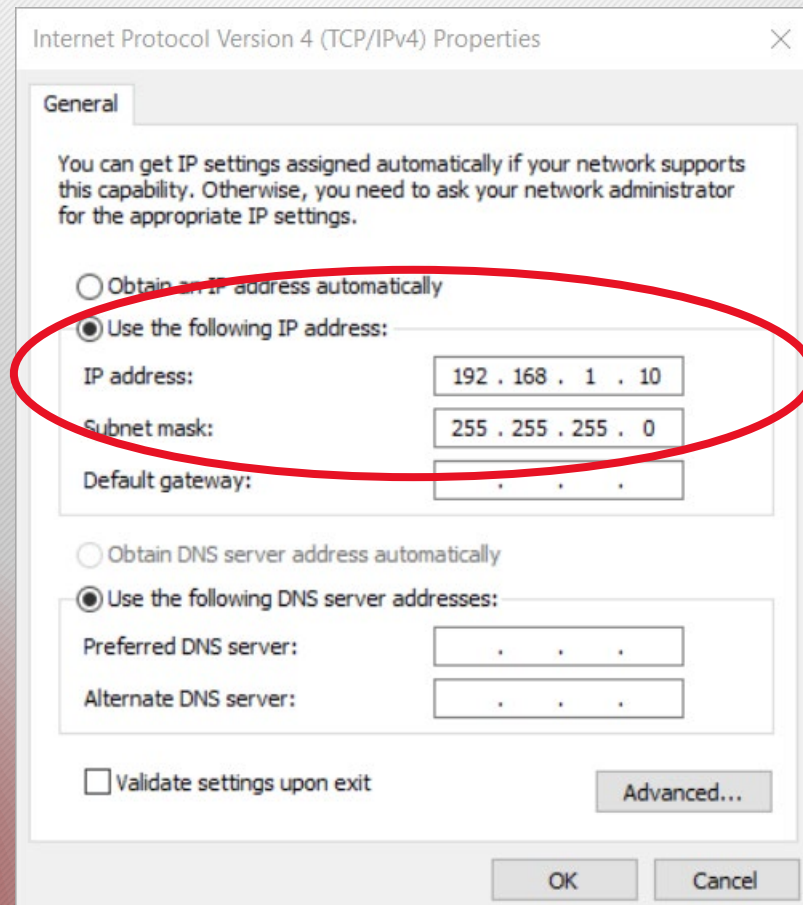
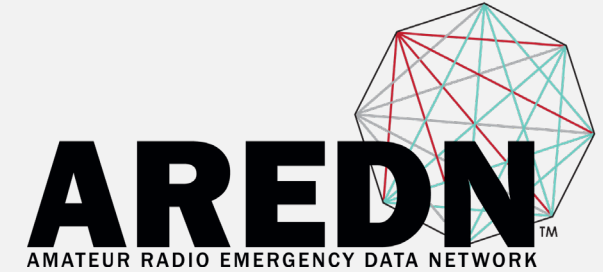
Directory of C:\AREDN

04/04/2019  09:58 PM  <DIR>          .
04/04/2019  09:58 PM  <DIR>          ..
04/04/2019  09:54 PM             6,685,073  aredn-3.19.3.0-mikrotik-rb-nor-flash-16M-ac-sysupgrade.bin
04/04/2019  09:54 PM             8,839,912  aredn-3.19.3.0-mikrotik-vmlinux-initramfs.elf
04/04/2019  09:54 PM             8,839,912  rb.elf
               3 File(s)      24,364,897 bytes
               2 Dir(s)    213,706,461,184 bytes free

C:\AREDN>
```

Mikrotik Preparation - Step 2

Windows Procedure



Set your computer's Ethernet network adapter to a static IP address of 192.168.1.10 with a netmask of 255.255.255.0

Turn **OFF** your computer's WiFi connection.

New HAPs may be on 192.168.88.1. To check, set PC interface to 192.168.88.10 and ping 192.168.88.1 using CMD "ping" to verify returns ok on 192.168.88.1.

Mikrotik Preparation - Step 3

Windows Procedure



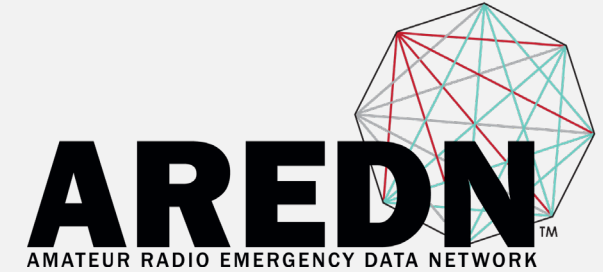
Connect an Ethernet cable from your computer to the switch, and another from the LAN port of the PoE adapter to the switch.

For a Mikrotik hAP ac Lite device, connect the Ethernet cable from Port 1 of the Mikrotik to the switch.

Do "ping" on 192.168.88.1 w/this setup to verify HAP is on 88.1 and not 1.1 do not proceed until you have a good ping.

Mikrotik First Install Process - Step 1

Windows Procedure



```
C:\Program Files (x86)\TinyPXE\config.ini - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window
config.ini x
1 [arch]
2 ;will over rule the bootp filename or opt67 if the client ar
3 ;00006=bootia32.efi
4 ;00007=bootx64.efi
5 ;00008=bootx64.efi
6 [dhcp]
7 rfc951=1
8 ;needed to tell TFTPd where is the root folder
9 root=files
10 ;bootp filename as in http://tools.ietf.org/html/rfc951
11 ;filename=ipxe-undionly.kpxe
12 filename=ipxe.pxe
```

Navigate to the folder where you extracted the Tiny PXE software and edit the **config.ini** file.

Directly under the **[dhcp]** tag, add the following line:

rfc951=1

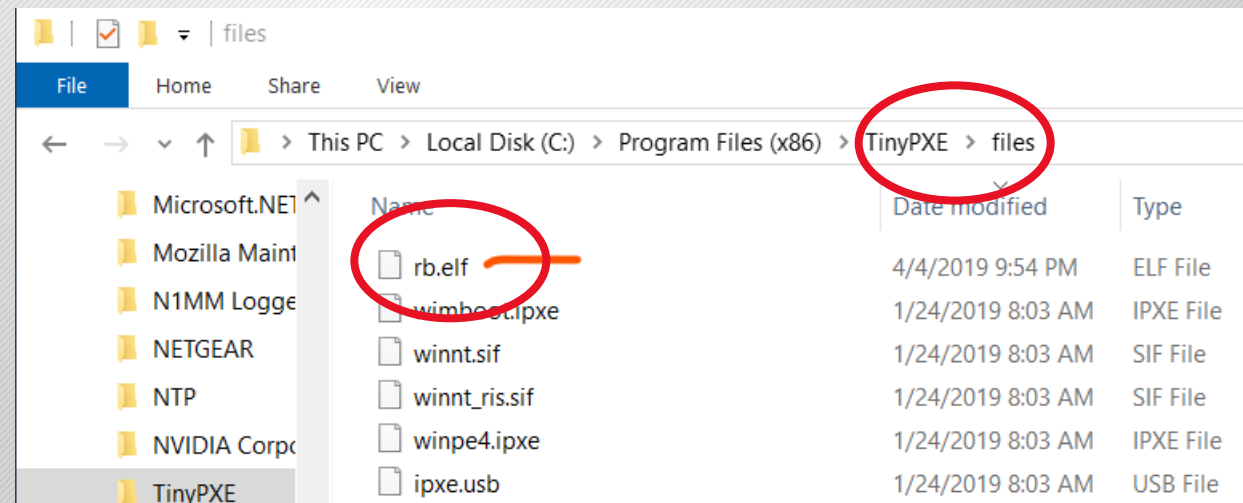
then save and close the file

Mikrotik First Install Process - Step 2

Windows Procedure



Copy the **rb.elf** file into the files folder under the Tiny PXE server directory location.



Mikrotik First Install Process - Step 3A

Windows Procedure



Tiny PXE Server - 1.0.0.23

☐ BINL ☐ ProxyDhcp ☒ HTTPd ☐ DNSd ☐ SMB

11:42:27 AM Ctrl Keys: R Refresh interfaces, O/F Online/Offline, I Display current config filename
11:42:27 AM loading config
11:42:27 AM HTTPd enabled
11:42:27 AM TFTPd enabled

Option 54 (DHCP Server) * 192.168.1.10 ☒ Bind IP

IP Pool start / size * 192 . 168 . 1 . 11 10

Next-Server 192 . 168 . 1 . 10

Option 51 (Lease time in secs) * 3600

Option 1 (Subnet Mask) 255 . 255 . 255 . 0

Option 3 (Router) 0 . 0 . 0 . 0

Option 6 (DNS Server) 10 . 70 . 147 . 17

Option 28 (Broadcast) 192 . 168 . 1 . 255

Option 15 (DNS Domain Name)

Boot File
Filename ipxe.pxe
☒ Filename if user-class=gPXE or iPXE menu.ipxe

More V

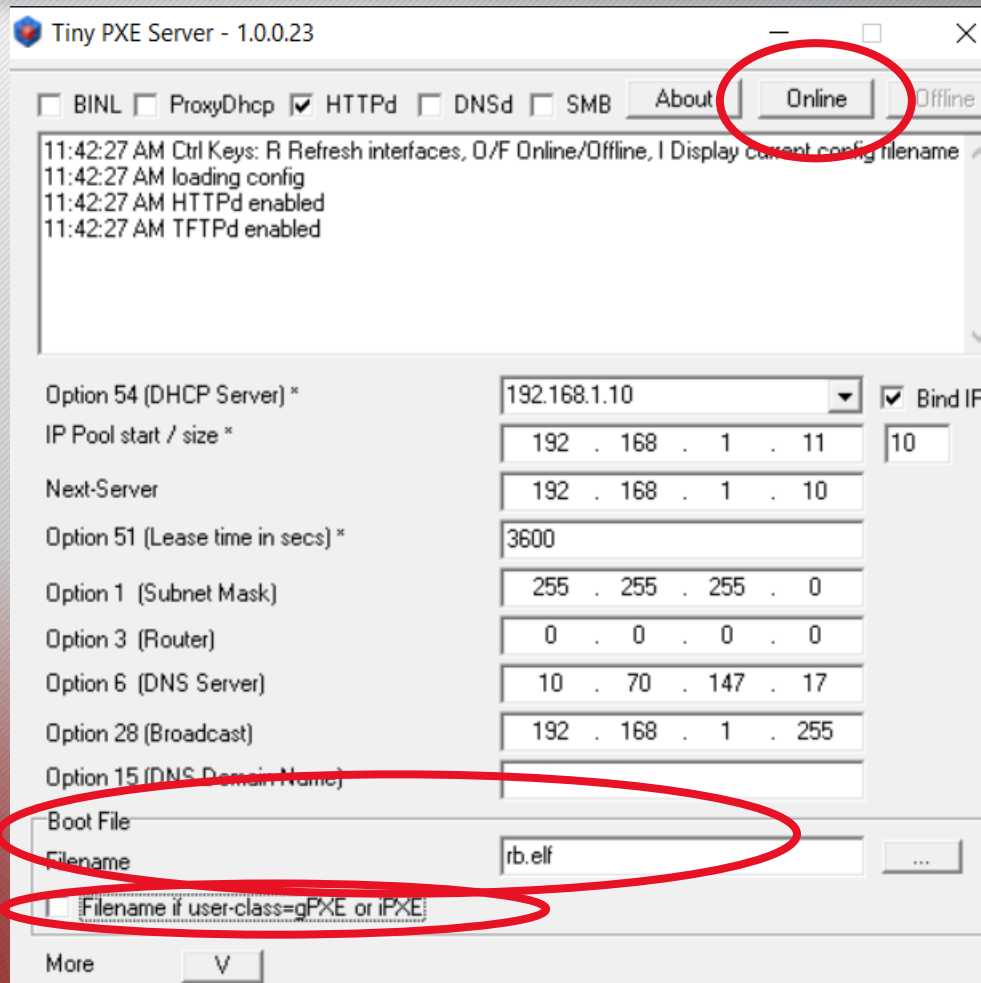
Start the Tiny PXE server exe and select your Ethernet interface IP from the dropdown list called **Option 54 [DHCP Server]**

Make sure to check the **Bind IP** checkbox.

Note: IP will be 192.168.88.10 if previous step verifies "newer" HAP.

Mikrotik First Install Process - Step 3B

Windows Procedure



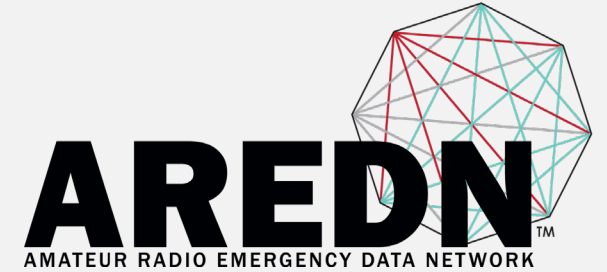
Under the “Boot File” section, enter **rb.elf** into the the Filename field

Uncheck the checkbox for Filename if user-class = gPXE or iPXE.

Click the **Online** button at the top of the Tiny PXE window.

Mikrotik First Install Process - Step 4

Windows Procedure

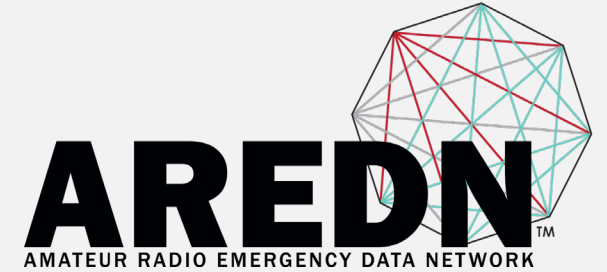


With the PoE unit powered off, connect the Mikrotik node to the POE port.

If you are flashing a Mikrotik hAP ac lite device, connect the LAN cable from Port 1 of the Mikrotik to the dumb switch.

Mikrotik First Install Process - Step 5

Windows Procedure



You may want to consider using a foot switch to turn the power on and off.

Holding a device and pressing the reset button on the node while powering on the PoE unit is awkward.

Mikrotik First Install Process - Step 6A

Windows Procedure

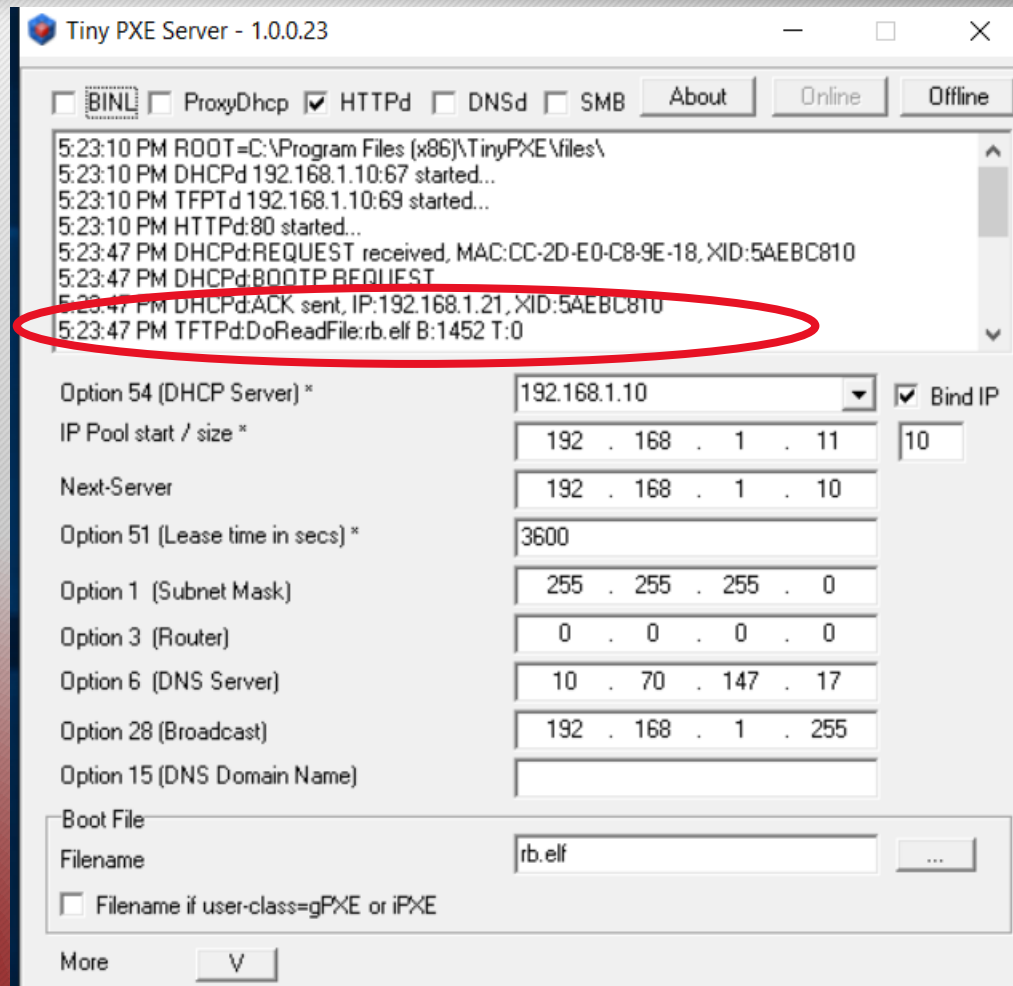


Press and hold the reset button on the node while powering on the PoE unit or the device.

Note that the toothpick probe pushing the reset button has a flat end rather than a point.

Mikrotik First Install Process - Step 6B

Windows Procedure



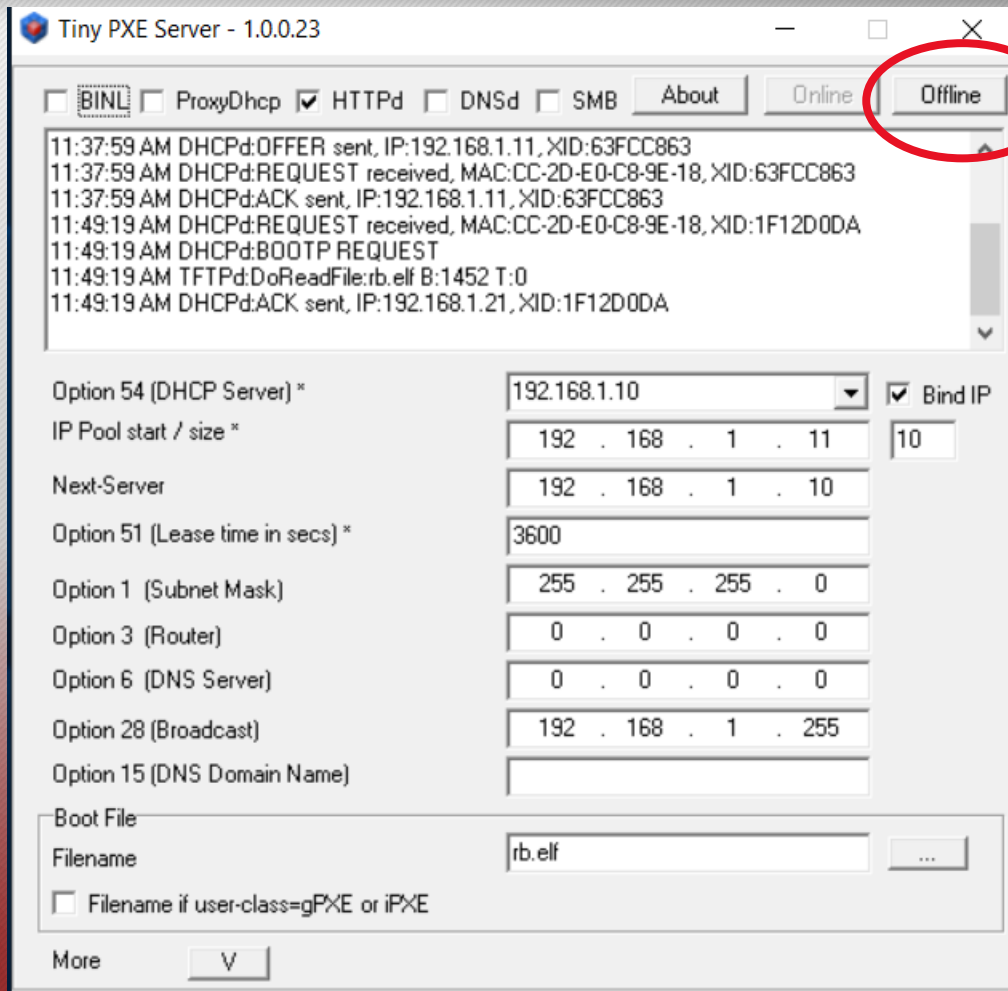
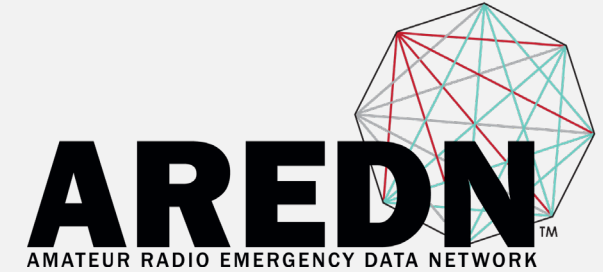
Continue holding the reset button until you see

TFTPd: DoReadFile: rb.elf
in the Tiny PXE log window.

HINT: Click "Offline" button on PXE immediately after you see the DoReadFile.

Mikrotik First Install Process - Step 7

Windows Procedure

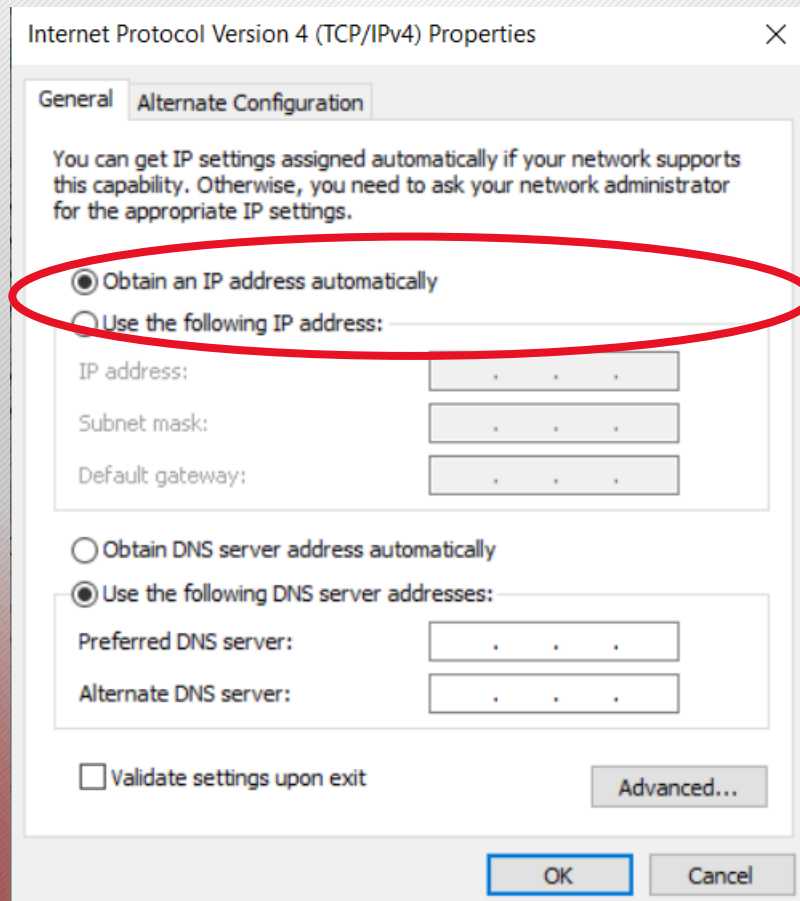


Release the node's reset button and click the Offline button in Tiny PXE.

You are finished using Tiny PXE when the firmware image has been read by the node.

Mikrotik First Install Process - Step 8A

Windows Procedure

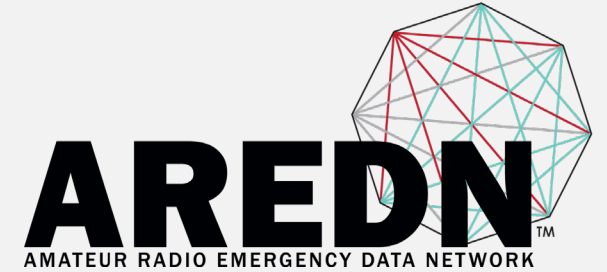


After booting the AREDN firmware image the node should have a default IP address of 192.168.1.1. Change your computer's Ethernet interface to DHCP mode to obtain an IP address from the node.

NOTE: For HAPs, change PC network

Mikrotik First Install Process - Step 8B

Windows Procedure



For the **hAP ac Lite**, pull the Ethernet cable from the Internet port (1) and insert it into one of the LAN ports (2,3,4). Do NOT power off the unit.



Mikrotik First Install Process - Step 8C

Windows Procedure



```
C:\Users\randy>ping 192.168.1.1
```

```
Pinging 192.168.1.1 with 32 bytes of data:
```

```
Reply from 192.168.1.1: bytes=32 time<1ms TTL=64
```

```
Reply from 192.168.1.1: bytes=32 time<1ms TTL=64
```

```
Reply from 192.168.1.1: bytes=32 time<1ms TTL=64
```

```
Reply from 192.168.1.1: bytes=32 time<1ms TTL=64
```

```
Ping statistics for 192.168.1.1:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

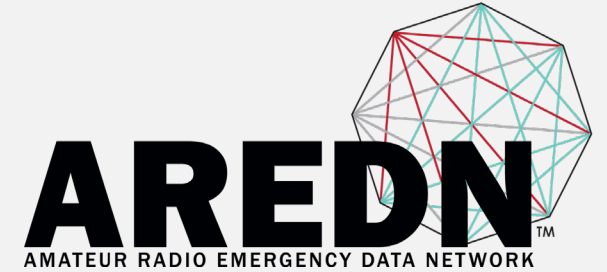
You should be able to ping the node at 192.168.1.1. If this does not work, then something is wrong.

Don't proceed until you can ping the node.

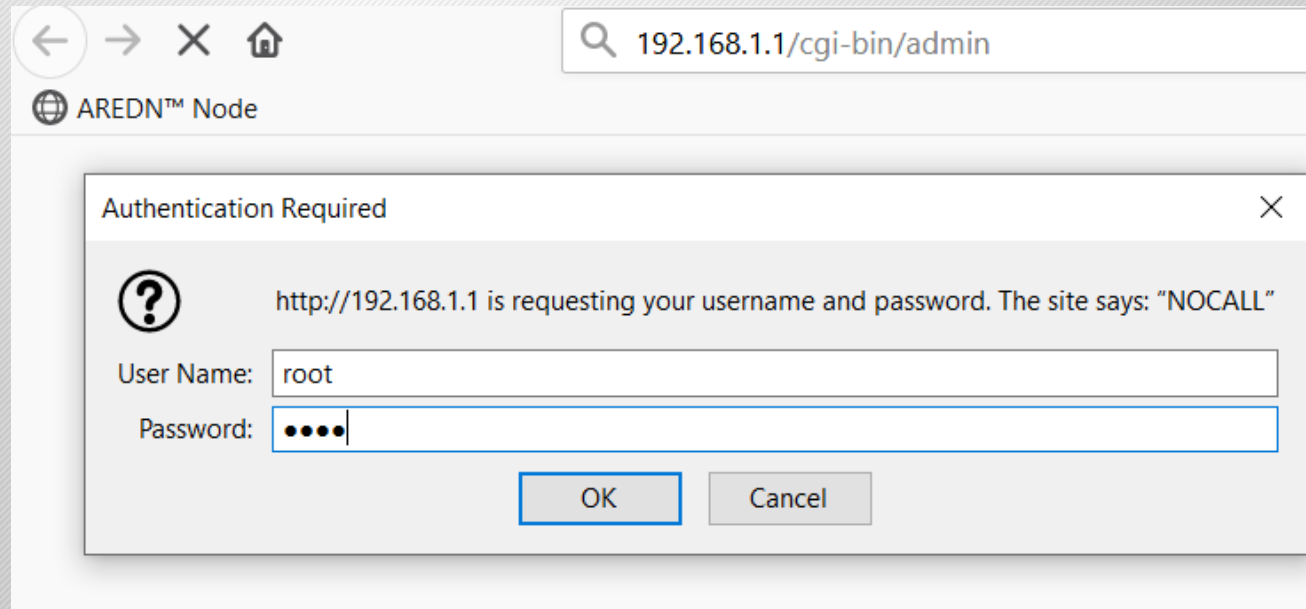
If ping fails, check you PC interface is "static" at 192.168.1.10. Check

Mikrotik First Install Process - Step 9A

Windows Procedure



In a web browser, open the node's Administration page
http://192.168.1.1/cgi-bin/admin Use "localnode:8080" in browser
user = 'root' password = 'hsmm' for HAPs if no "login" window.



Mikrotik First Install Process - Step 9B

Windows Procedure



Go to the Setup > Administration > Firmware Update section.
Select the **sysupgrade** file you previously downloaded and click the **Upload** button.

The screenshot shows the AREDN web interface. At the top left is the AREDN logo. Below it is a navigation bar with links: [Node Status](#), [Basic Setup](#), [Port Forwarding, DHCP, and Services](#), [Tunnel Server](#), [Tunnel Client](#), [Administration](#) (highlighted with a black background), and [Advanced Configuration](#). Below the navigation bar are links for [Help](#) and a **Reboot** button. The main section is titled **Firmware Update** and displays the current version as 3.19.3.0 and the hardware type as mikrotik (rb-952ui-5ac2nd). A red circle highlights the 'Upload Firmware' section, which includes a 'Browse...' button, the text 'No file selected.', and an 'Upload' button. Below this, there is a 'Download Firmware' section with a dropdown menu set to '- Select Firmware -', a 'Refresh' button, a 'Download' button, and a checkbox labeled 'Keep Settings'.

Mikrotik First Install Process - Step 10

Windows Procedure



NOCALL-200-158-29

Location Not Available

[Help](#)

[Refresh](#)

[Setup](#)

[Select a theme](#) ▼

This node is not yet configured.

Go to the setup page and set your node name and password.

Click Save Changes, even if you didn't make any changes, then the node will reboot.

This device can be configured to either permit or prohibit known encrypted traffic on its RF link. It is up to the user to decide which is appropriate based on how it will be used and the license under which it will be operated. These rules vary by country, frequency, and intended use. You are encouraged to read and understand these rules before going further.

After the node reboots, navigate to the node's Setup page and configure the new “firstboot” node as described in the Basic Radio Setup section of the AREDN documentation.

https://arednmesh.readthedocs.io/en/latest/arednGettingStarted/basic_setup.html



At the Center of Emergency
Prep**ARED**Ness

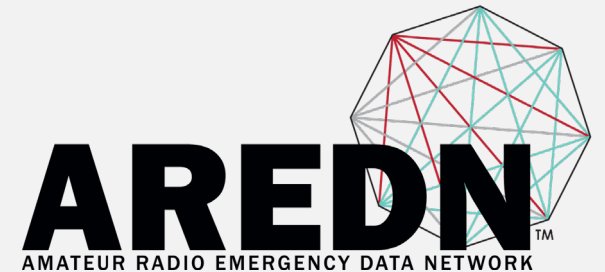


Thank You from the AREDN Project Team

Randy Smith, WU2S

wu2s@arednmesh.org

Semper Certus, Saepe Falsus



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