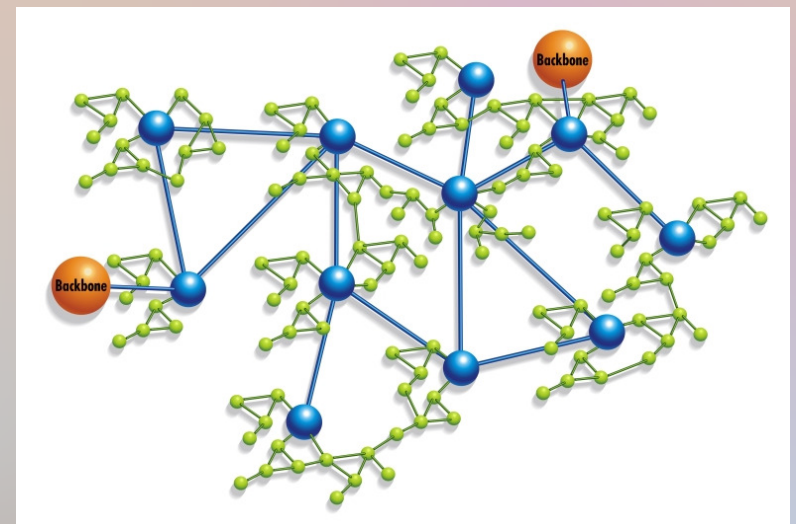


# HSMM-MESH™ / Broadband-Hamnet™



Presented by  
**Don Hill, KE6BXT**  
and  
**Joe Ayers, AE6XE**



The Orange County Mesh Organization  
[Http://ocmesh.org](http://ocmesh.org)

# Overview

- Selecting the Right Hardware
- Downloading the AREDN Firmware
- Loading the AREDN Firmware on a Mesh Node
- Basic Configuration (Node Name, SSID, etc.)
- Node Pages: Node Status, Mesh Status, OLSR, WiFi Scan, Setup
  - Setup pages: Basic Setup, Port Forwarding, DHCP, and Services
  - Tunnel Server, Tunnel Client, Administration
- Adding a Second Node
- Adding Services
- Connecting Mesh Islands

# Selecting the Right Hardware



Amateur Radio Emergency Data Network

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**SUPPORTED PLATFORM MATRIX**

DOWNLOAD

INSTALLATION

NETWORK SWITCH CONFIGS

## Supported Platform Matrix

The supported platform matrix identifies the make and models of hardware which may be used with AREDN firmware in the various frequency bands. The equipment marked with a green background is fully supported and tested. Models with a red background are NOT supported nor are they compatible with AREDN firmware. The orange background indicates equipment that is likely to work well, but has not yet been thoroughly tested. Equipment with a yellow background is in the research stage and may or may not achieve fully-supported status depending on test results.

Current As of AREDN™ 3.15.1.0 (updated on 01/27/2016)				
Manufacturer/Model	Band			
	900Mhz	2.4Ghz	3Ghz	5.8Ghz
Ubiquiti Networks (www.ubnt.com)				
AirGrid (XM revision/old)		M2		M5
AirGrid (XW)				AG-HP-5Gxx
AirRouter		M2**		
AirRouter HP		M2**		
Bullet		M2		M5
Bullet Titanium		M2		M5
NanoBeam (XW)				NBE-M5-16/19
NanoBridge	M9	2G18	M3	5G22/5G25

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	900Mhz	2.4Ghz	3Ghz	5.8Ghz
<b>Ubiquiti Networks (www.ubnt.com)</b>				
AirGrid (XM revision/old)		M2		M5
AirGrid (XW)				AG-HP-5Gxx
AirRouter		M2**		
AirRouter HP		M2**		
Bullet		M2		M5
Bullet Titanium		M2		M5
NanoBeam (XW)				NBE-M5-16/19
NanoBridge	M9	2G18	M3	5G22/5G25
NanoStation Loco (XM)	M9	M2		M5
NanoStation Loco (XW)				M5
NanoStation (XM)		M2	M3	M5
NanoStation (XW)				M5
PicoStation		M2		
PowerBeam (older Nanobeams)		NBE-M2-400		NBE-M5-300/400
Rocket (XM)	M900	M2	M3	M5
Rocket (XW)				M5
Rocket Titanium		M2		M5
Rocket Titanium (XW)				M5
<b>TP-Link</b>				
CPE		CPE210		CPE510
-				
GREEN = "GO"	AREDN Supported			
RED="STOP"	No Compatibility or Support			
ORANGE="CAUTION"	High Confidence of compatibility. Included in current release, but not rigorously tested			
YELLOW="RESEARCHING"	Under research for future support consideration.			
GREY="N/A"	No such device			
**	In beta			

# Orange County Mesh Organization

Search this site

- Home
- More Nodes in Orange County
- Bands, Channels, and Frequencies
- Band Plans
- OC RACES
- Backbone Nodes
- Events
- Hardware**
- Software (Firmware)
- Basic Setup
- Services
- External Links
- FAQs
- Contact Us

## Navigation

### Home

#### Orange County Major Nodes

- Anaheim Ham Radio Outlet
- Red Cross - Santa Ana
- Pleasants Peak
- Laguna Woods Village Tower
- Saddleback Nodes
- Mission Viejo City Hall (EOC)
- San Juan Capistrano

### Bands, Channels, and Frequencies

#### Band Plans

#### More Maps

- More Nodes in Orange County
- AREDN Node Map
- OC RACES
- S.A.T.E.R.N.
- Las Vegas Mesh
- Backbone Nodes

### Events

#### Hardware

- Antennas (MiMo)
- Antennas (non-MiMo)
- airRouter
- AirGateway
  - Wireless Clients or Wireless Internet

### Software (Firmware)

#### Basic Setup

#### Internet Tunneling

#### Services

- Adding Services to a Node
- Cameras

## Hardware

### [Why we do not recommend using the Linksys WRT54G Routers for HAM Mesh Networking](#)

Bullet/Bullet-Ti					
					
<b>BM2HP</b>	2.4 GHz	100+ Mbps	600mw	28 dBm	2412-2462 MHz
<b>BM2-Ti</b>	2.4 GHz	100+ Mbps	600mw	28 dBm	412-2462 MHz
<b>BM5HP</b>	5 GHz	100+ Mbps	600mw	25 dBm	5170-5825 MHz*
<b>BM5-Ti</b>	5 GHz	100+ Mbps	600mw	25 dBm	5170-5825 MHz*

Source: [bm\\_ds.web.pdf](#) and [BulletM\\_Ti\\_DS.pdf](#)

\* Only 5725 - 5850 MHz is supported in the USA

Note: dBm refers to output power

AirGrid M					
					

# Supported Hardware

Linksys:

- WRT54G\*

Ubiquiti

- Nanostation Loco
- Nanostation
- NanoBridge
- Rocket
- Bullet
- Airgrid



# Supported Hardware

- Rockt Dish
- Airmax Basestation  
Sector antenna  
(90 deg, 120 deg)
- MIMO Omni
- Non-MIMO Omni  
or Grid Dish



# Orange County Mesh Organization

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- Events
- Hardware
- Software (Firmware)**
- Basic Setup
- Services
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- FAQs
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## Navigation

### Home

#### Orange County Major Nodes

- Anaheim Ham Radio Outlet
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- Mission Viejo City Hall (EOC)
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### Bands, Channels, and Frequencies

### Band Plans

#### More Maps

- More Nodes in Orange County
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- Las Vegas Mesh
- Backbone Nodes

### Events

#### Hardware

- Antennas (MiMo)
- Antennas (non-MiMo)
- airRouter
- AirGateway
  - Wireless Clients or Wireless Internet

#### **Software (Firmware)**

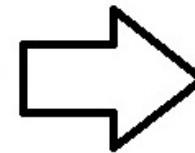
### Basic Setup

#### Internet Tunneling

#### Services

- Adding Services to a Node
- Cameras

## Software (Firmware)



### Turning your Ubiquiti radio into an AREDN mesh node

All of the instructions on how to download and load the AREDN firmware are on the AREDN website. Rather than repeating the steps here, we will refer you to <http://AREDN.org>

Go to the menu at the top of the page and mouse over SOFTWARE.

Below **SOFTWARE** is **DOWNLOAD** that allows you to download the firmware from the web site and store it on your computer.

Below **DOWNLOAD** is **INSTALLATION** that walks you through verifying that your hardware will support the AREDN firmware, and then upload the firmware from your computer to the Ubiquiti radio.





# Amateur Radio Emergency Data Network

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## Software

- SUPPORTED PLATFORM MATRIX
- DOWNLOAD**
- INSTALLATION
- NETWORK SWITCH CONFIGS

[Before flashing a device that is running or has been running AirOS version 5.6, please run the AREDN U-Boot Test program below to ensure a successful firmware load or upgrade.](#)

We have developed the following utility to help you determine if your device is compatible, as well as being able to take a BACKUP of your node's critical partitions.

Download and run the [AREDN U-Boot Test Setup Program](#). If the test results in a "GOOD/GOOD" result, then you may proceed to load the appropriate AREDN firmware onto it.

If the test results are "BAD," then you should do the following:

1. Backup your device partitions using the AREDN U-Boot Test program.
2. Use the AirOS GUI to downgrade to AirOS v5.5.x.
3. Re-run the AREDN U-Boot Test program and look for a "GOOD/GOOD" test.
4. If "GOOD/GOOD", you can safely use the AirOS GUI to install the AREDN firmware.

Requires Windows 7 or higher and Microsoft .NET Framework 4.5.

---

Notes for Over the Air Upgrade are [below](#)

---

**Use this "factory" file when loading from AirOS or TFTP**  
**Use this "sysupgrade" file when loading from AREDN (or BBHN)**

Use this "factory" file when loading from AirOS or TFTP  
 Use this "sysupgrade" file when loading from AREDN (or BBHN)

Latest Stable version is: 3.15.1.0

**AREDN™ Firmware for Ubiquiti**

Bullet M2 Bullet M5 Bullet M2 Titanium Bullet M5 Titanium NanoStation Loco M2 NanoStation Loco M5 (XM) NanoStation Loco M9 NanoBridge M2 NanoBridge M5 NanoBridge M9 AirGrid M2 AirGrid M5 PicoStation M2	<a href="#">factory</a> md5sum: 284883fd8158466c0322735a0568db18  Size: 4.4M	<a href="#">sysupgrade</a> md5sum: 78c38e1d8d01240f70db069d59866dc6  Size: 4.4M
NanoStation M2 NanoStation M3 NanoStation M5 (XM) NanoBridge M3	<a href="#">factory</a> md5sum: 2bf57572e27cd6a328371af1885e73e4  Size: 4.4M	<a href="#">sysupgrade</a> md5sum: 90a07696015a3f7c52dfd2ad085d3c02  Size: 4.4M
Rocket M2 Rocket M3 Rocket M5 Rocket M9	<a href="#">factory</a> md5sum: 83850ee1f7cccef92a3938b286bcc3ec  Size: 4.4M	<a href="#">sysupgrade</a> md5sum: 790d25a1e6d0a04d5168dbd2840ffd8a  Size: 4.4M
NanoStation M5 (XW)	<a href="#">factory</a> md5sum: 3d80d30764c65d6e60ca67289cb1b94c  Size: 4.4M	<a href="#">sysupgrade</a> md5sum: 50cc9e479bb24aaf500e6cf7ba698b59  Size: 4.4M

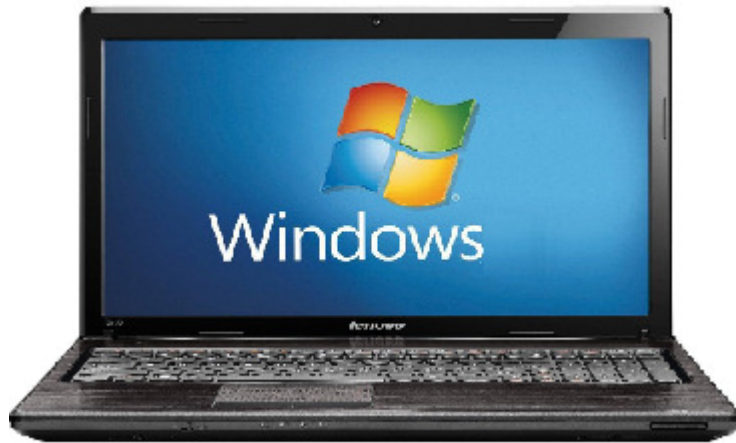
**AREDN™ Firmware for TP-Link**

CPE210 CPE510	<a href="#">factory</a> md5sum: 77598cd1c8b53beeb36eddb5867bf5b1  Size: 4.5M	<a href="#">sysupgrade</a> md5sum: 2db1d122a51f9d3189a017213ec56ea1  Size: 4.9M
------------------	--	---

**Patches**

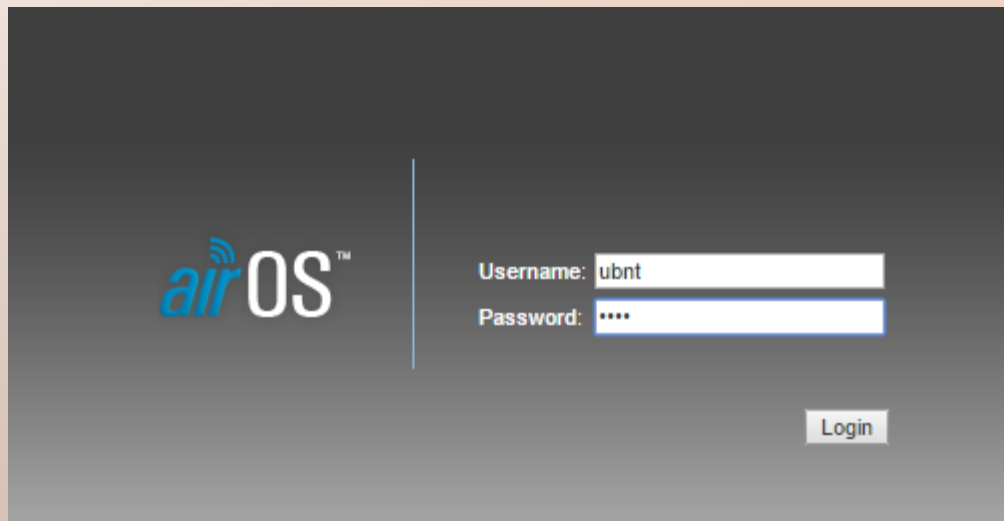
Over The Air Upgrade support for AREDN v3.0.2. To be used	<a href="#">V3.0.2 OTA Support Final</a>
---	--

## Loading the AREDN Firmware on a Mesh Node



- Connect node to POE port on POE
- Connect computer to LAN port on POE
- Set computer IP address to 192.168.1.15,  
subnet mask 255.255.255.0
- Open browser and go to 192.168.1.20

## Loading the AREDN Firmware on a Mesh Node



Log in with Username: ubnt

Password: ubnt

[MAIN](#)[WIRELESS](#)[NETWORK](#)[ADVANCED](#)[SERVICES](#)[SYSTEM](#)Tools: [Logout](#)

## Status

Device Name:	NanoStation M2	AP MAC:	Not Associated
Network Mode:	Bridge	Signal Strength:	-
Wireless Mode:	Station	Horizontal / Vertical:	0 / 0 dBm
SSID:	ubnt	Noise Floor:	-
Security:	none	Transmit CCQ:	-
Version:	v5.5.3	TX/RX Rate:	- / -
Uptime:	00:26:04	airMAX:	-
Date:	2012-10-12 17:41:58		
Channel/Frequency:	3 / 2422 MHz		
Channel Width:	20 MHz		
Distance:	0.7 miles (1.1 km)		
TX/RX Chains:	2X2		
WLAN0 MAC	00:27:22:2A:FD:CA		
LAN0 MAC	00:27:22:2B:FD:CA		
LAN1 MAC	02:27:22:2B:FD:CA		
LAN0 / LAN1	100Mbps-Full / Unplugged		

## Monitor

[Throughput](#) | [AP Information](#) | [Interfaces](#) | [ARP Table](#) | [Bridge Table](#) | [Routes](#) | [Log](#)

LAN0

[Refresh](#)



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**AREDN U-Boot Tester v1.1.4.0**

Step 1: Verify Connectivity

Device IP

Step 2: Provide Connection Details

Device IP

Login user (ubnt for UBNT, root for AREDN)

Login password

SSH port (22 for UBNT, 2222 for AREDN)

Step 3: Run the test

Step 4: Make a Backup

U-Boot   Cfg

U-Boot Env   EEPROM (ART)

Zip Enabled

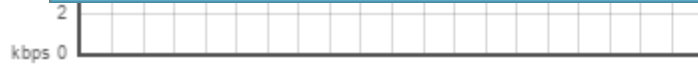
MTD Map

Results

Version  Map

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Moni





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### AREDN U-Boot Tester v1.1.4.0

Step 1: Verify Connectivity

Device IP

Step 2: Provide Connection Details

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Login user (ubnt for UBNT, root for AREDN)

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U-Boot   Cfg

U-Boot Env   EEPROM (ART)

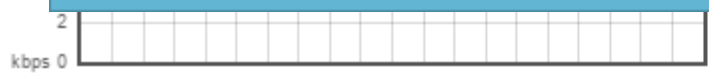
Zip Enabled

MTD Map

Results

Version  Map

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### AREDN U-Boot Tester v1.1.4.0

**Step 1: Verify Connectivity**

Device IP

**Step 2: Provide Connection Details**

Device IP

Login user (ubnt for UBNT, root for AREDN)

Login password

SSH port (22 for UBNT, 2222 for AREDN)

**Step 3: Run the test**

**Step 4: Make a Backup**

U-Boot   Cfg

U-Boot Env   EEPROM (ART)

Zip  Enabled

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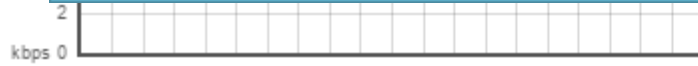
#### MTD Map

mtd0	0x00040000	u-boot
mtd1	0x00010000	u-boot-env
mtd2	0x00100000	kernel
mtd3	0x00660000	rootfs
mtd4	0x00040000	cfg
mtd5	0x00010000	EEPROM

#### Results

Version	Map
<b>GOOD</b>	<b>GOOD</b>

Moni





[MAIN](#)[WIRELESS](#)[NETWORK](#)[ADVANCED](#)[SERVICES](#)[SYSTEM](#)Tools: [Logout](#)

## Status

Device Name:	NanoStation M2	AP MAC:	Not Associated
Network Mode:	Bridge	Signal Strength:	-
Wireless Mode:	Station	Horizontal / Vertical:	0 / 0 dBm
SSID:	ubnt	Noise Floor:	-
Security:	none	Transmit CCQ:	-
Version:	v5.5.3	TX/RX Rate:	- / -
Uptime:	00:26:04	airMAX:	-
Date:	2012-10-12 17:41:58		
Channel/Frequency:	3 / 2422 MHz		
Channel Width:	20 MHz		
Distance:	0.7 miles (1.1 km)		
TX/RX Chains:	2X2		
WLAN0 MAC	00:27:22:2A:FD:CA		
LAN0 MAC	00:27:22:2B:FD:CA		
LAN1 MAC	02:27:22:2B:FD:CA		
LAN0 / LAN1	100Mbps-Full / Unplugged		

## Monitor

[Throughput](#) | [AP Information](#) | [Interfaces](#) | [ARP Table](#) | [Bridge Table](#) | [Routes](#) | [Log](#)

LAN0

[Refresh](#)

### Firmware Update

Firmware Version: XM.v5.5.3

Upload Firmware:  No file chosen

Build Number: 14763

Check for Updates:  Enable

### Device

Device Name:

Interface Language:

### Date Settings

Time Zone:

Startup Date:  Enable

Startup Date:

### System Accounts

Administrator Username:

Read-Only Account:  Enable

### Miscellaneous

Reset Button:  Enable

### Location

Latitude:

Longitude:

### Device Maintenance

Reboot Device:

Support Info:

### Configuration Management

Back Up Configuration:

Upload Configuration:  No file chosen

Reset to Factory Defaults:

Firmware Update

Firmware Version: XM.v5.5.3  
Build Number: 14763

Upload Firmware:  No file chosen

Open

This PC > Downloads > hsmm-mesh > AREDN > 3.16.1.0

Search 3.16.1.0

Organize New folder

Name	Date modified	Type	Size
AREDN-3.16.1.0-ubnt-air-gateway-squashfs-factory.bin	4/27/2016 9:24 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-air-gateway-squashfs-sysupgrade.bin	4/27/2016 9:24 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-airrouter-squashfs-factory.bin	4/27/2016 9:25 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-airrouter-squashfs-sysupgrade.bin	4/27/2016 9:25 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-bullet-m-squashfs-factory.bin	4/27/2016 9:25 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-bullet-m-squashfs-sysupgrade.bin	4/27/2016 9:26 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-loco-m-xw-squashfs-factory.bin	4/27/2016 9:26 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-loco-m-xw-squashfs-sysupgrade.bin	4/27/2016 9:26 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-nano-m-squashfs-factory.bin	4/27/2016 9:27 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-nano-m-squashfs-sysupgrade.bin	4/27/2016 9:27 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-nano-m-xw-squashfs-factory.bin	4/27/2016 9:28 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-nano-m-xw-squashfs-sysupgrade.bin	4/27/2016 9:28 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-rocket-m-squashfs-factory.bin	4/27/2016 9:28 PM	VLC media file (.bi...	4,801 KB
AREDN-3.16.1.0-ubnt-rocket-m-squashfs-sysupgrade.bin	4/27/2016 9:29 PM	VLC media file (.bi...	4,801 KB

File name: AREDN-3.16.1.0-ubnt-nano-m-squashfs-factory.bin

All Files

Open Cancel



MAIN

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Tools:

Logout

## Firmware Update

Firmware Version: XM.v5.5.3

Build Number: 14763

Check for Updates:  Enable

Upload Firmware:  AREDN-3.16...actory.bin

## Device

Device Name:

Interface Language:

## Date Settings

Time Zone:

Startup Date:  Enable

Startup Date:

## System Accounts

Administrator Username:

Read-Only Account:  Enable

## Miscellaneous

Reset Button:  Enable

## Location

Latitude:

Longitude:

## Device Maintenance

Reboot Device:

Support Info:

## Configuration Management

Back Up Configuration:

Upload Configuration:  No file chosen

Reset to Factory Defaults:

Firmware Update

Firmware Version: XM.v5.5.3

Build Number: 14763

Check for Updates:  Enable

Upload Firmware:  AREDN-3.16...actory.bin

Device

Device Name:

Interface Language:

Date Settings

Time Zone:

Startup Date:  Enable

Startup Date:

System Accounts

Adminis

Ret

Please Wait. Uploading Firmware...

Miscellaneous

Reset Button:  Enable

Location

Latitude:

Longitude:

Device Maintenance

Reboot Device:

Support Info:

Configuration Management

Back Up Configuration:

Upload Configuration:  No file chosen

Reset to Factory Defaults:



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Logout

Uploaded Firmware Version: XM.v6.0.0-OpenWrt-r42549

**WARNING: Uploaded firmware is third-party, make sure you're familiar with recovery procedure!**

Update

Discard

## Firmware Update

Firmware Version: XM.v5.5.3

Build Number: 14763

Check for Updates:  Enable Check Now

Upload Firmware: Choose File No file chosen

## Device

Device Name:

Interface Language: English ▼

## Date Settings

Time Zone: (GMT) Western Europe 1 ▼

Startup Date:  Enable

Startup Date:

## System Accounts

Administrator Username:

Read-Only Account:  Enable

## Miscellaneous

Reset Button:  Enable

## Location

Latitude:

Longitude:

Change

## Device Maintenance

Reboot Device: Reboot...

Support Info: Download...

## Configuration Management

Back Up Configuration: Download...

Upload Configuration: Choose File No file chosen

Reset to Factory Defaults: Reset...

Firmware Update

Firmware Version: XM.v5.5.3  
Build Number: 14763

Upload Firmware: Choose File AREDN-3.16...actory.bin Upload

Device

System Ac

Adn

Miscellane


Device Mai

[NanoStation M2] - Firmware Update - Google Chrome

[https://192.168.1.20/fwflash.cgi?do\\_update=do](https://192.168.1.20/fwflash.cgi?do_update=do)

**Firmware Update**

Firmware is being updated.  
This operation takes several minutes to complete -  
meanwhile **DO NOT POWEROFF** the device!



Close this window

Support Info: Download...

Upload Configuration: Choose File No file chosen

Reset to Factory Defaults: Reset...

Change



This site can't be reached

**192.168.1.20** took too long to respond.

ERR\_CONNECTION\_TIMED\_OUT

Reload

[Details](#)

- Change computer network card back to DHCP
- Connect by cat5e or Wi-Fi (ssid: MeshNode)
- Connect to 192.168.1.1:8080



Authentication Required

http://192.168.1.1:8080 requires a username and password.  
Your connection to this site is not private.

User Name:

Password:

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.

This device is pre-configured with no restrictions as to the type of data being passed.

Follow these steps if you wish to prohibit known encrypted traffic on the RF link. These instructions will disappear, so copy them for your reference:

1. Setup your node name and password as instructed at the top of this page
2. After you Save Changes allow your node to reboot
3. Return to the Node Status page and navigate to Setup > Administration
4. Obtain the blockknownencryption package from the AREDN™ website OR refresh the Package list (node must be connected to the internet)
5. Install the blockknownencryption package by uploading it or choosing it from the package drop-down list
6. Wait until the package installs and then reboot your node

firmware version 3.16.1.0

root / hsmm

The screenshot shows the AREDN web interface for a node named 'NOCALL-42-253-202'. The interface is divided into several sections:

- Navigation:** Node Status, Basic Setup (active), Port Forwarding, DHCP, and Services, Tunnel Server, Tunnel Client, Administration.
- Buttons:** Help, Save Changes, Reset Values, Default Values, Reboot.
- Node Information:** Node Name: NOCALL-42-253-202, Password: [empty], Node Type: Mesh Node, Verify Password: [empty].
- WiFi Section:**
  - Protocol: Static
  - IP Address: 10.42.253.202
  - Netmask: 255.0.0.0
  - SSID: AREDN
  - Mode: Ad-Hoc
  - Channel: 1 (2412)
  - Channel Width: 20 MHz
  - Active Settings: Antenna selection is now automatic.
  - Tx Power: 28 dBm
  - Distance to FARTHEST Neighbor: 0.00 miles, 0 kilometers, 0 meters.
  - Apply button.
- LAN Section:**
  - LAN Mode: 5 host Direct
  - IP Address: 10.87.238.81
  - Netmask: 255.255.255.248
  - DHCP Server: [checked]
  - DHCP Start: 82
  - DHCP End: 86
  - Advanced: Disable Default Route [unchecked].
- WAN Section:**
  - Protocol: DHCP
  - DNS 1: 8.8.8.8
  - DNS 2: 8.8.4.4
  - Advanced: Mesh Gateway [unchecked].
- Optional Settings:** Latitude, Longitude, Grid Square, Find Me!, Apply Location Settings, Show Map, Upload data to AREDN Servers.

- Set Distance to FARTHEST Neighbor (Apply)
- Change Node Name (Must start with callsign)
- Enter Password
- Change SSID, Channel, and Channel Width

KE6BXT-M2NS-42-253-20

192.168.1.1:8080/cgi-bin/setup

Apps Brain Games Comedy 1210 myHAMcallsign.com Freeplay Music | Welc 25 cox mail Other bookmarks

**AREDN**  
AMATEUR RADIO EMERGENCY DATA NETWORK

[Node Status](#) **Basic Setup** [Port Forwarding, DHCP, and Services](#) [Tunnel Server](#) [Tunnel Client](#)

[Help](#) [Save Changes](#) [Reset Values](#) [Default Values](#) [Reboot](#)

Node Name  Password

Node Type  Verify Password

WiFi	LAN	WAN
Protocol: <input type="text" value="Static"/>	LAN Mode: <input type="text" value="5 host Direct"/>	Protocol: <input type="text" value="DHCP"/>
IP Address: <input type="text" value="10.42.253.202"/>	IP Address: <input type="text" value="10.87.238.81"/>	DNS 1: <input type="text" value="8.8.8.8"/>
Netmask: <input type="text" value="255.0.0.0"/>	Netmask: <input type="text" value="255.255.255.248"/>	DNS 2: <input type="text" value="8.8.4.4"/>
SSID: <input type="text" value="AREDN"/>	DHCP Server: <input checked="" type="checkbox"/>	
Mode: <input type="text" value="Ad-Hoc"/>	DHCP Start: <input type="text" value="82"/>	
Channel: <input type="text" value="-2 (2397)"/>	DHCP End: <input type="text" value="86"/>	
Channel Width: <input type="text" value="10 MHz"/>		
	<b>Advanced</b>	<b>Advanced</b>
	Disable Default Route: <input type="checkbox"/>	Mesh Gateway: <input type="checkbox"/>

Active Settings

Antenna selection is now automatic

Tx Power:  ?

Distance to FARTHEST Neighbor:  miles,  kilometers,  meters

- Click on Save Settings
- Click on Reboot (when prompted)

# Orange County Mesh Organization

 Search this site

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- More Nodes in Orange County
- Bands, Channels, and Frequencies
- Band Plans
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- Backbone Nodes
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- Antennas (non-MiMo)
- airRouter
- AirGateway
  - Wireless Clients or Wireless Internet

### Software (Firmware)

#### Basic Setup

#### Internet Tunneling

#### Services

- Adding Services to a Node

## Basic Setup

### Configuring your node to attach to another node in the OC Meah

Now that you have flashed the AREDN firmware on your new Ubiquiti or TP-Link node there are a few settings you need to make (in addition to naming your node with your callsign).

Clicking on the Setup button should take you to the Basic Setup page. Looking at the [OC Mesh map](#) determine which node you want to connect to and enter the following information in the WiFi section.

After you have entered your SSID, Channel, and Channel Width, click on the **Save Settings** button and, when prompted, click on the **Reboot** button.

## 2.4 GHz nodes

Node Name	SSID	Channel	Chanel Width
W6ARH-M2HP-24A43C	BroadbandHamnet	-2 (2397)	10 MHz
AE6XE-PleasantsPk-RM2	BroadbandHamnet	-2 (2397)	10 MHz
AE6XE-Saddleback-RM2	BroadbandHamnet	-2 (2397)	10 MHz
KE6BXT-MVCH-M2B-Grid-140-228-165	BroadbandHamnet	-2 (2397)	10 MHz
KE6BXT-MVCH-M2R-NORTH-122-48-97	BroadbandHamnet	-2 (2397)	10 MHz
KE6BXT-MVCH-M2R-SOUTH-62-84-116	BroadbandHamnet	-2 (2397)	10 MHz
KE6BXT-M2NB-RedCross	BroadbandHamnet	-2 (2397)	10 MHz
KE6BXT-W6HRO-M2R-12-238-64	BroadbandHamnet	-2 (2397)	10 MHz
KE6BXT-W6HRO-M2R-RDISH	BroadbandHamnet	-2 (2397)	10 MHz




You now have a working  
Mesh Node

AREDN™ Node KE6BXT-M

localnode:8080/cgi-bin/status

Apps Brain Games Comedy 1210 myHAMcallsign.com Freeplay Music | Welc Other bookmarks



# KE6BXT-M2NS-42-253-202

[Help](#) Refresh Mesh Status OLSR Status WiFi Scan Setup Select a theme ▼


<b>WiFi address</b>	10.42.253.202 / 8 fe80::227:22ff:fe2a:fdca Link	<b>Signal/Noise/Ratio</b>	N/A Charts
<b>LAN address</b>	10.87.238.81 / 29 fe80::227:22ff:fe2b:fdca Link	<b>firmware version</b>	3.16.1.0
<b>WAN address</b>	none fe80::227:22ff:fe2b:fdca Link	<b>configuration</b>	mesh
<b>default gateway</b>	none	<b>system time</b>	Thu Apr 21 2016 04:24:37 UTC
		<b>uptime</b>	11 min
		<b>load average</b>	0.03, 0.07, 0.08
		<b>free space</b>	flash = 2516 KB /tmp = 14336 KB memory = 4456 KB

Part of the AREDN™ Project. For more details please [see here](#)

KE6BXT-M2NS-42-253-20

localnode:8080/cgi-bin/mesh

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# KE6BXT-M2NS-42-253-202 mesh status

Refresh Auto Quit

Local Hosts	Services	Current Neighbors	LQ NLQ TxMbps	Services
KE6BXT-M2NS-42-253-202.local.mesh		none		


Remote Nodes	ETX	Services	Previous Neighbors	When
none			none	

Part of the AREDN™ Project. For more details please [see here](#)

AREDN™ Node KE6BXT-M

localnode:8080/cgi-bin/status

Apps Brain Games Comedy 1210 myHAMcallsign.com Freeplay Music | Welc Other bookmarks



# KE6BXT-M2NS-42-253-202

[Help](#) Refresh Mesh Status OLSR Status WiFi Scan Setup Select a theme ▼

<b>WiFi address</b>	10.42.253.202 / 8 fe80::227:22ff:fe2a:fdca Link	<b>Signal/Noise/Ratio</b>	N/A	<a href="#">Charts</a>
<b>LAN address</b>	10.87.238.81 / 29 fe80::227:22ff:fe2b:fdca Link	<b>firmware version</b>	3.16.1.0	
<b>WAN address</b>	none fe80::227:22ff:fe2b:fdca Link	<b>configuration</b>	mesh	
<b>default gateway</b>	none	<b>system time</b>	Thu Apr 21 2016 04:24:37 UTC	
		<b>uptime</b>	11 min	
		<b>load average</b>	0.03, 0.07, 0.08	
		<b>free space</b>	flash = 2516 KB /tmp = 14336 KB memory = 4456 KB	

Part of the AREDN™ Project. For more details please [see here](#)



Browser window showing a WiFi scan result for KE6BXT-M2NS-42-253-202. The page title is "KE6BXT-M2NS-42-253-202 WiFi scan". The scan results are displayed in a table below the AREDN logo and navigation buttons (Refresh, Auto, Quit).



## KE6BXT-M2NS-42-253-202 WiFi scan

Refresh Auto Quit


Sig	Chan	Enc	SSID	Hostname	MAC/BSSID	802.11 Mode
-68	-2		BroadbandHamnet-10-v3	N/A	EE:93:5A:69:75:97	Foreign Ad-Hoc Network

Part of the AREDN™ Project. For more details please [see here](#)

AREDN™ Node KE6BXT-M

localnode:8080/cgi-bin/status

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# KE6BXT-M2NS-42-253-202

[Help](#) Refresh Mesh Status OLSR Status WiFi Scan Setup Select a theme ▼

<b>WiFi address</b>	10.42.253.202 / 8 fe80::227:22ff:fe2a:fdca Link	<b>Signal/Noise/Ratio</b>	N/A Charts
<b>LAN address</b>	10.87.238.81 / 29 fe80::227:22ff:fe2b:fdca Link	<b>firmware version</b>	3.16.1.0
<b>WAN address</b>	none fe80::227:22ff:fe2b:fdca Link	<b>configuration</b>	mesh
<b>default gateway</b>	none	<b>system time</b>	Thu Apr 21 2016 04:24:37 UTC
		<b>uptime</b>	11 min
		<b>load average</b>	0.03, 0.07, 0.08
		<b>free space</b>	flash = 2516 KB /tmp = 14336 KB memory = 4456 KB

Part of the AREDN™ Project. For more details please [see here](#)

AREDN™ Node KE6BXT-M

localnode:8080/cgi-bin/status

Authentication Required

http://localnode:8080 requires a username and password.  
Your connection to this site is not private.

User Name:

Password:

Log In Cancel

AREDN™  
AMATEUR RADIO EMERGENCY DATA

KE6B

Help Refresh

Select a theme

WiFi address 10.42.253.202 / 8  
fe80::227:22ff:fe2a:fdca Link

LAN address 10.87.238.81 / 29  
fe80::227:22ff:fe2b:fdca Link

WAN address none  
fe80::227:22ff:fe2b:fdca Link

default gateway none

Signal/Noise/Ratio N/A Charts

firmware version 3.16.1.0  
configuration mesh

system time Thu Apr 21 2016  
04:32:04 UTC

uptime 18 min  
load average 0.00, 0.03, 0.05

free space flash = 2516 KB  
/tmp = 14332 KB  
memory = 4196 KB

Part of the AREDN™ Project. For more details please [see here](#)

Browser window: KE6BXT-M2NS-42-253-20

Address bar: localnode:8080/cgi-bin/setup

Navigation: Node Status, **Basic Setup**, Port Forwarding, DHCP, and Services, Tunnel Server, Tunnel Client, Administ

Buttons: Help, Save Changes, Reset Values, Default Values, Reboot

Node Name: KE6BXT-M2NS-42-253-202  
Node Type: Mesh Node


WiFi	LAN	WAN	
Protocol: Static	LAN Mode: 5 host Direct	Protocol: DHCP	
IP Address: 10.42.253.202	IP Address: 10.87.238.81	DNS 1: 8.8.8.8	
Netmask: 255.0.0.0	Netmask: 255.255.255.248	DNS 2: 8.8.4.4	
SSID: AREDN	DHCP Server: <input checked="" type="checkbox"/>	<b>Advanced</b>	
Mode: Ad-Hoc	DHCP Start: 82	Mesh Gateway: <input type="checkbox"/>	
Channel: -2 (2397)	DHCP End: 86	Disable Default Route: <input type="checkbox"/>	
Channel Width: 10 MHz			

Active Settings

Don
x
-
□

KE6BXT-M2NS-42-253-20 x
localnode:8080/cgi-bin/ports
☆
8+1
p
s
☰

Apps
Brain Games
Comedy 1210
myHAMcallsign.com
Freeplay Music | Welc
25 cox mail
Discount los angeles
Other bookmarks



---

[Node Status](#)
[Basic Setup](#)
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[Tunnel Server](#)
[Tunnel Client](#)
[Administration](#)

---

[Help](#)
Save Changes
Reset Values
Refresh

#### DHCP Address Reservations

Hostname	IP Address	MAC Address	
<input type="text"/>	- IP Address - ▼	<input type="text"/>	Add

#### Advertised Services

Name	Link	URL	
<input type="text"/>	<input type="checkbox"/>	://KE6BXT-M2NS-42-253-202 ▼ :	Add

#### Current DHCP Leases

KE6BXT-VAIO-AiO	10.87.238.85	a4:17:31:e0:05:91	Add
-----------------	--------------	-------------------	-----

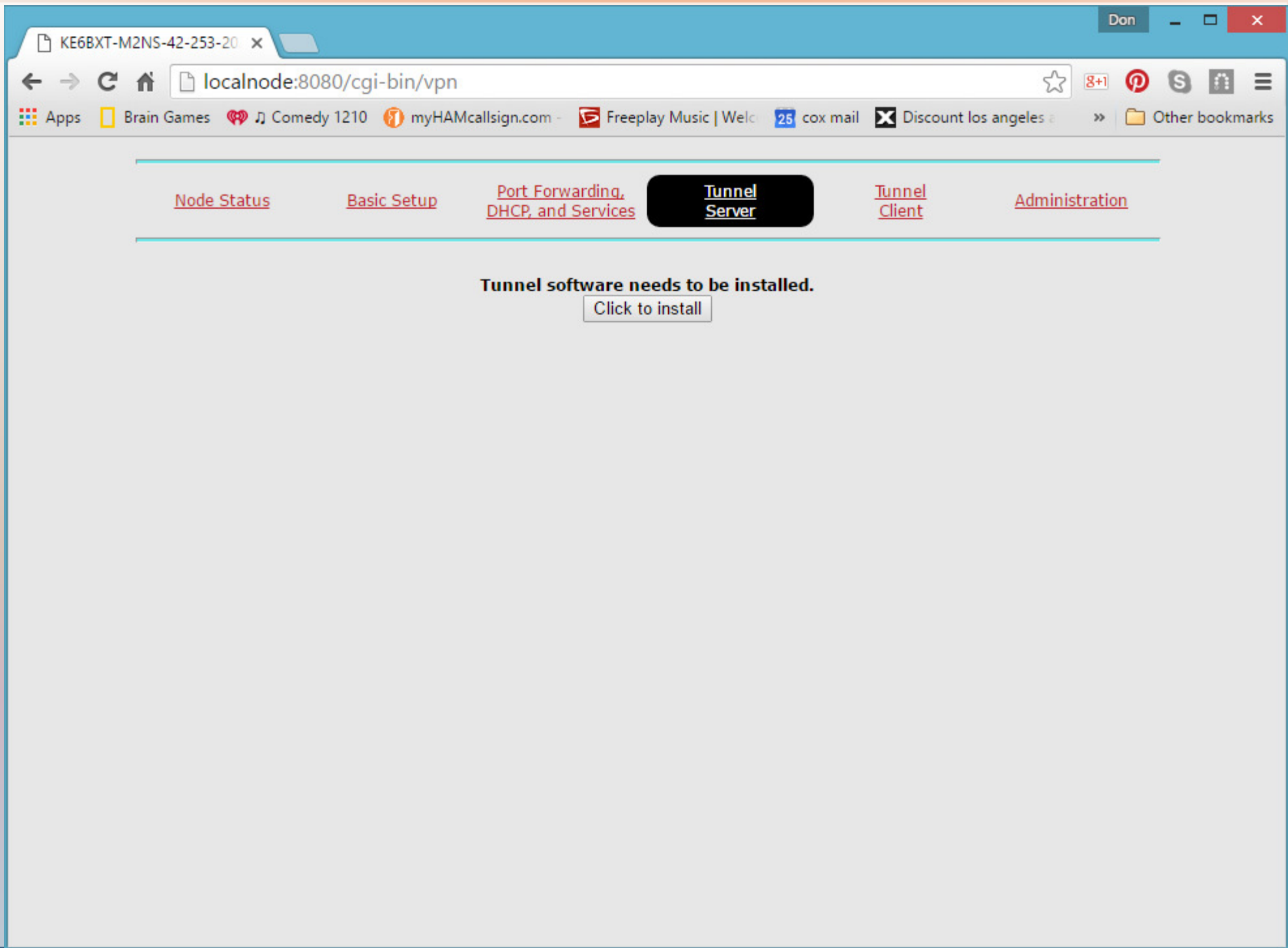
---

#### Port Forwarding

Interface	Type	Outside Port	LAN IP	LAN Port	
WAN ▼	TCP ▼	<input type="text"/>	- IP Address - ▼	<input type="text"/>	Add

---

Part of the AREDN™ Project. For more details please [see here](#)



[Node Status](#)

[Basic Setup](#)

[Port Forwarding,  
DHCP, and Services](#)

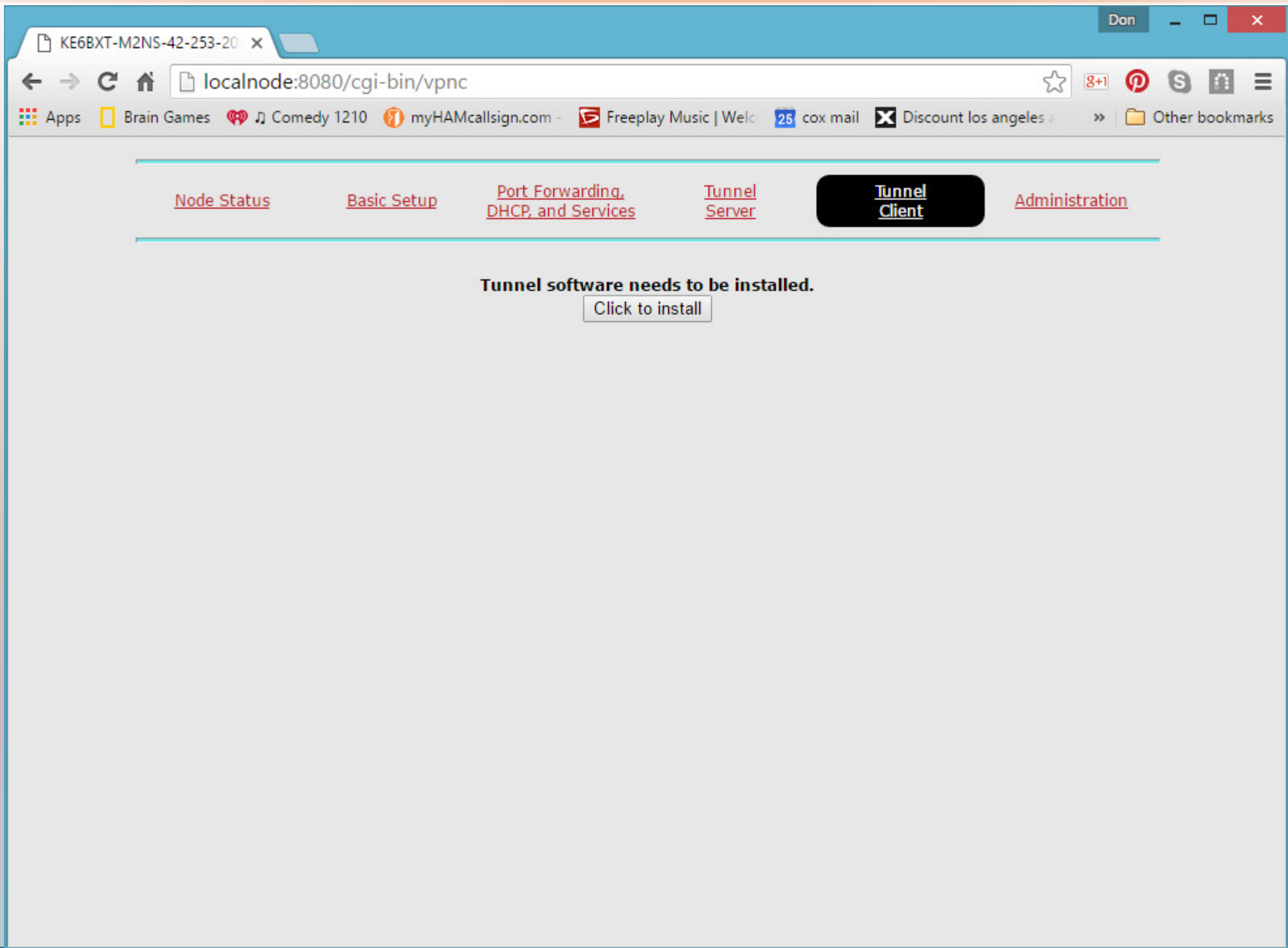
**Tunnel  
Server**

[Tunnel  
Client](#)

[Administration](#)

**Tunnel software needs to be installed.**

Click to install



KE6BXT-M2NS-42-253-20

Don



localnode:8080/cgi-bin/vpnc



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[Node Status](#)

[Basic Setup](#)

[Port Forwarding,  
DHCP, and Services](#)

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**Tunnel  
Client**

[Administration](#)

**Tunnel software needs to be installed.**

Click to install



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[Tunnel Server](#)

[Tunnel Client](#)

**Administration**

[Help](#)

### Firmware Update

current version: 3.16.1.0

Upload Firmware  No file chosen

Download Firmware     Keep Settings

### Package Management

Upload Package  No file chosen

Download Package

Remove Package

### Authorized SSH Keys

Upload Key  No file chosen



# Adding a Second Node

# Adding a Second Node

Repeat slides 11 through 29....

# Adding Services

## 1. Software services that run on the node

MeshChat

## 2. Hardware services that plug into a node

Camera or Video Server

VOIP Phone

VOIP Video Phone

Web Server

Weather Station

Power Controls

# Orange County Mesh Organization

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  - ▶ Adding Services to a Node
  - Cameras
  - VOIP
  - Ham-Chat / MeshChat
  - WinLink
  - Raspberry Pi Applications
- Don & Joe's Schedule
- Don & Joe's Mesh Presentation
- External Links
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## Affiliations



## Services



### Services

A mesh network, or any network for that matter, is of no use unless you have services. Having a large mesh network would be similar to having a large number of routers connected with cat5e cables or having your home router connected to your Internet Service Provider's modem and then not connecting any computers, printers, video streaming encoders, or home automation devices to it.

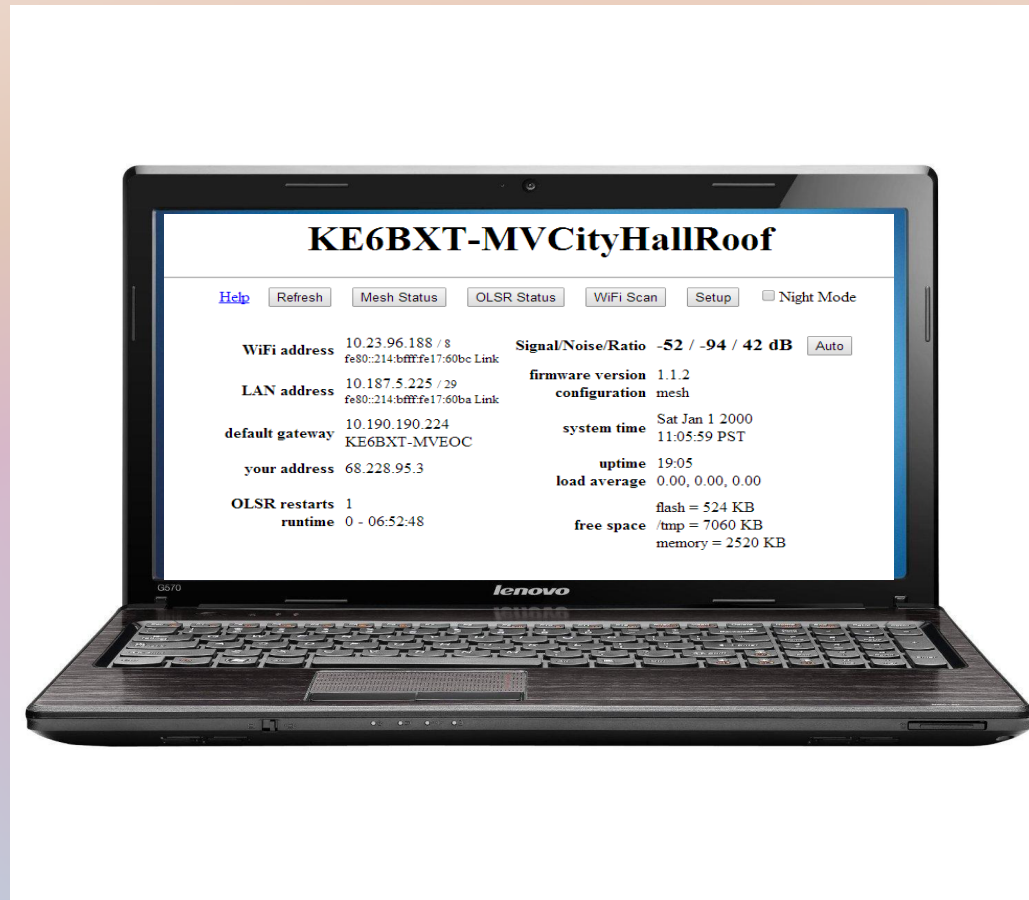
On a Broadband-Hamnet/ARDEN mesh network there are a lot of devices (services) that can be added in order to make having the mesh network worthwhile. There are also several devices that you can connect to your home or business network that you can NOT connect to a Broadband-Hamnet/ARDEN mesh network. After all, a Broadband-hamnet/AREDN network uses Amateur Radio (HAM) radio frequencies and therefore must comply with FCC rules, Part 97.

But for now, let's not concentrate on what you can't do on a Broadband-Hamnet/AREDN mesh network and look at some of the things you can do.

First, you will need a Computer!



First, you will need a Computer!  
So you can check the Node/Mesh status.



# You'll want an IP Camera



Do you want to talk over the network?  
Add phones using a VoIP adapter

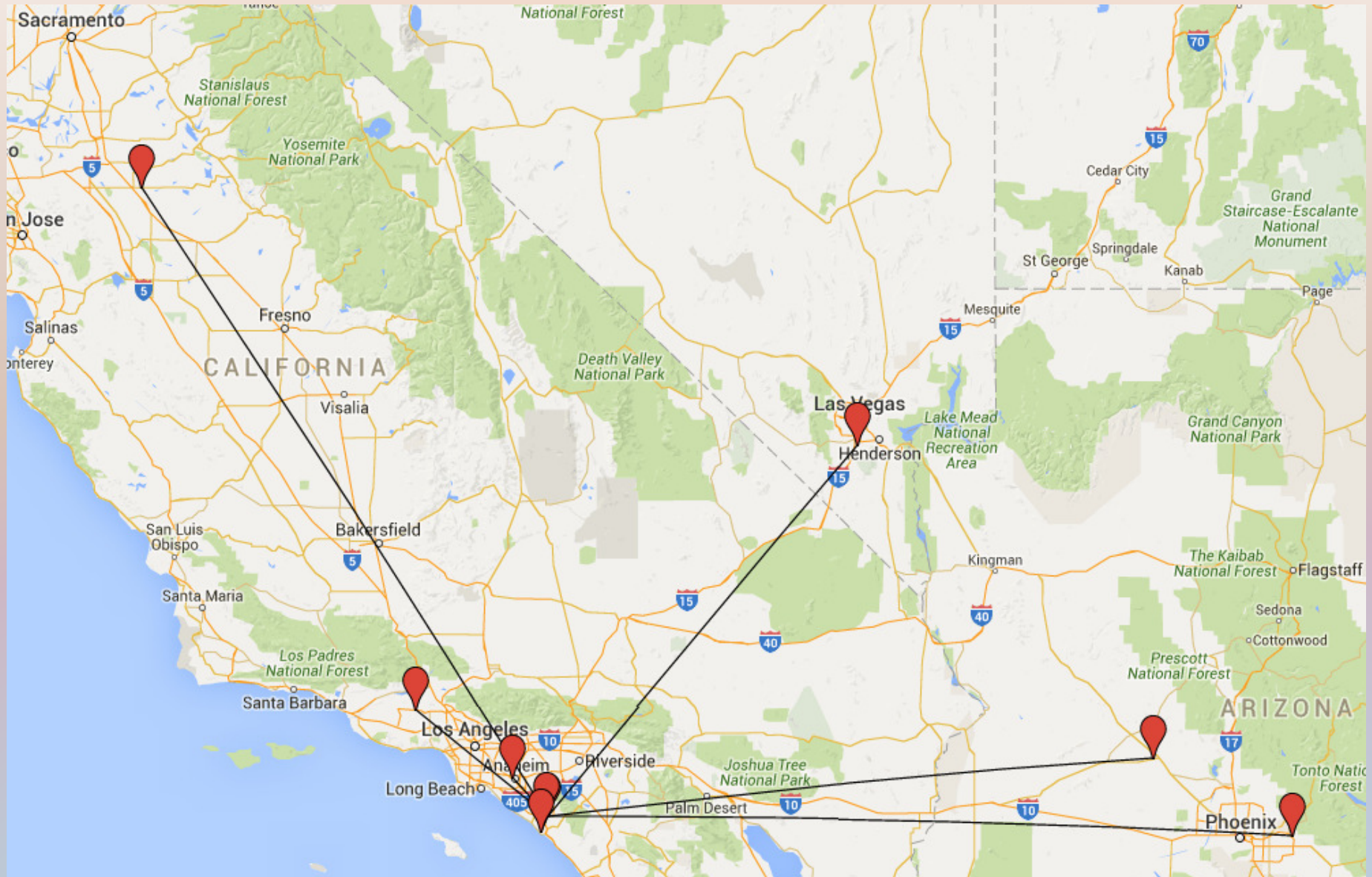






# Connecting Mesh Islands

## Internet Tunneling



# Orange County Mesh Organization

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- Backbone Nodes

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#### Hardware

- Antennas (MiMo)
- Antennas (non-MiMo)
- airRouter
- AirGateway
  - Wireless Clients or Wireless Internet

### Software (Firmware)

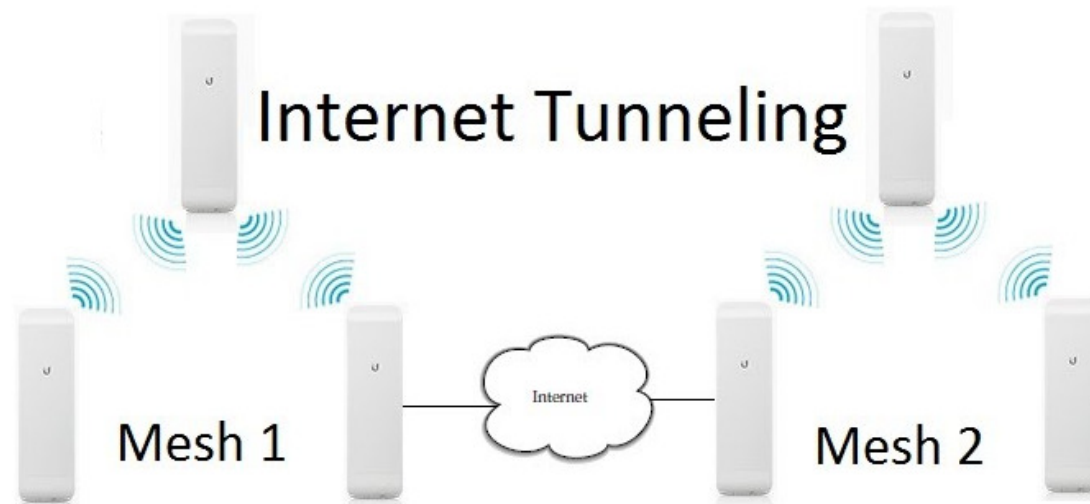
### Basic Setup

#### Internet Tunneling

#### Services

- Adding Services to a Node
- Cameras

## Internet Tunneling



**Internet Tunneling** is a method to connect Mesh Islands together using the Internet. Each AREDN Mesh Node has the capability to either be a Tunnel Server, a Tunnel Client, or both a Tunnel Server and a Tunnel Server.

After flashing the AREDN firmware on your node you must install the Tunneling software before you can configure it. Click on the Setup button to go to the Basic Setup page. Next, click on either the [Tunnel Server](#) or [Tunnel Client](#) links. If the Tunnel software has not yet been installed you will see one of the following messages:

[Node Status](#)

[Basic Setup](#)

[Port Forwarding, DHCP, and Services](#)

**[Tunnel Server](#)**

[Tunnel Client](#)

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DHCP, and Services](#)

**Tunnel  
Server**

[Tunnel  
Client](#)

[Administration](#)

**Tunnel software needs to be installed.**

[Click to install](#)

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Client**

[Administration](#)

**Tunnel software needs to be installed.**

[Click to install](#)

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**Tunnel  
Server**

[Tunnel  
Client](#)

[Administration](#)

[Help](#)

Save Changes

Reset Values

Refresh

Tunnel Server Network: 172.31.140 .180 (must be between 0 and 254)

Tunnel Server DNS Name:

Enabled?

Allow the following clients to connect to this server:

Client

Pwd

Net

Active Action

172.31.140.180



Add

[Node Status](#)

[Basic Setup](#)

[Port Forwarding,  
DHCP, and Services](#)

[Tunnel  
Server](#)

**Tunnel  
Client**

[Administration](#)

[Help](#)

Save Changes

Reset Values

Refresh

Connect this node to the following servers:

Enabled?

Server

Pwd

Network

Active Action

Add

# KE6BXT-M2NS-42-253-202

[Node Status](#)   [Basic Setup](#)   [Port Forwarding, DHCP, and Services](#)   **Tunnel Server**   [Tunnel Client](#)   [Administration](#)

[Help](#)   Save Changes   Reset Values   Refresh

Tunnel Server Network: 172.31.140.180 (must be between 0 and 254)

Tunnel Server DNS Name: KE6BXT-M2NS-42-253-202

**Allow the following clients to connect to this server:**

Enabled?	Client	Pwd	Net	Active Action
<input type="checkbox"/>	KE6BXT-M2NS-42-253-333	password	172.31.140.180	Add

In this example, 68.14.222.44 is the IP Address of KE6BXT-M2NS-42-253-202

# KE6BXT-M2NS-42-253-333

[Node Status](#)   [Basic Setup](#)   [Port Forwarding, DHCP, and Services](#)   [Tunnel Server](#)   **Tunnel Client**   [Administration](#)

[Help](#)   Save Changes   Reset Values   Refresh

**Connect this node to the following servers:**

Enabled?	Server	Pwd	Network	Active Action
<input type="checkbox"/>	68.14.222.44	password		Add

# THE END

## Don Hill, KE6BXT

27271 Regio  
Mission Viejo, CA 92692  
Phone: +1 714-345-1114  
donhill@gmail.com

## Joe Ayers, AE6XE

28251 Coulter  
Mission Viejo, CA 92692  
Phone: 949-466-1228  
ae6xe@arrl.net

