

## **\*\*\* Release Notes for Broadband-Hamnet 3.1.0 \*\*\***

### **(Please Read and Consider Updating Soon)**

This release is a foundation layer for resolving several issues widely discussed in the support forums for older versions. Although 3.1.0 will inter-operate with any other 3.x.x version of the BBHN software **in the same ham band and with the same SSID**, users should move to the 3.1.0 to get all mesh nodes on a stable platform and to enable additions like the tunnel feature and software upgrades via patching. As we are still adding features (particularly for Linksys), the patching feature will be helpful in reducing the time and effort needed in upgrades.

This software is delivered by the Broadband-Hamnet core team and participating developers. Broadband-Hamnet™ and BBHN™ are trademarks of the Broadband-Hamnet corporation. For more information about recent changes, see the main web site page.

#### **Patching**

After installation, this baseline load will return to the use of patches for small updates rather than a full image all the time. A complete image download may still be required if the size of the changes is large and/or numerous. If you are already at 3.0.0, then a patch exists. If you have 3.0.0, it will become 3.1.0 in a single step followed by a reboot. Please use caution as the patch only supports Broadband-Hamnet version 3.0.0. This team has not released any software version higher than 3.0.0 until today. Software other than the official Broadband-Hamnet 3.0.0 could fail if patching is attempted. Users with other software or a tunnel installed are encouraged to use the full image upgrade. The patching process can be done remotely across the mesh network and will retain your current settings and configuration. Due to space limitations certain types of changes in Linksys devices won't be possible using a patch.

#### **Issues Resolved in this Release**

Several bug fixes generated by recent release versions have been consolidated into this release. As before, some issues will remain with VLAN function and the space to install certain options if Linksys devices are used. Supported Ubiquiti models have no issues with VLAN use or with room to install mesh tunnel functions. Quite frankly, the Linksys routers have firmware space constraints that will continue to be limiting. On the flip side, the utility of the Linksys products and their integrated switch makes them very useful for many BBHN mesh applications. We are working hard to continue maintaining their usefulness.

## Support for linking between mesh nodes using an Internet Tunnel

The version 3.1.0 as a base firmware install is a stable platform for VTUN tunneling. The tunnel firmware is not installed by default. To have tunnel functionality, you must load either the Tunnel Server function or the Tunnel Client function separately. Only one Tunnel Server is needed for an entire group of users, even separated by thousands of miles. Only one Tunnel Client is needed for a group of mesh users in communication with each other. Both Tunnel Server and Tunnel Client require Internet access to function. All supported Ubiquiti models may be used to create a tunnel device. The WRT54GS v1.0–3.0 Linksys devices with 8-MB flash will also work. Please refer to tunnel page <http://www.broadband-hamnet.org/documentation/204-the-tunnel> for specific details and run the install process your mesh node will need. The ability to create a tunnel has existed and been discussed for quite a while on the forums although many issues remained. You will need a public IP address or an updatable DNS address for your tunnel server. This set of software changes and tunnel scripts is the result of a number of users in North America, Europe and elsewhere testing and modifying settings to deliver a working configuration. The download scripts now enable web based setup and reconfiguration to manage the tunnel. See the tunnel page for more information and specific credits.

## Chat Function

In the past most BBHN chatting was done via IRC via installation of a package on a mesh node (or an attached PC) to act as IRC server. It also required the installation of an IRC client on your local computer (tablet, phone, etc.). With 3.1.0 a new package is available where the HamChat server is the only software needed. This package does not require client software on the local computer, using your web browser instead. The chat package is smaller and much simpler to use than IRC but does allow one to have chats across the mesh in short order. It does not have file transfer support or other advanced features. It is extremely quick to install on your mesh network.

The 'HamChat' program by Nikolai Ozerov, VE3NKL, is not installed by default on the BBHN 3.1.0 firmware. It can be downloaded into a node via the Package Management section on the node's Administration webpage. Below are the comments of the author:

*I would like to clear up some confusion people are having with how HamChat compares to IRC and other similar solutions.*

*Yes, HamChat is very basic in functionality and, yes, it is very small and compact. However, the main advantage of HamChat and the only reason it was developed is to help communicate on Broadband-Hamnet without any prearrangements.*

*Imagine, you are mobile and entered an area where your router connected to some established mesh network. You have no idea what ways of communication to use, what additional software you need to install, etc. However, HamChat running on your router will be visible in the resource link related to your station. And this is a simple http link which can be clicked on in any regular Web browser. As soon as your station is noticed and someone clicks on the link they will be in your small chat room and you could "talk" to each other.*

*You don't need a special client to work with HamChat, almost any modern browser could be used for this purpose. This means that you can assume that the client software is already installed on every computer connected to the mesh.*

*73, Nikolai (VE3NKL)*

## **Reference information about changes and additional hardware**

The information below was presented with 3.0.0 and is copied here, though with some edits. Support for additional bands, additional hardware, wired linking of devices in different bands and SSID changes are discussed below. This information explains features that remain present in the 3.1.0 release.

## **Content and changes delivered with release of 3.0.0 are below.**

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### **Expanded Support for 900 MHz Devices**

Addition of the 900 MHz adds a new dimension to BBHN as it offers several advantages over higher, microwave bands:

#### **900 MHz (M9)**

- Penetrates trees and some obstacles
- Usually higher noise levels
- 6dB propagation advantage vs. 2.4 GHz
- Limited available spectrum – We encourage limiting channel bandwidth to 5MHz in this limited band.

#### **2.4 GHz (M2 and WRT54x)**

- Only two non-overlapping 20MHz channels (1, 6)
- Crowded and noisy band, interference from cordless phones, wireless routers and WIFI clients

#### **5.8 GHz (M5)**

- Relatively large amounts of spectrum available, easier to co-locate nearby devices
- Typically much quieter than 2.4 GHz
- 6dB propagation penalty vs. 2.4 GHz

For a given gain, the higher the frequency the smaller an antenna's physical size needs to be. Therefore the propagation penalties of utilizing the higher frequencies are usually offset by the higher gain of similarly sized antennas.

## Expanded Device Support

This release expands BBHN support. The following Ubiquiti M-Series devices are supported:

	M2	M5	M9
AirGrid	√	√	
Bullet	√	√	
Bullet Titanium	√	√	
NanoBridge	√	√	√
NanoStation Loco	√	√	√
NanoStation	√	√	
Rocket	√	√	√

**NOTICE:** Ubiquiti has made a board and code change to some devices manufactured beginning in early 2014 which prevents the loading of our firmware. We therefore caution that some new devices may not be supported. We have seen this in the following devices, but may be the case with more:

- AirGrid M5
- NanoStation
- Loco M5
- NanoStation M5
- NanoBeam M2
- NanoBeam M5
- Rocket M5
- Rocket M5
- Titanium

To confirm whether a device is of this new generation, look at the System tab of the factory installed AirOS. The Firmware Version is displayed at the top left of the System tab. If it begins with XM, then BBHN will install.

Another way to confirm the firmware version is to Telnet or SSH into the device. The command line prompt will be one of two types as follows:

1. XM: This is the older version onto which the release should load
2. XW: This is the new board/device firmware which doesn't accept a new firmware load

We have investigated the cause, understand what is needed to support these new devices, and are planning support for them in the near future.

**The Broadband-Hamnet core team has rescinded the end of support statement regarding Linksys hardware. We don't know how long we will be able to continue the compatibility of the Linksys WRT54 family and similar devices, but we will try very hard to maintain connectivity to the other 2.4 GHz devices supported by BBHN firmware.**

WRT54G v4 and below  
WRT54GL v1.0 and 1.1  
WRT54GS v4 and below

## **Bandwidth Selector**

We have added a channel bandwidth selector for Ubiquiti devices. In the Basic Setup screen you can choose between 5/10/20MHz RF bandwidth based on your needs. For 2.4 GHz this affords the possibility of having more non-colliding channels. Of course, the data rate throughput of the link will track proportionately.

Linksys devices are limited to the 20 MHz channel bandwidth.

Devices with a non-default bandwidth will also change the SSID automatically and therefore will be different mesh networks from the default setting.

## **Multi-function Reset Button**

The Ubiquiti reset button's function is now based on how long it's depressed (not available on Linksys):

- Hold for 5 seconds for a password reset and DHCP server reset
- Hold for 15 seconds and the node will return to "just-flashed" conditioned

## **SSID Considerations and Compatibility with Earlier Releases**

SSIDs are now comprised of two elements:

1. A User modifiable portion: "BroadbandHamnet". Unless you have a compelling reason to modify this, we encourage you to leave it alone.
2. A device-generated portion which describes:
  - a. the RF bandwidth the device has been configured for (ex:"5","10",or"20")
  - b. the compatibility version (ex: "v3")

If you default these values, the full SSID would be: "BroadbandHamnet-20-v3".

## Device-to-Device Ethernet Linking

Device-to-device linking through Linksys devices has been turned off by default. A hardware firmware issue with the Ethernet switch was determined to be the cause of numerous problems. Advanced users may choose to turn this function back on following this link:

<http://www.broadband-hamnet.org/documentation/202-dtd-linking-on-linksys>

However, you must do so at your own risk and problems with it will not be supported by Broadband-Hamnet team.

The supported workaround for this is to use an outboard Ethernet switch. Connecting devices via Ethernet can serve very useful purposes, for example:

- A 5 GHz network backbone cross-banded to 2 GHz last-mile links. Here M5 nodes are collocated with M2 nodes.
- Several nodes on the same band are collocated on a hilltop or tower. The nodes pass traffic between these devices via their Ethernet ports, eliminating congestion on the RF channel.

For the advanced user, this is accomplished through an upgraded OLSR protocol. Where RF paths can achieve a minimum routing cost metric of "1", Ethernet paths are assigned a cost metric of "0.1". As a result you will notice fractional routing metrics in the Mesh Status screen and OLSR routing tables.

Caution must be exercised to avoid static routes which produce routing loops. For those unfamiliar with this problem, an explanation can be found at:

[http://en.wikipedia.org/wiki/Routing\\_loop\\_problem](http://en.wikipedia.org/wiki/Routing_loop_problem)

Note that when multiple nodes are attached by joining LANs, the DHCP service should be turned off for all but one node. This will eliminate any problems stemming from nodes defining incompatible network addressing schemes on the common LAN.

## DMZ and LAN Port Distinctions

If you need the WAN network on a Ubiquiti device, then you will require an outboard Ethernet Switch which supports 802.1q VLANs (virtual LANs). Typically this will be a "managed" switch. Configure the VLANs as follows:

- Untagged = LAN
- vlan1 = WAN
- vlan2 = DTDLINKING (device-to-device linking)

Note: You will consume 2-ports in this configuration, so if you want to end up with the equivalent of what the Linksys WRT54Gx series device offers, then you will need a 6-port switch.

Look for additional support for this configuration in the UBNT Firmware Support Forum on this server.

## **Off-Channel Operation**

Ubiquiti devices will not search for Broadband-Hamnet nodes off-channel. The configured channel is the only one on which the device will operate

## **Band-edge Vigilance**

Linksys devices utilize the 802.11g standard where transmitted data are contained within 22MHz "channels." If you choose a different channel, then care must be taken to ensure the entire channel remains within its licensed operating spectrum. For example, if it's being operated on 2.4 GHz at 20 MHz bandwidth, in the US under Part 97, then it must be kept to channels 1-6. All higher numbered channels will cause the devices to exceed the upper limits of the ham band.

Additional care must be exercised if International UBNT versions are used. These devices will not only operate outside the Amateur coordinated broadband segment, but also outside the entire ham allocation.

The 900 MHz band is only 26 MHz of spectrum. Running 20 MHz of bandwidth would be irresponsible and a gross disservice to hams utilizing the band for other purposes. Therefore you should set the bandwidth to 5 MHz on the 900 MHz band. Also, band plans for 900 MHz are coordinated locally, so you should confirm where in that plan your mesh should reside to minimize interference to other ham operating modes.

## **Untested and Unsupported UBNT Devices**

For Ubiquiti devices, the release requires 32MB of memory and 8MB of flash. Attempting to load this release into anything smaller will result in an error. This generally precludes older, pre-"M" models from being supported.

There are two classes of Ubiquiti devices that are not supported. They will be identified by a highlighted banner across the top of the user interface:

- Untested: These devices may operate with little or no issues. However, because we have not had the opportunity to test and confirm they work with this release, we will not provide technical support for them until we have done so. You will see a banner across the GUI indicating this status. Please do not ask for help with these unless you are prepared to assist in testing the new device. We will fit these devices into a subsequent release as time permits.
- Unsupported: These are devices for which the software is not intended. They may load the software and they may appear to work to some degree, but we are not prepared to add them unless and until we have a strategy for code development and support for them. You will see a banner across the GUI indicating the device is not supported.

## **Cautionary Statements on Previous Releases**

After evaluating security issues and other flaws in previous versions, the Broadband-Hamnet core team strongly encourages all users to upgrade all nodes to 3.1.0 as soon as is feasible. An added benefit of everyone upgrading is readiness and interoperability are dramatically increased. Users deploying with different versions are a problem we find all too common at this time.

Release 3.0.0 has a firewall flaw resolved by 3.1.0.

The BBHN 1.1.x releases of this software exhibited problems due to issues with the OLSR Secure module which had been added at the request of users to prevent network routing tables from being updated by unauthorized devices/individuals. While a worthy feature, it had to be removed from this release until such time as a stable combination of OLSR and Secure modules are released by that project. At that time it will be re-incorporated into the BBHN software. Continuing to use this release will cause the OLSR routing module to periodically crash and require you to reset the node. The BBHN 1.0.0 release of this software exhibited problems in the WAN firewall rules which exposed the node to exploits from the Internet regardless of the Gateway option setting. Continuing to use this release will place your mesh network at risk.