



Setting up 900 Mhz or 5 Ghz P-t-P or mesh links using Qcode 3.x with Atheros radios

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The Qcode 3.x mesh software release from Qorvus includes support for Atheros-based radios such as the Wistron CM9 and Ubiquity SR series, which are capable of operating on the 900Mhz, 2.4 Ghz (802.11g mode only), and 5.8 Ghz ISM bands. For indoor applications the UNII 5.2 Ghz band is also supported. Setting up meshed, point-to-point, or point-to-multipoint links using these radios is somewhat different from standard Prism chipset radios such as the SMC2532w and Senao mp 2511's. The earlier versions of Qcode up to 2.5, support only the prism-based radios, not the Atheros.

Initial default settings for Atheros radios

Under the initial default settings for Qcode 3.x, all Prism and Atheros radios are set up for Master (meshAP) mode. However, since the stable Atheros drivers radios do not support WDS, two Atheros radios that are both set up for Master mode will NOT see or associate with each other. Until you change the settings to meet your specific layout, you won't be able to pass traffic or see the other Atheros radios with the GUI's signal-strength meter. **Atheros radios will only see or associate with each other when set up either in Ad-hoc mode, or in master / managed P-t-P (point-to-point) or P-t-MP (point-to-multipoint or star) mode as described below:**

Typical setup for the Qnode master AP that's providing ptmp backhaul to your repeater nodes:

Radio 1 (wlan0) | MAC: 00:02:6F:38:E6:76 | [Radio 1 Signal Meter](#) is inactive

Radio Type: Atheros Dist. (meters): Ant. Select
 Outside Inside Mesh ID: Hide SSID Broadcast:
Yes No Interface Mode: P-t-P AP
MAC Data Rate:
Channel: Power: RTS: WEP:
Yes No WEP Key:

Note that the minimum distance setting is CRITICAL for proper operation. Specifically, it should be set at or about 10% greater than the actual distance in meters. For the example above, the furthest client node is 1000 meters away from the AP. **If you have nodes at varying distances from the gateway node, set all the nodes to the distance setting of the repeater node that's furthest away.**

In general, Power and Data Rate settings should be left at Auto. However for longer or noisier links it may be beneficial to set the rate to 12M or even 6M. For testing, you can briefly change data-rates on-the-fly by typing on the ssh command line: "iwconfig wlan0 rate 12M" (or choose another valid data-rate such as 6M). However, this manual setting will be over-ridden by the background cron-jobs so it will last only for a minute or so. For longer test periods you'll need to make the change using the GUI.

Frequency / channel settings should be selected based upon antennas and local conditions. For example, many 5 Ghz antennas that are intended for indoor applications resonate at the lower end of the band (channel 36) while others resonate at the upper end (channel 149). The effects of this on signal-to-noise ratio can be dramatic. You will need to experiment to determine the best channel for your particular circumstances. For testing, you can change channels on-the-fly by typing on the ssh command line: "iwconfig wlan0 channel 149" (or for indoor use choose another channel e.g. 36 which is at the low end of the 5 Ghz band). As of Qcode 3.22, 900 Mhz operation is also supported, using the Ubiquiti SR9. However, only channels 104 and 105 are permitted within the United States.

Please be aware that within the United States, current FCC regulations (part 15, subpart E) permit the use of 5.15Ghz to 5.25 Ghz (channels 36 to 50) ONLY in indoor settings. If you set up outdoor links using these frequencies, you are in violation of those regulations, and could be subject to heavy fines.

The goal of rate, channel, and antenna installation and orientation is to achieve a signal that is **consistently** at least **24db above the indicated floor when running in 802.11a/g mode**, for good performance and data payload. Fortunately, this is easier to achieve in the 5 Ghz band than it would be in 2.4 Ghz, due to the smaller size and greater efficiency of 5 Ghz directional gain antennas, and the OFDM channel coding system.

Typical setup for a Qnode that's acting as a repeater, associated with the master AP above:

Radio 1 (wlan0) | MAC: 00:02:6F:38:E6:76 | [Radio 1 Signal Meter](#)
Radio Type: Atheros Dist. (meters): Ant. Select
 Outside Inside Mesh ID: Hide SSID Broadcast:
Yes No Interface Mode: P-t-P AP
MAC Data Rate:
Channel: Power: RTS: WEP:
Yes No WEP Key:

Note that the radio Mode is set to Managed (not mesh AP), and the P-T-P AP MAC is set to that of the master Qnode. This is not mandatory, but when the MAC is specified, the repeater will attempt to associate with that specific AP first (rather than any AP with the same SSID and Channel).

Typical setup for a Qnode in a 900 Mhz or 5 Ghz mesh (multiple units equipped with omni's each peered with each other, with one acting as a gateway, e.g. a standard single-radio mesh setup):

Radio 1 (wlan0) | MAC: 00:02:6F:38:E6:76 | [Radio 1 Signal Meter](#)
Radio Type: Atheros Dist. (meters): Ant. Select
 Outside Inside Mesh ID: Hide SSID Broadcast:
Yes No Interface Mode: P-t-P AP
MAC Data Rate:
Channel: Power: RTS: WEP:
Yes No WEP Key:

Note that all 900 Mhz or 5 Ghz nodes participating in the mesh need to have their Atheros 5 Ghz radio set for **ad-hoc** (not meshAP or managed). The distance should be set the typical distance between each Qnode and its neighbor, or slightly longer. In the example above, that is 250 meters.

Typical setup for the second (client access) prism-based radio using a prism-based 802.11b radio (the current Atheros driver does not properly support 802.11b mode):

Radio 2 (wlan1) | MAC: 00:02:6F:38:E6:76 | [Radio 2 Signal Meter](#)

Radio Type: Prism B/G Atheros Dist. (meters): N/A Ant. Select

Outside Inside Mesh ID: CustomerAccessSSID Hide SSID Broadcast:

Yes No Interface Mode: Mesh (AP) P-t-P AP

MAC Data Rate: Auto

Channel: 1 (2.412Ghz) b/g Power: Auto RTS: 250 WEP:

Yes No WEP Key: 01234567890123456789123456

In general, Power and Data Rate settings should be left at Auto.
Please do not attempt to operate the radios continuously at full 200Mw power settings! This will only cause interference, signal distortion, and reduce the life of the radio!

Note that if you have your customer access SSID's and channel set the same throughout your network, you may establish incidental mesh routes between one customer access radio and another, if they are within radio range of each other. This could create undesired operation if the hop-count metric to the nearest gateway (master AP) is lower through the incidental route than through the primary route, causing potentially poor bandwidth. If this happens, it can be addressed by using the selective blocking feature in the GUI (click on active mesh nodes) or the manual WDS MAC association feature newly introduced in 3.1.

Bandwidth settings:

Qcode optionally encrypts client traffic tunnels using Blowfish. When enabled, this limits the available client bandwidth when using pc-engines WRAP boards (QnodeJr) to about 4-5 mb/s, due to the lower processor speed and smaller memory footprint on those motherboards. Otherwise, we have tested up to 8 mb/s net client traffic. The client bandwidth is also affected by the settings in the GUI for various classes of bandwidth shaping. When using 5 Ghz links, since the total available bandwidth is often much higher than the 3 mb/s that's typical in 2.4 Ghz links, you may want to adjust the Maximum Wired Device and Maximum Wireless Device Bandwidth accordingly. Or for fastest performance, you can run the entire system with bandwidth shaping turned off.