Troubleshooting EnGenius Wi-Fi Devices

THE LEADER IN
Long Range Data Communications Systems

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Topics

- Long Range Point to Point
  - Line of Sight
  - Choose the right type of antenna
  - Tx Power Calculation
  - ACK Timeout
- Multiple AP deployments
  - Choosing 2.4GHz channels
  - 5GHz channels
  - Settings that can increase WLAN performance
- Multiple SSIDs and VLANs
- L2.5 bridging vs transparent bridging
- Firmware Upgrades

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Maximizing Long Range Point to Point

- **Line of sight is critical.**
- **Less than 30% obstruction of the Fresnel Zone.**
- **Proper antennas and alignment.**
- **Adequate Tx and Rx power on both ends.**
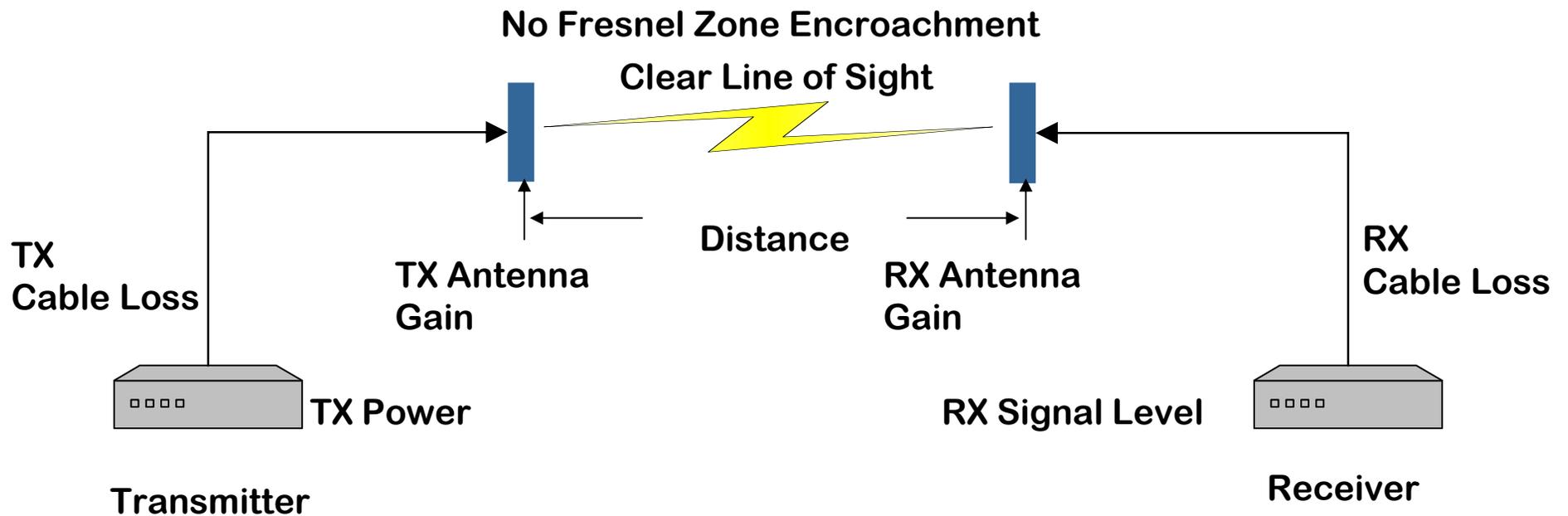
No Fresnel Zone Encroachment

Clear Line of Sight

Distance

**TX
Cable Loss**

**TX Antenna
Gain**

**RX Antenna
Gain**

**RX
Cable Loss**

TX Power

RX Signal Level

Transmitter

Receiver

- **The Fresnel zone for a radio beam is an elliptical area immediately surrounding the visual path. It varies in thickness depending on the length of the signal path and the frequency of the signal.**
- **Free space loss and curvature of the earth must also be considered.**
- **Elevate antennas to get above the obstruction.**
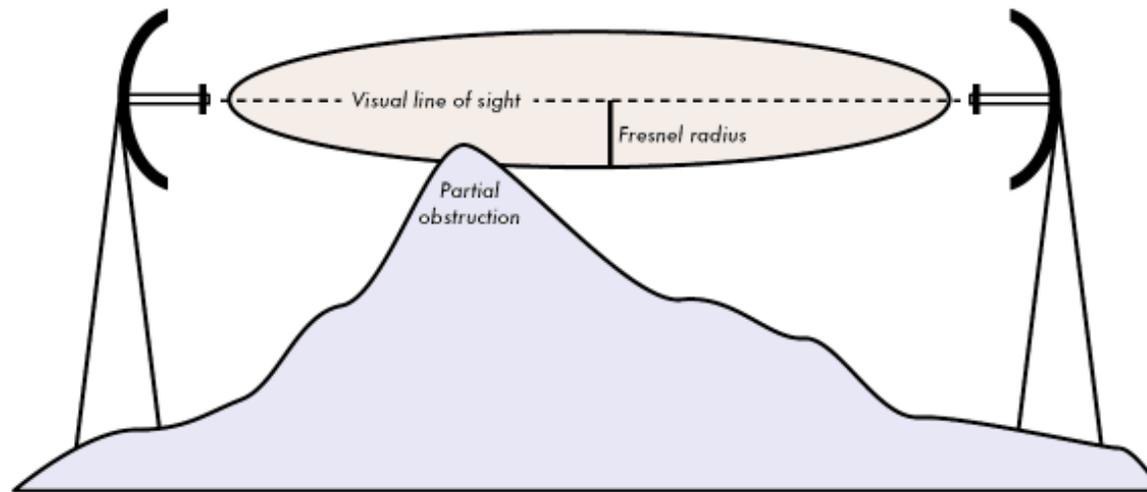
How do you choose an antenna?

- Antenna gain is how much the RF signal is focused. The higher the gain, the tighter the beam.
- Using horizontally polarized antennas can help reject 15 to 30dB of all vertical noise.
- Using a link budget calculato r can help determine the antenna gain required on both ends.
- Free online link budget calculator:

  http://www.wirelessconnections.net/calcs/BudgetCalc.asp

  Frequency
  Distance between antennas
  Free Space Loss
  Tx Antenna Gain   Rx Antenna Gain
  Tx Cable Loss   Rx Cable Loss
  Tx Power   Rx Sensitivity

Transmit Power (Tx)

- **Transmit power can be adjusted to provide better range.**
- **When using high gain antennas, transmit power can be turned down to stay within FCC Part 15 limits (EIRP 1 Watt).**
- **An increase of 3dBm = double the power in mW.**

ACK Timeout

- **Should only be used for distances over 2km.**
- **Can improve bandwidth over long distance wireless links if there is plenty of Tx power and Rx Sensitivity**
- **On the EOC-2611P and EOC-5611P models, the ACK is related to the Distance value in kilometers.**

Multiple AP Deployments

Basic things to consider when determining the number of APs:
- How large is the coverage area?
- What type of materials is the building made of?
- Is there enough bandwidth to support the maximum number of users?
- Will clients need to roam between Wi-fi devices?

Other considerations
- Wi-fi clients were not originally designed for roaming between APs
- Newer Wi-Fi clients allow users to set the "roam tendency" which adjust the threshold for when the device will scan for a better RSSI value.
- The more APs, the greater chance of RF interference being an issue.
- Site surveys are recommended to determine placement of APs and indentify sources of potential interference.
- The number of users will affect the speed of your network, making bandwidth shaping important.

Choosing 2.4GHz Channels

- Choose non-overlapping channels to minimize interference when deploying multiple APs that are in range of one another.

- Channels are 22MHz wide, but only separated by 5MHz.

- Using 2437 as center frequency the signal covers between 2427to 2447. The signal spans over the center frequency of 4 channels but encroaches on 6 channels signal span

- Site survey using a spectrum analyzer can determine other sources of 2.4GHz interference.
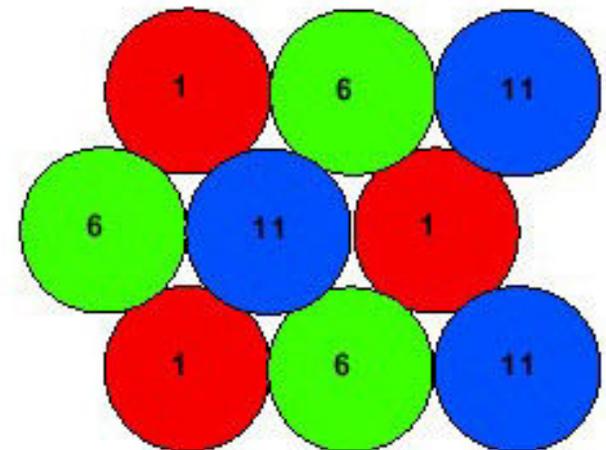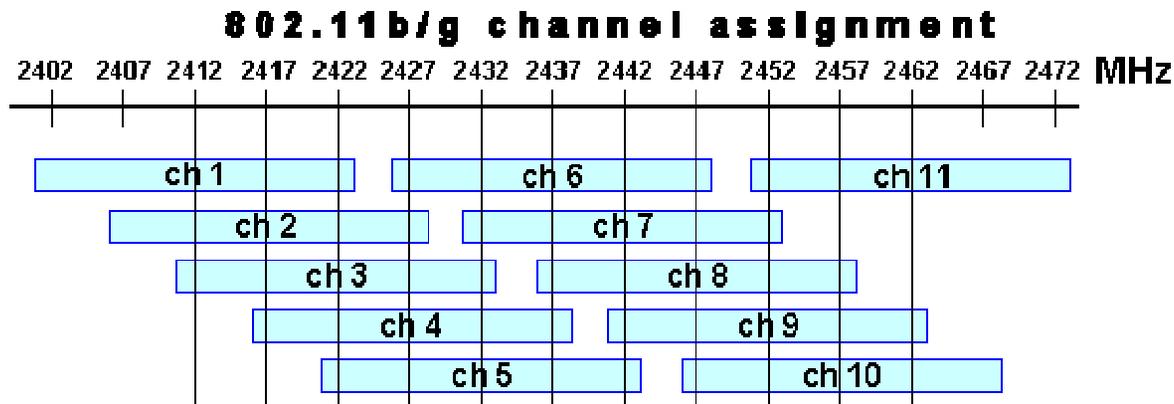
Choosing 5GHz Channels

- Channels 36-48 for indoor use.

- DFS Channels 52-60, 100-140 (UNI-II bands)

- Channels 149-161 for outdoor use.

Frequency Band	Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)	SG (GHz)	ASIA (GHz)	TW (GHz)
Lower Band (36 = default)	34	—	—	5.170 [1]	—	—	—
	36	5.180	5.180	—	5.180	—	—
	38	—	—	5.190	—	—	—
	40	5.200	5.200	—	5.200	—	—
	42	—	—	5.210	—	—	—
	44	5.220	5.220	—	5.220	—	—
	46	—	—	5.230	—	—	—
	48	5.240	5.240	—	5.240	—	—
Middle Band (52 = default)	52	5.260	5.260	—	—	—	5.260
	56	5.280	5.280	—	—	—	5.280
	58	5.300	5.300	—	—	—	5.300
	60	5.320	5.320	—	—	—	5.320
H Band	100	—	5.500	—	—	—	—
	104	—	5.520	—	—	—	—
	108	—	5.540	—	—	—	—
	112	—	5.560	—	—	—	—
	116	—	5.580	—	—	—	—
	120	—	5.600	—	—	—	—
	124	—	5.620	—	—	—	—
	128	—	5.640	—	—	—	—
	132	—	5.660	—	—	—	—
	136	—	5.680	—	—	—	—
	140	—	5.700	—	—	—	—
Upper Band (149 = default)	149	5.745	—	—	5.745	5.745	5.745
	153	5.765	—	—	5.675	5.675	5.675
	157	5.785	—	—	5.785	5.785	5.785
	161	5.805	—	—	5.805	5.805	5.805
ISM Band	165	5.825	—	—	5.825	—	5.825

Note 1: Channel 34 is the default channel for Japan

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Fragment Length

- **Divides frames into smaller pieces and can increase reliability of frame transmissions.**
- **With smaller frames, collisions are less likely to occur.**

RTS / CTS

- Can reduce collisions caused by the "hidden node" problem.
- A node wishing to send data initiates the process by sending a Request to Send frame (RTS).
- The destination node replies with a Clear To Send frame (CTS).
- Any other node receiving the RTS or CTS frame should refrain from sending data for a given time

Traffic Shaping

- **Increase performance for the entire network by limiting bandwidth per user.**
- **Recommended to do this at the gateway.**
- **Limiting bandwidth at the AP also an easy solution but you have less control.**

Multiple SSIDs and VLANs

- Lowers equipment and installation cost.
- Separate networks for staff and guests using the same APs.
- Must use switches that support VLAN tagging.
- VLAN support only available in AP mode
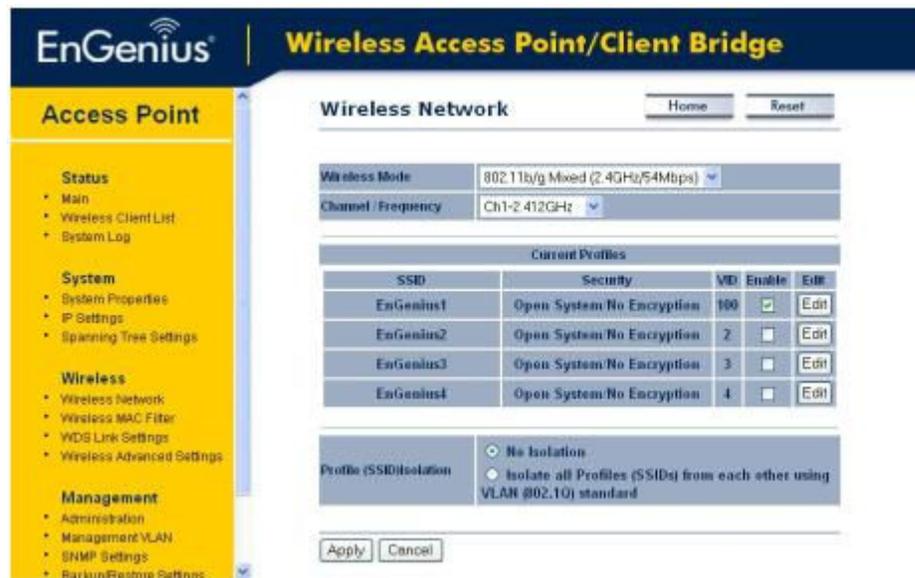
Available on the EAP3660, ECB-3500, EAP9550, ECB-9500

Assigning a VLAN tag to an SSID

- **Navigate to Wireless Network then click on edit for the SSID you wish to assign a VLAN tag to.**

VLAN ID Tag

- In the pop up window for SSID Profile, set the VLAN ID tag, then click Save.

Profile (SSID) Isolation

- The newly assigned tag will appear in the **VID** column.
- Next to **Profile (SSID) Isolation**, make sure to select **Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard**.
- Make sure to click **Apply**.

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Management with VLAN

- **When VLAN with Profile Isolation enabled, you can only access the AP from the profile with the same VLAN tag specfied in the Management VLAN page.**

L2.5 Bridging

- In L2.5 bridging, the Client Bridge inserts it's MAC address in the source MAC field of any frame that passes though it.
- Can prevent applications using MAC registration. This is a requirement such authentication gateways and VoIP SIP registrars from working properly.
- A work around is to use WDS Bridge mode which is transparent.

Firmware Upgrades

- **Many times a new firmware may be available to fix bugs or add new features.**
- **http://www.engeniustech.com**
- **Firmware can be easily upgraded via the web based GUI.**

Application Guides

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