

# *Troubleshooting EnGenius Wi-Fi Devices*



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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**

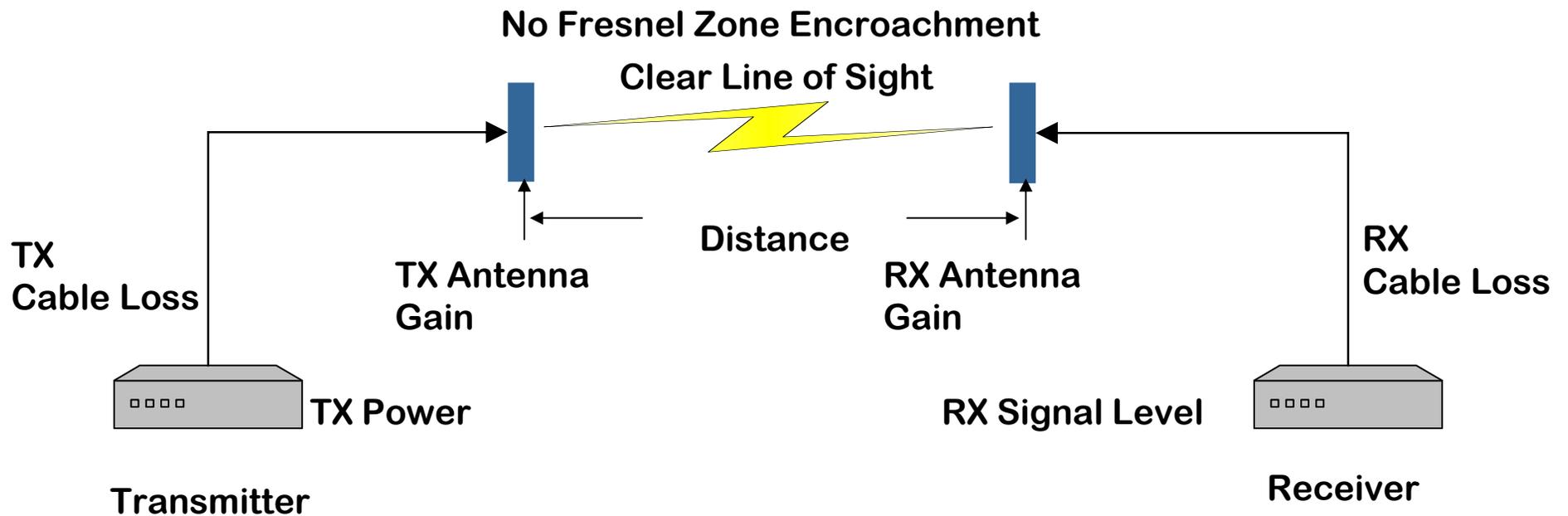
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# Maximizing Long Range Point to Point

- 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.



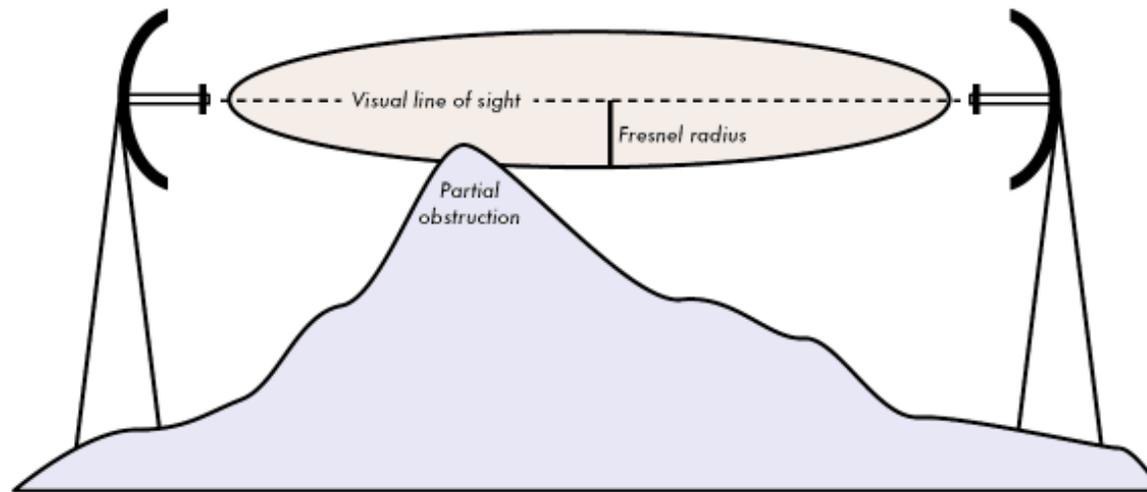
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## What is RF line of sight

- 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 calculator 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

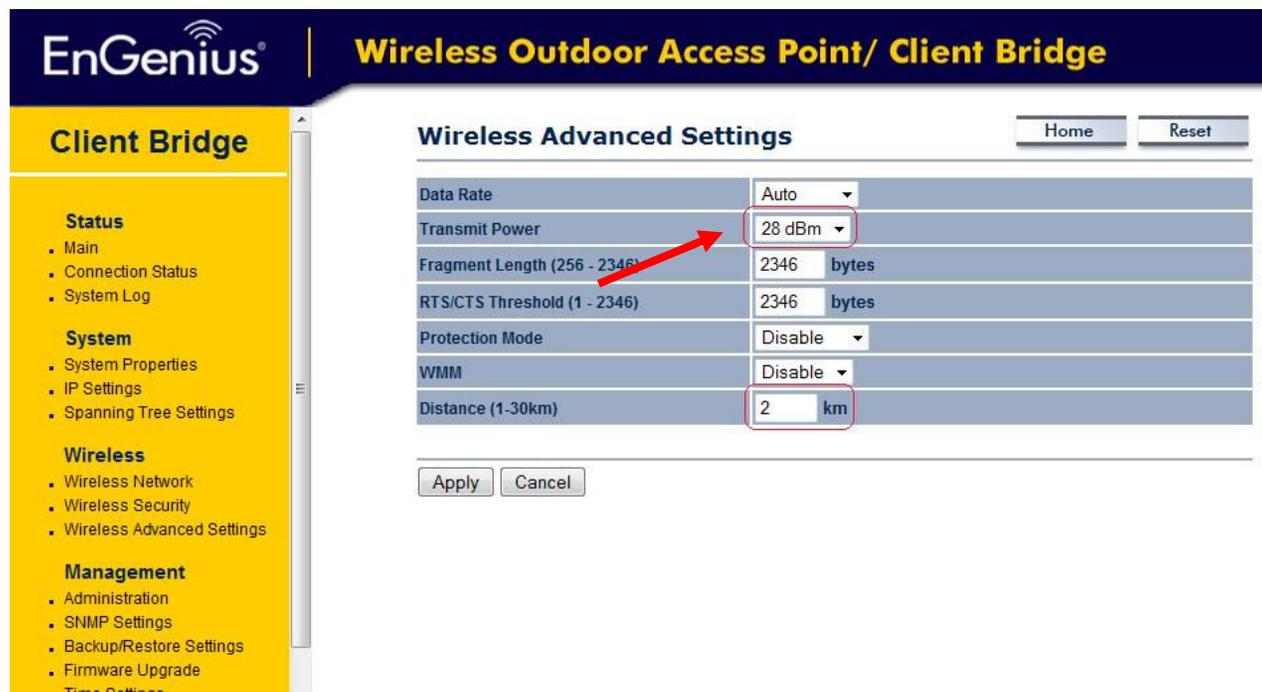
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# Transmit Power (Tx)

- 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.



The screenshot shows the EnGenius Wireless Advanced Settings page for a Client Bridge. The interface includes a navigation menu on the left and a main settings area on the right. The settings are as follows:

Setting	Value
Data Rate	Auto
Transmit Power	28 dBm
Fragment Length (256 - 2346)	2346 bytes
RTS/CTS Threshold (1 - 2346)	2346 bytes
Protection Mode	Disable
WMM	Disable
Distance (1-30km)	2 km

Buttons for Home, Reset, Apply, and Cancel are visible at the bottom of the settings area.

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# 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.

The screenshot shows the EnGenius web interface for a Wireless Outdoor Access Point/Client Bridge. The left sidebar contains a navigation menu with sections: Client Bridge, Status (Main, Connection Status, System Log), System (System Properties, IP Settings, Spanning Tree Settings), Wireless (Wireless Network, Wireless Security, Wireless Advanced Settings), and Management (Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings). The main content area is titled 'Wireless Advanced Settings' and includes 'Home' and 'Reset' buttons. A table of settings is displayed with the following values:

Data Rate	Auto
Transmit Power	28 dBm
Fragment Length (256 - 2346)	2346 bytes
RTS/CTS Threshold (1 - 2346)	2346 bytes
Protection Mode	Disable
WMM	Disable
Distance (1-30km)	2 km

At the bottom of the settings table are 'Apply' and 'Cancel' buttons. A red arrow points to the 'Distance (1-30km)' field, which is also highlighted with a red box.

# *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.

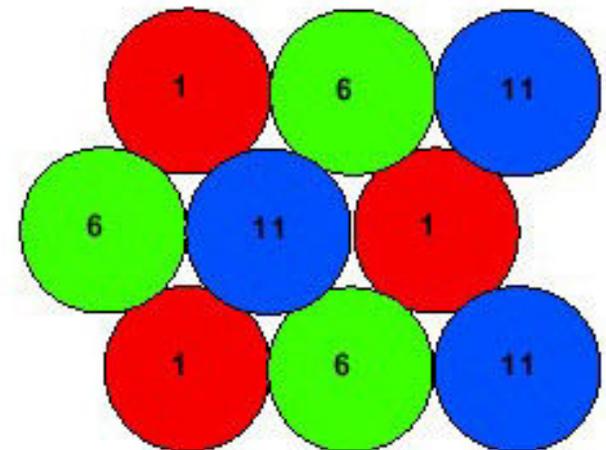
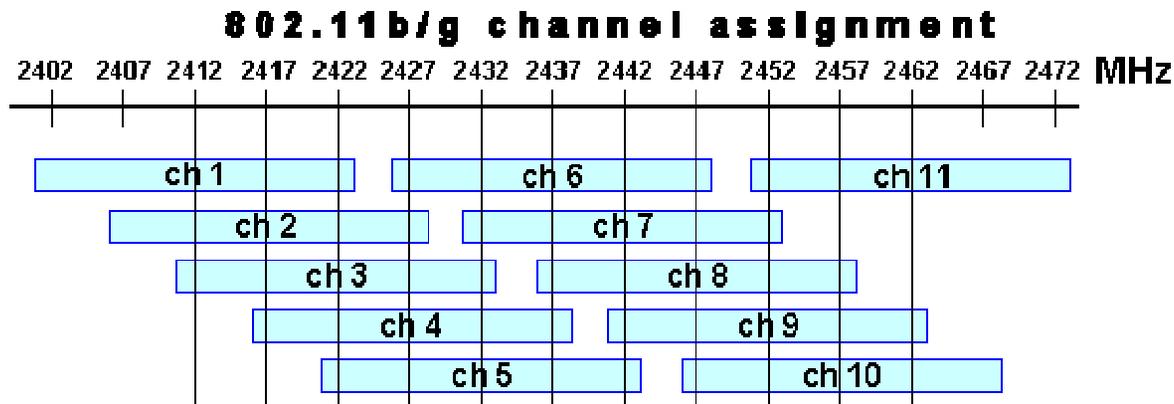
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# Choosing 2.4GHz Channels

- 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 2427 to 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.



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# 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 <sup>1</sup>	—	—	—
	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.

The screenshot shows the EnGenius Wireless Access Point configuration interface. The left sidebar contains a navigation menu with categories: Status, System, Wireless, and Management. The main content area is titled 'Wireless Advanced Settings' and includes a 'Home' and 'Reset' button. The settings table is as follows:

Setting	Value
Data Rate	Auto
Transmit Power	20 dBm
Fragment Length (256 - 2346)	2346 bytes
RTS/CTS Threshold (1 - 2346)	2346 bytes
Protection Mode	Disable
WMM	Disable

Below this table is the 'Wireless Traffic Shaping' section:

Setting	Value
Enable Traffic Shaping	<input type="checkbox"/>
Incoming Traffic Limit	0 kbit/s
Outgoing Traffic Limit	0 kbit/s

At the bottom of the settings area are 'Apply' and 'Cancel' buttons. A red arrow points to the 'Fragment Length' field.

# 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

The screenshot shows the EnGenius Wireless Access Point configuration interface. The main title is "Wireless Access Point". The left sidebar contains a navigation menu with sections: "Access Point", "Status" (Main, Client List, System Log), "System" (System Properties, IP Settings, Spanning Tree Settings), and "Wireless" (Wireless Network, Wireless MAC Filter, WDS Link Settings). The main content area is titled "Wireless Advanced Settings" and includes "Home" and "Reset" buttons. A table of settings is displayed:

Data Rate	Auto
Transmit Power	20 dBm
Fragment Length (256 - 2346)	2346 bytes
RTS/CTS Threshold (1 - 2346)	2346 bytes
Protection Mode	Disable
WMM	CTS Only

The "Protection Mode" dropdown menu is open, showing the following options: "Disable" (highlighted with a red arrow), "CTS Only", and "RTS/CTS". "Apply" and "Cancel" buttons are located at the bottom of the settings table.

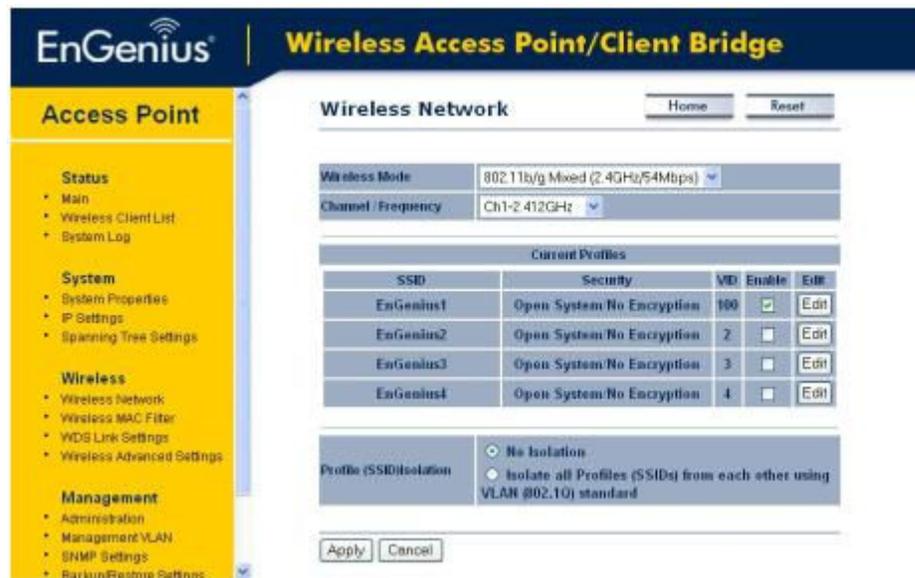
# Traffic Shaping

- 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.

The screenshot displays the EnGenius Wireless Access Point configuration web interface. The left sidebar contains a navigation menu with categories: Status (Main, Client List, System Log), System (System Properties, IP Settings, Spanning Tree Settings), Wireless (Wireless Network, Wireless MAC Filter, WDS Link Settings, Wireless Advanced Settings), and Management (Administration, Management VLAN, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings, Log, Diagnostics). A red arrow points to the 'Wireless Advanced Settings' link in the menu. The main content area is titled 'Wireless Advanced Settings' and includes 'Home' and 'Reset' buttons. It contains two sections: 'Wireless Advanced Settings' with fields for Data Rate (Auto), Transmit Power (20 dBm), Fragment Length (2346 bytes), RTS/CTS Threshold (2346 bytes), Protection Mode (Disable), and WMM (Disable); and 'Wireless Traffic Shaping' with a checkbox for 'Enable Traffic Shaping' (unchecked) and input fields for 'Incoming Traffic Limit' and 'Outgoing Traffic Limit' (both set to 0 kbit/s). 'Apply' and 'Cancel' buttons are at the bottom.

# 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



EnGenius1  
Guest Internet Access

EnGenius2  
Staff Network

EnGenius3  
IT Dept

EnGenius4  
Security



Available on the EAP3660, ECB-3500, EAP9550, ECB-9500

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# 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.

The screenshot shows the EnGenius configuration interface for a Wireless Access Point/Client Bridge. The left sidebar contains a navigation menu with categories: Access Point, Status, System, Wireless, and Management. The 'Wireless' category is selected, and 'Wireless Network' is highlighted. The main content area is titled 'Wireless Network' and includes 'Home' and 'Reset' buttons. Below this, there are settings for Wireless Mode (802.11b/g Mixed (2GHz/54Mbps)), Channel / Frequency (Ch1-2.412GHz), and AP Detection (Scan). A table titled 'Current Profiles' lists four SSIDs: EnGenius1, EnGenius2, EnGenius3, and EnGenius4. Each row shows the SSID, Security (Open System/No Encryption), VID (1, 2, 3, 4), Enable status (checked for EnGenius1), and an Edit button. The 'Edit' button for EnGenius1 is highlighted with a red box. Below the table, there is a 'Profile (SSID) Isolation' section with two radio buttons: 'No Isolation' and 'Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard'. The 'Isolate all Profiles...' option is selected. At the bottom, there are 'Apply' and 'Cancel' buttons.

**EnGenius** | **Wireless Access Point/Client Bridge**

**Access Point**

- Status
  - Main
  - Wireless Client List
  - System Log
- System
  - System Properties
  - IP Settings
  - Spanning Tree Settings
- **Wireless**
  - **Wireless Network**
  - Wireless MAC Filter
  - WDS Link Settings
  - Wireless Advanced Settings
- Management
  - Administration
  - Management VLAN
  - SNMP Settings
  - Backup/Restore Settings
  - Firmware Upgrade
  - Time Settings
  - Log
  - Diagnostics

**Wireless Network** [Home] [Reset]

Wireless Mode: 802.11b/g Mixed (2GHz/54Mbps) v

Channel / Frequency: Ch1-2.412GHz v  Auto

AP Detection: [Scan]

**Current Profiles**

SSID	Security	VID	Enable	Edit
EnGenius1	Open System/No Encryption	1	<input checked="" type="checkbox"/>	[Edit]
EnGenius2	Open System/No Encryption	2	<input type="checkbox"/>	[Edit]
EnGenius3	Open System/No Encryption	3	<input type="checkbox"/>	[Edit]
EnGenius4	Open System/No Encryption	4	<input type="checkbox"/>	[Edit]

Profile (SSID) Isolation:  No Isolation  Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard

[Apply] [Cancel]

# VLAN ID Tag

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

SSID Profile

Wireless Setting

SSID	EnGenius1	(1 to 32 characters)
VLAN ID	55	(1~4095)
Suppressed SSID	<input type="checkbox"/>	
Station Separation	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable

Wireless Security

Security Mode	Disabled
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Save Cancel

# 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**.

**Wireless Network** Home Reset

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Wireless Mode: 802.11b/g Mixed (2GHz/54Mbps)

Channel / Frequency: Ch1-2.412GHz  Auto

AP Detection:

---

Current Profiles

SSID	Security	VID	Enable	Edit
EnGenius1	Open System/No Encryption	55	<input checked="" type="checkbox"/>	<input type="button" value="Edit"/>
EnGenius2	Open System/No Encryption	2	<input type="checkbox"/>	<input type="button" value="Edit"/>
EnGenius3	Open System/No Encryption	3	<input type="checkbox"/>	<input type="button" value="Edit"/>
EnGenius4	Open System/No Encryption	4	<input type="checkbox"/>	<input type="button" value="Edit"/>

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Profile (SSID) Isolation:  No Isolation  Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard

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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 specified in the **Management VLAN** page.

The screenshot shows the EnGenius web interface for a Wireless Access Point/Client Bridge. The left sidebar is yellow and contains a navigation menu with categories: Status, System, Wireless, and Management. The 'Management' category is expanded, and 'Management VLAN' is highlighted with a red box and a red arrow pointing to it. The main content area is titled 'Management VLAN Settings' and includes a 'Caution' message: 'Caution: If you reconfigure the Management VLAN ID, you may lose connectivity to the access point. Verify that the switch and DHCP server can support the reconfigured VLAN ID, and then re-connect to the new IP address.' Below the caution, there are two radio button options: 'No VLAN tag' and 'Specified VLAN ID 55'. The 'Specified VLAN ID' option is selected, and the value '55' is entered in a text box. A red box highlights the text '(must be in the range 1 ~ 4095.)' below the text box. At the bottom of the settings area, there are 'Apply' and 'Cancel' buttons, both highlighted with red boxes. A red arrow also points from the 'Management VLAN' menu item to the 'Management VLAN ID' label.

## *L2.5 Bridging*

- In L2.5 bridging, the Client Bridge inserts its MAC address in the source MAC field of any frame that passes through 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.

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# 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.

The screenshot shows the EnGenius web-based GUI for a Wireless Access Point/Client Bridge. The page title is "Firmware Upgrade". The current firmware version is 1.0.38. The page prompts the user to "Locate and select the upgrade file from your hard disk:" and provides a "Browse..." button. An "Upgrade" button is also visible. The left sidebar contains a menu with categories: Client Bridge, Status, System, Wireless, and Management. The "Firmware Upgrade" option under the Management category is highlighted with a red arrow. Another red arrow points to the "Browse..." button in the file selection area.

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# *Application Guides*

**EOA7530 / 7535** [www.engeniustech.com](http://www.engeniustech.com)

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# Questions

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