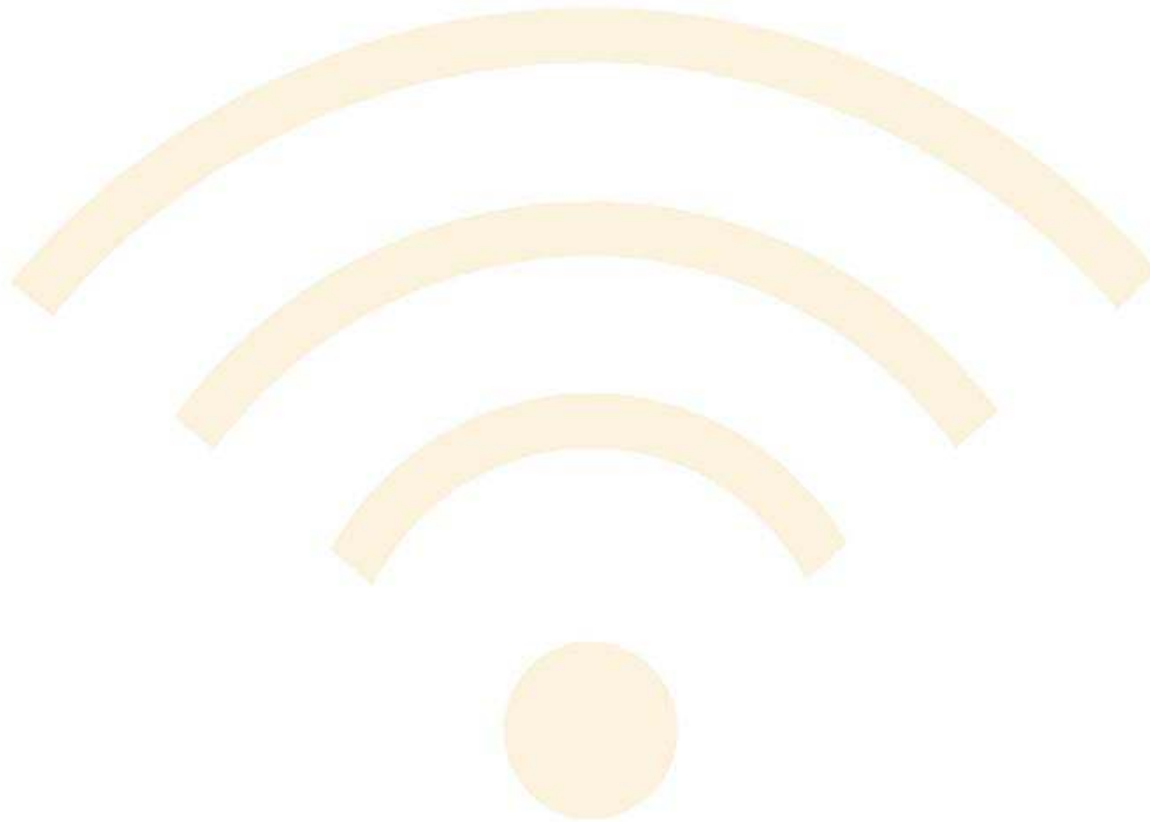


# *Troubleshooting EnGenius Wi-Fi Devices*

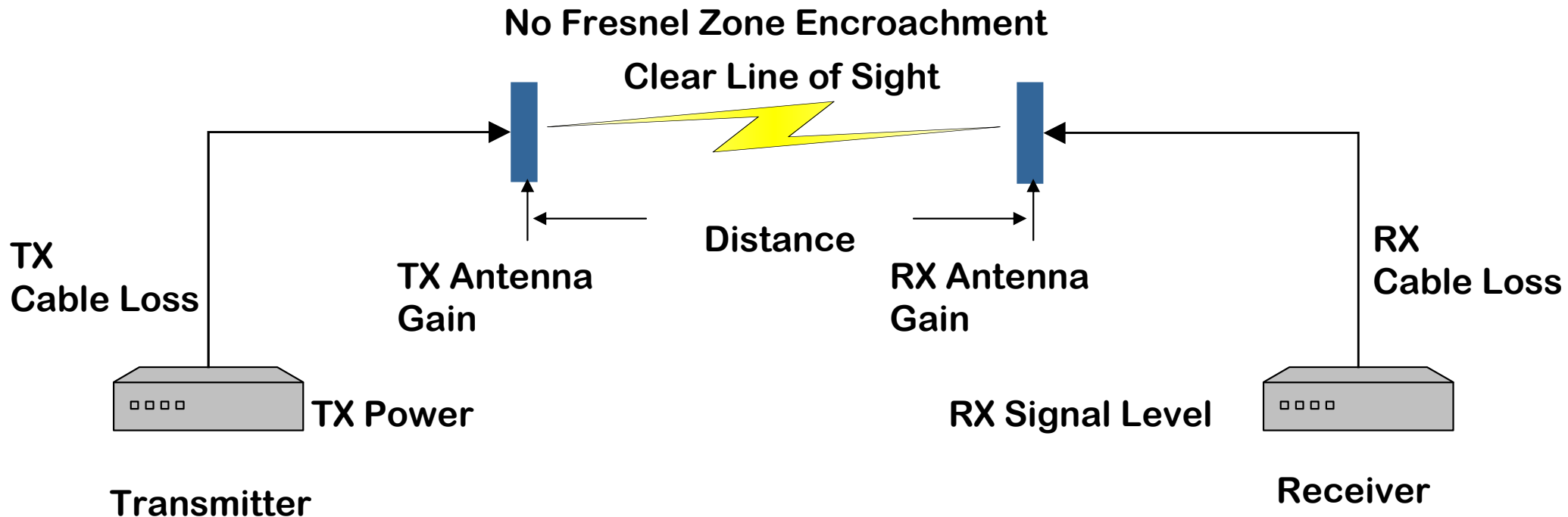


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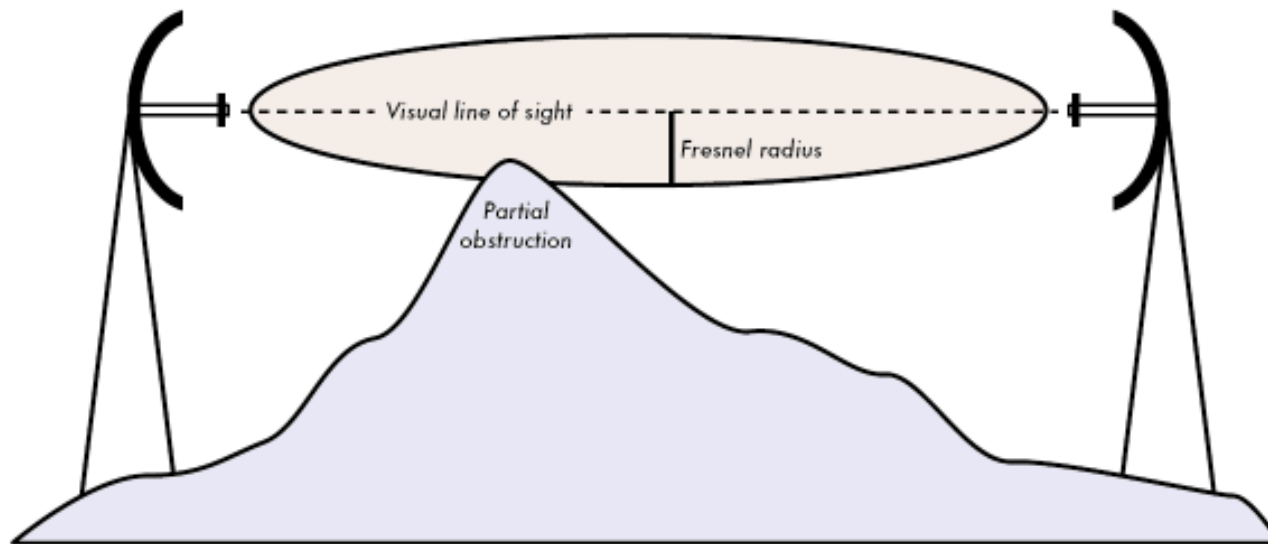
# Long Range Links

- 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.



# 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.



# High Gain Directional Antennas

- 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.

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

**Client Bridge**

- Status**
  - Main
  - Connection Status
  - System Log
- System**
  - System Properties
  - IP Settings
  - Spanning Tree Settings
- Wireless**
  - Wireless Network
  - Wireless Security
  - Wireless Advanced Settings
- Management**
  - Administration
  - SNMP Settings
  - Backup/Restore Settings
  - Firmware Upgrade
  - Time Settings

**Wireless Advanced Settings** Home Reset

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

Apply Cancel

# 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-2610 and EOC-5610 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: 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, there are 'Apply' and 'Cancel' buttons. A red arrow points to the 'Distance (1-30km)' field, which is also highlighted with a red box.

# 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

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

**Client Bridge**

**Wireless Advanced Settings** Home Reset

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

Apply Cancel

**Status**

- Main
- Connection Status
- System Log

**System**

- System Properties
- IP Settings
- Spanning Tree Settings

**Wireless**

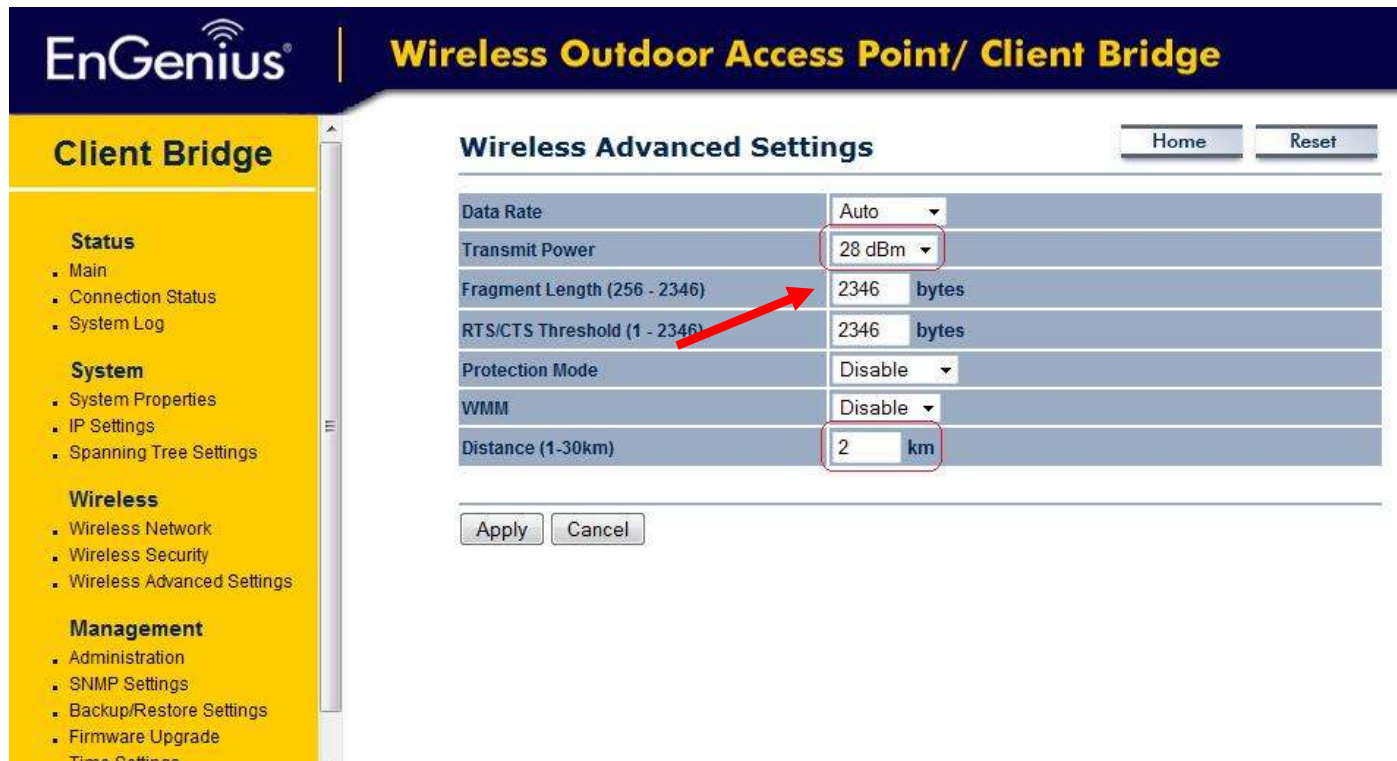
- Wireless Network
- Wireless Security
- Wireless Advanced Settings

**Management**

- Administration
- SNMP Settings
- Backup/Restore Settings
- Firmware Upgrade
- Time Settings

# 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 web management interface for a Wireless Outdoor Access Point/Client Bridge. The left sidebar contains a navigation menu with sections: 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. The settings table is as follows:

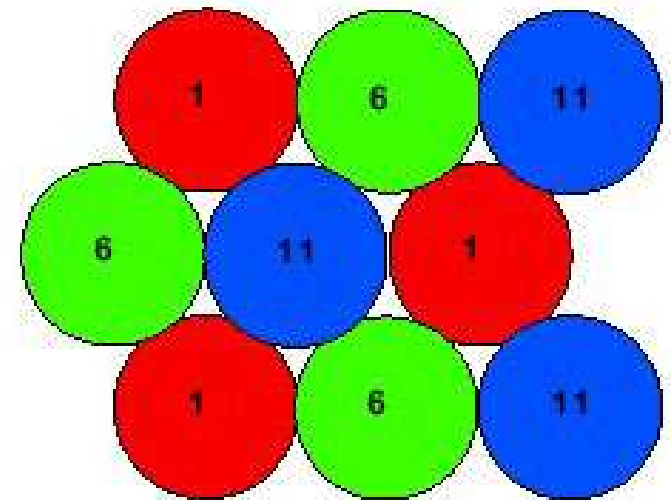
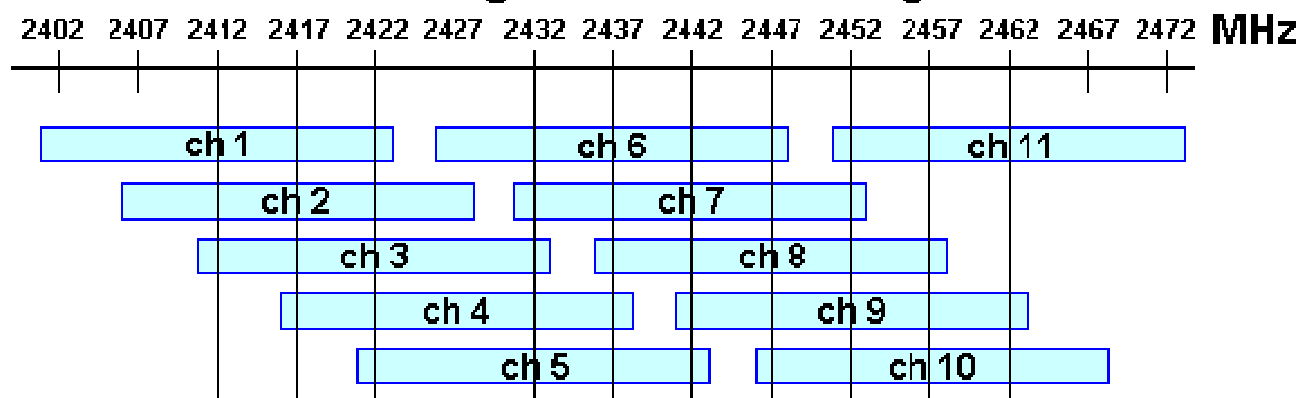
Setting	Value	Unit
Data Rate	Auto	
Transmit Power	28 dBm	
Fragment Length (256 - 2346)	2346	bytes
RTS/CTS Threshold (1 - 2346)	2346	bytes
Protection Mode	Disable	
WMM	Disable	
Distance (1-30km)	2	km

At the bottom of the settings table are 'Apply' and 'Cancel' buttons. A red arrow points to the 'Fragment Length' value of 2346 bytes.

# 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.

## 802.11b/g channel assignment



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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	—	—	5.775	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

# 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

EnGenius Wireless Access Point/Client Bridge

Access Point

Wireless Network

Wireless Mode: 802.11b/g Mixed (2.4GHz/54Mbps)

Channel / Frequency: CH1-2 412GHz

SSID	Security	VID	Enable	Edit
EnGenius1	Open System No Encryption	100	<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

EnGenius1  
Guest Internet Access

EnGenius2  
Staff Network

EnGenius3  
IT Dept

EnGenius4  
Security



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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.

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

**Access Point**

**Wireless Network** Home Reset

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	1	<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"/>

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

# VLAN ID Tag

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

http://192.168.1.1/setup.cgi?reqfile=/html/AP\_SSIDProfile.htm&tableidx=1&actionEditSSIDProfile - Windows Internet Exp...

http://192.168.1.1/setup.cgi?reqfile=/html/AP\_SSIDProfile.htm&tableidx=1&actionEditSSIDProfile=1&wlanmode=3&wlanchannel=1&wlanssidisolation=2

## 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
---------------	----------

# 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

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"/>

---

Profile (SSID) Isolation

No Isolation

Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard

---

# 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 displays the EnGenius web interface for configuring a Wireless Access Point/Client Bridge. The page title is "Management VLAN Settings". On the left, a sidebar lists various configuration categories: Status, System, Wireless, and Management. The "Management" category is selected, and the "Management VLAN" option is highlighted with a red box and a red arrow. The main content area shows the "Management VLAN Settings" section with 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". The "Specified VLAN ID" option is selected, and the value "55" is entered in the adjacent text field. A red box highlights the "Specified VLAN ID" option and the text field. Below the options, there are "Apply" and "Cancel" buttons. The "Apply" button is also highlighted with a red box. The "Home" and "Reset" buttons are visible in the top right corner of the main content area.

# 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 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/datacom/support/firmware.aspx>
- Firmware can be easily upgraded via the web based GUI.

The screenshot displays the EnGenius web-based GUI for a Wireless Access Point/Client Bridge. The interface is divided into a left sidebar and a main content area. The sidebar, titled 'Client Bridge', contains a navigation menu with the following categories and items:

- Status**
  - Main
  - Connection Status
  - System Log
- System**
  - System Properties
  - IP Settings
  - Spanning Tree Settings
- Wireless**
  - Wireless Network
  - Wireless Security
  - Wireless Advanced Settings
- Management**
  - Administration
  - SNMP Settings
  - Backup/Restore Settings
  - Firmware Upgrade** (highlighted with a red circle and a red arrow)
  - Time Settings
  - Log

The main content area, titled 'Firmware Upgrade', features a 'Home' and 'Reset' button at the top right. Below this, the current firmware version is displayed as '1.0.38'. A section labeled 'Locate and select the upgrade file from your hard disk:' contains a file selection input field with a 'Browse...' button. A red arrow points from the 'Firmware Upgrade' menu item in the sidebar to this input field. An 'Upgrade' button is located below the file selection area.

# Questions

[info@engeniustech.com](mailto:info@engeniustech.com)

888-735-7888

[www.engeniustech.com](http://www.engeniustech.com)

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