

Diagnosing and Mitigating Sticky Clients in Enterprise Wi-Fi Networks

—Detection, Analysis, and Optimization of Client Roaming Behavior

1 Issue Description

In enterprise Wi-Fi deployments, users often report that their devices remain connected to a distant AP even after moving closer to another AP with a significantly stronger signal.

Typical user complaints include:

- Wi-Fi shows only one or two signal bars after moving to another room.
- Applications become slow or unresponsive.
- Video calls experience freezes or packet loss.
- Performance immediately recovers after manually disabling and re-enabling Wi-Fi.

This condition is commonly known as a Sticky Client issue.



2 Basis for judging sticky clients

A sticky client typically exhibits the following characteristics:

Metric	Healthy Client	Sticky Client
RSSI	> -67 dBm	< -75 dBm

PHY Rate	High	Very Low
Retry Rate	< 10%	> 25%
Airtime Consumption	Low	High
Roaming Events	Normal	Rare or None

Additional indicators:

- Client remains associated with a distant AP.
- Signal quality continues to degrade without roaming.
- Nearby APs provide stronger coverage but are ignored.
- Airtime utilization becomes disproportionally high.

3 Why Sticky Clients Matter

Sticky clients impact more than just the affected user.

When a client remains connected at low signal levels, its PHY rate may drop from hundreds of Mbps to only a few Mbps.

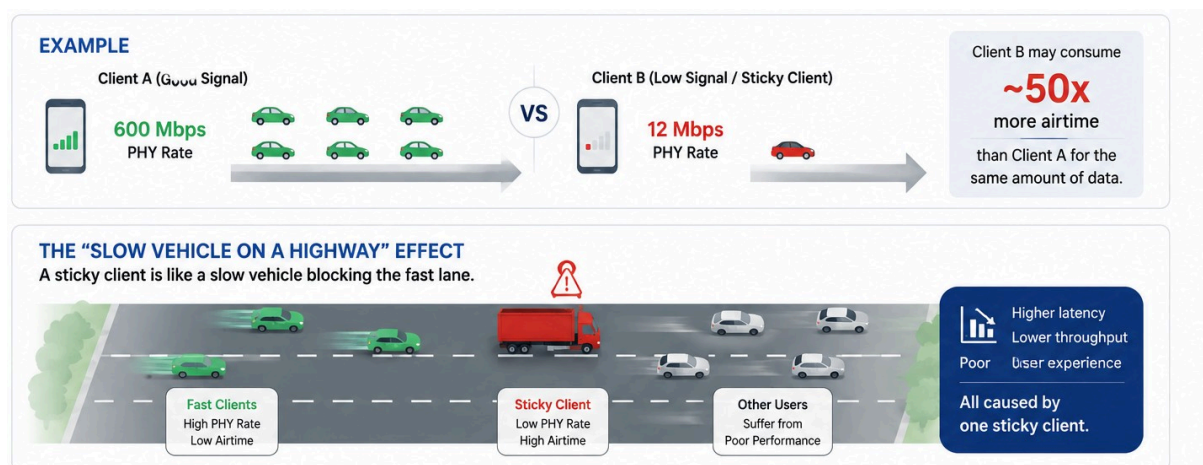
As a result, the device occupies significantly more airtime to transmit the same amount of data.

For example:

- Client A: 600 Mbps PHY Rate
- Client B: 12 Mbps PHY Rate

Client B may consume approximately 50 times more airtime than Client A for the same traffic volume.

This creates a “slow vehicle on a highway” effect, reducing performance for all users sharing the same channel.



4 Quickly Discovering Sticky Clients Using the OpenWiFi Controller

Identify Sticky Clients Using OpenWiFi Controller

Under the OpenWiFi architecture, the Controller provides centralized visibility while data forwarding remains local on the AP.

Administrators can quickly identify sticky clients through:

Client Statistics

- RSSI History
- PHY Rate
- Airtime Utilization
- Roaming History



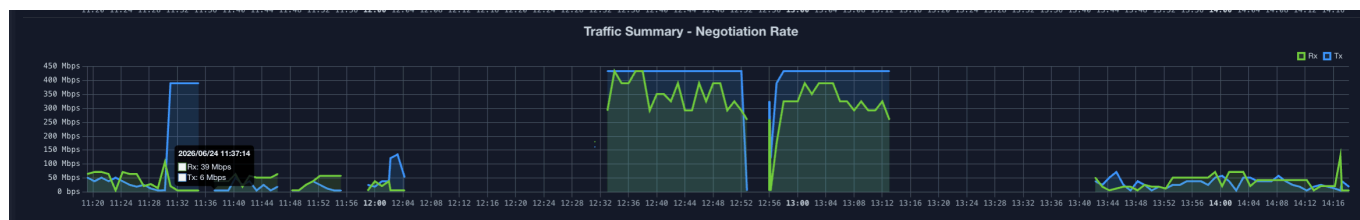
Trend Matrix

Trend Matrix can reveal:

- Persistent low signal conditions
- Roaming behavior over time
- Channel State of the Associated AP
- Negotiated Data Rate of the Client

All of this information can be viewed on the Client Details and AP Details pages.

Example:



The client's SNR and negotiated PHY rate are both very low right now.

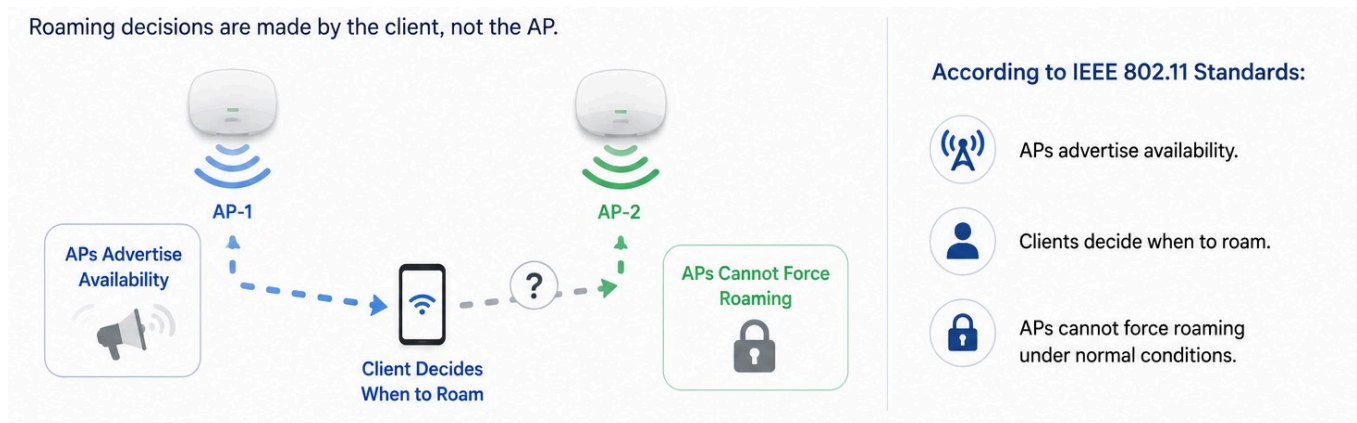
5 Root Cause and Troubleshooting Plan

5.1 Client-Controlled Roaming

Sticky clients occur because roaming decisions are primarily made by the client device, not the AP.

According to IEEE 802.11 standards:

- APs advertise availability.
- Clients decide when to roam.
- APs cannot force roaming under normal conditions.



Power Saving Behavior

Modern devices prioritize battery life.

Many devices delay scanning for alternative APs until signal quality becomes severely degraded.

As a result:

- Devices remain connected longer than desired.
- Roaming occurs too late.
- User experience deteriorates.



5.2 RF Coverage

One of the most common causes of sticky clients is excessive AP transmit power.

Best Practice

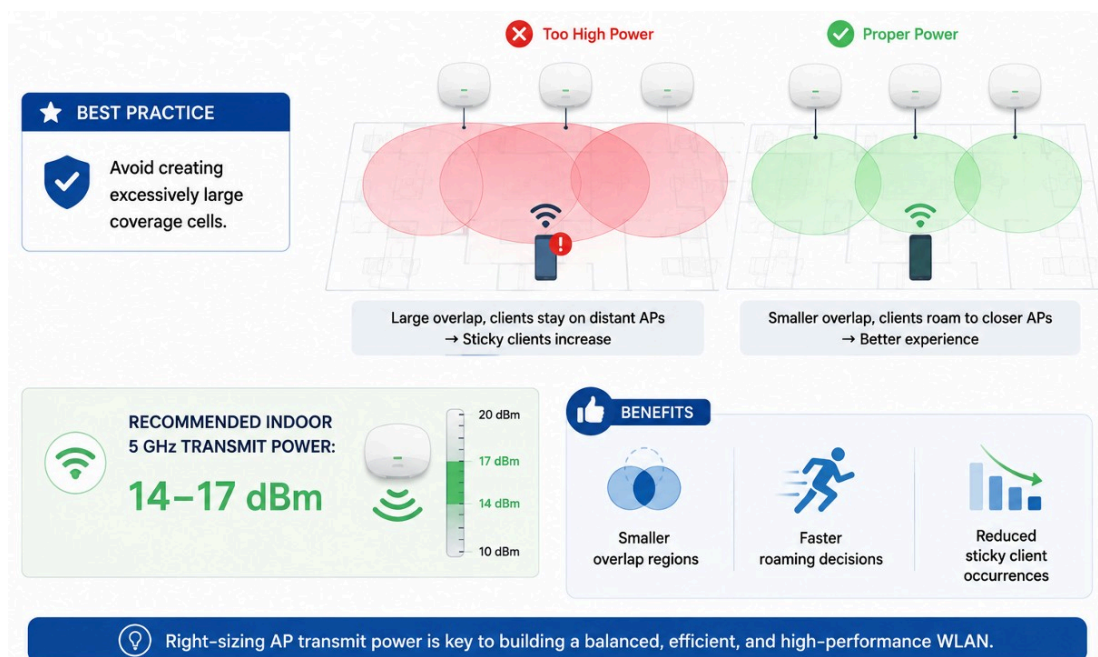
Avoid creating excessively large coverage cells.

Recommended indoor 5 GHz transmit power:

- 14–17 dBm

Benefits:

- Smaller overlap regions
- Faster roaming decisions
- Reduced sticky client occurrences



Alternatively, you can view the current AP transmit power on the controller.

60eb5a000f14	216-52	Wi-Fi 7	CAP7030-Z	default	China (CN)	EHT 20MHz 6 128 10dBm Enable
60eb5a000f16	212-1-BigMeeting...	Wi-Fi 7	CAP7030-Z	default	China (CN)	Tx Power 20MHz 11 128 2dBm Enable
60eb5a000f18	60eb5a000f18	Wi-Fi 7	CAP7030-Z	default	China (CN)	HE 20MHz Auto(None) 128 30dBm Enable
60eb5a000f1a	212-2-east-52	Wi-Fi 7	CAP7030-Z	default	China (CN)	EHT 20MHz 1 128 2dBm Enable
60eb5a000f1c	212-1-west-52	Wi-Fi 7	CAP7030-Z	default	China (CN)	EHT 20MHz H(6) 128 2dBm Enable
60eb5a000f1e	212-2-west-52	Wi-Fi 7	CAP7030-Z	default	China (CN)	EHT 20MHz 6 128 3dBm Enable
60eb5a001122	60eb5a001122	Wi-Fi 7	CAP7030-Z	wpd	China (CN)	HE 20MHz Auto(None) 128 30dBm Enable

5.3 802.11k/v Assisted Roaming

802.11k Neighbor Reports

802.11k allows the AP to provide neighboring AP information to clients.

Instead of scanning every channel, clients can focus on a small list of recommended candidates.

Benefits:

- Faster scanning
- Reduced roaming delay
- Lower battery consumption

802.11v BSS Transition Management

802.11v enables the AP to recommend a better AP.

Example:

Current AP:

- RSSI: -72 dBm

Candidate AP:

- RSSI: -55 dBm

The AP sends a BSS Transition Management Request recommending migration to the stronger AP.

Most modern devices (iOS, Android, Windows) support this mechanism.



Asterfusion APs have 802.11k/v/r enabled by default.

5.4 Smart Roaming Protection

When assisted roaming is insufficient, Smart Roaming can enforce migration.

Recommended settings:

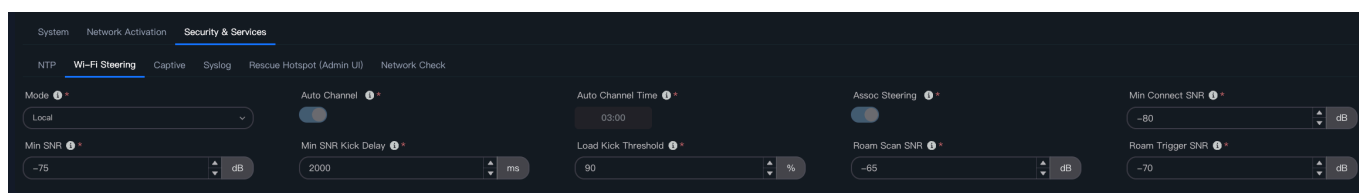
Parameter	Recommended Value
RSSI Kickout Threshold	-75 dBm
Detection Window	3-5 seconds
802.11k	Enabled
802.11v	Enabled
Smart Roaming	Enabled

Operational flow:

- RSSI falls below threshold.
- AP sends 802.11v steering request.
- Client ignores recommendation.
- AP deauthenticates the client.
- Client reconnects to a stronger AP.

This approach minimizes user impact while preventing long-term sticky client behavior.

The following image shows how to configure Smart Roaming or Wi-Fi Steering parameters on the OpenWiFi Controller.



5.5 Packet Capture Verification

If roaming issues persist, perform over-the-air packet capture.

Verify 802.11v Steering

Check for:

- BSS Transition Management Request
- BSS Transition Management Response

Possible outcomes:

- Accept → Client follows recommendation.

- Reject → Client refuses roaming.

Verify Forced Roaming Events

Check for:

- Deauthentication frames
- Disassociation frames

Confirm that:

- Client receives kickout notification.
- Client immediately begins AP discovery.
- Association occurs with the expected neighboring AP.

Air Capture Environment Setup

Environment Requirements

- Linux OS
- Intel AX200 (Kernel 5.1 or later)
Intel AX210 (Kernel 5.10 or later)
- Wireshark (Packet analysis)
- Aircrack-ng (Enable Monitor Mode)

Workflow Overview



1. Verify Driver & Firmware
2. Enable Monitor Mode
3. Set Channel & Capture
4. Analyze Packets

1 Verify Wireless Driver

Verify that the Intel wireless firmware is installed correctly.

```
ls /lib/firmware/iwlwifi-cc-a0-46.ucode
```

If the firmware file exists, the wireless driver is ready for Monitor Mode.

2 Install Wireshark

Install Wireshark for packet analysis.

```
sudo apt update
sudo apt install wireshark
```

- When prompted, select Yes to allow non-root users to capture packets.
- If No was selected, run: `sudo dpkg-reconfigure wireshark-common`

3 Enable Monitor Mode

- Identify the wireless interface.
- Install Aircrack-ng.
- Enable Monitor Mode.

```
ifconfig
sudo apt install aircrack-ng
sudo airmon-ng start wlp2s0
```

Interface will be renamed to: `wlp2s0mon`

Disable Monitor Mode (after capture)

```
sudo airmon-ng stop wlp2s0mon
```

4 Lock the Target Channel

Lock the wireless adapter to the target Wi-Fi channel.

```
sudo iwconfig wlp2s0mon channel 40
```

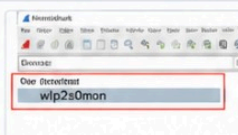
Example: Channel 40



5 Start Packet Capture

- Launch Wireshark.
- Select the wlp2s0mon interface and start capturing.

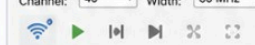
```
sudo wireshark
```



Wireless Toolbar (Optional)

View → Wireless Toolbar

Channel: 40 Width: 80 MHz



6 Capture & Analyze

Wireshark captures raw 802.11 management, control, and data frames over the air.



Common Troubleshooting Scenarios

- Roaming failures
- Sticky clients
- Authentication issues
- Packet retransmissions
- DFS events
- Association / Disassociation

6 Conclusion

Sticky clients are not merely a roaming inconvenience. They directly impact airtime efficiency, user experience, and overall WLAN performance.

The most effective mitigation strategy combines:

- RF optimization
- 802.11k assisted discovery
- 802.11v steering
- Smart Roaming enforcement
- OpenWiFi Controller visibility and analytics

By leveraging these mechanisms together, network administrators can significantly improve roaming performance and maintain a consistently high-quality wireless experience across the entire WLAN infrastructure.

Sticky Clients Impact More Than Just Roaming

When clients stick to a suboptimal AP, it leads to:



Wasted Airtime

Inefficient channel usage
reduces network capacity



Poor User Experience

Slow speeds, higher latency,
and unstable connections



Overall Performance Impact

Affects the entire WLAN
and business applications

A Holistic Approach to Fix Sticky Clients

The most effective solution is a combination of multiple technologies and best practices.

1 RF Optimization



Proper coverage, channel
planning, and power control
create a balanced RF
environment.



2 802.11k Assisted Discovery



APs provide neighbor
information so clients can
find better APs faster.



3 802.11v Steering



The network guides clients
to roam to the most
appropriate AP.



4 Smart Roaming Enforcement



When clients don't roam
voluntarily, the network
enforces migration.



5 OpenWiFi Controller Visibility & Analytics



Real-time visibility, metrics,
and analytics help detect
issues and validate
improvements.



Better Roaming. Happier Users. Stronger WLAN.

By working together, these technologies ensure seamless mobility
and a consistent high-quality wireless experience.



Higher Efficiency



Better Experience



Stronger Performance