



ALCATEL-LUCENT ENTERPRISE WIRELESS LAN (WLAN)

ClientMatch TECHNOLOGY

TECHNOLOGY BRIEF

Ensuring that all wireless network clients get the service levels they need is a major challenge – especially when smartphones, tablets and other clients control their own connectivity and roaming decisions.

ClientMatch™ technology from Alcatel-Lucent is an RF management technology that puts the WLAN infrastructure in control of client connectivity and roaming.

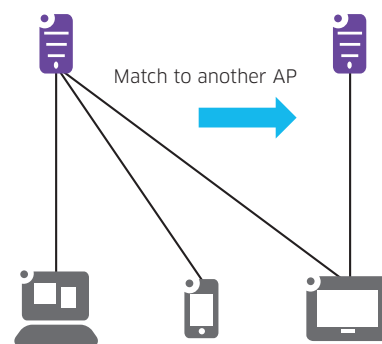
Leveraging a system-level view of the network, ClientMatch monitors clients and automatically matches them to the right radio on the right access point (AP), boosting overall WLAN performance and delivering consistent, predictable performance to every user and client while eliminating the sticky client problem.

ClientMatch technology works with all clients – including new 802.11ac clients – across all operating systems, without the need for client software. It is available as part of Alcatel-Lucent WLAN OS Release 6.3.0 and higher.

As shown in Figure 1, ClientMatch technology eliminates sticky client problems for any mobile device, including 802.11ac devices.

Figure 1. ClientMatch technology

- No more sticky clients
- Compatible with any mobile device model
- Must-have for 802.11ac



How clients impact a WLAN

Client behavior has a significant impact on WLAN performance. Key issues include:

- Client-based decision making
- Unpredictable performance = user dissatisfaction
- Poor roaming algorithms and sticky clients
- Increasing client diversity
- AP signal and load

CLIENT-BASED DECISION-MAKING

Clients are typically in control of connectivity decisions, such as which AP to associate with, the speed at which they send and receive data, and when to change APs as they roam.

Unfortunately, clients do not have a system-level view of the network, so often make poor connectivity decisions – such as connecting to the first AP they hear, regardless of whether it meets their needs.

For example, a dual-band 2.4- and 5-GHz-capable smartphone may attach itself to the 2.4-GHz band even if that band is crowded, reducing the client's throughput by half despite the availability of a 5-GHz-capable AP within that client's range.

These poor decisions reduce both client performance and overall network performance. Likewise, since the WLAN is a shared medium and only one client can talk on a channel at a time, one slow client can significantly degrade performance as other clients wait for access to that channel.

UNPREDICTABLE PERFORMANCE = USER DISSATISFACTION

Because clients have a narrow perspective on the network and different clients behave differently, WLAN performance can be unpredictable.

Consequently, IT staff must field calls from unhappy users with performance problems, which increases help desk and support costs, and can lead to unnecessary spending on WLAN and wired gear in an attempt to improve service.

Users should have predictable WLAN performance no matter which type of client they use. However, IT is in no position to micro-manage client capabilities such as band selection, client distance from an AP, AP load and other parameters needed to match a given client to the right AP.

Client-based software solutions are also problematic because they may not be available for all operating systems or compatible with all client hardware, and they can be very difficult to install in bring your own device (BYOD), education and other highly dynamic environments.

In addition, client-based software requires vigilant version control, which is virtually impossible to manage in today's diverse and rapidly changing client environments.

POOR ROAMING ALGORITHMS AND STICKY CLIENTS

Once attached to an AP, clients tend to stay attached – even when users begin to roam and the WLAN signal weakens.

As a result of this stickiness, performance for mobile users and clients often degrades, dragging down overall network throughput. Even a client capable of fast data rates must drop back to a slower rate if its user moves far from the AP serving that client.

INCREASING CLIENT DIVERSITY

The number and type of smartphones, tablets, laptops and other clients that connect to WLANs continues to rise as new generations of clients arrive on the market.

These clients are quite diverse, with different operating systems and WLAN chipsets, resulting in a variety of connection speeds (ranging from 11 Mb/s to 1.3 Gb/s), roaming behaviors, band preferences (2.4 or 5 GHz) and other capabilities.

This diversity impacts WLAN performance because slow clients, like slow cars on a highway, require everyone to slow down. So if an 802.11ac client connects to an AP with a weak signal, its performance will be slow, forcing other clients to wait before they can send or receive data.

AP SIGNAL AND LOAD

Because clients (especially smartphones) tend to attach to the strongest AP they hear, a given AP can become overloaded. And clients will continue to attach to an already overloaded AP simply because it's the first or strongest signal they detect.

This is a common problem in lobbies, auditoriums, cafeterias and other locations where users congregate. Clients attached to an overloaded AP experience poor performance and, due to client stickiness, performance can degrade even as users leave the area.

In contrast, the WLAN infrastructure, with its system-level view of the network and ability to monitor clients, is ideally suited to manage client connectivity. That's why Alcatel-Lucent WLAN ClientMatch technology puts the infrastructure in control of client connection decisions.

Network control over client behavior

ClientMatch monitors each client's capabilities and connection on a WLAN, matching every client to the best radio on the best AP. By consistently monitoring each client, ClientMatch can react to client behavior at the time of connection and as client and network conditions change.

For example, if a client moves into another AP's coverage area or if interference causes performance to drop, ClientMatch will automatically move the client to an AP or channel that can deliver better performance.

ClientMatch leverages industry standards to accomplish its monitoring and control functions, including the 802.11k and 802.11v standards. As a result, IT is assured of interoperability with no additional overhead.

All standards-based clients work with ClientMatch; no proprietary client software is required. For clients that do not yet support newer standards, Alcatel-Lucent WLAN provides a proprietary solution that ensures ClientMatch supports all clients on a WLAN.

By taking a system-level approach to client connectivity, ClientMatch can:

- Create a holistic view of each client by leveraging all the APs on a network to dynamically gather information on a client's capabilities and behavior, such as signal strength and channel utilization
- Aggregate and share client information across APs, and coordinate APs to consistently connect each client to the AP that best meets its needs

Many WLAN vendors offer limited client control, in which APs that are overloaded, for example, can actively discourage clients from attaching. In contrast, ClientMatch is aware of every client connected to every AP and directs each client to a specific AP based on its connection needs.

To illustrate, a client might not know that it is connected to an AP that's very busy while a lightly loaded AP is only 15 feet away, or that a nearby AP has a stronger signal.

ClientMatch is aware of all these characteristics and automatically moves a client to the optimal AP, adjusting dynamically to deliver consistent, predictable performance to everyone on the network.

ClientMatch capabilities

ClientMatch features a number of capabilities that enable it to pair clients and APs, including:

- Band steering
- Client steering
- Dynamic load balancing

BAND STEERING

If a dual-band-capable client attempts to connect to a 2.4-GHz radio on an AP with a 20-MHz channel, ClientMatch will steer the client to an available 5-GHz radio with a 40-MHz channel and good signal strength, taking advantage of the client's capabilities to double its throughput.

CLIENT STEERING

When a client attempts to connect to an AP that provides sub-optimal performance, ClientMatch uses client steering to direct that client to a better AP. For example, if a client connects to an AP with a weak signal, ClientMatch will steer that client to an AP with a stronger signal.

The floor plan in Figure 2 shows an unhealthy client (red), which ClientMatch will automatically steer to a better AP and radio to optimize overall performance.

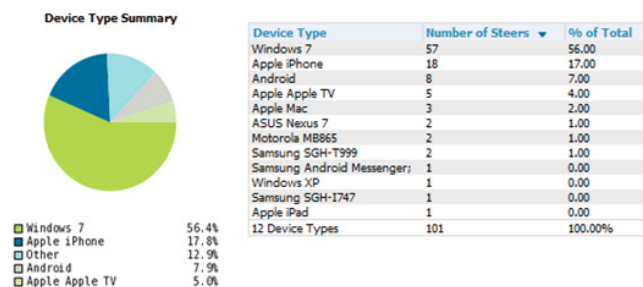
Figure 2. An unhealthy client



Likewise, if a user begins to roam, ClientMatch will move that client to another AP to maintain optimal performance. ClientMatch focuses on optimizing the lowest performing clients. For example, only unhealthy clients are moved, such as a user experiencing interruptions on a call due to dropped packets.

The ClientMatch report (see Figure 3) shows sticky clients that were steered, how many times they were steered and why they were steered.

Figure 3. A ClientMatch report



DYNAMIC LOAD BALANCING

ClientMatch addresses client density and stickiness problems by dynamically distributing clients across available APs and channels, ensuring that individual APs aren't overtaxed and client performance is continually maximized, even in dense environments.

Table 1. ClientMatch features and benefits

ClientMatch FEATURE	BENEFIT
Band steering: Moves 5-GHz-capable clients to a suitable 5-GHz-capable AP for higher performance	The 5-GHz band offers better noise immunity, less interference and more available channels.
Client steering: Continuously monitors client health and steers clients to the appropriate AP to boost performance	When a client attempts to connect to an AP that provides sub-optimal performance, ClientMatch uses client steering to direct that client to a more suitable AP and continues to monitor the client even after the client is connected if the connection becomes sub-optimal.
Dynamic load balancing: Avoids overloading a single channel or AP by evenly distributing clients across available channels in a given area	Improves the performance of associated clients by preventing a single AP or channel from becoming overloaded.

An exceptional WLAN experience

Just a handful of poorly behaved clients can have a significant negative impact on WLAN performance. By optimizing client connections, ClientMatch delivers numerous benefits, including:

- Faster network connections for individual clients, which translates to better overall performance for everyone
- Vastly improved performance for roaming smartphones, tablets and laptops
- A standards-based solution that works with all client types, including 802.11abg, 802.11n and 802.11ac clients; there's no need to purchase new clients or install new software
- Automatic operation, so there's nothing for IT to configure, monitor or manage
- Continuous optimization of client connections by the network, so overall network capacity and performance remain consistent and help desk calls are dramatically reduced due to a better user experience

With ClientMatch, WLAN performance gets a significant boost and users get predictable, consistent performance, no matter what type of client they use.

Table 1 shows the features and benefits of ClientMatch.