WIRELESS PERFORMANCE MANAGEMENT

SUMMARY OF FEATURES

INTELLIGENT WIRELESS OPTIMIZATION

- AUTOMATIC SENSITIVITY DETECTION
- DYNAMIC CHANNEL SELECTION
- DYNAMIC LOAD BALANCING
- MULTICAST TO UNICAST CONVERSION

HIGH DENSITY WI-FI

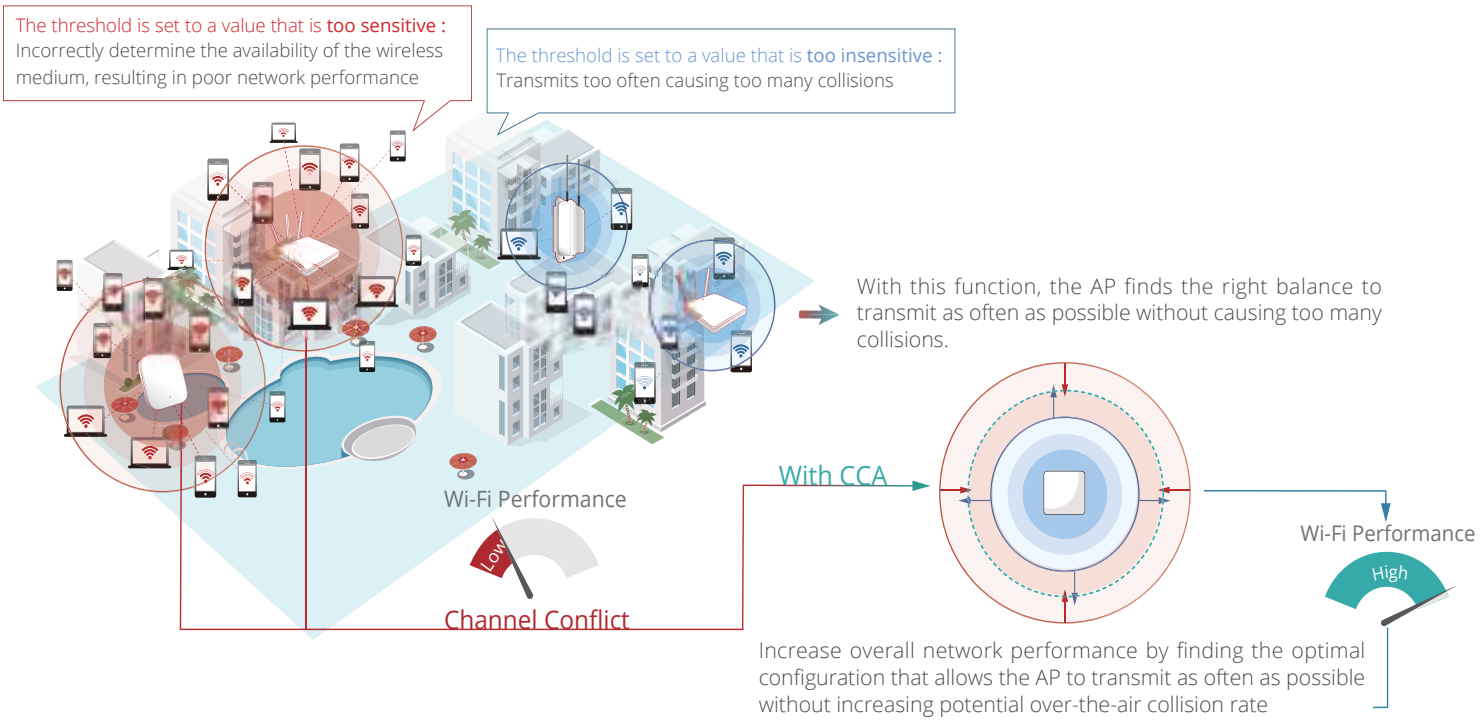
- BAND STEERING
- AIRTIME FAIRNESS
- OPTIMAL CLIENT FILTERING
- FAST ROAMING

ADVANCED WIRELESS COMMUNICATION

- WIRELESS QOS
- BANDWIDTH CONTROL

AUTOMATIC SENSITIVITY DETECTION

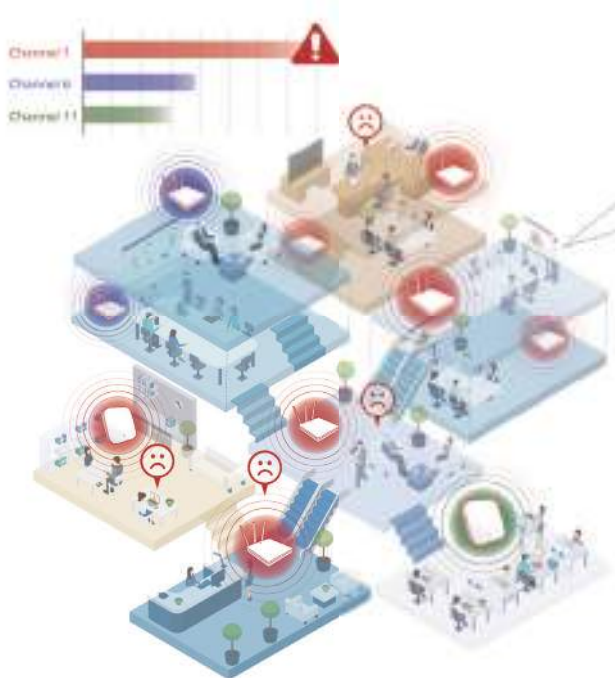
Clear Channel Assessment (CCA) is a feature that allows access points to modify their sensitivities for detecting nearby devices transmitting in the same frequency. If the CCA threshold is set to a value that is too sensitive, the AP will often incorrectly determine the wireless medium as busy (even though in actuality transmissions can be made), resulting in poor network performance and dropped packets. On the other hand, if the threshold is set to a value that is too insensitive, the AP will attempt to transmit even when there are other valid transmissions occurring nearby, causing increased packet collision rate and retransmissions. Finding the optimal value can be challenging, but with Edgecore APs network administrators can simply enable the built-in algorithm that automatically selects the optimal configuration based on the characteristics of the surrounding wireless environment.



DYNAMIC CHANNEL SELECTION

As Wi-Fi operates in an unlicensed spectrum, it is virtually impossible for most venues to have complete control over what devices are transmitting in the spectrum. For example, multiple operators may install independent Wi-Fi networks in the same shopping mall, or public Wi-Fi from an adjacent outdoor deployment may leak into the mall due to its high-power configuration. In these scenarios if no adjustment is made to the mall's AP configurations, the entire network performance may deteriorate.

With Edgecore, network administrators do not need to adjust the configuration manually - Edgecore's Dynamic Channel Selection allows each AP to intelligently monitor co-channel and adjacent channel wireless utilization, and if pre-defined thresholds are met, the AP will automatically seek out a new operating channel with the best performance.



Your existing access point is operating on channel 1, and (unfortunately) your next door neighbors install new access points configured also to operate on channel 1. While channel 1 may have been reliable in the past, it is now too congested, leading to deteriorated Wi-Fi performance to the point where even simple web browsing is difficult.

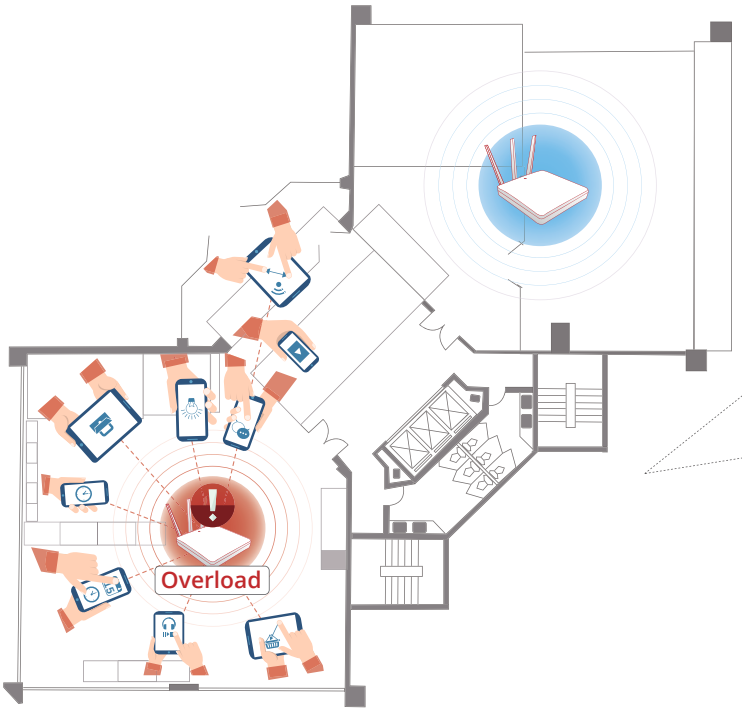
Edgecore provides automated tools for adjusting AP configuration to address this issue and to find the clearest operating channel

Dynamic channel selection allows the AP to automatically detect exceeding thresholds for co-channel and adjacent channel interference in response, determines that channel 11 is now the most optimal operating channel.

DYNAMIC LOAD BALANCING

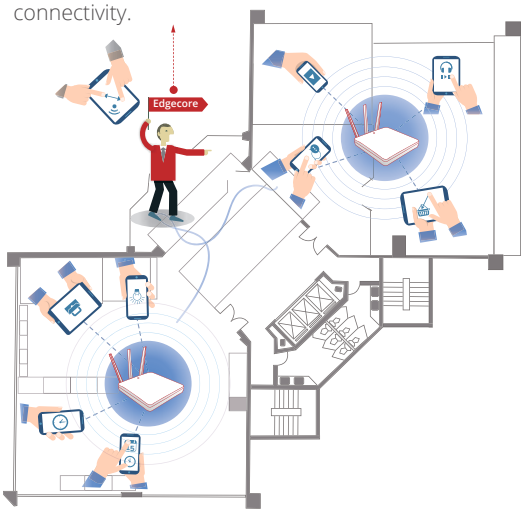
Imagine you have two access points providing coverage for a lobby area. As people enter this area through the front door, their Wi-Fi devices will automatically associate to the AP showing the stronger signal at the point of entry. Before long, this AP will become overloaded with too many connected devices, while the other AP is still relatively idle. What follows is service degradation and a poor wireless experience, as all the devices are competing for transmission and airtime on the same AP (same frequency).

When deploying the combination of Edgecore gateway-controllers and Edgecore APs, network administrators can easily avoid these unpleasant experiences by utilizing Edgecore's dynamic AP load balancing to automatically adjust each AP's transmit power according to the current connected devices status. When a particular AP in a load balancing group is overloaded, it's transmit power will be adjusted lower relatively to other APs in the group so that new devices are steered to associate to the other APs. As users come and go, the system will continually reassess current client status and make adjustments to improve overall network performance. Lastly, combining this feature with RSSI and transmit rate thresholds provides the added effect of being able to actively move clients to the other AP.



Automatically steer devices to the most suitable access point in range depending on connected capacity, balancing the load across multiple APs.

As users come in the venue, the AP closer to the entrance will naturally be preferred by devices due to the stronger signal strength. As a result, all the devices are trying to transmit on the same frequency, causing slow Wi-Fi connectivity.



MULTICAST TO UNICAST CONVERSION

In Wi-Fi networks, multicast packets are typically sent at slower rates to ensure that devices at the edge of an AP's cell are able to receive the packets without error. This may be useful in environments where most clients are at further distance from the AP. However, if the cell size is very small and most clients are densely packed around the AP, this would be an inefficient use of airtime.

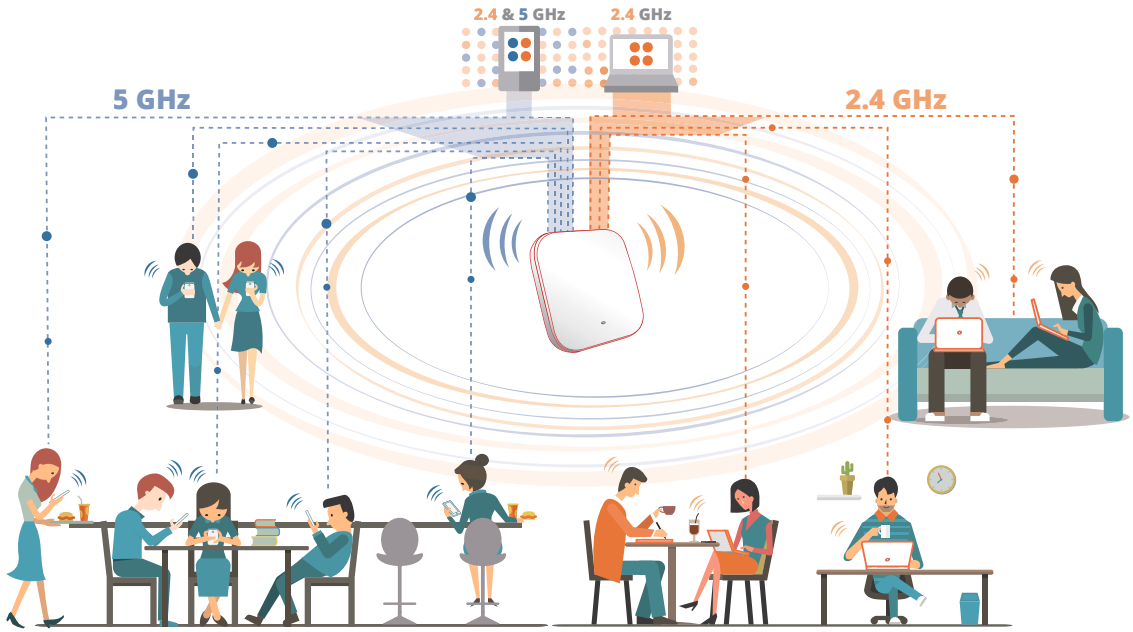
Multicast to Unicast conversion is a method that Edgecore APs employ to convert multicast transmissions to unicast so that they can be sent at unicast rates. When clients are close to an AP, high transmission rates can be more easily sustained, and thus unicast is more efficient. On the other hand, attempting to use the same rate with clients far away from the AP will lead to a high number of retransmissions, which lowers efficiency. As a result, Multicast to Unicast Conversion is not a universally beneficial feature in all deployment scenarios – it merely allows network administrators to optimize performance based on how clients are spatially distributed around APs.

Multicast to Unicast conversion is ideal in environments where the majority of clients are densely packed around APs.

BAND STEERING

In today's wireless environment, the 2.4 GHz frequency band is becoming increasingly congested due to the limited spectrum and widespread adoption of mobile devices. With most access points offering dual-band dual-radio architectures, and most client devices having both 2.4 GHz and 5 GHz Wi-Fi capability, it is natural to shift clients to connect to 5 GHz with higher priority for a better wireless experience.

Band steering is a feature in Edgecore access points that provides this functionality and helps to offload the congestion on 2.4 GHz. When enabled, the AP will preferentially associate client devices to the 5 GHz radio if the device supports both 2.4 and 5 GHz.



AIRTIME FAIRNESS

As networks migrate rapidly to newer wireless standards, network operators are increasingly struggling with the tradeoffs between legacy client support and wireless performance.

Airtime Fairness is a feature that allows networks to mitigate the decrease in performance incurred by supporting legacy clients, which naturally require longer airtime to complete the same amount of data transmission. Edgecore access points support two Airtime Fairness options, depending on the needs and preferences of each deployment:

1. Fair Access – all devices, regardless of wireless standards supported, obtain roughly the same amount of airtime. If a client occupies the wireless medium for a longer period of time in one transmission, then subsequent transmissions are placed on a lower priority, ensuring that overall airtime distribution is balanced.

2. Preferred Access – clients with newer wireless standards are given a slight preference. Legacy clients are not blocked from the network, but they will be allocated less airtime. This option is ideal for organizations that wish to optimize network performance while still supporting older clients.

Without Airtime Fairness

When legacy clients (bicycles) are transmitting (moving), all other clients (motorcycles and cars) have to wait for the legacy client to finish transmission. This results in a decreased overall network throughput, as the total quantity of data transmitted (vehicles) between the transmitter and receiver is decreased. However, it's also not feasible to completely disallow legacy clients access to the network.

Herein lies a dilemma:

With Airtime Fairness

The following two options can be selected:

1. All clients obtain the same amount of airtime
   (for example: bicycles must leave the road every minute to let cars and motorcycles pass)

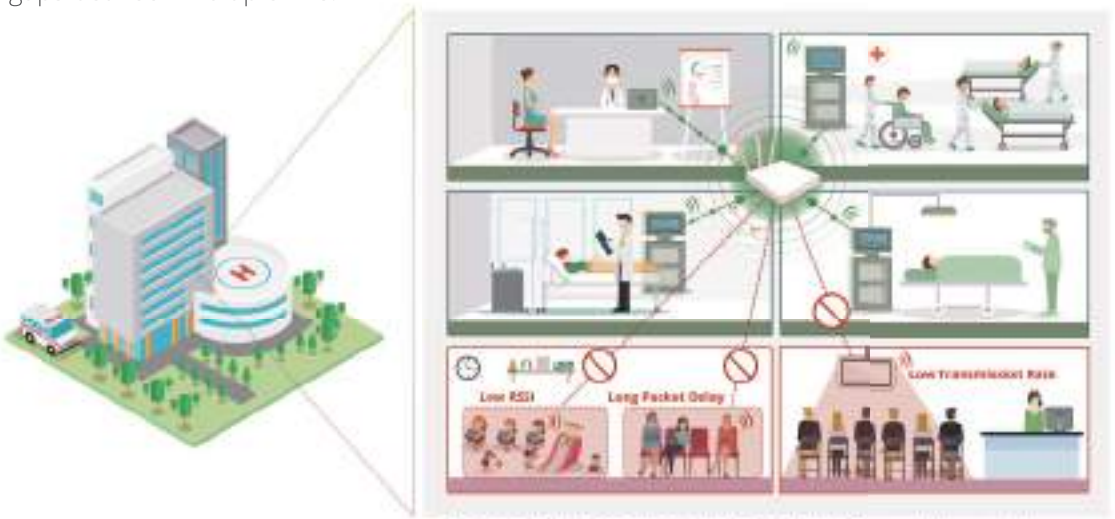
2. Clients with newer Wi-Fi standards are given a slight preference in airtime.
   (more cars are allowed on the road than bicycles)

With both options, administrators are able to increase overall network throughput without sacrificing the support of legacy clients.

OPTIMAL CLIENT FILTERING

For a wireless network to perform optimally, devices should connect to APs that offer them best connection quality. Edgecore's Optimal Client Filtering is a set of thresholds that help Edgecore APs filter out clients that will negatively impact the AP's overall throughput. With thresholds such as Dropped Packet Threshold, Transmission Rate Threshold, and Receiving RSSI Threshold, the AP is able to remove clients that have poor connectivity. This ensures that all clients connected to an AP have an acceptable connection quality, minimizing the number of packet retries and increasing airtime efficiency.

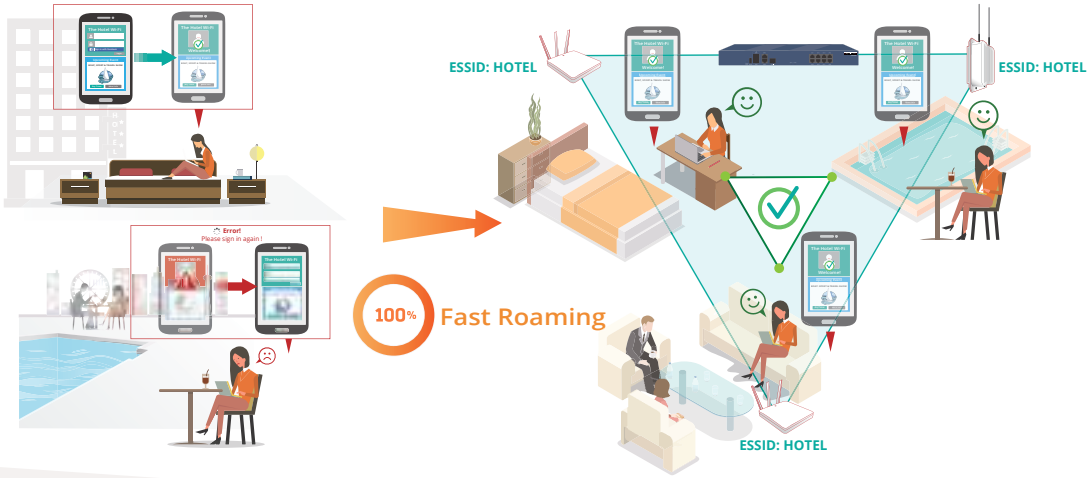
One of the most common reasons for Wi-Fi networks experiencing slow performance, dropped packets, or dropped connections is because there are too many clients associated to the AP, but with a connection strength that is far too weak. In these situations, network administrators can fine-tune each threshold value to find the configuration that ensures optimal wireless performance, without inducing wireless coverage gaps between multiple APs.



- Filter out clients that will negatively impact the AP's overall throughput.
- Enable a set of Optimal Client Filtering thresholds → such as Dropped Packet Threshold, Transmission Rate Threshold, and Receiving RSSI Threshold.

FAST ROAMING

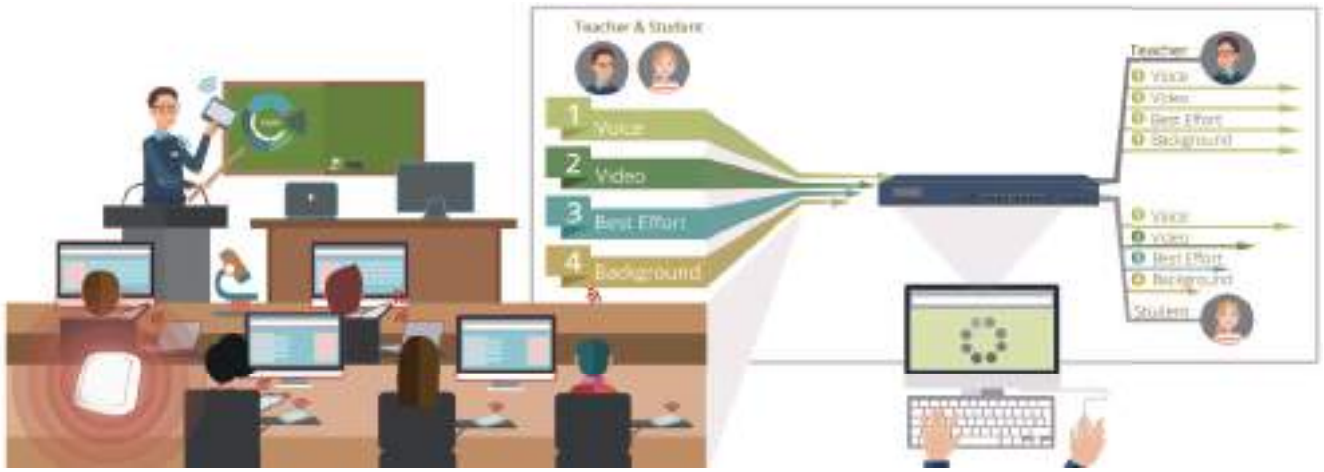
Fast roaming, also known as IEEE 802.11r, allows a client device to roam quickly between access points by completing the initial handshake between the device and the new AP before the client even arrives at the new AP. Due to the reduction of handshake overhead, the time required is significantly reduced, which is especially important for sensitive and mission-critical applications such as voice and video.



WIRELESS QOS

Wi-Fi Multimedia (WMM) provides fundamental Quality of Service (QoS) functionality to wireless networks by increasing the performance of differentiated wireless traffic, such as audio, video, and traditional application data. Based on the needs of each type of data, they are placed in one of four different queues, BE (Best Effort), BK (Background), VI (Video), and VO (Voice). WMM assigns shorter or longer average back-off periods to each of the four queues, which in essence gives each queue a different priority. The queue with the shorter average random back-off period (e.g. Voice) will forward traffic faster and more easily (with higher priority) than queues with longer average random back-off periods (e.g. Best Effort).

On Edgecore access points, traffic is automatically prioritized and placed into one of the four queues based on its 802.1p priority tag or Differentiated Services Code Point (DSCP) value. Along with the traffic remarking function on Edgecore gateway-controllers, network administrators have a complete arsenal of tools at their disposal to guarantee reliable, latency-free operation of mission-critical applications.



BANDWIDTH CONTROL

The bandwidth control functionality of Edgecore's solution allows network administrators to allocate a fixed amount of network bandwidth to a particular SSID or a specific group of users. This is especially crucial in deployment locations where bandwidth is limited or expensive, and can also help to avoid situations where individual users consume the entire network bandwidth when downloading large content or using P2P applications.

For example, a hotel may have a pre-defined bandwidth (e.g. 100M) from the ISP, and wish to allocate that bandwidth to employees and guests to ensure a minimum service level for both groups of users. If the two groups of users are connected to two different SSIDs in the wireless network, then bandwidth control for SSID can be applied. If the two groups of users are all connected to the same SSID, then the network administrator must enable role-based bandwidth control, available as a feature when the access points are deployed together with Edgecore gateway-controllers.