

BelAirOS Very High Capacity and Interference (VHCI) Module

Cable operators are deploying Wi-Fi to help them attract and retain broadband subscribers while mobile carriers increasingly using Wi-Fi to offload traffic from their 3G networks. In both cases, the key objective is to deliver a great user experience. Service providers can quickly deploy and integrate BelAir Networks Access Points (AP) to address any Wi-Fi deployment scenario. However, providing a great user experience in venues with a very high user concentration, such as popular music festivals and packed stadiums presents a unique challenge requiring high capacity coverage in an area subject to high levels of interference. These applications have user densities up to 10 times that found in the busiest enterprise WLAN settings!

To enable service providers to address the opportunities and challenges of serving a high density of users within a relatively constrained area, BelAir Networks has developed the BelAirOS Very High Capacity and Interference module. BelAirOS VHCI encompasses software features – such as modulation control, adaptive cell size control and AP load balancing – as well as network planning guidelines, and monitoring and management features that deliver high throughput while minimizing interference and its effects.

Architecture

BelAir Networks uniquely enables the complete control of all traffic optimization and interference mitigation related functions across all of its APs, regardless of the type of network or the venue in which it operates. BelAirOS VHCI enables the combination of active and passive features co-ordinated with best of breed centralized BelView NMS to allow full control and monitoring of both access and backhaul radio settings related to the venue coverage.

There are a number of variables that impact a service provider's ability to deliver the highest throughput to the maximum number of users while minimizing interference. VCHI enables these variables to be optimized to address



the demands of a specific venue, whether for temporary events or permanent deployments. VHCI functions include:

- Controlling the size of the cell
- Controlling self-interference
- Improving system ability to operate under interference
- Minimizing packet collisions in the air
- Automating and adapting settings to the real time system needs
- Real time visibility of the network performance
- Network design for capacity

Features

There are a number of features related to the AP that are incorporated into the VHCI module. These features ensure that the network can operate at the highest capacity, in terms of users and throughput, while reducing interference from other APs and outside factors. These features include:

Rate Adaptation

When activated, the VHCI Rate Adaptation feature assumes that an interference problem is caused by collisions, which is often the case in high user density

locations, rather than excessive noise. Results show dramatic improvement in modulation rates in high collision areas like stadiums and venues.

Address Resolution Protocol (ARP) to Attached Clients Only

This feature prevents the radio from forwarding ARP requests for IP addresses that are not in use by an attached client. Transmitting the ARP when we know no client will respond is a waste of bandwidth.

Admission Control

The maximum number of associated clients per radio is operator configurable. If the number of associated clients exceeds the configured value, new clients are not allowed to connect. Clients that fail to connect to other APs and repeatedly try to connect to this radio will be associated after three retries.

Radio Sensitivity Control

This feature blocks some clients from associating if their Received Signal Strength Indication (RSSI) is below a threshold value. In high usage areas, clients can often see multiple APs. The intent is to prevent clients who will be forced to use a low modulation rate from connecting to a distant AP.

Broadcast Filter

This feature limits the types of multicast and broadcast traffic passed through the AP. In the incoming (from the client) direction, the only group addressed messages required are ARP, Dynamic Host Configuration Protocol (DHCP) request, and DHCP discover. In the outgoing (to the client) direction, the only group addressed messages required are ARP and DHCP. All other protocols will be dropped when this filter is enabled.

Other key features that are part of the VHCI include:

- Ignore Foreign RX frames
- Aggregation Disable for 802.11n Clients
- Management Frame Modulation Control
- Ethernet broadcast Frame Modulation Control
- Auto RF Power
- ARP Proxy

BelView

BelView Network Management System (NMS) ties it all together, enabling service providers to set and monitor parameters for the VHCI module. BelView is a comprehensive software package that allows network operators to easily adjust the VHCI feature settings to optimize the network for their specific requirement and provide a real time view of the results of the changes to ensure that the end clients are getting the optimal user experience.

These VHCI features are available across the entire network, built with any combination of BelAir Networks APs, and all managed using one BelView NMS. BelView NMS uses the latest GIS-based mapping software and GPS information to set-up and support management of the network – maximizing utility while minimizing cost.

Regardless of the size and type of network, access means, deployment type, or business model (retail and/ or wholesale), the BelAirOS VHCI provides the features and functionality to address carrier-grade capacity requirements in very high traffic venues.



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