

Airvenue Cellular LAN Architecture

For most applications, WiFi access points typically provide connections to devices in a 100 ft (30 m) radius. To cover a wider area, additional indoor access points are required. These access points have to be interconnected. They require cables, switches, routers and power and, as a result, the wireless network is no longer wireless.

The Airvenue approach to wireless networking changes all that by eliminating the need for all those access points, wires and switches.

Combine the Best of Cellular Networks and Wireless LAN

Airvenue advanced wireless networking solutions are designed around WiFi, WiMAX and cellular technologies and are optimized for high density hot zone and metro deployments.

They are built on a cellular LAN architecture, which integrates wireless access with wireless backhaul in an innovative multiple point-to-point mesh to provide a high-capacity wireless backbone.

Like a cellular network, the Airvenue cellular LAN architecture provides wide area coverage and long reach, and enables the creation of cell-based networking solutions. And like a WLAN, it incorporates an open IP architecture and standards-based WiFi technology that enables the deployment of large-scale wireless networks.

The complete Airvenue offering simplifies wireless infrastructures and delivers unmatched coverage, capacity and deployment flexibility for high capacity data, video and voice services.

Most importantly, the Airvenue cellular LAN offers the lowest-cost network deployment for large wireless LANs, and is the only system that can deliver WiFi access over large areas in dense urban environments.

Integrated Access and Backhaul

The Airvenue cellular LAN mesh is created with modular internetworking platforms that are designed for outdoor deployment to provide coverage over large areas and into buildings. These broadband platforms are built around a high-performance network processing core, multiple WiFi access and backhaul modules and an open, embedded software environment.

The multiple backhaul radios in each platform are configured for multiple, secure, point-to-point links that provide wireless backhaul in the Airvenue cellular LAN architecture. Each platform can connect to multiple others and the combined connections form a wireless mesh.

The advanced radio and antenna techniques used by Airvenue enable multiple radios to operate in a single package without degradation of performance. Integrated access radios allow for full WiFi point-to-multipoint access at every point.

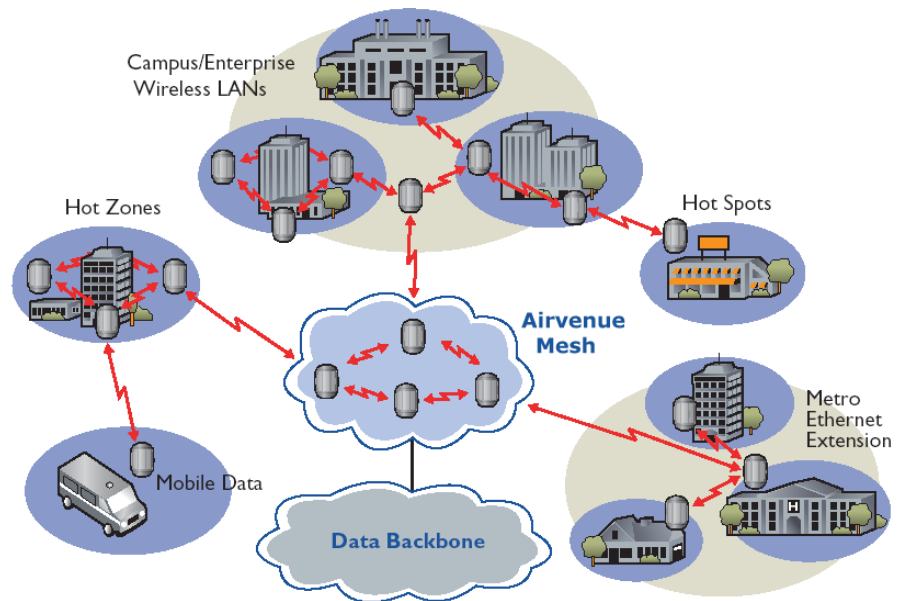
Reliable and Scalable Mesh Architecture

There are no extra switches, routers or cables required to connect multiple BA200 platforms. The backhaul radio modules form a fully meshed wireless backbone that provides carrier grade network level redundancy to ensure service availability without operator intervention.

This multiple point-to-point mesh is not a shared network. The backhaul radios that form the mesh operate in a different frequency band from the WiFi access radios. This allows both the wireless access and backhaul networks to operate independently and at full speed.

The multiple point-to-point links also make interconnecting BA200 platforms much simpler and more cost-effective than conventional point-to-point mesh architectures. So as more BA200s are added to the network, system capacity increases.

Capacity, scalability and reliability are also enhanced because the Airvenue mesh architecture supports multiple, full duplex, exit points. In addition, wireless routing with load balancing and alternate paths are used to enhance system availability and provide a self-healing network.



Airvenue Multiple Point-to-Point Cellular LAN

Automatic Antenna Selection Simplifies Deployment

Each Airvenue broadband platform supports backhaul coverage in all directions using antennas in a circular array. The antennas have a high gain and a narrow horizontal beamwidth, which, together with enhanced radio performance, provides significant reach extension.

To get the full benefits of point-to-point radios with directional antennas and to simplify deployment, the Airvenue solution automates antenna beam selection on the backhaul. This eliminates the need to have the installer manually point antennas in the right direction.

The three backhaul radios can automatically connect to any one of the eight backhaul antennas with no need for manual pointing. The selection is done under software control via Airvenue autoantenna selection algorithm.

Connectors are also available for optional external antennas to extend reach further, if required.

5-10x More Capacity, 5x More Range

Airvenue cellular LAN delivers guaranteed backhaul performance for throughput and latency. This contrasts with multipoint mesh approaches where the capacity is drastically reduced as the number of users increases.

A typical multipoint mesh uses a single radio channel with omnidirectional antennas and as such it has extremely poor frequency reuse. The Airvenue cellular LAN uses three independent channels, each with highly directional antennas, which allows for excellent frequency reuse.

Also, the Airvenue cellular LAN does not share spectrum for access and backhaul, further improving capacity.

As a result of these innovations, the Airvenue cellular LAN architecture provides five to ten times more radio capacity compared to traditional multipoint mesh backhaul solutions.

In addition, directional antennas used in the Airvenue cellular LAN add 15 dB to the backhaul link budget. This allows the multi-service platforms to operate at distances five times greater than traditional multipoint mesh systems.

High System Availability

System availability in a Airvenue cellular LAN architecture is ensured through a combination of techniques.

The radio environment is constantly changing, and the radios adapt to these changes on a packet-by-packet basis. In addition, dynamic power and data rate changes on individual radio links compensate for radio effects such as fading and shadowing.

Radio-aware routing algorithms choose the best route for traffic through the cellular LAN based on a number of relevant metrics, such as available capacity, latency and radio link performance. Where standard routing approaches would be inadequate in chasing the changes in the radio environment, the Airvenue cellular LAN adapts itself to maintain a stable traffic flow.

To increase system up-time and minimize traffic outages, traffic from each multi-service platform can be load balanced across a minimum of two routes to reduce the impact of link congestion and failure. Alternate paths are continuously calculated and refreshed so that seamless re-routing of traffic can occur with minimal packet loss in the unlikely event of a link failure.

The Airvenue cellular LAN topology is updated on a continuous basis, enabling the network to self-heal if a mesh point stops functioning. New platforms can be incorporated into the network automatically, without complex operator intervention.

A network can be deployed with a single egress point (point of presence) in the early days, and as usage increases, additional egress points can be added for increased capacity and redundancy through multi-homing. This enables operators to scale their network as appropriate for the service level they wish to provide.

State-of-the-Art Security

The Airvenue cellular LAN is fully secured using peer-to-peer authentication over secured encrypted pipes. Every platform is mutually authenticated to prevent rogue devices from entering the network. State-of-the-art TKIP and 802.1x schemes have been optimized by Airvenue for this application. Either is available depending on the network's existing infrastructure.

Although the backhaul technology shares some elements with 802.11a, Airvenue backhaul radios cannot be seen as 802.11a devices by other radios or sniffing devices.

Capacity and Coverage As Needed

The Airvenue solution is a totally new approach to wireless networking that allows operators to easily deploy access capacity and coverage where and when needed.

The patented, multiple point-to-point mesh is designed to overcome the limitations associated with traditional hot spot WLANs and deliver ubiquitous, high capacity data, video and voice services. This enables the creation of large-scale WiFi networks for today and tomorrow.