

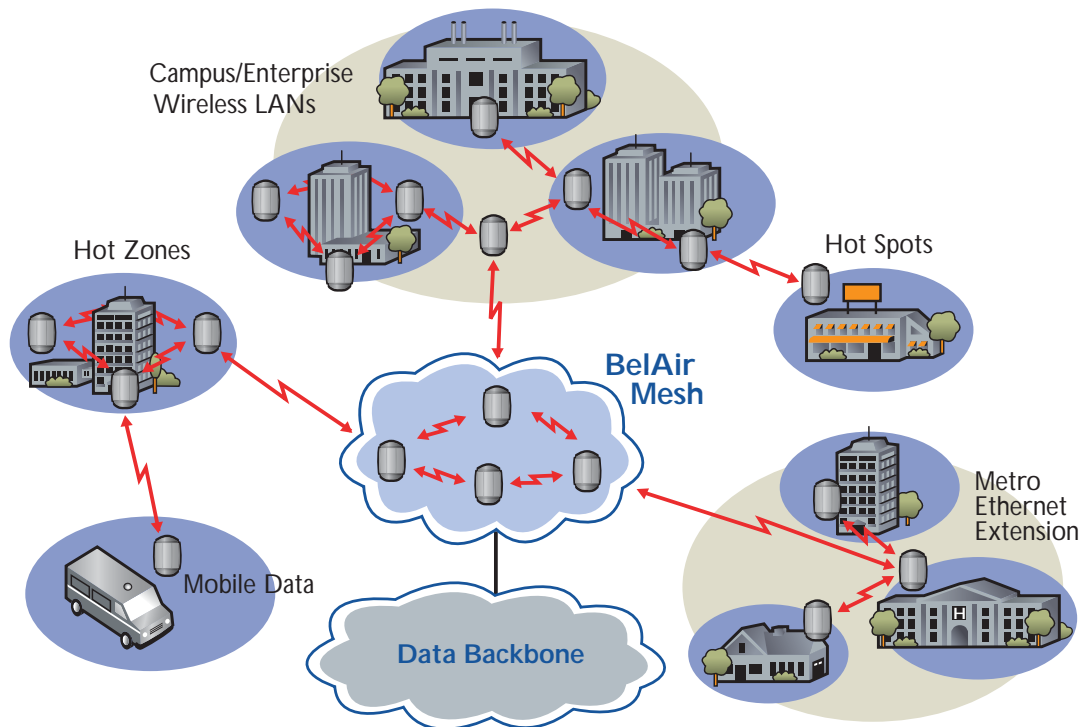
## BelAir Networks Cellular LAN Architecture

The driving force in networking today is freedom. Enterprises and service providers are searching for ways to extend the reach of existing infrastructures and improve productivity by providing untethered access to wired networks—at the office and from anywhere around the world.

To address this need, enterprises and service providers are deploying Wireless Local Area Networks (WLANs) with Wi-Fi equipment that promises freedom of access in hot spots and in key corporate locations.

But current wireless networking options are complicated and costly. Multiple access points, endless feet of cable to and from switches and routers, security issues and maintenance requirements create costly deployment nightmares that complicate the road to wireless freedom.

For most applications, Wi-Fi access points typically provide connections to devices in a 100 ft radius. To cover a wider area, additional indoor access points are required. These access points have to be interconnected. They require cables,



BelAir Networks Multiple Point-to-Point Cellular LAN

switches, routers and power and, as a result, the wireless network is no longer wireless!

The BelAir Networks cellular LAN architecture eliminates these complications and simplifies WLAN deployments.

## Combine the Best of Cellular Networks and Wireless LAN

BelAir Networks mobile networking solutions combine the best of WLAN and cellular technologies. They are designed to overcome the limitations associated with traditional hot spot WLANs and deliver ubiquitous, high capacity data, video and voice services.

To accomplish this, BelAir Networks uses a patented, multiple point-to-point mesh backhaul architecture that provides the most robust and cost-effective solution for medium- and large-scale WLAN networks.

Like a cellular network, this architecture is designed for outdoor deployment. It 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 Wi-Fi technology that enables the deployment of cost-effective private and profitable public cellular LAN networks.

Most importantly, by combining the best of cellular and WLAN networking, the BelAir Networks cellular LAN offers the lowest-cost network deployment on the market.

## Integrated Access and Backhaul

The core of a BelAir Networks cellular LAN is created with multi-service platforms, which beam

signals into buildings from the outside. These multi-service platforms are built around a high-performance network processing core, multiple Wi-Fi access and backhaul modules and an open, embedded software environment.

The multiple radios in each platform are configured point-to-point with directional antennas. Each platform can connect to multiple others and the combined connections form a wireless mesh.

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

There are no extra switches, routers or cables required to connect multiple cellular LAN platforms. The fully meshed backbone provides carrier-class network-level redundancy to ensure service availability without operator intervention. It also makes interconnecting platforms simpler and more cost-effective than conventional point-to-point mesh architectures.

## Automatic Antenna Selection Simplifies Deployment

Each BelAir Networks multi-service platform supports backhaul coverage in all directions using antennas in a circular array. The antennas have a high gain and a narrow horizontal beam-width, which, together with enhanced radio performance, provides significant reach extension.

To get the full benefits of point-to-point radios with directional antennas and simplify deployment, the BelAir Networks 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 BelAir Networks patent pending auto-antenna selection algorithm.

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

## 5-10x More Capacity, 5x More Coverage

BelAir Networks cellular LAN delivers guaranteed backhaul performance for throughput and latency. This contrasts with multipoint mesh approaches where the capacity is drastically reduced with the offered load.

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

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

As a result of these innovations, the BelAir Networks 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 BelAir Networks cellular LAN add 15 dB to the backhaul link budget. This allows the multi-service

*BelAir Networks cellular LAN  
architecture provides five to ten  
times more capacity and five  
times more coverage*

platform to operate at distances five times greater than traditional multipoint mesh systems.

## High System Availability

System availability in a BelAir Networks 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 absorb fast fading and shadowing effects in the radio path.

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 BelAir Networks 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 BelAir Networks cellular LAN topology is updated on a continuous basis, enabling the network to self-heal if a platform 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 BelAir Networks 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 BelAir Networks for this application. Either is available depending on the network's existing infrastructure.

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

## Capacity and Coverage As Needed

The BelAir Networks 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 profitable public and cost-effective private, medium- and large-scale wireless networks for today and tomorrow.



BelAir Networks U.S. East  
11921 Freedom Drive  
Suite 550  
Reston, VA  
USA  
20190

703-736-8306

BelAir Networks U.S. West  
1902 Wright Place  
Suite 200  
Carlsbad, CA  
USA  
92008

760-918-5544

[sales@belairnetworks.com](mailto:sales@belairnetworks.com)

BelAir Networks Inc.  
603 March Road  
Kanata, Ontario  
Canada  
K2K 2M5

613-254-7070

[info@belairnetworks.com](mailto:info@belairnetworks.com)

[www.belairnetworks.com](http://www.belairnetworks.com)