Indoor5G™

INNOVATIVE SMART ANTENNA TECHNOLOGY

Connecting Better, Reaching Further

Vantiva

Maximizing ROI on 5G Spectrum & Network Infrastructure

Investments in 5G spectrum have been vast. In recent years, bids reached unprecedented heights, concluding with a U.S. auction that hit a peak of $81.11 billion in 2020 — resulting in the world's most expensive mid-band 5G spectrum sale to date — crushing records worldwide.

Internet service providers (ISP) that have purchased 5G spectrum now possess a crucial asset that allows them to significantly expand and enhance their service offerings — **with big opportunities to cash in on ROI**.

ISPs must now consider the next steps in building the necessary infrastructure to support 5G technology: upgrading existing towers, installing new cell sites, and ensuring that their subscribers are equipped with the latest 5G technology. A strategic aspect of that is to collaborate with hardware and technology providers such as Vantiva for the equipment necessary to deploy 5G services.

With this in mind, Vantiva engineers have developed Indoor5G™, a Fixed Wireless Access (FWA) technology that aims to improve and accelerate ROI by focusing on three objectives.

Indoor5G™ in 3 objectives:

Expand Service Reach and Enhance the Revenue per Base Station →

Improve Internet & Mobile Service Reliability by Mitigating Congestion in Low-Bands →

Enhance Customer Satisfaction, Lifetime Value, and Reduce Churn with Consistent Broadband Performance →

The Objectives of Indoor5G™

#1 Expand Service Reach and Enhance the Revenue per Base Station

The capacity to connect more households within a service area directly correlates with the revenue per 5G base station. However, the ability to serve a larger number of homes is constrained by several critical factors:

- **Bandwidth Capacity and Hardware Limitations:** Each base station possesses a finite bandwidth capacity. As more subscribers connect, the available bandwidth per user diminishes, which can lead to reduced speeds and impact service quality.
- **Signal Range and Quality:** The effective transmission range of a base station is a limiting factor in the number of subscribers it can serve. Physical barriers like buildings and trees, along with the frequency of the wireless signal, influence the distance and efficacy of signal propagation.
- **Interference:** Service quality can be severely impacted by interference from other electronic devices, competing wireless networks, and environmental conditions. High levels of interference compromise signal clarity and reduce the effective subscriber capacity of a base station.

Indoor5G™ significantly enhances these aspects by integrating high-gain, high-efficiency antennas. This advancement allows for:

- **A greater number of connected households within the 5G footprint of the base station** due to a better spectral efficiency i.e. more throughput for similar bandwidth thanks to the ability to use higher modulations, more often.

- **A wider 5G footprint around the base station by up to 40%*.**

- **Ultimately, boosted overall revenue per 5G gNode B.**

*combined with PowerClass 1.5

The Objectives of Indoor5G™

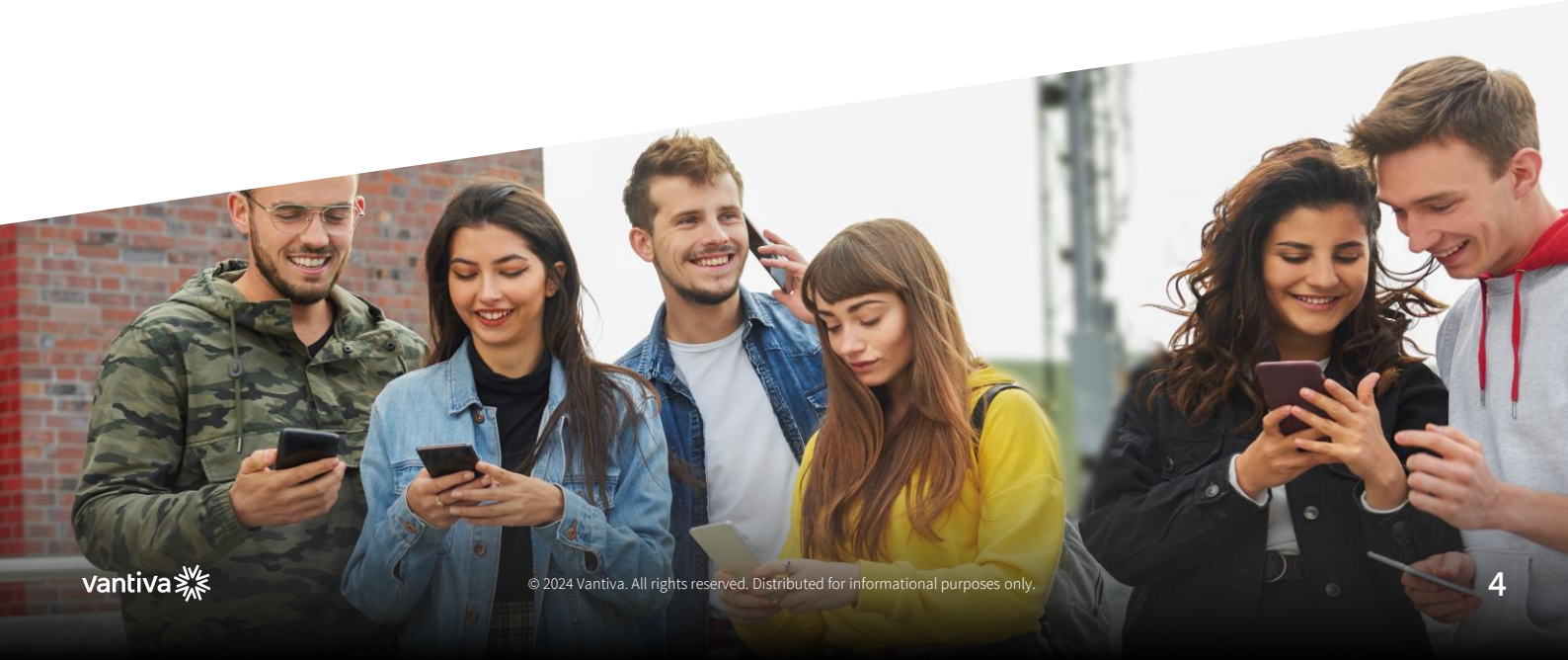
#2 Improve Internet & Mobile Service Reliability by Mitigating Congestion in Low-Bands

The 5G network operates across two groups of primary frequency ranges: the low frequencies (600-2,700 MHz) shared with 4G/LTE, and the mid-bands (n77/n78 bands, 3.3-4.2 GHz) mainly designated for 5G. Both Fixed Wireless Access (FWA) and mobile services depend on these bands for data transmission.

Mobile services often utilize the low-band, fragmented spectrum. These bands offer slower speeds but greater stability and extended coverage, making it ideal for mobile usage. Conversely, the mid-bands, with their higher speeds and lower latencies, are better suited for residential applications such as streaming 4K TV, videoconferencing, and online gaming.

However, substantial data consumption by FWA subscribers, especially during peak periods, can lead to significant network congestion. This problem is exacerbated if FWA gateway connections are suboptimal, resulting in two major issues: inefficient spectrum use, requiring more bandwidth to transmit the same amount of data, or a fallback to low-band, which risks congesting the mobile network and potentially leading to its collapse.

Indoor5G™ addresses this challenge by more effectively utilizing mid-band frequencies, thereby alleviating pressure on the low-bands. By offloading traffic from low-band frequencies, Indoor5G™ technology ensures smoother data transmission and a more consistent user experience, with faster download and upload speeds, lower latency, and better overall performance, even in densely populated areas.



The Objectives of Indoor5G™

#3 Enhance Customer Satisfaction, Lifetime Value, and Reduce Churn with Consistent Broadband Performance

One of the primary drivers of dissatisfaction among 5G Fixed Wireless Access (FWA) customers is the inconsistency in performance and connectivity. The quality of FWA services can fluctuate significantly due to various environmental factors such as building materials, terrain, and weather conditions. While some users experience satisfactory service, others encounter **persistent issues with speed and connectivity stemming from several critical areas**:

- **Design Flaws:** Inadequately positioned or standard, low-cost antennas may fail to optimally capture the signal from the base station.
- **Installation Challenges:** The effectiveness of both self-installations, guided by mobile applications, and professional installations by technicians can vary greatly. Incorrect positioning and orientation of the gateway can severely impair the speeds your subscribers achieve, detrimentally affecting your service.
- **Signal Inconsistency:** Network conditions are continuously influenced by environmental changes, meaning the optimal antenna setup at installation may no longer be ideal as conditions evolve, leading to unstable broadband connections.

Indoor5G™ strategically addresses these issues with a multifaceted approach:

Optimal Antenna Placement

Indoor5G™ utilizes high-quality antennas, smartly positioned and isolated from one another to avoid coupling and to maximize signal reception.

Simplified Installation

In addition to Vantiva's NaviGate™ 5G app for signal strength detection, we facilitate an easier installation process by ensuring coverage across a 360° radius, accommodating any space configuration.

Adaptive Technology

Indoor5G™ is designed to adapt to changing broadband conditions, ensuring consistent performance and enhancing customer satisfaction.

Read on to discover the Indoor5G™ technology in detail →

Locking In 5G Mid-Bands with Indoor5G™ Antennas

Indoor5G™ Antenna Component

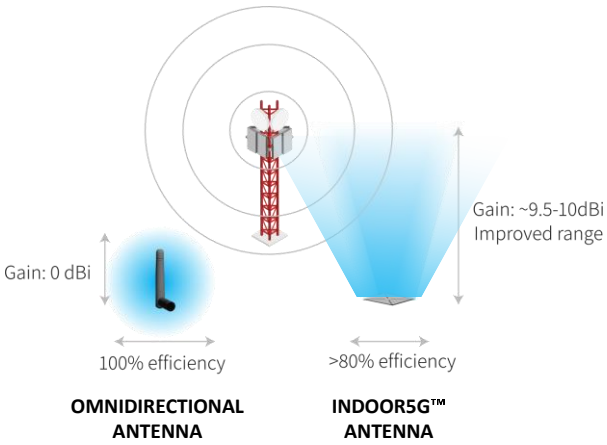
In combination with **omni-directional antennas**, Indoor5G™ relies on a new technology by Vantiva: a compact antenna component designed to offer the best high-gain/high-efficiency balance and lock in 5G signals more efficiently and at a greater distance.

The Superior Performance of Indoor5G™ Antenna Components

Indoor5G™ antennas are engineered to maximize efficiency in a compact format, measuring just 59x59 mm. Each component integrates **two antennas tuned to 3.3 - 4.2GHz, specifically designed to efficiently capture the mid-band frequencies crucial for high-speed data transmission**. This unique arrangement involves antennas that operate on different electromagnetic planes, ensuring they remain highly isolated and optimally polarized. The design includes parasitic strips and a strategically sized and positioned reflector plate. Together, **these elements focus the radiated energy forward, significantly boosting signal gain and efficiency**. This setup not only captures waves more effectively but also minimizes interference with other antennas within the CPE.

The benefits are threefold:

- the ability to pick up mid-band waves from a more distant base station and consequently **the ability to extend the service area around base stations by 40%** when combined with PowerClass 1.5 Tx Power.
- the ability to make better use of the spectrum thanks to less electric loss, fewer errors and less redundant information - and thus **serve more subscribers per base station.**
- lock-in mid-bands to **avoid running into low-bands and affecting mobile service.**



Indoor5G™ Algorithm
Where the Magic Happens

As the quality of each backhaul connection may vary overtime due to interference, network traffic, or environmental conditions, continuous optimization is key.

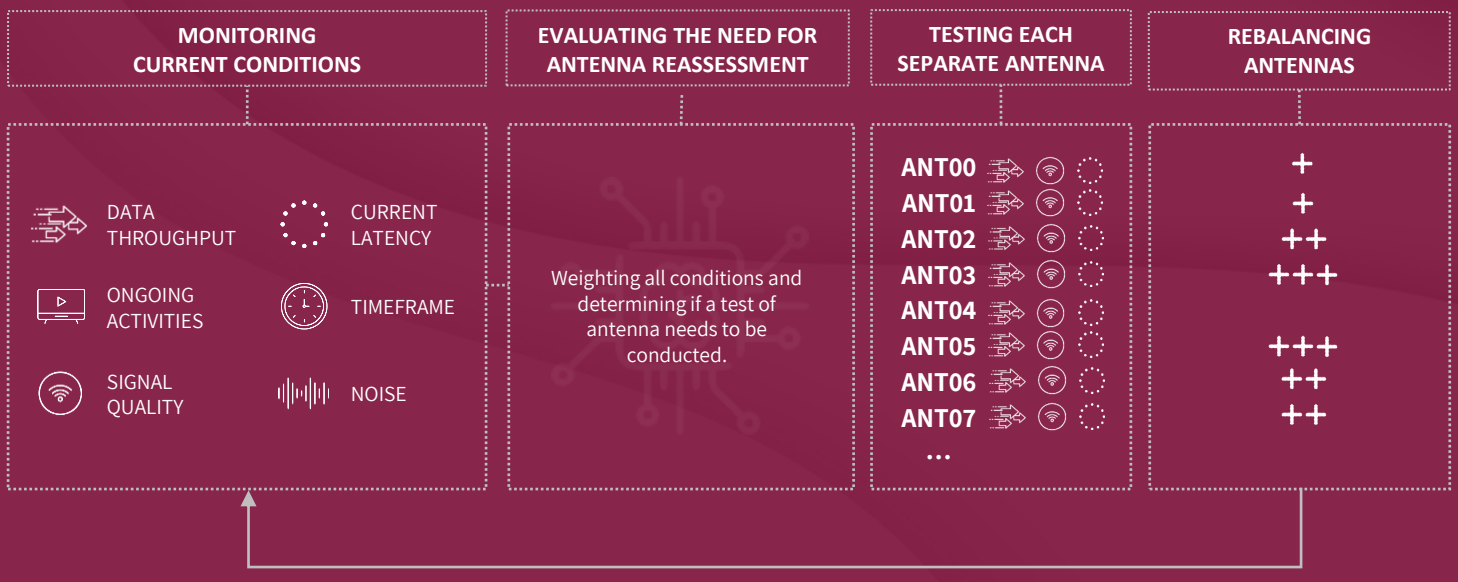
Vantiva's Indoor5G™ algorithm allows the CPE to self-optimize by automatically tuning the direction and configuration of its internal antenna system to ensure the best mid-band reception.

Indoor5G™ dynamically determines whether the CPE's WAN connection is at its best, based on a set of predefined factors, including current data throughput, ongoing activities, signal quality on each band, noise, latency, and timeframe.

Balancing all factors, if it considers that a reception quality enhancement is necessary and may be conducted without slowing down users' current activities, Indoor5G™ launches a self-conducted test of each antenna's performance, resulting in the selection, activation and setup of the most efficient ones – all transparently for the user.

The possibility of choosing from multiple antennas means that the transmission channels can be adapted in near-real-time to the prevailing conditions (weather, electromagnetic interference, network congestion…) and base stations in reach, thus offering the best possible connectivity experience at any given time.

How The Indoor5G™ Algorithm Works



The Advantages of the Indoor5G™ Technology

Vantiva's FWA CPE Cobra 5G, Falcon 5G and Condor 5G leverage the Indoor5G™ technology, offering users an unparalleled connectivity experience, ensuring that mid-bands are used to their full potential, and increasing the FWA footprint around base stations.

- Multiple antennas located to feature up-to-360° radiation coverage means **less time spent on finding the best location in the home and less effort spent on user guidance**, service calls, and tech support.
- Dual-polarized, high gain antennas means a **stronger connection to 3+GHz bands**, less congested low bands, and ultimately **better use of the 5G spectrum** for more subscribers.
- Dynamic antenna activation and optimization means the **best throughput achievable at any given time** based on the current electromagnetic conditions.

Altogether, Indoor5G™ translates to better UX in terms of CPE installation, better average throughput, connection stability, signal strength, & low latency – leading to higher client satisfaction & retention.

But above all, it means more clients served – and an immediate, higher, and measurable financial return on your considerable network and spectrum investments.

For more information about Indoor5G™ and our 5G FWA CPE, contact Vantiva or visit vantiva.com

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Pushing the edge