



Delivering In-Building 3G/4G Cellular with InnerWireless Horizon™ DAS.

I am planning an enterprise-wide wireless roadmap. How do I support the many mobile devices on the many different wireless networks that our staff and visitors use – Smartphones, Tablets, and Mobile Computers?

Horizon – the InnerWireless Converged Wireless DAS – is an indoor broadband wireless platform that can deliver virtually any wireless service, reducing the need to install and maintain multiple, single purpose and overlay wireless networks. Engineered for whole-house deployment of key wireless services, Horizon supports all wireless initiatives, including 3G and 4G cellular, 802.11 a/b/g/n Wi-Fi, fire/life/safety, two-way radio, paging, and WMTS.

Horizon is often described as a passive hybrid DAS. In reality, all DAS solutions involve both passive and active components. This means that all systems are hybrid solutions with some being a primarily-passive hybrid solution like Horizon, while others are predominately-active hybrid solutions. The InnerWireless passive hybrid approach balances the use of active fiber optic components, for wireless carrier connectivity and monitoring, while using passive coaxial cabling and antennas for vertical and horizontal RF distribution. This approach provides both exceptional reliability and scalability.

Is it possible to deliver flawless coverage for data – on Day 1 - so that I can begin to minimize wireless coverage related help desk calls?

Horizon provides guaranteed RF coverage and signal strength for the various wireless bands, including 700 MHz (LTE), 850 MHz (cellular), 1900 MHz (PCS), and 1700/2100 (AWS) frequencies. Traditionally, indoor wireless systems, including DAS, have been deployed to improve wireless voice coverage. However, data is exploding - 3G data is growing at a rate of 200% - and requires a high signal level with a

high signal-to-noise ratio. 3G data throughput cannot be achieved by driving signal through a small number of antennas. As a result, Horizon provides the required high quality signal using smaller coverage areas with dense antennas. InnerWireless designs, project manages, installs, and tests every Horizon solution. Working with both the construction characteristics of the facility and staff usage requirements, InnerWireless provides engineered RF coverage for each wireless frequency and guarantees the signal coverage at the required signal power. InnerWireless works with the service provider's regional engineers to determine the optimum RF source and power, provides floor-by-floor RF design with pre-installation predictions, performs installation, and proves key deployment characteristics with post-installation walk-through verifications. This process has yielded a 100% first time acceptance record.

My building is a public facility, how can I support all of the wireless service providers with consistent network performance and accelerate key wireless initiatives?

Horizon is a neutral host DAS and can provide support for up to eight service providers. Paging, two-way radio, fire/life/safety, and 2G/3G/4G cellular services are connected to Horizon at a single, central location and are distributed through the building by the vertical and horizontal RF distribution system. The capacity for each wireless service provider is determined by their wireless equipment that is connected to Horizon (e.g. BDA or micro-cell BTS). All wireless signals from the service providers, and their different technologies, are multiplexed and layered on to the DAS in such a way they stay separated in the active components and in the passive portion of the DAS (e.g. Verizon 850 MHz and 1900 MHz signals stay

separated from AT&T 850 MHz and 1900 MHz signals). With both proper coverage and capacity the consistent network performance will help accelerate the adoption of your future wireless applications.

I don't have experience with wireless service provider equipment. How do I easily connect the wireless carriers?

A macro-cell Base Transceiver Station (BTS), micro-cell BTS, or Bi-Directional Amplifier (BDA) is used to connect Horizon to the wireless wide-area network based on the traffic requirements/demands of the facility. Traditionally, a BDA has been used to deliver voice-grade connectivity to an in-building DAS by sharing signal with the outside network. However, today, capacity is the key driver for data-grade connectivity and a dedicated micro-cell BTS is more commonly used.

My building is Green, can my network be Green as well?

The InnerWireless DAS is a primarily-passive hybrid architecture and minimizes the total cost of ownership (TCO). First, Horizon uses 60% less electronics than a comparable sized active hybrid system. With a minimal footprint and zero power consumption in the RF distribution, no additional physical space or HVAC requirements are imposed in the telecom rooms. From an active-electronics perspective, Horizon only uses active components for service provider connectivity and expansion in very large facilities. IT staff can monitor cellular coverage inside the building using these active components. As an example, where Horizon may only use two or three active components in a one million sq. ft. building, competing predominately-active solutions will use in excess of one hundred (100) active components. These characteristics allow Horizon to

provide both exceptional environmental and operational savings.

I am hearing more and more about 4G. How does Horizon™ support 4G services, such as Long Term Evolution (LTE), so that I can plan my roadmap?

The InnerWireless Horizon DAS has supported 4G-LTE at both the 700 MHz spectrum (used by AT&T and Verizon Wireless) and the 1700/2100 MHz spectrum (used by AT&T, Verizon, MetroPCS, T-Mobile) beginning in 2002. InnerWireless is the only currently deployed DAS that inherently supports 4G-LTE. With its primarily-passive hybrid architecture, the entire RF distribution is ready for 4G-LTE today and requires no changes. Additionally, since most Horizon customers converge many of their wireless services onto the single platform, including Wi-Fi, Horizon inherently uses more antennas and is engineered for the higher-quality signal that 4G requires. Because it is broadband, Horizon does not need to be re-engineered to support the 4G frequencies. To upgrade to 4G-LTE on Horizon, the wireless service providers simply add and connect their 4G electronics to the central location. Additionally, for large facilities the centralized fiber optics are also updated. With Horizon, no disruptive changes are needed in the RF distribution that covers the facilities valuable workspaces. This is contrary to predominately-active solutions that require a complete “overlay system” or major upgrade of centralized and disruptive upgrade of distributed electronic/hardware components (dual-band to multi-band) along with additional antennas and re-engineering of the coverage area to meet 4G requirements.

Is MIMO required for 4G services?

InnerWireless supports MIMO for WMTS and Wi-Fi and can deploy MIMO for 4G; however InnerWireless believes that 4G deployed over a SISO DAS currently is, and will remain, the most viable candidate based on economic and technical considerations. Outdoor, 4G technology deployments are faced with the same deployment problems as 3G, they just become more pronounced (i.e. the outdoor coverage boundary of one cell to the next is poorly defined, the signal level varies greatly from users close

to the tower to those at the edge, and the signal-to-noise ratio that each user receives is highly dependent on the terrain/distance from tower). In order for 4G to deliver its promised support of data intensive applications and more users, MIMO allows optimized transmissions to and from each user. This allows the overall average capacity to increase.

In-building and in contrast, the InnerWireless Horizon DAS in a SISO configuration provides a well defined coverage boundary; there is relatively minor signal level variation among users; each user achieves consistent signal-to-noise ratio because the DAS compensates for walls/building materials/reflections/distance from antennas. This allows the overall average capacity to begin at a higher value than an outdoor network. Additionally, capacity can be increased through sectorizing the BTS. Conversion of a DAS, any DAS, from SISO to MIMO can be a significant undertaking and requires doubling the number of antennas deployed along with the supporting cables and infrastructure. From an indoor coverage and capacity perspective this is not required and could result in a cost basis that is not appealing to either the enterprise or wireless service provider.

I am looking for a vendor partner. Is there a DAS vendor with a long track record in deploying DAS?

The InnerWireless Horizon DAS is field proven. The first InnerWireless Horizon solution for 2G cellular was installed in 2001 at Rockefeller Center in New York City. Since then, InnerWireless has expanded Horizon to support multiple frequencies of fire/life/safety, two-way radio, WLAN, medical telemetry, paging, 3G cellular and now 4G cellular. Today, InnerWireless has deployed DAS in some of the most respected healthcare organizations and largest buildings in North, including at City Center in Las Vegas – the largest known DAS installation in the world. InnerWireless works directly with our customers in healthcare, hospitality, Fortune 500 commercial, and government to enable cellular service for all wireless service providers. InnerWireless interoperates with all major wireless service providers, including AT&T, Verizon Wireless, Sprint, and T-Mobile. InnerWireless maintains

deployment relationships with all the service providers to ensure proper connectivity. InnerWireless collaborates with the wireless service provider engineering departments during the site survey and design processes to ensure the provider’s requirements are met. After deployment, InnerWireless maintains the first point of contact for Horizon, but continues to keep the service provider abreast of any issues with appropriate escalation through agreed-upon contacts.

A wireless service provider has offered to provide a DAS at “no charge”. What are the implications for my facility?

Three important trends are emerging in the in-building DAS marketplace.

First, since many large buildings are public spaces a DAS should accommodate the services of all the service providers. Often times the “no-charge” DAS is intended to just provide service for the operator making the offer. Secondly, a new study shows significant growth in the *enterprise owned & operated DAS segment* substantiating a trend similar to enterprise WLAN ownership. Finally, since a DAS can host multiple wide area and local area frequencies, including WLAN and fire/life/safety, the DAS can be used strategically. Typically, with a “no-charge” DAS, the wireless service provider picks the DAS, but then requires the enterprise to agree to a minimum dollar volume of annual revenue or number of phones, and require an exclusivity period during which no other operator is allowed to use the DAS. Unfortunately, in this case the operator owns the DAS, and in reality, is not incented to upgrade the DAS to support other operators – because of the upgrade costs – even when exclusivity ends. By owning the DAS, the enterprise stays in charge. If funding is required, most operators will negotiate financial participation in an enterprise owned DAS.

To learn more about the many benefits of InnerWireless’ Converged Wireless Platform, please visit innerwireless.com, or call **214.242.7777**.


Everything. Everywhere. Everytime.