



BUYER'S GUIDE

Wireless Solutions to Improve
Cellular Coverage for Your
Commercial Business

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In today's hyper-connected world, the use of cellular technology allows people to work remotely and stay connected to customers, colleagues and families while on the go. When this mobile technology doesn't work, people quickly feel frustrated. Unreliable service and dropped calls make people feel like they are living in the past.

Unfortunately, unreliable service is still a reality. In a Pew Research Center survey, 72% of cell phone owners claimed they experienced dropped calls at least occasionally. If you are a business owner, you know that this stat doesn't bode well for your team members who depend on reliable cellular connectivity for managing customer service, connecting with vendors and coordinating with employees. Not only is losing a call or having spotty service frustrating, but poor cellular connectivity can negatively impact the delivery of goods, customer service and reputation.

Likewise, if you are a homeowner living in a remote area or on significant acreage, you don't have time to waste walking through your house seeking reception or going outside to find the one spot where you

can make a call, especially if that means doing so in 100-degree heat or during a snowstorm.

The advantages of working from home also quickly dissipate when cellular service is unreliable. Why bother setting up a home office if it means getting up and moving outside just to take a phone call? After all, the point of cellular technology is to create more flexibility, not less.

One way to solve poor cell reception is with wireless coverage solutions, which guarantee reliable connectivity to improve business efficiencies. In this buyer's guide, we examine some of the most popular cellular coverage options for home and office – and the advantages and disadvantages of each.

What Causes Poor Cell Reception?

You might be wondering what causes poor cell phone reception in the first place. **Reception problems result from two main issues:** distance and obstruction.

Geographic barriers - If a phone is too far from a cell tower, then the signal will be weak or even undetectable. This is common when living or working in a remote area far from a cell tower.

Physical obstruction - When an obstacle, natural or man-made, comes between a phone and the nearest cell phone tower, it affects the strength of service. Common obstructions include:



Vegetation

Trees, shrubbery, and any other kind of foliage can absorb and weaken cell signals.



Natural Terrain

Any physical obstructions between the device and the cell tower, including hills, mountains, ridges, canyons, and bluffs will block cell signals.



Man-made objects

In urban settings, buildings are the main obstructions to cell signals. Radio frequency signals can't easily pass through metal, brick, concrete or even glass. Almost any building can have reception problems indoors. Even if you are standing outside and surrounded by tall buildings, cell reception can be spotty.

How Can You Test for Poor Signal?

To most cell phone users, testing for cell phone reception means looking at the “bars” graphic on the top of the phone’s home screen. While the bars graphic provides a quick reference, no standard exists for what a bar of signal means, so it doesn’t present a comprehensive view of signal strength or explain why the signal is poor. Here are a few ways to more accurately test for cell phone signal strength:

- If you’re experiencing poor cell reception inside a building, step outside to see if signal strength increases. An increase could indicate that building materials weaken the signal.
- Both Android and Apple iOS phones provide “Field Test Mode” options to test for signal strength and will present signal strength in decibels (dB) rather than bars (The closer the number is to 0, the stronger the signal). For example, -90db is a stronger signal than -105dB.
- Conducting a site survey with a signal meter is the most comprehensive test. A signal meter detects and displays signal frequency, bandwidth, and strength with total certainty, and also updates in real time.

If these tests reveal an especially weak (or very strong) signal strength, it might be time to explore connectivity solutions. Luckily, there are a variety of options available to help users solve these signal strength problems.

What is a Good Cell Signal?

> -70 dBm:

Perfect signal strength.

-71dBm to -80dBm:

Coverage for Broadband Personal Communications Service (PCS) and Advanced Wireless Services (AWS) bands decrease. Coverage for LTE and Cellular remain strong.

-81dBm to -95dBm:

Coverage for all bands decreases significantly.

SIGNAL STRENGTH	EXCELLENT	GOOD	FAIR	POOR	DEAD ZONE
3G/1x (typically voice)	-70 dBm	-71 to -85 dBm	-86 to -100 dBm	-101 to -109 dBm	-110 dBm
4G/LTE (typically data)	-90 dBm	-91 to -105 dBm	-106 to -110 dBm	-111 to -119 dBm	-120 dBm

What Solutions Are Available?

Boosting cell phone service in your home or office might be a simple fix. Many consumer friendly, easy-to-install solutions exist in the marketplace. So, it's important to prioritize the parameters you're looking for in a system to narrow down the list and ensure you choose the best option for your needs. The most important factors to consider include:



Size of your building - Larger buildings require additional hardware to both cover the area of the building and account for interior obstructions.



Budget - Connectivity options exist to fit every business's budget, from free-to-use applications to multi-million-dollar solutions.



Number of Users - Businesses with a large staff or aggressive growth plans need more dynamic solutions with the capacity to handle multiple devices without compromising quality.



Timeframe / ease of installation - Some connectivity solutions can transform signal strength or serve as a workaround in a matter of minutes, while others require more intensive installation requirements, taking upwards of a year.

Using these parameters, let's investigate the following options:

Wi-Fi

Many businesses believe that the most immediate fix for cellular connectivity problems is Wi-Fi calling. Handsets from most major carriers now allow users the added functionality of placing calls over a wireless internet connection rather than the carrier's network. By enabling the Wi-Fi calling functionality in a phone's settings, users are able to place a phone call across any Wi-Fi network connection.

This user-friendly and cost-efficient option is available in any home, office or retail location with a Wi-Fi connection. Rather than dealing with dropped calls at the coffee shop or supermarket, Wi-Fi calling offers a quick and easy solution in the event of spotty cell coverage.

However, Wi-Fi calling is not without its drawbacks. For Wi-Fi calling to be effective, it requires seamless Wi-Fi coverage and a Wi-Fi-enabled handset. And because it operates on the available wireless internet connection, Wi-Fi calling competes with other devices on the same network for bandwidth. When

What does it cost?

Most major carriers' monthly voice plans include wi-fi calling to domestic numbers at no added charge. International calls incur an additional fee based on the user's calling plan.

placing a call over Wi-Fi in a room full of laptops, tablets and smartphones, the network may not have sufficient bandwidth to support a reliable connection. In addition, when using Wi-Fi calling in a retail setting, customers can find signing into a Wi-Fi network a nuisance and prefer alternatives to offload data usage.

Security concerns also arise with Wi-Fi calling. Much like a financial transaction placed over an open Wi-Fi connection, a call placed over Wi-Fi is vulnerable to outside digital threats.

While Wi-Fi calling offers an affordable and quick fix to cellular connectivity, it does not provide a stable, long-term solution.

Network Extender

Network extenders (sometimes called femtocells or microcells) are also available through most major carriers. They utilize the existing internet making them easy to set up in a home or office. Network extenders connect through Ethernet and provide enhanced 4G LTE coverage for up to four active devices.

However, network extenders are only effective in homes or offices of 7,500 square feet or less. Additionally, if you operate more than four devices, which must all be individually registered on the system, a network extender's impact on cellular connectivity

What does it cost?

Samsung network extenders on the Verizon network cost approximately \$250 and require no monthly fee. The Airave from Sprint costs approximately \$100 with a \$5 per month fee.

is negligible. Lastly, network extenders must connect to a router's Ethernet port, which limits the location of device installation in the building. This lack of flexibility may limit cellular signal improvement where it's needed most.



Digital Apps

Digital applications may be the most commonly used cellular connectivity alternative. Offerings like Skype, Google Hangouts and Apple FaceTime boast accessible Voice over Internet Protocol (VoIP) and digital communications solutions, including but not limited to: video calling, voice calling and instant messaging.

Many of these applications provide an easy and free-to-use service across multiple devices. Some of them also allow users calling access over both cellular and internet connections, offering a versatile alternative to traditional cellular voice calling. However, like Wi-Fi calling, these digital options do not solve spotty cellular service.

Although digital applications provide an easily accessible, consumer-friendly alternative to traditional cellular service, they are limited by security

What does it cost?

While many digital applications are free-to-use, others, including Skype, are “freemium” services and charge users to call landlines and mobile devices, or for increased functionality.

and quality issues. Call quality depends on sufficient bandwidth and a reliable connection, so users operating their computer and a VoIP call over the same network simultaneously may experience poor voice quality. VoIP calls are also vulnerable digital threats like viruses, malware and identity theft.

In other words, they offer less value to larger businesses needing seamless call transition, enhanced security or a scalable in-office solution, due to their reliance on an internet connection for service.



Active DAS

The most robust and infrastructure-intensive cellular connectivity solution is an active Distributed Antenna System (DAS). An active DAS offers a carrier-grade, high-capacity infrastructure solution for large areas.

An active DAS creates cell coverage within a building using its own cellular signal. It distributes the signal between a centralized signal source and “remote nodes” placed around a building. An active DAS system accommodates large areas where thousands of users access the network in a confined space, including airports, arenas and large convention centers.

Despite the strengths of an active DAS, expensive hurdles exist. A solution as robust as an active DAS requires significant investment of time, infrastructure and capital, including the construction of a

What does it cost?

Active DAS can be a multi-million-dollar solution, costing between \$2 and \$4 per square foot for a single-carrier solution. For a multi-carrier solution, cost increases to \$5 to \$10 per square foot. Additionally, in some cases, there are recurring support fees for dedicated fiber or sufficient facility backhaul to the public network.

dedicated backhaul.

In addition, an active DAS only offers a single-carrier solution, meaning it only enhances connectivity on the user's network of choice. Any installation must also be approved by other affected carriers, per FCC regulations.



Passive DAS

A passive DAS, also known as a cell signal booster system or bi-directional amplifier (BDA), enhances an existing signal with passive components and amplifiers. In this system, antennas on the outside of a building capture the cellular signal and pass it through a booster. The booster amplifies the signal, and it's otherwise unaltered.

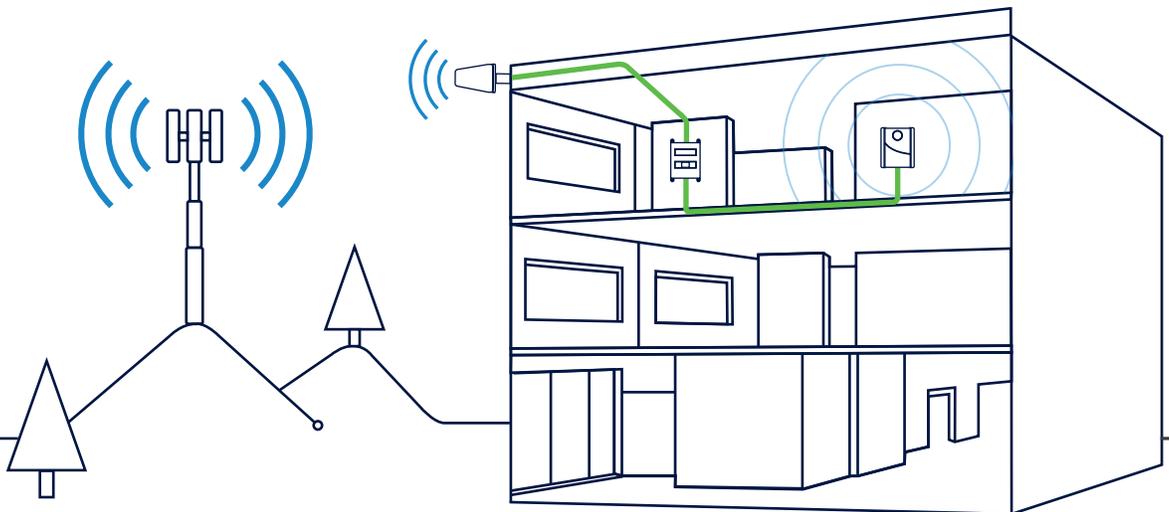
A passive DAS conforms to FCC regulations so it typically does not require outside approval. Exceptions to this rule are some industrial products which do need approval from carriers. With most systems being pre-approved, combined with less infrastructure-heavy installation requirements, a passive DAS solution can be installed to overcome wireless signal challenges in a matter of days or weeks. With

💰 What does it cost?

Costs for hardware and installation of a passive DAS ranges anywhere from 30 cents to 70 cents per square foot.

less overhead, fewer regulations and lighter equipment than an active DAS, a passive DAS is a financially viable option for a wide range of users.

Many passive DAS systems are [carrier-agnostic](#), [supporting multiple carriers](#) simultaneously. Because the system captures an existing cell signal, all users benefit, regardless of carrier or device.



How Do the Options Compare?

Each of these options has its benefits and drawbacks. Some are perfectly suitable for home and small office use but are not robust enough to support continual high-capacity use, while others lack security.

Consider the size of your building, the number of users you wish to accommodate and your budget when evaluating the best cellular connectivity option for your business or home. From easy-to-install and cost-effective options for your home to reliable, business-grade systems, there is a solution to meet all your requirements.



	WI-FI	NETWORK EXTENDER	DIGITAL APPLICATIONS	ACTIVE DAS	PASSIVE DAS
CARRIER AGNOSTIC	YES	NO	YES	NO	YES
BUILDING SIZE	Unlimited	<7,500 sq ft	Unlimited	>500,000 sq ft	Unlimited
USER CAPACITY/ RELIABILITY	Low	Low	Low	High	High
SECURITY	Low	Low	Low	High	High
BUDGET	\$	\$	\$	\$\$\$	\$\$
EASE OF INSTALLATION	Easy	Easy	Easy	Difficult	Moderate

Ready to discuss your wireless solution options?

Learn more about commercial cell signal amplifiers, how they work, and how WilsonPro can provide cell signal coverage solutions by visiting www.boltontechnical.co.za or [emailing us](#) today.