

# AN INSIDER'S GUIDE TO Distributed Antenna Systems





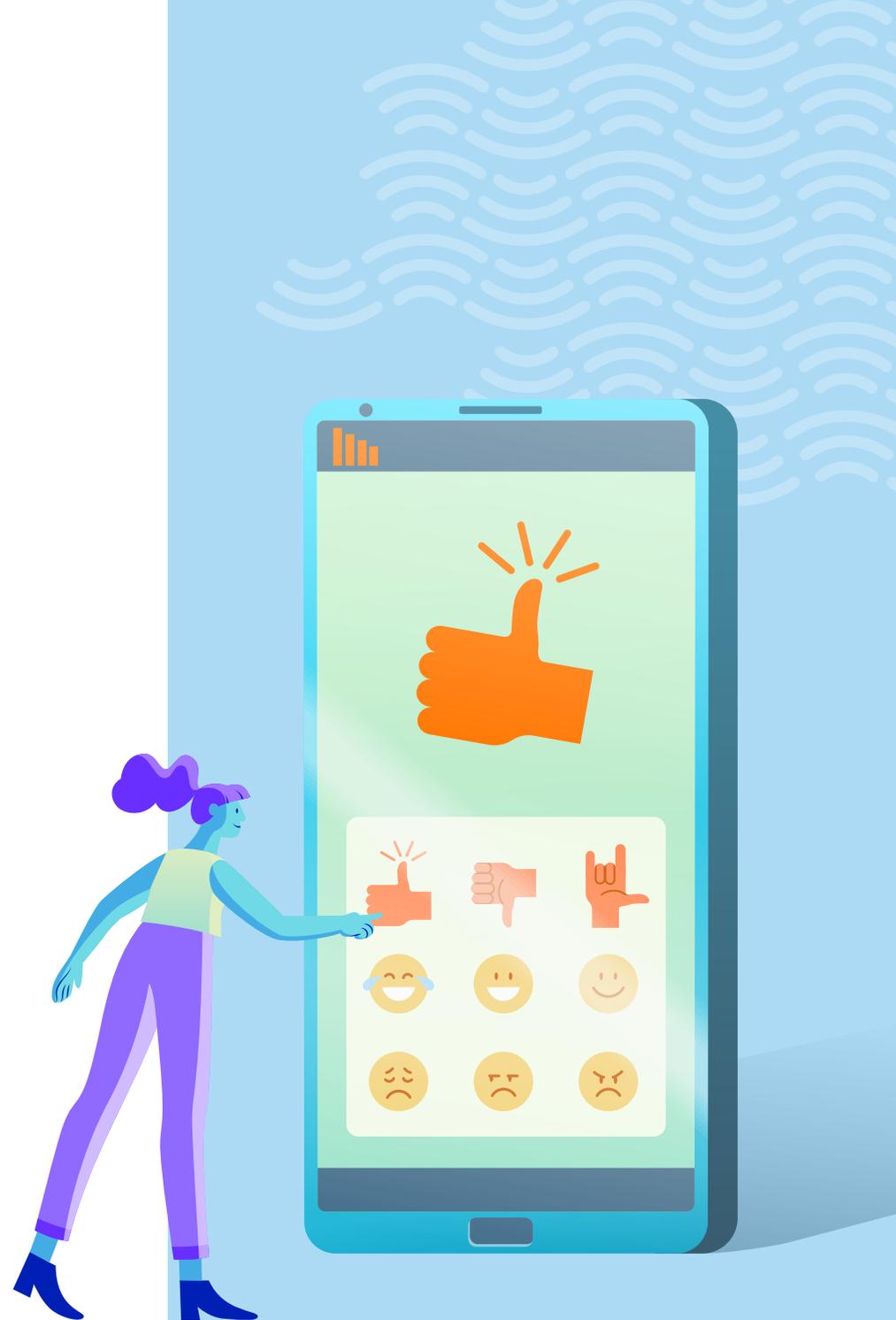
# Introduction

It's no longer news that connectivity is the future. However, what businesses and users are discovering is that the type of connectivity you use is **key to success**.

WiFi dominates indoor connectivity. But as a consumer-grade solution, its bandwidth, interference, security and latency issues leave much to be desired.

By contrast, LTE-based cellular signal is the ideal solution, particularly as lightning-fast, high-capacity 5G networks emerge. It's the gold standard of secure, encrypted connectivity. Unfortunately, cellular signal struggles to penetrate buildings — unless you have the right technology in place.

**Distributed antenna systems (DAS) ensure that 4G LTE and eventually 5G signal are distributed throughout buildings. They eliminate dead zones and provide secure, reliable, fast connectivity.**





# To help you navigate the solutions in the market, this guide walks you through:

How the technology works ..... 5

Which types of DAS to consider ..... 7

What to look for in a DAS partnership ..... 12



## The potential of this technology is staggering.

### By employing a DAS, organizations will:

- Receive mobile calls anywhere without dropped calls
- Attract and retain more clients with standout connectivity
- Create dedicated networks rather than share bandwidth
- Increase team mobility without connectivity concerns
- Provide coverage in locations they previously couldn't reach
- Deploy and operate on 5G as soon as it's available
- Control their infrastructure and connectivity solution

Perhaps most importantly, DAS allows organizations to **dictate where the network traffic is hosted**: transactions or confidential information are routed via the DAS, guest calls and web surfing via the WiFi. In hospitals, for instance, healthcare providers and staff can share files and operate equipment on the LTE, while patients watch movies or video call family members via WiFi.

## However, not all DAS systems are built equal.

DAS comprises numerous solution families, only some of which are active, 5G-ready, and future-proof.

With a slew of DAS solutions on the market, it's vital to find the right option for your business — or a partner that will design the right option. **A mediocre DAS will fail to deliver benefits or only leave you with moderate indoor coverage.** DAS that's optimized for your needs, however, will leverage the right technology to deliver the best possible signal throughout your building.





# How Does DAS Technology Work?

Active, 5G-ready DAS is comprised of small antennas installed strategically throughout a venue to maximize the reception of mobile networks. These antennas are connected to radios via fiber optic and coaxial cables, which are in turn connected to a central signal source. Together, this system creates a **dedicated LTE network that connects users to all the major cellular carriers in your area.**

Essentially, you're building telecommunications infrastructure into the walls and ceiling of your building, which means you'll get all the benefits of a high-quality, private 5G network without the clunkiness of exposed wires, modems or other connectivity equipment. With DAS, these elements are neatly organized and hidden out of sight.

This type of true DAS is a standalone system that provides a dedicated service for the given building or company. It doesn't boost an existing mobile network; instead, it generates a new dedicated network leveraging signals from mobile carriers. DAS delivers next-level mobile connectivity by accounting for characteristics unique to each enterprise, including venue architecture, flow of people and user profiles.



# A Closer Look at the Mechanics of a Typical DAS:



Essentially, the signal source captures various LTE signals from multiple carriers. Those signals then need to be cleaned up and distributed throughout the venue, which is where the other two systems come in.

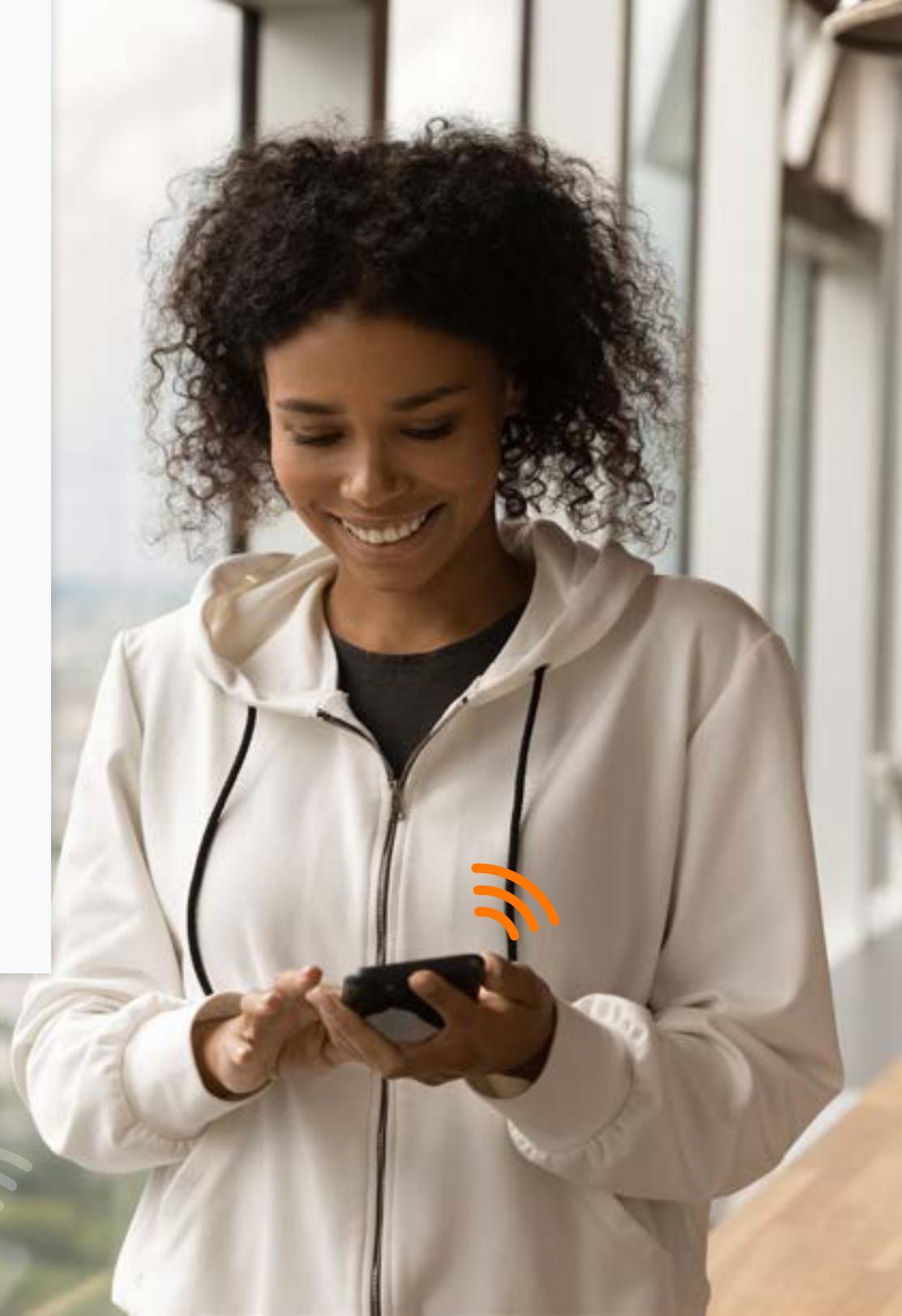
The interface system combines those signals via a single transmission path from the source to the antennas; **this is a key step to ensure that LTE signal level is homogenous across different technologies and frequencies throughout the building.** Last, antennas distribute the combined signal at set points.



# Which Types of DAS Should You Consider?

To find a DAS that meets your needs, you need to optimize for each aspect of DAS technology, from signal origination to distribution. Perhaps most important of all is the signal source: the best distribution system can only supply the quality of signal provided by that source.

**Different types of DAS vary dramatically in signal source technology**, with significant consequences for signal quality, interference and network capacity. It's more than just 4G or 5G — it's the difference between slow, unreliable networks and lightning-fast **reliable** ones.



# Active DAS

Active DAS systems create a scalable, 5G-ready network designed for your building, with a dedicated capacity to ensure the best experience for your users.

**There are several makes and models of DAS, and each type was created to address a slightly different design problem.**

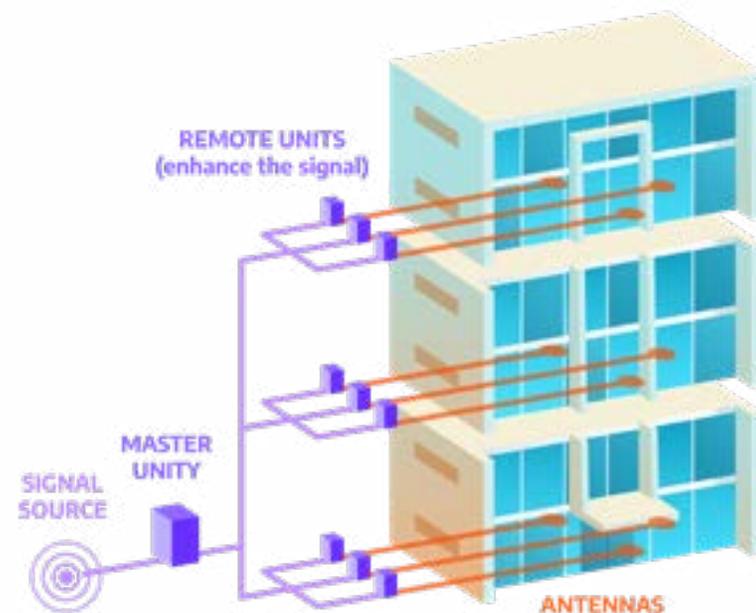
While passive DAS may be more widely available to a public audience, these incomplete solutions can't guarantee a reliable connection. On the other hand, active DAS creates a distinct, building-specific LTE signal, delivering an investment-worthy and carrier-approved connectivity experience.

**Here are just some of the types of active DAS on the market:**

- Enterprise C-RAN
- CAT5e or POE-based
- FTTE (Fiber to the Edge), using only fiber optic cables to connect the antennas
- HFC (Hybrid Fiber-Coax), a mix of both cable types

In active DAS systems, the signal source and distribution systems are connected by fiber-optic or coaxial cables and supported by small antennas hidden within the structure of the building. Some DAS solutions also leverage small cell antennas that transmit a carrier-specific signal.

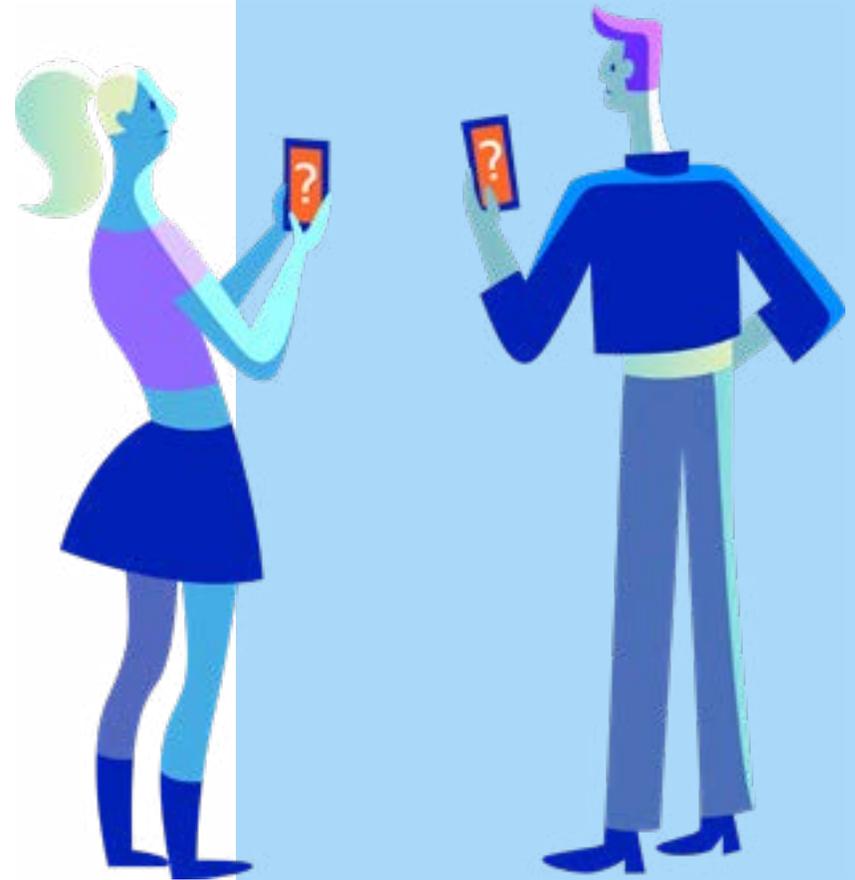
A bespoke, active network can mix and match components to create optimal coverage. **This approach enables consistent, reliable connectivity across every inch of your venue** and ensures your users won't experience lag or downtime due to weak signals or heavy traffic on a shared local network.



# Private LTE

Private networks are nothing new. Pretty much everyone has set up a Wi-Fi router at some point. The same can't be said for LTE, though. LTE as a technology has historically been expensive and spectrum with which to use LTE has been very limited. All this changed with the advent of CBRS (Citizens Broadband Radio Service). This licensed and shared spectrum at 3.5 GHz makes it possible for enterprises to take advantage of LTE's superior security, mobility, and performance.

**However, this technology has a few major drawbacks: it's still in the early stages, involves expensive operating costs, and requires a hands-on approach to network management. Unlike a Wi-Fi hotspot, a Private LTE network requires the enterprise to become a full-fledged operator.**



# Passive DAS

Though widely available, passive DAS systems are a 3G-era architecture that don't fully deliver on the promise of modern, active DAS. However, it's important to understand them and the risks they pose.

## Passive DAS systems are known by several names:

- Off-air
- Over-the-Air (OTA)
- Booster
- Bi-directional Amplifiers (BDAs)
- Repeater

Passive DAS technology appeals to unknowing customers because it's quick to install, cheap and readily available — some units can even be purchased on Amazon. These systems seem to deliver the same service as active DAS because they pick up the existing outside LTE signal of carriers and redistribute it indoors.

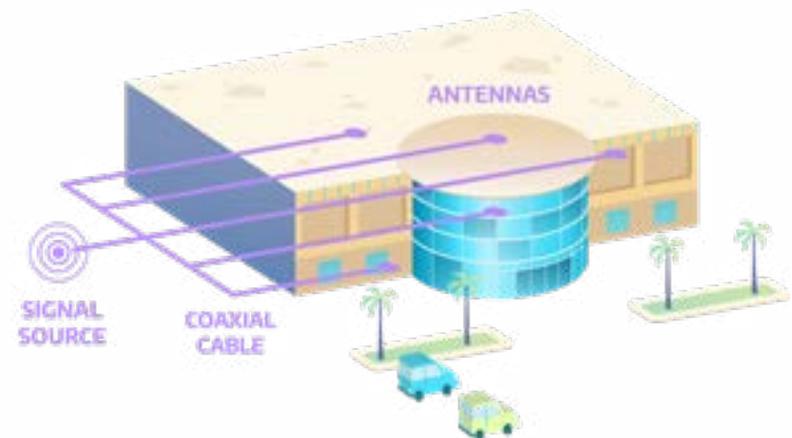
**Passive DAS systems do not generate an LTE signal the way an active DAS signal source does.** Instead, think of them like the WiFi booster plugs you might buy for your back room: they simply latch on to an existing signal and amplify it, including any flaws that exist within that original signal.

Imagine your building is located near restaurants and shops. During the lunch hour, when pedestrians pack the neighborhood and use

mobile data, your signal speed will drop dramatically because it's shared will all those users — the same shared-bandwidth issue you sought to escape by leaving WiFi.

**Similarly, if the signal is poor and provides low-quality service for cell phone calls, there's nothing you can do about it because it's not your own network. It's simply borrowed and echoed from an existing one.**

Worst of all, **the carriers themselves don't approve of passive DAS.** Donor antennas transmit this reflected signal back to them full of noise, so they receive a "dirty" signal; in many cases, carriers are known to send out teams to investigate these signals and turn them off by order of the FCC.



# Designing for 5G

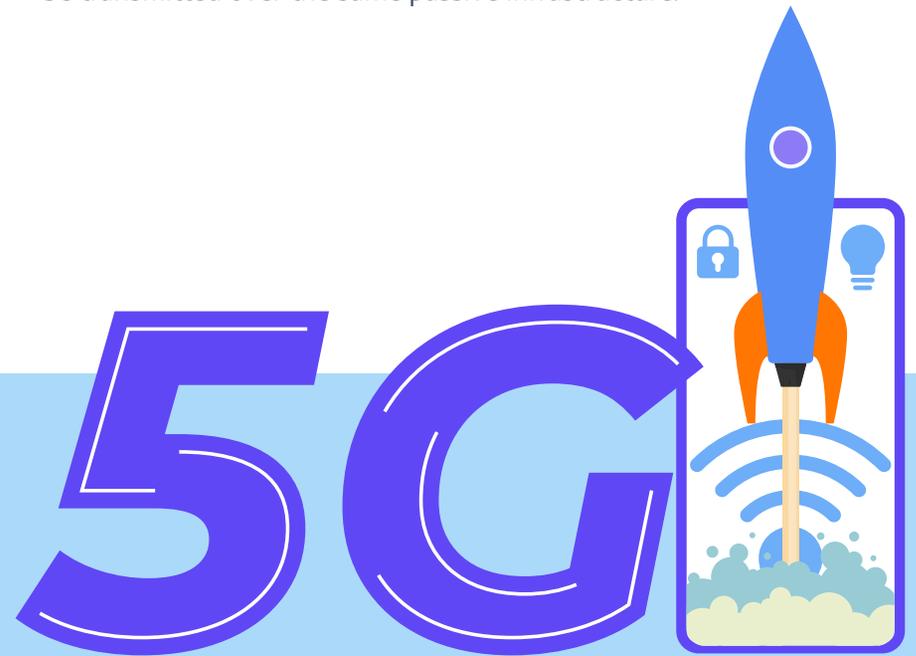
Truly future-proof active DAS systems are **designed with 5G in mind**. That doesn't necessarily mean they're 5G immediately, as not all regions have 5G available and carriers are rolling it out on their own timelines.

Instead, DAS should be built to be easily upgradable to 5G, like a multi-layer cake with lots of features baked in, rather than a flat, "bare minimum" design. More specifically, it should be modular, fiber-based and MIMO-capable.

**MIMO stands for multiple-input, multiple-output.** Many DAS systems are SISO, or single-input, single-output, with only one signal path. High-quality 4G DAS uses a setup of 2x2 antennas, or 2x2 MIMO, whereas 5G will generally require at least 2x2 MIMO with more data streams running and more bandwidth available.

This technology enables a dramatic increase in throughput and extra capacity — and it's absolutely necessary for 5G. An old SISO DAS will never be able to upgrade to MIMO, requiring a wholesale replacement instead. A MIMO-capable setup, even if it's using fewer antennas, is much easier to transition.

A great way to tell if your setup is truly 5G capable is whether your passive infrastructure has been designed to accommodate both LTE and NR signal. LTE is 4G signal, while NR or New Radio signal is 5G. A good DAS will be designed to ensure both sets of signal bands can be transmitted over the same passive infrastructure.





## What Should You Look for in a Partner?

The right technology is only half the equation. Just as important is the right partner to deploy that technology. Otherwise, your DAS may not deliver the full potential of the technology due to challenges like cost, early hardware failure or suboptimal system design.

**The following pages explain key factors to consider when choosing a DAS partnership.**



## 1. Multiple DAS Options

Avoid prospective partners that only work with one or two types of active DAS, such as only fiber-based. Otherwise, you run the risk that they'll shoehorn the wrong type of DAS into your building.

**Above all, be wary of partners that recommend passive DAS boosters as an option.** Though these solutions are cheaper, they're heavily flawed for the reasons discussed above, and partners that work with passive DAS are likely either inexperienced or overpromising.

From design shops to third-party operators, high-quality partners will be able to work with and provide several active DAS options. These providers can ensure an optimal solution that's tailored to the needs of your building and ecosystem by considering all available options.



## 2. References and Tenure

Proven experience is important in every industry, but in DAS deployment, it's critical. Inexperienced companies can cost significant time and money, and harm vendor or carrier relationships.

**Look for companies that have been working explicitly in the DAS field for a while, not just similar telecommunications operations.** General telecom companies that are new to DAS may not understand how to properly dimension and test DAS during installation. This is a true test of experience and a major indicator of credibility.





### 3. System Warranty & Maintenance

High-quality partners with significant DAS experience also tend to be more willing to stand behind the quality of their work for a long period of time, whereas newer companies might have an abbreviated warranty or fail to support a DAS over its full useful life.

For instance, at QMC, we monitor our DAS systems 24/7 and maintain them for the **lifetime of the partnership** (at least 10 years), through every modification driven by the venue or the carrier.



### 4. Accurately Priced Bids

Be wary of bids loaded with assumptions. Some partners will lowball, assuming that they'll complete projects and make profits via change orders. Scrutinize a scope of work to confirm that every aspect of design, installation, and commissioning is being accounted for.

For instance, a bid that comes in significantly lower may include the assumption that a wire would go across the hallway floor, rather than through a closet. Moving that wire would add cost to the scope — but without digging into the bid, you wouldn't realize that until everything was partly installed. A low-ball bid might also not observe building and fire codes or adhere to labor regulations, which can vary widely with each local market.



## 5. Venue Control & Financing

Until recently, active DAS was only available to larger venues, whose heavy traffic appealed to carriers. Neutral host partners broadened access, but in the traditional neutral host model, the need to secure funding from the carriers directly often delays projects dramatically. This is true now more than ever as carriers are no longer funding in-building projects for non-marquee venues.

You should aim for a partner who streamlines the funding process and puts you, the venue owner and client, in control rather than the carrier.

**That's been our goal at QMC:** we've pioneered a venue-led model that truly democratizes DAS solution delivery. Check out [this piece](#) to learn more about our approach, based on long-term partnership and flexible financing.

Want to learn more about DAS and find the right solution for your building? Get in touch with one of our experts today.

**GET IN TOUCH**

