High-Throughput, Reliable Cabling Support for Wireless Networks

Lightweight, rugged cabling delivers simplified installation and robust operating life for Distributed Antenna Systems (DAS)

These days we expect to be connected wherever we are. As an individual, losing connectivity is frustrating but for certain professions (such as first responders) it can be a matter of life or death. These factors, coupled with a post-pandemic environment that sees more people working from home or taking on a 'digital nomad' lifestyle, means distributed antenna systems (DAS) that plug connectivity gaps and enhance indoor and outdoor communications are proliferating.

The rise of this market is reflected in a recent report[1] by Grand View Research, which valued the DAS market at USD 8.39 billion in 2023, growing at 10.1% CAGR – leading to a doubling of size (USD 16.39 billion) by 2030. Currently, the largest market is in North America (30.3% of total) while Asia-Pacific is showing the strongest growth.

Figure 1: Distributed antenna systems provide essential coverage both indoors and across urban areas

A DAS uses several antennas to provide enhanced wireless coverage to an area and deliver greater reliability with reduced total power. In general, a system will include several components including couplers and amplifiers to split and boost the wireless signal from the source.

Typically, a DAS combines the use of coaxial cabling and fiber optics to connect the equipment to the antennas providing services that include Wi-Fi, cellular and first responder coverage. These systems are used indoors and outdoors in a variety of locations including residential neighborhoods, shopping malls, underground transportation, airports, medical facilities, tunnels and densely packed urban areas where connectivity may be 'patchy'.

DAS Cabling Challenges

Clearly, reliable connectivity between the equipment and the antennas is crucial to the successful operation of a DAS. The challenges associated with indoor and outdoor deployment of cables are somewhat different, although there are certain similarities.

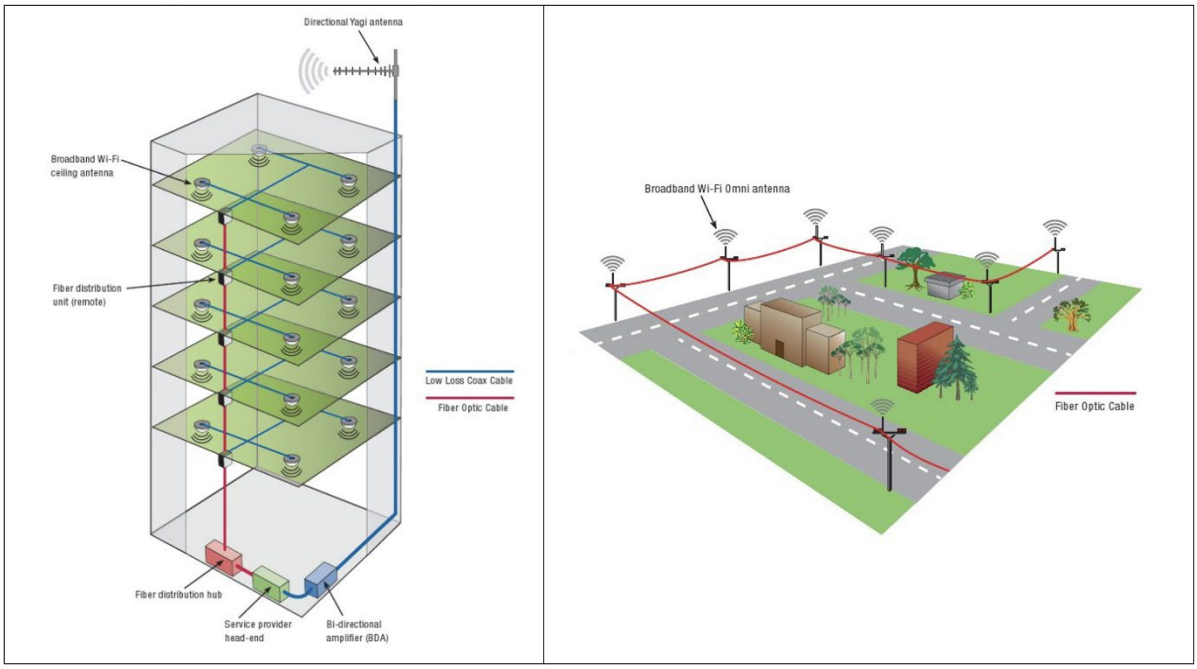

Figure 2: Key elements in a DAS deployment

In many cases, deploying a DAS within a building means adding to existing infrastructure. In these situations, conduits may already be congested with cabling for other, unrelated systems. This can pose significant challenges for the installer, particularly with conventional bulky armored fiber optic cable.

Outdoors, cables are often strung between poles so mechanical strength is a pre-requisite, but adding weight to achieve this can cause more problems than it solves – including the need for more poles, which may not be possible in certain areas.

Using a non-armored cable may seem to be a solution but indoors there is a very real risk of damage as it is pulled through congested conduit. If this does not break the cable on install, the tight bends and force may well introduce latent defects that will show up later. Outdoors, there are different challenges. Here, there is a need for solutions that allow the cable to be self-supporting on longer runs between poles. And in both cases, rodents and other animals are a problem as they could attack the cable, requiring an expensive repair or re-installation – along with the hidden costs of system downtime.

While the challenges may differ, there is a common solution to indoor and outdoor DAS fiber cabling - TiniFiber's patented Micro Armor Fiber™ Optic Cable, which is 65% smaller in diameter and 75% lighter than regular Aluminum Interlock Armor (AIA) cable. Choosing Micro Armor allows for higher data rates than coaxial cable, robust protection during operating life and greatly eases the installation task.

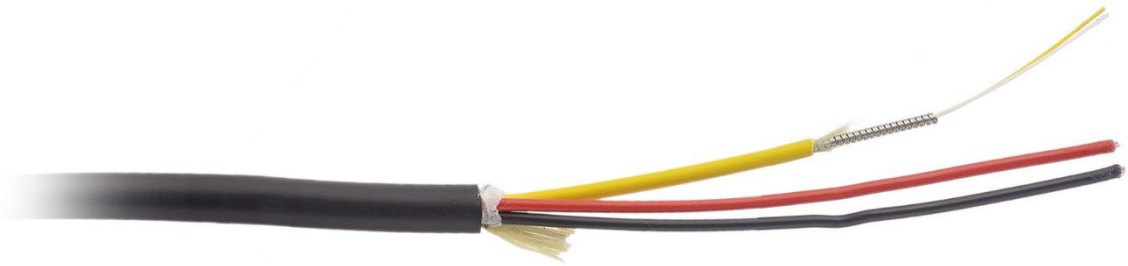

Figure 3: TiniFiber's Hybrid Power Micro Armor cable[2]

Micro Armor is stronger and more flexible than other cables, due to the tightly wrapped tubular stainless-steel coil combined with Kevlar®. This protects the fragile glass fiber optic strands against damage during installation as well as defending against hazards after the install is complete. What's more, self-supporting aerial solutions achieved using stranded steel messenger wire are available for outdoor deployment.

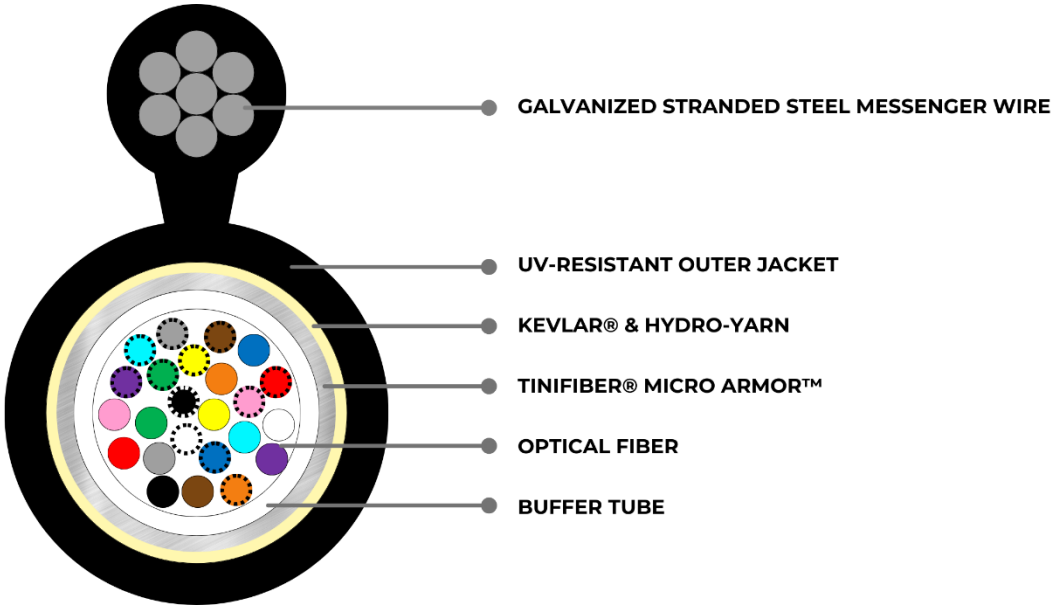

Figure 4: Self-supported Aerial TiniFiber with galvanized stranded steel wire

Whether it is installed in an indoor or outdoor DAS, operators can have confidence there will be no damage from installation. And unlike coaxial cable, the data is transmitted as light in the fiber meaning that no EMI is generated, and the signal itself cannot be corrupted by external EMI, lightning or similar voltage spikes.

When installing in conduits with existing wiring in place, Micro Armor permits smaller bend radii, allowing installation in the small remaining space. In conduits with more space, Micro Armor's size offers future-proofing for additional cabling to be added to the same conduit for further system upgrades.

As TiniFiber's cable is easier to pull and much stronger, installers are confident that it will pull without damage every time. Other reasons installers love this cable include the fact that TiniFiber cable reels are smaller and weigh less – saving valuable storage space and permitting more cable to be carried in a small vehicle. Also, it is easier to carry around site!

If a DAS operator selects an organization that is registered under the TiniFiber Certified Installer (TCI) Program, then they are granted a full 25-year TiniFiber warranty on the installation, giving them a high degree of confidence and peace of mind.

TiniFiber Cables

The extensive range of TiniFiber cables are compatible with indoor/outdoor mixed use, making them ideal for DAS applications. Every TiniFiber cable contains the patented armor (stainless steel coil combined with Kevlar) and they are all significantly smaller than any other comparable cable.

Hybrid cables that combine power connectivity with the protected fiber are also offered. Popular environmental cable jackets (including LSZH) are available. Alongside the cables, TiniFiber offer selected tools and accessories of interest to installers, including fusion splicers.

Figure 5: TiniFiber cable dramatically reduces space taken and weight in DAS applications[3]

The fiber heart of the cable is formed from modern bend-insensitive glass in two coated sizes (250 µm and 900 µm). The 900 µm tight buffer cables contain up to 24 strands while the gel-free sub-unitized 250 µm breakout style cables are available with up to 12, 24, 36, 48, 72, 96 or 144 strands.

Summary

DAS implementations are increasingly important in a world that relies on high-throughput wireless connectivity to support everything from critical infrastructure and emergency services to business operations and leisure activities built around cloud-based services. Ensuring reliable, high-speed connections and simplifying the installation process are vital aspects of delivering effective DAS, which is why operators are seeking alternatives to traditional cabling.

Providing a robust, high-throughput cable that is lighter and occupies a fraction of the space than other technologies while supporting right-first-time installation and the peace of mind of long, reliable and future-proofed operation, TiniFiber's patented Micro Armor cable provides such an alternative for both conventional coax and unarmored and armored fiber options.

Notes/References

1. https://www.grandviewresearch.com/industry-analysis/distributed-antenna-systems-das-market#:~:text=The%20global%20distributed%20antenna%20systems%20market%20size%20was%20estimated%20at,USD%2016.44%20billion%20by%202030.
2. https://tinifiber.com/products/
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