

Distributed Antenna Systems (DAS) Application Guidelines

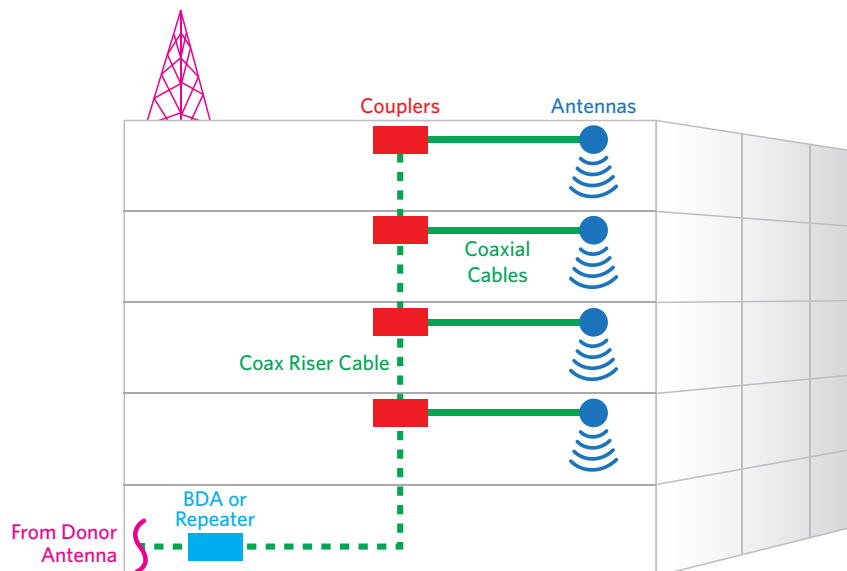
A Distributed Antenna System (DAS) is an extension of the wireless network that provides added coverage and/or capacity within a geographic area or structure. DAS is employed in structures such as commercial buildings and underground facilities that tend to inhibit external radio frequency (RF) signals, as well as high-capacity venues such as stadiums that require more bandwidth than what is provided by the standard, local wireless access points.

DAS consists of a network of spatially separated antenna nodes connected to a common source via a transport medium. The system splits the transmitted power among several antenna elements, which are separated in space, yet provide coverage over the same area as a single antenna with reduced total power and improved reliability. Antennas may also be strategically located to eliminate dead zones in areas such as elevator shafts where steel, concrete, or other barriers interfere with or block wireless service.

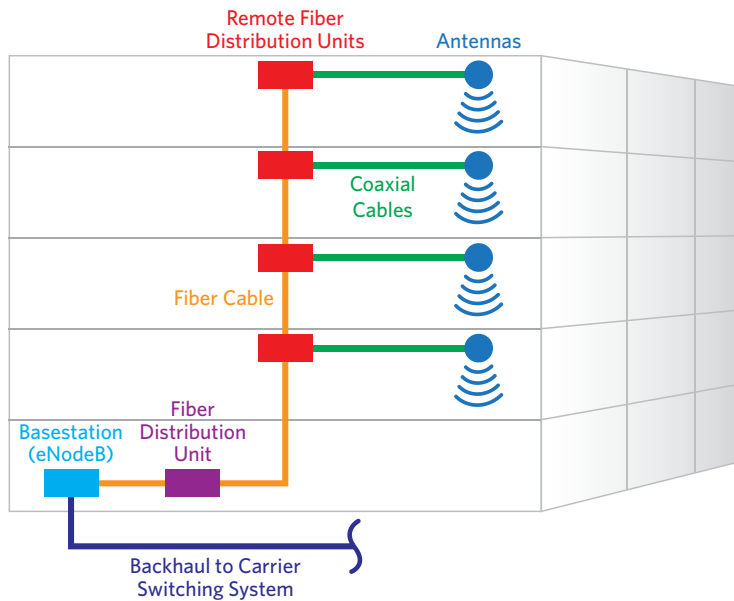
System Types

DAS is commonly divided into three broad categories: Passive, Active, and Hybrid.

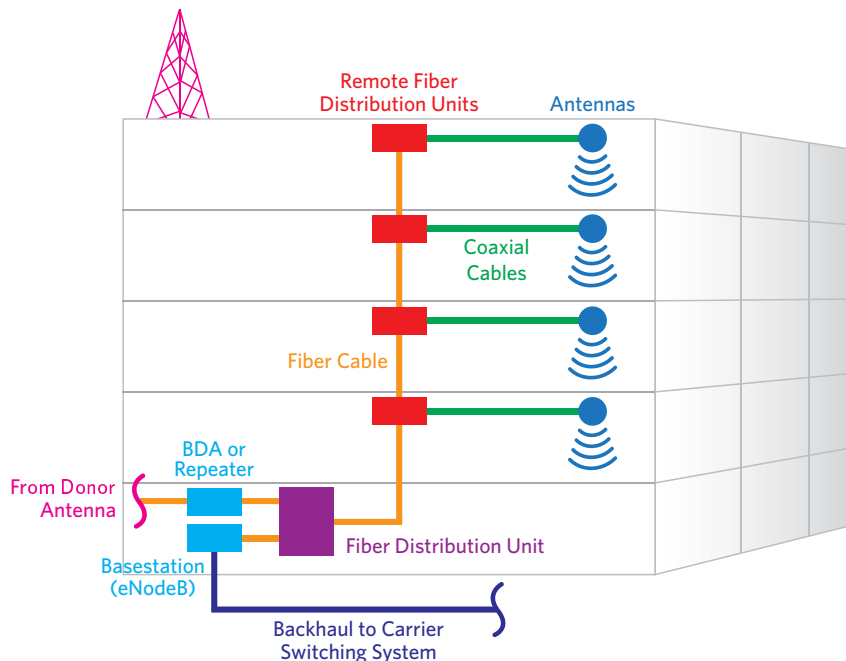
- A **Passive DAS** is a true extension of an adjacent wireless network such as a local wireless carrier. The Radio Frequency (RF) signal is typically obtained from an off-air repeater/signal booster. There is no active control of RF signals beyond the initial amplification of the donor signal. A network of 50 Ohm Coax, couplers and splitters is used to carry the RF signal to/from the distributed antennas.



- An **Active DAS** is characterized by a main hub that converts the RF signal into an optical signal, which is distributed to remotes via optical fiber. Remotes may convert the signal back to RF for distribution to antennas, or the signals may convert to intermediate frequencies for distribution over CAT 5e/6 to access points. An Active DAS is scalable and can support multiple bands or service. For example: cellular, PCS, and public safety.



- A **Hybrid DAS** is characterized by multiple Passive systems that are fed by a single Passive DAS via fiber-fed remote units (RF amplifiers). A Hybrid DAS extends the footprint of Passive DAS and is typically utilized in large footprint applications.



Ownership Models

Several system ownership models have been developed to fund, deploy, and operate DAS installations. The most common scenarios are:

- **Carrier** – Funded and operated by a wireless carrier. These are typically single carrier, but can be a consortium.
- **Neutral Host** – Funded and operated by independent 3rd parties that are DAS aggregators. Owner leases space back to multiple carriers.
- **Venue Owner** – Funded by the venue owner. Typically deployed and operated by a DAS integrator/contractor, although carrier(s)/3rd parties may partially fund. Network designs can be built for single or multiple carriers.

System Design

DAS by nature is implemented to solve coverage and/or capacity issues. Accordingly, DAS design is not as simple as picking a convenient spot for an antenna and connecting cable to the source. The use of an experienced DAS designer is highly recommended. iBwave is the modeling application used to predict RF coverage and design the DAS system.