Chapter 1

Understanding DAS Basics

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A well-known TV commercial for one of the country’s largest cellular network providers has an actor speaking into his phone saying, “Can you hear me now?” The commercial works well because anyone who’s used a mobile device has probably experienced more than one instance of a dropped call, a garbled voice on the other end of the line, or a failure to connect to the network. While annoying, a poor-quality connection isn’t usually life-threatening or a danger to the general public. The same can’t be said about poor-quality radio signals when first responders, such as firemen or police, are responding to an emergency. When first responders are unable to communicate, lives can be lost and the public safety is put at great risk.

Modern building construction techniques can create great challenges with regard to radio-based communication systems. Steel building skeletons, dense firewalls, and even energy efficient window glazing all have the potential to block or at least significantly reduce radio signal strength. In an emergency situation where an adequate radio signal is a first responder’s lifeline, blocked radio signals can create an unacceptable risk. But that’s where Distributed Antenna Systems (DAS) step in. In this chapter, you discover the ins and outs of DAS basics.

Understanding DAS Terminology

In this section, you take a look at two technologies — DAS and Bi-Directional Amplifiers (BDA) — that are designed to reduce or eliminate this risk.
Although a BDA and a DAS are different items, they’re both components of in-building RF (radio frequency) systems — the types of systems that enable two-way radio communications to function properly within a large building. In some cases, the installation requires a DAS but may also receive a signal from one of two types of RF sources. Type 1 is a BDA, which is an off-air system. Type 2 is a BTS or a basestation transmitter system.

**DAS**

A DAS is a set of radio antennas that help provide adequate radio signals in areas that may otherwise experience poor coverage. For example, you may have one or more antennas providing radio signals within each building of a large campus.

Each DAS has at least two antennas and requires at least one of two types of RF sources. One of these antennas is located outside the building and communicates with the public safety radio transmitter site or cellular carrier site, and one or more antennas are installed inside the building where they can communicate with the first responders’ portable radios. Chapter 3 goes into more detail about DAS hardware.

**BDA**

A BDA is the combination of a radio receiver and transmitter that increases radio signal strength in both incoming and outgoing directions. A BDA enables the use of public safety radios or cellular carriers in areas that may normally be radio dead zones, such as in the basement of a high-rise building. Chapter 3 covers BDAs in greater depth.

A BDA must receive and then retransmit radio signals by using the same frequencies for both receiving and transmitting. This requirement to use the same frequencies is what enables a BDA to be transparent to public radio and cellular network signals. Unfortunately, this same requirement also makes installing and properly configuring a BDA considerably more complex because the two signals can interfere with each other.
Understanding International Fire Code Requirements

After 9/11, the national fire codes changed and required all new construction of large buildings to include provisions ensuring that first responders could communicate properly inside the building. In many cases, this requirement for public safety radio coverage also applies when buildings are remodeled. In either case, the building owner must provide this enhanced coverage.

The International Fire Code requires you to provide adequate public safety radio coverage in your building, or you won’t be able to get a certificate of occupancy. Chapter 2 discusses the signal levels that are required.

Depending on the situation, a DAS may be the best or the only solution to providing proper public safety radio coverage in a building or on campus. Quite simply, a DAS system is needed when no signal is present inside a new or existing building for public safety radio or cellular carrier networks.

In some circumstances, such as a building that’s very close to the public safety radio transmitter, adequate radio coverage inside the building may exist without additional equipment. But under the new codes, a site survey (see Chapter 5) will almost certainly be required to document the coverage.

Looking at the Costs of DAS Systems

You’re going to encounter certain costs in implementing a DAS system in a building or on a campus. These costs can vary depending on a number of factors:

- Size of the area to be covered
- The type of building construction involved
- The number of antennas and amplifiers that are required to provide proper coverage
- Local labor rates
Generally, larger buildings have a lower per square foot cost than smaller ones. Economies of scale apply when you’re dealing with a larger project. Costs can’t be determined until a site survey is done because no two buildings are the same, and the requirement varies from city to city.

Each building or campus configuration is unique. Each DAS system must be properly planned in order to determine both the amount of equipment required and the actual costs of implementing the system.

**Offsetting part of your cost**

Don’t look at providing for better two-way radio coverage within your building as simply an added (but necessary) expense; it’s also a great opportunity. In some cases, it’s possible to leverage a DAS investment so the investment serves dual purposes by adding cellular networks.

ROI is important to the cellular carriers. You must be able to demonstrate that the carrier has a significant amount of users in the building, and be able to demonstrate if they’re public users or static users. A way to attract carriers is by using a neutral host system. A neutral host system is owned by the building owner and is capable of being scaled for multicarrier use. Carriers may contribute to the cost but will want to know how many public visitors they’ll have versus static users. By providing this type of demographic information, your DAS provider should negotiate with the different cellular carriers and provide the best option for your building.

In addition to possible participation by the different cellular service providers, if your DAS system is configured to provide better cellular network service, you may find that you can charge higher rents if you can demonstrate that your DAS installation provides superior reception to the tenants. Gone are the days of most landlines, so good cellular network service and reception for mobile devices are things people both desire and expect.

People who depend on mobile devices may become more attracted to your building — especially compared to nearby buildings that may not offer enhanced cellular network services. It doesn’t matter if your building is an office building or a multi-tenant building, either, because better cellular network service is attractive to both markets.