

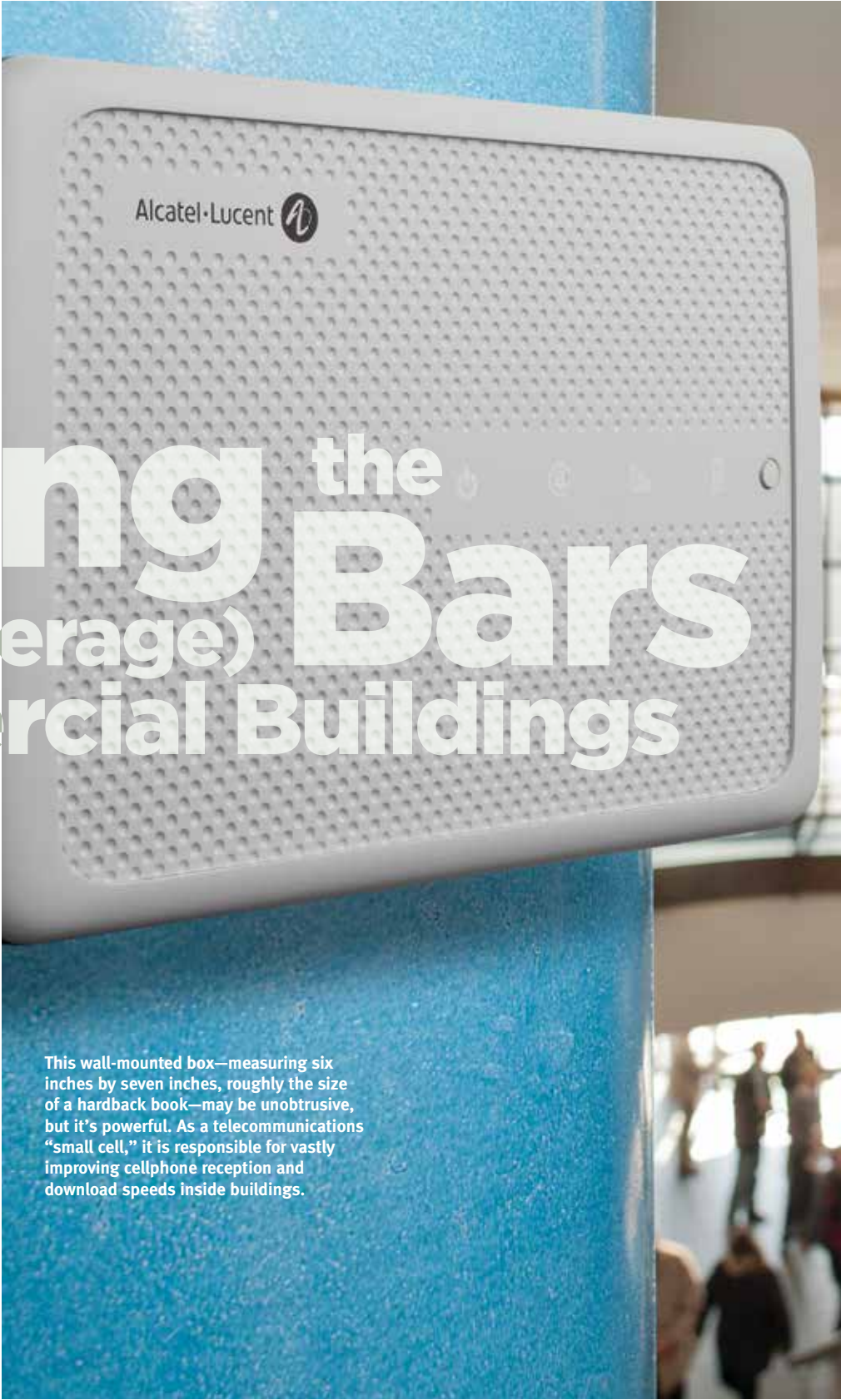
JEFFREY SPIVAK

Building owners and telecom carriers are finding ways to bridge the mobile phone coverage gaps that frustrate users.

Raising the Bars (Phone Coverage) in Commercial Buildings

JUST ABOUT EVERYONE has experienced it. You're in an office building and your mobile phone connection plummets from four bars to barely one, making reception spotty. Or you are at a sporting event, trying to post a picture to Facebook from your phone, and it's not working. Or you're at a convention and your phone shows four bars, but you still cannot make a call or retrieve e-mail.

It can be frustrating and bewildering. But some emerging solutions are being embraced in commercial real estate. Building owners and telephone carriers are installing customized telecommunications systems to improve cellular phone service, fill in coverage gaps, and provide better emergency communications capabilities. The companies are making these investments—which can range from tens of thousands of dollars to several millions of dol-



This wall-mounted box—measuring six inches by seven inches, roughly the size of a hardback book—may be unobtrusive, but it's powerful. As a telecommunications "small cell," it is responsible for vastly improving cellphone reception and download speeds inside buildings.

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lars—to satisfy customers, retain tenants, and, in some cases, even generate extra revenue.

Telecom equipment called a distributed antenna system—known as DAS—is being mounted at stadiums, airports, universities, hospitals, convention centers, high-rise towers, and other large-scale properties where thousands of people gather daily or occasionally. Meanwhile, smaller-scale products called femtocells, picocells, and metrocells—collectively known as “small cells”—are gaining favor in office buildings, hotels, industrial warehouses, shopping centers, and other facilities where better phone service is not just a desire, but a demand in today’s smartphone culture.

“The mobile phone has become such a critical part of everyday life that any office or retail space that doesn’t support a mobile phone is really going to suffer,” says Andy Germano, vice president for the Americas at the Small Cell Forum, an industry association that promotes the adoption of telecom improvements. “Some business owners realize that if they want to attract tenants, they need better coverage. It could be the difference between tenants coming in or not coming in. We’re just at the tip of the iceberg in terms of understanding, education, and wider deployment.”

It is an issue intertwined with real estate. The telecom industry estimates that 60 percent of mobile calls and 70 percent of data usage occur inside buildings—and that is where problems crop up. According to a recent survey done for telecom systems provider SpiderCloud Wireless, 61 percent of larger U.S. offices have noticeably poor indoor cellular reception. Similarly, a recent survey conducted for the Washington, D.C.-based National Multi Housing Council found that more than one-third of respondents in large apartment complexes felt cell reception was weak or spotty. More than 150 municipalities now mandate consistent wireless coverage in large buildings so that public-safety responders can communicate anywhere inside.

In the past, phone companies tried to handle such needs by simply building more cell towers. But they cannot keep up with

phone usage demands. Many buildings already have wi-fi service, but that does not work for phone calls. So the market for DAS and small-cell solutions in new and existing buildings is forecast to skyrocket in coming years. Real Wireless, a U.K.-based independent wireless consultancy, predicts that DAS and small-cell usage will spread from about 2 percent of all medium and large buildings worldwide to 35 percent in the next dozen years. In the United States alone, the combined number of DAS and small-cell installations is predicted to soar more than tenfold from 116,000 this year to 1.5 million in 2020.

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—Rick Haughey

“There’s definitely more awareness and planning for cellular coverage, but it’s an education process,” says Doug Lodder, vice president of business development for Los Angeles-based Boingo Wireless, which installs DAS systems. “DAS and small cells aren’t exactly household words yet.”

DAS has been making inroads at sports stadiums such as Soldier Field in Chicago; at airports such as Los Angeles International Airport; on college campuses such as the University of Kansas in Lawrence, Kansas; and at office buildings such as the Empire State Building in New York City. Small cells are only beginning to hit the buildings market, with installations at hotels such as Starwood Hotels and at warehouses such as those serving furniture retailer Rooms To Go.

Dallas-based Granite Properties has installed small cells in six of its 28 mid-rise office locations across the country, mainly to boost cellular reception in sections of the

buildings. But the company has not passed along the costs—which are in the tens of thousands of dollars—back to tenants, according to chief executive officer Michael Dardick, who is also assistant chairman of ULI’s Industrial and Office Park Development Council (Gold Flight).

“The trend is clear: We’ve gotten to the point where everyone wants to use their phone everywhere,” Dardick says. “But is it something they expect wherever they are, or something they’re willing to pay for? We still have to find that out.”

Coverage and Capacity

Like many college campuses, the University of Kansas has plenty of cellphone dead spots. Some historic buildings have masonry walls three feet (0.9 m) thick, blocking phone signals, and some points on the 1,000-acre (405 ha) campus are too far from a cell tower. In these cases, cellphone reception drops from four bars to one or none. These are cell “coverage” issues.

What can be just as maddening, though, are network “capacity” issues, which arise when too many people are trying to use their



Small cells are used in a variety of interior building settings, from warehouses (pictured here) to grocery stores, to improve cellphone coverage and capacity.

phones simultaneously. These can occur at inopportune times, such as when 16,000 fans pack the university’s Allen Fieldhouse to watch the highly ranked Jayhawk men’s basketball team. Their phones may show four bars, but too many people are calling, texting, or posting at the same time, so the calls, texts, and posts don’t go through because the nearest cell tower cannot handle them all. “Virtually everyone on campus has experienced that,” says Jeff Perry, the university’s deputy technology officer.

As a result, the university recently announced a project to deploy a DAS network. It involves dozens of antennas installed on the roofs of buildings, along with a custom system inside Allen Fieldhouse. This design is expected to cover 90 percent of indoor spaces on campus and provide a 20- to 30-fold increase in the university’s cellular capacity. In addition, the university will earn a small amount of revenue from leasing space to the phone carriers for their DAS equipment.

“This isn’t about making big money. It’s about making our properties more modern,” Perry says.

Indeed, people increasingly view five bars not as a luxury but as an essential amenity, like utility services. “In addition to plumbing and electricity, it’s something people count on now,” says Tracy Ford, director of the HetNet Forum at PCIA—the Wireless Infrastructure Association, an industry trade group.

Yet phone companies can hardly keep up with the demand. For example, AT&T notes that mobile data usage on its network alone soared 30,000 percent from 2007 to 2013. Going forward, mobile data traffic from phones, tablets, and laptops is predicted to grow sevenfold in North America between 2013 and 2019, according to a new report from communications company Ericsson. The main reason: greater use of streaming video, from YouTube to TV shows.

Streaming videos on your phone inside modern buildings is already tough because wireless signal strength decreases as it travels through walls and windows. Yet the challenges



A more powerful solution to improve cellphone reception is called a distributed antenna system, or DAS. It can improve phone service over a larger expanse of space, inside or outside. A DAS was installed at Chicago’s United Center arena, and one of the system’s antennas is embedded in the box atop the exit sign.

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are getting even tougher, according to a study last year from Real Wireless. For instance, some popular green building features, such as low-e glass with metalized coatings, tend to slow cellular penetration within buildings. “I don’t think a majority of people realize that green features impact cell service. That was a surprise to me,” says Rick Haughey, vice president of industry technology initiatives for the National Multi Housing Council.

Return on Investment

DAS and small cells will increasingly fill the need for better wireless service. But the two systems are entirely different.

DAS creates wide zones of coverage using multiple antennas connected to a base station hub by fiber or copper wiring. The antennas—as small and unnoticeable as a smoke alarm—are usually affixed to ceilings, and each can cover 5,000 square feet to 25,000 square feet (465 to 2,300 sq m) of space. The base station requires a separate room with upwards of 50,000 square feet (4,600 sq m) for the equipment.

The main benefits of DAS networks are the large coverage areas involved, such as stadiums and university campuses, and the ability to incorporate connections with multiple phone companies. But DAS can take several weeks to install, and it can be costly. Installation cost can range from \$1 to \$5 per square foot (\$10.76 to \$53.80 per sq m) because the system must be designed, and it requires extensive cabling, according to Exact Ventures, a telecom market research firm based in Burlingame, California. For a 500,000-square-foot (46,000 sq m) office building, then, DAS could cost from \$500,000 to \$2.5 million.

Meanwhile, small cells, as the name implies, are smaller in every way. A typical picocell is about the size of a small printer, and its signal covers only about 650 square feet (60 sq m) of space. Also, each small cell transmits a single frequency, meaning it connects with just one carrier. But the system is easy to install, taking just a few days, and its primary appeal is its low cost. Installation can range from \$0.25 to \$0.50 per square foot (\$2.69 to \$5.38 per sq m), and once equipment is factored in, the cost of outfitting a 100,000-square-foot (9,300 sq m)

facility would range from about \$35,000 to \$65,000, according to industry experts.

In commercial real estate, investments in DAS and small-cell systems are made in three ways: operator-driven installations, property owner financing, and third-party integration.

The operator model involves one carrier, such as AT&T or Sprint, taking on the installation, management, and integration with other cell networks. This makes financial sense

This can make financial sense for the real estate owner or developer if better signal reception quality and internet connectivity provide a competitive advantage in the marketplace, resulting in lower tenant turnover. In some cases, though, the investment is merely the cost of staying competitive.

That is how the Athens Group, a Phoenix-based development company, justified incorporating DAS in the development of its two



Like with small-cell boxes, DAS antennas are designed to be small and unnoticed in interior settings. In this plush upstairs lobby inside the United Center, a DAS antenna is the white rounded mound in the ceiling tile between the speaker and the lights.

for the phone companies mostly in indirect ways—reflecting what the companies can save rather than what they can gain. Better reception, for instance, could lead to fewer customers switching to other carriers. Also, DAS and small cells free up capacity on carriers’ cell towers, thus reducing the need to build more towers.

“The return on investment is long-term,” says Bryce Bregen, vice president of sales and marketing for Duluth, Georgia-based Connectivity Wireless, which develops DAS systems as a third-party vendor. “It doesn’t make a lot of sense financially, but they’re trying to prevent chum.”

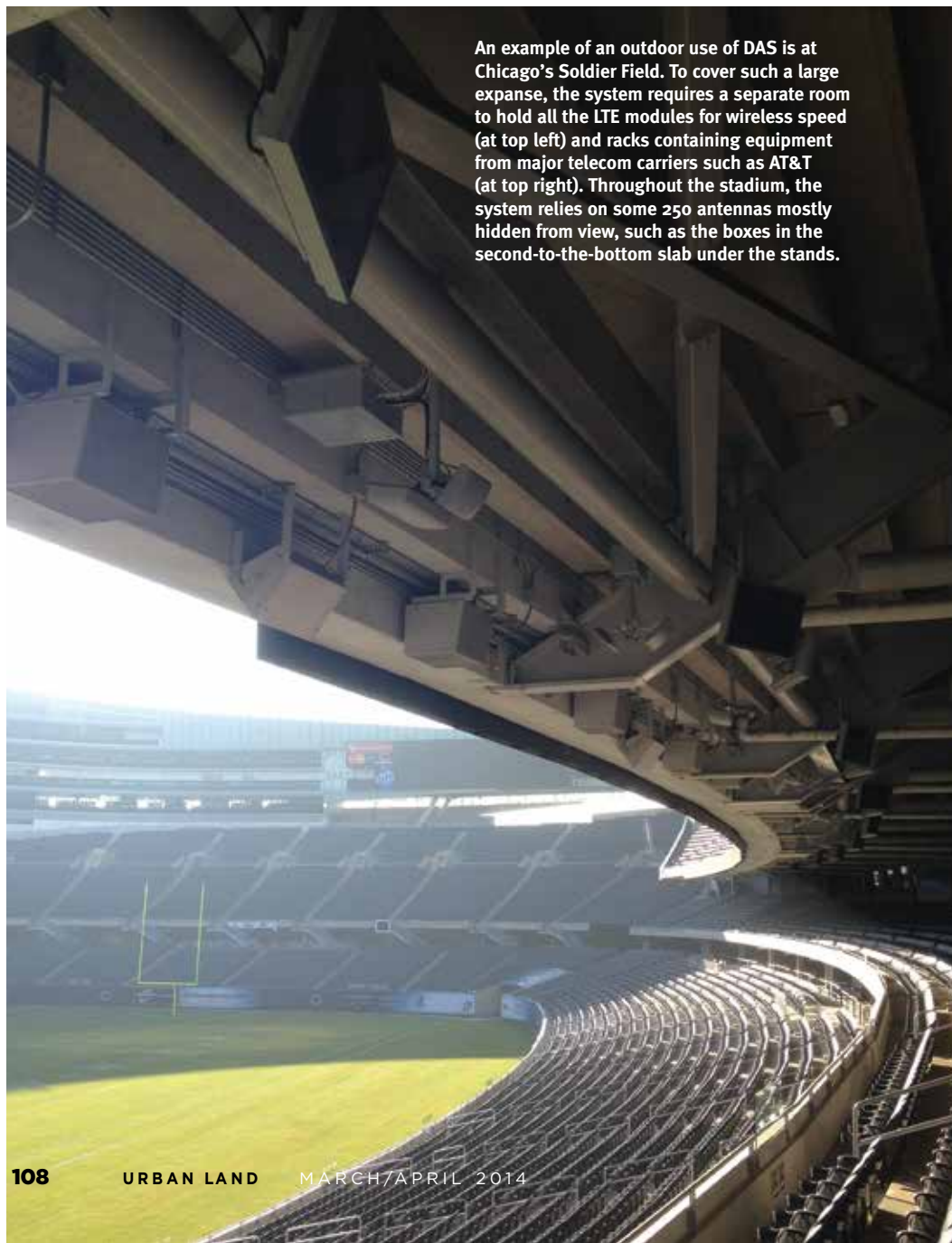
If phone companies won’t make needed telecom improvements, building owners may decide to make the investment themselves.

newest luxury hotels—the 174-room Montage Deer Valley in Park City, Utah, and the 201-room Montage Beverly Hills in Beverly Hills, California. “The hotel operator does not want to jeopardize losing these customers who pay very high rates to stay at ultra-luxury properties,” says Jeff Mongan, a senior vice president at Athens and a vice chairman of ULI’s Recreational Development Council (Red Flight).

Finally, a number of companies like Connectivity Wireless, Boingo Wireless, and Public Wireless have emerged in recent years as third-party vendors, acting as telecom consultants that find a prospective property and fund the system themselves. This produces revenue for two participants—for the consultant through a lease with the phone companies to hook into the system, and for



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An example of an outdoor use of DAS is at Chicago's Soldier Field. To cover such a large expanse, the system requires a separate room to hold all the LTE modules for wireless speed (at top left) and racks containing equipment from major telecom carriers such as AT&T (at top right). Throughout the stadium, the system relies on some 250 antennas mostly hidden from view, such as the boxes in the second-to-the-bottom slab under the stands.

the property owner through a lease of space for the system's equipment. For the property owner, the arrangement isn't a large revenue generator—upwards of tens of thousands of dollars a year, according to industry experts—but it is an additional amenity without an upfront cost.

In New York City, cellphone reception tends to drop off above 20 stories, so the Empire State Building is adding DAS at no cost through the third-party approach. A third-party provider is making the investment and signing up carriers in lease arrangements, then sharing part of the revenues with the building. "It's a great model," says Tom Durels, executive vice president in charge of property operations and leasing for the Empire State Realty Trust.

Real estate professionals who have worked with DAS and small cells offer one important lesson from their experiences: investigate and address cell reception on the front end of any new construction or redevelopment process, rather than discover there are issues once the project is completed. "You may not be thinking about it now, but you should be, or it'll be a \$100,000 solution later," says Haughey. **UL**

JEFFREY SPIVAK, a senior market analyst in suburban Kansas City, Missouri, has been writing about real estate, development, and infrastructure issues for more than 20 years.

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