STADIUM TECH REPORT

SUMMER 2021

COORS FIELD WI-FI 6 UPGRADE

GETTING READY FOR THE ALL-STAR GAME

UNIVERSITY OF ARIZONA ESPORTS FACILITY

SMART POLES

STADIUM TECH REPORT

Welcome to the second issue of our EIGHTH year of STADIUM TECH REPORTS, the Summer 2021 issue!

These long-form reports are designed to give stadium and large public venue owners and operators, and digital sports business executives a way to dig deep into the topic of stadium technology, via exclusive research and profiles of successful stadium technology deployments, as well as news and analysis of topics important to this growing market.

Our stories for this issue include an in-depth profile of the new Wi-Fi 6 network upgrade at the Colorado Rockies’ Coors Field, which will host the Major League Baseball All-Star Game this July. We also have a profile of a new esports facility deployment at the University of Arizona, done by a new firm called 1337 Facilities, which is led by stadium technology veteran Bob Jordan.

We’d like to take a quick moment to thank our sponsors, which for this issue include Corning, Boingo, MatSing, Cox Business/Hospitality Network, American Tower, CommScope, AmpThink and Belden. Their generous sponsorship makes it possible for us to offer this content free of charge to our readers. We’d also like to welcome readers from the Inside Towers community, who may have found their way here via our ongoing partnership with the excellent publication Inside Towers.

As always, we are here to hear what you have to say: Send me an email to kaps@mobilesportsreport.com and let us know what you think of our STADIUM TECH REPORT series.

Paul Kapustka, Founder & Editor
Stadium Tech Report

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Paul Kapustka

FANS ARE RETURNING.
IS YOUR VENUE REALLY READY?

As spring turns into summer, it seems like every day there are new pieces of good news arriving. With more areas of the country seeing the pandemic in recession, more and more cities and states are giving venues permission to hold full-attendance events. For those of us in the events business as well as those who drive our business — the fans — it's a welcome shift. But the pandemic? Hate to say so, but it ain't over yet.

As mask requirements in the U.S. start to fall by the wayside and vaccinated people are beginning to return to "normal" lives, it's tempting to just say "it's over." But that's not really true. Just look to Japan, where the Olympics will be held later this summer with no outside visitors and strict limits on attendance at every event, all to keep the Covid-19 virus at bay. Or look to other parts of the world where infections linger on. New variants of the virus are starting to cause small increases in infections here in the U.S., mainly in places where vaccination levels are low.

So yes, if your region says it's safe, go ahead and hold your events. But it's still a good time to ask your school, team or venue — are there ways to use technology to help keep fans protected as they come back? If fans are returning, is your venue really ready to make them feel safe and welcome?

FOCUS ON THE ENTRY

In our previous coverage of what venues were doing to help keep fans safe as events started to happen again, the simplest thing venues could do was eliminate lines. Today, most people understand the idea of social distancing in public situations. If venues can eliminate lines or make them shorter and faster it's an easier task for all involved.

The first place to try to whittle down lines is the most obvious, entry into the stadium or arena. While every venue we've talked to has made the shift to requiring digital tickets for entry, the question remains — are venues ready technologically to handle the shift to digital ducats?

What that means on the most basic level is, does your venue have adequate connectivity just outside the doors — the very place where many fans realize they need to download their tickets? In our lead profile this issue the IT team at the Colorado Rockies told us about a big paradigm shift from several years ago. They purposely cut off Wi-Fi access just outside the stadium gates (mainly to keep it separate from the nearby residential buildings). In the Rockies' offseason deployment of Wi-Fi 6 the team went the other direction, adding significant coverage around the stadium's exterior, especially outside the entry gates and even extending into the new McGregor Square area adjacent to the ball park.

At FC Cincinnati's new TQL Stadium (profiled in our previous issue) the same thinking was in place: Third-party DAS operator Mobilitie designed in extra coverage for spaces outside the main entry, with the historical knowledge that many fans don't think about downloading a digital ticket until they are within sight of the stadium.

A second step some venues have taken is to upgrade the next choke point in fan-entry flow — metal detectors. We've not been out to see new detector systems live, but reports from our field scouts tell us that the walk-through detectors at Wrigley Field — where fans don't have to take things out of pockets or purses — are light-years better than the systems they replaced. Similar systems installed at Miami's Hard Rock Stadium got thumbs-up from fans. Is your venue moving in this direction or will your detector line still resemble an airport?

CONCESSIONS: LESS CASH, MORE AUTOMATION

We've also profiled how concessions technology can help venues keep fans safe by reducing person-to-person contact. By adding more automation to the ordering and fulfillment of drink and food, lines are shrinking.

Major League Baseball took things a step further than most leagues by requiring that all concessions purchases be made through the league-standard Ballpark app. But judging by some early problems with the process, more fan education and maybe some in-person help might have been warranted. Many venues reported issues like orders not going through or fans not completely understanding the process at the early games this season. It might be low-tech, but increased signage with online ordering instructions and even some "ambassador" type staffers might not be a bad idea to help fans new to the process.

As a team or venue it's also good to ask if the wireless coverage in and around your concessions areas is at full strength, making sure that the increase in wireless traffic can be handled both on the client side and on the back-end processing side.

It's encouraging to see more venues experiment with new technologies. TD Garden opened a couple of walk-out stores earlier this year (where cameras and sensors record what fans are buying) using technology from Amazon. Zippin technology powered a new store at AT&T Center in San Antonio. And Mashgin will have its checkout technology will in place at the PGA Tour's Travelers Golf Championship in late June. Mashgin camera scanners look at what a fan is buying and then post the cost on a nearby card-payment machine.

STR STADIUM TECH REPORT

COORS FIELD GETS WI-FI 6 UPGRADE AHEAD OF ALL-STAR GAME

When Major League Baseball moved this year's All-Star Game from Atlanta to Denver, it no doubt set off a lot of organizational scrambling in order to get Coors Field ready to host the sport's mid-summer celebration.

Technology Integrator **AMPTHINK**
Network & Wi-Fi Gear **CISCO**

The view from the bleachers at Coors Field. Credit all photos: Paul Kapustka, STR

\\ **BY PAUL KAPUSTKA**

Even with a full house of fans expected in July, one thing that didn't cause any last-minute chaos was the upgrading of the stadium's Wi-Fi network, which had already been undergoing a full renovation with added capacity and support for the new Wi-Fi 6 standard. With finishing touches being put in place at the time of a Stadium Tech Report visit to Coors Field in early May, the new Wi-Fi network should be able to more than handle the connectivity needs of the expected 50,000-plus guests at one of the first 100-percent capacity "big events" since the Covid-19 pandemic hit last year.

MAKING A GOOD NETWORK BETTER

Unlike the need driving some upgrades or network refreshes, the Wi-Fi situation at Coors Field wasn't exactly underperforming. Four years ago, a visit by Stadium Tech Report found that the network that was initially deployed for the start of the 2015 season was doing fine, with strong performance marks all around the "old" venue, which opened in 1995.

Coors Field was one of the first stadiums that took part in the first iteration of Major League Baseball's 2014-era "tech consortium" — where the league partnered with teams, equipment vendors and wireless service providers to bring negotiated-cost Wi-Fi and DAS deployments to every stadium that didn't have them, a plan that eventually touched 23 of the MLB parks.

But even if the early networks were still working, with a new Wi-Fi standard available, it seemed like a good time to upgrade the old systems since for just about every public Wi-Fi or cellular network, demands continue to only go up with each passing year. For 2020, MLB had hatched a new consortium-type plan to bring the new Wi-Fi 6 standard to stadiums before the start of the season, and Coors Field was slated to be one of the first to get an upgrade.

Then, the Covid-19 pandemic hit and with fans not coming to stadiums, deployment plans were delayed.

Fast-forward to 2021, and another curve ball arrived, in the form of a February deal struck between MLB and Extreme Networks under which Extreme would become the league's "official Wi-Fi solutions provider," with 16 teams signing on to get Extreme gear installed. Coors Field, however, had a slight issue in that it had already purchased Wi-Fi 6 gear for its planned upgrade, from previous consortium supplier Cisco.

While the Colorado Rockies remain committed to the MLB consortium plan, with the league's blessing the team moved ahead with its already-underway deployment of Cisco gear, with design and installation done by AmpThink. The new network at Coors Field also includes some Extreme Networks Wi-Fi 6 gear, located in bullpens and dugouts as part of an extension to the MLB/Extreme Wi-Fi deal.

ADDING CAPACITY, FINE-TUNING PLACEMENTS

Even if the existing Wi-Fi network was working well, the Rockies knew it was time to increase the capacity and reach of the system, especially in the area just outside the stadium walls.

"In the past, we really didn't want a Wi-Fi signal outside the stadium, and we even configured it so that there was a 'waterfall' dropoff once you got a few steps away," said Mike Bush, senior director of information systems for the Rockies. "But now, we want fans to have access outside."

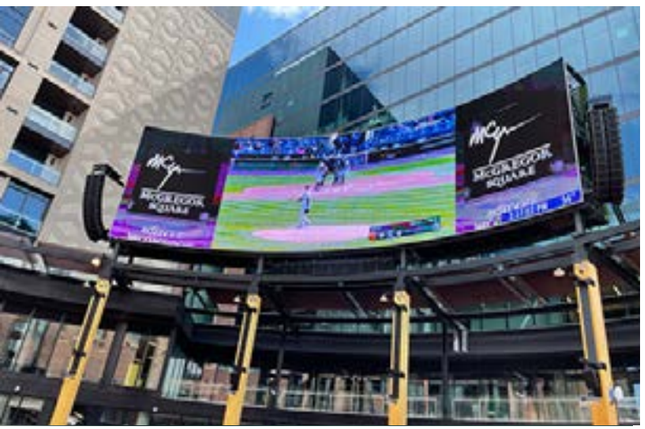
To that end, the deployment team of the Rockies, MLB, Cisco and AmpThink added a number of new antenna placements all around the signature red-brick outside facade, and significantly increased the Wi-Fi coverage

Extra Wi-Fi coverage was installed for exterior gathering places, like stadium entry gates

at the newly refurbished entry gates where the Rockies built awning coverages for the security lanes — which became a perfect mounting place for overhead Wi-Fi antennas.

The team also extended network coverage down the walkway outside Gate E on the stadium's south side, to the new McGregor Square area where fans are expected to gather before, during and after events. During our visit our Wi-Fi connection switched automatically from the Verizon-customer SSID to a Rockies-specific SSID when we walked from the stadium to McGregor Square. Inside the outdoor plaza area, where a huge curved LED screen was showing live game action, we got a speedtest of 44.6 Mbps on the download and 62.1 Mbps on the upload.

"From an end user perspective, we want it to be



The nearby McGregor Square will also have stadium Wi-Fi coverage.

seamless, where you just jump on the network once and stay connected," Bush said. Bush added that the network now also reaches out to the Coors Field parking lots, with some spaces a half-mile away from the stadium.

Like just about all other sports events these days, MLB games are now using all-digital ticketing, which makes the increased coverage at entry gates especially important. Bush noted that in the past, fans in groups were able to enter with all tickets being scanned off one device, but now safety and security procedures requires that every fan has a single digital ticket — which means more devices need to connect to a network for entry.

As fans were entering the stadium we stopped by the main gate inside lobby, where a few new AP placements no doubt helped with the speedtest we got, with 108 Mbps for download and 91 Mbps for upload.

Wi-Fi antennas were moved out farthe on overhangs to increase coverage.

DOUBLING DOWN ON THE LOWER BOWL

When the original Wi-Fi network was installed at Coors Field, new design techniques like railing antenna enclosures and under-seat locations were not yet mature, so the Rockies went with the more traditional overhead and back-to-front or front-to-back deployment methods to cover most of the seating area.

For the upgrade the ballpark architects wanted to stick to that method, which meant that the Rockies, AmpThink and Cisco had to get creative in expanding the number of APs and antennas. One feature that was utilized frequently was the fact that the newer Cisco APs can support two 5 GHz antennas per unit, which allowed AmpThink to double down in many areas, installing two antennas where there used to be just one.

Other capacity-increasing tweaks included moving some antenna locations from the farthest points back of the overhangs to spots closer to the end, giving the antennas better reach into the harder-to-cover seats in the middles of sections.

"We put a lot of effort into finding ways to increase capacity while still using existing cable," said Eric Miller, AmpThink senior project manager, who is responsible for overseeing the Coors Field upgrades. In all, Coors Field increased its antenna count from 570 to 805, using 720 APs, with 85 of those being the dual-antenna version. Previously the stadium had 570 APs.

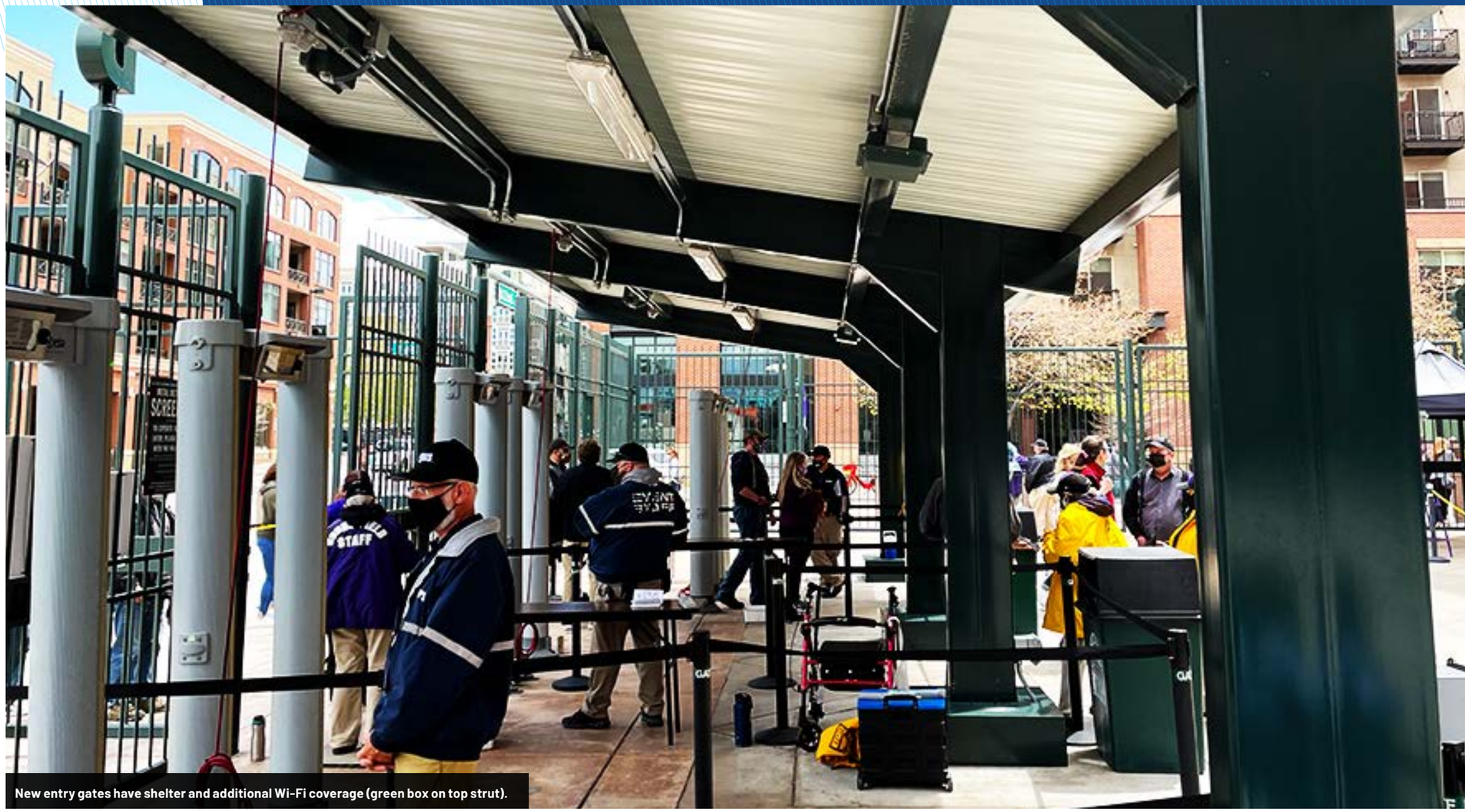
'We put a lot of effort into finding ways to increase capacity while still using existing cable.'

AmpThink also installed newer versions of the so-called "coffin" box enclosures for locations like the ones on the field wall pointing back up into the stands, which are thinner and easier to maintain with easier access and more easily replaceable electronics.

"The new installations reflect years and years of us perfecting our enclosures," said AmpThink's Miller, who noted that while in the past AmpThink bought the enclosure hardware it now designs and manufactures its own patented offerings, which are specifically built to withstand things like stadium power-washing.

The upgrade plan also sought to solve some previous connectivity problem areas, like several sections of ADA seating on the upper deck that weren't easily covered by antennas from below or above. The solution this time was found in a bit of unused space behind the restrooms on the upper-level concourse. By putting AP electronics

A slimmer 'coffin' enclosure points back from the field wall to lower-bowl seats.



New entry gates have shelter and additional Wi-Fi coverage (green box on top strut).

inside the space and then drilling a hole through the concrete wall to put antennas outside, the team was able to deploy flat-panel antennas right behind the ADA seating, which should more than solve any previous issues.

Expanded capacity also took place on the network's back end, where 55 new Cisco 9300 edge switches were deployed along with new Cisco 9500 series core routers, to help enable a backbone bandwidth upgrade from 1 Gbps to 10 Gbps.

MORE CONNECTIVITY FOR THE ROOFTOP, FOR WHEN FANS COME BACK

At the time of our visit, local regulations would only allow the Rockies to admit fans up to 40 percent capacity of the 50,000-seat park, but that limit was recently raised. Coors Field is now allowed to have full capacity seating, which means there should be a completely sold-out stadium for the All-Star Game and all its surrounding festivities, including the popular Home Run Derby. If the Covid-19 infection rates keep dropping in the current trend, the team is hoping that it will be able to have no limitations on attendance when the All-Star Game festivities arrive in mid-July.

Bush, for one, is looking forward to the re-opening of the stadium's popular "Rooftop" area, a segment of the upper right-field deck where seats were removed and stroll-around areas were built around a food and bar complex. According to Bush, more Wi-Fi capacity was added in the Rooftop area as well, since statistically it has proven to have the highest data use rates of any section of the stadium.

And those data rates should only go up, as fans return and find not just more raw capacity but also the potential increases in speed and efficiency promised by the Wi-Fi 6 standard, which is now included in most popular devices, including Apple's iPhone 11 and iPhone 12 series.

"When you look to the future and think about things like sports betting, connectivity is only going to keep being more and more important to the fan experience," Bush said. "We want to have the capacity needed to support all that, to allow people to have a great experience and then be able to share it instantly."

STR STADIUM TECH REPORT

UNIVERSITY OF ARIZONA TAPS 1337 FACILITIES TO BUILD 'FLEXIBLE' ESPORTS CENTER

\\ BY PAUL KAPUSTKA

After bursting onto the sporting mindset a few years ago with a huge bang, the idea of live-attendance "esports events," or fans watching competitive organized gaming, has had some problems living up to the hype.

While projections of Super Bowl-sized crowds assembling to watch live gaming events haven't quite materialized yet, the undeniable popularity of competitive gaming, from casual play, to collegiate events, to pro leagues, has many organizations scrambling to figure out the best way to build special-purpose facilities to support all the needs of competitive gaming; from instruction and training to actual events.

Like almost all other competitive sports, esports worldwide were affected by the Covid-19 pandemic, which put a halt to almost all live-attendance events for most of the past year. But as things start to return to normal, many supporters — especially U.S. colleges — are looking for ways to build facilities that can not only host live events, but act as training or casual-play

The new esports facility at Arizona was designed and deployed by 1337 Facilities and AmpThink. Credit all photos: Dan Grimsley, AmpThink

facilities that can realize some revenue from paid-play time or corporate sponsorships.

For the University of Arizona, a company called 1337 Facilities — we'll explain the name in a bit — led by longtime sports technology deployment expert Bob Jordan, has developed a model for building a flexible esports facilities using existing university space. By using uniquely designed furniture manufactured by AmpThink that can quickly transition from tournament setting, to team training, to class-type instruction, the company was able to reconfigure an existing

Custom LED lighting is part of the 'gaming' feel.

campus billiards room into an esports facility for about a quarter-million dollars.

According to Jordan, a flexible system that can accommodate the widest ranges of gaming needs is a much better solution — economically and operationally — than single-purpose venues that have inherent constraints on flexibility.

"There has to be a way to create gaming centers that meet all of the needs of esports including revenue generation," said Jordan. "I think our approach to modularity sets us apart."

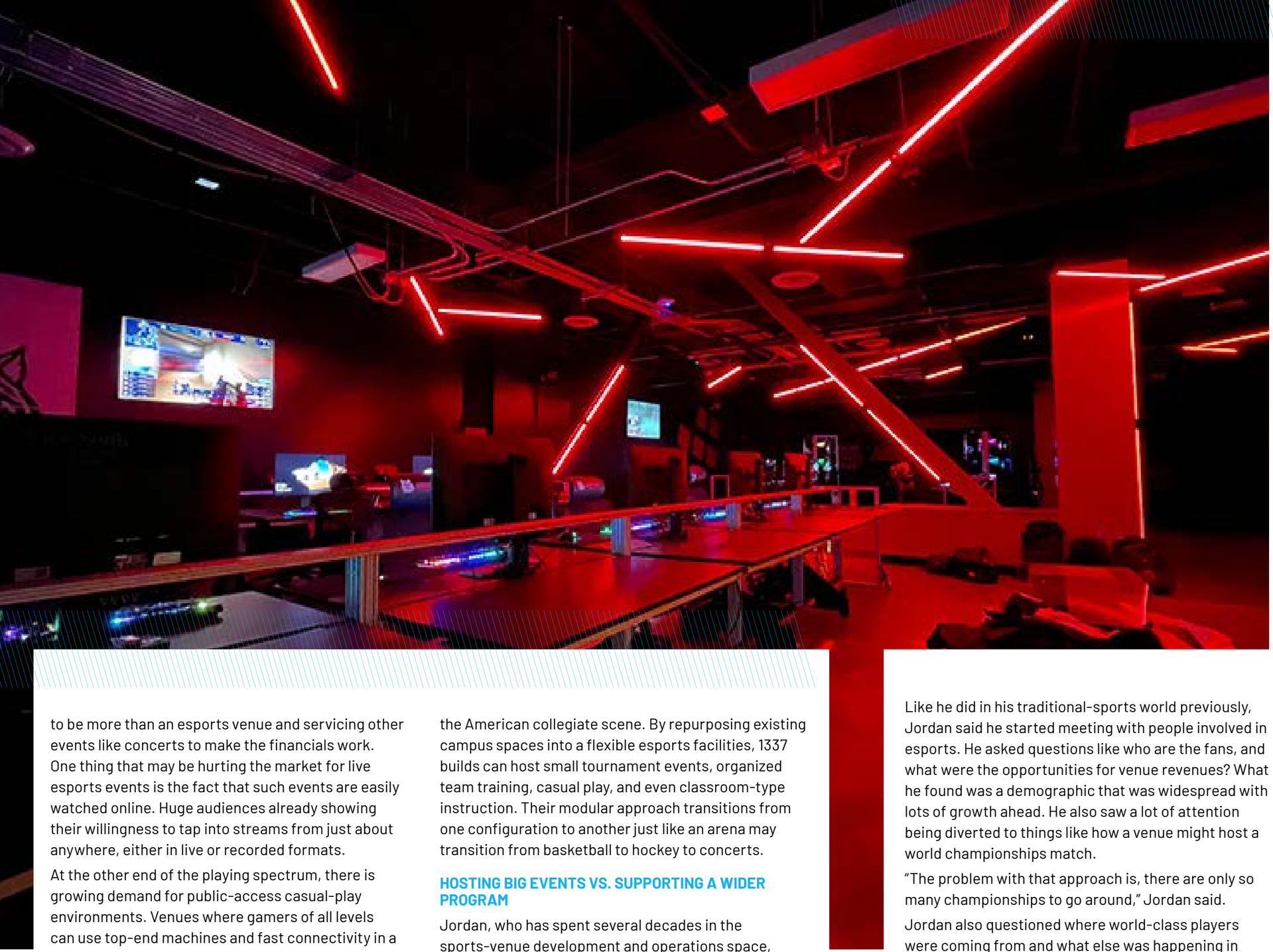
> **"There has to be a way to create videogame centers that meet all the various needs of esports including the ability to generate revenue"**

WHAT IS THE APPETITE FOR LIVE ESPORTS EVENTS?

Big gaming events, like yearly championship matches for the top pro teams playing the most popular games, have been held in existing basketball-sized arenas. But the specialized needs for professional-level gaming — including high-speed network connectivity and integrated digital displays for sharing the action with the fans in attendance — have many esports backers and promoters seeking venues of their own. The ambition is right-sized facilities that maximize performance and enjoyment of the action.

On the high end of the expectation curve are special-purpose esports venues like esports Stadium Arlington, Fusion Arena in Philadelphia, and a proposed Toronto arena. Esports Stadium Arlington, a 100,000-square-foot space in Arlington is already open. The Fusion Arena in Philadelphia, a $50 million space capable of hosting 3,500 fans for live events that was supposed to open in 2021, has been put on indefinite hold due to the Covid-19 pandemic. The proposed Toronto esports arena, a $500 million facility capable of hosting 7,000 fans for live gaming events that has a target opening date of 2025.

But the unanswered question remains the appetite for attending live esports events. Even the promoters of the proposed Toronto arena recognize that it needs



to be more than an esports venue and servicing other events like concerts to make the financials work. One thing that may be hurting the market for live esports events is the fact that such events are easily watched online. Huge audiences already showing their willingness to tap into streams from just about anywhere, either in live or recorded formats.

At the other end of the playing spectrum, there is growing demand for public-access casual-play environments. Venues where gamers of all levels can use top-end machines and fast connectivity in a welcoming environment — the modern equivalent of the video arcades.

By blending tournament play and casual gaming, 1337 Facilities hopes to tap into a sweet spot in the market — the American collegiate scene. By repurposing existing campus spaces into a flexible esports facilities, 1337 builds can host small tournament events, organized team training, casual play, and even classroom-type instruction. Their modular approach transitions from one configuration to another just like an arena may transition from basketball to hockey to concerts.

HOSTING BIG EVENTS VS. SUPPORTING A WIDER PROGRAM

Jordan, who has spent several decades in the sports-venue development and operations space, said he started looking into esports about four years ago."There was a lot of noise, and media attention," Jordan said. "I wanted to find out what was really happening, and where the noise was coming from."

Like he did in his traditional-sports world previously, Jordan said he started meeting with people involved in esports. He asked questions like who are the fans, and what were the opportunities for venue revenues? What he found was a demographic that was widespread with lots of growth ahead. He also saw a lot of attention being diverted to things like how a venue might host a world championships match.

"The problem with that approach is, there are only so many championships to go around," Jordan said.

Jordan also questioned where world-class players were coming from and what else was happening in some of the bigger pools of players and enthusiasts — mainly, the U.S. collegiate scene. Eventually, Jordan's search led him to team up with a couple of people who were active in the esports space – Jordan Rambis and Gary Briggs. Jordan Rambis is the son of former NBA player Kurt Rambis and a minority owner of Evil Geniuses, a well-known professional gaming team. Gary Briggs is CEO of Real Time Strategies, which organizes and produces gaming events.

Together, the trio formed 1337 Facilities. In gaming lingo, "1337" is numeric shorthand for "Leet" (if you look at the numbers upside-down) meaning "elite." Rambis and Briggs combined their esports knowledge with Jordan's facilities expertise in order to pursue the collegiate esports market with the goal of helping schools design, build and operate esports facilities that could address a wide range of uses and potential revenue streams.

NOT JUST FOR EVENTS, BUT FOR PRACTICE AND FUN

At some big-name schools that were early adopters of an esports strategy, the facilities are designed to see how many players could be packed into a space.

"We saw some deployments with lots of desks and infrastructure," Jordan said. "Modularity had never been considered. Our look at this market was to be smaller and adaptable, at a lower price point to make dynamic use of space. Our model was one of a greater audience and more uses than a static deployment."

To help flesh out the idea, 1337 Facilities brought on stadium technology master integrator AmpThink as an investing partner, bringing a wealth of design and deployment expertise to the equation.

AmpThink president Bill Anderson, whose firm custom-manufactures many of the elements used in its stadium deployments, compared Jordan's idea to a traditional arena, which change from basketball to hockey to concerts to accommodate different events.

"Bob's idea [for esports] was prescient, because there are lots of spaces on campuses like pool halls whose time is past," Anderson said. AmpThink took the original 1337 Facilities ideas and solved some issues with heat management and wiring by designing and building a package of furniture and infrastructure that can be easily reconfigured by students. The approach enables quickly switching from tournament setup, to team training, to casual play.

The 1337 package includes a "tower" housing the gaming PCs that with integrated wiring and cooling that can be easily moved. The tower is coupled with desks

PC 'towers' (lit red in back) and desks can be moved around to support an event configuration, or for training or casual play.

for play that can be folded up or out for different event configurations. The company's first build even included an AmpThink-designed LED lighting system to bring some of the visual style and theming that gamers want in their playing spaces.

WHO'S COMING TO PLAY

After winning the bid for Arizona's esports facility two years ago, the 1337 Facilities plan got derailed by the pandemic. "Covid put us back 12 months," Jordan said. "But now all systems are ready to go, with full operations expected when students come back to campus this fall."

Jordan said focus groups conducted by 1337 Facilities showed some non-surprising desires. For example, gamers wanted "rock-solid connectivity on high-end PCs, no latency" in any esports facility. But the focus groups also showed that students were also looking for "a place to hang out with other gamers," somewhere other than in dorm rooms or with roommates.

Instead of looking like a classroom or a practice facility, the Arizona esports facility is more of "a cool destination for after hours," Jordan said, with acoustical panels, video displays, hospitality and the LED lighting solution that AmpThink designed from scratch, at a fraction of the cost of a proposed third-party solution. "For Arizona students", Jordan said, "the software being used to run the up to 65 PCs and six consoles in the room will allow students to use their meal cards to rent machines. The operating software also manages the game inventory, updates and provides metrics on usage, players and machine health."

When it's time for a tournament-type event, Jordan said the room can be reconfigured in a very short amount of time, simply by moving the towers around, and reconfiguring the desks.

"Within an hour, we can be set up for team play in a tournament setup with a broadcast area... in the same space where a day before there might have been a STEM class taking place," Jordan said.

"Everyone wants to build the bespoke arena or the bespoke room," said AmpThink's Anderson. "But what Bob and 1337 have done is make very good use of an existing space — and every university has a space like this."

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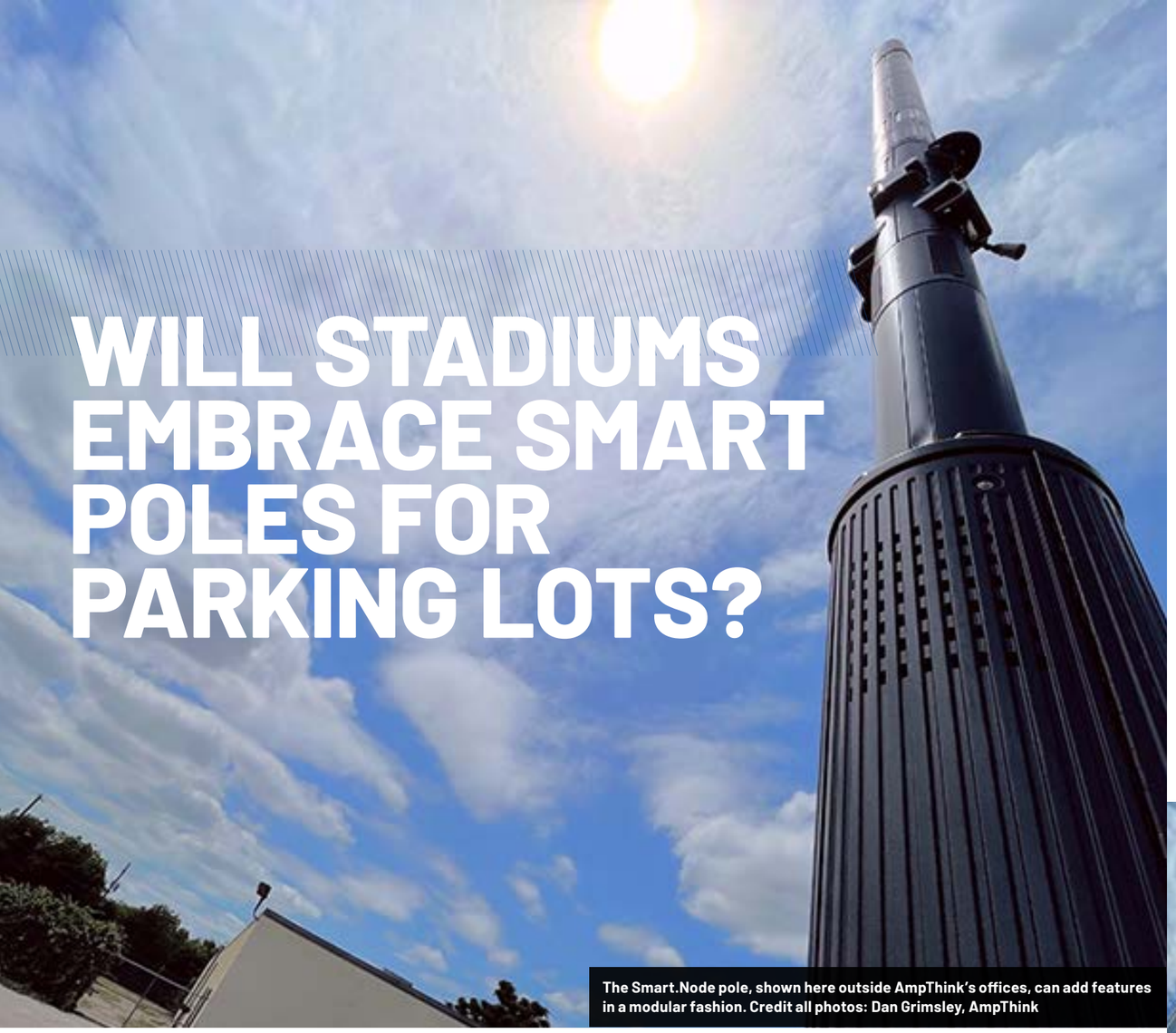
WILL STADIUMS EMBRACE SMART POLES FOR PARKING LOTS?



The Smart.Node pole, shown here outside AmpThink's offices, can add features in a modular fashion. Credit all photos: Dan Grimsley, AmpThink

\\ BY PAUL KAPUSTKA

If providing technology inside a stadium is an accepted idea, bringing more technology to the spaces just outside stadiums — mainly parking lots — is still a work in progress.

While venues have tried different types of one-off integrations, like attaching Wi-Fi or cellular antennas to existing light poles, some new offerings are coalescing around the idea of a "smart pole." The smart pole is a structure designed from the start to be aesthetically pleasing as well as modular and expandable. Designed as more than a light pole, smart poles are able to support a wide range of technologies including wireless connectivity, cameras, microphones, weather sensors, smart lighting and even electric-vehicle car-charging ports.

Ahead of this year's Super Bowl, Verizon helped fund the deployment of a number of smart-pole systems outside Raymond James Stadium in Tampa.

Manufactured by a company called ConcealFab, the poles were mainly targeted at providing a base for a range of wireless antennas. Another smart pole manufacturer is ENE.HUB. Stadium technology integrator AmpThink has installed one of the ENE.HUB Smart.Nodes at its Garland, Texas, headquarters to trial its capabilities. Owned now by Brookfield Infrastructure Partners, ENE.HUB is originally an Australian company that develops smart poles that are highly modular and support an impressive volume of technology.

> **"Construction in the public right of way is a big deal"**

SEEING WHAT IS POSSIBLE

As part of a partnership with Brookfield, the AmpThink installation had to address the same requirements venues and other public places need to satisfy to build something along a city street.

"Construction in the public right of way is a big deal," said AmpThink president Bill Anderson, whose company unveiled the smart-pole installation earlier this year. In addition to city construction permits and other civic negotiations, smart poles like the Smart.node need connectivity and power. In this case AmpThink provided fiber and power from its adjacent headquarters building.

Right now, modules operative on the AmpThink-hosted pole include street lighting, a phone charging station, a car-charging station, convenience outlets, a weather station, a high-performance microphone, security cameras, a wireless access point, and a speaker system.

According to the ENE.HUB product documentation, the poles can also host a wide range of other systems, including air quality monitoring sensors, noise measuring sensors, and ultrasonic detection. The

A wireless charger module (above) is just one of the many feature possibilities on the Smart.Node poles.

Smart.node can be equipped with a range of lighting and display capabilities. Options include flood lights, warning/flashing lights, and a digital-display panel for wayfinding and other information.

CONNECTING FANS

At the Super Bowl deployment, the ConcealFab poles were a veritable United Nations of wireless gear. While not every pole hosted every device, according to ConcealFab, their poles housed:

- Ultra wide-band Ericsson radios (mmW)
- CommScope AWS, PCS, and CBRS radios
- JMA canister antennas
- Extreme Networks access points and Wi-Fi antenna
- Leotek LED luminaires, and
- Axis cameras

As fans return to venues from the Covid-19 pandemic closures, they will likely find the need for increased wireless support for digital ticketing and more-complex wayfinding. Smart poles could be part of the solution as venues try to allow guests to connect and be informed well before they are inside the doors. The poles could also potentially be a revenue stream, especially with fee-based services like electric-vehicle charging ports supported by the ENE.HUB Smart.node.

"At this point, we're just testing what is possible," said AmpThink's Anderson.

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Corning is a leading provider of wireless infrastructure solutions, offering flexible architectures in the rapidly growing wireless market. With a portfolio of products ranging from converged cellular and Wi-Fi solutions for enterprises, to distributed antenna systems for wireless operators, Corning offers in-building infrastructure solutions that cover the needs of venues of all types and sizes. www.corning.com

Boingo Wireless (NASDAQ: WIFI) is a leading provider of cellular and Wi-Fi networks at stadiums and arenas, universities, airports, military bases, convention centers, multifamily communities and commercial properties. You'll find Boingo connecting people at sports and entertainment venues across the NFL, NBA, MLS, NCAA and more. These venues include Soldier Field, Vivint Arena, State Farm Arena, University of Arizona's Arizona Stadium, University of Nebraska's Pinnacle Bank Arena and more. Boingo's industry-leading Distributed Antenna System (DAS) networks leverage state-of-the-art design to deliver comprehensive stadium coverage and maximize carrier participation to ensure more fan access and meet the demands of the 5G era. As a global leader in managed Wi-Fi services, the company maximizes access to networks through global roaming agreements via carrier offload and major brand sponsorships through the Boingo Media Platform. For more information, visit www.boingo.com.

MatSing is a pioneer company in bringing high performance RF lens solutions to industries including wireless broadband, satellite, measurement and big venues. MatSing has had a strong focus on meta-material development and design, allowing them to construct the worlds lightest and largest RF lenses. Having developed unique high-performance lens antennas for multiple industries, MatSing is now driven to transform 4G networks to lens technology. Holding several RF technology patents, MatSing Inc. has led the development of a new approach to antenna design, focusing on using RF Lenses to outperform traditional phased-array (panel) or dish antennas, providing a needed solution to growing capacity demands. www.matsing.com

Hospitality Network, an affiliate of Cox Business, is a premier provider of choice for Managed Wi-Fi, Location Based Services and In-Room Entertainment to convention centers, arenas, stadiums and hotels across the nation. Our custom tailored, technology solutions are created to meet the specific needs of each of our customers. HN has proven solutions that benefit our customers, their guests and visitors from coast to coast. Visit us at www.coxhn.com to learn more.

American Tower brings building and venue owners more than 15 years of experience deploying and monitoring in-building and outdoor wireless infrastructure solutions, including Distributed Antenna Systems (DAS), In-Building Small Cells, and Carrier Grade Wi-Fi. Today, we manage more than 400 networks, covering 390 million square feet, in offices, malls, campuses, stadiums, arenas, casinos, and other venues. Our multitenant networks support mobile coverage, high-speed internet, building automation, security, and the Internet of Things, while enabling a path to 5G coverage. As one of the largest Real Estate Investment Trusts (REIT) in the U.S., we have the financial strength and scale to support any in-building wireless communications needs.

Belden's complete, end-to-end infrastructure solutions (including racks, cable and connectivity) are designed to accommodate entertainment facilities large and small – new or decades old – and all the upcoming technologies and future-forward applications headed their way.

Can't find a solution that offers you what you need? Belden can provide specialized products created for your specific stadium or venue application. We've helped our customers create solutions to simplify cable deployment and make moves, adds and changes fast and easy.

CommScope (NASDAQ: COMM) is pushing the boundaries of technology to create the world's most advanced wired and wireless networks. Our global team of employees, innovators and technologists empower customers to anticipate what's next and invent what's possible. Discover more at www.commscope.com.

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