

STADIUM

TECH REPORT

WINTER 2022



AT&T, AMPthink

BRING NEW WI-FI TO LOUISVILLE'S
CARDINAL STADIUM

FACIAL AUTHENTICATION

LOOKING LIKE A WINNER FOR STADIUM
APPLICATIONS

FENWAY PARK

GETS NEW EXTREME WI-FI 6 NETWORK

Transform your venue. Enhance fan experiences.

All with Verizon 5G.

Verizon 5G Ultra Wideband is powering the next generation of smart venues to help transform how fans enjoy events. Delivering immersive experiences, with all-new ways to see the action and share it in near real time.

Plus, with 5G Edge Solutions like up-to-the-minute crowd analytics, fans can spend less time waiting in lines and more time watching what they love.

From the most reliable 5G network in America.

Learn more at verizon.com/entertainmentsolutions



5G Ultra Wideband is available in select areas. Most reliable 5G: based on most first place rankings in RootMetrics® 1H 2022 assessments of 125 metros. Experiences vary. Not an endorsement.

STADIUM TECH REPORT

Welcome to the third issue of our NINTH year of STADIUM TECH REPORTS, the Fall 2022 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 look at the new Wi-Fi network installed at the University of Louisville's Cardinal Stadium, which required some extra concrete work; a technology profile of facial authentication systems, including those being used at First Energy Stadium in Cleveland, Citi Field in New York and Mercedes-Benz Stadium in Atlanta; and a look at the new Extreme Networks Wi-Fi 6 network installed at Boston's venerable Fenway Park.

We'd like to take a quick moment to thank our sponsors, which for this issue include Verizon, ExteNet, MatSing, Cox Business/Hospitality Network, Boingo, American Tower, and AmpThink. Their generous sponsorship makes it possible for us to offer this content free of charge to our readers.

We'd also like to welcome members of The Association of Luxury Suite Directors (ALSD) and the International Association of Venue Managers (IAVM), who now have access to Stadium Tech Report content. 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



\ IN THIS ISSUE:

6

LETTER FROM THE EDITOR

8

AT&T, AMPthink BRING NEW WI-FI TO LOUISVILLE'S CARDINAL STADIUM

18

FACIAL AUTHENTICATION LOOKING LIKE A WINNER FOR STADIUM APPLICATIONS

26

FENWAY PARK GETS NEW EXTREME WI-FI 6 NETWORK

36

SPONSOR SHOWCASE

STAY UP TO DATE WITH THE STADIUM TECH REPORT EMAIL NEWSLETTER!

Get regular updates on news, analysis and new reports, delivered directly to your email in-box!

*We never sell your email information.
Unsubscribe at any time. You only get emails when there's something interesting to share!*

 [CLICK HERE FOR EMAIL SIGN UP](#)

 [FOLLOW US ON TWITTER!](#)

 [JOIN OUR LINKEDIN GROUP](#)

NOTHING BUT NETWORK

EXTENET ENABLES FANS WITH NEXT LEVEL PLAY



ADVANCED CONNECTIVITY. WORLD CLASS SOLUTIONS.
A BETTER FAN EXPERIENCE.

 extenet
SYSTEMS



Paul Kapustka

CAN TECHNOLOGY HELP VENUES SOLVE STAFFING ISSUES?

If staffing is the biggest concern facing stadiums and venues right now, how can technology help? So far, we're already seeing many stadiums using new technologies to help cope with the staffing shortages — with changes we are guessing are here to stay.

If you haven't yet downloaded our results and white paper from our [2022 Stadium Connectivity Outlook Survey](#), you should do that now. One of the more interesting year-to-year comparisons came in a question about top concerns venue IT operators might have. Last year, as no huge surprise, dealing with the Covid pandemic was the top concern. But this past year, with Covid issues greatly diminished, a new concern rose to the top of the list as stadiums

started refilling again: Trying to find enough people to staff all the necessary jobs it takes to open the doors on any venue, from ticketing to security to concessions and everything in between.

While Covid as its own concern was far down the list this year, repercussions from the pandemic are no doubt a big part of the staffing shortages. In the midst of a lot of people leaving lower-paying jobs for better-paying, work-from-home

opportunities, it's perhaps no surprise that stadium jobs — many of which are on the lower end of the pay scale and also very part-time and at undesirable work times (nights and weekends) — are less attractive. So how can (and did) stadiums react?

LET THE FANS DO THE WORK

The most obvious shift we've seen to address the staffing shortage is a wholesale move to as many self-serve procedures as possible, starting with stadium entry. Security scanning, which used to almost always require fans to stand in front of someone and empty pockets into bins before going through metal detectors, is now morphing into a much more contact-free encounter. New technologies in the security scanning space from companies like Evolv, CEIA, and Xtract One (a company that just changed its name from Patriot One) are designed for fans to simply walk through without divesting any items, and for the most part, not stopping unless they trigger a positive security result. While staffers are still needed as part of the equation — and may need a higher level of training since the new scanners don't conveniently slow people down — pretty much every stadium we've talked to with the new equipment says that overall, fewer staff are needed.

Ticketing is also going through a self-serve revolution, with many places now using devices on

pedestals for fans to self-scan digital tickets instead of having a staffer do that work with a handheld device. Newer models from leaders in the field like Axess are showing a quick learning curve for the technology providers, addressing problems like being able to scan in bright sunlight (a huge problem with early scanning devices) and having the ability to support multiple ticketing technologies, including NFC (near-field communications).

Some stadiums are also seeing early success with facial authentication systems that tie a face to a ticket, allowing fans to walk in without having to pull out a device (see feature on facial authentication systems in this issue). In all these new iterations, a smaller number of staff are generally needed to keep the same amount of gates covered.

KIOSKS, SELF-SCAN DEVICES AND CHECKOUT-FREE CONCESSIONS

Self-serve and other staff-reducing technologies have simply taken over many stadium concession stands. After decades of doing concessions the same old time-consuming way — one person taking an order, turning around to fill it, adding it up and taking payment — stadium concession stands are now catching up with the rest of the world when it comes to things like kiosks for ordering and payment, optical scanners for checkout, and even checkout-free stores where you scan a card (or even

the palm of your hand) before walking in and then walking out with your purchases, which will be charged to you later.

Born a bit from the post-Covid desire to reduce human to human contact, kiosk technology makes a ton of sense in a stadium situation. With a bank of kiosk terminals outside a stand, multiple people can order at once; then instead of waiting for one-by-one fulfillment in a line, people who have ordered (and paid) can simply wait in an area close by the stand, picking up their order when it is ready, most often by seeing their order number displayed on an overhead screen.

While fans will probably always want some kind of stand available with a list of multiple items, many stadiums have added a number of so-called "grab and go" stands, which usually offer a limited number of fan-favorite items. Many of these stands are also taking advantage of new technology like the optical scanners from Mashgin, where fans place items on a platform where cameras "see" what items are there and then total up a bill, which is then paid via an attached card reader.

And then there's the checkout-free stands, which have simply exploded this fall with new stores announced every week. Using technology from one of three leading companies, a list that includes Zippin, Amazon and AiFi, stadiums are seeing great

acceptance by fans who can often get a drink or a snack in seconds. And the stands are adding quickly to the stadiums' bottom lines, in many places generating revenue from previously empty concourse space. Like the grab and go stands, some staffing is needed, especially for ID verification for alcohol purchases. But according to concessionaire Delaware North, which has installed a number of such stands at stadiums where it operates, the staffers are more now like ambassadors or concierges, helping fans figure out the new systems in a friendly, helpful way.

NEW JOBS, HIGHER PAY?

While stadiums are always going to need stockers, cooks, cleaners and other labor-intensive workers, the time-consuming, brain-numbing tasks of adding up totals or punching or scanning tickets are being quickly replaced by machines that can do those jobs much faster and more accurately.

For most of the stadiums we have talked to, they are quick to point out that they aren't looking to get rid of staff with more technology — the idea is, you can now take staffers and move them to a different, more interesting (and potentially higher-paying) position, making things better all the way around.

AT&T, AMPTHINK BRING NEW WI-FI TO LOUISVILLE'S CARDINAL STADIUM

You know that old saw about how it takes a lot of wires to build a wireless network? Well, here's a new spin: Sometimes it takes a lot of concrete too.

Wi-Fi Network Lead **AT&T**

Master Technology Integrator **AMPTHONK**

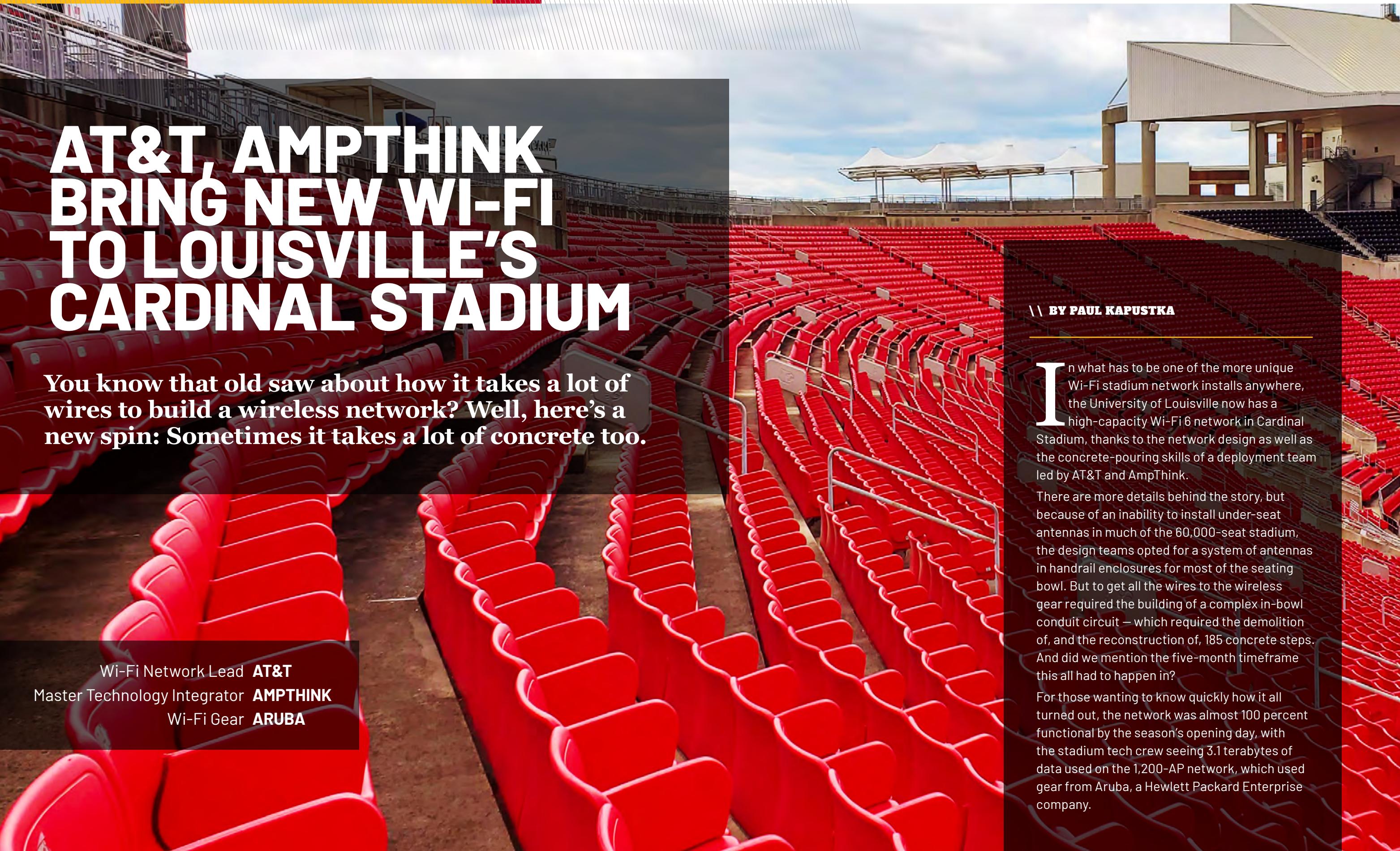
Wi-Fi Gear **ARUBA**

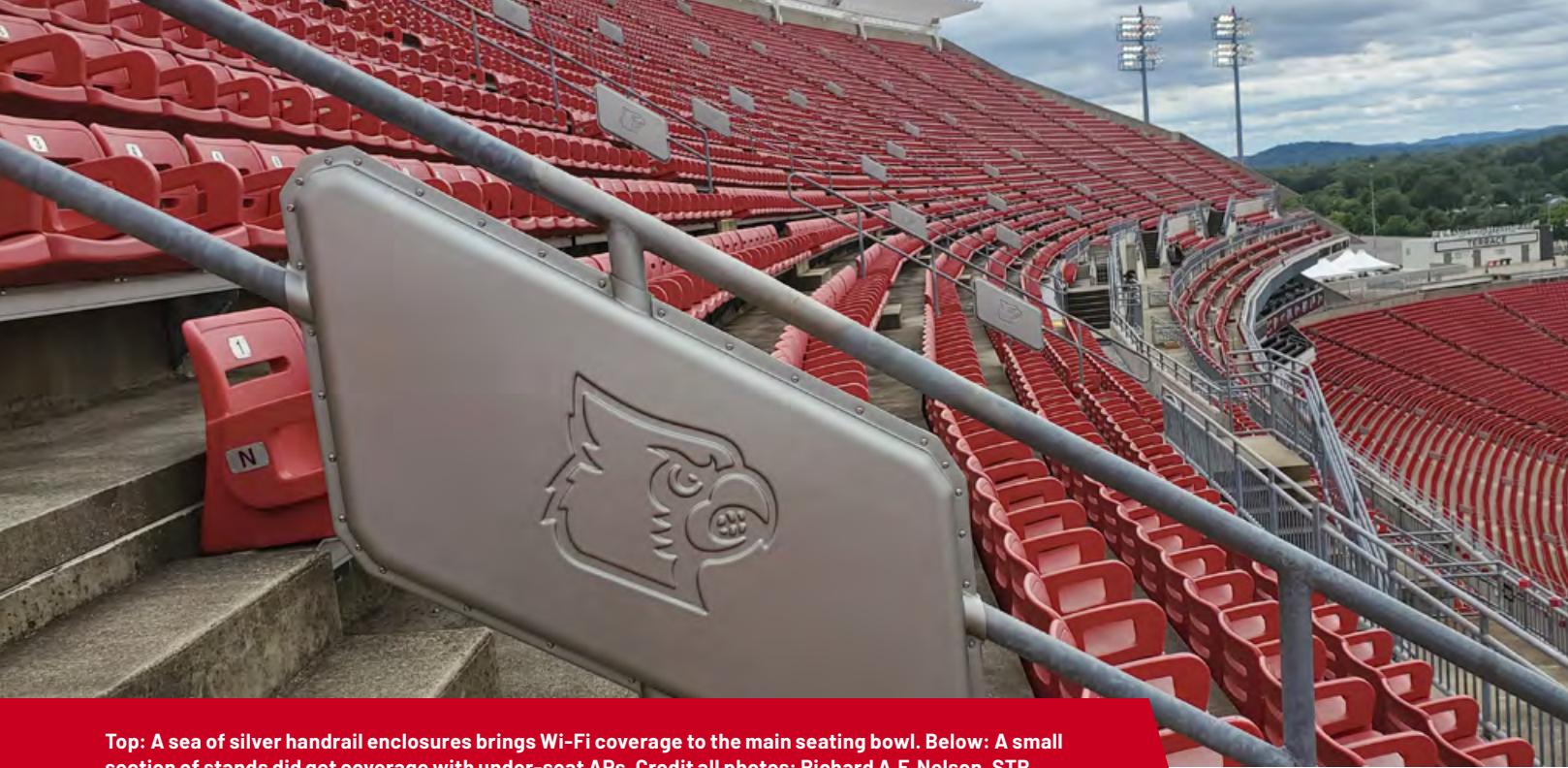
\\ BY PAUL KAPUSTKA

In what has to be one of the more unique Wi-Fi stadium network installs anywhere, the University of Louisville now has a high-capacity Wi-Fi 6 network in Cardinal Stadium, thanks to the network design as well as the concrete-pouring skills of a deployment team led by AT&T and AmpThink.

There are more details behind the story, but because of an inability to install under-seat antennas in much of the 60,000-seat stadium, the design teams opted for a system of antennas in handrail enclosures for most of the seating bowl. But to get all the wires to the wireless gear required the building of a complex in-bowl conduit circuit – which required the demolition of, and the reconstruction of, 185 concrete steps. And did we mention the five-month timeframe this all had to happen in?

For those wanting to know quickly how it all turned out, the network was almost 100 percent functional by the season's opening day, with the stadium tech crew seeing 3.1 terabytes of data used on the 1,200-AP network, which used gear from Aruba, a Hewlett Packard Enterprise company.





Top: A sea of silver handrail enclosures brings Wi-Fi coverage to the main seating bowl. Below: A small section of stands did get coverage with under-seat APs. Credit all photos: Richard A.F. Nelson, STR

"We had good coverage and good speeds," said Jason Bond, Louisville's director of technology. "I had friends at the game who said they were streaming the game on their phones, and watching replays. That's how you know the network's good."

NO DIGGING IN THE DIRT

According to Bond, at one point in late 2021 the long-held plans for bringing Wi-Fi to Cardinal Stadium – delayed in part by Covid shutdowns – were still on hold, with no deals signed.

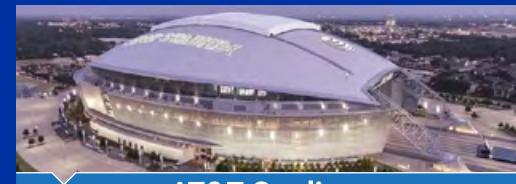
But according to Dennis Myer, client solutions executive for AT&T, the carrier, which had been negotiating with the school on the idea, found a way to use an existing services contract with the state of Kentucky that would provide the resources needed to build the stadium network. So near the end of 2021 the project was green-lighted, giving the school and

the suppliers a tight window to get construction done before the fall.

While under-seat Wi-Fi deployments are often a first design choice due to the density of coverage they can provide, the history of the land underneath Cardinal Stadium made it largely impossible to go that route. When the stadium was originally built in 1998, it used land that had been a train yard for most of the past century.



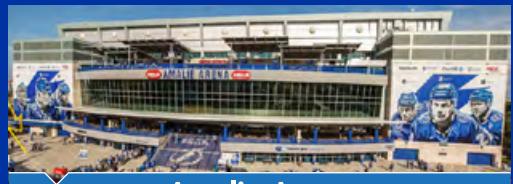
MATsing®
LENS TECHNOLOGY ENABLED
Connecting Your Stadium
Using MatSing Lens Antennas



AT&T Stadium
Home of The Dallas Cowboys

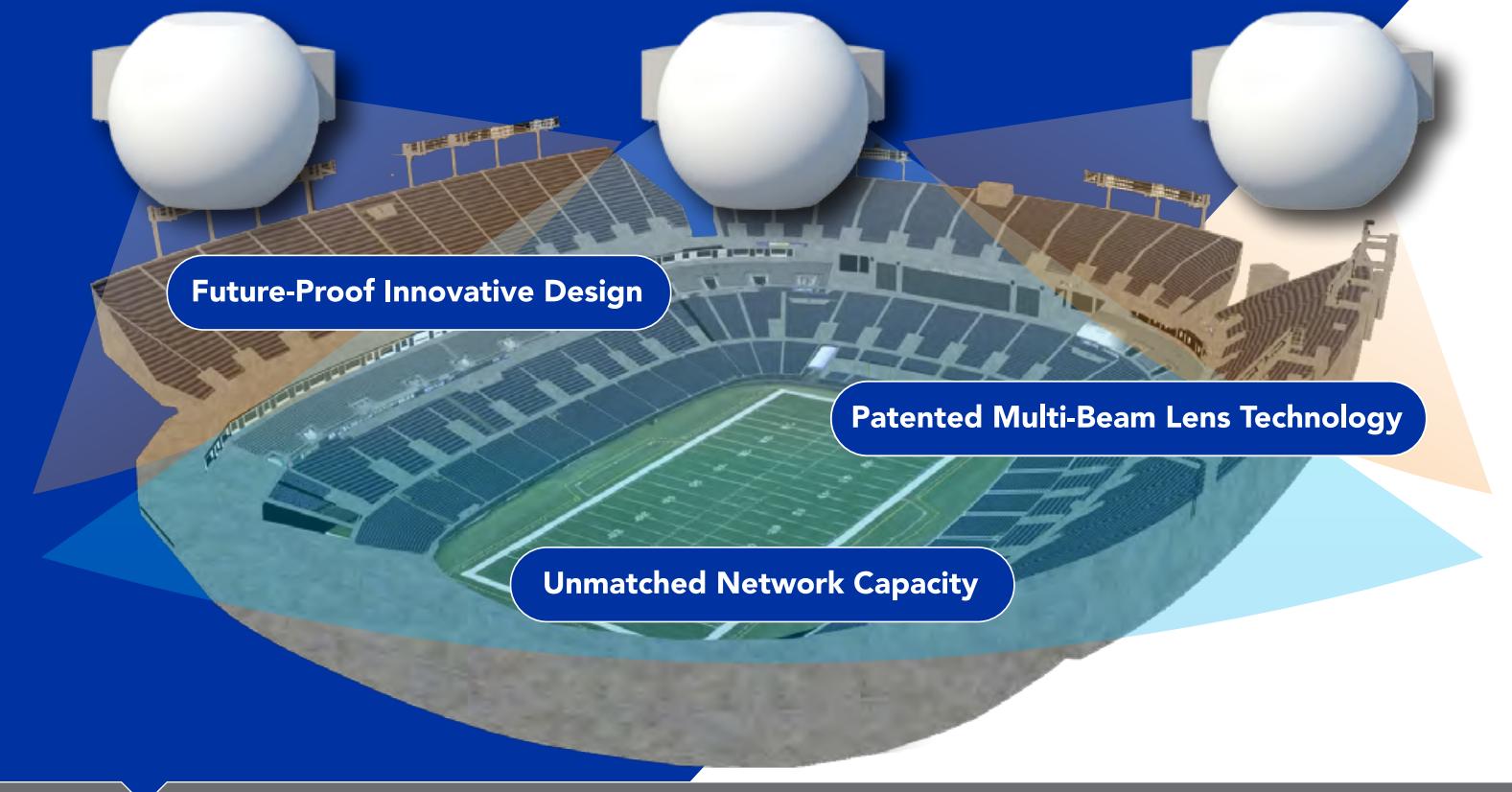


Allegiant Stadium
Home of The Las Vegas Raiders



Amalie Arena
Home of The Tampa Bay Lightning

Delivering An Immersive Venue Experience



Contact us today and learn how we can help provide your fans the best possible game connectivity.

MATsing®
LENS TECHNOLOGY ENABLED

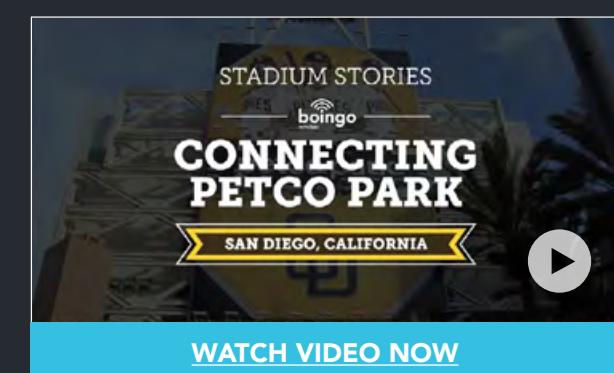
CASE STUDY

DRIVING REVENUE WITH 5G

[DOWNLOAD NOW](#)

To improve the mobile experience and capitalize on 5G opportunities, Petco Park tapped Boingo Wireless to design, build and manage a private cellular network inside the stadium's Gallagher Square. The results from large-scale activations like Padres Beerfest and concerts are clear:

- ↓ 50% average reduction in line abandonment for concessions and merchandise
- ↓ 30% average reduction in queuing wait times for concessions and merchandise
- ↑ 10% up to 10% increase in food, beverage and merchandise revenue



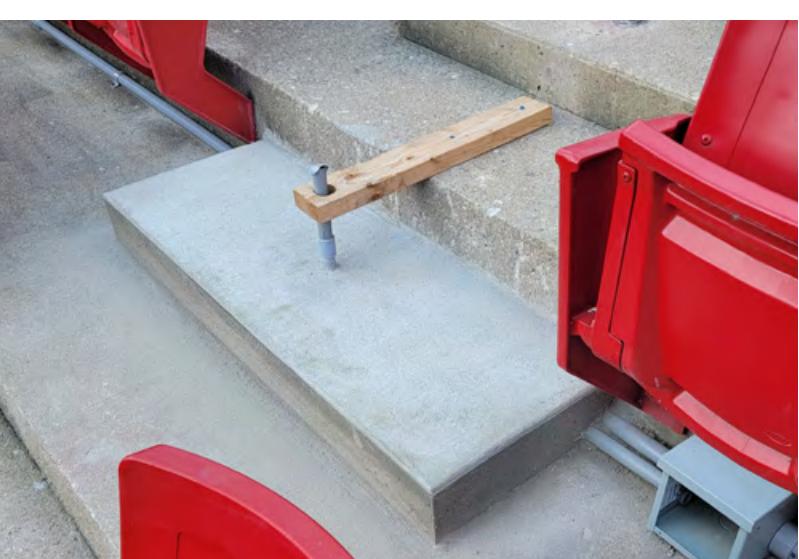
Boingo Wireless, Inc.

privatenetworks@boingo.com
boingo.com/petcopark

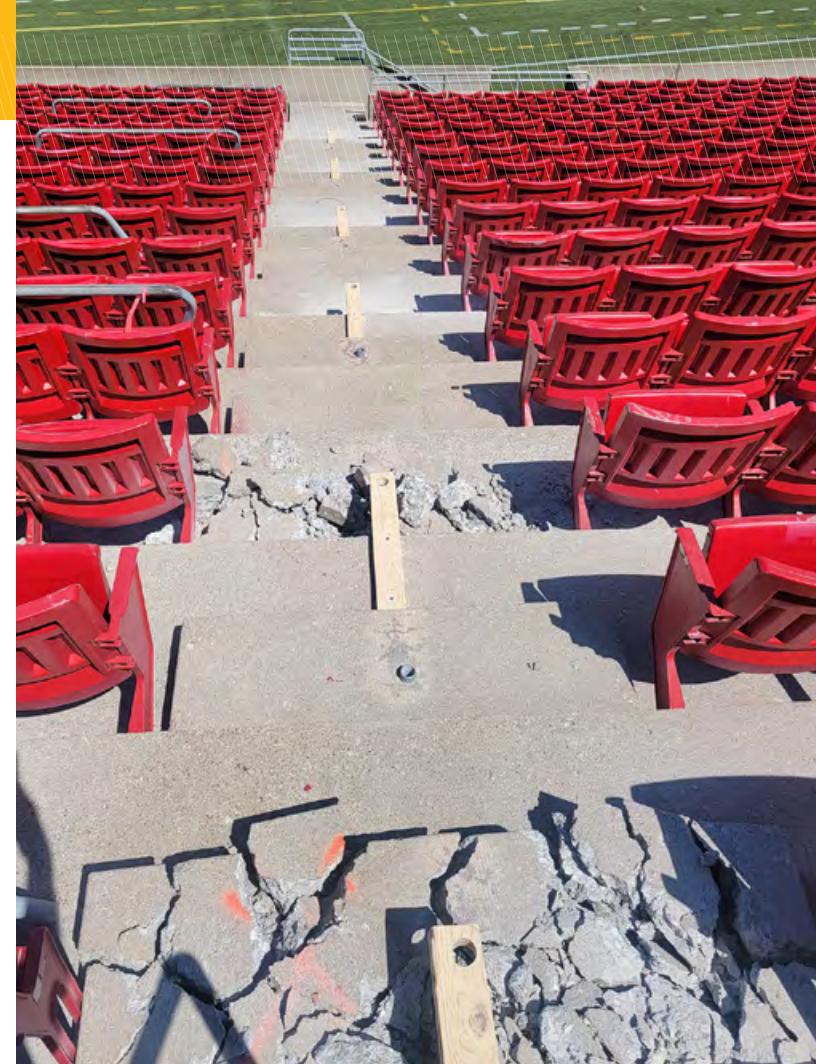
FOLLOW US

[boingo-wireless](#)
[@boingo](#)
[boingo-wireless](#)

Check out the video and download the case study to learn why Boingo's private network is a grand slam 5G solution for operational excellence.



How it started, how it's going: A visual look at the process of demolition and concrete pouring to bring the Wi-Fi conduit to the seats.



"There's a lot of dirty dirt there," said Michael Ortman, Louisville's associate athletic director and facilities and stadium manager, who estimated that more than a million gallons of diesel oil was spilled into the railroad grounds over its long history. As such, Louisville cannot dig much around the stadium property.

"It didn't take long for everyone to decide, let's stay out of the dirt," Ortman said.

The next design choice was to use a handrail-based enclosure approach, one made even more solid when AT&T chose master technology integrator AmpThink to lead the install. AmpThink, which has a heralded history of stadium network design, deployment and operation, had a long list of handrail-based networks in its resume, including U.S. Bank Stadium in Minneapolis, Notre Dame Stadium, Ohio Stadium at the Ohio State University, and the University of Oklahoma's Gaylord Family Oklahoma Memorial Stadium.

AT&T's Myer also noted AmpThink's can-do approach to construction challenges as another reason the firm was selected.

"We knew AmpThink's reputation of being able to accomodate [challenges] better than anyone else," Myer said. "We're glad we chose them."

BUCKET BRIGADE TO REBUILD THE STEPS

According to Eric Miller, AmpThink senior project manager who headed up the Louisville network build, the network deploy at Cardinal Stadium was a true roll up the sleeves kind of project.

"Getting the lower bowl done was a huge physical construction challenge," Miller said.

To bring cable to the railing enclosures, AmpThink needed to build a multi-path conduit network under the seats. But to get those conduits to cross stairways meant taking jackhammers to the old steps and



Clockwise from left: Conduit lines went from seating areas through an entry to the concourse; a conduit line under the seats; a spot where the pipes went through the new steps.



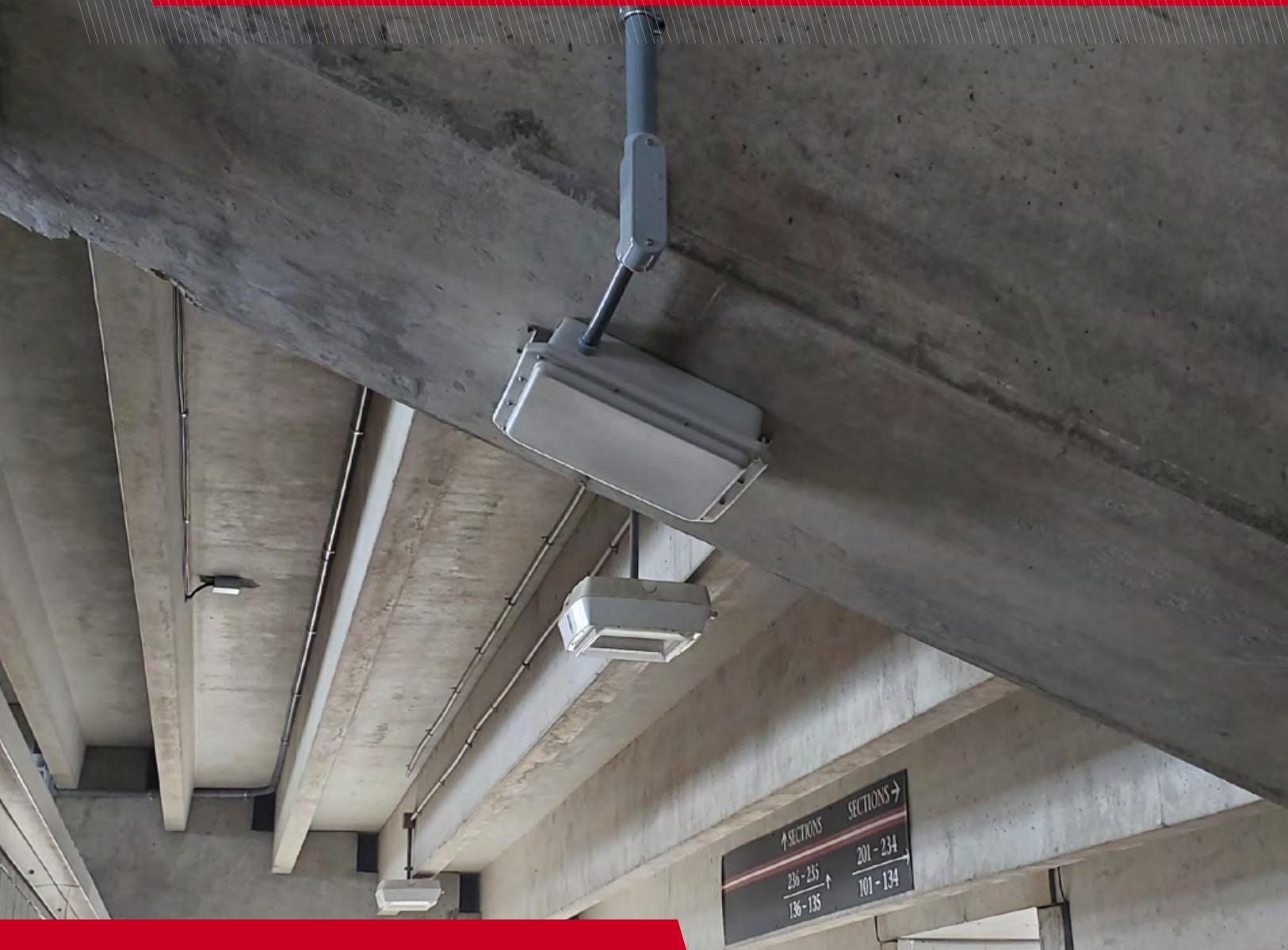
AmpThink's patented designs brought the Cardinal logo to all the railing enclosures.

pouring new ones with conduit pipes enclosed inside. In all, AmpThink demolished and re-poured 185 step locations, Miller said, with 11 of those being double-high step areas that required four times the concrete of the regular steps.

What made the work even more challenging than the 90-day deadline to get the construction completed was the fact that concrete pouring equipment couldn't be easily brought to the steps — so the team had pouring stations inside the stadium concourse, and brought concrete to each step using buckets, Miller said.

Then came the enclosures themselves, which of course presented another challenge to AmpThink's engineers. While AmpThink prides itself on its patented enclosure manufacturing — which includes stamped-in team logos to make the enclosures stand out — the varied design of the stadium added a degree of difficulty.

"There was no even slope to things — we had to design the logos to fit eight different angles of slope," Miller said, a task that required AmpThink crew members to walk every stairway to measure the precise angle



A concourse AP points down from underneath the stands

needed to make sure that the logos on that stairway's enclosures sat straight.

In the end, there was what Miller called "a perfect sea of silver enclosures," 336 in total covering the upper and lower bowls.

"It's a really slick build," said Louisville's Ortman. The network also included another 45 under-seat APs in the north end zone seating, as well as approximately 200 APs for back of house use. AmpThink also ended up digging a tunnel across the road outside the stadium to bring the network to a mixed-use space across the street where the school plans to host activities like away-game watch parties.

OTHER IMPROVEMENTS

The new network follows a recent \$63.25-million dollar expansion of the stadium, in which approximately 6,000 seats were added to increase the total capacity to about 60,000. Other new technology adds include two 40-foot by 80-foot LED videoboards in the north end zones and a 24-foot by 92-foot videoboard for the south end zone.

But the new Wi-Fi network may end up being the amenity enjoyed by most of the fans who now attend games, especially since the previous Wi-Fi coverage was almost nonexistent.



Top: Classic top-down deployments were used where overhangs provided mounting spaces. Bottom: Small IDFs in the concourses connected the seating network to fiber

"We had some Wi-Fi for ticket scanning and some coverage in club areas, but there really was no fan-facing Wi-Fi to speak of," Louisville's Bond said.

A cellular distributed antenna network (DAS) was installed by Boingo in 2014, but it didn't include AT&T, whose customers now enjoy automatic offload to the Wi-Fi network.

According to Bond, fans took to the network immediately, with 10,000 on the Wi-Fi for the home opener, and averages of around 12,500 using the network later in the fall. According to everyone involved, the project took up a lot of late nights and extra hours, but to have happy, well-connected fans is worth the effort.

"We get very few complaints [about the network]," Bond said. "It's something our fans are going to expect now."



FACIAL AUTHENTICATION LOOKING LIKE A WINNER FOR STADIUM APPLICATIONS

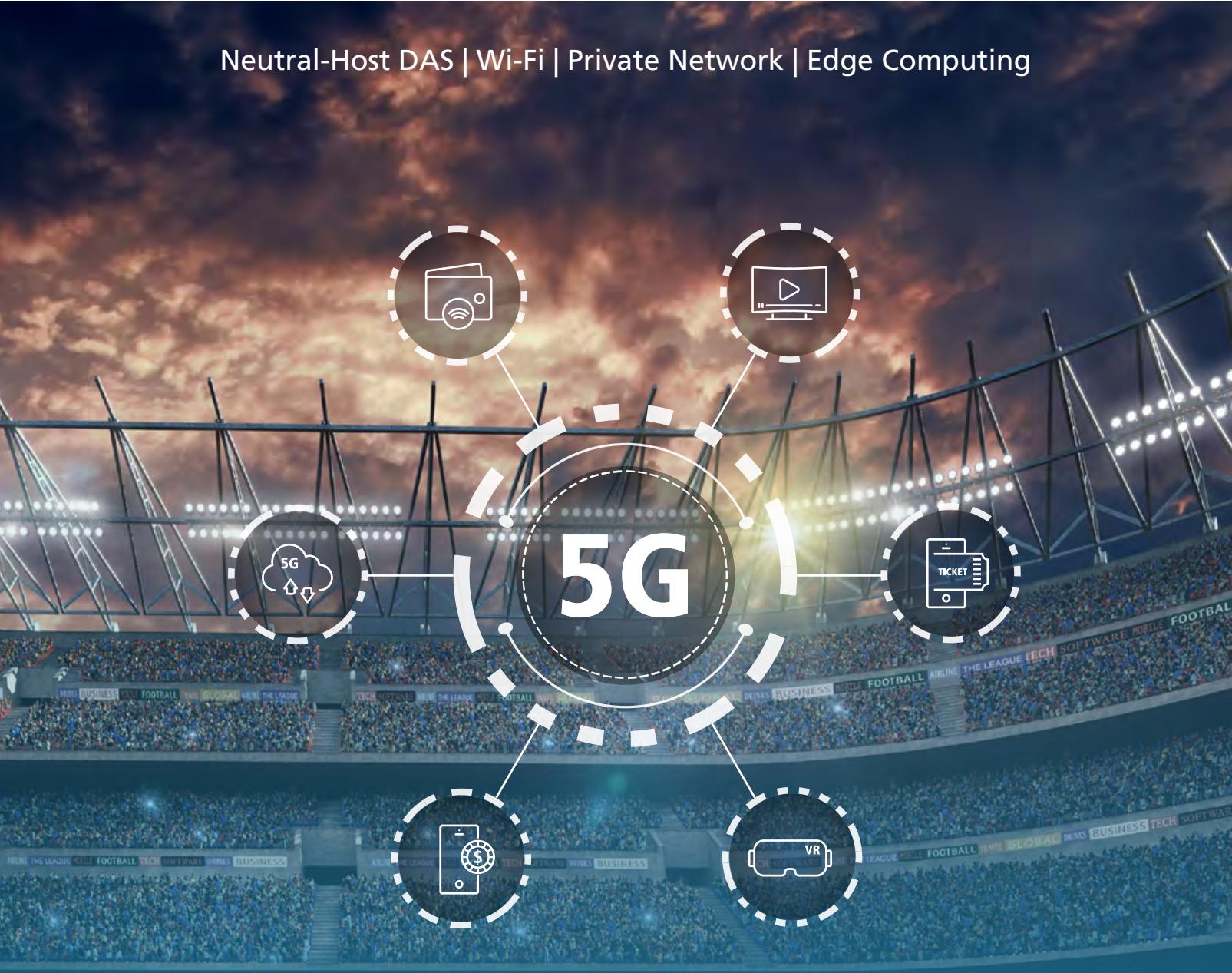
\ BY PAUL KAPUSTKA

Facial authentication technology may be the next new thing to start multiplying soon at stadiums, as initial deployments are drawing rave reviews from both fans and venues for their ability to speed up identification-based transactions.

For uses including stadium entry, security checks and concessions-based age verification, facial authentication systems at stadiums like First Energy Stadium in Cleveland, Citi Field in New York and Mercedes-Benz Stadium in Atlanta are showing early positive results, with venue operators scheduling expansion plans after successful trials.

For fans who make the leap of faith to participate in the systems, the reward is much shorter or faster lines for things like stadium or club entry,

Fans at Mercedes-Benz Stadium in Atlanta can use Wicket facial authentication systems for ticket verification. Credit: Atlanta Falcons/AMBSE



Delivering next-gen fan experiences can't wait

Bring the forefront of technology to your venue today by working with a trusted industry leader, who simplifies the deployment process and delivers a turnkey network.

americantower.com/venues | sales.REsolutions@americantower.com



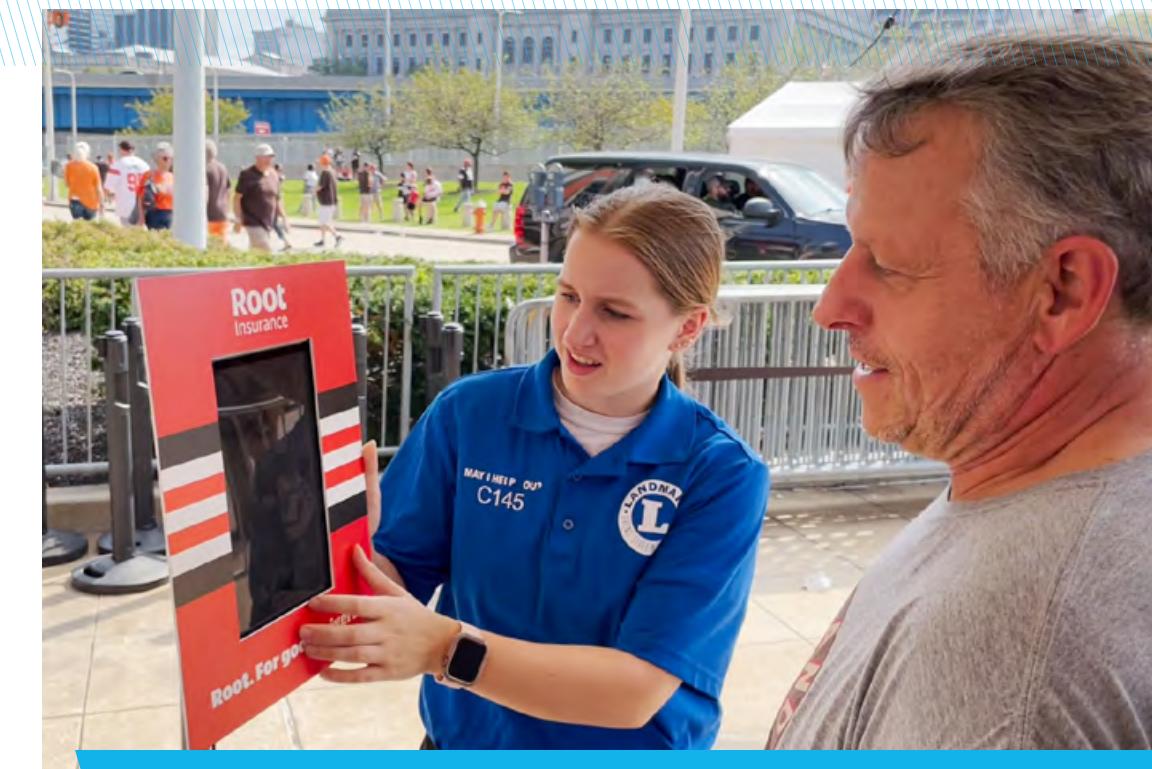
or for purchasing alcoholic beverages, with the process simplified by being able to simply stare into a screen instead of having to stop to show some form of physical identification. For venues the benefits include less crowding, more granular control of identity-based operations and the ability to increase sales while also producing a much better overall fan experience.

REDUCING THE FRICTION OF GAME DAY

If there is one general agreement across the venue technology landscape, it's that necessary responses to the Covid pandemic – like all-digital ticketing and cashless concessions – greatly accelerated acceptance of those new practices. But while the moves to all-digital ticketing and card-only purchases did improve the fan experience by improving some line speeds, even with those systems in place there is still a lingering amount of what is commonly called "friction" – like the need for fans to figure out how to download tickets and properly scan them at a pedestal, or the need for fans to still pull out a physical ID when purchasing alcohol – that produces game-day lines.

Using facial authentication technology, however, could be a big next step in eliminating some of those remaining delays. One of the emerging leaders in the space is a Cambridge, Mass.-based startup named Wicket, whose software runs on Apple iPads as the hardware interface that people look at.

An important note here is the distinction between "facial authentication" and "facial recognition," which according to the suppliers are not equal terms. Unlike some public-safety systems that store facial images



An attendant helps a fan use the Wicket system at First Energy Field in Cleveland.
Credit: Cleveland Browns

for comparison and verification, Wicket says its system doesn't actually store any facial information anywhere on the device but instead uses what it calls its "facial authentication" system, which uses artificial intelligence to map a photo of a face digitally, and uses that code to authenticate people by matching the code to a live face.

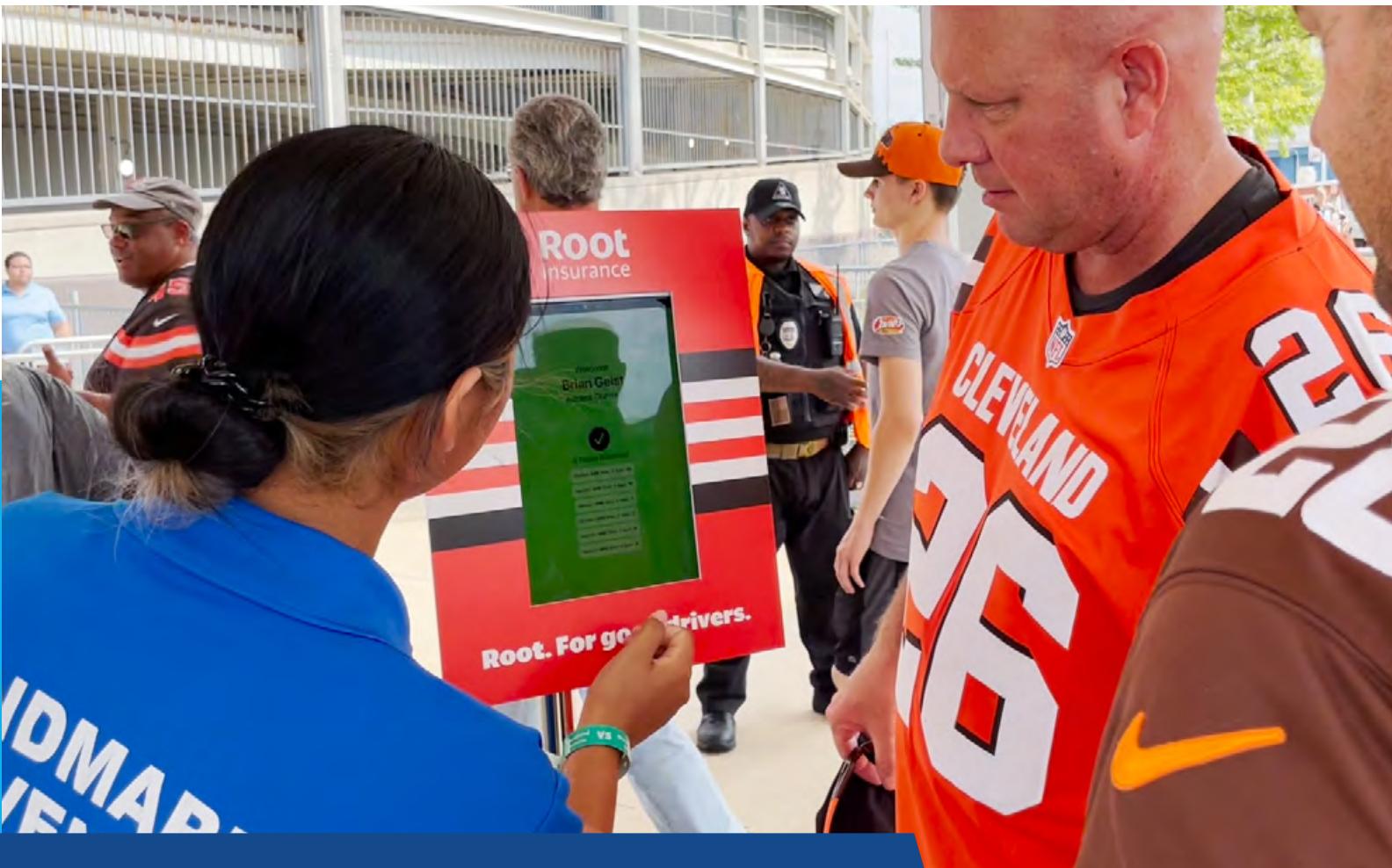
While systems like Wicket's are always likely to cause some pause from potential users because of privacy concerns, the authentication vs. recognition distinction is one that the company and its clients hope can increase confidence for operators and end users. Several venues using Wicket also point to the fact that Apple's introduction of Face ID starting with the iPhone X in 2017 has made the technology much more acceptable to the phone-using public.

"Two or three years ago, we weren't sure how [public acceptance of] facial recognition would go," said Karl Pierburg, chief technology officer for the Atlanta Falcons and for AMB Sports and Entertainment. "But now, if you have an iPhone, you use it every day."

MULTIPLE TICKETS A BREEZE WITH FACIAL AUTHENTICATION

If there is one place where facial authentication shines it is when fans come to the stadium as a group, usually

has now been in place for more than a year, and at football games. Oscar Fernandez, vice president of technology solutions with the Mets, said the success of a pilot program in 2021 led to the Mets having Wicket-enabled systems at every entry gate this past season.



Left: The Wicket system makes it easier for fan groups with multiple tickets on the same account to all walk in quickly. Credit: Cleveland Browns. Right: The Atlanta Falcons have a dedicated lane for their Wicket system trial. Credit: Atlanta Falcons/AMBSE

with all the tickets purchased under one name. Instead of having to scan each ticket code individually – which most optical scanning systems still require – with Wicket's technology when the ticket purchaser is confirmed, everyone else can just follow along in line without stopping.

According to technology teams that have deployed Wicket, the system works great at both baseball stadiums, like at Citi Field where Wicket technology

"We saw that getting into the stadium could be a friction-intensive experience," Fernandez said. "Now we have something that's easy to use, and makes the fans feel welcome."

According to Fernandez the Mets have signed up 4,500 fans to use the Wicket systems at games.

Brandon Covert, vice president for information technology with the Cleveland Browns, said the team's pilot test this season of Wicket technology is off to a fast start, with as many as 6,000 fans out of a capacity crowd of 60,000 using facial authentication to get into the stadium.

The quick lines to get in using the Wicket system are especially helpful at one gate area where there isn't a lot of real estate between the venue and a nearby street, Covert said. Though it does take some sign-up action to use the Wicket system – fans have to enroll with a selfie and payment and ticketing information – Covert said the Browns already have more than 21,000 active accounts.

Both NFL teams are also using the systems for other identity-check procedures, like club spaces and field access.

FASTER ID CHECKS FOR CONCESSIONS

The Browns have taken the lead on the concessions front by partnering with Wicket and a couple startup firms for something called the "Cleveland Cold Ones," where fans can order a beer on their mobile device and then when they go to pick it up at a special stand, need to only show their face to a Wicket iPad for age and payment confirmation.

"For us it's all about trying to find best ways to get people back to games quickly," said Alicia Woznicki, vice president of sports & entertainment for Aramark, the Browns' concessionaire. While the Cleveland Cold Ones idea had already existed without Wicket, Woznicki



Like the Browns, the Falcons combine the Wicket gates with the new walk-through security scanning systems from Evolv, a combination that provides one of the fastest street-to-seat procedures anywhere.

"The whole notion is for the fans to not break stride," said AMBSE's Pierburg. "We want to make it so you can go from your car to your seat, and get a hot dog and beer, and not stop on the way."

said "we thought, wouldn't it be great if you also didn't have to pull out an ID."

To use the system, fans must enter more pre-transaction information, including a selfie and photos of their legal ID. The procedure uses mobile app technology from TapIn2 as well as an age-verification system developed by a company called IDmission. The



CROWDS ARE BACK, CONNECTING AND SHARING EXPERIENCES.

Let's ensure your venue is ready.

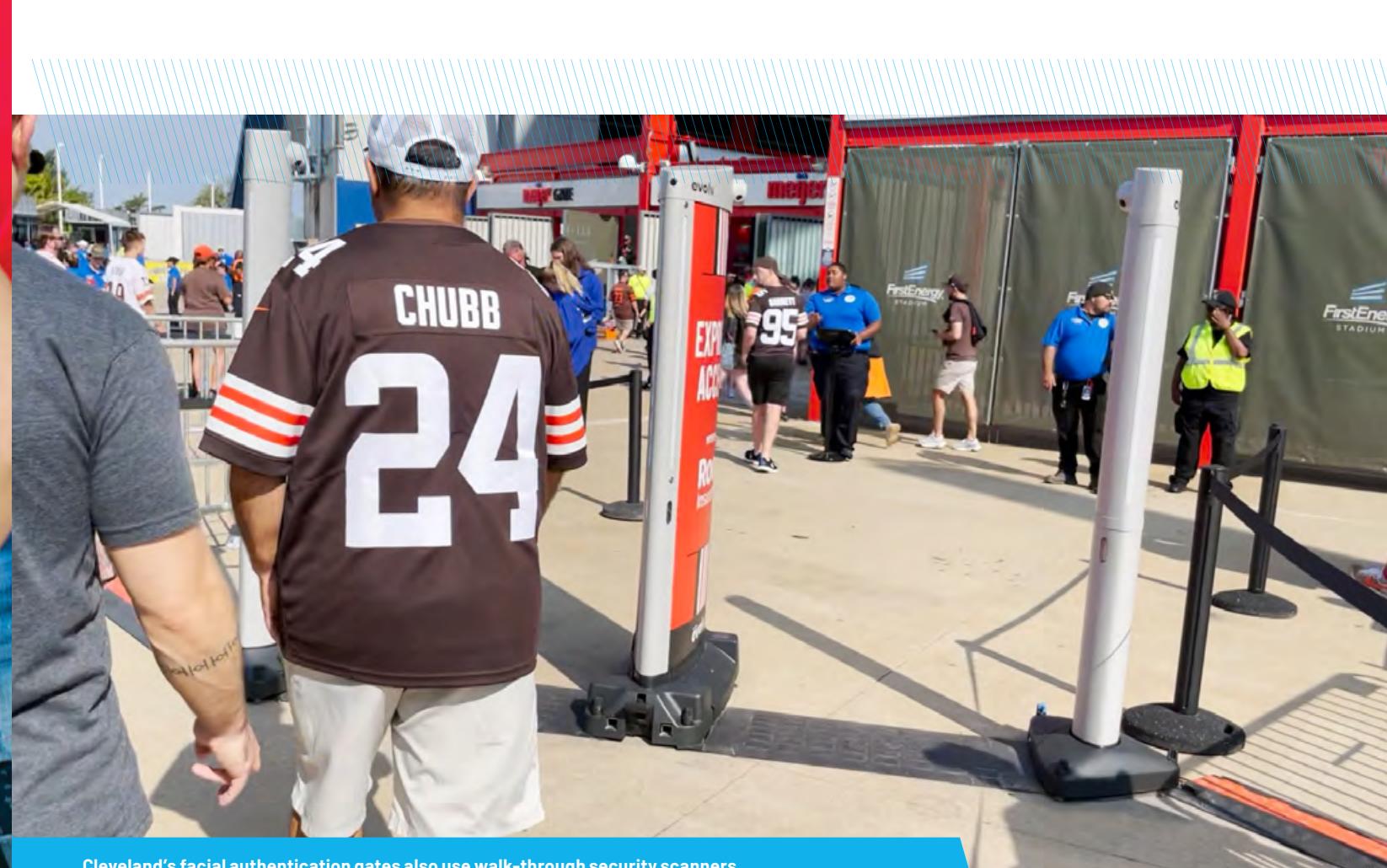
Hospitality Network is a nationwide provider of technology services to venues from coast to coast.

INTERNET • MANAGED WIFI • VIDEO SERVICES

STADIUMS • CONVENTION CENTERS • ARENAS • RESORTS

HN Hospitality
Network

Visit us at coxhn.com to learn more.



Cleveland's facial authentication gates also use walk-through security scanners for more speed, and a sponsor activation. Credit: Cleveland Browns

new self-ordering drink stands from TendedBar, which have started to appear in some other NFL stadiums, also use facial authentication for age verification.

CONNECTIVITY IS A KEY CORE NEED

If there is a key tech underpinning facial authentication it is the need for fast, low latency communications between the fan-facing systems and the back end, since there is a non-trivial amount of information that needs to be exchanged to do the confirmations. Wicket's choice of Apple iPads is based in part on the solid connectivity found in the off-the-shelf devices, which include a wide range of cellular bands, including some more esoteric ones like CBRS and Wi-Fi 6 (and now 6E).

In Cleveland, Covert and the Browns installed a small CBRS network from Celona to power the Wicket devices, so that the Wicket system didn't have to compete with the public Wi-Fi in the crowded area. In Atlanta, Pierburg said the Falcons have "very robust

Wi-Fi" covering the plaza areas where the Wicket systems are in use, so they connect there via Wi-Fi.

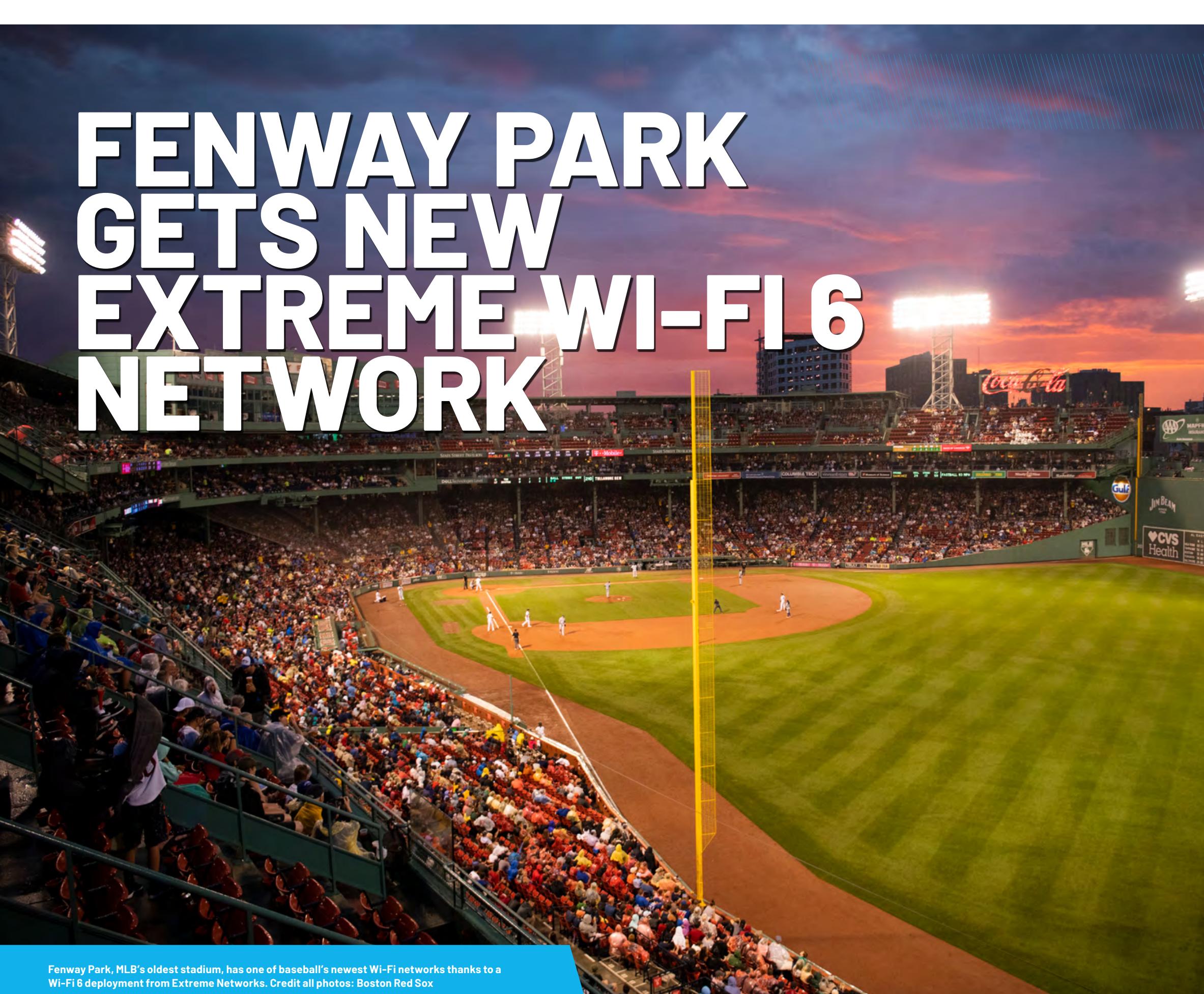
MAKING FANS HAPPY, REPLACING PAIN POINTS WITH BETTER BUSINESS

While most venues who are deploying the systems don't ever expect that all fans will want to make the effort to divulge photos and other information, putting facial-authentication systems side-by-side with traditional entry gates can be a big selling point, when one gate has a line and the other doesn't.

"Some people don't want it, and we understand that," said AMBSE's Pierburg. "But watching the fans who do use it, it's fun to watch their eyes light up when the screen flashes their name."

STR
STADIUM
TECH REPORT

FENWAY PARK GETS NEW EXTREME WI-FI 6 NETWORK



Fenway Park, MLB's oldest stadium, has one of baseball's newest Wi-Fi networks thanks to a Wi-Fi 6 deployment from Extreme Networks. Credit all photos: Boston Red Sox

\ \ BY PAUL KAPUSTKA

As the oldest stadium in major league baseball, the Boston Red Sox's Fenway Park is a beloved icon, especially for its architectural quirks like the "Green Monster" wall in left field. While endearing and intriguing, those same construction elements – some dating back to the park's opening in 1912 – also make it extremely challenging to deploy modern wireless technology.

Recently we talked to Randy George, vice president of technology operations for the Boston Red Sox, about how the team overcame those construction and aesthetic challenges to provide fans with a cutting-edge Wi-Fi 6 network using gear from Extreme Networks that enables the connectivity experience fans now expect everywhere they go. While Boston's beloved ballpark has actually been a proponent of in-stadium Wi-Fi for a long time – according to George, some of the initial network deployments started as early as 2004 – for multiple reasons the stadium has never been able to deploy a true state-of-the-art, full-ballpark coverage network, until now.

Finally, after technical innovations and some internal arm-twisting, George and his team now have a network they can be proud of, both now and into the foreseeable future.

"I'm happy that for our customers and employees, Wi-Fi is not a pain point anymore," George said. "It's been a long time since we were able to actively promote it."

THE PROBLEMS OF PUTTING TECHNOLOGY INTO A HISTORICAL SPOT

As the oldest active big-league baseball stadium, Fenway Park doesn't need an introduction and probably doesn't need much help to be one of those



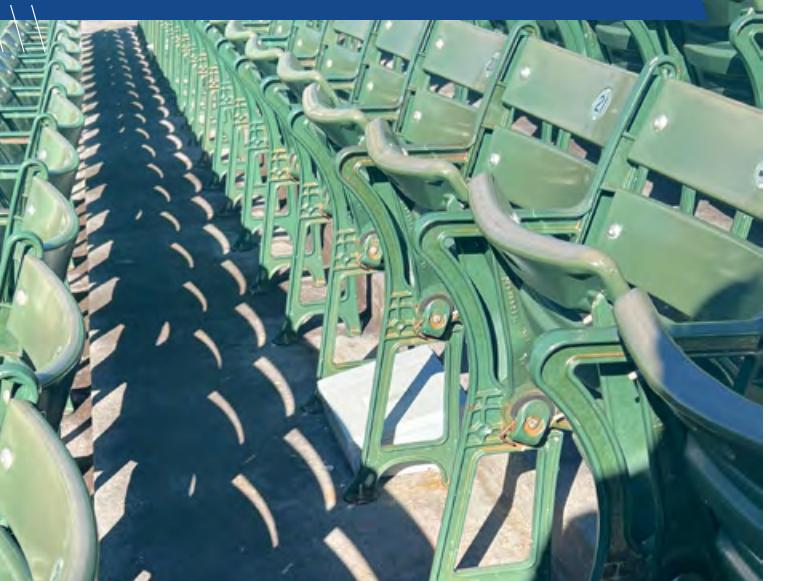
Top: Fans in Fenway Park's center field bleachers can now cheer for the improved Wi-Fi. **Bottom:** A look down the bleacher seats where under-seat APs are deployed

places that is on just about every fan's bucket list for a visit. From the famed Green Monster wall in left field to the short foul pole in right field, the place just oozes baseball history, with quirks and charms that are abundantly evident even during TV broadcasts.

But what happens when you want to update a building with parts dating back to its opening in 1912 with new technology? Especially wireless technology, which requires things like conduit pipes and antennas that aren't a clean fit with older architecture?

"It is an interesting place to manage technology in," said George, who has been facing that challenge now for 21 years with the team. "We need to be very careful where we place technology, relative to the original structures," he added.

According to George at one point the Red Sox had to answer about any construction in the park to three different regulatory bodies, including the Boston Landmarks Commission, a Massachusetts historic commission and even the National Parks, creating



documentation to get approval for any changes. While George said that lately the process has become easier, the regulations still exist.

"There are things in the park like steelwork that we have to stay away from," George said. "But we've become pretty good at working around those hurdles."



VENUE OPERATORS AND CONCESSIONAIRES:

DYNAMICALLY UPDATE YOUR MENU BOARDS & OTHER CONCESSION CONTENT WITH AN INTUITIVE CLOUD-BASED SOLUTION

With the AmpBoards Signage CMS solution, you can build:

- Menu Boards
- Directional Signage
- Dynamic Updates from POS
- Task & Management Lists
- Promotions & Notifications
- Advertisements

**Find out more at AmpBoards.com
or call us at 1.800.735.6310**

BEATING THE COVID SUPPLY CHAIN ISSUES

After some playoff events a few years ago stressed the park's wireless capabilities, George said the Red Sox looked in earnest at upgrading the Wi-Fi network. According to George the team was already working with Extreme Networks on the deployment when in February of 2021, Extreme announced that it would become the Wi-Fi supplier to Major League Baseball's technology consortium, which assists MLB parks with the costs of wireless and other technology installations.

"We had talked to the Patriots about what Extreme had done for them [at Gillette Stadium], and were already planning to engage with Extreme prior to the MLB announcement," George said. That early move became important when supply chain issues hit the entire world after the Covid pandemic hit. While some of the ballparks that were scheduled to get Extreme Wi-Fi networks last year had their deployments delayed, Boston was able to get its new network finished on time for opening day in 2022.

"We were fortunate to have started pre-Covid, ahead of the crazy supply chain issues other clubs have been dealing with," George said.

FINALLY GOING UNDER SEAT IN THE BLEACHERS

George said that Extreme's purpose-designed enclosures for stadiums, especially its under-seat models, helped the Red Sox IT team win an internal battle they'd been fighting over the years.

According to George, several earlier proposals to put under-seat enclosures in the outfield bleacher seating areas had been "shot down" by other people in the organization, for aesthetic and other reasons. But with the MLB consortium backing providing monetary resources and the Extreme gear providing a good look, George said the IT team finally got to install under-seat APs in the bleachers.



Overhangs and beams provided other mounting spots for APs covering the main seating bowl



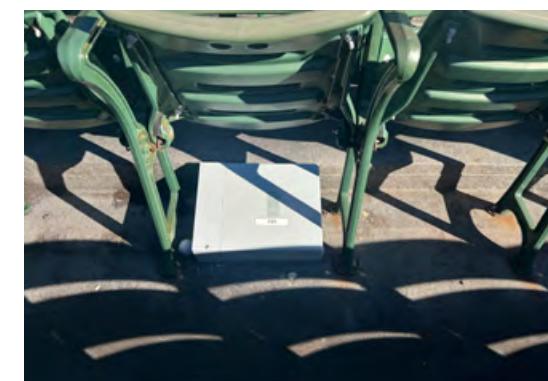
Top: Fenway Park's architectural quirks and historical importance have historically provided a challenge to bringing wireless technology into the stadium; Bottom: A center field under-seat enclosure and a lost golf ball

"We just have no overhead assets to get signals close to the fans out there," George said. But the combination of being able to deliver good service in a way that everyone could live with won the day.

"The Extreme gear is good-looking, as far as under-seat enclosures go," George said. "They deserve a lot of credit for bringing to the plate a form factor we could digest and get begrudgingly approved."

George, who tested the service in the bleachers, called the deployment of the 65 under-seat APs a game changer.

"It was the first time I was able to sit out there and have really good service," he said.



For the rest of the stadium, especially from foul pole to foul pole in the main seating bowl, George said under-seat wasn't an option mainly due to the age of the structures, including some parts that had been built for the original opening in 1912. But with good overhang access as well as the ability to put APs into the field wall pointing backwards, the Red Sox

were able to bring full Wi-Fi 6 coverage to the entire seating area.



Optical scanners for concessions checkout (left) and ticket scanning (right) are another part of the enhanced technology now found inside Fenway Park

In total, the new network has approximately 597 Extreme Wi-Fi 6 APs, which includes not just the stadium but also coverage of the new 5,000-seat MGM Music Hall venue that opened during the summer, just outside the Fenway Park walls. According to stats provided by the Red Sox, the network saw a peak unique client count of 23,412 users on opening day. Another benefit of a fully functional Wi-Fi network is its ability to offload cellular customers to take pressure off the stadium's DAS. According to the Red Sox there were 14,980 Verizon subscribers who were automatically authenticated on opening day, along with almost 4,000 T-Mobile subscribers (offload is not available for AT&T customers). According to George, Verizon is currently deploying a new 5G cellular network inside the park that is scheduled to be ready for opening day in 2023.

LOOKING TOWARD THE FUTURE

Like other ballparks, Fenway Park is steeling itself for a future that may include some kind of sportsbook



facility either in or around the stadium. George also mentioned that the formerly sleepy ballpark neighborhood is now a hub of activity, with new residential and commercial buildings starting to rise. The team's goal is to ensure that fans in and around the stadium have a single good method of connectivity, so for George the network planning doesn't end at the outfield walls anymore.

"It's interesting to watch the stats on usage now, to see what people are doing while they're at the game," George said. "But what's really great is to see things like 20,000 users on the Wi-Fi and the environment doesn't skip a beat."

STADIUM CONNECTIVITY OUTLOOK SURVEY RESULTS ARE IN!

Download the results and our white paper now!

FREE DOWNLOAD



What is the top concern of venues this year? According to the results of our annual Stadium Connectivity Outlook survey, finding enough people to help staff the return of capacity crowds to venues was top of mind among the stadium technology professionals who participated in our survey.

In a partnership with sponsor Verizon, in August and September of this year we reached out to the Stadium Tech Report audience and asked them to participate in our second Stadium Connectivity Outlook survey, which asked a wide range of questions about the current state of a venue's connectivity, and where the venues, teams and schools would prioritize investments and strategies. Their answers are now available for you to read, in both a survey results format and an accompanying white paper that summarizes the data.

Presented by Stadium Tech Report and





BUILDING CARRIER CLASS INFRASTRUCTURE SOLUTIONS FOR LARGE PUBLIC VENUES

Wired Networking • Wireless Networking • IPTV
IoT • DAS • Telephony

800.735.6310



**We are passionate technologists and innovators
helping partners achieve integrated builds on large
scale infrastructure projects.**

Leveraging concepts drawn from lean construction methodologies, AmpThink focuses on the role of a Master Technology Integrator ("MTI"). The premise of the MTI role? Technology should be delivered on a unified platform; one structured cabling plant, one network, and a common compute platform. All for easy operations and a premium guest experience.

AmpThink.com | info@AmpThink.com

Dallas Los Angeles Toronto Orlando Quebec City

intelligence
by Inside Towers

Wireless Infrastructure Industry: Quarterly Market Analysis Reports & Briefings

These Reports:

- Pinpoint market trends & outlooks
- Evaluate MNO & InfraCo CapEx
- Provide industry expert perspectives
- Track transactions & relevant stocks

Subscribe >

ExteNet Systems is the nation's largest privately held network provider of secure 5G and fiber neutral host infrastructure solutions serving mobile network operators, real estate owners, enterprises, content providers, wholesale carriers, municipalities, and rural internet providers. Our solutions operate in urban, suburban, and rural markets to connect customers to the applications and services they need, indoors and out, within hundreds of sports and entertainment venues, hotels, resorts, convention centers, commercial office buildings, healthcare facilities, and transit systems nationwide. Visit www.extenetsystems.com for more information.



Hospitality Network, an affiliate of Cox Business, **HN Hospitality Network** 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.



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



Boingo Wireless is a leading provider of cellular and Wi-Fi networks at stadiums and arenas, universities, airports, military bases, convention centers and commercial properties. You'll find Boingo connecting people and things 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.



Stadiums need to provide a seamless fan experience. To do so, your wireless network must support 5G low-latency connectivity to satisfy fans and enable innovative applications. American Tower is ready to bring the forefront of wireless technology to your venue today. With over 20 years of experience deploying and managing in-building wireless infrastructure, our neutral-host Distributed Antenna System (DAS), Wi-Fi, private network, and edge computing solutions can accommodate the unique circumstances of your venue, while meeting the needs of mobile network operators. Learn more at americantower.com/venues.



Delivering the connected world. Simply. Securely. Reliably. In today's rapidly transforming environment, we integrate, secure and operate the networks, and mobile technologies that help businesses in the live sports and entertainment sector innovate to bring fans back to venues in safe, smart and immersive ways. Our solutions across Connectivity, Security and Advanced Business Communications are designed to help companies pursue new possibilities and create entirely new revenue streams. Verizon has the expertise and solutions venue owners and operators need to create more future-ready facilities.

Visit us at: <https://www.verizon.com/business/solutions/industry/media-entertainment/> to learn how VBG can help you prepare for digital transformation, innovation and accelerated growth in the 5G era.



AmpBoards is a creative and development agency which specifically designs, builds and implements the AmpBoards digital signage and menu CMS HTML solution in large venues and arenas. The powerful platform assists with removing the burden of making menu board and signage updates from Event Day Operators and hands that power to the people who need it most... concessionaires. F&B groups now have the ability to make menu board and other signage updates quickly and easily through an intuitive user interface. AmpBoards currently partners with concessionaires such as Levy, Aramark, Delaware North, VenueNext, Legends and others to build eye-catching menu and signage designs using data and best practices. AmpBoards also currently works with multiple POS and DB providers including SpotOn Enterprise (formerly Appetize), Oracle Micros, Clover/Bypass and VenueNext.

Learn more at www.ampboards.com.

A M P B O A R D S

STADIUM

TECH REPORT

SUBSCRIBER LICENSE AGREEMENT

Between

MOBILE SPORTS REPORT and Subscriber

Any Mobile Sports Report ("Report") and the information therein are the property of or licensed to Mobile Sports Report, and permission to use the same is granted to site-wide or single-category Subscribers ("Subscribers") under the terms of this Subscriber License Agreement ("Agreement"), which may be amended from time to time without notice. When requesting a Report, you acknowledge that you are bound by the terms and conditions of this Agreement and any amendments thereto. Mobile Sports Report therefore recommends that you review this page for amendments to this Agreement prior to requesting any additional Reports.

OWNERSHIP RIGHTS

All reports are owned by Mobile Sports Report and protected by federal, state and international copyright, trademark and intellectual property laws, under and by applicable treaties and/or conventions. Subscriber agrees not to export any Report into any country that does not have copyright, trademark and intellectual property laws that will protect Mobile Sports Report's rights therein.

GRANT OF LICENSE RIGHTS

Mobile Sports Report hereby grants Subscriber a non-exclusive, non-refundable, non-transferable license to use the Report for research purposes only pursuant to the terms and conditions of this Agreement. Mobile Sports Report retains exclusive and sole ownership of each Report disseminated under this Agreement. Subscriber agrees not to permit any unauthorized use, reproduction, distribution, publication or electronic transmission of any Report or the information/forecasts therein without the express written permission of Mobile Sports Report.

In case of any distribution of Reports under this Agreement, Subscriber agrees to retain all copyright, trademark and other proprietary notices on the Reports.

DISCLAIMER OF WARRANTY AND LIABILITY

MOBILE SPORTS REPORT, ITS EMPLOYEES, AFFILIATES, AGENTS AND LICENSORS DO NOT WARRANT THE ACCURACY, COMPLETENESS, CURRENTNESS, NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF ANY REPORTS COVERED BY THIS AGREEMENT. MOBILE SPORTS REPORT, ITS EMPLOYEES, AFFILIATES, AGENTS AND LICENSORS SHALL NOT BE LIABLE TO SUBSCRIBER OR ANY THIRD PARTY FOR LOSS OR INJURY CAUSED IN WHOLE OR PART BY MOBILE SPORTS REPORT'S NEGLIGENCE OR BY CONTINGENCIES BEYOND MOBILE SPORTS REPORT'S CONTROL IN COMPILED, PREPARING OR DISSEMINATING ANY REPORT, OR FOR ANY DECISION MADE OR ACTION TAKEN BY SUBSCRIBER OR ANY THIRD PARTY IN RELIANCE ON SUCH INFORMATION, OR FOR ANY CONSEQUENTIAL, SPECIAL, INDIRECT OR SIMILAR DAMAGES (INCLUDING LOST PROFITS), EVEN IF MOBILE SPORTS REPORT WAS ADVISED OF THE POSSIBILITY OF THE SAME. SUBSCRIBER AGREES THAT THE LIABILITY OF MOBILE SPORTS REPORT, ITS EMPLOYEES, AFFILIATES, AGENTS AND LICENSORS, IF ANY, ARISING OUT OF ANY KIND OF LEGAL CLAIM (WHETHER IN CONTRACT, TORT OR OTHERWISE) IN CONNECTION WITH ITS GOOD/SERVICES UNDER THIS AGREEMENT SHALL NOT EXCEED THE AMOUNT SUBSCRIBER PAID TO MOBILE SPORTS REPORT FOR USE OF THE REPORT IN QUESTION.

This License will be governed by the laws of the State of California.

MOBILE SPORTS REPORTS, LLC

1919 14th St., Suite 700, Boulder, CO 80302 | (720) 668-9842 | kaps@stadiumtechreport.com

©2023