Transforming Networks in Large Public Venues

Enhancing experiences and operations through innovation

COMMSCOPE®

Game Highlights

Venue owners are re-thinking the way networks are deployed and managed

They are realizing more efficiencies through a holistic approach to solving network and connectivity needs across the entire complex.

Innovative wireless technology is transforming the industry with game changing performance and cost savings

Venue owners are enabling fan experiences and services with 5G and LTE, while leveraging digital wireless systems for significant cost savings in equipment, space and power.

Convergence is the network strategy of the future-and the future is already here

Delivering multiple network services on a common infrastructure is critical to meeting the ever-increasing demand for bandwidth, and the need to reduce CapEx and OpEx costs.

"We'll transform the network to provide an exceptional user experience by creating solutions that are simple, reliable, and adaptable"

Ben Cardwell
SVP Venue and Campus Networks, CommScope

THE DIGITAL SHIFT IN VENUES

As the guest experience in large venues is transforming from a purely physical one to a combination of physical and digital, the network has become the backbone of its success. New integrated network functions and services are driving a shift in design and procurement of network connectivity solutions. As a result, venue owners are realizing new efficiencies through a holistic approach to solving network and connectivity needs across large public venues (LPVs).

NETWORKS ARE AT AN INFLECTION POINT

Due to the ever-increasing demand of high-bandwidth mobile user applications such as video sharing, and the proliferation of IoT devices, networks have become a critical component for LPVs' revenue generation and cost-effective operations. At the same time, the introduction of network technologies such as Wi-Fi 6, 5G and private networks are creating an inflection point that is driving complexity resulting from the need to deploy and manage independent networks and vendors. Together, these forces are causing venue owners to re-think the way networks are deployed and managed. A transformational approach is needed that considers all the network requirements up front and defines a solution that is flexible and adapts to future needs. Doing this facilitates use of the most appropriate technologies and provides the opportunity to leverage a common infrastructure. These enhanced methods drive cost savings through the reduction of space, equipment, materials and labor required to deliver a network that meets high visitor expectations while minimizing inefficiency and network complexity.

A WINNING STRATEGY

CommScope's integrated framework for network connectivity provides a unique alternative that streamlines the transformation journey while improving network performance and lowering cost. Leveraging our experience with over 250 large public venue implementations worldwide, CommScope is shaping tomorrow's large public venue networks with a robust portfolio of Wi-Fi, switching, distributed antenna systems (DAS), copper, fiber and services to enable transformation end to end. We work collaboratively with venue owners, consultants, engineers and contractors to meet the evolving needs of the venue and its stakeholders.

EVOLVING FAN EXPECTATIONS

Large public venues compete for their share of consumer dollars against an increasingly immersive in-home experience that is fueled by large-screen high-resolution displays and audio, social media connectedness, and augmented reality experiences. To respond, LPV owners and managers are expanding their core sports/entertainment offerings with new ways to connect with their brands: social sharing, player stats and betting, and amenities like easy concession ordering. LPVs must also support complex operations while meeting public health and safety regulations by controlling congestion, access and tracking movement of people.

These challenges require robust and high-capacity communication networks to support multiple different classes of users, services and applications that run in the network and at the edge. CommScope meets these challenges with a technology and service portfolio that delivers high performance and cost-saving advantages along with the efficiencies of a single solution provider.

THE GAME PLAN

CommScope's strategy is to offer – along with our partner network – a unique combination of products and services. Our team brings together CommScope's connectivity solutions and expertise across licensed and unlicensed wireless spectrum, along with wired infrastructure and cloud-based management solutions. Our partners provide software and value-added integration services enhancing the CommScope portfolio by delivering fully integrated network systems that provide agility, high availability, security, and flexibility of the network while reducing overall costs. Collectively, our team offers an integrated capability spanning technology, design, implementation and management to drive outcomes drawing on our strengths, namely:

- Complete connectivity portfolio of DAS, Wi-Fi, switching, IoT and cabling infrastructure
- Scalable, modular all-digital DAS that delivers massive mobile capacity while reducing data center (head-end) footprint by up to 80%
- Patented technology and multi-protocol access points (APs) that eliminate wireless network silos and maximize Wi-Fi system capacity
- Converged wired, Wi-Fi and IoT network management platforms that reduce management complexity and cost up to 40%
- Design and deployment expertise capable of addressing unique configuration requirements and reducing project risk, while driving structured cabling CapEx and OpEx savings up to 20% through a shared network infrastructure
- Financial flexibility reducing upfront capital requirements or shifting CapEx to OpEx entirely.

250

Large public venue implementations world-wide

80%

Reduction in DAS headend footprint

20%

Cost savings in converged infrastructure

One platform unlocking performance today with the simplicity to realize 5G's full potential in the future

UNLOCKING 5G'S POTENTIAL

For LPVs, 5G creates a better user experience and a competitive advantage. 5G networks enable exciting new services and applications, such as ultra-high definition video camera angles, augmented reality and virtual reality, and player tracking. 5G will be a foundation for tomorrow's LPVs and the spaces that surround them. For venue owners this represents a massive business opportunity. Many venues are looking for ways to interact digitally with their audiences, enabling fans to experience events in new ways. Now is the time to think about and plan for the future of 5G to address these evolving trends.

How do you start positioning yourself for the future with 5G? It begins with keeping in mind that 4G isn't going away anytime soon and identifying the possibilities of 5G technologies using a simplified approach for migration in a cost-effective manner. According to the GSMA, even by 2025 global 4G connections will outnumber 5G connections by a factor of 2.8 to 1[1]. Begin to identify the possibilities for future 5G applications, identify the 5G performance requirements, and plan for the infrastructure required to support future 5G enabled experiences.

As the leader in distributed antenna systems[2], CommScope anticipated the challenge years ago. The result is a digital DAS architecture (ERA) that is "frequency agnostic", meaning it can support 3G, 4G/LTE and 5G enabling maximum flexibility today and into the future. CommScope's solution delivers multi-operator support, massive scalability and maximum investment protection. CommScope delivers both LTE and 5G service with the performance, simplicity and economics venue owners and mobile network operators need to realize 5G's full business potential. CommScope anticipates and innovates to develop the solutions you need now and prepare you for what's next.

[1] GSMA, *The Mobile Economy 2020*, at https://www.gsma.com/mobileeconomy/

[2] Mobile Experts, LLC, *Distributed Antenna Systems*, November 2019.

HIGH PERFORMING WIRELESS IN A SMALL FOOTPRINT

Fans now expect to instantly share their experiences with their family and friends at the game and their social media network around the world. With visitor capacities of up to one hundred thousand, venues must deliver reliable bandwidth to meet fan expectations on game days. Stadium owners around the world consistently turn to CommScope to meet these high demands for their fans' wireless capacity and coverage needs. With our ERA digital DAS, venue owners realize the following advantages:

- A platform that meets current bandwidth needs and is scalable for future demand
- Support for current and emerging technologies (5G/4G/3G/2G and CBRS)
- Substantial reduction in power, space, and fiber relative to analog DAS alternatives, driving down total cost of ownership (TCO) and reducing the headend footprint up to 80 percent.
- Advanced capabilities that enable flexible software-defined capacity allocation across the entire stadium complex.

"Providing an exceptional experience for our fans—on the field and in the stands—is a top priority for the entire Panthers organization,"

James Hammond
Director of IT for the Carolina Panthers

Everyone carries a mobile device and expects Wi-Fi connectivity everywhere

SCORING BIG WITH WI-FI

New Wi-Fi 6 technology brings fast, reliable connectivity to ultra-dense LPV environments, enabling immersive, interactive fan experiences. Guests can be engaged, rewarded, and impressed through personalized applications and targeted marketing. A robust Wi-Fi platform can enable innovative ways of interacting, creating new fan engagement opportunities. Additionally, the Wi-Fi network must deliver a secure and reliable connection that can scale to support a wide range of new applications, devices, and use cases.

CommScope addresses these challenges with RUCKUS high performance Wi-Fi and switch technology. CommScope continues to preserve the RUCKUS heritage of Wi-Fi innovation, which includes:

- Patented RF performance and radio innovations that improve performance for all clients, even ultra-high-density environments
- Advanced SmartZoneOS network controller architecture for converged wired and wireless management
- AI/ML-enabled network analytics and assurance for SLA management and proactive trouble resolution
- Experienced in-house RF and LAN design team with the latest 3D modeling tools

CommScope has a vision and understanding of Wi-Fi innovation that gives customers the confidence the network will easily scale to meet increasing guest demands. The RUCKUS platform includes private- or public cloud-based controllers along with footfall and presence analytics to support venue operations and marketing objectives.

A RUCKUS Wi-Fi network delivers the exceptional application performance for every fan and every client, giving guests the data when they need it for that great immersive game day digital and physical experience. No matter where a user is in the venue, they get an amazing connection to venue and team applications for ordering food and beverages, merchandise, or checking on their favorite player.

Case Study

BANC OF CALIFORNIA WI-FI

There are only a small number of soccer- specific stadiums in the U.S. One of the newest is the Banc of California Stadium, home of the Los Angeles Football Club (LAFC). Just one of the stadium's many distinctions is its technology infrastructure, which has captured the attention of major corporations in entertainment, broadcasting and sports. The centerpiece is the RUCKUS Wi-Fi network, the foundation for delivering a great wireless experience to LAFC fans.

RUCKUS was chosen as the Wi-Fi vendor of choice for the network. "Frankly, I thought the default would be Cisco. But we certainly made the right choice with RUCKUS. RUCKUS Wi-Fi performs flawlessly in this environment. I know that other stadiums have ongoing problems with other Wi-Fi vendors; they can't handle the interference, high density usage and other challenges. In our stadium, we had every intention of pushing Wi-Fi to its limits. We had to start with the right foundation, and that was RUCKUS." Said Christian Lau, VP of Technology for the LAFC.

The RUCKUS solution delivers a great user experience for mobile oriented soccer fans with 500 indoor and outdoor access points with 3 RUCKUS ZoneDirector Controllers. The day to day demands on the IT staff are minimized with a network that allows them to "Set it and forget it"

"The opening game for the Los Angeles Football Club (LAFC) included paratroopers landing on the field, a falcon circling above the crowd, and the best Wi-Fi experience of any stadium in the U.S."

Christian Lau
VP of IT for the LAFC

The Internet of Things (IoT) is transforming the way guests are entertained and operations maximize resources

SMART IOT PLAYS

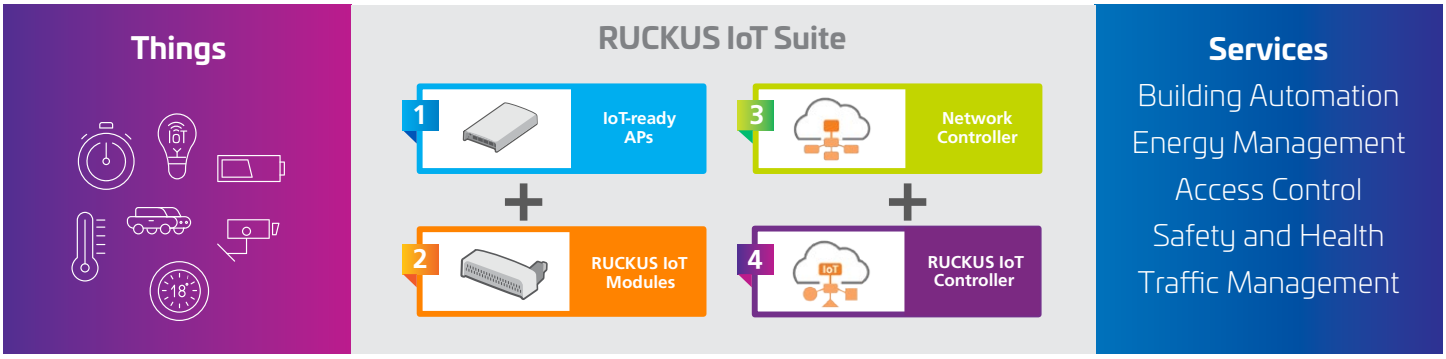
Large public venue owners are looking to the Internet of Things (IoT) to transform the way guests are entertained and maximize operational efficiency. However, current models for implementing IoT solutions are often complex and expensive. Applications can be highly fragmented, relying on multiple wireless connectivity protocols. Smart lighting infrastructure, for example, might use Bluetooth, while connected environmental systems run over Wi-Fi, while smart door locks run over yet another protocol like Zigbee. Each connected application typically functions as a self-contained system requiring its own dedicated wireless network and management infrastructure.

CommScope makes it easy to integrate Smart Building IoT applications into LPVs, making them safer, greener and more comfortable. With a growing platform of building automation solutions, all running over the RUCKUS network with the RUCKUS IoT Suite, LPV owners and operators can build a flexible foundation for a world of new IoT experiences. Large public venue owners can deploy solutions to optimize comfort and convenience, safety and security, and resource management in their venues and have them all run over the same converged RUCKUS wireless network.

UP THE GAME WITH CROWD INTELLIGENCE

Using data to drive more revenue and improve operations is presenting new opportunities in LPVs. Guest engagement and interaction is being enhanced through knowing their precise location in and around the venue. RUCKUS SpoT analytics dashboard identifies where crowds are and enables better decision-making using data and predictive intelligence. This gives venue owners and operators powerful insights for planning security, staffing, optimizing traffic flows, and guest services. Social distancing guidelines can also be monitored for compliance and anomalies. Multiple use cases for smart venues are now enabled by location analytics capabilities to:

- Improve situation awareness and safety –notifications by section, best exit routes, traffic and hot spot flow analysis
- Enhance Public Health – touchless payments, air quality monitoring, improve contact tracing
- Drive new ticket sales from non-season ticket holders with tailored offers
- Increase customer spend – retail, food & beverage, merchandise through personalized and context specific advertising
- Wayfinding to seat & line wait times updates, in-game stats



The long-term economics point to convergence which requires cooperation of multiple stakeholders

INTEGRATION FOR PEAK PERFORMANCE

For any LPV environment, the key to efficient connectivity depends on an informed strategy and an integrated deployment approach. The temptation is to regard large venue connectivity as a series of related but distinct challenges, such as Power over Ethernet (PoE), wireless DAS coverage, fiber and copper connectivity and integration into the data center. However, dealing with these challenges individually invites complexity, where vital efficiency gains can be diminished—or even reversed—by dealing with multiple solution providers, a lack of asset optimization and even redundant layers of infrastructure. To be effective, integrated connectivity should be:

Comprehensive - The strategy must emphasize both wired and wireless connectivity needs. Starting with a common robust fiber and copper infrastructure for all systems including Wi-Fi, IoT wireless connectivity, as well as cellular connectivity systems, DAS, CBRS and small cells. Taking this approach with a single vendor can result in substantial savings through increased design velocity, reduced material, labor and maintenance costs.

Simple - Complexity is a hidden-but-enduring cost for a piecemeal connectivity execution. Done well, a deployment will take advantage of time and cost-saving opportunities like modular design, pre-terminated cables and the capacity to share multiple services across a converged physical infrastructure realizing fiber and copper savings up to 20%.

Flexible - While each LPV deployment is unique, all LPVs need the flexibility to move services and add new services quickly and simply as the needs of the venue change. A common robust infrastructure will help your network support the latest technologies and applications from Wi-Fi, LTE, 5G and IoT to keep your venue on the leading edge of guest experience and operational efficiency.

Automated Management - Automated Infrastructure Management (AIM) solutions should provide clear visibility into the network for LPV IT managers showing the connectivity of every device, down to the port level. CommScope's imVision AIM solution can reveal potential trouble spots, security breaches and underutilized assets that could undermine your LPV business goals.

Case study

ALLEGIANT STADIUM

For the Las Vegas Raiders, the 65,000 seat venue boasts 2,400 multi-media screens and 1,700 WiFi access points. Supported by the CommScope-enabled infrastructure, fans and staff will enjoy connectivity at all ten levels of Allegiant Stadium, including some 2,400 video screens, dynamic displays and smart signs. The network will enable fans to use their Raiders and Allegiant Stadium mobile app throughout the facility to find parking spaces, locate concession stands, order food directly to their seats and share their experience on social sites via livestreamed videos.

The result of the CommScope/Raiders partnership is a vast yet highly integrated cabling infrastructure featuring 227 miles of fiber and 284 miles of Category 6A copper cabling. The CommScope SYSTIMAX 100G fiber backbone and 10G CAT 6A copper delivers connectivity for critical stadium systems and applications such as high-resolution security cameras, fire and safety, HVAC and lighting controls, wayfinding, ticketing, concessions, merchandise, and parking.

Supporting the various wired and wireless applications with a single unified and integrated infrastructure involved multiple product portfolios, including network fiber, copper, coaxial cabling, ribbon fiber for DAS and more. CommScope is one of the only companies with the breadth and depth in its portfolio to provide the necessary infrastructure.

"CommScope fiber optic cabling delivers the high bandwidth connectivity needed for a truly compelling and interactive Las Vegas Raiders fan experience."

Matthew Pasco
Technology VP, Las Vegas Raiders

We keep an eye on the future, making it our job to know what's next.

BEYOND THE BOWL

LPVs are increasingly becoming full lifestyle centers including retail stores, hotels, restaurants and multi-dwelling unit (MDU) residential properties in addition to the anchor stadium. All the capabilities that CommScope brings to the stadium are equally critical to ensuring the value of the surrounding property. Leading global hospitality brands and MDUs rely on CommScope to achieve '5-star' connectivity ratings.

ENVISION THE FUTURE

Before embarking on a full network design and deployment initiative, consider developing a vision for the guest experience and how technology will be used to shape those experiences. A journey map of the technology touchpoints can help define what the connectivity requirements need to be to support your guests from driveway to seat and seat to driveway.

Once the high-level requirements are defined then it's time to start asking important questions. The following are questions you should consider before beginning your network plan and design:

- Are the various design teams involved in the project aware of each other's network plans?
- Do these teams cooperate to avoid inefficiencies like running multiple infrastructures for separate networks?
- Could a single point of contact solution integrator reduce complexity with overall project management and a cohesive plan?
- Are emerging technologies and services such as 5G, Wi-Fi 6 and 6E, CBRS and powered fiber accounted for?
- If not converging your network infrastructures, what are your CapEx and OpEx costs for building, maintaining, and operating separate infrastructures compared to a single converged one?

MAKING THE RIGHT CALL

Holistic approaches to solving network and connectivity needs across LPVs have arrived, with converged infrastructures becoming mainstream drivers of enabling connectivity for new technology demands in LPVs. To be successful, venue owners must secure the interest and cooperation of multiple providers of services in their venues.

Consider a provider that can take an end-to-end view to your network needs and has innovative approaches and a comprehensive portfolio that includes DAS, Wi-Fi, infrastructure and professional services. Doing so will help you drive cost savings, reduce project risk, improve operational efficiencies, and unlock new revenue opportunities with an enhanced guest experience.

The industry's most comprehensive end to end portfolio that minimizes supply-chain complexity and decreases global fulfillment costs.

A WINNING TEAM

CommScope gives you one source for a broad range of LPV infrastructure needs. Our technology portfolio includes RF and fiber connectivity, cellular and Wi-Fi, converged network management, small cell and backhaul, along with the services and expertise to bring it all together. We also keep an eye on the future with a long-range vision for 5G, Wi-Fi 6, IoT, making it our job to know what's next. With a proven track record of delivering high-performance LPV solutions, CommScope provides the deep experience that ensures the infrastructure you deploy today will be ready for the communication challenges of tomorrow. Our project management team works collaboratively with your project team and contractors to simplify the process. Our partner ecosystem and alliances include application developers, distributors, installers, integrators and consultants all of whom are dedicated to keeping our customers ready for whatever is next.

WHY TEAM WITH COMMSCOPE?

CommScope provides a single source with capacity to provide the following equipment and solution design.

- All-digital DAS and Wi-Fi, including carrier-approved CPRI interface
- CBRS for private LTE networks
- Small cells for additional capacity and cell virtualization
- Public Safety DAS Ensures Emergency Radio Coverage (ERRCS) For First Responders
- Full design services across our entire product portfolio
- Full program management and installation of wired and wireless solutions
- Managed Network Solutions expertise to provide real-time health and monitoring of the network and instantly provide alerts to the identified dispatch team

Explore large public venue solutions at www.commscope.com.

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Visit our website or contact your local CommScope representative for more information.

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