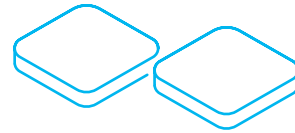


SPECTRUM CENTER LARGE VENUE INFRASTRUCTURE DEPLOYMENT SUPPORTS DIGITAL TRANSFORMATION



Wi-Fi network supporting property with
20,200 seating capacity



147 hybrid access points—under the seat,
overhead and in other locations

Located in Charlotte, North Carolina, Spectrum Center is the 20,200-seat home to the Charlotte Hornets of the National Basketball Association (NBA). It is also used for a variety of other events, including concerts, ice shows, and more.



Spectrum CENTER

Customer
Spectrum Center

Location
Charlotte, North Carolina

Upgrading for changing expectations

In a world that's more connected and mobile than ever, fans of sports and entertainment have high expectations. When they attend an event, they expect nonstop, fast connectivity on their favorite devices, wherever they are. When the global pandemic emerged, it accelerated digital transformation trends—and introduced new challenges. Cashless payment systems and mobile

tickets have become the norm, and large venues are under more pressure to transform operations to interact with fans in new ways.

Spectrum Center (formerly Time Warner Cable Arena), first chose RUCKUS® Wireless in 2011 to help it enhance performance and capacity across all the public seating areas in its arena as well as the facility's locker rooms, luxury suites, concourses, and back-office areas. Home to the NBA's Charlotte

Hornets, the arena also hosts everything from concerts and ice shows to high-profile events like the 2012 Democratic National Convention.

Balancing capacity and coverage

Rolling out wireless broadband connectivity to a high-density venue like Spectrum Center wasn't easy. People connect on a variety of devices, so the deployment would have to accommodate not just smartphones, but tablets and laptops. The first step in the project was to accurately assess the



demand that more than 20,000 guests and employees could place on the network. RUCKUS engineers considered the percentage of attendees who would carry a smartphone into the venue, and set this at a high percentage (in the 90th percentile) while utilizing a more cost-effective deployment model with overhead directional antenna mounting. This approach provided a balance between cost, coverage, and capacity, with typical average throughputs of 5M per user in the seating bowl, even at the hard-to-reach front rows and field of play.

Other locations in the arena—such as locker rooms, concourses, back offices and luxury suites—would also need broadband coverage, with the network being accessible from anywhere and virtually at any time. This led to different design approaches for two very different areas, with both needing to be optimized for capacity as well as coverage.

The greatest challenge in the design approach was in the seating bowl, where an enormous capacity requirement was needed for the more than 20,000 seats and expected devices. The usual approach to supporting high-density environments is to deploy a very large number of access points (APs), but, without proper engineering, this approach can introduce interference issues. High-density deployments are all about interference management.

Tripling capacity to meet new demands

As visitor expectations grew and new social network applications emerged—and the expectation of richer multimedia content and streaming became more prevalent—Spectrum Center continued its work with RUCKUS to uplevel its environment to maintain a great fan experience as well as support its own evolving digital operations. In 2018, RUCKUS deployed a new set of APs utilizing an innovative hybrid approach for increased capacity in the seating bowl locations. The new densification of access points located under the seat, leveraging RUCKUS BeamFlex+ dynamic antennas overhead, greatly outperforms the previous design in terms of overall venue capacity by tripling the overall network.

The new design uptake level can now support up to 95 percent of the crowd being online at the same time. Performance has been greatly enhanced as well, supporting average speeds well north of 20 Mbps per user. These dramatic improvements in coverage and capacity enable Spectrum Center to not only meet the new fan expectations for rich media content, such as video replays and social media, but also support many of the applications the venue depends on for a frictionless game-day experience, such as ticketless entry and cashless payments.

Transforming the large venue environment

RUCKUS had initially been chosen for the Spectrum Center project, as well as its upgrade, specifically because of its vast portfolio of large venue solutions designed for very high density and capacity, as well as its in-house, world-class high-density design and engineering capabilities.

The right technology. The right design. The right performance.

To get adequate capacity and coverage over the main seating area, RUCKUS employed a design utilizing RUCKUS R710 access points underneath the seats, where smaller higher capacity cells can be created. This allowed an AP to serve fewer people than an overhead narrow directional antenna at higher distances, where the area of coverage would be too wide and would lower the overall per-user capacity. In the upper bowl, where the distances to the catwalk mounting locations were closer to the users, RUCKUS engineers deployed T710s sectorized narrow antennas to allow more focused coverage RF to maximize mobile broadband capacity. These antennas direct the RF energy in a specific direction and, in this case, it was down into specific seating areas of the upper bowl. Given the height of the catwalk above certain sections, the narrower the beam the better to

maximize spectral reuse. RUCKUS R710 APs also provide coverage in other parts of the arena, such as luxury suites, locker rooms, concourses, and back offices). These APs utilize BeamFlex® adaptive antenna technology to keep RF energy focused on the specific users for whom the transmissions are intended—and away from other APs that might see this as interference. In addition, to optimize the RF into the environment, RUCKUS leverages its ultra-HD suite of features intended for stadiums and arenas, such as ChannelFly™, a RUCKUS proprietary technology. ChannelFly was used on this project to allow APs to automatically select the right RF channel based on the conditions. This approach can increase capacity while minimizing interference. In the Spectrum Center project, ChannelFly was shown to increase available capacity in the 2.4 GHz band by over 56 percent compared to a traditional static channel selection algorithm.

AP placement

A design goal for Spectrum Center was to make sure all seating areas were able to get a very strong signal. This included fans down on the floor as well as those in the highest levels in the arena. Because the first group of APs was mounted in the catwalk, they

tended to provide a stronger signal for those fans at the higher levels in the arena. To strengthen the signal for fans down near the floor, APs were mounted in the catacombs under the seats. This provided a very good signal for the fans sitting above, and the concrete kept the RF energy from propagating too far. This allowed a large number of APs to be deployed down near the floor on the lower bowl, without creating much of a co-channel interference problem. RUCKUS R710 APs with 120-degree sectorized antennas were used to focus a very narrow beam of RF energy up toward fans sitting directly above each section of the catacombs. The concrete structure allowed this deployment model to be reproduced for each section, as it tended to absorb RF energy and limit co-channel interference.

The challenge in deploying wireless broadband in a high-density venue like Spectrum Center is in managing interference. A key design practice is to always mount APs (to the extent possible) in an area where RF energy can only propagate out in the intended direction. BeamFlex adaptive antenna technology has proven to be of great value when coupled with proper site selection.

RUCKUS products

- 147 RUCKUS R710 access points
- RUCKUS ChannelFly technology maximizes capacity and reduces interference

With its RUCKUS Wi-Fi network in place, the Spectrum Center is exploring how it can support compelling new applications over its broadband infrastructure. For example, the venue may engage fans on their wireless devices to advertise special services to fans. These services could include information on where to purchase food items, merchandise or even tickets to a future event—all on a mobile wireless device. In our post-COVID world, sporting venues worldwide are moving rapidly toward wireless broadband as a way to provide new services to the large crowds that visit their facilities every day. Spectrum Center in Charlotte is well out in front of this trend, with its cutting-edge smart Wi-Fi network from RUCKUS Wireless.

About RUCKUS Networks

RUCKUS Networks builds and delivers purpose-driven networks that perform in the demanding environments of the industries we serve. Together with our network of trusted go-to-market partners, we empower our customers to deliver exceptional experiences to the guests, students, residents, citizens and employees who count on them.

www.ruckusnetworks.com

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

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