

>> Arizona Cardinals Stadium, Glendale, Arizona



University of Phoenix stadium, which is home to the Arizona Cardinals, sports the latest in digital wireless amenities

Cardinal Rules of Communications Apply at a Digital Stadium

Completed in August 2006, the state-of-the-art stadium used by the Arizona Cardinals football team sports the latest wireless technology that makes today's stadiums a more enjoyable and safe experience for millions of fans. Located in Glendale, Arizona, the 1.7 million square foot facility hosted the Tostitos Fiesta Bowl and the Bowl Championship Series National Championship games in January and will be the site of Super Bowl XLII in 2008. In 2009, the stadium will host the regional basketball tournament of the NCAA men's basketball tournament.

Company

Cardinals Stadium is a multipurpose stadium located in Glendale, Arizona. Its primary tenants are the Arizona Cardinals of the NFL. This 63,400-seat stadium (expandable to 73,000) opened in August 2006 after three years of construction. It is considered an architectural icon for the region and includes a retractable roof and roll-in natural grass field.

Challenges

- > Communication for Cardinal employees and visitors with wireless coverage across nearly 2 million square-feet
- > Support multiple carriers including: Verizon, Cingular, T-Mobile and others
- > Scalable, yet cost-effective solution, to support future growth without disruption to the network

Solutions

- > Scalable architecture provides complete coverage for the stadium
- > Single platform enables virtually any combination of wireless services, including cellular, paging, WiFi, two-way radio, telemetry and public safety communication
- > Modular design offers flexible, multi-carrier service

CASE STUDY

Building Wireless Solutions 

Communications Challenge

The Cardinals wanted to achieve a wireless triple play:

1) a single communications system that could accommodate multiple needs, from fans to public safety officials; 2) communications for the Cardinals corporate staff; and 3) coverage across almost 2 million square feet.

Solution

Mark Feller, senior director of technology for the Arizona Cardinals, wanted to keep the system flexible to accommodate a variety of mobile devices and achieve the three major goals for use. His vision was in concert with the Arizona Sports and Tourism Authority, which owns and operates the stadium and books it for football as well as a variety of events from soccer matches to expositions and concerts. Cellular Specialties Inc. (CSI) was chosen to engineer a Distributed Antenna System (DAS) specifically designed to provide coverage for the stadium, working closely with the Cardinals organization to ensure their communication needs were met. CSI also oversaw the entire installation process.

Among the number of available equipment options, CSI and the Cardinals chose to use MobileAccess' Universal Wireless Network system as a portion of the system. Bi-directional amplifiers (BDA), made by CSI, were also used in the design of this system. With the ability to receive signals from 450 MHz to 6 GHz, the network can support virtually any combination of wireless services, including cellular and paging from multiple operators, Wi-Fi, two-way radio and telemetry. "One of the big things was that we wanted to ensure that customers in the building would be able to use the wireless device of their choice, whether it is a cell phone, personal digital assistant or laptop," says Feller.

The system can also support public safety communications in the 450 MHz and 800 MHz bands. "It is not unusual in public venues for the local governing authority to require a working public safety system to get a certificate of occupancy," says Mike Altman, western region sales manager of CSI.

During its evaluation stage, Feller compared passive radiating antennas versus active systems, which included signal boosters. "We considered a radiating coaxial cable solution, which I consider to be truly passive," he says. "For our stadium environment, we chose a system that combined passive and active elements."

Passive coaxial antenna systems are primarily used in smaller facilities, according to Altman. Located at the headend, main hub and near the remote hubs, the active components in the MobileAccess system use signal amplifiers to provide RF signal coverage throughout the facility. Active fiber optic components also offer scalability so additional antennas can be added.

“One of the big things was that we wanted to ensure that customers in the building would be able to use the wireless device of their choice, whether it is a cell phone, personal digital assistant or laptop.”

Mark Feller
Senior Director of
Technology,
Arizona Cardinals

CASE STUDY

Building Wireless Solutions 

Kelley Carr, vice president of service for the custom solutions group at CSI, notes, "Wire-It-Once™ technology [from MobileAccess] combines the low-loss transport of fiber optics with the broadband flexibility of coaxial cable." The system has been up and running for more than six months now. The Rolling Stones held the first concert at the stadium in November 2006 before an audience of 40,000. "I was walking through the crowd at the concert watching them enthusiastically making phone calls relating the experience using cell phones and PDAs," says Altman. "It's clear that wireless communications is an amenity that is expected when someone goes to an indoor facility."

To provide ubiquitous wireless service, every cellular carrier must also have access to the facility. The Cardinal's technology partner and preferred wireless carrier, Alltel, was permitted to install base station equipment in the stadium's data center. Signals from additional carriers — including Cingular, T-Mobile, Verizon and other cellular carriers — enter into the facility via external equipment, which uses fiber optics to plug into the DAS. Bi-directional amplifiers receive signals from carrier base stations, which are approximately one mile away. From the BDAs, the signals are sent to the MobileAccess system on nearby racks and are then redistributed via the DAS installed in the stadium.

System Doubles as Enterprise Network

What is good for the fans is also good for the administrative offices in the stadium. At the same time the system enables customers to use their wireless voice and data handsets, the Cardinals wanted to provide that same level of 802.11 wireless local area network service to their employees, vendors and anyone else providing services within the stadium. Even before the stadium was finished, employees were using wireless laptops to manage construction and make other preparations. "We have a lot of office space in the stadium," says Feller. "Staff wanted to use Wi-Fi throughout the stadium for Internet, email and WLAN use."

Because the Cardinals were looking for an integrated network, the communications backbone has become the workhorse for multiple systems: an IP phone system and computer network in addition to the wireless system. "We wanted a full-fledged backbone for wired communications and one for wireless communications, says Feller.

In conjunction with the MobileAccess DAS, a CISCO advanced IP network was deployed by technology products and service provider Insight North America, which is the exclusive IT partner to the Cardinals organization, to handle all data, voice and video traffic in the stadium. In the box seats, Cisco Unified IP Phones with touch-screen displays can be used for credit card transactions to order food and beverages, buy tickets for future games, shop at the Cardinals' online store, and access football statistics.

"I was walking through the crowd at the concert watching them enthusiastically making phone calls relating the experience using cell phones and PDAs. It was clear that wireless communications is an amenity that is expected when someone goes to an indoor facility."

Mike Altman
Western Region
Sales Manager, CSI

CASE STUDY

Building Wireless Solutions 

The stadium communications system is fully integrated with the network at the Cardinals' headquarters and training center in Tempe, 21 miles away, which uses an IP-based Cisco Unified Communications system that includes call-management and callcenter software to handle all phone functions for office operations and ticket sales. Employees can operate seamlessly, using the same telephone number, whether they are in the offices in Tempe or in the stadium in Glendale.

Executives and staff now have the capability to communicate via videoconference and send data, game film, and marketing materials back and forth. The team has full access to its database on the headquarters network from wireless laptops, whether it is in training camp in Flagstaff, Arizona or while playing a game on the road.

Feller believes that implementing the multi-carrier DAS reflects the Cardinals' commitment to creating a state-of-the-art, first-class experience for their fans and visitors from the full-featured wireless system to the stadium with the first completely retractable playing surface and a retractable roof.

While wireless access for fans is critical, Feller wanted to provide a solution that would support a variety of other applications for the purpose of streamlining operations in the stadium. "From an economic perspective, the design of the CSI DAS solution allows us to add new services to support any future applications without disrupting our existing wireless system," he says. "We were looking for the most efficient and practical way to deploy a communications system and do it right the first time, while covering as much technology ground as possible."

DAS a Gateway to Many Applications

Distributed antenna systems make innumerable digital advances possible in today's digital stadium. Increased security can be offered through radio frequency identification (RFID) tags on staff passes. Law enforcement also benefits from wireless video cameras, which they can monitor on their personal digital assistants as they do their rounds and they can use twoway radios for coverage with no dead spots. Additionally, soccer stadiums in Europe use wireless digital video with biometric facial recognition as a security measure.

As a way to provide instantaneous updates on fans entering the facility, bar coding and RFID technology are increasingly being deployed to allow a stadium operator to ensure that it has the correct inventory in the concession stand, according to a CNN.com Special Report, as well as allowing officials to know which sections of the stands are filling up first. Data culled on attendance, which is stored on a mainframe, can also be used later for better marketing. Whether it is serving the customers or protecting them, wireless will continue to be more and more a centerpiece of the stadium experience.



Bi-directional amplifiers (BDA) receives signal via fiber from cellular carrier base stations, which are then sent to the MobileAccess system on nearby racks and redistributed via the distributed antenna system installed in the stadium



Twenty 450 MHz omnidirectional antennas are positioned around the stadium to enhance first responder communications. This one located under the stands