



CASE STUDY: BANDIMERE SPEEDWAY

50 Acres of High-Speed Wireless for High-Speed Racetrack

UniFi® APs provide 802.11ac Wi-Fi to wireless client devices for customers and employees

airMAX® products deliver wireless internet throughout the widespread event site

EdgeMAX® and UFiber products form the wired network for moving high-speed data

Telos Online is a large-scale Wireless Internet Service Provider (WISP) that offers fiber, VoIP telephony, and other web services to businesses in the Denver, Colorado area since 2000. The company owns and operates its own infrastructure, using Ubiquiti® products for all networks, from UniFi to airMAX to EdgeMAX, to power a nimble business delivering reliable service with quick delivery times and affordable pricing.

Founded in 1958, Bandimere Speedway is a full-time racing facility located at 5,869 feet elevation in Morrison, Colorado. It is approximately a mile long by a quarter mile wide and showcases a quarter-mile drag strip. Sanctioned by the NHRA (National Hot Rod Association), Bandimere Speedway holds more than 130 events a year, with peak crowds of 25,000 during a race weekend – almost 30,000 for its largest event.

WIRELESS REQUIREMENTS

Initially, Bandimere Speedway had a small Wi-Fi network to handle ticketing for entrance gates and a small fiber network for its timing system. It realized it needed better coverage for the ticketing system, as well as Point-of-Sale (PoS) for third-party vendors, track security, and guest Wi-Fi, which must be high-performance and robust to handle heavy traffic loads.

"In this specific case, we had the core of the Wi-Fi system online and working less than one hour after turning everything on, and were able to serve the site's almost 30,000 customers over the National's weekend only three days later."

Jim McNally, CTO, Telos Online

NEW NETWORK DESIGN



UniFi BaseStation XG mounted on a pole

Telos Online designed a large network using a mix of UniFi, airMAX, and EdgeMAX products. After deployment, Ubiquiti equipment delivered Wi-Fi coverage to over 50 acres of event space at Bandimere Speedway's largest event, the Dodge Mile-High NHRA Nationals held during July 20-22, 2018.



PrismStation 5AC and UniFi AC Mesh AP with antenna



UBIQUITI SOLUTION



Starting line for the Top Fuel race

"No complaints from anyone, and the National Race Teams made extensive use of the system throughout and said it was one of the best systems they had ever used."

Jim McNally, CTO, Telos Online

THE NEED FOR POWER

AC power was used for most of the deployment; however, solar and battery power were used as well. Several locations for equipment used solar power because running AC power was cost-prohibitive, while portable batteries powered airMAX Point-to-Point (PtP) links to UniFi Access Points (APs) for temporary Wi-Fi coverage in rarely used locations.

NETWORK TOPOLOGY

Although there is a single physical network comprised of Ubiquiti products, Telos Online separated the UniFi and EdgeMAX networks, using VLANs and static IP addressing. Two networks for device management keep the wireless payload traffic separate from management traffic to increase security.

Static IP addressing also helped to secure the network, as it would be hard for anyone to join the under-the-radar management network. Telos Online also used strong passwords and separate VLANs for management.

"Ubiquiti makes it simple enough to expand and add new devices from my phone or tablet. That in a matter of minutes you're up and going – which makes it crucial for when we need a temporary Wi-Fi setup in our remote locations for accepting credit cards to pay to park. With three temporary units on hand (NanoBeam and AC Mesh), all I have to do is plug them in and they link right back up, even after being off and stowed away when not in use."

Cody Crispe, Installer and A/V Integrator, Bandimere Speedway

NETWORK CORE AND WIRELESS ACCESS

The UniFi XG Security Gateway feeds into the UniFi XG Switch, which connected to multiple UniFi Switches. Telos Online selected a variety of UniFi APs, each handpicked for its advantages, to suit each AP's location at Bandimere Speedway.

The UniFi BaseStation XG units are used to cover the east stands for the north and south ends of the track, as well as the Top Eliminator Club (TEC), an elevated seating area that can be rented out for private events.

The TEC also uses the UniFi SHD AP, and two UniFi AC Mesh Pro APs deliver Wi-Fi to the TEC stands, which seat over 700 attendees. The UniFi AC Mesh Pro and UniFi AC LR APs are also deployed at various buildings, including the ticket offices.

For better coverage, the UniFi AC Mesh AP is frequently paired with the UMA-D antenna to deliver Wi-Fi to POS (Point-of-Sale) terminals for vendors in the stands, concessions area, fuel depot, and photo building.

VIDEO SURVEILLANCE

Telos Online also installed six UniFi Video Cameras, model UVC-G3-AF, as part of the surveillance system. The UniFi Switches run data and PoE to the cameras, and recordings are sent to the NVR located on the UniFi Application Server.

| Model | Number | Purpose |
|----------------|--------|---|
| UWB-XG | 10 | 802.11ac Wave 2 4x4 MU-MIMO wireless coverage on three 5 GHz radios with dedicated security and beamforming antenna |
| UAP-AC-SHD | 1 | Dual-band 802.11ac Wave 2 4x4 MU-MIMO wireless coverage with dedicated security |
| UAP-AC-LR | 2 | Dual-band 802.11ac 3x3 MIMO wireless coverage for long-range deployment |
| UAP-AC-M-PRO | 9 | Dual-band 802.11ac 3x3 MIMO wireless coverage for expanded range outdoors |
| UAP-AC-M | 22 | Dual-band 802.11ac 2x2 MIMO wireless coverage, indoors/outdoors |
| UMA-D | 18 | Dual-band directional antenna for use with the UAP-AC-M |
| UVC-G3-AF | 6 | 1080p indoor/outdoor IP camera with infrared |
| USG-XG-8 | 1 | 10G security gateway |
| US-16-XG | 1 | 10G aggregation switch |
| UniFi Switches | 4 | Various port sizes: 8-port, 16-port, 48-port and PoE support |
| UAS-XG | 1 | Server running UniFi Controller, UniFi Video with NVR, and Ubiquiti Network Management System (UNMS™) |
| UDC-1 | 6 | Direct Attach Copper (DAC) cable, 10 Gbps, 1 m |





OUTDOOR ROUTING AND SWITCHING

Telos Online deployed a variety of EdgeMAX devices.

For outdoor routing, the EdgePoint® R6 is deployed in two locations. At the lower section of the west stands, it connects and powers three UniFi AC Mesh APs, while at the north end of the track, the EdgePoint R6 connects and powers two UniFi Video Cameras G3 and a UniFi AC Mesh AP.

For outdoor switching, the EdgePoint S16 is installed in three locations. At the north and south ends of the east stands, an EdgePoint S16 connects and powers three UniFi XG BaseStations and two additional UniFi APs. On the tower roof, the EdgePoint S16 connects and powers a UniFi XG BaseStation, a PrismStation AC, and a IsoStation AC.

The EdgePower™ EP-54V-150W acts as a power supply for the EdgePoint S16. The EdgePower features dual hot-swappable power modules for increased reliability and offers remote monitoring – helpful for any troubleshooting.

Telos Online installed many 1 Gbps and 10 Gbps UFiber links, which took advantage of the SFP+ ports of the EdgePoint S16 as well as the UniFi XG Switch. The network's throughput can easily be increased as bandwidth demands grow.

| Model | Number | Purpose |
|-------------|--------|---|
| EP-R6 | 2 | Outdoor Gigabit routing with SFP port, PoE, and power input options (PoE or DC) |
| EP-S16 | 3 | Outdoor Gigabit switching with SFP+ ports and PoE |
| EP-54V-150W | 3 | DC power supply supports up to two 150W PSU modules |
| UF-SM-10G-S | 6 | Single-mode SFP+ module, 10G, BiDi, 1-pair |
| FC-SM-100 | 2 | Single-mode fiber cable, 100' |

POINT-TO-MULTIPOINT (PTMP) LINKS

Telos Online deployed several airMAX links around Bandimere Speedway to deliver wireless internet to various locations, including the photo building, upper west stands, and pole #1.

... all the UBNT equipment worked flawlessly [for the Nationals]... Even without any advertising or promotion of the Wi-Fi being there, close to 2000 people connected into and used the system and there were zero problems or failures."

Jim McNally, CTO, Telos Online

For PtMP links, the IsoStation™ AC and PrismStation AC act as APs, using horn antennas for sector coverage. A IsoStation AC and PrismStation AC are located on the tower roof, pointed towards different locations, and the second PrismStation AC is installed in the concessions area.

Two CPE models, the LiteBeam® AC and NanoBeam® AC, are used. The LiteBeam AC was selected for its ease of deployment, excellent performance, and affordability; it is installed in various locations including the photo building, pole #1, the office, and the highway sign.

The NanoBeam AC maximizes performance in a compact form factor and is deployed at multiple sites, including the upper section of the west stands.

| Model | Number | Purpose |
|--------------|--------|---|
| IS-5AC | 1 | airMAX AC radio with isolation antenna (default: 45° beamwidth) |
| LBE-5AC-Gen2 | 11 | Lightweight and low-cost airMAX AC CPE |
| NBE-5AC-16 | 6 | Compact airMAX AC CPE |
| PS-5AC | 2 | airMAX AC radio with airPrism® technology |
| Horn-5-30 | 1 | Horn antenna with 30° beamwidth |
| Horn-5-45 | 2 | Horn antenna with 45° beamwidth |



CENTRALIZED MANAGEMENT



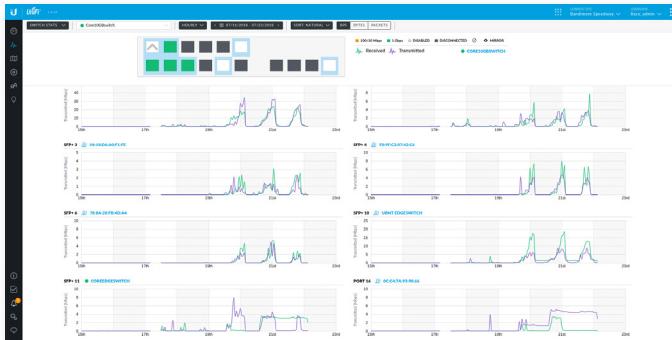
Statistics > Traffic Statistics screen of UniFi Controller

"With my mixer connected to a Wi-Fi network, I can control the sound anywhere in the facility from my iPad... You won't find anything but Ubiquiti at our facility from now on. There's no reason to try anything else; this stuff just works."

Cody Crispe, Installer and A/V Integrator, Bandimere Speedway

UNIFI IN CHARGE

The UniFi devices are monitored and managed by the UniFi Controller software or the UniFi mobile app, while the UniFi Video Cameras are managed via their software or mobile app. Software for the UniFi devices and cameras, the Network Video Recorder (NVR), and UNMS run on the UniFi Application Server.



Statistics > Switch Statistics screen of UniFi Controller

"By adding Ubiquiti products to our existing infrastructure, we were able to provide a wireless network for our entire facility. With the wireless network in place, we can capture information from our season ticket holders and [general admission] attendees. With our personalized splash page, our sponsors are able to gain more coverage and bring their products to the attention of our customers."

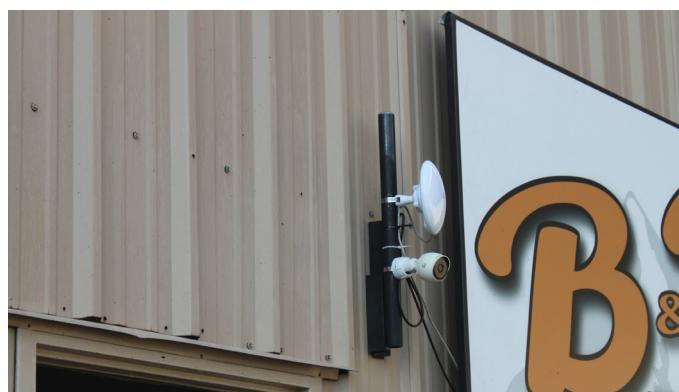
Christy Emilyon, Ticketing Manager, Bandimere Speedway

"By expanding our wireless network to our parking lots, we [can] scan pre-purchased parking passes and also sell passes using our Janam scanners, so our parking staff [can get] cars into the facility in a more efficient manner."

Christy Emilyon, Ticketing Manager, Bandimere Speedway

UNMS SOFTWARE

The other Ubiquiti devices offer two options: a web UI interface for individual device management, as well as the Ubiquiti Network Management System (UNMS).



NanoBeam® 5AC and UniFi Video Camera G3

PLANS FOR UPGRADES

To enhance the track experience for visitors, as well as the network's performance and reliability, Bandimere Speedway and Telos Online plan more upgrades in the immediate future – all using Ubiquiti products.

- live video feeds for on-site race viewing in real time
- direct battery backup for EdgePower locations
- private GPON system

"We were very fortunate to find two great partners to help us improve our wireless structure... We are looking forward to growing and improving our customers' experience with support from Ubiquiti and Telos Online."

Larry Crispe, Facility Manager, Bandimere Speedway

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