

# Good Vibrations

Cisco deploys massive Wi-Fi network for Bonnaroo Music Festival.

By David Baum

*"How many times must a man look up before he can see the sky?"*

These memorable lyrics by Bob Dylan more than likely occurred to Cisco's Andy Hettinger, a cable marketing manager, as he scanned the gathering clouds above rural Tennessee the day before the Bonnaroo Music Festival was about to begin. Hettinger and colleagues had been working around the clock to create a wireless network for the festival, helping to set the stage for some of the biggest artists in the music business. Would adverse weather affect the radio signals?

## Music Milestone

With a coverage area of more than five square miles, the network represented the largest temporary Wi-Fi deployment in US history. Network solutions from Cisco and Linksys were deployed with a high-speed transport infrastructure from Cisco Powered Network provider Charter Communications to supply high-speed connectivity to hundreds of musicians, along with production personnel, administrative workers, and festival-goers.

"All ticketing was handled electronically, and administrators had unlimited network access for business activities such as shipping and receiving and cutting paychecks," says Jeff Steinberg, service acceleration manager at Cisco, who worked with Hettinger on the event. "Wireless access was also provided for the organizers and VIP campground residents. Everybody was extremely pleased with the results."

Named by *Rolling Stone* magazine as one of the top 50 milestones in music history, more than 130,000 people attended the four-day music festival, which was held on a 650-acre farm on the outskirts of Nashville.

Workers began with a patch of unimproved farmland and constructed what amounted to a small city, with temporary administrative offices, six sound stages, general stores, concession stands, camp sites, parking facilities, and all the services necessary to allow tens of thousands of fans to enjoy more than 80 bands including Trey Anastasio, The Dead, Bob Dylan, Dave Matthews, Patti Smith, Wilco, and dozens of others.



**SEA OF FANS** The Bonnaroo Music Festival drew more than 130,000 rock music fans this year.

## Getting in Gear

Co-promoted by A.C. Entertainment of Knoxville, Tennessee, and Superfly Productions of New Orleans, Bonnaroo has spun off concert CDs and DVDs, along with an Internet radio broadcast.

For Cisco and Charter, the six-month project involved planning, design, construction, setup, and teardown of all network facilities—and a fair amount of related IT gear. In addition to the network itself, Cisco and Charter supplied the infrastructure for an Internet Village where festival attendees could share music, burn CDs, access the Internet, and read e-mail.

One month before the event, systems engineers John Kerrigan and Mike McCullough of Cisco conducted a site survey to scope out the physical terrain, determine where to place utility poles, and assess what kinds of equipment they would need. In addition to careful placement of wireless "hotspots," they decided to supplement the wireless transport facilities with Cisco Long-Reach Ethernet where a thick line of trees bisected one section of the farm. While wireless transmissions normally penetrate trees, Kerrigan was concerned that, in the event of rain, water on the leaves would cause interference by reflecting the radio signals in random ways.

You can relive the Bonnaroo music experience at [livebonnaroo.com](http://livebonnaroo.com), the festival's online outlet, where downloadable recordings of live performances are available.



**FIELD WORK** Andy Hettinger and Jeff Steinberg of Cisco hard at work building Bonnaroo's wireless LAN from their "virtual office" on Tennessee farmland.

### The Infrastructure

Event organizer Superfly Productions supplied power through diesel generators located near each pole, while Cisco created enclosures for the wireless equipment, which included Cisco Aironet® 1200 Series access points and Cisco Aironet 350 Series wireless bridges. The access points were connected to the Internet using dual cable modems and a Cisco uBR7246VXR cable modem termination system (CMTS).

The Cisco Aironet 1200 Series Access Point is commonly used to create secure wireless LANs. Its modular design allows single or dual radio configurations for up to 54-Mbit/s connectivity in both the 2.4 and 5 GHz bands. The technology is compliant with the IEEE 802.11a, 802.11b, and 802.11g standards. The Cisco Aironet 350 Series Wireless Bridge enables high-speed long-range outdoor links and is ideal for harsh environments.

Thanks to this innovative infrastructure, anyone at the festival who had 802.11b-enabled adapters in their laptop computers and personal digital assistants (PDAs) could easily communicate over the airwaves at 11 Mbit/s. Attendees could stay connected with friends and family at the VIP camping area, in the Centeroo village, and in an Internet café, where 40 laptop PCs were available to check e-mail, download music, and access the Internet. Festival organizers also created a music-sharing village where attendees could burn CDs from a huge library of music supplied by the artists.

"Cisco Aironet 1200 Series Access Points gave users high-speed wireless performance," says McCullough. "Many users were astounded by the speed, which was generally in excess of 3 megabits per second."

### Design Considerations

The Cisco engineers carefully laid out the network to avoid interference from one wireless area, or cell, to another. "When you lay out the wireless access points, typically you design them with overlapping coverage areas, much like the concentric circles in the

Olympic logo," McCullough explains. "However, you must be careful not to assign the same channel IDs to overlapping cells or the devices will interfere with each other, reducing the available bandwidth to clients who use those particular cells."

According to McCullough, the sound mixers consumed the most bandwidth, as they recorded and mixed music from each act onto 8 terabytes of local storage, then streamed the final cuts to offsite servers. Next year, says Hettinger, the team hopes to enable live streaming of audio and video to local servers for immediate sharing and download.

"The wireless network and associated applications were a great success," says Joel Patten, director of business development at Charter Communications. "The general consensus from my team is that we would definitely like to partner with Cisco and do the event again in 2005."

### Confronting Challenges

Because there were few precedents for this type of installation, a large part of the challenge was to predict how much bandwidth Cisco and Charter would need. "Soon after the festival began, we realized that we had underestimated the Internet throughput requirements, both internally and externally, as well as the number of available clients," says McCullough. "We had to tune the network as needed to accommodate burgeoning usage."

The team also faced challenges delivering wireless connectivity to 25 aluminum trailers set up for musicians and crew, because radio waves don't permeate metallic substances. They solved the problem by placing antennas in front of windows and doors, which were generally constructed of glass and wood. In cases where wireless signals coming through windows were too weak, or the PCs did not have the proper access cards, they supplemented the endpoints with Linksys® routers, which support wireless communication with the Cisco Aironet access points on the poles. Other challenges involved occasional power surges from generators and competing wireless signals in the area. Because of the overlapping coverage supplied by adjacent cells, neither issue caused significant disruptions.

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### FURTHER READING

- Cisco Aironet 1200 Series  
[cisco.com/packet/164\\_7c1](http://cisco.com/packet/164_7c1)
- Cisco Aironet 350 Series  
[cisco.com/packet/164\\_7c2](http://cisco.com/packet/164_7c2)
- Cisco 7200 Series Router  
[cisco.com/packet/164\\_7c3](http://cisco.com/packet/164_7c3)
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