

COVERAGE SYSTEMS

Chicago Transit Authority

DAS Delivers Voice/Data for Passengers, Employees and Public Safety Personnel

Challenge To enhance the Chicago Transit Authority's (CTA) existing two-way radio system and improve redundant subway communication options for the CTA, Chicago Police Department and Chicago Fire Department/EMS personnel. In addition, the system should also be able to provide commercial services, which will allow CTA customers to use their wireless devices throughout the CTA's subway system and prove an additional revenue stream for the agency.

Solution An indoor distributed antenna system (DAS) consisting of a series of repeaters and antennas connected to a common fiber-optic backbone devised by Powerwave's Network Solutions Group team, a group of RF and system engineers specializing in the delivery of turnkey solutions for complex environment.

Result A scalable, robust coverage system design that provides multitechnology, multi-carrier wireless coverage to commercial customers, with an independent UHF/VHF system that supports uninterrupted wireless access for public safety personnel.

In operation since 1947, the CTA is the nation's second largest public transportation system. Its 1,190 rapid transit cars operate over seven routes and 222 miles of track, providing about 500,000 customer trips each day and serving 144 stations throughout the City of Chicago and its surrounding suburbs. In 2003, Powerwave and Liberty, Illinois-based Aldridge Electric, Inc., one of the United States' largest electrical contractors competitively bid and completed the design and installation of a wireless coverage system that now delivers high-quality subway communications options for the CTA, the Chicago Police Department and Chicago Fire Department/EMS personnel, as well as accommodates commercial wireless services within the rapid transit system's underground stations, station passageways, and two 11.4-mile tunnels.

Among the key objectives in establishing an indoor DAS in the CTA's rapid transit tunnels, underground stations and station passageways were to:

- Create a common, non-discriminatory, comprehensive wireless coverage system that leverages state-of-the-art technology that supports UHF/VHF frequencies for public safety communications, as well as provide seamless voice and data access for commercial customers
- Avoid costly upgrades with a system that is capable of supporting commercial, private and public safety wireless services within a single platform
- Develop a flexible and scalable platform that accommodates existing public safety and private network frequencies, as well as new and emerging frequencies and technologies



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In designing and implementing a scalable coverage system for the CTA that could support an independent UHF/VHF system for wireless access by public safety personnel, as well as voice and data services for commercial customers, Powerwave and Aldridge Electric faced several challenges. First of all, because the CTA coverage system is based on a series of antennas that support commercial wireless services, as well as a system of radiating cables for UHF/VHF transmission capabilities, the design plan had to be very detailed and accurate, as even the slightest mistakes in the planning phase could cause serious signal degradation. Additionally, the installation of the coverage system in the rapid transit tunnels, underground stations and station passageways presented its own challenges including limited work hours, strict safety regulations and line closings.

“Our proven expertise in providing coverage solutions for complex environments worldwide, coupled with Aldridge Electric’s extensive installation experience within Chicago’s subway system, provides the Chicago Transit Authority with the most comprehensive, cost-efficient method for expanding communications capabilities,” said Dave Quinn, managing director, Network Solutions Group, Powerwave Technologies. “Our multi-technology platform is specifically designed to be the most reliable and cost-effective method of providing access to wireless communications services in an indoor environment. With the design and implementation phase of the indoor distributed antenna system at the CTA now complete, commercial subscribers and public safety personnel alike can experience seamless connectivity anytime, anywhere throughout the covered areas.”

Powerwave’s fiber-based distributed antenna network installed at the CTA is designed to transmit mobile radio signals from strategically positioned radio base station hotels located outside the CTA tunnel system. In addition to supporting all major U.S. wireless service providers serving the Chicago area, and their technologies including cellular and PCS, the DAS enhances the communication capabilities of the CTA with an independent RF system that supports the Chicago Police Department, the Chicago Fire Department, the CTA’s own two-way radio system, and emergency medical services (EMS). Carrier-dedicated equipment enables carriers choosing to use the system to be completely independent of one another, yet still have the ability to manage their individual networks via the base stations located in centralized base station hotels.

Powerwave designed the CTA coverage solution using predominantly passive components that provide a more reliable wireless connection, ensuring greater system availability and overall system integrity throughout the rapid transit tunnels, underground stations and station passageways.

The CTA coverage system supports six UHF channels and one VHF channel as well as 800MHz and 1900MHz commercial frequencies.

All Aboard with Easy Installation and Maintenance

By using a broadband antenna in conjunction with coaxial cable, only one type of antenna must be installed to accommodate all in-building frequencies within the CTA’s rapid transit tunnels, underground stations and station passageways. Because there is common wideband system backbone supporting each service with Powerwave’s indoor DAS, fewer parts need to be maintained once the system has been installed. In addition, all active components of the system reside in secure, non-public areas of the CTA, so rapid transit passengers are not inconvenienced during system maintenance and repair. The system also provides substantial cost savings over other competing solutions due to fewer initial infrastructure requirements and ease of maintenance routines, shorter installation times and smoother technology upgrades.

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Built-in Scalability for Future Destinations

The inherent flexibility and scalability of Powerwave's indoor DAS at the CTA not only provides a cost-effective platform to support current technological and capacity requirements for additional airport facilities, but enables the CTA to accommodate future private and commercial wireless services with minimal effort and expense.

New modules, servicing new and subsequent public safety and emergency services frequencies may easily be added as new technology is required, or to accommodate user demand, as well as provide coverage extension for these bands.

The CTA is one of many underground transit systems around the globe to deploy Powerwave Technologies' distributed antenna systems. Other locations include:

- Berlin Metro (Germany)
- Santiago Metro (Chile)
- Brussels Metro (Belgium)
- Moscow Metro (Russia)
- Taipei Mass Railway Transit (Taiwan)
- Bonn Metro (Germany)
- Rio Metro (Brazil)
- Buenos Aires Metro (Argentina)
- Nuremburg Metro (Germany);

About Powerwave's Network Solutions Group

Powerwave's Network Solutions Group is a team of RF and system engineers within Powerwave who manage, or assist you in, your projects for cellular coverage worldwide. Increasing complexity of wireless systems today combines with regulatory restrictions and a variety of practical considerations to demand comprehensive experience and know-how for cost-efficient cellular coverage solutions. Based on Powerwave's outstanding track record of customer projects completed, and on our extensive experience and know-how in quality wireless communications, Powerwave offers novel solutions that are carefully tailored to your specific needs.



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