CEL-FI™

QUATRA / GO

Smart Cellular Coverage

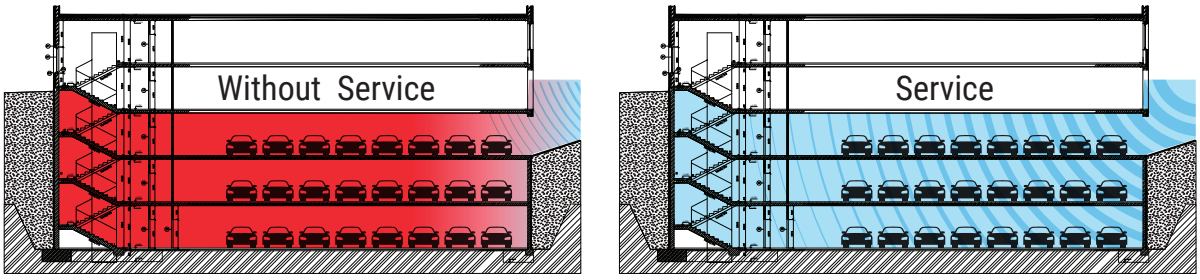
Cellular Coverage is Essential for EV Charging Stations in Parking Lots and Indoor Structures

As electric vehicles (EV) increase in popularity, EV charging stations are increasingly commonplace in outdoor parking lots and indoor parking facilities.

Charging stations generally require a strong cellular connection to enable remote monitoring by owners and manufacturers for system outage alarms, electricity usage status, and tracking who is using the equipment.

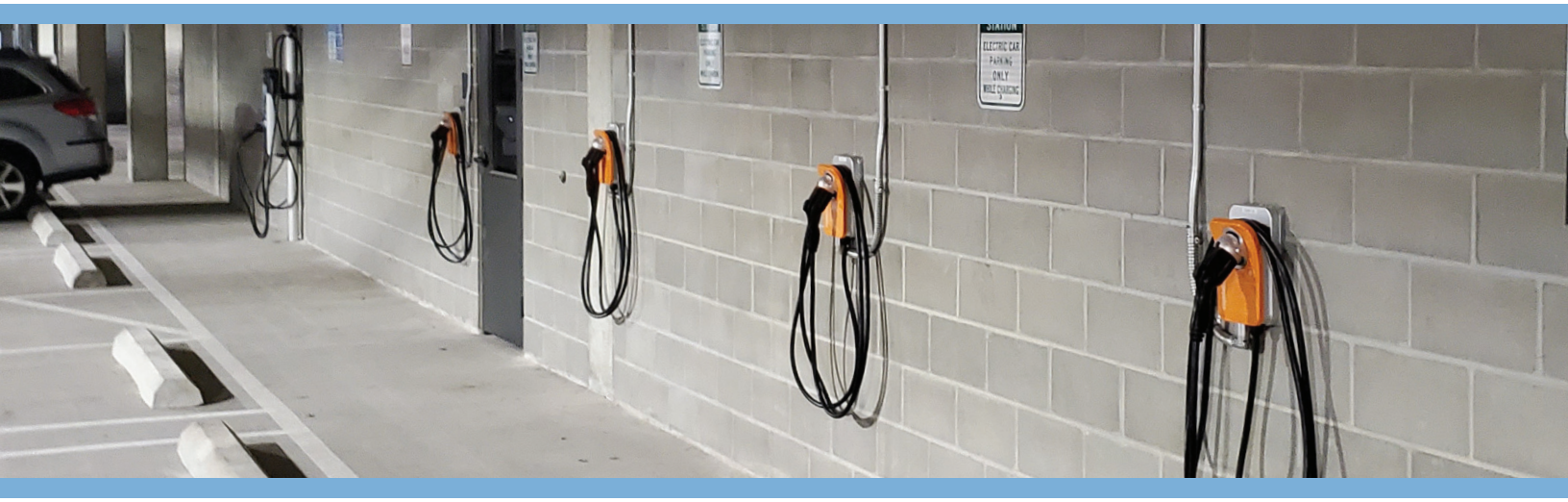
The leading manufacturers of EV charging stations also provide mobile apps that connect drivers directly with the stations so they can easily find a charging station when they need it, get in line to charge when stations are busy, instantly start sessions, see their charging status and activity over time, and pay for their charges.

The cellular signal in outdoor parking lots and indoor parking facilities are often weak due to environmental or construction obstacles. The Cel-Fi product line provides robust solutions that circumvent these challenges.



EV charging stations need the cellular connectivity to perform as intended. Examples of Cel-Fi solutions deployed for this thriving market segment are discussed in the following case studies..

Cel-Fi QUATRA Powers Cellular Connection for Underground Electric Vehicle Charging Stations



SUMMARY

CHALLENGE

- Poor cellular coverage in 20,000 sq. ft. parking garage on lower floors of multi-use building
- Cellular connection was required for Electric Vehicle (EV) charging stations in parking garage used by apartment tenants
- Poor donor signal due to construction and urban environment

SOLUTION

- Cel-Fi QUATRA

RESULTS

- Reliable signal for EV charging stations and all major carriers
- Quick and easy install
- Future proof solution

THE CHALLENGE

A large national builder needed to ensure there was reliable cellular coverage throughout a 20,000-square-foot parking garage in the lower and sub-ground levels of a multi-use building with retail spaces and apartments. Six ChargePoint electric vehicle (EV) charging stations were installed on the first level of the garage for apartment tenants, and another six are planned on the second floor parking for residents. The EV charging stations need cellular connectivity for remote management and to initiate payment processing, but the building's construction materials and urban environment, as well as the underground location, were obstructing cellular signals in the parking garage.

The EV charging stations in the parking garage need to be "reachable" by the building owners and ChargePoint network so the system can be remotely monitored through an online dashboard. SIM cards and modems are installed inside the stations for cellular connectivity, turning the stations from simple wall electrical outlets into "smart chargers" that can monitor usage and accept payments. If a station is not connected to the network, it will not be able to initiate a session to authorize a payment charge and the driver will not be able to pay.

KonectaUSA

- Established in 2015
- Based in Minneapolis, Minnesota
- Services include small cell, active DAS and passive DAS, and GPS Indoor Solutions
- Customers include education, hospitality, healthcare, commercial real estate and FORTUNE 500 companie

CEL-FI CERTIFIED **RESELLER**

Konecta USA, a leading commercial in-building installation and service provider in North America, was tasked with bringing reliable cellular coverage to the EV charging stations and across all the major carrier networks to alleviate communications and safety concerns for residents and retail customers while in the garage.

THE SOLUTION

To cost-effectively bring cellular coverage for the EV charging stations and from all major carriers into the parking garage, Konecta USA designed a solution that features Cel-Fi QUATRA, an active DAS hybrid that delivers uniform in-building cellular coverage for 3G/4G/5G voice and data. QUATRA specifically addresses the challenges of poor voice quality, dropped calls, and dead zones in large commercial facilities. Unlike analog boosters and older passive DAS systems, QUATRA delivers a cellular signal that is up to 1000x stronger, offering a much larger coverage footprint. QUATRA uses category cabling with Power over Ethernet, so there is no need to install additional power outlets for the internal remote antennas.

According to Mike Bozyk, co-owner of Konecta USA, one Cel-Fi QUATRA Network Unit (NU) – the head end of the system – was installed on the 10th floor IDF closet of the building. Konecta USA installed four directional antennas – one for each carrier – on the roof and ran coax cable from the rooftop down to the NU on 10th floor. The NU supports and enhances the outdoor signal, and digitally re-transmits the carrier signal with zero signal loss via CAT5 cabling to four QUATRA Coverage Units (CUs), the intelligent internal antennas of the system, including one CU that was installed on the ground parking level. Konecta USA then extended coverage by running coax from the CUs to passive antennas installed on the first and second floors.

"With garages, you don't have a high ceiling and your signal doesn't propagate as far, so you have to have more density when it comes to the number of passive antennas inside," explains Bozyk. He says his team used six passive antennas on the sub ground level. On the first floor, they used two passive antennas where the six charging stations are located; and on the second floor, they also used two for the additional EV charging stations planned by the client.

According to Bozyk, Cel-Fi COMPASS – a SMART RF spot scanning tool for outdoor and indoor that enables installers and integrators to better design, install, and optimize Cel-Fi equipment – was very useful in optimizing antenna positioning. "I used that tool to get our donor antenna oriented in the right direction. This is a very urban environment so there's a lot of noise up on the rooftop. The signal quality is not that great up there. That's one of the challenges that we run into in places like Minneapolis, making it hard to find a signal, but COMPASS really helped us with the antenna positioning. It's a really good tool."

THE RESULTS

Within one week, a team of two technicians from Konecta USA was able to run the cabling and install Cel-Fi QUATRA to provide cellular connectivity for the EV charging stations. The deployment also amplified cellular coverage in the parking structure for all major carriers, enabling general communications and for the safety of residents and retail customers.

"We're definitely starting to see more of the demand for cellular connectivity for EV parking stations," explains Bozyk. "Cel-Fi QUATRA enables us to effectively address this growing market opportunity by providing a solution that meets clients' needs today and tomorrow."

CEL-FI QUATRA

BEYOND BETTER COVERAGE

- **High-quality middleprise solution for 3G/4G/5G voice and data coverage**
- **Carrier approved and unconditionally network safe**
- **Can be monitored and managed remotely using Cel-Fi WAVE**

Waveform Enables Installation Partners to Deliver Cellular Connectivity for Electric Vehicle (EV) Charging Stations with Cel-Fi GO

SUMMARY

CHALLENGE

- Leading distributor of cell signal boosters was receiving growing requests from installation partners nationwide for a solution that could provide cellular connectivity for electric vehicle (EV) charging stations
- The solution had to be flexible enough to handle indoor and outdoor applications
- Partners must be able to install the solution quickly and easily

SOLUTION

- Cel-Fi GO

RESULTS

- Versatility to meet the needs of indoor and outdoor applications
- Quick and easy installation
- Future-proof solution

THE CHALLENGE

Since 2007, Waveform has helped more than 30,000 customers improve cellular signals in buildings, homes, and vehicles. Most recently, the company has been servicing more requests from partners looking for a proven solution to address the needs of the growing number of clients installing electric vehicle (EV) charging stations.

According to Marcus Carstens, business operations lead at Waveform, EV charging stations need reliable cellular connectivity. "When you plug in your car to charge it, you swipe a card, enter a code, and log into a system to book and sometimes pay for a charge. This is the way property managers and manufacturers of these EV charging systems monitor which stations are being used, how often, and how many units of power are being charged on the unit in a day or a week. That communication happens wirelessly through cellular frequencies," he explains. "In the early days, there was a lot of playing around with Wi-Fi, but cellular was found to be more reliable because it currently exists everywhere. It might not always be strong, but it does exist."

WAVEFORM

- Established in 2007
- Based in Irvine, CA
- Services include custom design of cell signal boosters for a wide variety of applications, including enterprise, small business/home office, and mobile
- Customers include major private and government corporations across the USA

CEL-FI CERTIFIED **RESELLER**

As cellular signal is weak in many outdoor parking lots and indoor parking structures where EV charging stations are installed, Carstens says, "They often need a reliable cellular signal booster that is powerful and flexible enough to overcome the unique challenges posed in both outdoor and indoor environments."

THE SOLUTION

When there is poor cellular signal around EV charging stations located in areas that are 15,000 to 30,000 sq. ft., whether at an outdoor parking lot or indoor parking structure, Waveform recommends the Cel-Fi GO Smart Signal Booster to deliver the cellular amplification needed. Cel-Fi GO is the first carrier-class cellular coverage solution to feature the industry-leading signal gain of up to 100 dB for 3G/4G/5G, can be placed indoors or outdoors, is guaranteed to be unconditionally network safe, and is NEMA 4 rated so it will withstand harsh conditions including dust and water exposure.

According to Carstens, there are different factors that influence how difficult it may be to bring cellular connectivity into outdoor or indoor parking facilities for EV charging stations. "If it's an underground garage, installation is usually pretty simple, because there'll be an electrical room or something of the sort nearby, so the Cel-Fi GO will be placed in that room. Then they'll just run cable to two antennas – one outside to the donor antenna to receive signal from the cell tower, and one inside to the server antenna near the EV chargers, usually on the ceiling of the underground garage – to feed the cell signals," says Carstens.

"A parking lot becomes trickier because it's all outdoors. That's where the Cel-Fi GO is really great, because it's waterproof. Partners often just mount the GO somewhere inconspicuous like behind a ground mounted AC unit," says Carstens. "We've also seen instances where GO was mounted to the same pole that the donor antenna was on. They had the donor antenna on the roof on a five-foot pole and they mounted GO to the same pole, which is convenient because you minimize the cable run to the donor antenna. You've got a longer run to the server antenna, but that's usually okay."

Antenna placement is a key consideration, according to Carstens. "Each server antenna can cover about 2,500 square feet and you can mount up to about seven antennas to the Cel-Fi GO. We've installed in parking facilities from 100,000 sq. ft. to just shy of 3,000 sq. ft. but the EV charging stations are in only a small part of them so very often just one or two antennas are needed," explains Carstens.

THE RESULTS

Carstens says it typically takes installation partners with booster experience two to four hours – including cabling – to install one Cel-Fi GO. The Cel-Fi WAVE platform is used to activate, optimize, and manage the booster. "The WAVE app makes it really simple, because you can do the antenna position test and that gets tuned in really nicely for you," explains Carstens.

He also thinks Cel-Fi GO offers installation partners an opportunity to deliver a future-proof solution to customers who plan to add more EV charging stations. "These stations aren't sending big amounts of data. It's really tiny bits of data trickling up and down. So realistically the GO could probably service 50 or so stations. You're going to hit limitations on how many fit into an area before you reach the maximum of how many the GO can actually support."

"For installation partners looking for a reliable, easy-to-install solution for connecting EV stations to cellular, Cel-Fi GO is such a robust and dependable kit," says Carstens. "Once partners connect their phone via Bluetooth to a booth, they can use the WAVE app to go into a "set it and forget it" mode. And once it's done, it's done. It's very, very seldom that it requires any kind of management after that. GO is a leader in our product portfolio."

What is Smart Cellular Coverage?

Award-winning Cel-Fi Products

Nextivity Inc., develops the award-winning Cel-Fi products that optimize cellular coverage in enterprise, business, residential, and transportation applications. Cel-Fi products are self-configuring, carrier-approved, and unconditionally network safe; leveraging the IntelliBoost chipset to deliver the industry's highest gain at the lowest cost per square foot. Cel-Fi is authorized by 200 carriers.

Best in Performance

Cel-Fi solutions are carrier-grade, and can perform at a level that is 1,000 times stronger.

Cel-Fi WAVE Portal

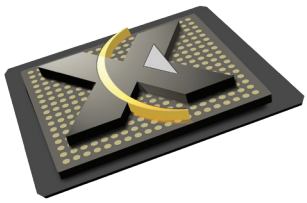
- Data modeling and reporting
- Cel-Fi device and asset management
- Mobile applications
- Globally trusted carrier-grade security
- Users can access the Cel-Fi WAVE portal through the dashboard interface.

Network Safe with No Noise Guaranty

Self-organizing edge intelligence ensures that Cel-Fi does not interfere with other indoor wireless products such as Wi-Fi routers, Small Cells, and Distributed Antenna Systems (DAS). High speed Automatic Gain Control ensures that Cel-Fi is unconditionally network safe, and enables more simultaneous calls and higher data speeds.

IntelliBoost® Chipset

The Nextivity IntelliBoost® baseband processor is the first six-core processor designed specifically to optimize the indoor transmission and reception of 3G, 4G, and 5G wireless signals. With advanced equalization and echo-cancellation techniques, Nextivity has developed an architecture which delivers unprecedented in-building data rates and pervasive voice and data connectivity. The IntelliBoost processor ensures that Cel-Fi products never negatively impact the macro network while providing maximum coverage.



Ease of Setup

Cel-Fi solutions are designed to be the easiest solutions in their class to set up. Leverage Cel-Fi tools to set up and install, and the core technology that does the math for you.

Solving coverage issues for voice, data, and public safety communications.

San Diego, CA based company, Nextivity builds and designs cellular coverage and public safetycommunication solutions. Cel-Fi products have been approved in 100 countries. In many countries, Cel-Fi products are the only legal solution approved by the communications regulatory commissions. Not interfering with the network, and only improving upon it is the key.

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