



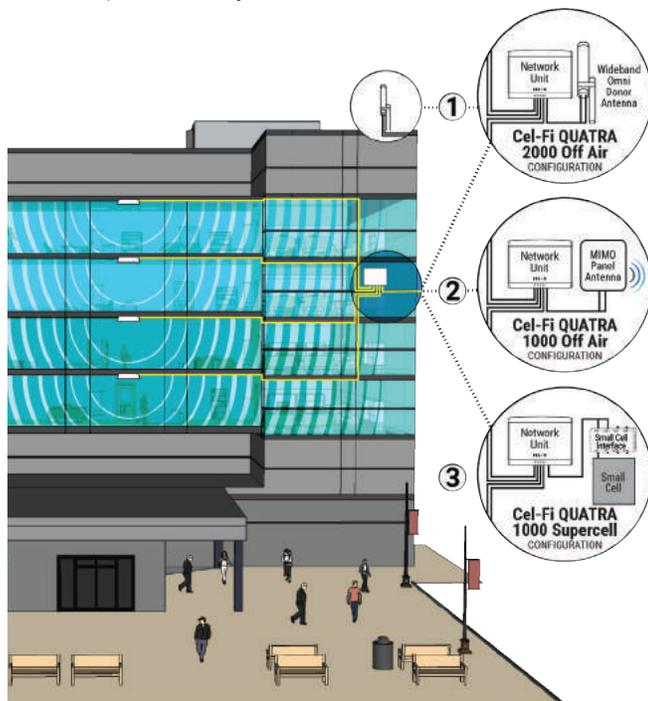
CEL-FI<sup>™</sup>  
**QUATRA**

In-Building  
Cellular  
Solution

# Atlantic Technology Group Solves Complex In-Building Cellular Coverage Challenges for Middleprise Clients with Cel-Fi QUATRA

Poor cellular service and dead zones in buildings are often caused by building materials, walls, and natural obstructions that block the cellular signal from carrier towers. When cellular service is not reliable, it is not only frustrating for employees, but also impacts productivity.

Following are case studies showing Rockville, Md.-based Atlantic Technology Group, a provider of mobility applications, devices, and lifecycle management services, has helped its valued clients overcome these coverage challenges and increase productivity with Cel-Fi QUATRA.



An active DAS Hybrid, Cel-Fi QUATRA is an all-digital solution that provides uniform, high-quality cellular signal throughout a building, and is scalable to the size needed. Unlike analog boosters and passive DAS technology, Cel-Fi QUATRA delivers a cellular signal that is up to 1000x stronger, utilizing CAT 5e cabling for RF and Power over Ethernet, with no signal attenuation right to the perimeter of the building. QUATRA can be installed in just days (compared to months typical of other solutions), and at a price point that meets the budget of the middleprise (those in spaces up to 500,000 sq. ft.).

Carrier approved and guaranteed network safe, Cel-Fi QUATRA was built with the integrator and installer in mind. Featuring proprietary, intelligent tools that provide integrators with greater flexibility and ease in optimizing the system design for any unique environment encountered, Cel-Fi QUATRA delivers the absolute best result for every customer.

For example, Atlantic Technology Group helped a major national daily newspaper increase the productivity of its reporters with Cel-Fi QUATRA. You'll learn how a multitude of factors blocking the newspaper's in-building cellular signal – including an extremely busy downtown location – was no match for the powerful duo of Atlantic Technology Group and Cel-Fi QUATRA.

And if you're looking to solve in-building cellular coverage challenges for clients with multiple locations, you'll also learn a thing or two from Atlantic Technology Group. The integrator helped a law enforcement agency put the cuffs on cellular signal issues inside 10 different facilities with Cel-Fi QUATRA. According to Dan Connelly, president at Atlantic Technology Group, leveraging Nextivity products helped his team go into all of the locations and get them all up and running within a few months, helping to ease the client's transition from one carrier to another.

Contact us today at [www.cel-fi.com/quatra](http://www.cel-fi.com/quatra) to learn how Cel-Fi QUATRA can help you get the best quality cellular signal for your middleprise customers.



# Cel-Fi QUATRA Helps Major Daily News Reporters Untether from Desks with Reliable Cellular Coverage

*A major daily newspaper relies on its corporate AT&T subscription to ensure staff are connected while working in its Washington D.C. newsroom. However, reporters and other employees on the AT&T network experienced spotty coverage and dropped calls when using their cellphones inside the eight-story building that spans a city block and houses the newspaper's 350,000 sq. ft. headquarters.*

## ABOUT THE PROBLEM

"Reporters were actually walking outside the building to take their cell calls, or were stuck near their desks waiting for important calls to come in, which hurt productivity," says Dan Connelly, President of Atlantic Technology Group. "They got a great signal outside, but the reception inside the building was really lousy."

A multitude of factors – mainly its location in the heart of Washington D.C. and its building materials (concrete and glass) – were blocking AT&T cellular signals inside the building. The passive DAS that was already in place in the office building did not improve the poor AT&T signal indoors.

## THE CHALLENGES: Media & Communications

- Major daily newspaper with a 350,000 ft<sup>2</sup>, eight-story office building
- Has existing passive DAS, but can't get AT&T cellular coverage inside
- Poor cellular signal inside the building hinders reporters' productivity and mobility
- Busy downtown location and building materials block AT&T cellular signal

## SOLUTION

To resolve the problem, Atlantic Technology Group proposed Cel-Fi.

"It's a revolutionary technology that's definitely shaking up the in-building cellular amplification game," says Keegan Harrington, project lead at Atlantic Technology Group.

## PROOF OF CONCEPT EXPANDS CELLULAR COVERAGE

Before implementing Cel-Fi QUATRA throughout all eight floors, Atlantic Technology Group met with the client and agreed to set up one floor as a proof of concept using one QUATRA Network Unit (NU), which is the head end of the system, and three remote internal antennas, known as Coverage Units (CU). Based on the initial results, the newspaper agreed to expand the installation to all eight floors.

Since the building is leased, Atlantic Technology Group also reviewed the site survey with the building owner and got their approval for antenna placement on top of the building. "The nice thing about the Nextivity solution is that the antennas are very non-obtrusive. They're relatively small in size, not these big satellite antennas. Building owners are typically pleased with the size," says Harrington.

## NOTHING WE COULDN'T WORK THROUGH

Washington D.C. is a very congested environment with a lot of interference from other cellular traffic. "In the heart of DC, no matter where you are, inside buildings the signal doesn't always give you a good signal to noise ratio," explains Harrington. "It was pretty bad on the roof, and we had to move the antennas many times to get the best signal."

Harrington explains how they used the installation tools provided with Cel-Fi QUATRA to determine the best positioning of the antennas. "We used the Cel-Fi MIMO antennas, with data and voice on separate ports, and moved the antennas many times to get the best signal. We used Nextivity's AntennaBoost solution to determine the best direction. Then we went into the individual NUs with Cel-Fi WAVE to see the signal to noise ratio and looked at the RSRQ and RSRP, RSSI and SINR to see the gain we were getting. In the end, we had to point the external roof antennas down to get out of the noise area."

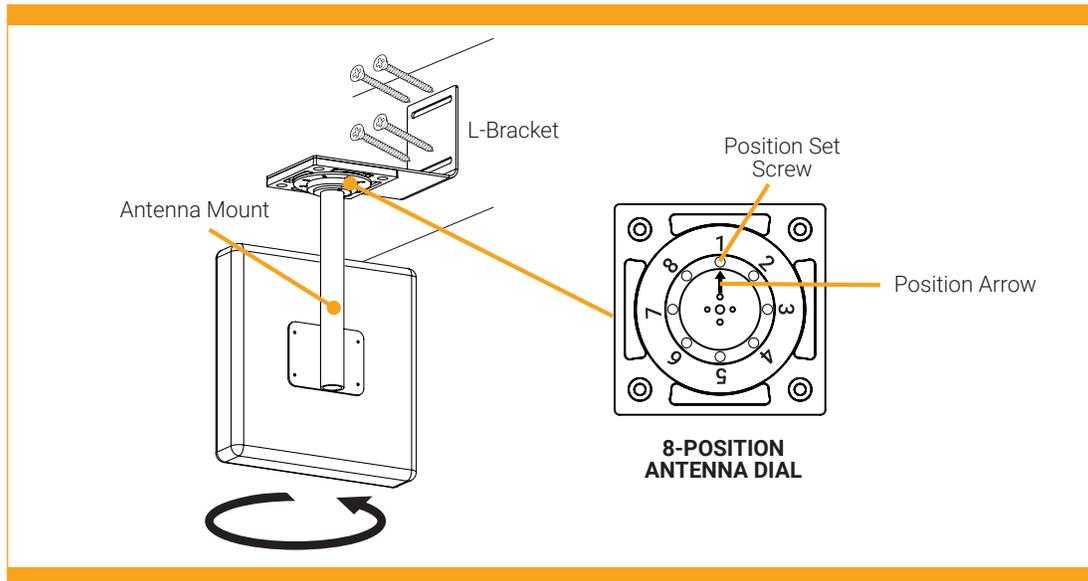


### Atlantic Technology Group

- Established in 2002
- Based in Rockville, MD
- Services include mobility applications, wireless devices and lifecycle management
- Customers include Healthcare, Fleet Management, Field Service, Business Continuity and Mobile Office

Hard ceilings in the building were another issue encountered by Atlantic Technology Group. This was resolved by putting the Cel-Fi QUATRA CUs in strategic locations, such as lights and access panels. Harrington explains that because QUATRA utilizes Power over Ethernet (PoE) and RF over Ethernet, there was a lot of flexibility on where the coverage units could be placed.

"With PoE it is easier because you don't have to find a source to light up your coverage unit. Not too many companies have power sources in the ceiling. You would either have to get an electrician out to put in power or put in power cables hanging from the ceiling, which wouldn't



*The 8-position dial base enables the antenna to be rotated in 45-degree increments, with real time performance data.*

work," says Harrington. "The client also really liked the way the coverage units look. They look like access points, so blend in well with their existing infrastructure."

Atlantic Technology Group was also able to use the newspaper's existing Cat 5 E and Cat 6 runs. "This saved the client money and saved us time. I like working with ethernet cable more than coax – it costs a lot less. It is also thinner, so it doesn't snag as much if I have to go through holes. It's also easier to run. The installation would have taken at least an extra week to run the cable if we didn't use the existing cable.

Almost one year after installation, Harrington reports that the client hasn't called with issues relating to cellular coverage. "I've found if you get the positioning and everything in the system right with Cel-Fi QUATRA, there are no problems thereafter unless an outdoor tower goes down, or multiple towers go down. Then all you have to adjust is the antenna," concludes Harrington.



CEL-FI  
**QUATRA**

**BEYOND  
BETTER  
COVERAGE**

- High-quality solution for the middleprise
- Supports multi-carrier 3G/4G/LTE voice and data
- Carrier-approved and unconditionally network safe
- Can be monitored and managed using Cel-Fi WAVE



# Cel-Fi QUATRA Helps Law Enforcement Agency Solve Cellular Signal Issues Inside Multiple Facilities



A law enforcement agency was having cellular coverage issues at many of its locations as it was transitioning from one service provider to another. The agency provided employees with cell phones, but they were unable to get a cellphone signal when inside its buildings. To resolve its cellular challenges for 10 sites (ranging in size from 30,000 to 240,000 square feet) from Seattle to Maryland, the agency turned to Atlantic Technology Group.

## ABOUT THE PROBLEM

"There were a multitude of factors at the different locations that were causing the poor indoor signal," says Harrington. "It could be RF blocking, building material, but it also could be the environment outside."

To solve coverage challenges for the agency, Atlantic Technology Group installed Cel-Fi QUATRA, an active DAS hybrid, at all 10 locations.

## GETTING ENOUGH BLEED TO PUSH THROUGH

One location outside of Washington, DC was 240,000 square feet and had experienced cellular service issues since it was built. The building had a fire control laboratory where tests and investigations were done. Equipment to improve coverage could not be installed inside the labs due to the type of testing that was done.

"There was terrible service in the laboratories, especially in the basement. There were cinder block walls about two feet thick and a lot of windows," says Harrington. "We weren't allowed to put things in the labs so we put CUs in the hallways and office space to bleed through signal into the labs. We were able to push through the windows and cinderblocks because Cel-Fi QUATRA has 100 dB gain, so this strong signal made the bleed-through possible. With a passive DAS, you get only 72 dB gain."

Atlantic Technology Group installed five network units (NU), the head ends of the system, and put 20 coverage units (CU) – which are the remote internal antennas – in the hallways and office space. They installed 5 MIMO antennas on the roof as they wanted one antenna per NU to facilitate specific management of each individual NU.

He adds, "When we were done, we did a walk-through with the head scientist and he was pretty happy with how it turned out."

## DIFFERENT LOCATION, SAME CELLULAR CHALLENGES

Another location in West Virginia was 175,000 square feet and was an older building with additions. Everything was mainly on one floor but it had a basement that was 35,000 square feet. The facility wanted to improve coverage for employees on the AT&T cellular network.

"They had cinder blocks everywhere. They had a phantom signal, where you have bars on your phone, but when you try to do something, you have no service. They just had no service at all inside," explains Harrington. "But other than that, the outside signal was good. There was not too much traffic up there. I liked the signal to noise ratio, which was up in the teens. They had a very strong signal that we could grab from outside into the network unit and then boost out onto the floor."

## THE CHALLENGES: Law Enforcement

- Law enforcement agency with multiple locations and research facilities ranging from 30,000 to 240,000 square feet
- Experienced coverage issues when transitioning from one service provider to another
- Cellular signal was blocked for different reasons at different locations



To achieve uniform cellular coverage inside the building, Atlantic Technology Group installed four network units configured for AT&T and 16 Cel-Fi coverage units with four Cel-Fi MIMO antennas on the roof.

## SOLUTION

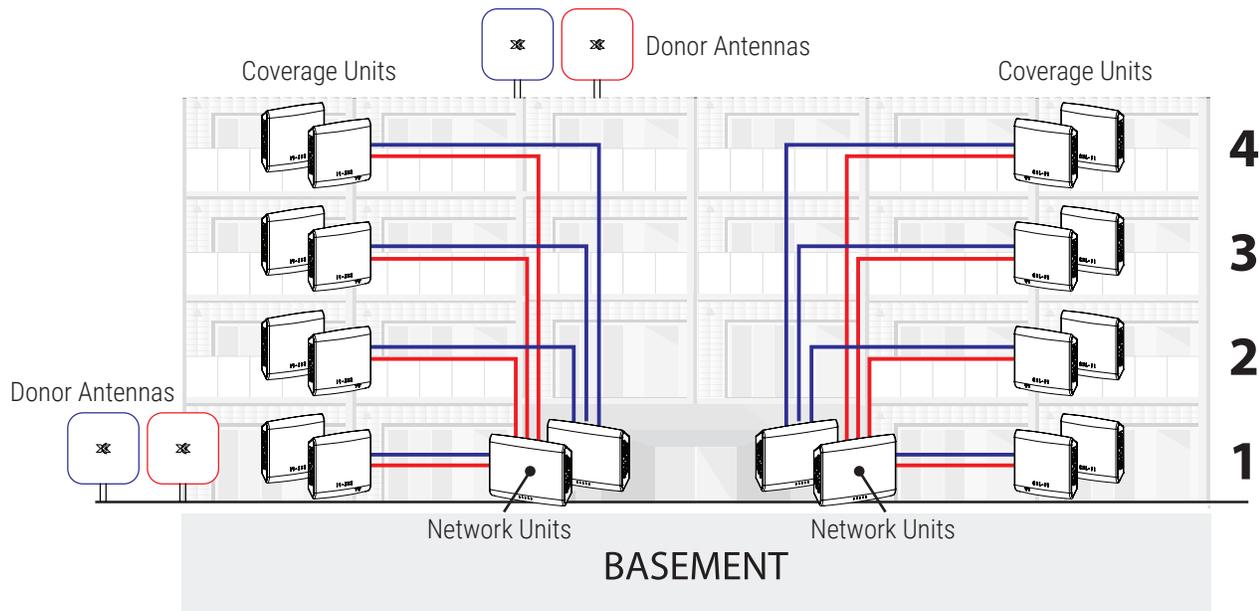
### CEL-FI QUATRA: THE COMMON DENOMINATOR

While each building was unique with its own issues, Cel-Fi QUATRA was consistently the solution recommended by Atlantic Technology Group in helping this agency overcome its cellular challenges while moving service providers.

“By leveraging Nextivity’s products, we were able to go into 10 different locations, including some pretty big facilities, and within a few months got all these sites done to rapidly assist the client during their transition from one carrier to the other carrier,” says Connolly.

## EXAMPLE OF AN EQUIPMENT LAYOUT

### CEL-FI QUATRA MULTI-CARRIER SOLUTION



CEL-FI  
**QUATRA**

BEYOND  
BETTER  
COVERAGE

- High-quality solution for the middleprise
- Supports multi-carrier 3G/4G/LTE voice and data
- Carrier-approved and unconditionally network safe
- Can be monitored and managed using Cel-Fi WAVE

# Specifications

**Power** 54 VDC @ 2.22 Amp via external supply (51.3 to 56.7 VDC tolerance)  
*(network unit)* External supply: 100 to 240 VAC, 47 – 63Hz  
 Power consumption less than 120W max  
 Network Unit provides power to Coverage Units over Cat5e (PoE)

**Environmental** Operating temperature: 0° to 40°C  
 Storage temperature: -25° to 60°C  
 Convection Cooling  
 Relative humidity: 0% to 95%, noncondensing  
 RoHS II 2011/65/EU  
 IP20

**Installation** Mounting hardware included  
 NU may be wall mounted (solid or hollow)  
 CU may be wall or ceiling mounted  
 1 NU supports 1 to 4 CUs  
 iBwave supported

**Radio Performance** Total boost all-channel bandwidth 75 MHz (2x2 MIMO uses double bandwidth per channel)  
*(check product version for specific band support)* DL Maximum NU in-band donor level -40dBm  
 DL Maximum NU survival donor level 30dBm  
 UL Maximum CU donor level -20dBm.  
 Maximum UL power 24dBm EIRP bands 1, 2, 3, 4, 7, 8  
 Maximum UL power 20dBm EIRP band 5, 12, 13, 20  
 Maximum DL power 12dBm per 5 MHz EIRP bands 1, 2, 3, 4, 7, 8  
 Maximum DL power 10dBm per 5 MHz EIRP bands 5, 12, 13, 20  
 LTE 5/10/15/20 MHz and WCDMA 3.84/5 MHz bandwidths

Physical Specifications	Network Unit	Coverage Unit
	264 x 185 x 62mm	225 x 185 x 37mm
	1.2 kg (40.8 oz.)	0.83 kg (29.2 oz.)

**Connections** 4x CU RJ45 Proprietary Gigabit link  
 100m max CU cable length Cat5e  
 200m max CU cable length with Cel-Fi QUATRA Range Extender (Cat5e or Cat6)  
 PoE IEEE 802.3at  
 RJ45 LAN management port (10/100 Fast Ethernet)  
 RJ45 LAN management output port (10/100 Fast Ethernet)  
 2x MIMO External RF Input (QMA Female 50 ohm)

**Compliance** 3GPP TS 25.143 Rel.10  
*(check individual product version for specific regional compliance)* 3GPP TS 36.143 Rel.10  
 CE  
 FCC Part 15, 20, 22, 24, 27  
 ISED Canada  
 UL 62368-1/CSA C27.2  
 Bluetooth BQB

**System Management** Cel-Fi WAVE cloud portal  
*(software)* Cel-Fi WAVE Remote Management:  
 • Status (list and map) • Settings  
 • Commissioning • Reporting  
 • Diagnostics • Alarms & Notifications  
 • Software Updates

Product Name	Model Number	Frequency (MHz)	Bands Supported	MIMO Support	Crossover Support
QUATRA 1000	Q34-2/4/5/12	1900 / 1700 / 850 / 700a	2, 4, 5, 12	4, 12	2, 5
QUATRA 1000	Q34-2/4/5/13	1900 / 1700 / 850 / 700c	2, 4, 5, 13	4, 13	2, 5
QUATRA 1000	Q34-1/3/8/20	2100 / 1800 / 900 / 800	1, 3, 8, 20	3, 20	1, 8
QUATRA 1000	Q34-1/3/7/8	2100 / 1800 / 2600 / 900	1, 3, 7, 8	3, 7	1, 8
QUATRA 1000	Q34-1/7/8/20	2100 / 2600 / 900 / 800	1, 7, 8, 20	7, 20	1, 8
QUATRA 1000	Q34-3/5/7/28	1800/850/2600/700 APT	3, 5, 7, 28	3, 28	5, 7
QUATRA 2000	Q34-4/5/12/13/25	1700/850/700a/700c/1900	4, 9, 12, 13, 25	n/a	n/a

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