



# The In-Building Ecosystem:

How Various Spectrum and Distribution Technologies Work to Bring Connectivity Indoors

## In-building Connectivity

*It's crucial because:*

- ✔ 80% of data traffic is generated indoors
- ✔ 60% of adults live in Wireless-only households
- ✔ 80% of 911 calls are made from cellphones

## Types of Communications Systems:

- ✔ **Wi-Fi** uses spectrum that can be used by anyone because it is unlicensed.
- ✔ **Cellular** uses spectrum that is licensed exclusively to individual wireless carriers
- ✔ **Public-safety** channels are licensed to first responders, including new FirstNet spectrum that uses LTE technology
  - ✔ **Private LTE** is a lightly licensed communications system using newly released CBRS spectrum that can be used by a wider variety of users similar to Wi-Fi

## Wireless Communications Systems use:

- ✔ Wireless Spectrum and Fiber
- ✔ Communications infrastructure designed to work at various frequencies
- ✔ Distribution technologies to carry those frequencies throughout the communications network

## Distribution Systems Used To Get In-building Connectivity

Macro Towers, Rooftop Antennas, Distributed Antenna Systems, Small Cells, Wi-Fi, Bluetooth, Zigbee

These wireless elements are connected by Fiber, Category Cable and COAX

*Most networks use a combination of all these distribution methods to bring connectivity to the end user, whether people or Internet of Things.*



# HetNetForum

The HetNet Forum, part of the Wireless Infrastructure Association, advocates for enabling mobile broadband. For more information, go to [www.hetnetforum.com](http://www.hetnetforum.com).

## CBRS – A New Opportunity

✔ Licensing in the CBRS band is neither exclusive nor completely open unlicensed spectrum.

### Two Types of Licenses

- **PAL** – issued to companies that win at auction, available at the county level with 10-year renewable license
- **GAA** – Open to Everyone to use free of charge on an opportunistic basis

*The hallmark principle of the CBRS band is that usage rights are available on an opportunistic basis – spectrum in the band is generally available for commercial use on a use-it-or-lose-it basis.*

## Many distribution technologies are designed to accompany a variety of frequencies:

- ✔ A DAS network can be designed to distribute traditional cellular and Wi-Fi networks as well as new CBRS spectrum.
- ✔ Small cells usually accommodate several technologies but are typically designed for one operator.
- ✔ Public-safety networks are designed exclusively for first responders.
- ✔ Cellular networks can include CBRS spectrum as well as new 5G, C-band and millimeter-wave technologies coming to market.

## The Connection Between Private LTE and CBRS

Private LTE is a communications system using newly released CBRS spectrum that can be used by a wider variety of users like Wi-Fi but with these added benefits:

- ✔ True Mobility
- ✔ Strong Security
- ✔ Higher Quality of Service

### Potential Users

- ✔ Municipalities
- ✔ Educators
- ✔ Utilities
- ✔ Hospitality industry
- ✔ Enterprises
- ✔ Manufacturing facilities
- ✔ Warehouses
- ✔ Transportation hubs
- ✔ Smart cities
- ✔ Mobile Network Operators (MNOs)
- ✔ Cable Operators (MSOs)
- ✔ Wireless Internet Service Providers (WISPs)
- ✔ Third-party Neutral Host infrastructure providers
- ✔ System integrators

### Opportunities for the building owner/enterprise user

- ✔ Density indoor network
- ✔ Point-of-Sale terminals
- ✔ Dispatch communications staff
- ✔ Security
- ✔ IoT communications
- ✔ Back-of-house operations
- ✔ Temperature checks
- ✔ Environmental systems monitoring
- ✔ Augmented Reality
- ✔ Industrial/Mission-critical applications
- ✔ Fixed Wireless
- ✔ 5G Services

For more information, see this [report](#)