COMMSCOPE®

Metro Cell: Best Practices

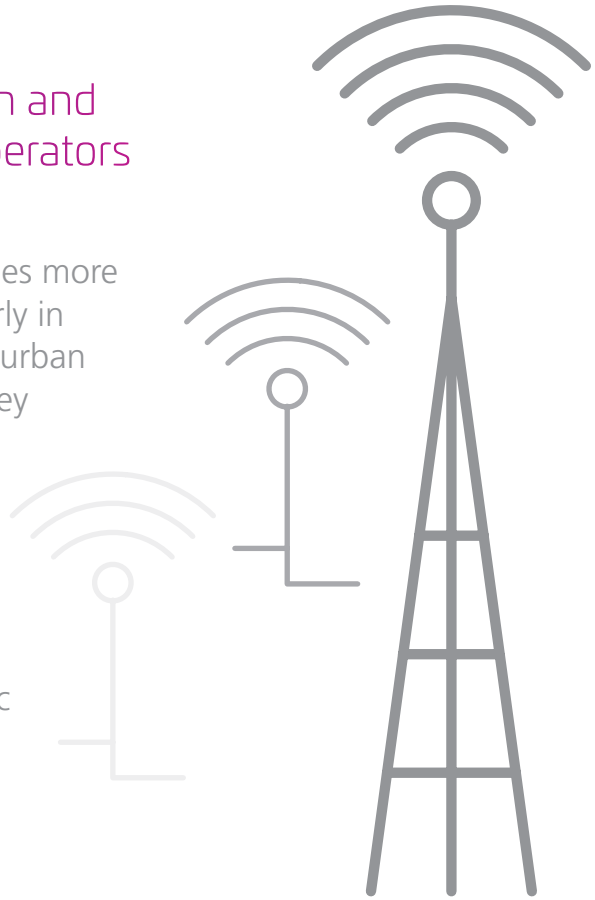
For a Successful Densification Strategy

Densification: a big part of your capacity strategy

Densification is the best known and most effective approach for operators striving to increase capacity.

As demand rises and spectrum becomes more expensive and hard to find—particularly in high-demand and low-site availability urban areas—densification strategies are a key element in network expansion.

Smaller outdoor cell sites, such as metro cells and mini macros, are built to fill this strategic urban gap—and if you apply these best practices, densification through offloading traffic to these smaller sites can play a big part in your overall capacity strategy.



Fast Facts

- Small, low-power radio access nodes covering discrete areas
- Flexible, fast-to-deploy alternative to adding macro network architecture
- "Small cell" encompasses multiple technologies
- Small cell architecture is inherently more susceptible to cell overlap interference
- LTE requires more precise cell design to limit overlap than older technologies do

There are good locations, but few *perfect locations.*

In urban settings, no two sites are the same and each comes with specific advantages and disadvantages. When your site could be anywhere from a rooftop to a utility pole to street furniture, you have to adjust to make the most of each site's potential because of the lower power and shorter reach typical of metro cell deployments.

Use of metro cell antennas with urban-specific azimuth patterns and higher gain can ensure the site can offload as much macro network traffic as possible while providing additional leeway with regard to location.

Q&A

Question 1: How much data can you expect to offload by using strategically placed outdoor small cells?

1) 30%
2) 40%
3) 50% or more

Answer: Placing just four small cells with a single macro area can result in more than 50% data offloading—improving macro performance by 315 percent.*

*Small Cell Forum, Elevator Pitch

#2 Best Practice: **Avoid zoning hassles**

Customers want to see *more bars, not more sites.*

This expectation is usually reflected in zoning ordinances and home owner association rules that govern where and how you can deploy.

Smaller, less visible cell sites can better blend into their environment while delivering added capacity. In many situations, regulations stipulate a given volume per radio, antenna, or site.

When considering the equipment footprint of the site, it's also smart to leave a margin for later expansion—after all, technologies change and new carriers must be added. Leaving space now will help you avoid another round of architectural and engineering effort and permit applications later on.

Q&A

Question 1: What percentage of homeowners feel that a new cell tower will negatively impact their property values?

1) 10%
2) 50%
3) More than 90%

Answer: A 2014 survey entitled Neighborhood Cell Towers and Antennas—Do they Impact a Property's Desirability shows that 94% of homeowners felt nearby cell towers would reduce home values and make it harder to sell their homes.

Question 2: Do homes within view of a cell site experience reduced selling prices compared to prevailing market values or tax appraisals?

1) Yes
2) No
3) Maybe

Answer: Yes. According to the same report, homes sell for 21% less than market value when a cell tower is within sight. Sadly, this is often not reflected in the tax appraisals of those homes.

#3 Best Practice: **Know the performance tradeoffs**

Frequency vs. capability

Where and how you deploy depends in large part on the size of your antennas, and the size of your antennas depends in large part on the frequencies you will be using there. For example, a 700 MHz metro cell antenna is about twice the size of a comparable 2100 MHz metro cell antenna. Low band antennas measuring 2.5 feet long or less might be easier to get approved, but their short stature will limit their electrical downtilt capability, a key enabler for controlling interference.

Whenever antenna length must be restricted, consider exclusive use of the upper bands (e.g. 1900 MHz, 2100 MHz). This provides for the best mix of size and performance in dense urban areas where good macro coverage likely exists already.

Q&A

Question 1: How much released CO2 can be avoided by using remote electrical downtilt systems across 200 sites, greatly reducing site visits?

1) 5 tons
2) 10 tons
3) 50 tons

Answer: 50 tons is the approximate amount of CO2 released into the environment annually due to driving to sites to perform manual optimization—fuel that need not be used at all with remote electrical downtilt systems.*

Question 2: Where are the cost efficiencies seen when using remote electrical downtilt systems?

1) Time savings
2) Cost savings
3) Both of the above

Answer: Both of the above. Frequent site visits to make optimizing adjustments are time consuming, weather-dependent, and costly.

*Calculations based on a U.S. Fuel Economy article, How can 6 pounds of gasoline create 19 pounds of carbon dioxide? In this example, the calculation is applied to a typical scenario involving three trucks, travelling 25 miles to visit each of 200 sites, five times per year to perform manual adjustments.

Offloading macro network traffic won't help without an *effective backhaul solution.*

Your backhaul solution will be determined by the amount of traffic you're moving and what is logistically and economically viable.

While dark fiber offers the greatest capacity, it's not always available or cost-effective. Line-of-sight (LoS) microwave backhaul offers a flexible alternative, using conventional bands or new millimeter wave solutions in the 60-80 GHz bands. This can yield capacity on par with metro Ethernet services, for as long as required.

Moreover, ETSI Class 4-compliant backhaul antennas are small, lightweight, energy-efficient and scalable. They can often hit the sweet spot of appearance, cost, time-to-market and performance.

Q&A

Question 1: Why choose microwave over fiber for backhaul?

1) Cost savings
2) Time-to-Market
3) All of the above

Answer: All of the above. Microwave backhaul is the fast, economical choice where there is no fiber access, or prohibitively high fiber leasing costs. Based on data provided in the iGR report U.S. LTE Metrocell Lifetime Costs: A Five Year Estimate, wireless backhaul can provide nearly 64% savings over fiber on new pole deployments over a five-year period.

Question 2: What happens when antenna performance is not considered during network planning for wireless backhaul?

1) Spectrum efficiency goes down
2) Reliability and QoS goes down
3) Customer churn goes up
4) All of the above

Answer: All of the above. It is critical that antennas meet specified radiation characteristics to ensure peak network quality, minimal maintenance costs and optimal revenue.

#5 Best Practice**: Conceal more functionality in each site**

Location *Sharing*

Where zoning rules often limit the number of antennas or cabinets any single site can have, equipment and site sharing can provide some relief and streamline the permitting process. These measures may include a single antenna supporting multiple bands or a single cabinet supporting multiple technologies or operators. However, the best solution may be concealment that can hide multiple radios, cables and even antennas.

Concealment by its nature is driven by its environment and the availability of suitable mounting locations. Building in an extra margin of expansion space for future technologies and carrier additions can help you avoid site aesthetic redesigns or re-permitting in the future.

Q&A

Question 1: Which re-permitting obstacles deter operators from upgrading sites?

1) Forced to meet costly additional requirements
2) Obtaining a permit can take almost as much time to get as a zoning approval on a new site
3) Both of the above

Answer: Both of the above. A panel discussion with Above Ground Level (AGL) magazine* revealed that re-permitting often triggered additional zoning compliance, a costly and time-consuming burden.

*AGL Conference – Dallas 2014, Challenges in Small Cell and Macro Cell Zoning, Getting to Yes

Much more than with earlier technologies, *managing interference is critical* to LTE networks.

Sector overlap degrades performance and reduces network capacity. One way to keep sharp, well-defined sectors and minimize overlap is to choose antennas with electrical downtilt capabilities and upper sidelobe suppression—both solutions that are widely used in macro sites to keep interference down.

For metro cell deployments in high-demand areas, the electrical downtilt should be continuously variable from zero degrees at the horizon to -20 degrees, while upper sidelobe suppression should be at least -15 dB up to 45 degrees above the horizon at zero degrees tilt. When using canister antennas, it is beneficial if each sector or panel is independently adjustable to compensate for variations in terrain elevation.

Q&A

Question 1: What is the potential increase in data throughput in the uplink when PIM interference is well-controlled?

1) 2X
2) 5X
3) 13X or more

Answer: Data throughput increased by a factor of 13 in the uplink for when PIM-reducing optimizations were made during a field trial at a dental hospital in Suzhou, China.

Question 2: How much coverage does 1 dB of PIM interference cost your network?

1) 2%
2) 5%
3) 11%

Answer: Up to 11 percent coverage loss is typical when as little as 1 dB of PIM interference is present in the system*, making it one of the biggest hidden costs in LTE networks today.

**The Importance of Addressing Passive Intermodulation (PIM) in the Field;* Talley Sheet 4Q2011

Making sense of densification

Densification is the key to increased capacity, but it's not a single solution—it's a lot of different technologies and practices that apply in different measures across different kinds of sites. A successful densification strategy requires a critical eye and careful approach—such as knowing how to get the most capacity from a street-level site or one on a rooftop.

It's about thinking ahead, building in room to grow as technologies inevitably change. It's about finding the right backhaul solution to move your fast-growing traffic reliably and cost-effectively. And it's about taking a page from macro site architecture to give a metro cell sharper, more LTE-friendly sectors.

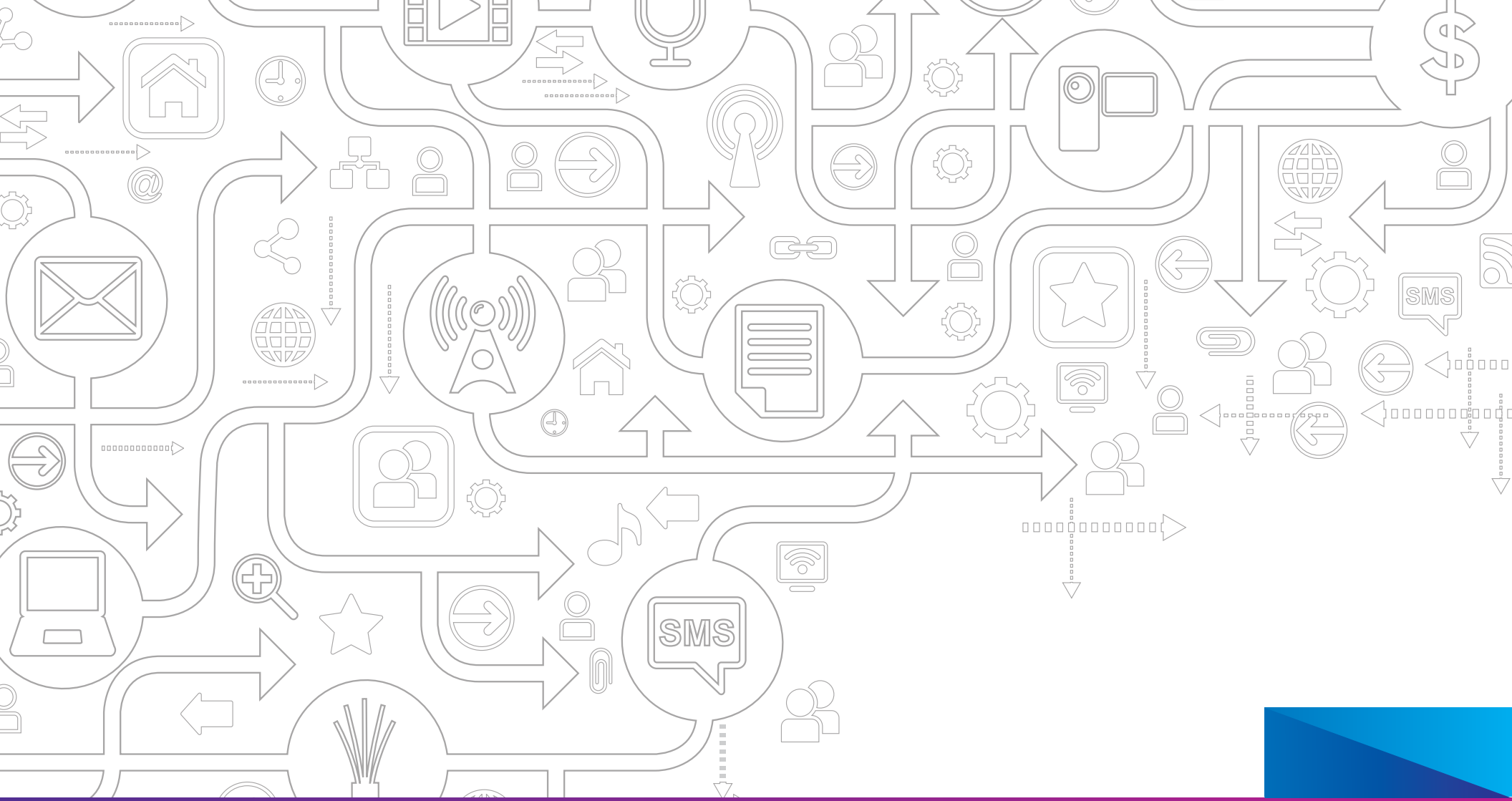
Know the *terrain*.
Know the *obstacles*.
But most of all,
know your options.

Additional Resources

eBook

LTE Best Practices: Insights to navigate the technology maze

Learn more



COMMSCOPE®

commscope.com

Visit our website or contact your local CommScope representative for more information.

CU-109320.2-EN (11/17)