

A close-up photograph of a speedometer. The needle is pointing towards the '5G' mark on the scale. The scale also shows '4G'. A silver badge with the word 'SPEED' is visible in the foreground. The background is dark and textured.

CORNING

Preparing for 5G

Practical Considerations for Community Broadband Providers

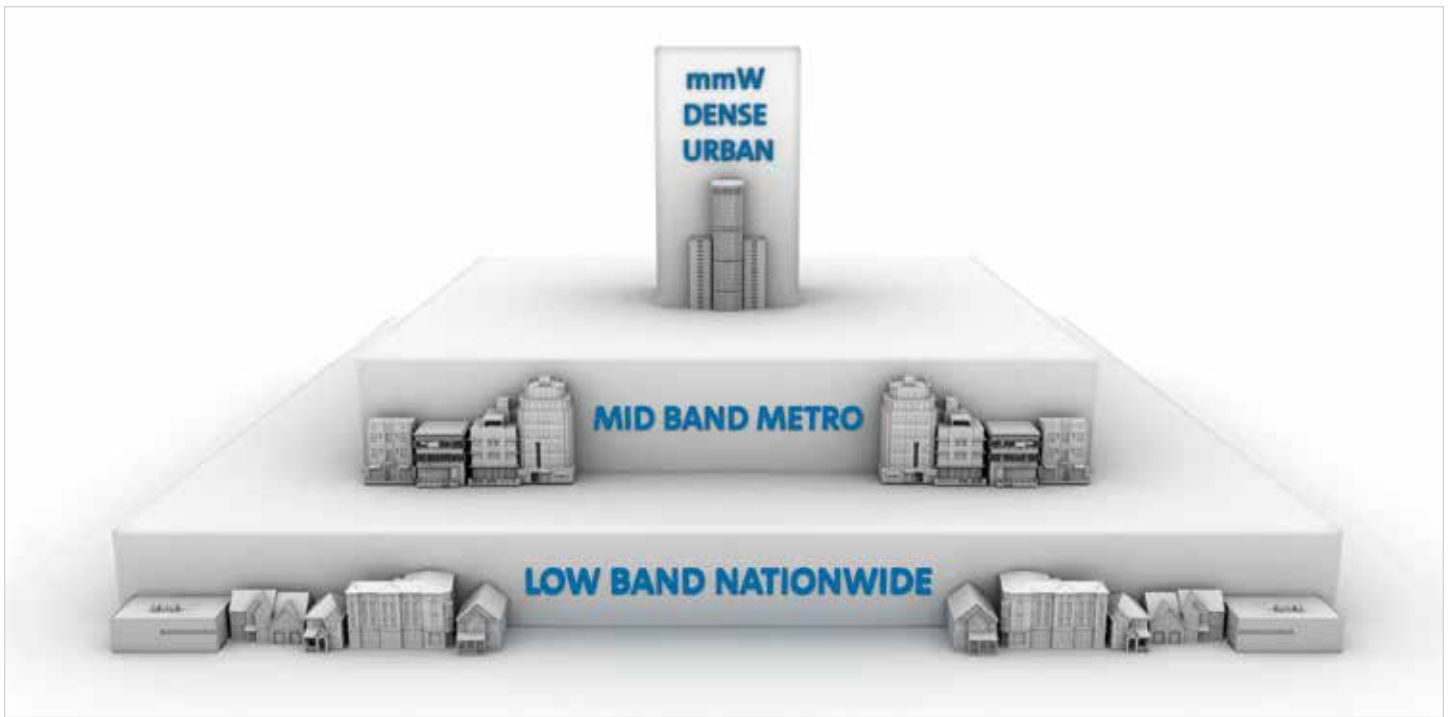
The road to 5G is already well underway. All three national wireless carriers have outlined their 5G strategies and are busy building 5G-capable networks across the country. A potential fourth national wireless carrier, Dish Wireless, is also joining the 5G movement with plans to build a 5G network from scratch.

The 5G playbook for these national carriers includes building out large Tier 1 dense urban markets, moving into the suburbs, and ultimately reaching smaller Tier 2 and 3 markets – including more rural territory. There are mandates for expanding 5G coverage beyond Tier 1 markets as well. To gain FCC approval of its acquisition of Sprint, T-Mobile has agreed to cover 90% of rural Americans with 5G.¹ Smaller communications service providers (CSPs) serve Tier 2, 3, and rural markets, so it's critical to prepare your network for the 5G opportunity on the horizon.

Large national wireless carriers are taking three distinct approaches with 5G, largely based on spectrum holdings. Where pockets of high population density are present, these carriers are deploying 5G infrastructure that leverages high-band millimeter wave (mmWave) spectrum. This spectrum offers very high bandwidth capabilities, but over very short distances. It requires the use of small cells every 1,000 feet or so to provide adequate coverage.

As you move into the suburbs and smaller markets, including rural areas, carriers are relying on low-band spectrum, which affords greater coverage and range, but lower bandwidth capabilities. Wireless carriers with access to mid-band spectrum may have the best of both worlds – high bandwidth capability with good range.

¹FCC Approves Merger of T-Mobile and Sprint



Regardless of 5G approach, one underlying factor is true for all carriers. Increased fiber connectivity will be needed, and lots of it. In anticipation of 5G coming to smaller markets, and with the carrier business opportunity that the move creates, smaller CSPs should plan network capacity accordingly. Larger national, and even regional, wireless carriers won't have fiber assets in all of these markets and will be looking for fiber connectivity partners to fulfill their 5G build out goals.

Proactive Build Strategy

To best prepare for this 5G opportunity, CSPs should take a proactive build approach. As CSPs upgrade their networks by implementing fiber-deep strategies, or as greenfield fiber-to-the-premises (FTTP) networks are constructed, carriers should think about how and where the network can enable 5G service. For example, each potential wireless carrier partner may require multiple fiber cables at each access node to enable 5G. In some cases, it could be as high as 6 to 8 fibers per wireless carrier at each node for transmit and receive capability for 5G radios.

That fiber capacity requirement can add up quickly with multiple 5G wireless carriers needing capacity. Fortunately, new cabling and electronics technology can better address the requirement for higher density. CSPs are deploying excess

fiber capacity during their builds in anticipation of future 5G-driven demand. For example, a 144-count fiber cable can now be the size of a large pencil and may weigh much less than previous options. The use of dense wavelength division multiplexing (DWDM) technology can also help lessen the physical cable requirement. With DWDM, the need for 6 to 8 fibers may be reduced to 1 or 2 fibers.

Here are some practical network planning considerations to think through as you prepare for 5G:

- **Determine Need** – Map out your geographic area and identify where pockets of density exist or may exist in the future and plot those areas against existing network infrastructure, including the capabilities of centralized radio access networks (CRANs) and the macro-cells fed by them.
- **Infrastructure Planning** – Identify where there may be “holes” in coverage for these pockets of density due to lack of network infrastructure or wireless reach. Keep in mind that 5G will require more capacity than previous wireless generations, so there may be inadequate capacity even where existing infrastructure exists. Plan your network build to address “holes” in the coverage or capacity so that when wireless carriers come calling, you have the infrastructure already there.

- **Build Proactively** – The need for fiber connectivity to backhaul 5G may not be present yet, but it's prudent to build the infrastructure proactively for potential future requirements. It may be difficult to precisely determine where fiber capacity is needed, so plan on at least having a junction point or feeder distribution point in close proximity, ideally about a half-mile away or less. Where wireless infrastructure already exists, ensure you're proactively adding capacity for 5G in those locations as well.
- **Fiber Access** – Where possible, using a single cable with added fiber capacity enables wireless carriers to quickly leverage the proactively built fiber capacity. It may not be feasible to have the actual fiber assets available, but provisioning spare duct pathways or having the rights-of-way completed allows for quick deployment of fiber assets.
- **Your Sidewalk Network** – In areas where 5G small cells are needed, CSPs may not have existing ductwork and may require trenching to deliver fiber connectivity. Traditional open trenching can go as deep as 4 feet and cost anywhere from \$100 to \$500 per foot. An alternative to consider is micro-trenching, particularly in dense urban areas where right-of-way access is limited. Micro-trenching only goes 12 to 18 inches deep and can cost anywhere between \$15 to \$40 per foot. As with all things, there are tradeoffs and you'll need to evaluate your specific deployment.

The goal is to seize the wholesale capacity opportunity that 5G presents. When wireless carriers come calling, you want to be first and you want to be ready. Always remember, the most expensive cost of any job is labor. Proper planning for fiber capacity – including adequate fiber access points and paths for future fiber distribution – will help you eliminate multiple jobs that incur additional labor costs.

Don't Forget About Power

Power has always been an important consideration for wireless infrastructure. Adding 5G to the equation exacerbates the power requirement, given the increase in nodes that 5G creates. Even utility companies that are now building and operating broadband networks would find it challenging to connect the power grid to all the locations required to power a 5G network. For CSPs, meeting this requirement could be a nightmare. It's not uncommon to take a year or more to complete the permitting process and to meet other requirements to bring power to these nodes.

Fortunately, there is a better way – composite cables. The relatively new approaches combine both optical and power components in a single cable using higher power transmission platforms. CSPs can leverage composite cables to bring power to network nodes, eliminating the need for tapping power at every single node. This approach can save considerable time and reduce construction costs. With composite cable, CSPs can power between 7 to 15 small cells from a single power tap. There's currently an effort to standardize this approach with the goal of ensuring safety compliance.²

Preparation Has Its Benefits

As 5G expands beyond Tier 1 cities into smaller markets, CSPs have a tremendous opportunity to increase the monetization of their fiber networks. Fiber powers 5G, which simply cannot exist without it. The technology may not be there now, but with proper network planning and preparation, CSPs can lay the foundation for 5G's arrival. That foundation includes a deep fiber network that's prepped to turn up 5G quickly and efficiently.

By preparing for 5G, you can not only take advantage of the business opportunity, but you can also ensure that the communities you serve benefit from the advantages that come with this next-generation technology. It will better position communities for economic growth and prosperity – transforming much more than the wireless network.

²ATIS Advances 5G Power Standards



CORNING

Corning Optical Communications LLC • 4200 Corning Place • Charlotte, NC 28216 USA
800-743-2675 • FAX: 828-325-5060 • International: +1-828-901-5000 • www.corning.com/opcomm

Corning Optical Communications reserves the right to improve, enhance, and modify the features and specifications of Corning Optical Communications products without prior notification. A complete listing of the trademarks of Corning Optical Communications is available at www.corning.com/opcomm/trademarks. All other trademarks are the properties of their respective owners. Corning Optical Communications is ISO 9001 certified. © 2020 Corning Optical Communications. All rights reserved. CRR-1436-AEN / August 2020