

5G: A Welcome Evolution

Wireless advances will make fiber networks easier to build and finance.

By Steven S. Ross / *Broadband Communities*

A shiny new object is on the horizon: 5G. Wireless technologies, particularly 5G, will soon be vitally important in broadband deployments.

I applaud the rebranding of Fiber to the Home Council Americas as the Fiber Broadband Association, which recognizes the importance of 5G. The proper endpoint of fiber is not always on the customer's wall, even though 99 percent or more of the distance a cell call travels is still on fiber.

But beware! Wireless is not the magic solution – especially in rural areas – that many policymakers believe it could become. In this issue, Larry Thompson and Warren Vande Stadt of Vantage Point Solutions, a South Dakota-based engineering firm, explain why: Networks still need backhaul – fiber to feed wireless access points. Today, most cellular traffic flies between smart phones and cell towers. In the United States, there are about 220,000 towers, many holding multiple cell sites. There are also more than 300,000 macro cell sites, typically on rooftops. Another 100,000 are expected in the next 18 months.

Thirty years ago, there were about 1,000 cell sites, all towers. Thirty years from now, there will probably be more than 20 million small-cell sites, each serving a few acres at most. Cell site ownership is fragmented, and will probably become more so – increasing the potential investor base.

Each cell tower can theoretically serve more than 1,000 square miles; in theory, 3,000 could cover the continental United States. Building a tower costs \$150,000 to \$400,000; rent or amortization, electronics, power and maintenance would total less than \$100,000 a year, the annual cell bill for no more than a few hundred families. Rural communications is also subsidized through the Universal Service Fund.

So why isn't cell service universal and dirt cheap? Cities have a lot of cell traffic and need many towers to handle it all. In rural areas, backhaul costs are hard to justify. Backhaul (ideally, fiber) links towers to the nation's telecom grid. Backhaul is costly to build and maintain.

THEY ALL NEED BACKHAUL

Throughout 2016, I worked with consultants and engineers (not at Vantage Point) to test **BROADBAND COMMUNITIES'** new multidistrict, multitechnology planning model (discussed in depth in the January-February issue and available online at FTTHanalyzer.com), seeing detail evolve for six districts in four proposed networks, with rougher calculations for another two builds.

We saw that distributed antennas, especially microcells, can save money but not much. The projects we helped model through dozens of iterations were 0 to 15 percent cheaper than FTTH. Time to first cash flow was typically less than for fiber. Initial capital expenses were as much as 10 to 25 percent lower, offset by fill-in costs later. There was no saving in rural areas because of the backhaul issue and the fact that one micro site might serve only a few families.

There are many uncertainties: Equipment expenses will fall, capabilities will improve. Labor costs are highly variable, but some wireless installation tasks require a lower skill level than installing fiber drops.

The 5G standard is still in flux. Consumers will need new portable devices to take significant advantage of 5G.

Without exception, the experts placed their technology bets in multiple ways in the same deployment – strategies changed as they moved from town centers to low-density road networks (more FTTH and mm-wave P2P wireless to homes along the roads and fiber all the way to some businesses in town centers). Both proposed hybrid fiber-coax/DOCSIS deployments we studied ultimately replaced coax with Ethernet PON to microcells at the curbside (in an old development with 2- to 4-unit MDUs spread over a wide area) or to the basement (in a 40-unit MDU).

Point-to-point wireless, not cellular, was a cost-effective, quick solution for smallish districts in which fiber would be expensive or time-consuming to deploy immediately.

Although 5G will use many bands – from 700 MHz to above 30 GHz – and different bands have different transmission properties, modern, energy-efficient building materials are often barriers. Roadside microcell placement turns out to be important for autonomous vehicles, each of which could generate and exchange data at 1 Gbps.

One strategy for internet-of-things security is to have coffeebots, cameras and thermostats send data out into the network without signing on to users' private home networks. The data goes to the wireless management system (probably in the cloud rather than in the basement), gets hashed and is sent back to the customer's network for secure retransmission – vastly increasing IoT bandwidth needs.

We welcome these wonderful new tools for network builders! ❖

Contact the Hawk at steve@bbcmag.com. The Hawk is a national finalist in the American Society of Business Publication Editors competition for 2016.