A Middle-Mile Model for Rural Operators

The need for higher-capacity middle-mile networks will become more pressing to connect islands of rural last-mile networks.

By Sachin Gupta / *Centranet*

Middle-mile networks (MMNs) connect two or more networks. Unlike last-mile networks, which directly relate to subscribers, MMNs are the fiber superhighways that provide transport to the greater internet, among other things. The 10 Gbps connection an ISP may boast about is practically worthless without an MMN link.

MMNs are indeed the unsung heroes of the telecommunications world, connecting islands of last-mile networks. Federal and state governments have created several programs that fund last-mile connections while largely ignoring MMNs.

This is most evident in National Telecommunications and Information Administration (NTIA) programs, including the Broadband Equity, Access, and Deployment (BEAD) Program, which allocates $42 billion to the last mile. The NTIA's Middle Mile Program allocates a paltry $1 billion to the middle mile. As new last-mile networks are built, the need for higher capacity in middle-mile networks will become acute.

RURAL MIDDLE-MILE PROBLEM

Rural operators generally serve between 2,000 and 50,000 subscribers. Middle-mile access for rural operators is commonly leased at a steep price from incumbent MMN operators and typically forms the primary operating expense. Further, the guaranteed level of service for rural operators is at a lower tier, mandating redundant connections and increasing the cost. The alternative of building their MMN is a capital-intensive task and, in most circumstances, out of reach for small, rural operators.

As new rural last-mile networks come online at an accelerated rate owing to the amount of government funding available, the demand for capacity on existing MMNs will steadily raise costs for all rural operators. They are uniquely positioned to build new networks and close the U.S. digital divide, but they will likely need to find a way to absorb the increased transport costs.

RURAL MIDDLE-MILE SOLUTION

The traditional model to establish an MMN is for a single entity to lay down several hundred or a thousand miles of fiber across large swaths of land, working with cities, counties and private land owners to secure rights of way and permits. This large, expensive undertaking is beyond the reach of small, rural operators.

With the drastic expansion of last-mile networks, it is common to see adjacent previous-mile networks operated by different operators within spitting distance of each other (see Figure 1). Most of these networks are designed with excess fiber in the ground. This enables a unique model in which several last-mile networks can connect with each other with minimal investment to create a decentralized middle-mile network owned by several entities. Following this model, the

MIDDLE-MILE NETWORKS GAIN STEAM

The middle mile is not a new concept, and a few MMNs already operate today under similar models:

- Diamond States Network: A coalition of 13 member-owned electric cooperatives with more than 50,000 miles of fiber covers 64 percent of Arkansas. (www.diamondstatenetworks.com)
- Accord Network: A coalition of 21 electric and telephone cooperatives with more than 20,000 miles of fiber covers 75 percent of Indiana. (www.accordtelcom.com)
- Hoosiers Network: A consortium of 17 ISPs provides services across Indiana.

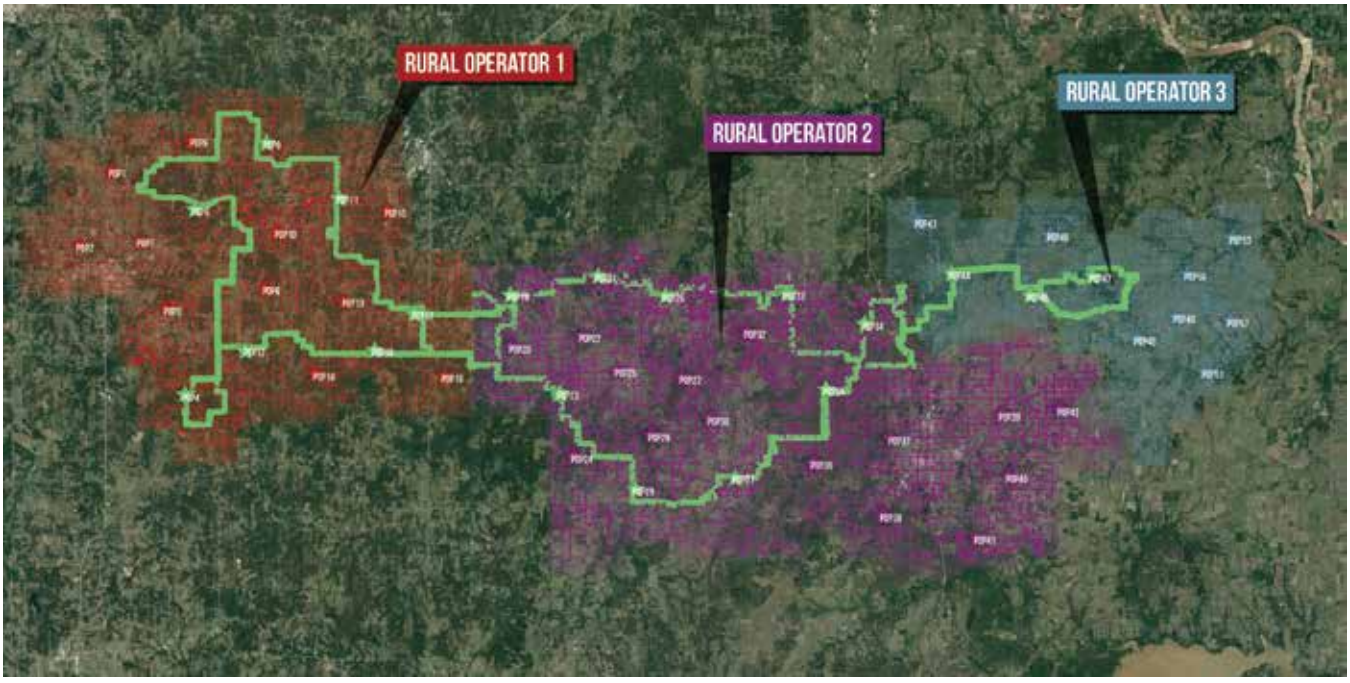

Figure 1. With the drastic expansion of last-mile networks, it's common to see adjacent previous-mile networks operated by different operators within spitting distance of each other.

cost of building an MMN is less than 40 percent of the conventional mode, especially because rights of way are already established and accounted for. This model, given its decentralized nature, has more redundancy built in. Such a model, however, requires developing a coalition and a high degree of collaboration among the coalition's members. In essence, the model is democratic, with each member having a vote in how the MMN operates.

In most circumstances, coalitions form among rural operators of the same category, such as electric or telephone cooperatives. Because electric and telephone cooperatives are member-owned, an MMN is owned by the people who use it, making it truly democratic. With a large amount of money available from the federal and state governments, this is the right time for all rural operators to start talking about forming coalitions, even if they don't belong in the same category. Associations such as NTCA–The Rural Broadband Association and the National Rural Electric Cooperative Association can go a long way in developing trust between disparate rural operators and forging alliances.

ESSENTIAL INFRASTRUCTURE

Middle-mile networks are essential infrastructure connecting last-mile networks. They have been around since the birth of telecommunications networks in one form or another. Edge networking and edge computing is a paradigm shift in which data is stored and processed close to the user (at the edges) so that transit time to the user is low. This is different from cloud networking and computing, in which data may be stored and processed thousands of miles away and take a long time to get to users. Shortly, edge networking and edge computing will transform communication. It is estimated that 75 percent of the internet will run on the edge within the next 10 years.

Besides being cheaper to build, the rural operator middle-mile model also has a technological edge over the conventional model. MMNs provide access to many points of presence (PoPs) without making any new infrastructure. This is because a middle-mile network has come out of interconnections between last-mile networks.

As content providers such as Netflix, Apple, Google, Meta and Amazon release low-latency applications such as AR/VR, IoTs, etc., they will need to be closer to their customers, running operations on edge. This model will allow rural operators to easily incorporate edge networking/computing within their infrastructure, incorporating the edge servers within their PoPs and scaling up very quickly. The path to edge networking/computing begins with this new MMN model.

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