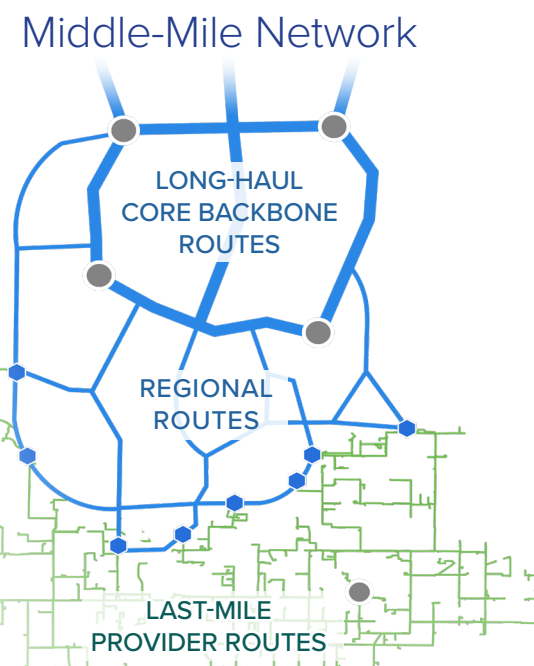
Middle-Mile Networks: What and Why

The level of interconnection necessary for the Internet to function would be impossible if billions of users had to be individually connected to each other as well as to millions of sources of content.

Achieving this interconnection implies a different approach, that of a middle-mile network consisting of long-haul core backbone routes and regional routes, and last-mile providers – not unlike the transportation model of high-capacity long-haul interstate highways that connect to major boulevards and traffic arteries, which then feed traffic into local business parks and residential streets.

In this model, an open-access middle-mile network plays the role of major highways and regional boulevards – bridging the gap between the global Internet and any last-mile providers that wish to connect to it, who then bridge the remaining gap to their individual local residential and business customers, as well as fire, earthquake, climate, and smart city sensors.



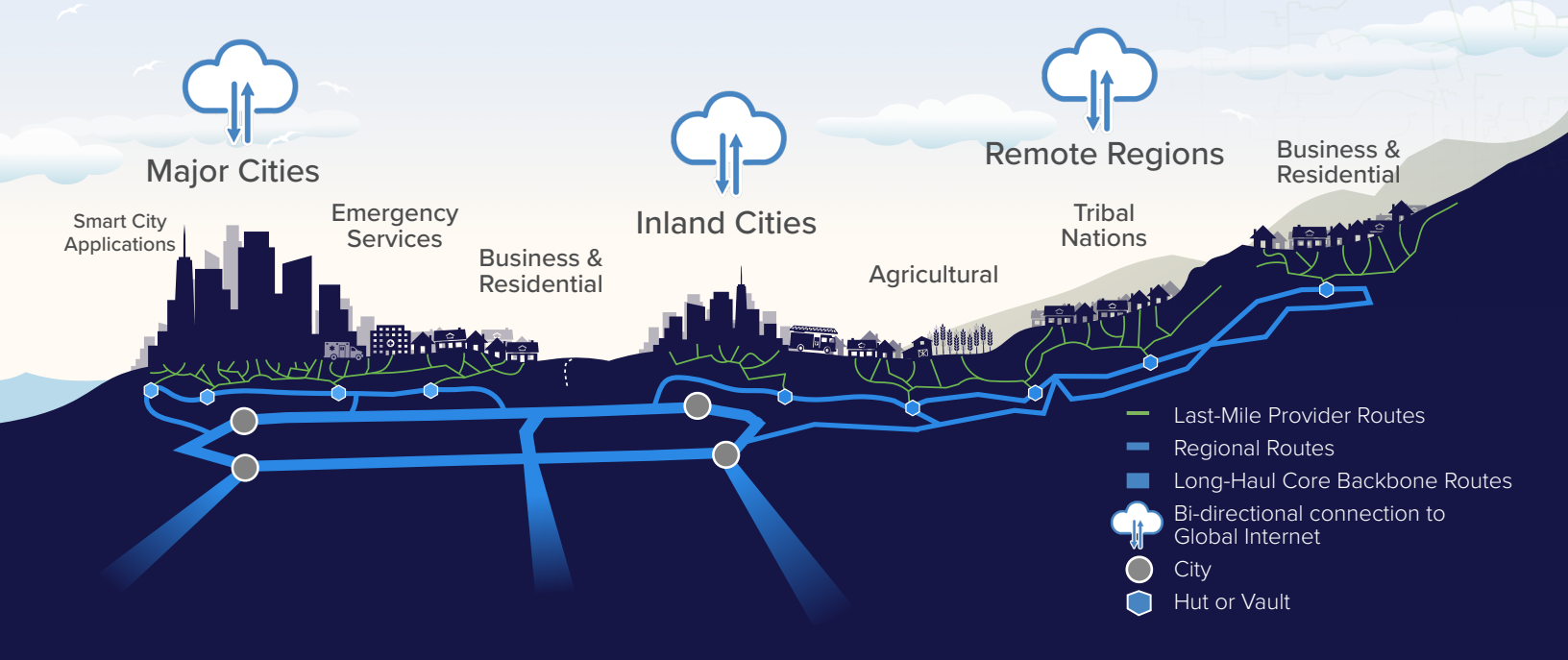
A Middle-Mile Network: More Than Just Fiber

OPERATIONS & MAINTENANCE activities are also needed to ensure the network remains up 24/7/365 – especially during emergencies when first responders will rely on it.

COMPLEX HARDWARE and software (and substantial electric power) is required to translate data into light pulses, and to send, amplify, and receive those pulses.

WIRELESS EQUIPMENT can be used to penetrate further into remote areas with special geographic challenges where installing fiber underground isn't cost-effective.

"HUTS" OR "VAULTS" are access points placed along the cable route where last-mile providers can install their own equipment to connect to the middle-mile network.



Characteristics of a Successful Middle-Mile Network

Since the purpose of an open-access middle-mile network is to bridge the gap between the global Internet at large and last-mile providers, it must consider the needs of these providers to ensure their success. This implies the following middle-mile network characteristics, which increase the attractiveness and usefulness of the network to reach even more communities, create cost savings, add resiliency, and shorten the time to service as well as ensure connections to the global Internet at the most affordable cost:

- Leverage existing infrastructure where possible and appropriate, such as IRUs on already installed fiber, existing rights-of-way, and partner resources through joint builds
- Offer a full suite of on-demand dark fiber and lit/managed services arrived at by trustworthy market research
- Design with resilient ring topologies and redundancy to ensure that spurs are only employed where absolutely necessary and never where fires, earthquakes, floods, or severe weather events can impact service
- Employ a flexible ring cut policy that permits the creation of vaults and meet-me locations where needed by last-mile Internet Service Providers

As hardware and software technology improves, *the data capacity of the exact same **fiber-optic cable** grows over time* – the very same fibers that carried 10 Gigabits per second decades ago are now carrying 400 or even 800 Gigabits per second today, and Terabit networks are on the horizon.

LONG-HAUL CORE BACKBONE ROUTES

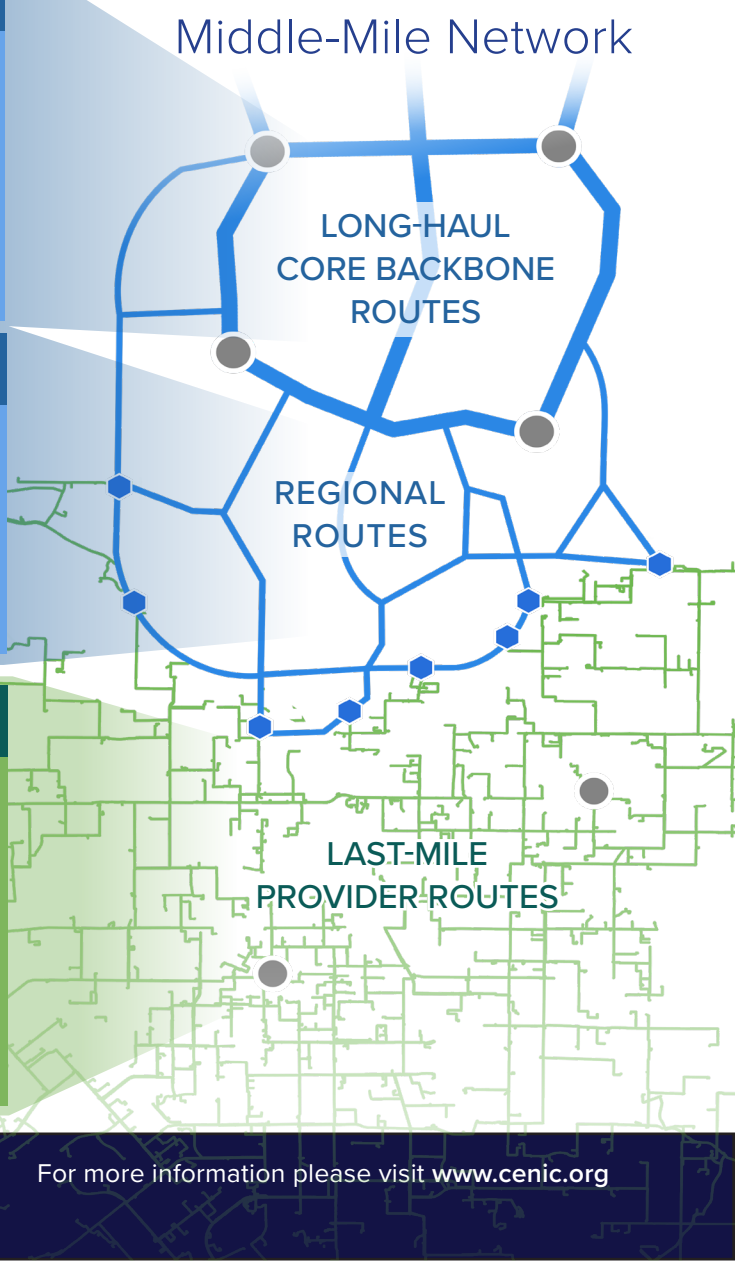
- Ultra-high-capacity, high-bandwidth routes of several hundred miles
- Reach across vast distances to interconnect widely separated regions
- Multiple resilient ring topologies an absolute must
- Connect to global Internet and content providers at major cities

REGIONAL ROUTES

- Penetrate into specific regional areas
- Provide backhaul for last-mile providers to the core backbone and global Internet
- Multiple resilient ring topologies may include occasional spur routes for last-mile provider connections or for future build-outs

LAST-MILE PROVIDER BENEFITS

- Increase and improve middle-mile services and offerings so last-mile providers may expand to more unserved/underserved areas for last-mile providers
- Provide competitive pricing for middle-mile connection services
- Alleviate the risks for last-mile providers associated with reliance on a single middle-mile provider
- Create colocation facilities that foster interconnection and growth



CENIC

For more information please visit **www.cenic.org**