Connecting Communities with Networks for the Needs of Today and Tomorrow

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From a network design perspective, building and expanding broadband networks requires one to answer *how far* from the end device should network data transition from a wireless interface to fiber optic transport. Answering the question of *how far* has many considerations and understanding how to approach efficient design for reliable broadband is anchored across the existing state of these edge networks and three variables: assessing use cases for connectivity, evaluating the aggregate supply of capital for network projects, and the laws of physics. To answer *how far,* for future network construction, a combination of variables across an efficient frontier is necessary where the mix of use cases, capital, and technology solutions are optimized for the connectivity requirements of today and are scalable for the demands of the future.

Networks Today: In today's network environment of utilizing smartphones, tablets, laptops, televisions and other smart devices, consumer driven data connections already originate or end their engagement wirelessly. The last few feet and up to the last few miles of data connectivity are in fact wireless, and ultimately limited to the modulating carrier capacity of that last leg of technology (such as Fixed Wireless, 5G, Wi-Fi or Bluetooth); where, on the edge, the last connecting leg is measured as the distance between consumer device and data handoff to fiber optic transport.

Use Cases: The global economy is being recast to be technology enabled. These changes include focal points on digital equity, access to telehealth, remote learning, streaming video, internet of things and an expanding ecosystem of connected devices. Particularly for communities in unserved, underserved and underrepresented locations, greater access to broadband connections enables families to utilize these every-day applications and expanding digital inclusion improves access to opportunity and jobs. The outlook for expanded access is positive and today we have the necessary technologies that are needed to upgrade existing networks and build new ones to meet these ever-changing marketplace choices.

Capital: While the outlook is positive affordability is a challenge. The cost to fully build nationwide high-capacity wireless edge networks can be estimated at approximately $2 Trillion, a price that exceeds available industry resources even with incremental investment supported through state and federal programs. Balancing limits in capital supply for network and infrastructure investment is a challenging task that requires increased coordination between teams of diverse skill sets, community advocates, network engineering, construction services, finance, and legal.

Physics: At the center of our data driven world are the physical laws of wave propagation. Families and users of broadband services connect at the network edge through electromagnetic waves using over the air technologies including Wi-Fi, Fixed Wireless and 5G. Data travels on these electromagnetic waves through the air before passing into physical cables (including both DSL/copper-based coaxial cable, which are commonly close to the edge), and ultimately waves transition into fiber optic cable as data moves in closer to the core network.

What this means: In the communities that we serve, we find that opening networks earlier with wireless solutions lowers the cost of home broadband solutions and provides greater diversity in connection options including for internet of things devices of the future, like smart lighting solutions and connected thermostats that lower the cost of heating. In addition to providing reliable broadband solutions that

meet the needs of today, the small cell architecture of hybrid fixed wireless networks that are interconnected with fiber optic transport arteries, are ideal and scalable beyond 10 gigabits. Design considerations for future hybrid networks support the flexibility of device connections and the increasing speed requirements of a world where technology is reshaping how we engage and how communities utilize connectivity services.

About JBRI: At JBRI we invest in communities for a more sustainable future by building Smart Cities with an integrated approach to real estate, clean energy and broadband networks (www.jbriholdings.com)