



April 2020

Network Sharing Could Be a Creative Way to Bridge the Digital Divide

By Jeff Johnston

Lead Economist

Inside...

- Introduction* 1
- What is Network Sharing?* 2
- Why Now? CBRS Simplifies Things* ... 2
- Why Now? Cost and Competition Concerns* 3
- Getting From A to Z* 3
- Challenges Still Exist* 4
- Conclusion* 4

Key Points:

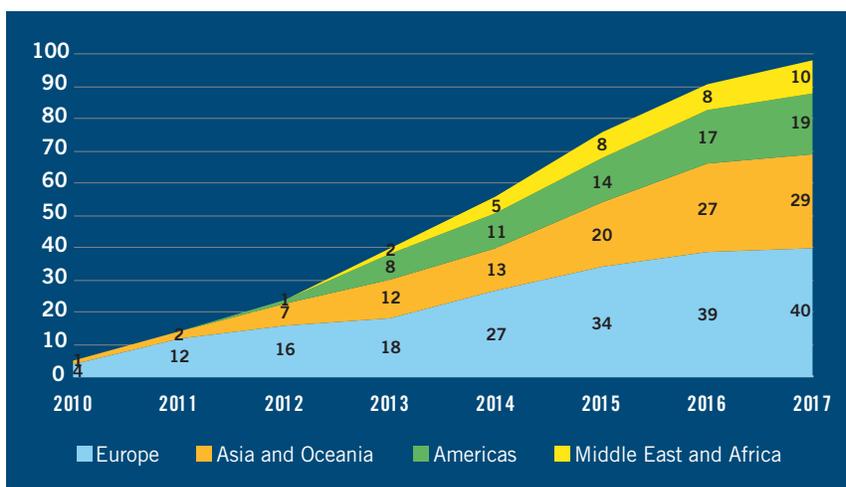
- Bridging the urban-rural digital divide will take a multi-pronged approach with creative business models. Simply relying on federal support is not enough.
- Wireless network sharing is an example of such a business model. It is a way for operators to reduce their cost of service, enabling them to provide more wireless broadband coverage in high-cost areas.
- Spectrum sharing in the CBRS band addresses many of the technical challenges of network sharing.
- The influence of ESG investors could convince operators to expand their rural coverage.
- The most likely scenario may be a third-party neutral host provider that builds and manages the network for the tenant operators.

Introduction

The primary challenge to bridging the digital divide is cost. In many rural markets there simply aren't enough residents to justify the capital and operating expenditures needed to run a profitable network. The FCC is addressing this by repurposing Universal Service Funds (USF) for broadband investment through a variety of programs. But these programs do not come close to the amount of funding needed to bridge the digital divide – estimated at \$100 billion-\$150 billion. For example, over the next 10 years, the FCC plans to repurpose approximately \$37 billion in USF for broadband deployments. Given the shortfall in funding, new approaches to building broadband networks are needed.

The purpose of this report is to explore the idea of wireless network sharing in rural America as a way to help bridge the digital divide. Network sharing significantly reduces capital and operating expenses by spreading them across multiple operators. And with the help of government support, the path to profitability in high-cost remote markets could get clearer.

EXHIBIT 1: Active Network-Sharing Agreements Announced



Source: GSMA Intelligence; Ovum; McKinsey

control over radio network equipment, and 2) the patchwork of spectrum holdings across operators created technical challenges.

Network sharing has not taken off in the U.S., but it has been adopted in other parts of the world (*Exhibit 1*). For example, Net4Mobility is a network-sharing agreement between Swedish operators Telenor and Tele2. In the UK, Telefonica and Vodafone announced a 5G expansion to their network-sharing agreement. And in Japan, Softbank and KDDI plan to share base stations in rural markets for 5G.

What is Network Sharing?

Network sharing can take various forms, but for the purpose of this article we are focusing on Radio Access Network (RAN) sharing. RAN sharing means multiple wireless operators, who provide connectivity to their respective customers, share the radio equipment on a wireless tower. These radio network elements are all integrated back to each participating operator’s core. This differs from the traditional network approach where each wireless operator has its own radio infrastructure on a tower to service only their customers (retail and wholesale). This was done for two (primary) reasons: 1) carriers have differentiated themselves with network coverage and quality and therefore want ownership and

Why Now? CBRS Simplifies Things

The emergence of spectrum available for sharing – specifically spectrum in the Citizens Broadband Radio Service (CBRS) band – removes one of the major hurdles for network sharing in the U.S.: the patchwork of spectrum holdings across wireless networks. Existing wireless networks use a variety of spectrum bands across the country, leaving operators with disparate spectrum holdings (*Exhibit 2*). This creates problems for network sharing as the number of markets where the big three operators’ spectrum holdings overlap is likely quite small. Therefore, to build a shared network that accommodates the lack of spectrum continuity, each cell site would

EXHIBIT 2: U.S. Carrier Spectrum Holdings

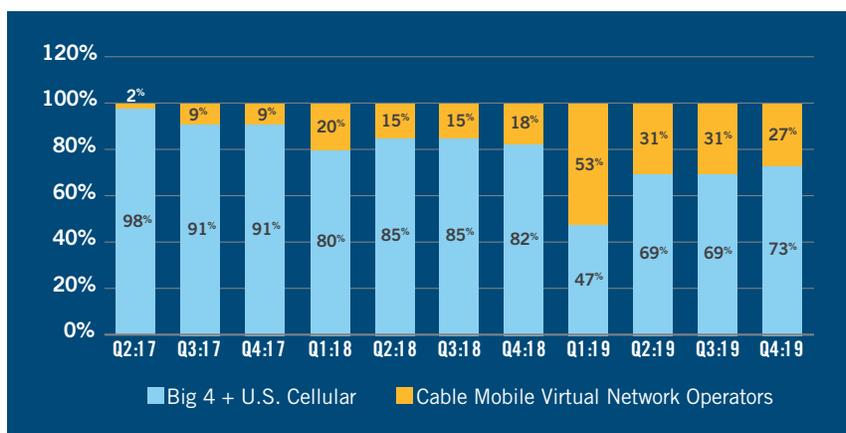
Operators	4G LTE Frequency Bands (MHz and common name)								5G NR Frequency Bands				
	600	700	850	1700/2100	1900	2300	2500	3500	600	850	2500	28000	39000
	DD	SMH	Cellular	AWS	PCS	WCS	BRS	CBRS	DD	Cellular	BRS	Ka-band	Ka-band
AT&T		in use	partial use	in use	partial use	in use		not in use		partial use		not in use	partial use
Sprint			in use		partial use		in use	not in use			partial use	not in use	not in use
T-Mobile		in use	partial use	in use	partial use			not in use	in use			partial use	partial use
U.S. Cellular	not in use	in use	partial use	in use	partial use			not in use	not in use	not in use		not in use	not in use
Verizon		in use	partial use	in use	partial use			not in use		not in use		partial use	not in use

Source: Wikipedia

Legend: in use (green), partial use (orange), not in use (blue), N/A (white)

*Note: Even though 4 carriers own SMH spectrum, T-Mobile does not have nationwide licenses, hence the lack of continuity with AT&T and Verizon who both own nationwide licenses. Similar challenges exist with the AWS spectrum.

EXHIBIT 3: Cable as a Percentage of Wireless Industry Phone Net Additions



Source: MoffettNathanson; CoBank

need to support a significant number of spectrum bands, which adds cost and creates radio frequency challenges.

CBRS spectrum is nationwide and accessible to all operators. The band is bifurcated into licensed and unlicensed spectrum. The licensed portion of the band will be auctioned off and the unlicensed portion will be available to the public. It appears that all national wireless operators will acquire some licensed CBRS spectrum, and as a result, eventually all phones in their portfolios will support the CBRS band. This is critically important for network sharing because it means that eventually all carriers' phones will have access to the unlicensed portion of the CBRS band. And given that it will be available throughout rural America – to whoever wants to use it – CBRS spectrum solves the continuity issue. Theoretically, each shared network cell site would only need to support the CBRS band for all participating operators to access the network. This simple configuration would cut down on equipment and tower leasing costs.

Why Now? Cost and Competition Concerns

Wireless operators' revenue and margins have been under pressure and competition will only intensify with new market entrants such as the cable companies and Dish Network. The new entrants are not encumbered by legacy systems / infrastructure, giving them an advantage over the incumbents. They can leverage

new technologies and unlicensed spectrum to build flexible networks with attractive economics, despite their lack of scale. In fact, one could argue that the cable operators are already having a competitive impact on the market (*Exhibit 3*). Therefore, as new players enter the mature and saturated wireless market, cost management becomes a major area of focus. In rural America, where the ratio of users to cell sites is the lowest, reducing costs is particularly important. Network sharing can help accomplish this.

The other factor to consider is 5G. Building 5G networks will be extremely costly for U.S. operators given the poor propagation characteristics of millimeter wave spectrum, which is needed in order to provide gigabit+ speeds. With millimeter wave spectrum, wireless operators need to deploy hundreds of thousands of small cells, all of which need to be connected to the network core via fiber. This takes time and lots of capital.

Getting From A to Z

In theory this sounds like a way for national wireless operators to reduce their network cost structure in rural America. The idea is that with these cost savings, operators would expand coverage to rural markets they would have otherwise avoided. But is it reasonable to think that any national operator would spearhead such an initiative? After all, they are fierce competitors, there is no love lost between them, and historically, urban and suburban markets have been their primary focus.

We do think rural market expansion is a possibility if operators feel pressure from investors to do so. More investors are adopting responsible investing principles, specifically Environmental, Social, and Governance (ESG) investing, and are seeking out companies that employ these principles. For example, BlackRock's new ESG Exchange-Traded Fund (ETF) had the best debut for any U.S. ETF this year. Therefore, leading a creative solution to help bridge the digital divide – while reducing



costs – could be a prudent strategy. It would not only please investors, but it would also be viewed favorably by regulators. To illustrate this point, we note that in order to get its merger with Sprint approved, T-Mobile had to agree to provide 5G coverage to 85% of rural Americans within three years of the merger, and 90% within six years. If they fail to meet these commitments, they will be fined.

A more likely champion for rural market expansion would be a third party neutral host provider. This business model limits capital and operating expenses for operators, and can be set up as more of a variable cost model. There are several ways a neutral host model can be implemented, but the most likely approach would include the following:

- The neutral host provider works with the carriers to determine the cell site locations and the overall network design.
- They would then work with the tower operators to negotiate space on new or existing towers.
- The provider would procure network equipment, work with construction companies to deploy it on the towers, and establish backhaul connections.
- Once the network is up and running, the neutral host provider would manage the ongoing network operations and charge the operator tenants for access to the network.

We note that typically the large tower owners do not allow network sharing on their towers. The reason is simple: network sharing results in less equipment on a tower, and therefore less revenue for tower operators. Given that most of the sites in this scenario would be newly constructed (assuming coverage is being deployed in unserved markets), an important consideration would be access to tower companies that are open to network sharing.

Challenges Still Exist

As with most strategic relationships and joint ventures, the devil is in the detail and network-sharing arrangements are no different. Coordinating and getting independent-minded operators to agree on network configurations will be a challenge. Also, troubleshooting the root cause of network issues could be problematic. Finally, as mentioned above, overcoming tower owners' objection to network-sharing agreements will also be an issue.

Conclusion

It's clear that existing federal broadband programs are not sufficiently funded to bridge the digital divide. Therefore, a multi-pronged approach with new business models is needed. Network sharing with CBRS is a step in that direction, but the challenge will be to convince national operators to reinvest the savings from these agreements back into rural America. ESG investing principles are real, so perhaps these companies may feel compelled to be good corporate citizens and serve the underserved. And as illustrated by T-Mobile's merger commitments, expanding coverage in rural America will be viewed favorably by the regulators. Taking the neutral host provider route would limit the impact on carrier operations and if all three national carriers signed on, the incremental cost to provide expanded coverage should be manageable. ■

References

<https://seekingalpha.com/news/3540895-blackrock-sees-pickup-in-esg-investing>

<https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/network-sharing-and-5g-a-turning-point-for-lone-riders>

<https://www.lightreading.com/mobile/5g/5g-may-drive-carriers-to-share-networks-andndash-like-it-or-not-/d/d-id/752820>

<https://telecoms.com/501903/deep-dive-whats-the-deal-with-network-sharing/>

**CoBank's Knowledge Exchange Division welcomes readers' comments and suggestions.
Please send them to KEDRESEARCH@cobank.com.**

Disclaimer: *The information provided in this report is not intended to be investment, tax, or legal advice and should not be relied upon by recipients for such purposes. The information contained in this report has been compiled from what CoBank regards as reliable sources. However, CoBank does not make any representation or warranty regarding the content, and disclaims any responsibility for the information, materials, third-party opinions, and data included in this report. In no event will CoBank be liable for any decision made or actions taken by any person or persons relying on the information contained in this report.*