

GAO Highlights

Highlights of [GAO-20-468](#), a report to congressional requesters

Why GAO Did This Study

As the latest generation of mobile communications, 5G networks are expected to provide faster connections to support consumer, industry, and public sector services. While private sector carriers deploy 5G networks, FCC has a role in managing deployment challenges, such as how to allocate low-, mid-, and high-band spectrum for 5G use.

GAO was asked to review 5G deployment challenges. This report examines challenges and the federal government's efforts related to 5G deployment with regard to managing spectrum for 5G and closing the digital divide, among other things. GAO, with assistance from the National Academies of Sciences, Engineering, and Medicine, convened a meeting of 17 experts from academia, industry, and consumer groups; reviewed relevant statutes, literature, and FCC documentation; and interviewed FCC and other relevant federal officials, along with stakeholders that include various localities, wireless carriers, and industry associations.

What GAO Recommends

FCC should develop specific and measurable performance goals with related strategies and measures to: (1) manage spectrum demands for 5G and (2) determine the effects 5G deployment and any mitigating actions may have on the digital divide. FCC indicated that setting spectrum goals could unnecessarily limit its options but did not agree or disagree with GAO's recommendations. GAO continues to believe that well-considered strategic planning would benefit FCC's efforts.

View [GAO-20-468](#). For more information, contact Andrew Von Ah at (202) 512-2834 or vonaha@gao.gov.

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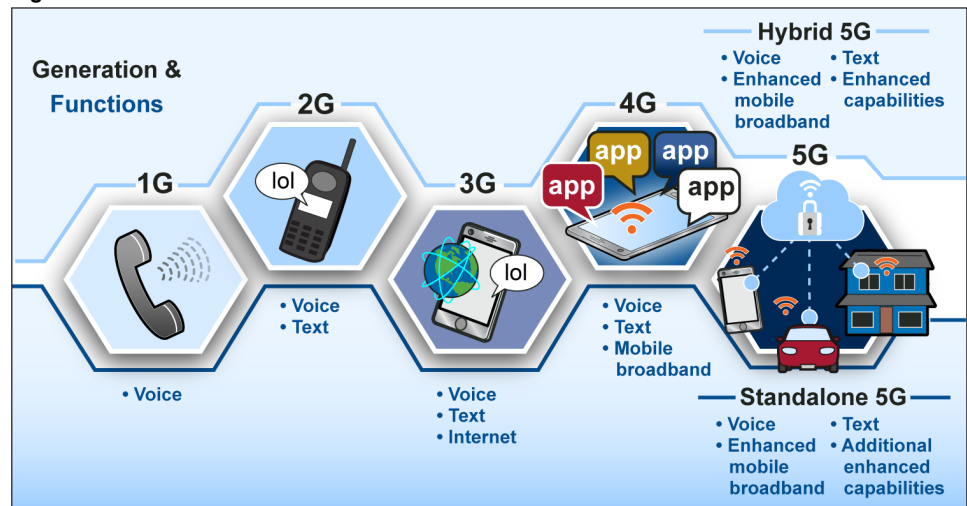
5G DEPLOYMENT

FCC Needs Comprehensive Strategic Planning to Guide Its Efforts

What GAO Found

Approximately every 10 years since the early 1980s, wireless carriers have deployed a new generation of wireless communication technology. This decade is no different, as carriers are now developing and deploying 5G networks, which offer greater speed and higher data capacity than previous generations of mobile wireless networks. Carriers in the United States are currently deploying "hybrid" 5G, which uses 5G technologies in combination with existing 4G networks to improve the networks' speed. In the future, carriers may deploy "standalone" 5G, which relies exclusively on 5G equipment to allow for additional enhanced capabilities (see fig. 1).

Figure 1: Functions of Wireless Communication Generations



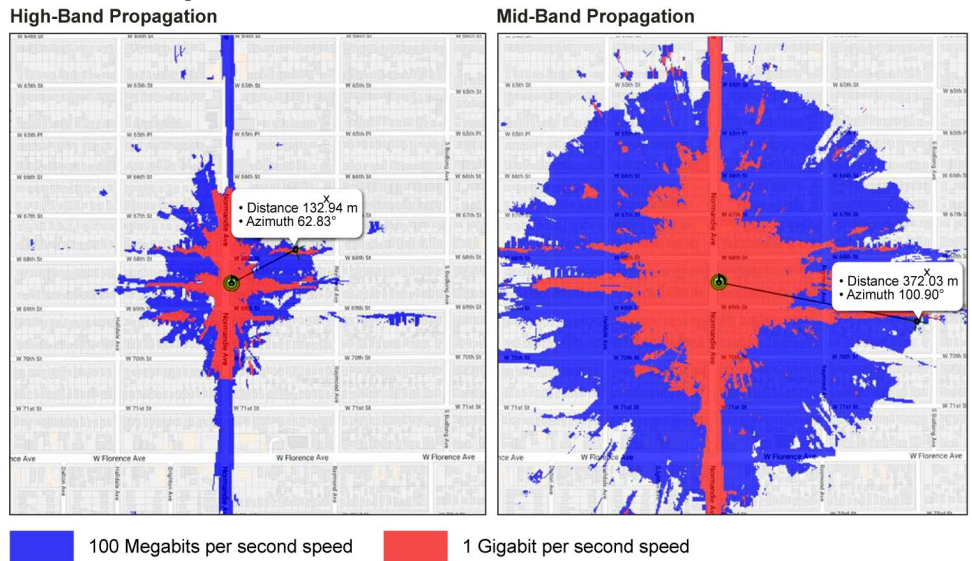
Source: GAO analysis of Congressional Research Service data. | GAO-20-468

Radio frequency spectrum is a finite natural resource used to provide a variety of communication services to businesses and consumers, as well as to federal, state, and local governments. The frequency bands—often referred to as low-band, mid-band, and high-band spectrum—have different characteristics that make them more or less suitable for specific purposes.

Experts GAO convened said that mid-band spectrum is highly congested, leading to an insufficient amount available for carriers to deploy their 5G networks in the United States. The experts stated that to avoid delays in 5G deployment, the commercial sector needs access to more mid-band spectrum.

These experts highlighted the need for mid-band spectrum for 5G due to mid-band's use internationally and because of its properties. Mid-band spectrum allows for higher data capacity than lower bands and can penetrate physical obstacles over long distances—a property known as "propagation"—better than higher bands (see fig. 2).

Figure 2: Comparison of Projected Distance Signals from High-Band and Mid-Band Spectrum Travel from a Single Cell Site in an Urban Environment



Source: GAO analysis of Defense Innovation Board data. | GAO-20-468

The Federal Communications Commission (FCC) has some efforts under way to make additional mid-band spectrum available but so far has primarily made high-band spectrum available for 5G because it is more readily available. Making more mid-band spectrum available to the commercial sector will be challenging, as current mid-band spectrum users include federal government users that may not be able to readily transition to new or less favorable spectrum bands.

FCC's planning document for 5G includes a section on making additional spectrum available but does not clearly identify specific and measurable performance goals or measures to manage the spectrum demands for 5G. Without such strategic planning efforts, FCC will be unable to determine the effectiveness of its spectrum management efforts, particularly related to the congested mid-band spectrum that is critical to 5G deployment.

The experts GAO convened also stated that 5G deployment would likely exacerbate disparities in access to telecommunications services, known as the "digital divide." Specifically, experts as well as stakeholders GAO interviewed said that 5G using high-band spectrum—which allows for high data capacity—is likely to be first deployed in areas already equipped with much of the necessary infrastructure.

Experts said the areas with existing infrastructure are generally urban, densely populated, high-income areas as opposed to rural or low-income areas. Further, within urban settings, experts said that high-band 5G networks are more likely to be deployed in commercially viable areas, including those parts of a city that already are equipped with fiber and power and, presumably, already benefit from the most advanced mobile broadband services available.

FCC has taken steps to address the digital divide, including a recent announcement to make up to \$9 billion in funding available to carriers to deploy 5G in rural areas of the United States. However, FCC has not developed specific and measurable performance goals with related strategies and measures to assess how well its actions are mitigating the added effects 5G deployment will have on the digital divide.