

GAO Highlights

Highlights of [GAO-18-71](#), a report to congressional requesters

Why GAO Did This Study

IoT generally refers to devices (or “things”), such as vehicles and appliances, that use a network to communicate and share data with each other. The increasing popularity of wireless IoT devices that use spectrum has created questions about spectrum needs. GAO was asked to examine issues related to spectrum and IoT. This report discusses, among other things, (1) spectrum challenges related to IoT, (2) how the federal government plans for IoT’s spectrum needs, and (3) how selected leading countries prepare for IoT’s spectrum needs.

GAO reviewed documents and interviewed officials from FCC and the National Telecommunications and Information Administration as well as 24 officials from a variety of sectors, including government, commercial, and manufacturing. Stakeholders were selected based on a literature review, among other factors. GAO interviewed government and commercial representatives from four leading countries regarding IoT planning and development and reviewed associated documents. These countries were selected based on criteria that included level of economic development among other criteria.

What GAO Recommends

FCC should track the growth in (1) high-bandwidth IoT devices and (2) IoT devices that rely on unlicensed spectrum. FCC did not believe these actions are necessary but noted that it would ask its TAC to periodically review and report on IoT’s growth. GAO continues to believe the recommendations are valid.

View [GAO-18-71](#). For more information, contact Mark Goldstein at (202) 512-2834 or goldsteinm@gao.gov.

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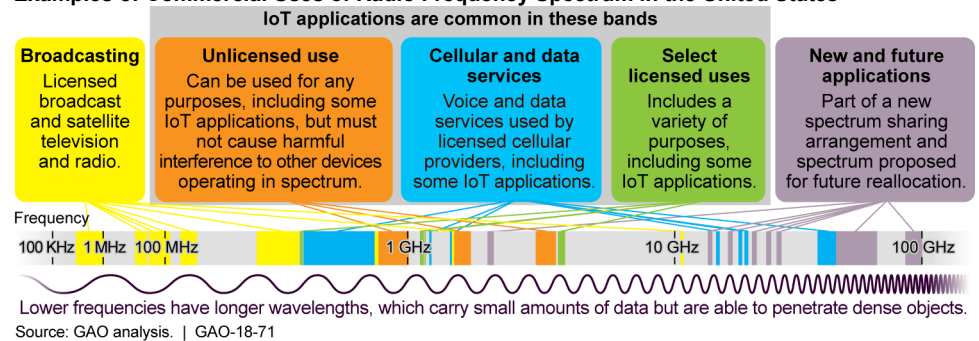
INTERNET OF THINGS

FCC Should Track Growth to Ensure Sufficient Spectrum Remains Available

What GAO Found

The stakeholders GAO spoke with identified two primary spectrum-related challenges for the internet of things (IoT)—the availability of spectrum and managing interference. Although not considered an immediate concern, Federal Communications Commission (FCC) staff and some stakeholders noted that rapid increases in IoT devices that use large amounts of spectrum—called high-bandwidth devices—could quickly overwhelm networks, as happened with smart phones. Stakeholders and FCC staff also indicated that managing interference is becoming more challenging as the number of IoT and other wireless devices grows, particularly in bands that do not require a spectrum license. The figure below illustrates the uses of radio frequency spectrum, including unlicensed use.

Examples of Commercial Uses of Radio Frequency Spectrum in the United States



FCC plans for IoT’s spectrum needs by broadly tracking spectrum demand and making additional spectrum available as needed. Ensuring sufficient spectrum to support commercial demand is one way FCC pursues its strategic goal of promoting economic growth. FCC has made additional spectrum publicly available at least four times since 2015 by repurposing over 11 gigahertz of spectrum. However, FCC does not track the growth of IoT devices in two areas that pose the greatest risk to IoT’s growth—high bandwidth and unlicensed-spectrum devices. In 2014, FCC’s Technical Advisory Council (TAC) recommended that FCC monitor high-bandwidth IoT devices and make sufficient unlicensed spectrum available. FCC officials said that FCC monitors spectrum use broadly and makes spectrum available as needed. However, since the process of reallocating spectrum is lengthy, FCC may not have adequate time to take actions to avoid a shortage, possibly hindering IoT’s growth and associated economic growth.

Spectrum planners in four leading countries—France, Germany, the Netherlands, and South Korea—have taken steps similar to those taken by the United States in preparation for IoT’s expansion, including taking a technology-neutral approach that stakeholders believe encourages innovation. Unlike the United States, officials from two leading countries said they are concerned about spectrum congestion from the growth of IoT devices, but only one is actively monitoring congestion. In addition, three leading countries have developed nationwide low power wide-area networks that use unlicensed spectrum with potential benefits including low costs and low barriers to entry.