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# Satellite Direct-to-Cellular (D2C) Service: Emergence, Use Cases, and Considerations for Congress

Satellite Direct-to-Cellular (D2C) is an emerging technology that connects smartphones to low Earth orbit (LEO) satellite networks, allowing users to connect to cellular service in areas where terrestrial (i.e., ground-based) cellular networks are not available. This could potentially help eliminate “dead zones,” ensuring that consumers are continuously connected to cellular service from their own devices (i.e., smartphones). D2C service differs from the Emergency SOS feature offered on some smartphones, which requires specialized satellite hardware built into the phone that allows users to access emergency services when no terrestrial cellular signal is available. D2C service aims to offer communications (e.g., voice and data) with anyone (beyond emergency services) along with access to numerous applications (e.g., navigation, internet browsing, video calls). With the emergence of D2C services, Congress may be interested in potential use cases, including how this service may shape the connectivity landscape. Congress may consider associated issues such as allocation of radio spectrum for D2C services, the growing number of satellites in orbit, and the role of U.S.-based satellite providers in global communications and affairs.

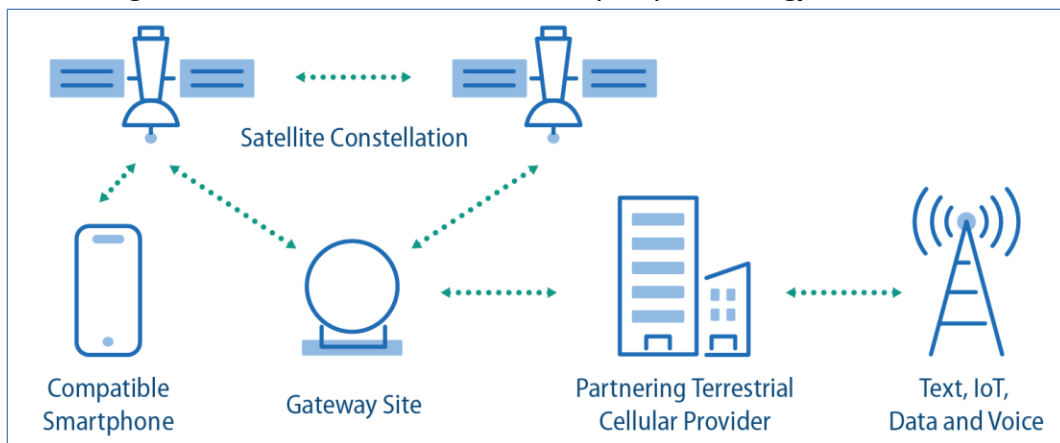
## Emergence of Satellite D2C Services

In 2025, telecommunication providers began partnering with LEO satellite providers to enable D2C services without the need for specialized hardware or a specialized satellite phone. For example, T-Mobile is partnering with SpaceX; AT&T and Verizon are partnering with AST SpaceMobile.

Typically, LEO satellite providers do not offer cellular service directly to consumers, but provide the capability for the retransmission of cellular data via satellite. D2C satellites are equipped with antennas and a modem, the same as those in terrestrial cellular towers—effectively functioning as “cell towers in space.” Data from a smartphone can be transmitted from Earth to space to a D2C satellite where the data enters the network. The LEO satellite provider then routes the data down to the nearest ground station, or gateway. The gateway routes the data directly into the partnering terrestrial cellular provider’s core network to complete the communication (see **Figure 1**). Cellular data may be passed through multiple D2C satellites to carry data over a long distance, and to ensure a continuous connection.

Typically, a user may only connect with a D2C satellite when terrestrial cellular coverage is unavailable (i.e., a smartphone generally does not have connectivity to terrestrial cellular and satellite service simultaneously). The connection to satellite occurs automatically and switches back to terrestrial cellular service when it becomes available. A number of smartphones are already compatible with D2C satellites; however, not all service providers offer the service and not all smartphones may be equipped for such service at this time (e.g., T-Mobile has a list of eligible devices for its T-Satellite service).

**Figure 1. Transmitting Cellular Data with Direct-to-Cellular (D2C) Technology**



**Source:** CRS. Adapted from Starlink, “Starlink Mobile,” <https://starlink.com/business/direct-to-cell>.

**Notes:** This figure provides an example of the pathway data that could be transmitted using D2C technology. IoT means Internet of Things, an interconnected network of objects that can communicate with one another.

## Potential Use Cases for D2C Service

According to the FCC’s National Broadband Map (data as of June 2025), approximately 69.4% of the United States is covered by 4G services and 38.6% is covered by 5G services. D2C advocates have noted, “for people living in rural communities, adventurers exploring the backcountry, and people in disaster-struck regions without functioning networks, it could be the difference between isolation and connection.” D2C service can be used to contact emergency services during disasters when traditional cellular networks are down. Wireless emergency alerts (WEA) may also be transmitted via D2C technology in areas without cellular service (e.g., remote areas) or after disasters, when networks have been damaged.

Short message service (SMS) messages are currently the main supported feature of D2C services, with other features expected to become available in the future (e.g., voice, internet browsing). Some users have reported that SMS performance may be inconsistent (e.g., difficulty connecting to a satellite, delays with sending and receiving). However, functionality, performance, and reliability could improve over time as additional D2C satellites are deployed and technologies improve and expand. D2C satellites currently do not support 5G, and speeds might not be comparable to terrestrial networks, as each satellite handles a smaller number of simultaneous connections compared to terrestrial cellular towers. Like with other satellite services, a direct line of sight is needed (e.g., no blockage by trees or foliage to effectively transmit and receive data). Thus, D2C connection may not always work indoors (or in a moving vehicle). D2C services can also be affected by outages. While outages are not frequent, they can occur—such as the Starlink outage in July 2025.

## Role of Certain Federal Agencies

Wireless technologies, such as LEO satellites and cellular, use radio spectrum (spectrum) to transmit and receive data. Spectrum for commercial use is allocated by the Federal Communications Commission (FCC); typically, specific frequencies are designated for certain users and uses. The Communications Act of 1934, as amended, requires a license—granted by the FCC—to use spectrum for any commercial communications transmitted via satellite to, from, and within the United States. The FCC and the National Telecommunications and Information Administration (NTIA) coordinate on spectrum use for space-based communications to enable federal use and avoid interference.

In March 2024, the FCC adopted rules to allow satellite communications on spectrum previously allocated only to terrestrial services. The FCC is also considering whether to allocate spectrum specifically for D2C services, which some in the industry claim “would enable a single, unified network that isn’t reliant on specific lease agreements between wireless and satellite operators.” Some LEO providers (e.g., AST SpaceMobile, SpaceX) have also expressed interest in acquiring additional spectrum from other satellite providers to boost D2C capabilities. Aside from the allocation of spectrum, the FCC also conducts other activities related to satellite and space-based communications (e.g., authorization of satellite constellations).

## Considerations for Congress

If D2C services succeed in eliminating dead zones, this may cause some policymakers to rethink the need for some federal programs that provide support for the build-out of terrestrial cellular networks, such as the 5G Fund for Rural America (5G Fund). Some telecom experts argue that D2C has specific use cases and will not replace terrestrial cellular service. Instead, D2C is viewed by some in the industry as “a reshaping of the connectivity landscape, where satellite systems like Starlink D2C fill in the gaps that traditional terrestrial 4G/5G networks can’t cover.” Congress may consider what role D2C can play in reaching rural areas and whether to direct the FCC to collect data on the availability of D2C services for the FCC’s mobile map.

Congress may also explore other emerging issues related to D2C services. For instance, the growing number of satellites in space may lead to orbital crowding, as LEO constellations can include tens of thousands of satellites. If more providers enter the market to provide D2C services, or existing providers expand satellite networks to increase coverage and capacity, this could aggravate orbital crowding. Some providers with D2C satellites have sought to reduce the number of satellites needed for global coverage. Congress could consider how to potentially incentivize other providers to follow suit. Orbital crowding has also raised concerns about orbital debris. In 2022, the FCC adopted a rule requiring certain satellite operators to deorbit their satellites after the end of their operations to minimize the risk of collisions that would create debris.

The emergence of, and consumer demand for, new wireless technologies and services has led to increased demand for spectrum. As more partnerships are formed in this space, Congress could consider identifying spectrum for D2C services or directing the allocation of spectrum (for dedicated or shared use) for satellite-terrestrial use, while also protecting incumbent users from interference.

As D2C services continue to emerge, Congress may assess how this technological innovation may further address gaps in cellular service and improve communication services nationwide. For example, in the 119<sup>th</sup> Congress, legislation has been introduced which would integrate satellite networks into the WEA system (H.R. 7022) to enhance alerting capabilities. As new satellite technologies emerge, Congress may decide to take action to further support the deployment of satellites for telecommunications services (e.g., through hearings, studies, legislation, federal funding programs). Congress may decide to take no action and defer to the industry and relevant federal agencies (e.g., FCC, NTIA). Congress could also continue to debate the role of U.S.-based LEO satellite providers in global affairs, including the growing reliance on some providers (i.e., SpaceX) by some foreign leaders, governments, and militaries. Congress could also examine how D2C services could help promote connectivity in certain countries (e.g., Iran; see, for example, S. 3360, H.R. 6469, and H.R. 7380 introduced in the 119<sup>th</sup> Congress).

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