Satellite smartphone connectivity is coming, but IoT will get there first

Alex Miller 4 minutes

Technology

Despite the attention surrounding the introduction by Apple of limited satellite connectivity in the latest iPhone — as well as news of a Starlink-T-Mobile offering — we're likely a few years out before any kind of meaningful service will be in place. These initial satellite links are meant mainly just for emergency texts, not for more bandwidth-intensive applications like phone calls or streaming.

But there's no doubt satellite connectivity to mobile phones and other small devices is right around the corner.

Apple's connection depends on the user being in an open area, since line-of-sight to a low Earth orbit (LEO) satellite is required. The service is an "Emergency SOS" feature that will try to send a text if you're in trouble in a place with no cellular coverage. There's a list of tips to help achieve a satellite connection, but the bottom line is this is early days when it comes to such connectivity.

Anish Sharma, vice president of communication architecture at E-Space, says there are quite a number of hurdles to enable the typical smartphone to function with a satellite network.

"A big one is having a device capable of supporting the frequency bands that satellite uses, changes in modem software, updated or additional antennas and seamless coordination between satellite and terrestrial networks," he says.

Satellites use a number of different waveforms, and asking a small handheld device to accommodate all of them for global coverage is a tall order.

"Every operator uses their own spectrum, and these devices are already dealing with 3G, 4G and 5G, and every band you add really increases the complexity," Sharma says. "There are also challenges with latency and the software protocols you need to sustain a connection."

Latency, which refers to the time it takes for data to travel from a device to some reference point external to the network, can be as low as few milliseconds for a terrestrial 5G network. That can jump to tens of milliseconds through a satellite in LEO and hundreds of milliseconds for one in geostationary orbit.

"Connecting those dots and managing user experiences around these limitations is going to be a big factor for smartphone-based connectivity where mobile network operators (MNOs) are already struggling to increase average rate per user (ARPU)," Sharma says, adding that creating a global-access model might have additional hurdles of setting up all the roaming interfaces between satellite providers and MNOs around the world.

That wouldn't necessarily be an issue for the Apple approach, which is based on one network using connectivity to iPhones only via Globalstar satellites in LEO. The Starlink-T-Mobile service is planned to be able to have any 5G smartphone be able to connect, with the companies saying they may have something in place by the end of 2023.

Other companies, including AST SpaceMobile and Amazon/Kuiper, are working on satellite-enabled mobile networks, but most likely not implementing widely available service for several years.

The IoT connection

It's far more likely we'll see 5G, satellite-connected Internet of Things (IoT) devices in the near term — a primary focus of the upcoming E-Space constellation. Most IoT devices require only small amounts of bandwidth to send and receive data, making it simpler to create a global network to serve them.

As with mobile, the big challenge is to create an antenna to fit in a small device. That requires a very large antenna on the satellite itself since the bigger the antenna, the more powerful and focused the beam can be to link to a small ground terminal. Historically, satellites with jumbo-sized antennas are also quite massive — and expensive — themselves, creating a challenge for global coverage.

The E-Space approach is quite different. Our plan is to disrupt the fundamental design of a LEO satellite constellation to deliver new capabilities at a fraction of the cost of traditional systems. By creating a global constellation of low-cost, low-mass satellites in LEO and optimizing it using advanced Artificial Intelligence (AI), we will create an IoT-centered network unlike anything seen before. Our satellites will also create a more sustainable constellation, with the ability to withstand collision events while also being designed to avoid them in the first place.

IoT is a quickly growing technology field with a wide variety of intriguing use cases as well as a great many yet to be discovered. Most of today's IoT devices are dependent on terrestrial infrastructure, but alternate connectivity pathways will enable the connection of billions of devices that can improve life on Earth in meaningful ways.

Alex Miller

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