

Ajit Pai doubts Elon Musk's SpaceX broadband-latency claims

Enlarge / SpaceX CEO Elon Musk at the Satellite 2020 Conference in Washington, DC, on Monday, March 9, 2020.

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The Federal Communications Commission is not convinced that SpaceX's Starlink broadband network will be able to deliver the low latencies promised by CEO Elon Musk. As a result, FCC Chairman Ajit Pai is proposing limits on SpaceX's ability to apply for funding from a \$16 billion rural-broadband program.

While traditional satellite broadband generally suffers from latency of about 600ms, Musk says that Starlink will offer "latency below 20 milliseconds, so somebody could play a fast-response video game at a competitive level."

Everyone expects Starlink to offer much lower latency than traditional satellites because SpaceX satellites are being launched in low Earth orbits ranging from 540km to 570km. By contrast, geostationary satellites used for broadband orbit at about 35,000km.

"SpaceX claims that because its low-Earth orbit satellite system operates at 'an altitude of 550 kilometers,' it can deliver roundtrip latency at less than 50ms," according to a public draft of Pai's proposed rules for the \$16 billion Rural

Digital Opportunity Fund distribution. But the FCC plans to classify SpaceX and all other satellite operators as high-latency providers for purposes of the funding distribution, saying the providers haven't proven they can deliver low-latency broadband.

The proposal, released yesterday, is scheduled for a vote by the five-member commission at its June 9 meeting. The \$16 billion in phone and broadband subsidies will be distributed in a reverse auction scheduled to begin on October 29. ISPs can seek funding in census blocks where no provider offers home-Internet speeds of at least 25Mbps downstream and 3Mbps upstream.

ISPs that aren't expected to provide latency below 100ms will be at a disadvantage because the FCC will prioritize low-latency networks when awarding funding. Pai's plan would put SpaceX and other satellite providers into the high-latency category, even though SpaceX says its latency will be much lower than 100ms:

In the absence of a real world example of a non-geostationary orbit satellite network offering mass market fixed service to residential consumers that is able to meet our 100ms round trip latency requirements, Commission staff could not conclude that such an applicant is reasonably capable of meeting the Commission's low latency requirements, and so we foreclose such applications.

Distance not the only factor in latency

To explain the decision, the proposed FCC order notes that the distance between Earth and satellites is not the only factor determining latency:

Service providers that intend [to] use low-Earth orbit

satellites claim that the latency of their technology is “dictated by the laws of physics” due to the altitude of the satellite’s orbit. While satellites in low-Earth orbit may not be subject to the same absolute physical latency limitations as higher-orbiting satellites, we disagree that the altitude of a satellite’s orbit is the sole determinant of a satellite applicant’s ability to meet the Commission’s low latency performance requirements. As commenters have explained, the latency experienced by customers of a specific technology is not merely a matter of the physics of one link in the transmission. Other factors will affect network performance as well: The latency of a satellite network, in particular, consists of the “propagation delay,” the time it takes for a radio wave to travel from the satellite to the earth’s surface and back, and the “processing delay,” the time it takes for the network to process the data. It is true that a radio wave takes less time to travel from an earth station to a low-Earth orbiting satellite and back when compared to a geosynchronous or medium earth orbit satellite. Propagation delay in a satellite network does not account for latency in other parts of the network such as processing, routing, and transporting traffic to its destination.

The FCC plan further notes that, in networks using satellite-to-satellite transmissions, “the latency of these transmissions could add to the latency experienced by the end user. Further, the inherent latency of earth station to satellite round trips does not account for latency in other portions of the network, which could also affect the latency experienced by the consumer.”

To back the FCC’s position, Pai’s plan quotes Viasat, a traditional satellite provider, as saying that “measured latency depends, among other things, on the space and ground segments and how those segment[s] are designed, the performance of various network components, and the distance to the FCC-designated [Internet exchange point].” The FCC does

“not yet have sufficient basis to assess the actual design and performance of these components for planned low-Earth orbit satellite constellations,” Pai’s plan said.

SpaceX and other satellite operators are also being ruled ineligible for a gigabit tier. Both the latency and gigabit decisions would put SpaceX at a disadvantage. As Pai said in an announcement, his plan “prioritizes bids offering to provide even faster speeds (up to a gigabit) and lower latency by giving those bids greater weight in the auction and awarding support to the bidder offering the best combination of speed and latency in each area.”

SpaceX asked for low-latency classification

SpaceX won’t like this decision, as the company previously told the FCC that excluding low-Earth orbit satellite operators from the low-latency tier “would create a technological bias, unsupported by the evidence, that prevents fair competition based on network capabilities, undermining the very purpose of the reverse auction.”

“Requiring SpaceX to bid as a high-latency service runs counter to the laws of physics and would mandate that SpaceX affirmatively mischaracterize the capabilities of its network in any bid,” SpaceX told the commission. SpaceX said its latency will be lower than “many terrestrial services and well below the Commission’s 100-millisecond threshold for low-latency services.” Because of the low orbits, “the roundtrip time for a signal to be sent from Earth to Starlink satellites and back is a fraction of the 100-millisecond threshold for a low-latency bid,” SpaceX said.

Like other universal service programs, the FCC’s rural-broadband fund is paid for by Americans through fees imposed on phone bills. The \$16 billion will be distributed over 10

years, so ISPs that get funded will collect a total of about \$1.6 billion a year and face requirements to deploy broadband service to a certain number of homes and businesses.

Satellite restricted to lower-speed tiers

The FCC plan would also prevent SpaceX and other satellite operators from applying for grants that require gigabit download speeds. SpaceX could still apply for funding in the 100Mbps-and-below categories.

Contrary to SpaceX's argument, Pai's proposal said that SpaceX does not have to mischaracterize its network capabilities. "Instead, our eligibility decisions mean that at this time we conclude that it is not in the public interest to permit low-Earth orbit satellite providers to bid for the Gigabit performance tier or low latency given their lack of a proven track record in offering the services that will be supported by Auction 904," the plan said.

Restrictions would apply to all satellite operators. "[T]he Auction Application System will not allow an applicant that intends to use any form of satellite technology, whether geostationary, high-Earth orbit, medium-Earth orbit, or low-Earth orbit, to select the Gigabit performance tier or to select low latency," the FCC plan said.

Pai's plan said the FCC must avoid giving funding to ISPs that might "default and strand consumers with no service, unreliable service, or with service that is not reasonably comparable to service offered in urban areas." The plan further explained:

Applying these principles, we find that the only applicants that can make a case to bid in the Gigabit performance tier or for low latency are those applicants proposing to use a

technology: (1) that has a proven track record of offering mass market voice and broadband services directly to residential consumers; and (2) where there are concrete examples of such technology being used to offer service at speeds that would meet the requirements for the higher speed tiers or at latency levels meeting our low latency requirements.

While low-Earth satellite providers may apply for funding in the 100Mbps category, geostationary satellite providers would only be allowed to bid in the 50Mbps-and-below tiers.

USTelecom, a trade group representing ISPs that could compete against SpaceX for funding, argued in an FCC filing that SpaceX won't have "sufficient capacity to provide gigabit service throughout rural America."

Financial statements required

SpaceX may also have to provide financial statements and proof of funding to qualify for the auction. Under Pai's proposal, applicants must demonstrate "operational experience and financial qualifications" to participate in the auction. Companies that don't have at least two years of experience offering broadband service must submit three years worth of independently audited financial statements "including balance sheets, net income, and cash flow as well as the audit opinion and accompanying notes." An applicant without two years experience "must also submit... a letter of interest from a qualified bank stating that the bank would provide a letter of credit to the applicant if the applicant becomes a winning bidder and is selected for bids of a certain dollar amount."

We contacted SpaceX about Pai's proposal today, and will update this article if we get a response.

Satellite is not the only category facing restrictions. Under

the plan, a fixed-wireless or DSL operator that hasn't previously reported offering gigabit service may only apply for gigabit funding if it demonstrates in its application "that it is reasonably capable of offering service meeting the Gigabit performance tier public interest obligations." Applications would be evaluated on a case-by-case basis.

Despite the setback for satellite providers, the FCC has issued several decisions helping SpaceX and other low-Earth satellite operators enter the broadband market. The FCC approved SpaceX applications to launch nearly 12,000 satellites and deploy 1 million user terminals, and approved satellite-broadband applications by OneWeb, Space Norway, and Telesat. (OneWeb has since filed for bankruptcy.)

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