

COMMUNICATIONS SERVICES PROJECT PARTNERSHIP

NASA's Communications Services Project (CSP) is pioneering a new era of near-Earth space communications by partnering with commercial industry to enable innovative networking for future missions. CSP will leverage \$278.5 million across six funded space act agreements with commercial industry to facilitate demonstrations, evaluate service performance, and identify future services and capabilities to meet mission needs.

Space Exploration Technologies (SpaceX) has been awarded \$69.95 million to demonstrate an optical relay network in low-Earth orbit that will provide high-rate satellite communications services to user spacecraft.

VISION

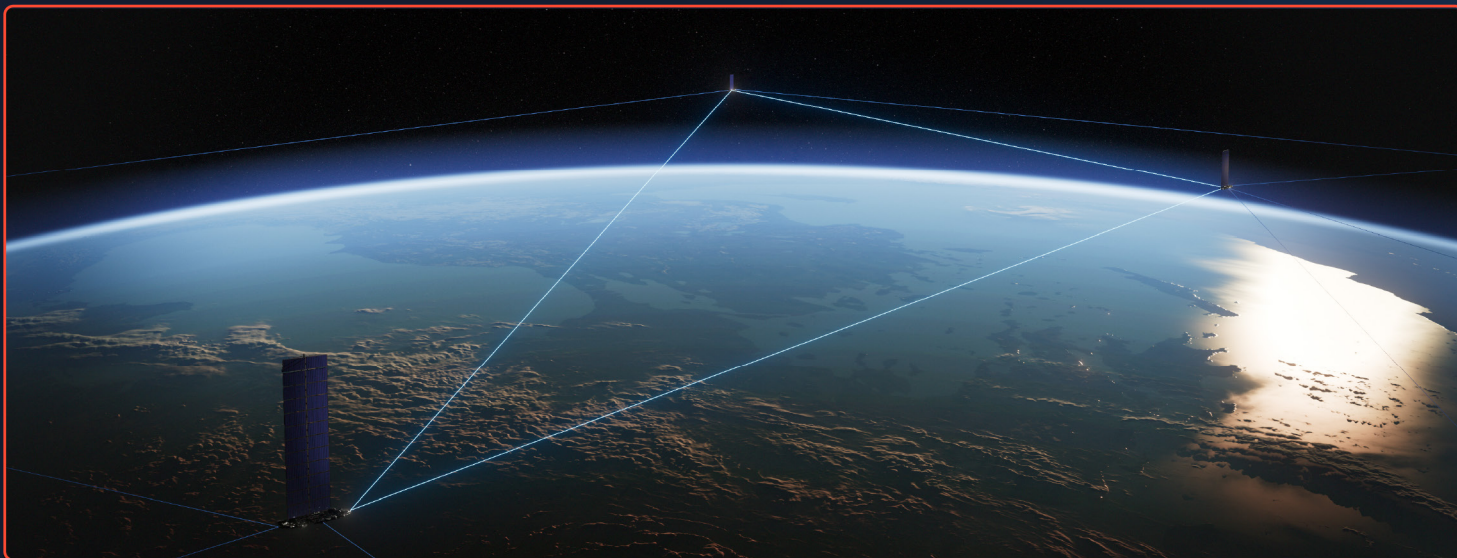
SpaceX plans to connect their established Starlink constellation and extensive ground system to user spacecraft through optical intersatellite links to enable high rate, low-latency data relay services for customers in low-Earth orbit (LEO).

The Starlink network, consisting of over 5,500 LEO satellites, will link to user spacecraft using laser based optical communication terminals created by SpaceX. Once integrated into a spacecraft, the terminals, known as Plug and Plaser, will allow users to link to the Starlink constellation to tap into a mesh network

capable of providing services for a variety of missions.

A SpaceX laser terminal, coupled with an avionics bridge, make up the Plug and Plaser, which will interface with third-party spacecraft. Inter-satellite optical links will allow 3rd party satellites to directly connect to user end-points on the ground using the encrypted communications across the open Internet with autonomous scheduling, increasing bandwidth and decreasing latency by orders of magnitude as compared to traditional direct-to-earth solutions.

NETWORK ARCHITECTURE



SpaceX will leverage the powerful mesh network of their established Starlink satellite constellation and leading-edge laser communications technology to provide data relay services for a variety of missions.

KEY FEATURES

- Reputable Starlink LEO constellation with proven reliability
- Enabled through leading-edge laser communication technology
- Mesh communications network constructed of optical intersatellite links
- Always-on capability with no prioritization or de-confliction required enabled by autonomous scheduling and data routing
- Bidirectional communication from and to anywhere in less than 100ms

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CSP is managed by NASA's Glenn Research Center in Cleveland, Ohio under the direction of the Space Communications and Navigation (SCaN) program. SCaN serves as the program office for all of NASA's space communications activities, presently enabling the success of more than 100 NASA and non-NASA missions.

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