NASA's LunaNet Lunar Communications and PNT

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June 25, 2024 International Committee on GNSS Intercessional

Vienna, Austria

Topics

Lunar Communications Relay and Navigation System

Architecture Evolution

Lunar Systems Relationships

LunaNet

Framework for Standardized Interoperable Services, umbrella under which many providers collectively work. *Architecture* originally documented by IOAG Lunar Communications Architecture WG. Interoperability defined in a *specification*.



Initial Capability Defined for LCRNS

- IOC phase will begin Sept 2026 with IOC-Alpha with a minimum of one Augmented Forward Signal (AFS) broadcast over the South Pole region.
- IOC-Bravo by mid-2028 with a minimum of two AFS over the same South Pole region.
- Service continues over an expanded South Pole volume with IOC-Charlie broadcasting a minimum of four AFS by Sept 2029, also meeting a requirement for GDOP for a limited portion of an Earth day.
- The LCRNS AFS will comply with the LunaNet Interoperability Specification.
- LCRNS orbit(s) will be defined by the service provider and are expected to meet the Signal-in-Space-Error.
- It is expected that LCRNS will be capable of providing two-way measurements from Point-to-Point signals.
- Service delivery is reliant on defined lunar geodetic system and lunar time.



LCRNS IOC-C Service Volume



LCRNS IOC-C Nav Service Volume

South Pole Service Volume (-90° up to -75° latitude, 200 km altitude); AFS/LANS available with GDOP <6 for 40% of Earth Day; P2P (PNT-over-comm) links expand the offerings.



FUTURE Minimum Service Volume

Full lunar nav global service volume; Continuous service; Global capability.

Overview of Architecture Evolution

Initial Phase: By 2025 - 2026

- DTE service for Near Side lunar orbiters and surface missions
- Intensive relay service for South Pole and a selected area of the Far Side
- Initial PNT service and lunar surface networks
- LunaNet interoperability established from the beginning

Growth Phase: 2027-2030

- ⊙ Continued DTE service for Near Side
- Expanded relay service for South Pole and multiple Far Side regions
- Limited relay services for other globally-dispersed locations and orbiters
- PNT Lunar Augmented Navigation Service
- ⊙ Surface networking
- ⊙ Introduction of optical links



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