



Draft Policy ARIN-2026-1

Taking IP To Other Planets (TIPTOP)

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Problem Statement



Current Text (27 May 2026)

Organizations conducting space exploration missions are deploying IP-based networking infrastructure beyond Earth orbit, including on the Moon and in other deep-space environments. These networks currently utilize address space allocated independently from multiple RIRs, including ARIN.

As international missions expand and networks operated by multiple agencies interconnect to share communications infrastructure and provide operational redundancy, the use of unrelated terrestrial address allocations introduces routing scalability concerns. Existing allocations are not aligned with the topology of outer space communications networks, which may require the advertisement of numerous disaggregated prefixes when networks interconnect.



Problem Statement Continued

Outer space communications infrastructure is expected to develop around natural clusters near celestial bodies, with limited communication links between those regions. Addressing structures that reflect these topological boundaries could improve route aggregation and long-term routing scalability.

Implementation of any such addressing framework would depend upon broader coordination within the Internet technical and registry communities, including determination by the IETF and IANA that dedicated address resources and registry coordination are necessary, concurrence among the RIRs regarding operational responsibilities, and a determination by the ARIN Board of Trustees that participation is consistent with ARIN's mission.

For the purposes of this policy, outer space includes the Moon and regions beyond Earth orbit, but excludes low Earth orbit (LEO) and geostationary Earth orbit (GEO).

Policy Statement



ARIN may allocate IPv4 and IPv6 address space to organizations operating IP networking infrastructure in outer space, including beyond Earth orbit and on the Moon. Allocations are intended to support interagency connectivity, operational redundancy, and scalable routing in emerging space networks.

Addressing structures should be organized hierarchically to reflect major celestial regions—such as the Moon, Earth–Moon Lagrange points, asteroid belt, and other planetary systems—enabling route aggregation where feasible.

Participation in aggregation is voluntary, and organizations may advertise more specific prefixes when necessary.

This policy applies to government, research, and commercial space operators, and encourages coordination among agencies to facilitate efficient address usage and scalable routing for outer space networks.

Policy Statement Continued



Definitions (Add to NRPM Section 2)

2.xx Extra-Terrestrial Network (ETN) An ETN is defined as any IP-based networking infrastructure operating physically beyond the Geostationary Earth Orbit (GEO) arc, including but not limited to Lunar, Martian, or deep-space deployments.

Policy Statement Continued



IPv4 Policy (Add to NRPM Section 4)

4.11 IPv4 Allocations for Extra-Terrestrial Networks ARIN shall maintain a dedicated pool or specific registration guidelines for organizations operating ETNs to ensure routing scalability.

4.11.1 Eligibility: Applicants must demonstrate a direct operational requirement for networking infrastructure located beyond Earth's orbit. Eligible entities include government agencies, research institutions, and commercial operators.

Policy Statement Continued



4.11.2 Topological Hierarchy: To prevent global routing table exhaustion, allocations for ETNs should be issued from contiguous blocks where possible, designated by “Celestial Regions” (e.g., Luna, Mars, Lagrange Points).

4.11.3 Utilization Requirements: Standard utilization requirements (Section 4.2.4) apply, but ARIN may grant exceptions for high-latency “cold storage” nodes or orbital relay constellations where traditional “active host” pings are impractical for verification.

Policy Statement Continued



IPv6 Policy (Add to NRPM Section 6)

6.12 IPv6 Allocations for Extra-Terrestrial Networks Due to the vast distances and high-latency nature of deep-space communications, IPv6 is the preferred protocol for ETN deployments.

6.12.1 Minimum Allocation: The minimum allocation size for an ETN operator shall be a /48, or a size sufficient to allow for hierarchical subnetting per celestial body.

Policy Statement Continued



6.12.2 Planetary Aggregation: Organizations are encouraged to aggregate all prefixes within a specific gravity well or orbital system to a single aggregate route for advertisement back to Terrestrial Ground Stations (TGS).

6.12.3 Sparse Allocation: ARIN will employ sparse allocation techniques within the ETN block to allow for the future growth of lunar and planetary colonies without fragmenting the space.

History

Action	Date
Proposal	3 March 2026
Draft Policy	24 March 2026
Revised	27 March 2026

Staff and Legal Review

(1 April 2026)

Staff Understanding: The Draft Policy seeks to establish provisions within the NRPM for the allocation of address space to organizations operating IP networking infrastructure beyond Earth orbit (Extraterrestrial Networks, or ETNs). The Draft Policy introduces definitions, eligibility criteria, and allocation practices intended to support routing scalability through hierarchical addressing aligned with celestial regions.

Specifically, the Draft Policy calls for:

- A. Establishment of a dedicated allocation pool or registration guidelines within ARIN for address space used by networks operating in outer space.
- B. Introduction of new definitions and eligibility criteria for Extraterrestrial Networks (ETNs) within the NRPM.
- C. Development of allocation practices intended to facilitate routing aggregation for deep-space networking environments, including hierarchical addressing aligned with celestial regions.

Staff and Legal Review

Continued

Per discussion on ARIN-PPML, the Draft Policy appears primarily motivated by concerns regarding current operational practices among space agencies deploying deep-space networking infrastructure. In particular, the Draft Policy seeks to address current use of address space from existing allocations without coordination for long-term routing aggregation across shared deep-space communications infrastructure and to establish a coordinated addressing framework intended to improve routing scalability in such environments.

The Draft Policy amends the NRPM directly and therefore falls within the procedural scope of ARIN's Policy Development Process (PDP). However, it raises several considerations related to clarity, implementability, and alignment with ARIN's role in the Internet number resource system.

Staff and Legal Review

Continued

The Draft Policy seeks to improve routing aggregation through coordinated allocation practices for ETNs from dedicated, contiguous address blocks reserved for deep-space use. Without such address space, networks built using ad hoc IPv4 and IPv6 allocations would not support meaningful aggregation.

Accordingly, the availability and source of dedicated address space are prerequisites for achieving the Draft Policy's stated objectives and should be clearly specified as an underlying assumption of the policy.

The IETF could direct IANA to allocate dedicated address space for this purpose, including coordination with the RIR system for appropriate allocation and registry services for the relevant operational community (including, for example, interim administration by an existing RIR of registry and policy development functions until such time as the establishment of a distinct Internet number registry organization by that community).

Staff and Legal Review

Continued

While ARIN served a “rest of world” role at the time of its formation (i.e., requests not handled specifically by RIPE NCC or APNIC were handled by ARIN), it is not clear that the ARIN Board would consider ARIN serving as the “default” registry for this purpose, even on an interim basis, to fall within the scope of ARIN’s current mission. If the Board were to determine that providing such services is compatible with ARIN’s mission (e.g., until such time as there is a deep-space Internet Number Registry organization), then ARIN could provide such services pursuant to policy recommended by the community and adopted by the Board. Such a determination would likely depend on both community sentiment and explicit acknowledgment by the other RIRs that such a role is acceptable.

Staff and Legal Review

Continued

The Draft Policy, as written, presumes that these prerequisite conditions have already been satisfied, and these conditions should be clearly stated in the policy to provide a shared understanding of the circumstances under which the policy could be adopted: (a) that the IETF has determined that a dedicated address block is required; (b) that IANA has allocated appropriate IPv6 and/or IPv4 address space for this purpose and coordinated with the RIRs to provide operational registry services for that space; (c) that the ARIN Board of Trustees has determined that providing such services is consistent with ARIN's mission; and (d) that the other RIRs have concurred with ARIN serving in this capacity.

Due to the complexity of this Draft Policy, active discussions, and necessary confirmations described above, a comprehensive staff review will be necessary once this Draft Policy is further developed.

Staff and Legal Review

Continued

Implementable as Written?: No

Impact on ARIN Registry Operations and Services: N/A

Legal Review: At this preliminary stage, Legal has identified several areas for further consideration, including potential jurisdictional questions, coordination with other RIRs, and the source of IP resources. Additional clarity in definitions and alignment with the service region model will also be important. These observations are based on the Draft Policy in its current form, and a more comprehensive legal analysis may be provided if and when the Draft Policy is further developed.

Implementation Timeframe Estimate: N/A

Implementation Requirements: N/A

Proposal/Draft Policy Text Assessed: 24 March 2026

Policy Impact

TIPTOP: What's Changed Since ARIN 57?

April 2026 → September 2026

- The ARIN draft has progressed through additional policy discussion.
- The IETF TIPTOP Working Group has advanced its **use-case and architecture documents**.
- The IETF has significantly developed the discussion around **dedicated address space for space**.
- A **new joint IPv6 address-space draft** was submitted in September.

Policy Impact

IETF TIPTOP — September 2026

Working Group Documents

Use Cases & Requirements

draft-ietf-tiptop-usecase-02

- Published July 6, 2026
- TIPTOP WG Document
- Defines deep-space networking characteristics, use cases, and requirements.
- Addresses Moon, Mars, and future deep-space networking.

IP Architecture

draft-ietf-tiptop-ip-architecture-01

- Published July 5, 2026
- TIPTOP WG Document
- Defines an architecture for IP in deep space.
- Addresses intermittent links, buffering, transport behavior, and long-delay environments.
- Applies to Moon, Mars, and general interplanetary networking.

Policy Impact

The Big Change: Address Space

Address Space Has Moved From Separate Proposals Toward a Joint Draft

In April/May, there were separate address-space proposals, including:

- draft-li-tiptop-address-space-02
- draft-kumari-tiptop-address-space-00

The Li draft was issued a **Call for Adoption**, but was not yet a WG document.

Then in August/September:

- The two address-space approaches were discussed on the TIPTOP mailing list and in various RIR and IETF meetings.
- The planned September meeting was cancelled because the authors had agreed on a path to merge the proposals.

Policy Impact

The Big Change: Address Space

On September 15, the joint draft was published:
`draft-limarsjenwar-tiptop-address-space-00`

IPv6 Address Space for Space

Authors: **Tony Li • Marshall Eubanks • Ran Atkinson • Warren Kumari • Jen Linkova**

The draft:

- Requests IANA allocation of IPv6 address space specifically for space environments.
- Calls for suballocation within celestial bodies.
- Says the NRO will determine how address resources are allocated and assigned for and within celestial bodies.
- Makes topological address aggregation a key requirement.

Community Feedback

- Support for continuing the work while the IETF TIPTOP effort develops.
- Interest in coordination with IETF, IANA, and the RIR community before finalizing the address-space model.
- Questions about the role of IPv4 and IPv6 in future space networks.
- Interest in how celestial-region addressing and aggregation should work operationally.
- Recognition that the technical and policy work need to remain aligned.
- Community input continues to be important as the IETF address-space work evolves.

Questions for the Community

What information would the community need from the IETF/IANA process before the ARIN policy can be proceed?

Should aggregation be a policy requirement, an allocation design principle, or simply an operational goal?