

# An Architecture for IP in Deep Space

draft-many-tiptop-ip-architecture  
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# Problem Statement

- How do we make IP work in inter-planetary networks with:
  - Really long delays (4-20 minutes one way)
  - Link outages for hours or days

# Non-goals

- We are NOT trying to boil the ocean.
- Not everything will work well:
  - Web surfing
  - Terminal access (ssh, telnet)
  - Facetime
  - Anything interactive
  - Anything with low delay or jitter requirements
  - Arbitrary any-to-any communications



# Goals

(see draft-many-tiptop-usecase)

- Bulk operations
  - File Transfer
  - E-mail
  - Non-interactive data streams
- Spacecraft control & management planes
- Relays with tweaked IP stacks that isolate changes
  - A 'limited domain'



# Network Layer

- Forwarding Plane
  - Extremely deep buffers to handle link outages
  - Possible rerouting to handle unexpected events
- Addressing
  - Hierarchical, with planetary prefixes (see draft-li-tiptop-address-space)
- Routing
  - Scheduled static over long delay links; conventional otherwise

# Transport Layer

- UDP
  - No new issues
- QUIC
  - Tweak parameters for long delays
  - Multiple streams
  - Pre-opened connections
- HTTP (e.g., curl transfers, REST)
  - Some tweaks needed for timeouts

# DNS

- Limit scope of resolvable names
- Use caching servers

# Management Plane

- NETCONF and RESTCONF, as usual (using space-profiled QUIC)



Questions?

# Ask

- WG Adoption