

IP in Deep Space:

Key Characteristics, Use Cases, and Requirements

draft-many-tiptop-usecase
IETF 122 TIPTOP WG Meeting

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<https://datatracker.ietf.org/doc/draft-many-tiptop-usecase/>

This draft targets the WG charter item for "Key characteristics, uses cases, and requirements" (Informational).

Note: Some topics may migrate between the other architecture draft and this one.

- Architecture: <https://datatracker.ietf.org/doc/draft-many-tiptop-ip-architecture/>
- Tony will discuss architecture later in this meeting.

Topics Covered

Provides background/context on deep space link layer, operations, and application layer topics.

Considers common facets, as well as points specific to different mission operating locations (Moon, Mars, Lagrange points, etc.).

Develops requirements for consideration in the other WG documents.

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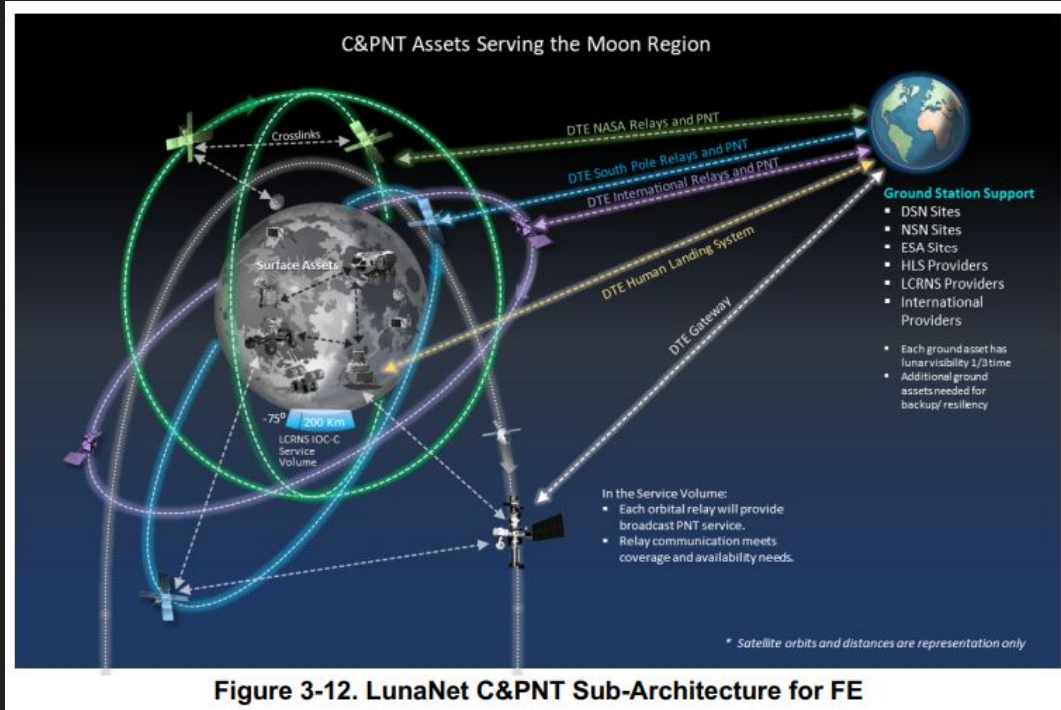
Challenges

We are trying to have a general document, but there are many specific details that vary between missions, and we try to be clear about those.

- Differences between Moon and Mars.
- Differences between crewed and uncrewed missions.
- Differences between Lagrange point and surface-based missions, etc.

For requirements, we want to focus on the similarities (needs in common) and accommodate the distinctions that are needed.

Example: Lunar Assets



May have richer connectivity options than Mars.

Much lower RTTs than Mars (seconds vs minutes), driving different ways of operating.

Differences between surface and orbiting missions.

Similar in some aspects to Lagrange point missions.

From Moon To Mars ADD:

<https://www.nasa.gov/wp-content/uploads/2024/12/esdmd-001-add-rev-b.pdf?emrc=194b15>

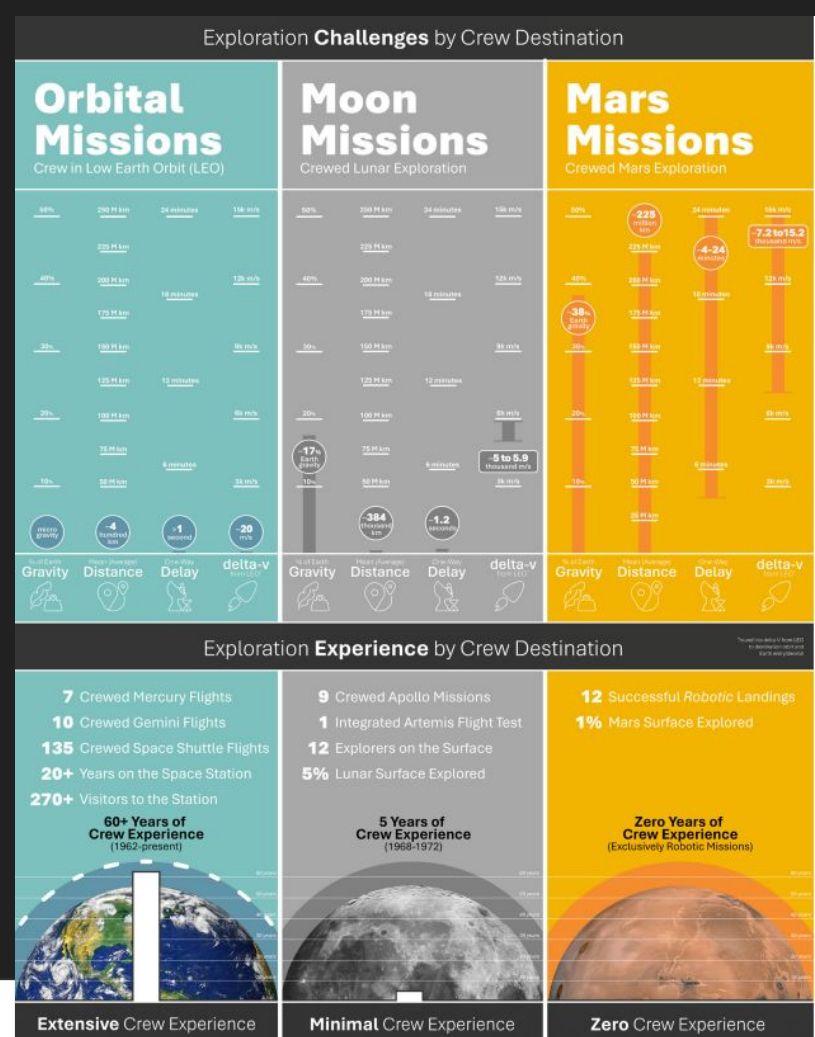
Example: Mars

Even less is certain about how networks will evolve for Mars missions.

Likely less routing opportunities and longer disconnection periods compared to other settings.

Similarities:

- Application aspects:
 - Commanding (low rate)
 - Telemetry
 - Science data (bulk transfer)
 - Messaging
 - Etc.
- Security aspects.
- Stated goal is to re-use many systems developed for lunar missions.



From Moon To Mars Architecture Executive Summary:

<https://www.nasa.gov/wp-content/uploads/2024/12/2024-architecture-executive-overview.pdf?emrc=4a55b3>

Requirements Areas (Current Draft)

1. Store-and-forward
2. Time
3. Signaling and Exchanges
4. Bandwidth
5. Addressing and Routing
6. (others planned to be added on next chart)

Not much time to discuss these in depth today; continue to discuss details on mailing list and in future WG meetings, after adoption.

Planned Additions

1. Add more background on why networking is becoming important.
2. Add aspects of transport requirements.
3. Add description of security requirements.
4. Address comments from Padma's review thread on the list.

Next Steps

Good feedback is coming in on the mailing list.

Should ask for WG adoption.