

# FROM MISSIONS TO INFRASTRUCTURE

Building the Interplanetary Network

**SPATIAM**  
INTERPLANETARY INTERNET

Dr. Alberto Montilla, CEO  
CEO, Spatiam  
STINT'26 Keynote  
Approved for Publication

A composite image of the Earth, Moon, and Mars in space. The Earth is on the left, showing the Americas with city lights. The Moon is in the center, and Mars is on the right. The background is a deep space scene with the Milky Way galaxy and numerous stars.

# Permanent human activity and presence across the Solar System

**Our destination**

# Why do we go now? Current and emerging drivers

## EXPLORATION

---

Learn to live beyond Earth

## SCIENCE

---

Study the universe and our place in it

## ECONOMY

Use space resources for humanity

# Three hypotheses in current approach

**01** Moon experience informs Mars operations

---

**02** Infrastructure shortens mission cycles and lowers cost

---

**03** A durable space economy finds commercial customers

# Traditional view of missions

- Missions deliver a series of key outcomes → **science & exploration.**
- Cost is at service of mission success → **It drives each separate system.**
- Mission Controls everything → **Payload users follow.**
- Return on Investment (ROI) is not measured in \$\$\$, it is in human knowledge → **Only the government can carry them on.**

| MISSION A      | MISSION B      |
|----------------|----------------|
| SPACECRAFT     | SPACECRAFT     |
| DEDICATED LINK | DEDICATED LINK |
| GROUND         | GROUND         |

A composite image of space featuring the Earth's horizon with city lights, the Moon, and Mars in the background.

**Businesses of all types & Industries are getting ready for space, their missions need to deliver extraordinarily fast ROI.**

**A Core Challenge for doing business in space**

# Shared Infrastructure as a solution

**Infrastructure can outlive the mission that first uses it**

---

**Lunar Comms  
Infrastructure cost:** From \$1B\* capital

**Mars Comms  
Infrastructure cost:** From \$3B\* capital

**Operating cost:** From \$100M annual

# Good examples of early space shared infrastructure

## Ground

- NASA Near Space Network (NSN)
- ESA ESTRACK
- NASA Deep Space Network (DSN)

## Space

- NASA Tracking and Data Relay Satellites (GEO) – TDRS
- Mars Relay Network (MRN)
- International Space Station (ISS)

These systems are the foundation  
of upcoming designs

# Infrastructure progress (Moonbase)

01

LAUNCH



02

LANDING



03

MOBILITY



04

COMMUNICATIONS



05

NAVIGATION



06

HABITATS



07

POWER



Service Delivery Contracts in place

07

# The lunar service model is taking shape with Communications as a Service (in progress) Service

– LunaNet Service Providers

## Hardware (in progress)

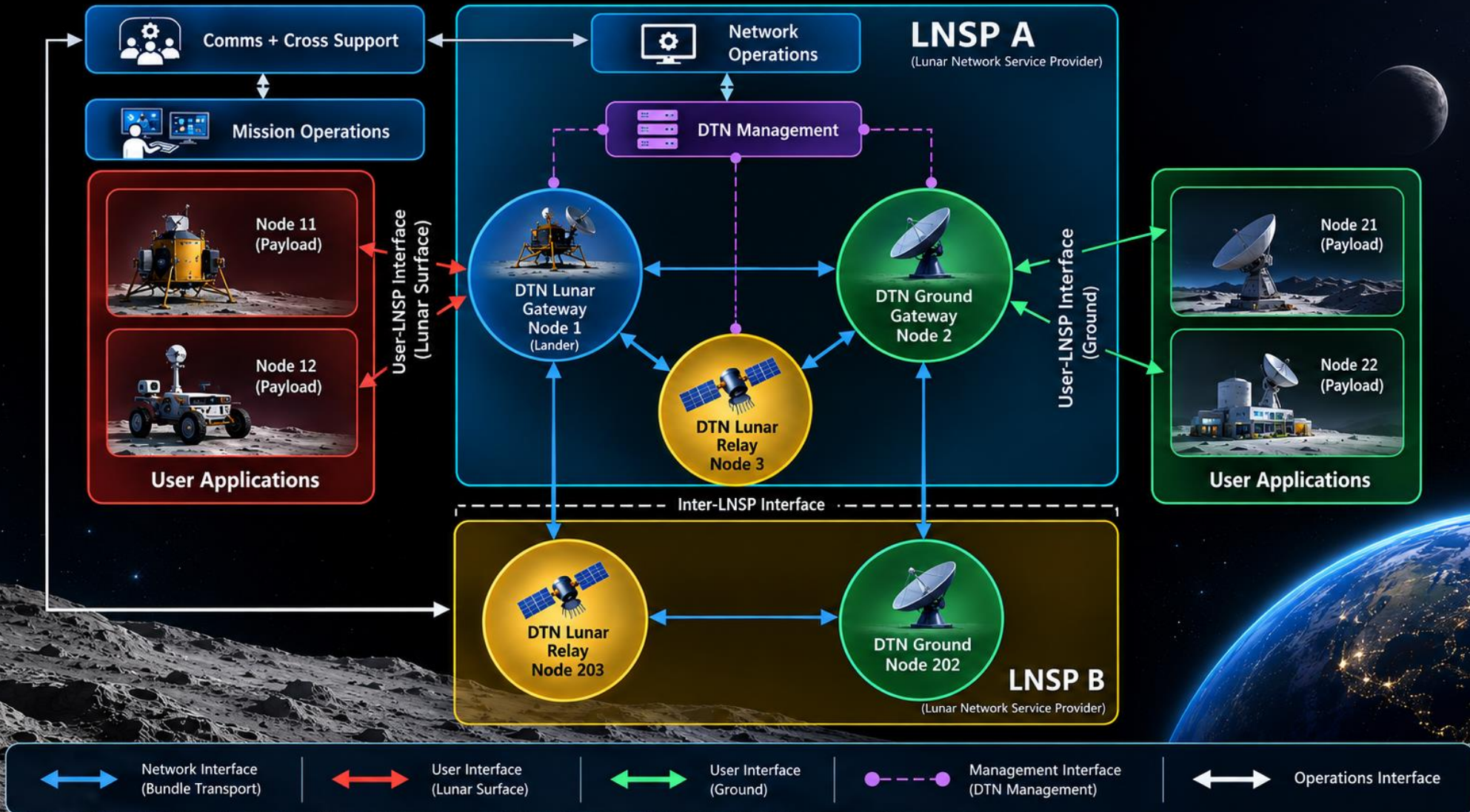
- Lunar Relay
- Ground Systems
- Lunar Terrain Vehicles
- +infra (HLS+)
- Landers (CLPS)?

## Networking

- LunaNet (IP + DTN)



# LunaNet IS the forward-looking architecture for the Moon and Mars





**We are in the lunar network transition phase**

**LunaNet is **not yet** available as operational infrastructure**

Current missions and some forward looking projects are inconsistently using or requiring standards network solutions.

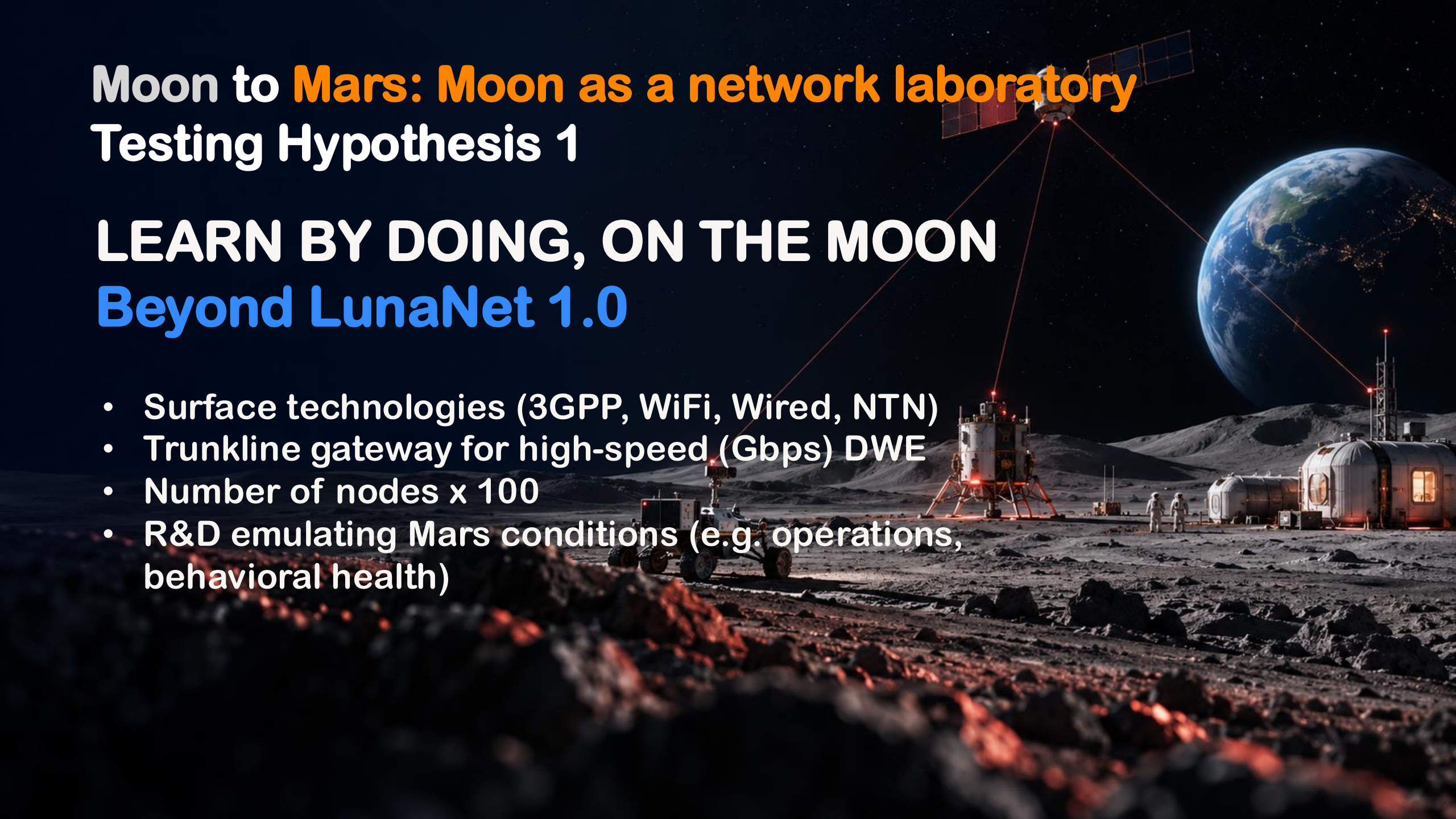
# Moon to Mars: Moon as a network laboratory

## Testing Hypothesis 1

## LEARN BY DOING, ON THE MOON

### Beyond LunaNet 1.0

- Surface technologies (3GPP, WiFi, Wired, NTN)
- Trunkline gateway for high-speed (Gbps) DWE
- Number of nodes x 100
- R&D emulating Mars conditions (e.g. operations, behavioral health)



# Operate at Mars

## Moon to Mars

From Mars Relay Network (MRO) to  
Mars Telecommunications Network  
(MTN)

Based on LunaNet  
DTN + IP

NASA issued a request for proposals for the first Mars  
Telecommunications Network Satellite Relay for \$700M.

# The unresolved economics

## Testing hypotheses 2 and 3

### Can infrastructure lower mission cost?

Communications savings depend on the mission requirements

**Space Agencies funded networks are built for human exploration**

---

### Who pays before commercial demand reaches scale?

Government investment · contracts · incentives · customers

**Long-term viability requires commercial customers**

# The transition

## MISSION SYSTEMS

Dedicated links

---

Mission ownership

---

Bespoke interfaces

---

Single mission planning

---

## INFRASTRUCTURE

Shared networks

---

Service consumption

---

Common interfaces

---

Multiple users and providers

---

**We are here**

# Look ahead 10 years

- Moon and Mars as participants in Interplanetary Networks
- A growing set of commercial assets will be on lunar surface and orbit. Humans are living on the Moon.
- The network is an enabler of the space economy.
- Positioning, Navigation and Timing operates at scale.
- Some industries will flourish; several companies will benefit.
- Access to space becomes a question of enough money.
- We will know more about the universe and will become interplanetary species.

From Missions to Infrastructure

# FROM MISSIONS TO INFRASTRUCTURE

Building the Interplanetary Network

**SPATIAM**  
INTERPLANETARY INTERNET

Dr. Alberto Montilla, CEO  
CEO, Spatiam  
STINT'26 Keynote  
Approved for Publication