esa

space for inspiration

ESA ESTEC
12-13 July
2022

SHAPE THE FUTURE OF MOON EXPLORATION

What would you do when Lunar Communications and Navigation Services (LCNS) will be available?

Moonlight Initiative
Call for Ideas and Use Cases

Part of the **Moonlight Initiative** User Engagement activities. Call closed on 30 April 2022.

Objectives:

- Stimulate Demand for LCNS services
- Better understand future needs for LCNS services
- Identify credible **lunar use cases**

- **36 applications** received from **13 nationalities**
- **Majority** from **commercial companies** (20)

- **Next steps:**
  - invite best ideas to one-to-one meeting at ESA
  - direct them to most suitable ESA-support mechanisms to mature ideas

Nationality	Entries
Germany	22% (8)
Italy	19% (7)
Spain	14% (5)
Other (non ESA MS)	8% (3)
Canada	5% (2)
France	5% (2)
Greece	5% (2)
Poland	5% (2)
Finland	3% (1)
Luxembourg	3% (1)
Netherlands	3% (1)
Norway	3% (1)
Switzerland	3% (1)

Entity	Entries
Commercial companies	55% (20)
Individuals	25% (9)
Academia	11% (4)
Space Agency	3% (1)
Public Org.	3% (1)
Not-for-profit	3% (1)

→ LCNS CALL FOR IDEAS AND USE CASES – RESULTS

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ESA ESTEC
12-13 July
2022

OPEN LUNAR
FOUNDATION

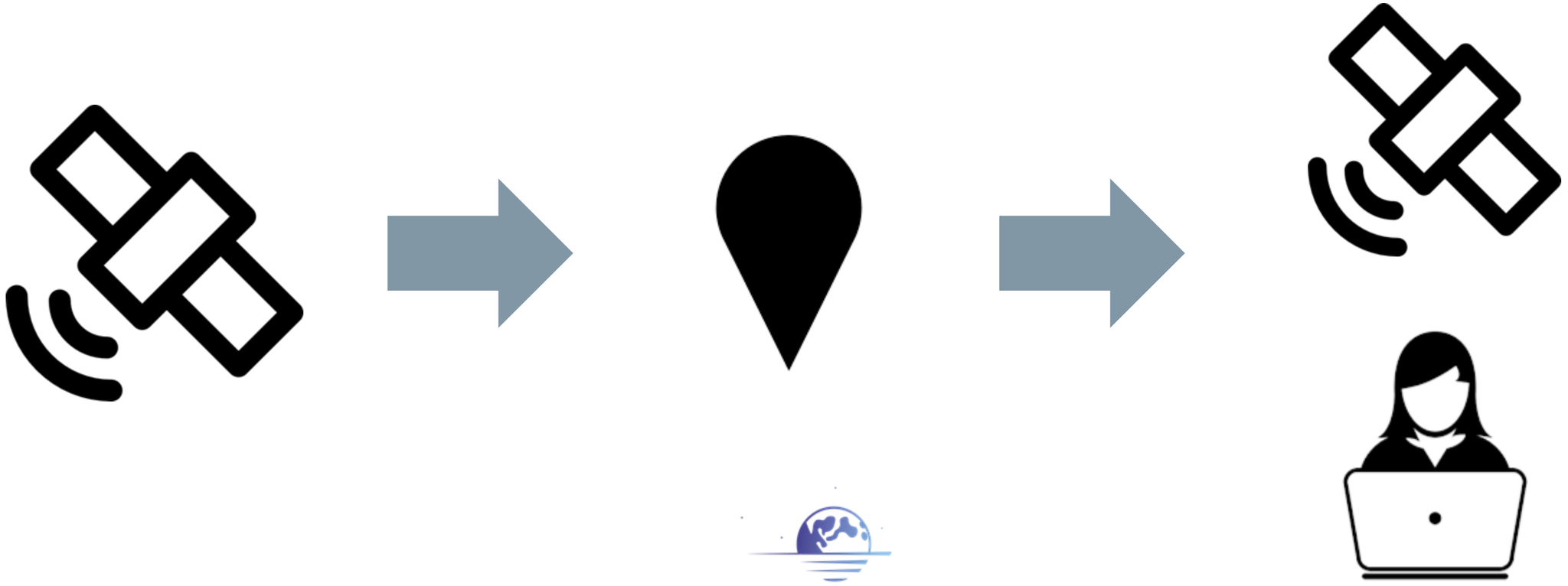
Lunar Object Registry

July 12, 2022

Jacob Malthouse
jacob@openlunar.org

A clear and accurate understanding of what is happening on and around the Moon.

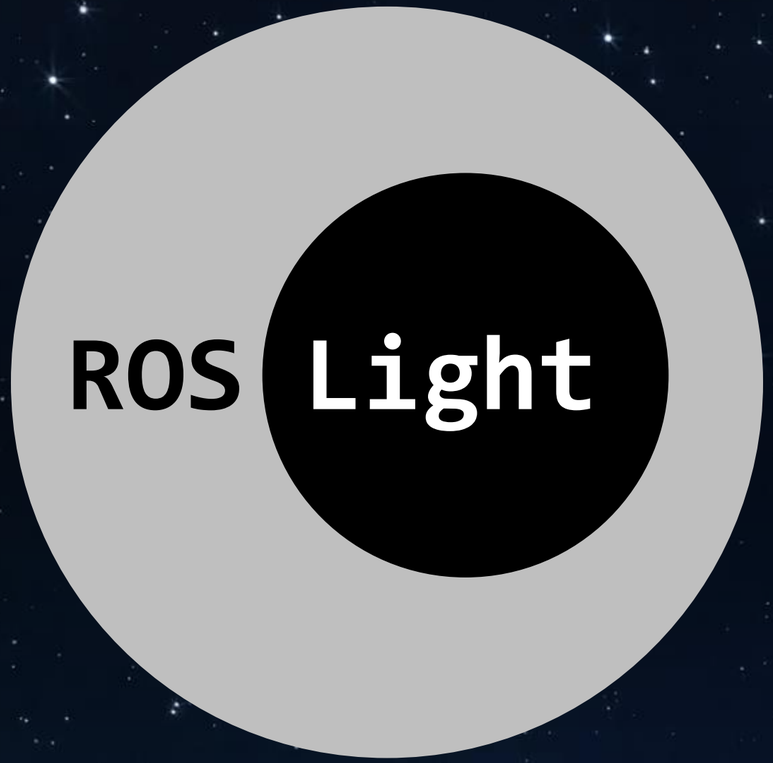
Share **where** you are.
Share when to **notify**.



Benefits

- Demonstrate **citizenship**
- Foster **collaboration**
- Reduce **risk**
- Low **cost**

ROSLight - Gateway for robotic lunar missions



VISION SPACE

Libre Space Foundation

Space for Inspiration, 12/06/2022

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LUNARS

LUNar
Autonomous
Robotic
Swarms

SPACECLICK®

MIST LAB.CA

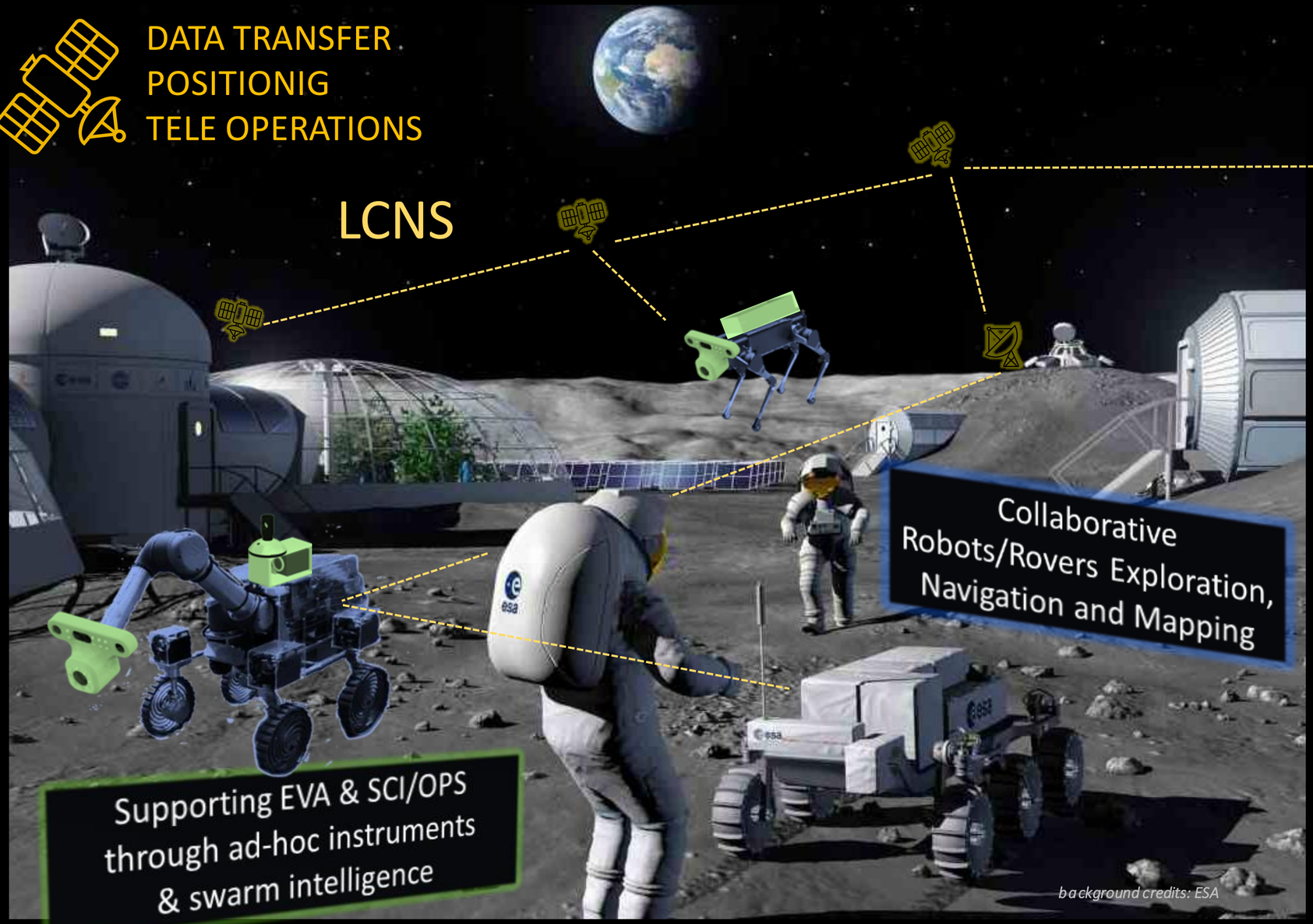
Heterogeneous robots become intelligent swarms

MIST SPACECLICK

SWARM OPERATIONS

DATA TRANSFER
POSITIONIG
TELE OPERATIONS

LCNS



Swarm Data Acquisition,
Monitoring & Control Platform

Open Data Distribution &
Public Engagement Platform
(external activity)

FIELD

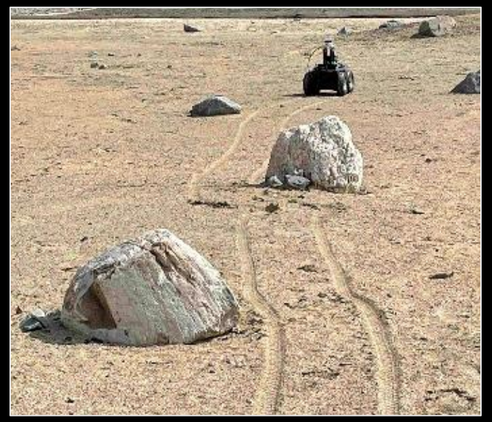
GROUND

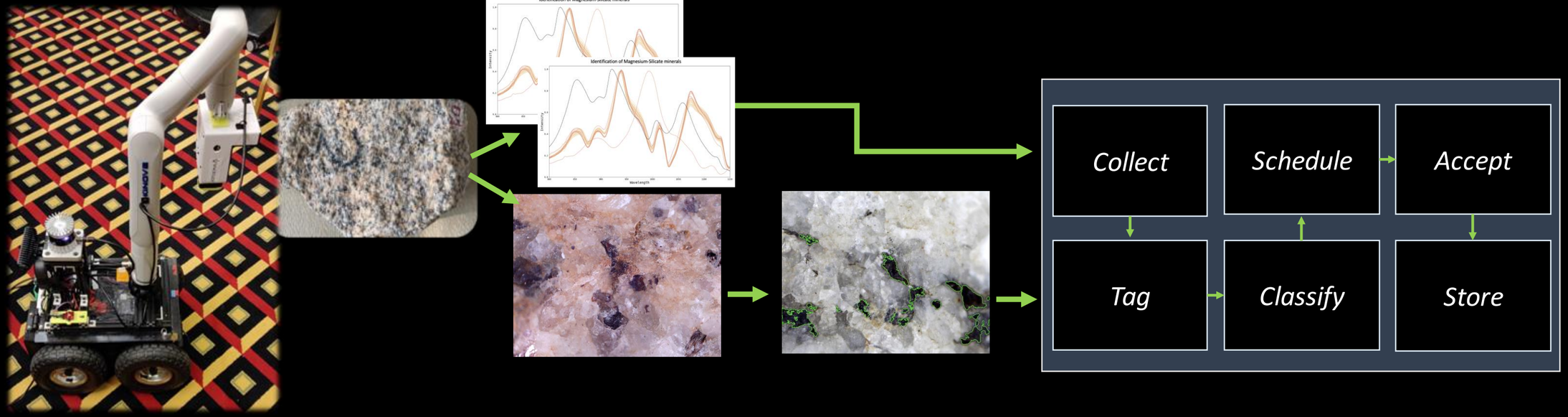
Unifying Robot Autonomy & Science Pipeline

MIST SPACECLICK

SCIENCE PIPELINE

EV/Crew support ISRU O2 Extraction safety
search & rescue improved mobility digging
extraction logistics situational awareness
collaborative 3D printing engineering assessments
maintenance surveillance scientific operations





Prospecting Probe ·····▸ Rock Recognition Suite ·····▸ Prospecting OS

Autonomous scouting + collaborative site area identification + sampling

SOCIAL PORTAL FOR LUNAR EXPLORATION

SPACE MISSION

LCNS

SILVER DOT

INFORMATION DISTRIBUTION

SPACECLICK®

AGGREGATION PLATFORM

Science sensors data

Rovers & Asset positions

Videos

Extra Vehicular Activities (EVA)

Pictures

SILVER DOT

Historical data

PUBLIC ENGAGEMENT

- PR
- Journalism
- Educational
- Gaming
- Collaborative Exploration
- Motivational Support

Interactive learning

Knowledge Retention

Citizen science

Digital twinning

Open access

SOCIAL NETWORKING

SPACECLICK

SILVER DOT + LCNS

A Web-Portal for Space Missions

DATA TRANSFER

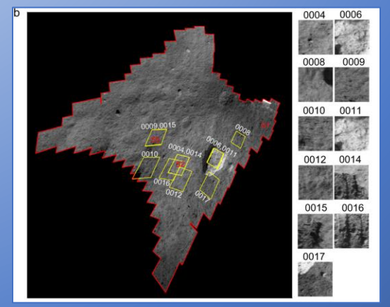
Mission and Post-mission data aggregation and analysis

- Independent scientists
- General public and journalists
- Students in schools, universities, research

POSITIONING

Enable access to the information coming from the lunar surface

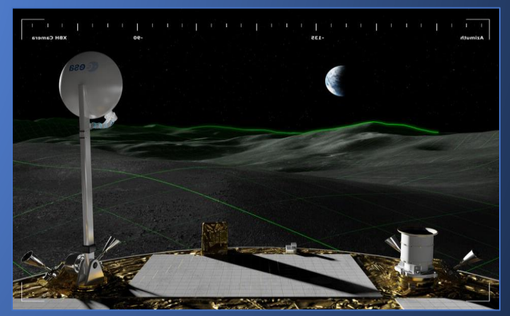
- Real time activity tracking
- Archive data
- Public networking



TELE OPERATIONS

Ad-Hoc ESA Organized PR Events

- Surface assets supervised remote control
- Polls and challenges
- Targetized outreach



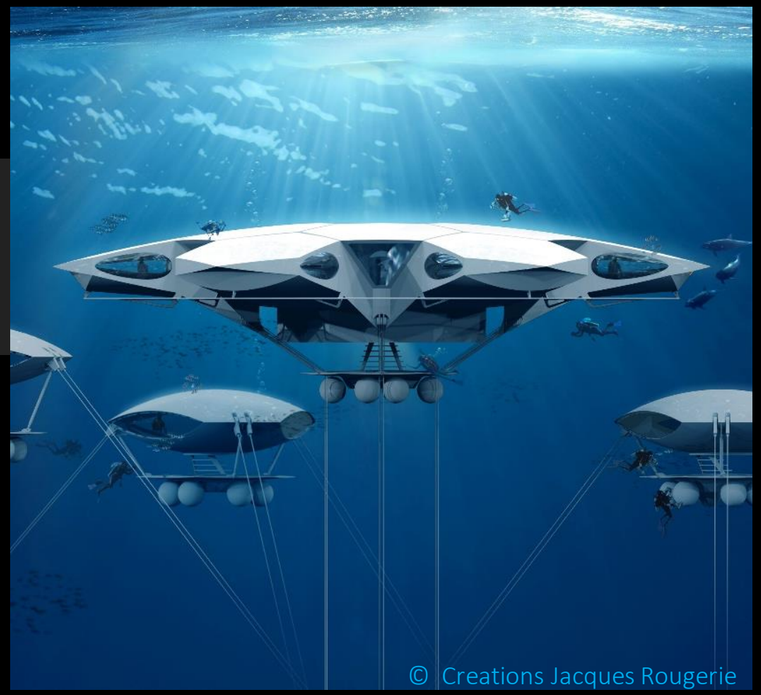
SPACECLICK

SPARTAN SPACE

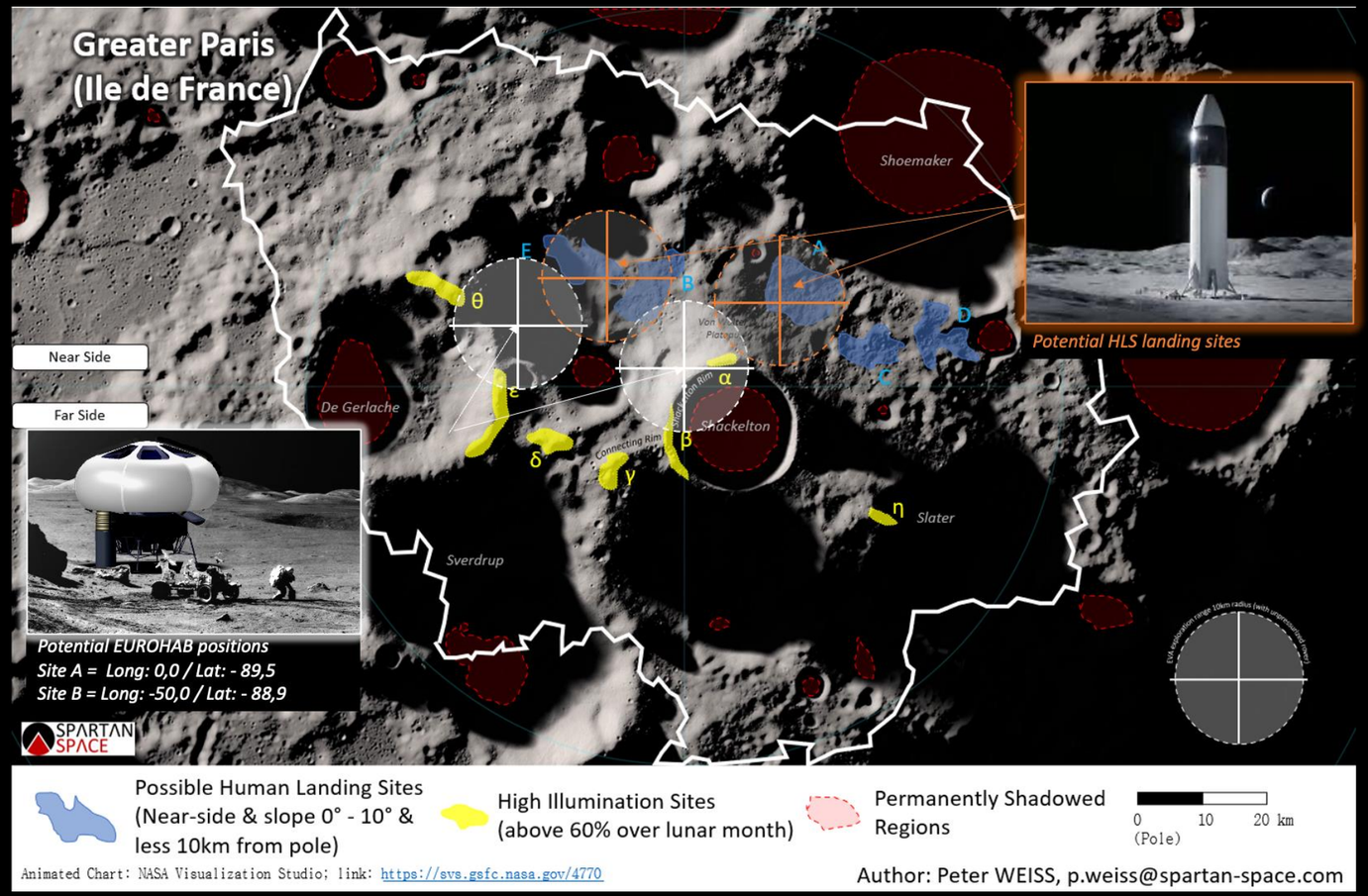
Elevator Pitch Session – LCNS Call

12/07/2022 - ESTEC

Eurohab, credits: N. Singh


© Creations Jacques Rougerie

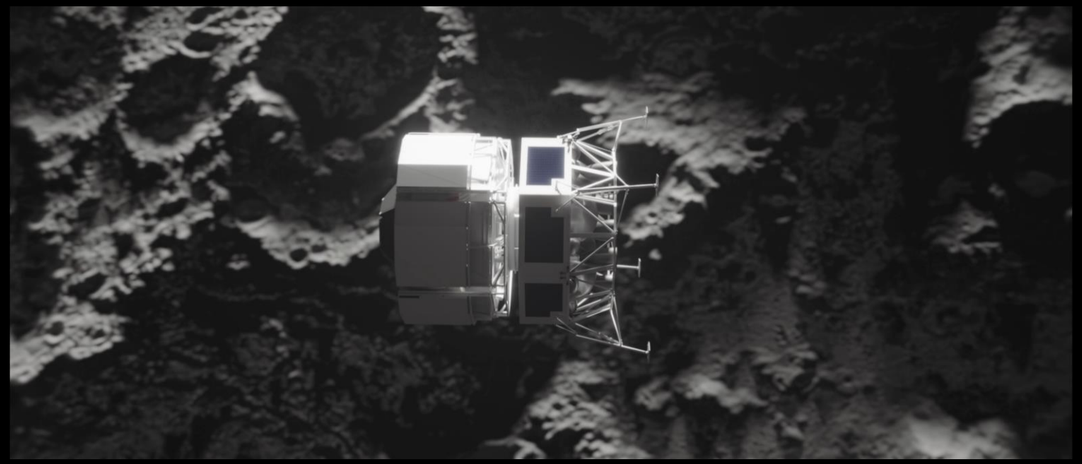
EUROHAB

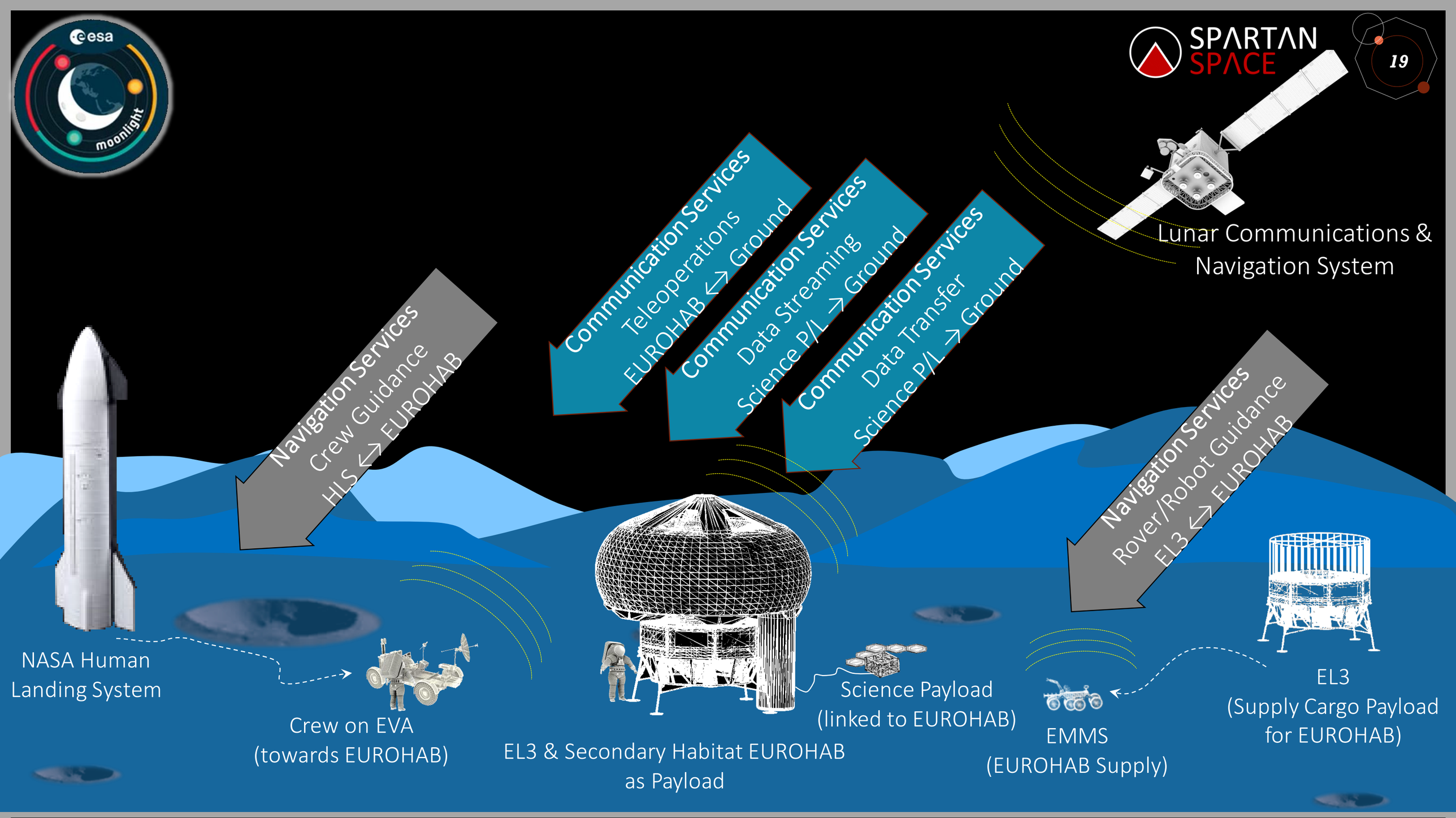


EUROHAB is a Secondary Habitat, designed as an EL3 payload.

It is positioned on strategic sites to bridge the gap between safe landing sites (for HLS) and sites of interest (PEL, PSR).

SPARTAN SPACE performed a CDD and is working on a Phase 0 under CNES contract.




esa
moonlight
Lunar Communications & Navigation System
Communication Services
Teleoperations
EUROHAB ↔ Ground
Communication Services
Data Streaming
Science P/L → Ground
Communication Services
Data Transfer
Science P/L → Ground
Navigation Services
Crew Guidance
HLS ↔ EUROHAB
Navigation Services
Rover/Robot Guidance
EL3 ↔ EUROHAB
NASA Human Landing System
Crew on EVA (towards EUROHAB)
EL3 & Secondary Habitat EUROHAB as Payload
Science Payload (linked to EUROHAB)
EMMS (EUROHAB Supply)
EL3 (Supply Cargo Payload for EUROHAB)

Thank you

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www.spartan-space.com

Confidential

MoonMap

Raluca Stefanescu

July 2022

CGI

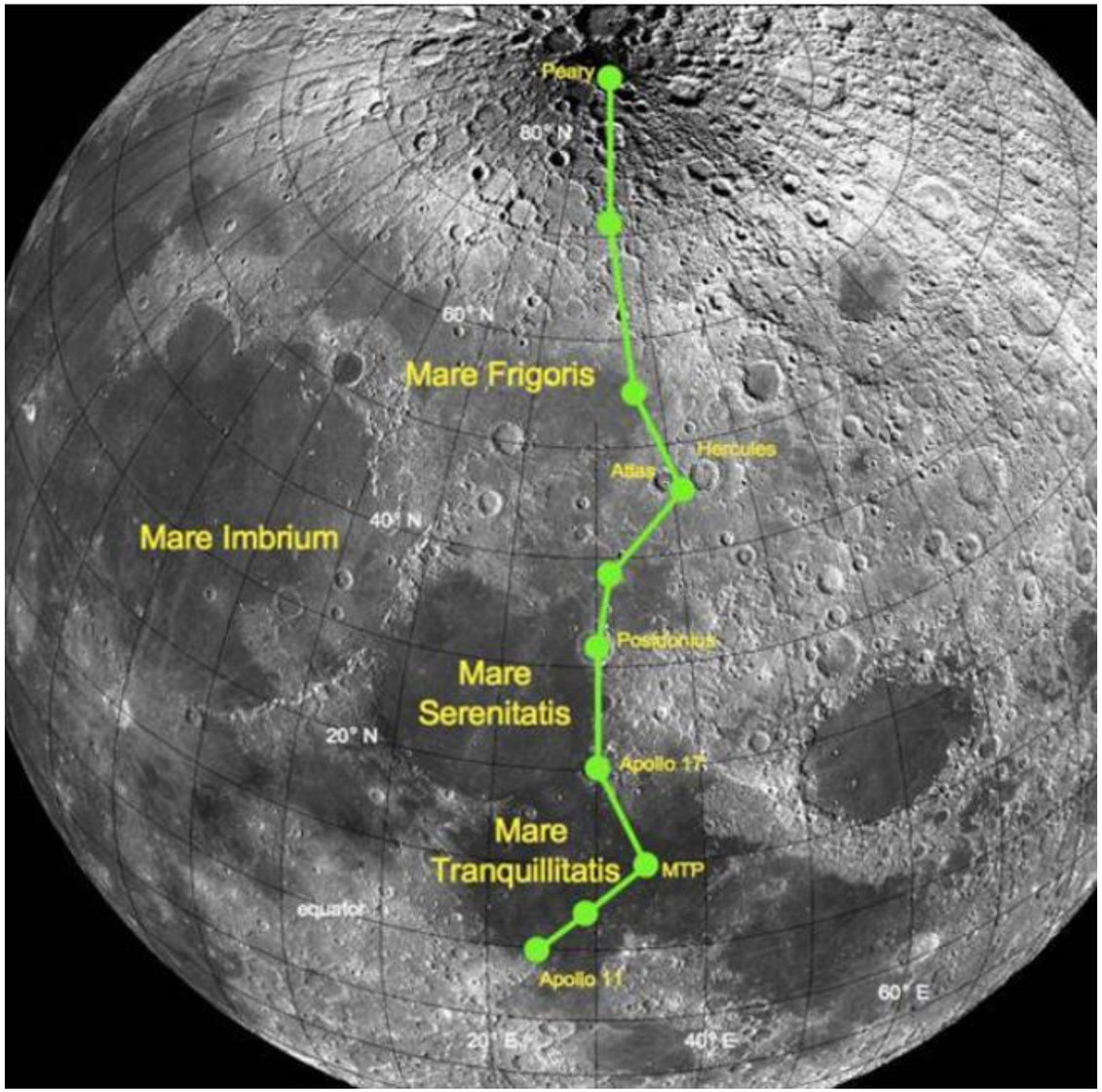
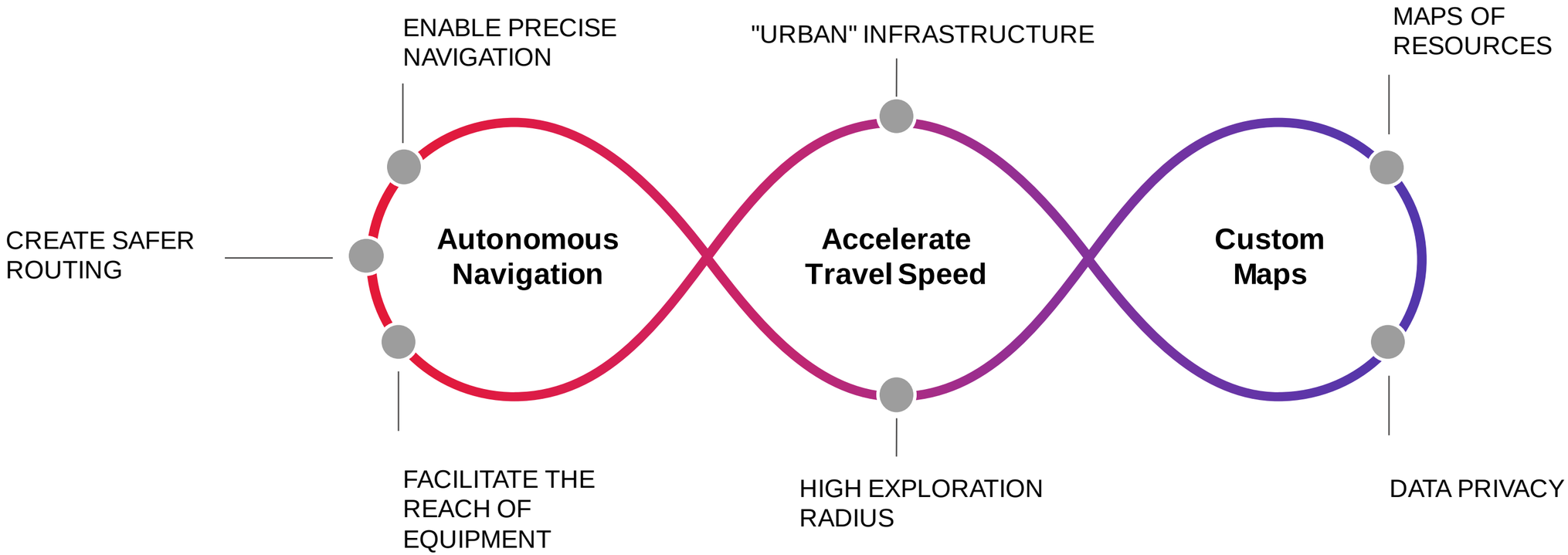


Image copyrights: https://www.smithsonianmag.com/air-space-magazine/road-trip-moon-180952925/

Goals and Benefits



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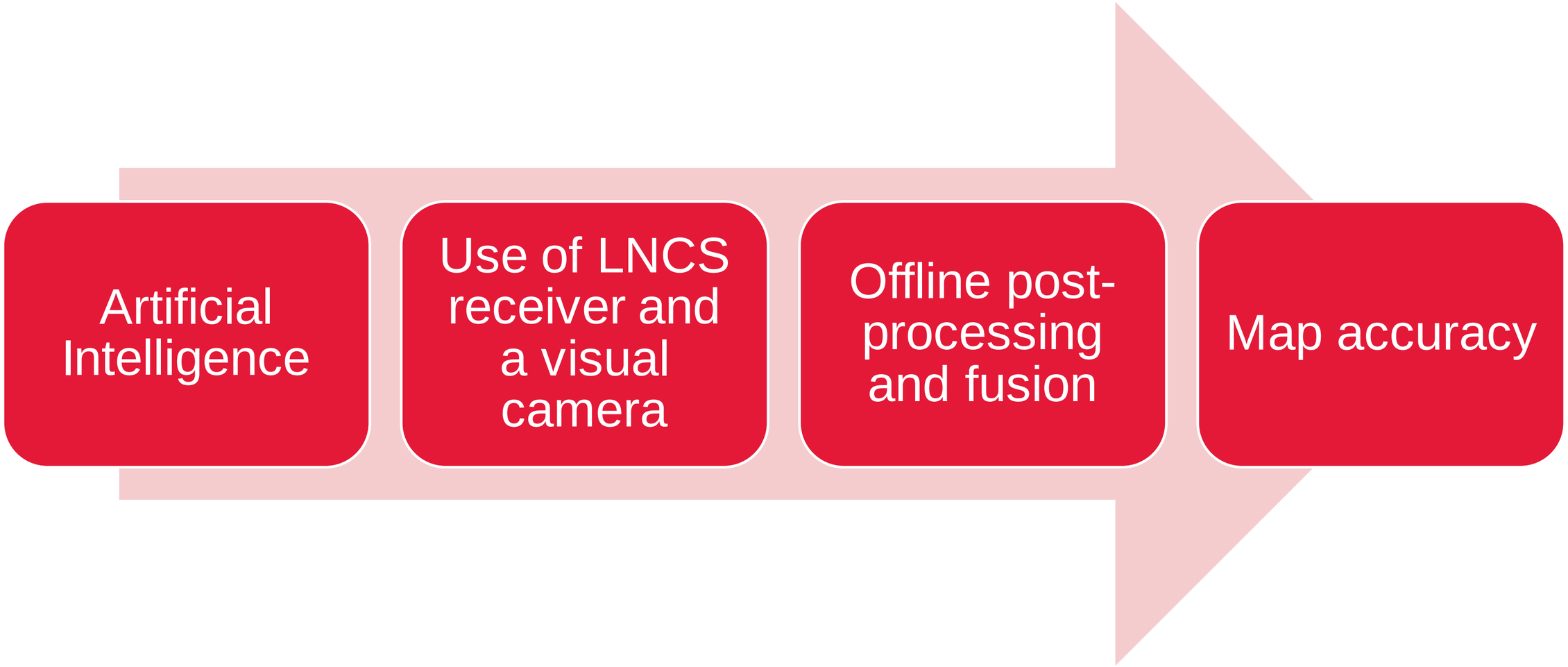
Key features



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CGI: Delivering innovation, value and results across the space industry

Satellite navigation

Earth observation

Downstream applications

Satellite communications

Satellite operations

200

Satellite missions supported by our software

1,000+

professionals helping **100+ clients across all industries**

40+

years partnering with our top space clients e.g. ESA

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Thank you!

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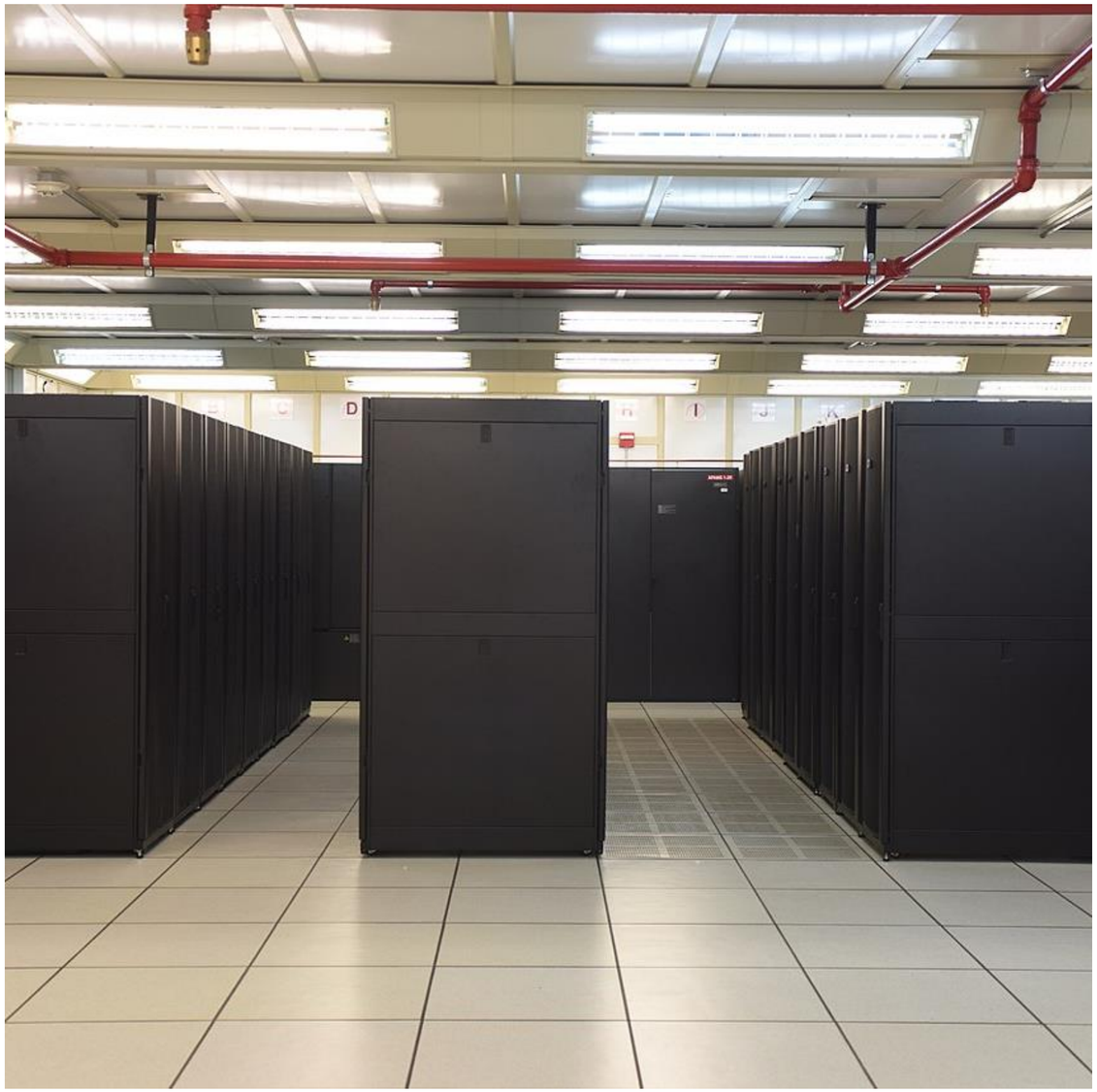
Moon Cloud

Malte Dietze

July 2022

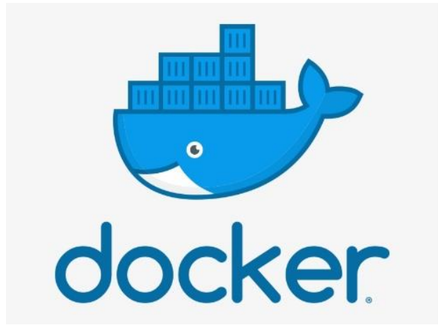
CGI



By Marco Herrera - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=65280240/

Moon Cloud

Data Centre on the moon



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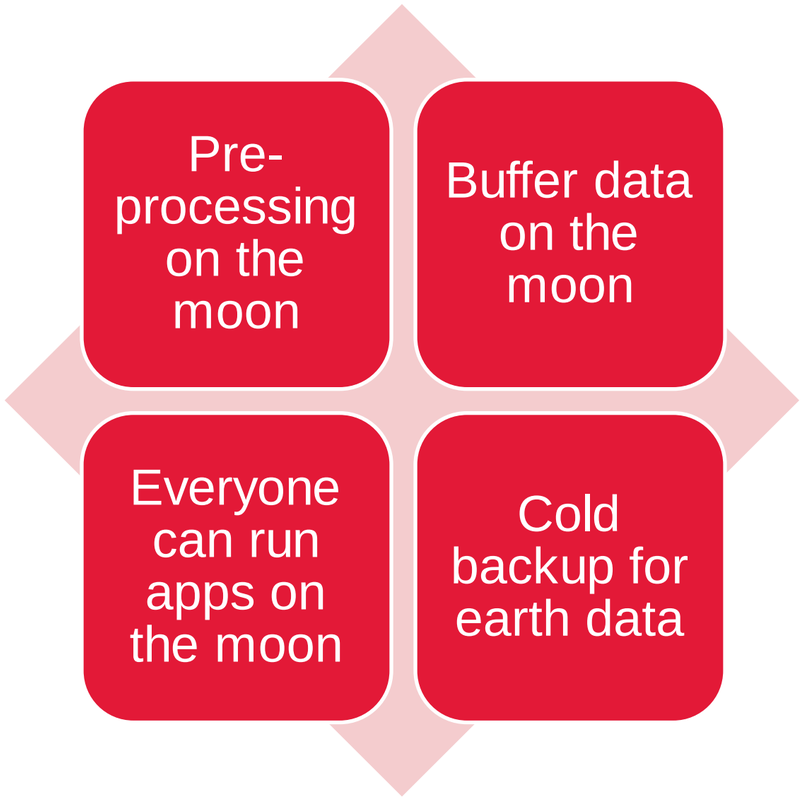

Use cases

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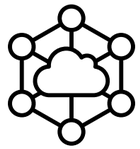

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Thank you!

Malte Dietze
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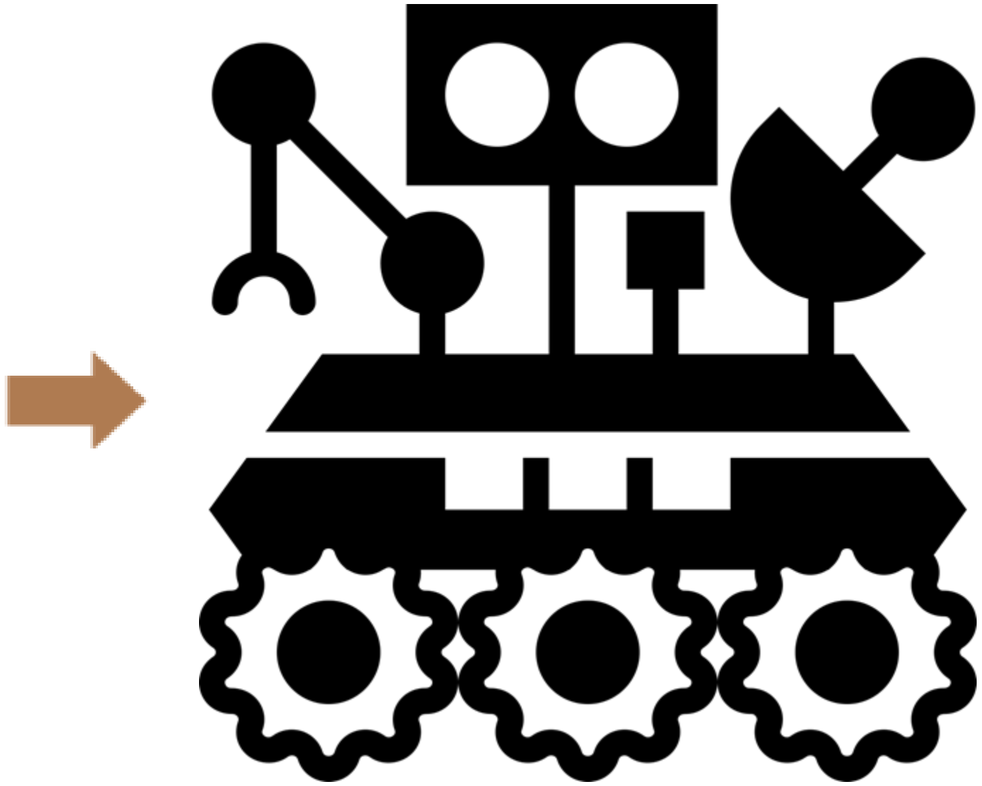
Public

OPS-SAT version of Open Lunar Robot with use of LCNS

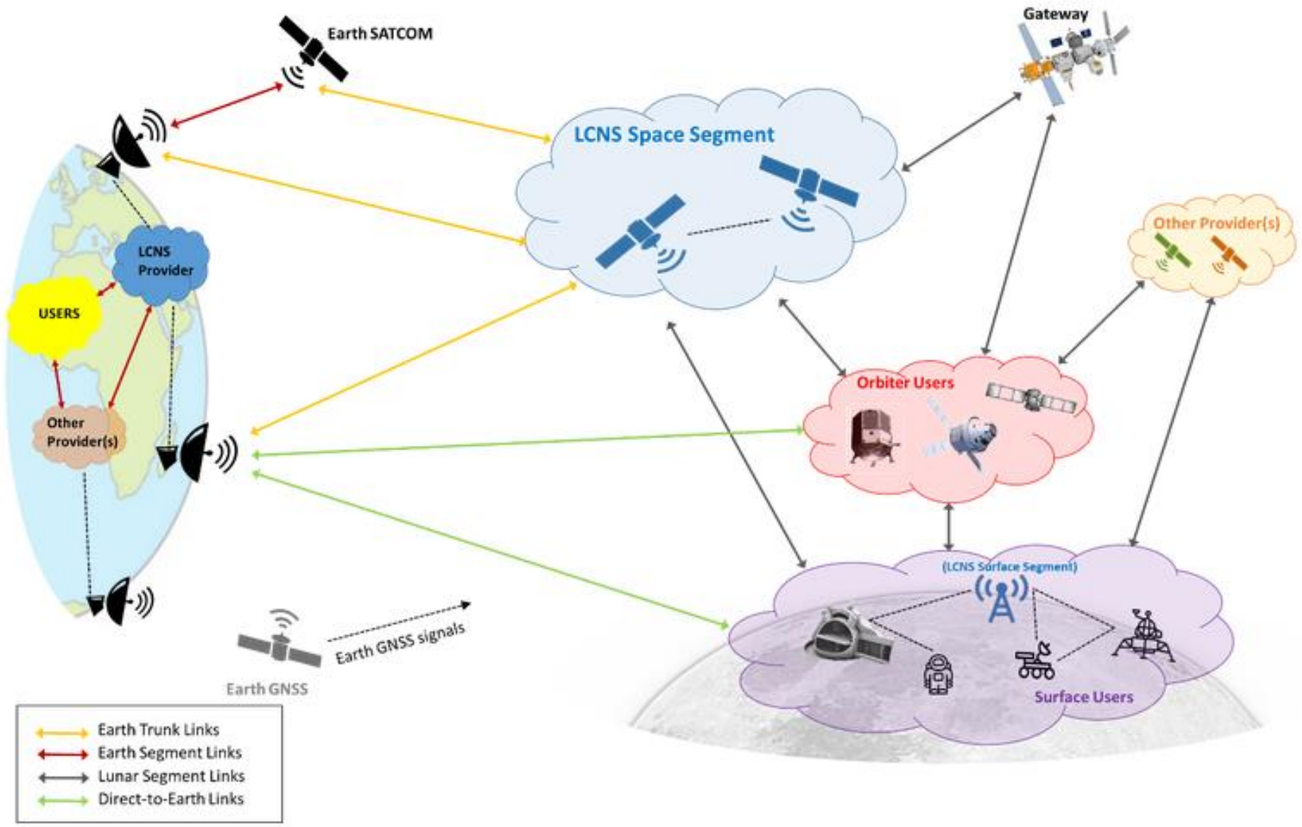
IoTeam.eu your partner in embedded world

What is OPS-SAT? What Open Lunar Robot could be?

*picture from www.esa.int



How Lunar Communication and Navigation Services (LCNS) can help?



*picture from www.esa.int

Open Source - together we can do more

Thank you for your attention
Do you want to discuss? Let's stay in contact!

Marcin Wilk - marcinw@ioteam.eu

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