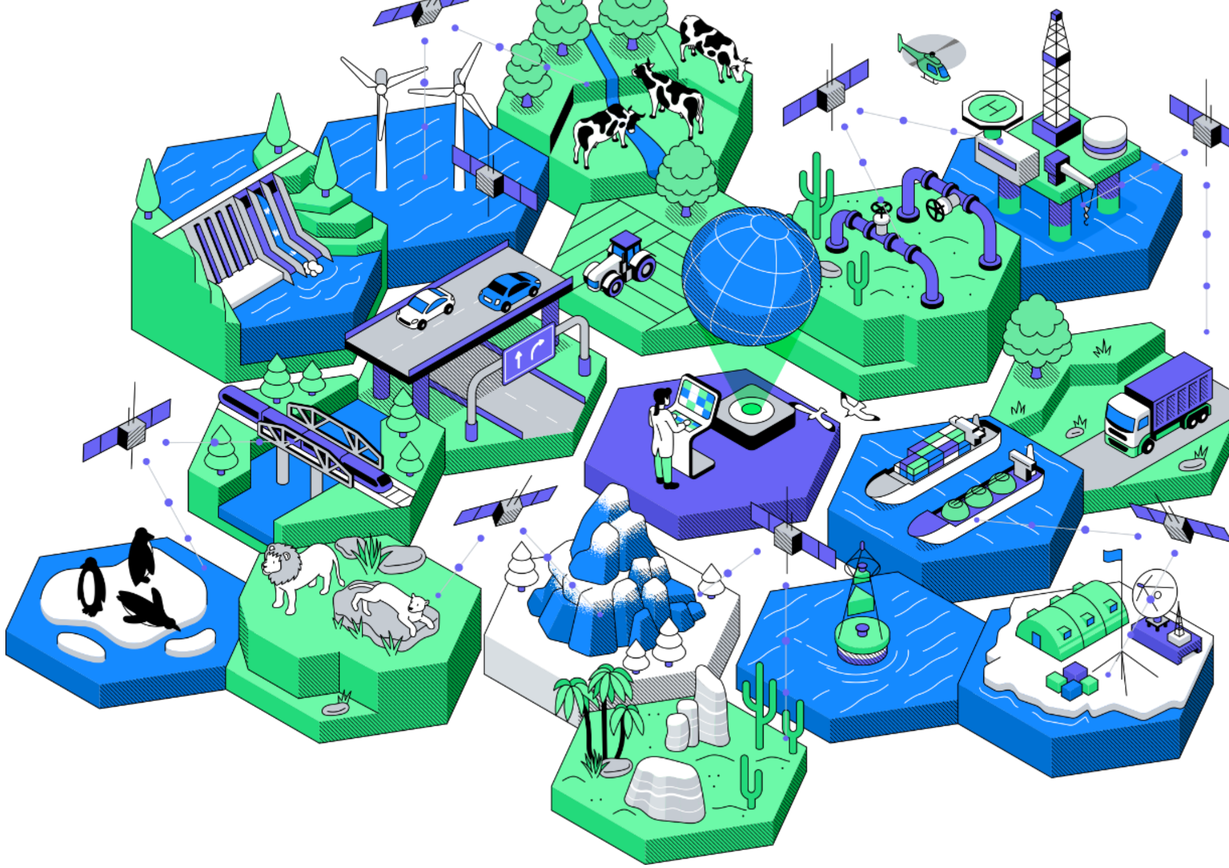
# IoT everywhere for everyone.



Company presentation 2025

**Guido Parissenti**
CEO & Co-founder

APOGEO SPACE


What we do

# The company is building the first private Italian picosatellites constellation, based on the proprietary 10x10x3 cm satellite platform.

With the successful launch of two proprietary satellites (the technology demonstrators FEES1 - March 2021 and FEES2 - January 2022 able to perform **IoT/IoV activities in LEO**) and the active involvement in scientific projects for both **ESA** and **NASA** the company has a strong heritage in space projects.

APOGEO SPACE

# Apogeo facilities – Offices


# Apogeo facilities – Meeting Rooms

# Apogeo facilities – Clean Room

**ISO8** Clean Room with **ISO5** area for **optical** payloads

# Apogeo facilities – TVAC

Thermal Vacuum Chamber from Telstar (Spain) integrated within the Clean Room environment

- Temperature range: **-60°C / +120°C**
- Ultimate vacuum: < 5.0x10-6 mbar
- Capacity: up to a **16U** satellite (20 x 20 x 40 cm)

# Apogeo facilities – Ground Stations

Two ground stations on premises:

- Motorized directional, UHF-VHF
- **Directional non-motorized, UHF** (proprietary design)
- Plans to add S/X bands

- Backup directional non-motorized in Lombardy, UHF

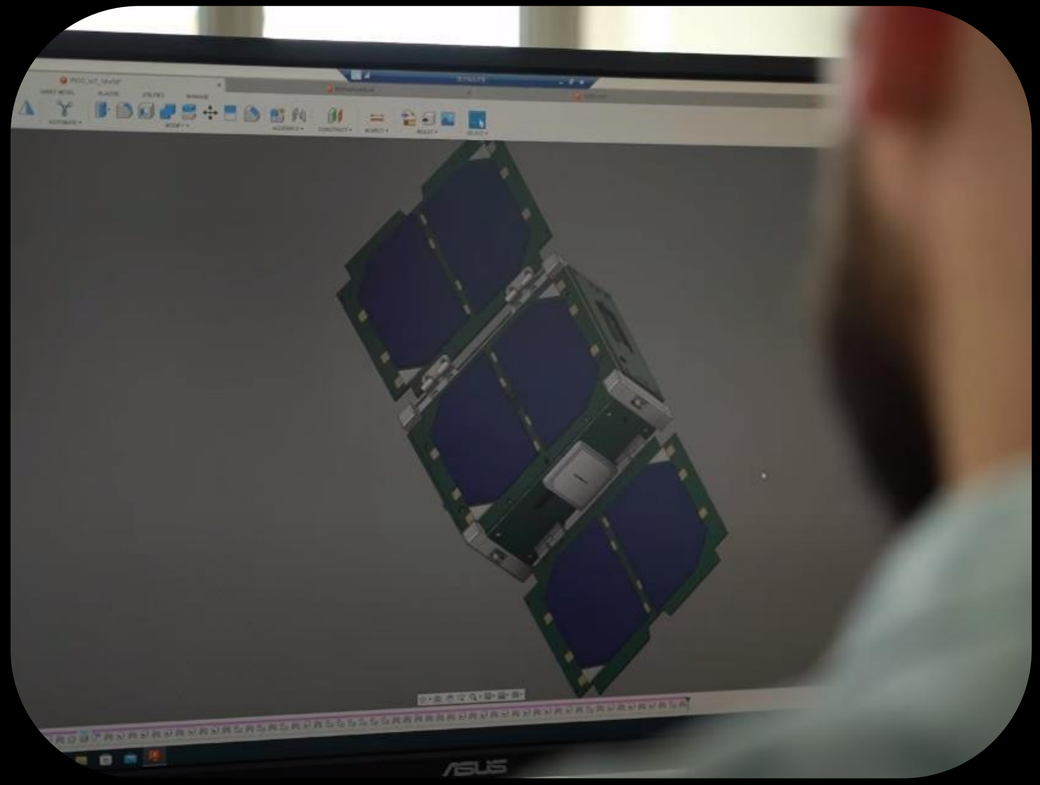
# Apogeo facilities – Control Room

- Receives data from all ground stations of the Apogeo network
- Can be integrated with GSaaS sources
- **In house** fleet and satellite data management and visualization **tools**
- Satellite **digital twin** software under development with Italian SW company

# Apogeo capabilities – Satellites Design

## Nano and picosatellite design, development, manufacturing and integration

- Crafting satellites tailored to customer needs
- From the single satellites to the **complete constellation**



# Apogeo capabilities – Satellites Testing

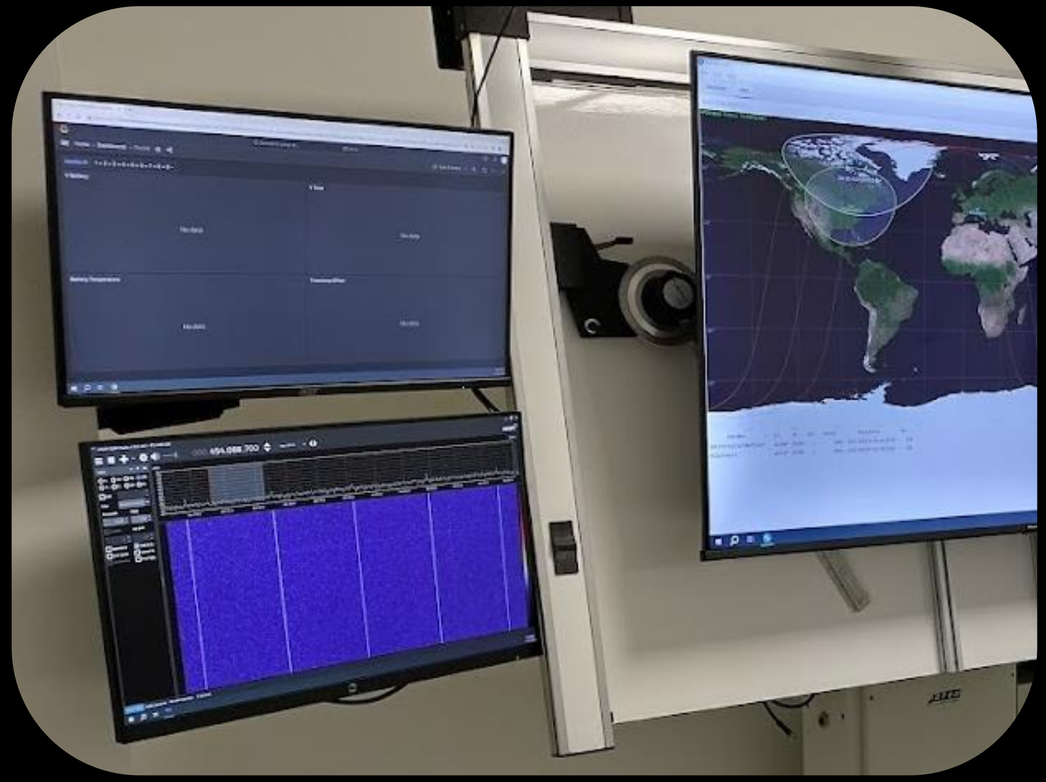
## Clean environment for integration and testing

- Clean room environment with electronics testing equipment
- Thermal Vacuum Chamber
- Access to external **vibration facilities** within 10 min from headquarter

# Apogeo capabilities – Ground Station Design

## Ground station HW and SW design, development and manufacturing

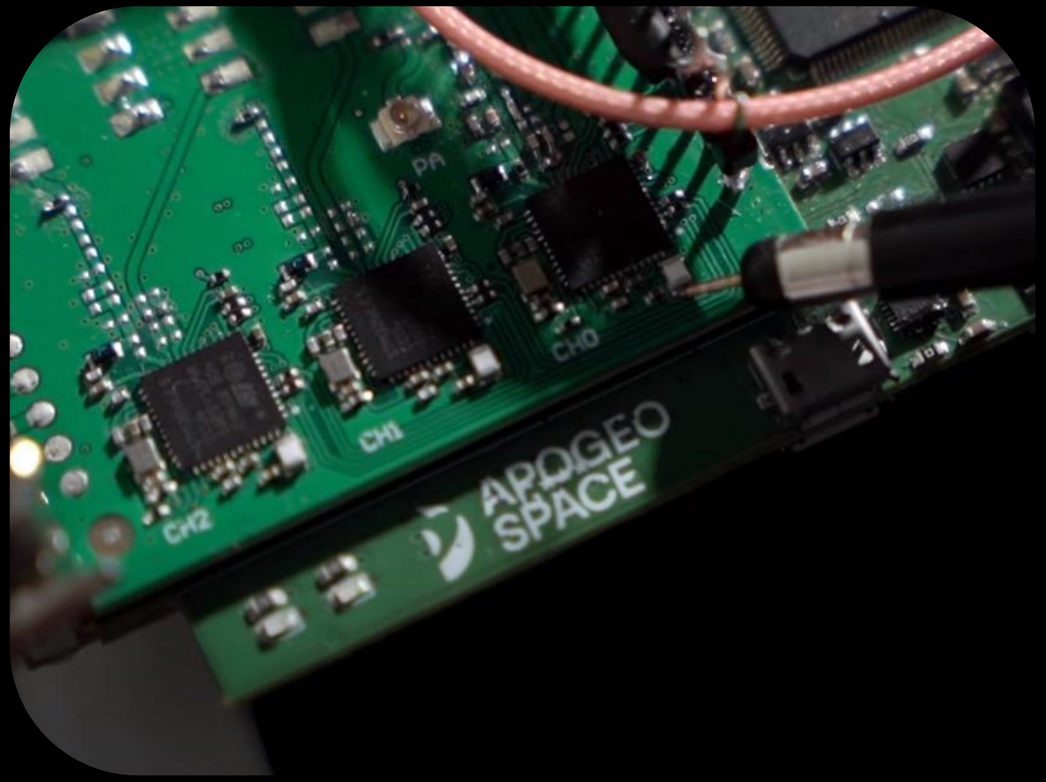
- State-of-the-art VHF and UHF equipment also in non-motorized, **low maintenance** solutions
- Ground station and satellite management SW
- Management of **operations**

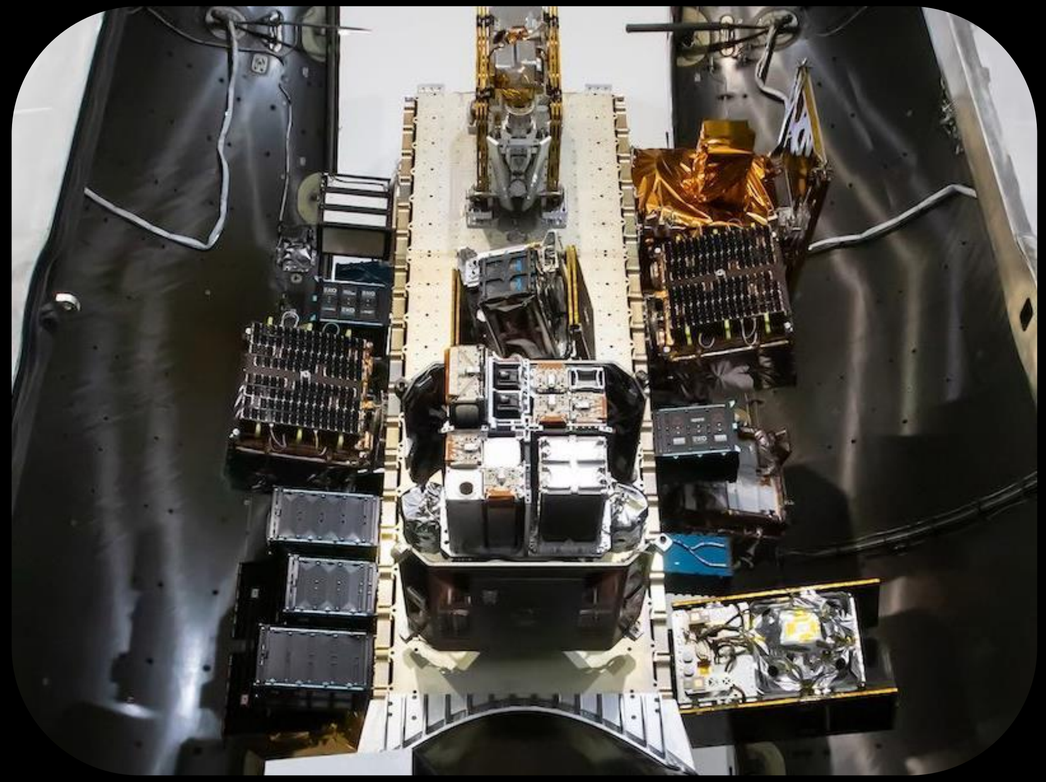


# Apogeo capabilities – Turn-Key Solutions

## A complete and tested supply chain which allows the provision of specialized service covering the entire value chain:

- RF electronics design up to GHz
- Frequency regulatory and **licensing**
- IoT Cybersecurity
- Orbital **launch brokerage**



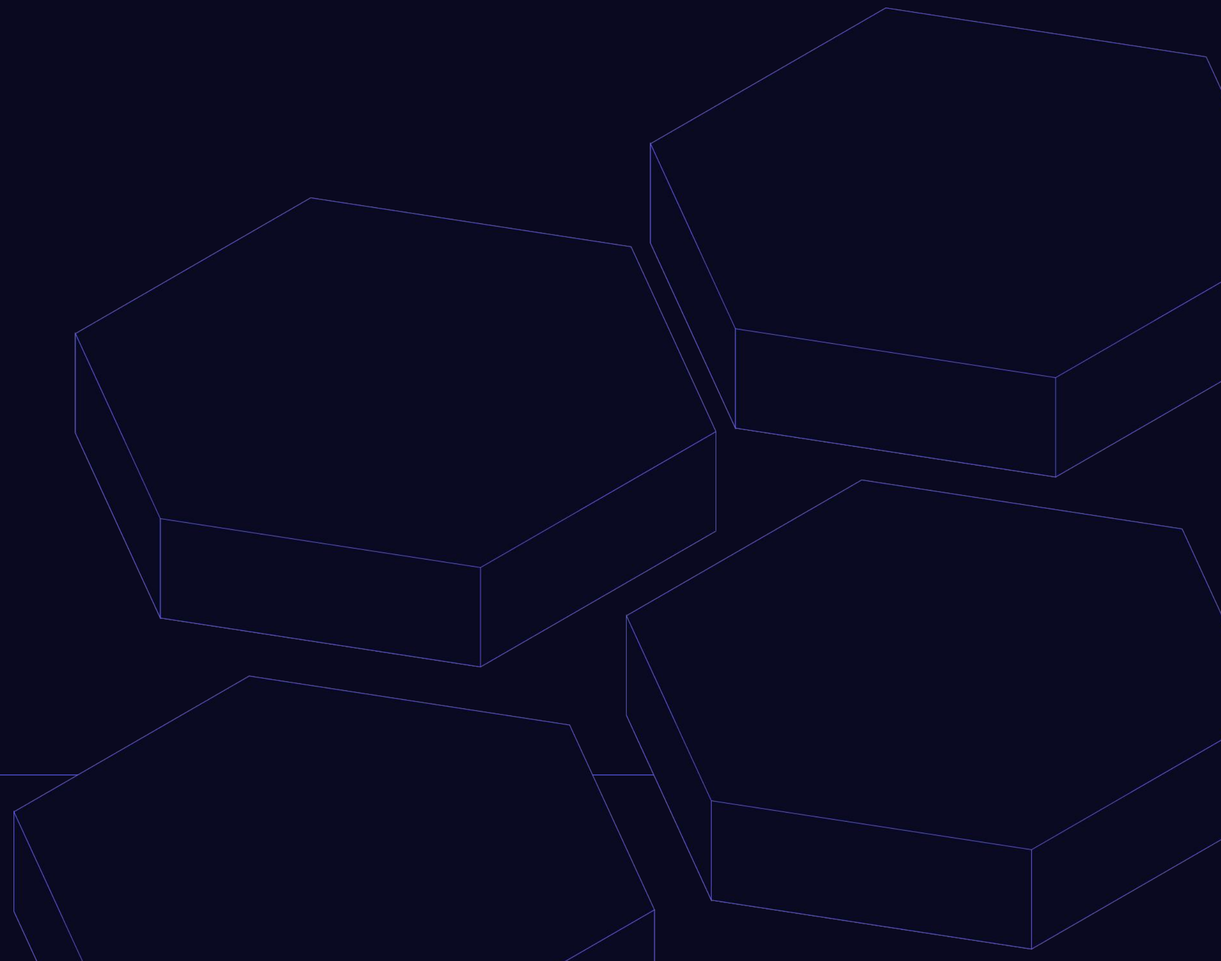



# Italian Space Agency visiting Apogeo

Apogeo Space Lab
01/12/2023
“PiCo-IoT” ASI Project final review

# IoT everywhere

According to Statista, a new data revolution is led by **32 billions of IoT devices by 2030**, with more than **2 billions adding-up** on average every year. IoT is a pervasive technology, ranging sectors such as agriculture, logistics, monitoring and more.



APOGEO SPACE

# IoT in Every Field.

**Agriculture**
Monitoring of environmental and growth conditions of crops.

**Oil & Gas**
Monitoring and surveillance of extended infrastructures.

**Maritime**
Tracking of physical assets and marine animals across the ocean.

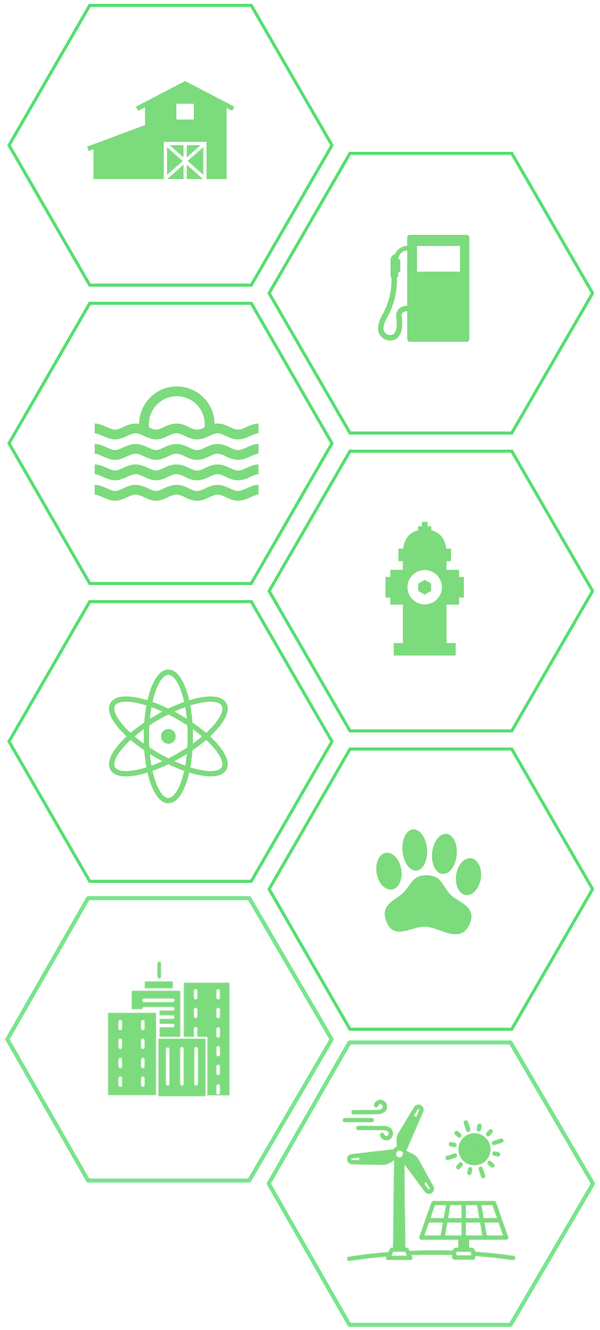
**Water Infrastructures**
Monitoring of large and small, natural and artificial waterways and basins.

**Research**
Connecting instruments & sensors for scientific and natural science purposes.

**Livestock**
Tracking of farm or wild livestock across large areas of land.

**Smart cities**
Optimizing urban infrastructures, resource management and enhancing efficiency in city services.

**Renewables**
Monitoring energy generation and its fluctuation.

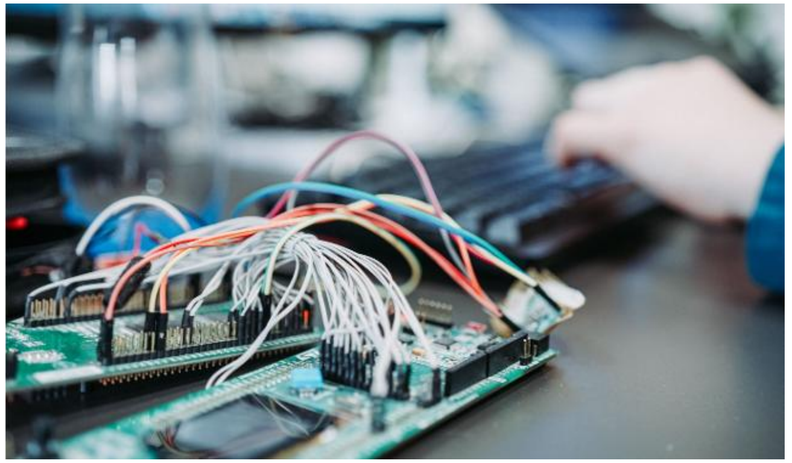


APOGEO SPACE

# Connectivity Problems

**A lack of connectivity** is still impacting on this huge market leaving many IoT devices permanently or intermittently out of connection. Problems commonly faced:

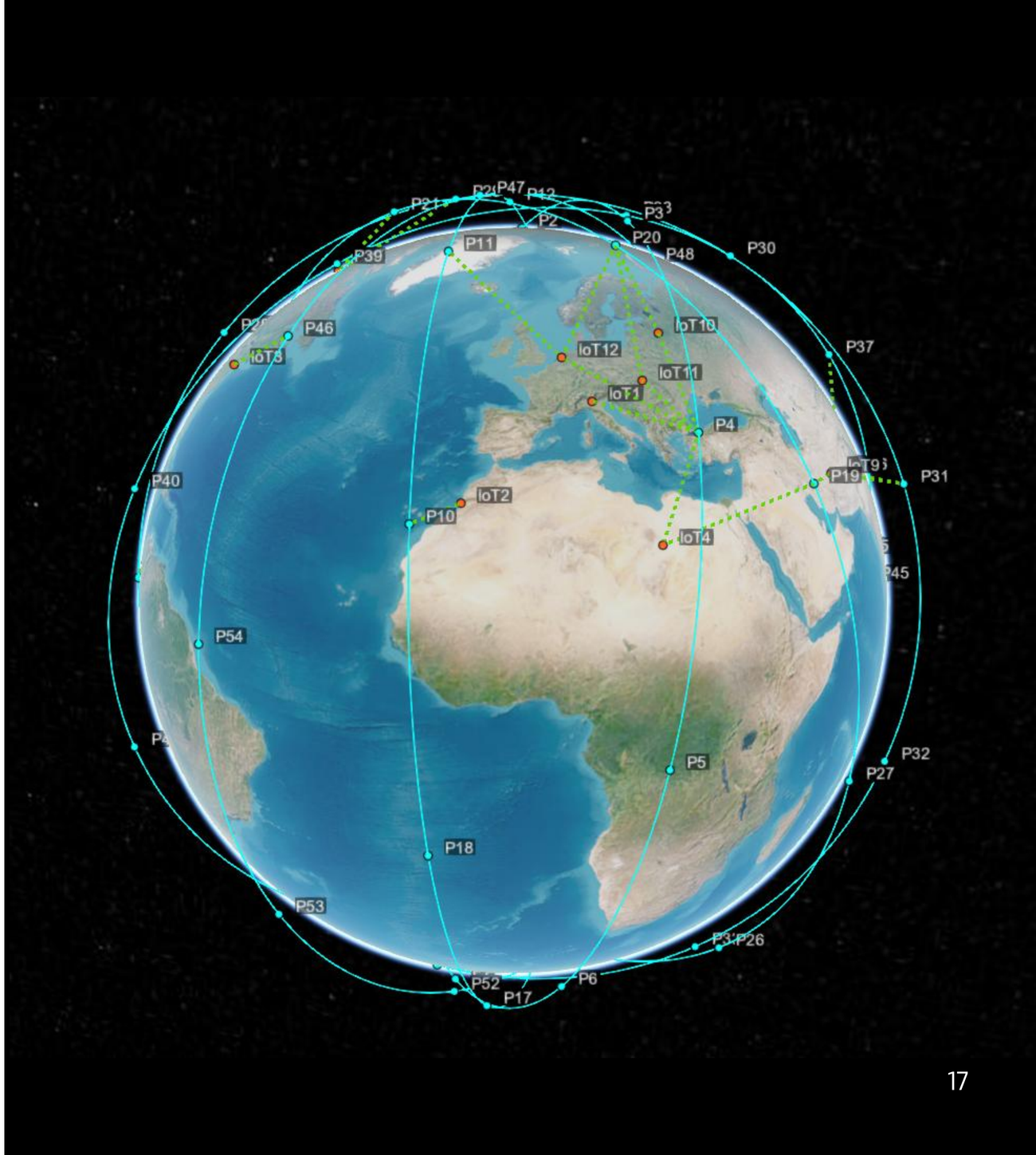
- Remote locations with no connection;
- Cross-border operations;
- Private and secure data transmission.



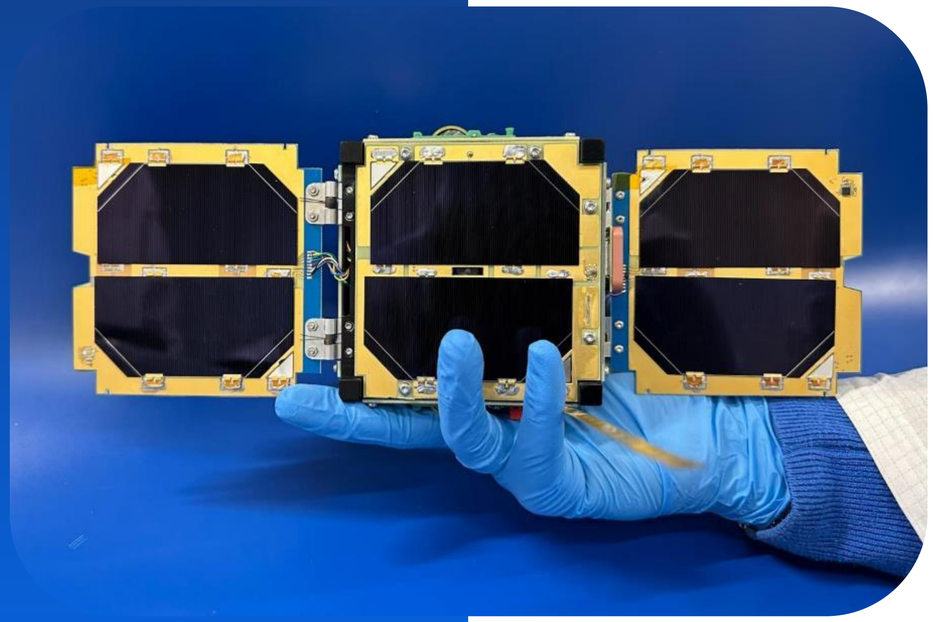
# A Satellite Constellation

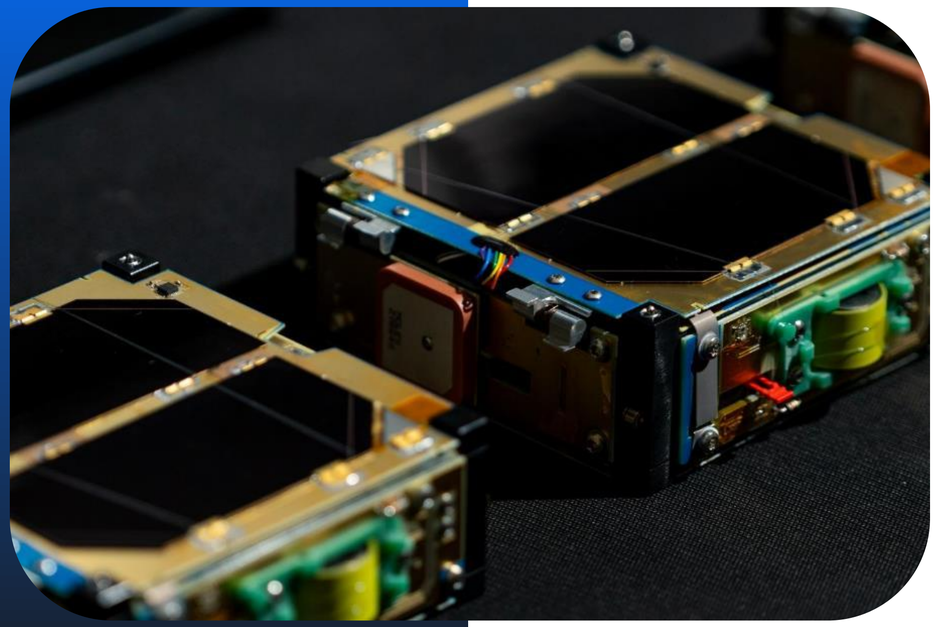
Apogeo Space solves this needs thanks to its space **picosatellites constellation** which provides IoT connectivity throughout the globe.

Apogeo Space's technology allows the collection of data for latency-tolerant applications, with **performance increasing** steadily from 2024 until the complete build-up of the constellation in 2027.




APOGEO SPACE



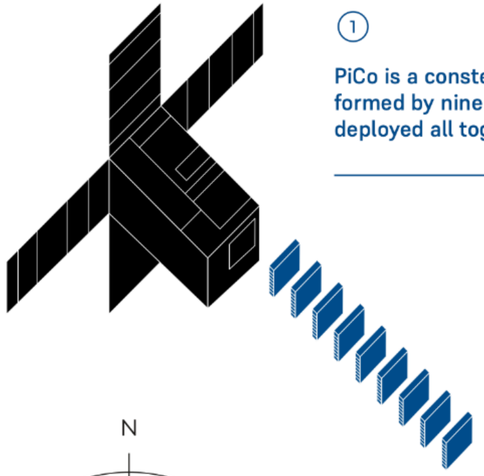


# Pico Technology
# Space segment

We developed a **miniaturized platform** containing all the subsystems of bigger satellites in a fraction of the volume:

- CubeSats 10x10x3 cm folded (**0.3U**) – 30x10x3 cm unfolded
- Mass **450g**
- Subsystems: OBC, OBDH, EPS, TCS, ADCS (passive and active 3 axis stabilization), GNSS, TMTC, Telecom payload
- Frequency and modulations:
  - 450 MHz **UHF** TMTC (**LoRa** and **FSK**) x 1 band
  - 169 MHz **VHF** IoT (**LoRa**) x 3 bands
- Launched in **batches of 9** (equivalent 3U)

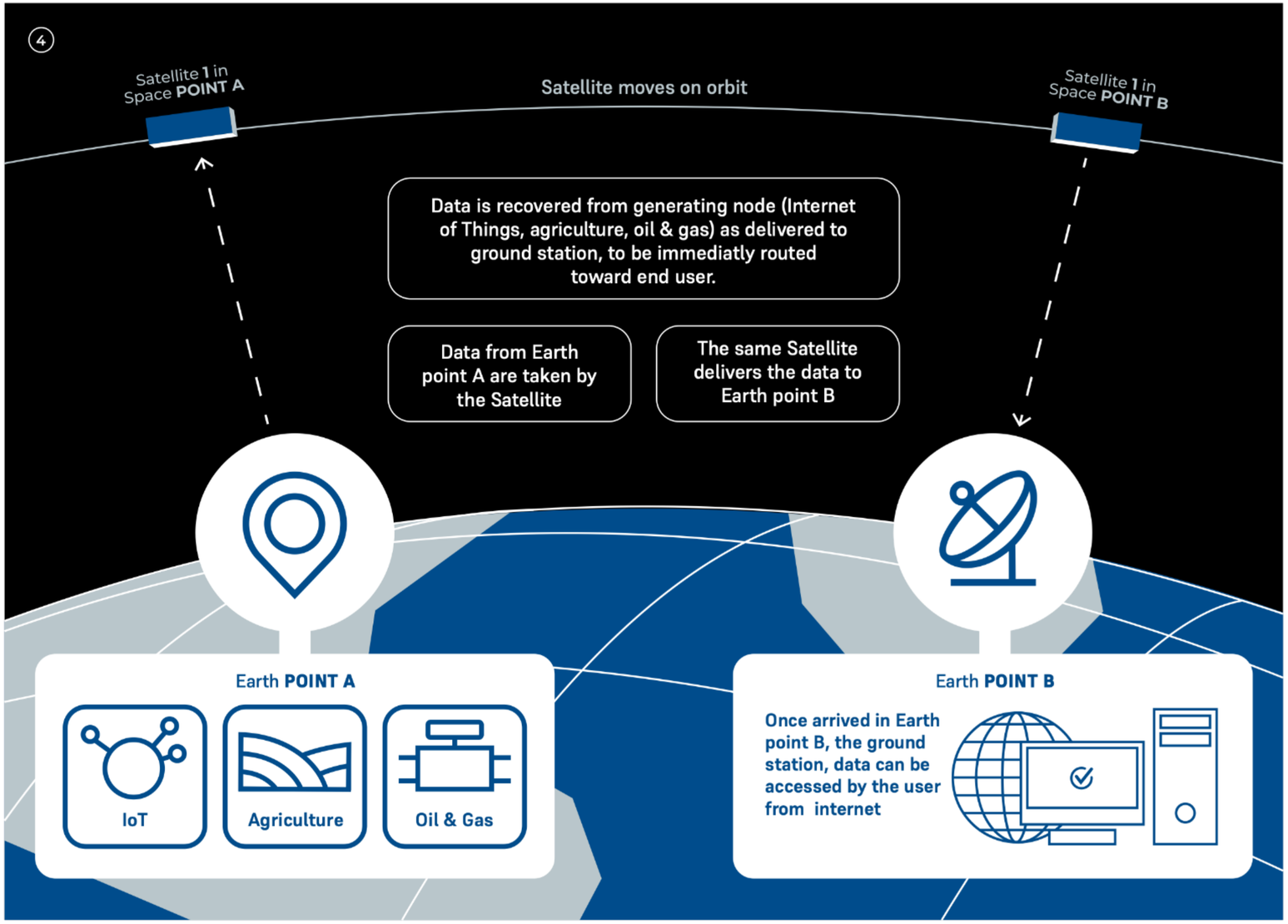
APOGEO SPACE



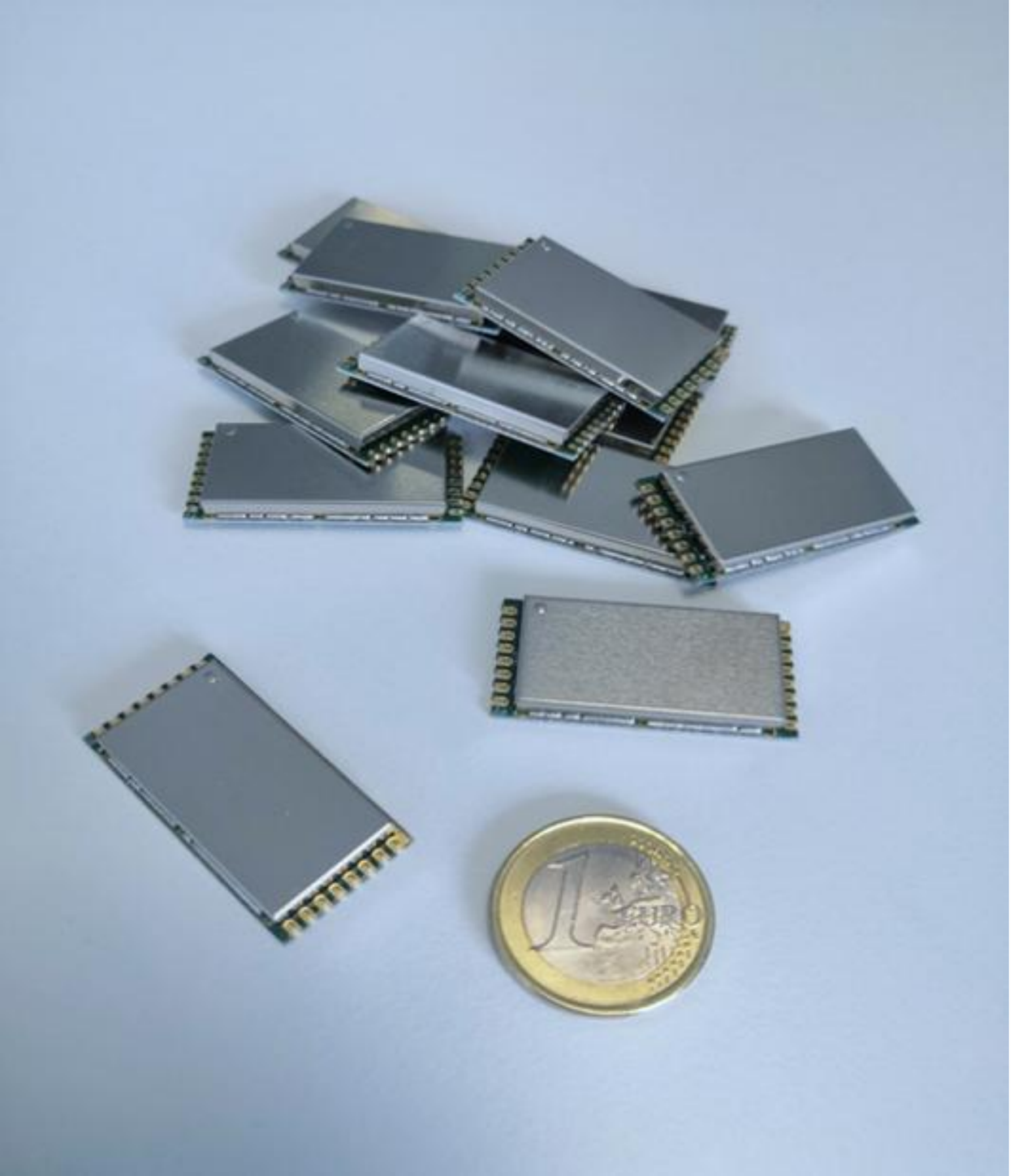
① PiCo is a constellation formed by nine satellites, deployed all together.


② After deployment, satellites increase their relative separation, reaching a complete orbit coverage.


③ At this stage, at least one satellite will pass over every point on Earth every maximum 60 min, which are reduced to 30 min to medium latitudes.




APOGEO SPACE



# Pico Technology
# IoT ground segment

We provide an open-source part list of off-the-shelf components available from multiple producers and distributors. **Reducing the hardware costs** makes it accessible to most markets and competitive with respect to SIM cards or similar.

**Low power** technology enables **life-long battery** applications. New applications are made possible using either solar power or battery only. Compact size and flexible integration options.

# Technical Informations

### CONSTELLATION

96 satellites (10x10x3 cm) operating by 2027.

### ORBIT

LEO (Low Earth Orbit) 550 km, Sun Synchronous Orbit.

### AVERAGE COMMUNICATION TIME

Around 6 minutes for each passage.

### TRANSMISSION DIRECTION

Bi-directional by 2025.

### MODULATION

LoRa.

### PROTOCOL

Proprietary.

### ENCRYPTION

AES 256.

### TRANSMISSION FREQUENCY

VHF

### MODEM

Existing modules on the market, embeddable in the device itself.

### MESSAGE SIZE

10 bytes.

APOGEO SPACE

**2015 - 2021**
Company foundation by developing projects for ASI, ESA, NASA

**Mar 2021 – Jan 2022**
FEES1 technological demonstrator is successfully launched.

FEES2 technological demonstrator is released from the International Space Station.

**April 2022**
Company rebranding into APOGEO SPACE and 5 mio € investment by Primo Space Fund

**Nov 2023**
The first batch of 9 test satellites of the PiCo IoT infrastructure has been launched

**Aug 2024**
PiCo IoT infrastructure will be operational with 9 satellites (<1h global revisit time)

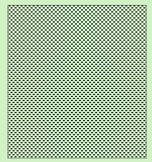
**2027**
PiCo IoT infrastructure will be fully operational with 96 satellites (continuous coverage)

# World first FREEMIUM pricing plan!

| | |
|---|---|
| Up to **2 messages** a day per device | FREE |
| >> then | 0,01€/message * |
| Up to **5 devices** | FREE |
| >> then | 0,99€/month/device * |

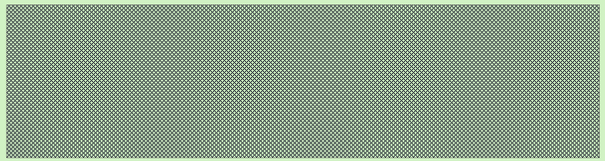
* VAT not included

# Total Cost of Ownership over 5 years



**Apogeo Space**

**151 €**



**Others***

**566 €**

Total Cost of Ownership for 1 node, based solely on Module + Data Plan, over a 5y period, assuming 5 messages/day.

*Average of publicly available price of competitors' LEO nanosatellites constellations TLC services.

# Our service: what you can do with a 10 bytes message

**30-bytes packet size:**

- Node ID
- Timestamp
- 10-bytes message
- AES 256 encryption bytes

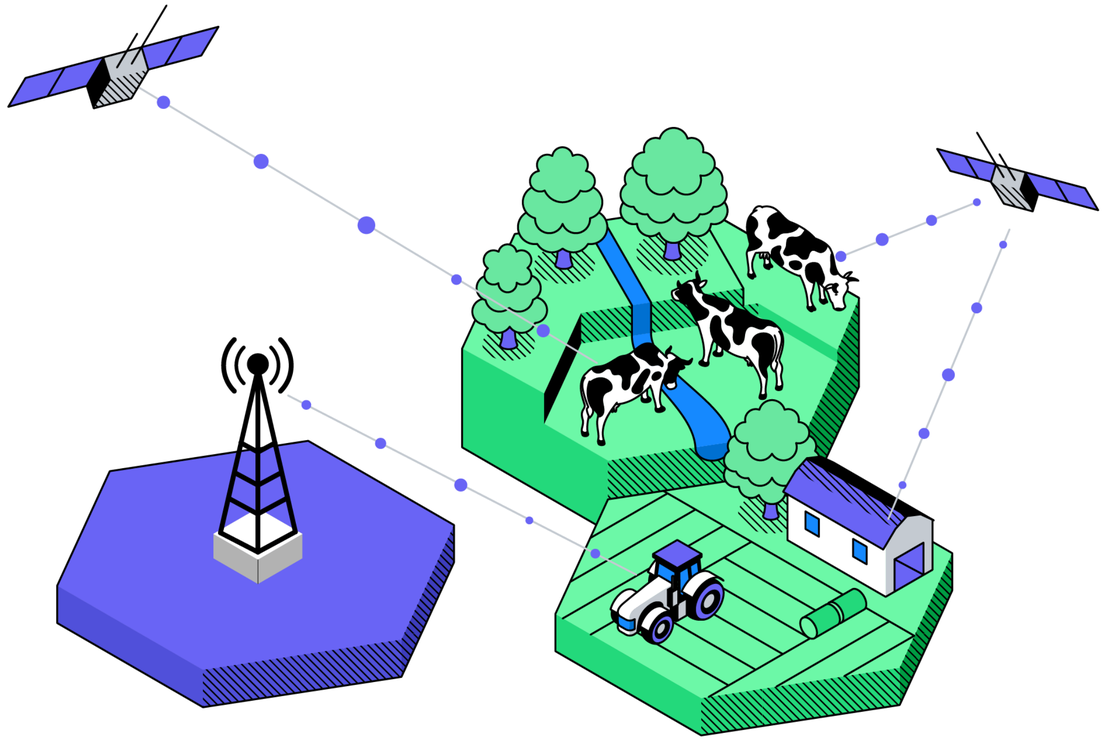
**Example of payload structure**

| | |
|---|---|
| **1 byte** | Temperature (e.g. 0-25.4°C w/ accuracy 0.1°C) |
| **1 byte** | Humidity (e.g. 0-100% w/ accuracy 0.5%) |
| **6 byte** | GPS coordinates |
| **1 byte** | Pressure (e.g. 990mbar-1244 mbar w/ accuracy 1mbar, or 0-100bar w/ accuracy 0.5bar) |
| **1 bit** | Alarm (0 or 1) |

| Use case | Parameter |
|---|---|
| Wildfire Detection | Alarm, Temperature |
| Container Tracking | GPS, Temperature, Light sensor |
| Soil Monitoring | Temperature, Pressure, Moisture |
| Environment Monitoring | Water level, Chemical sensor, Alarm |
| Gas Pipe Monitoring | Gas sensor, Pressure, Temperature |
| Livestock Tracking | GPS, Temperature |

# HYBRID Option

## Satellite + Ground



Starting from 2024, we progressively provide a **hybrid service** that smoothly integrates **boosters** and **satellites**, working together to deliver comprehensive asset coverage.

This innovative approach addresses distinct scenarios where the mobile network may be inaccessible, requiring the use of our satellite telecommunication service.

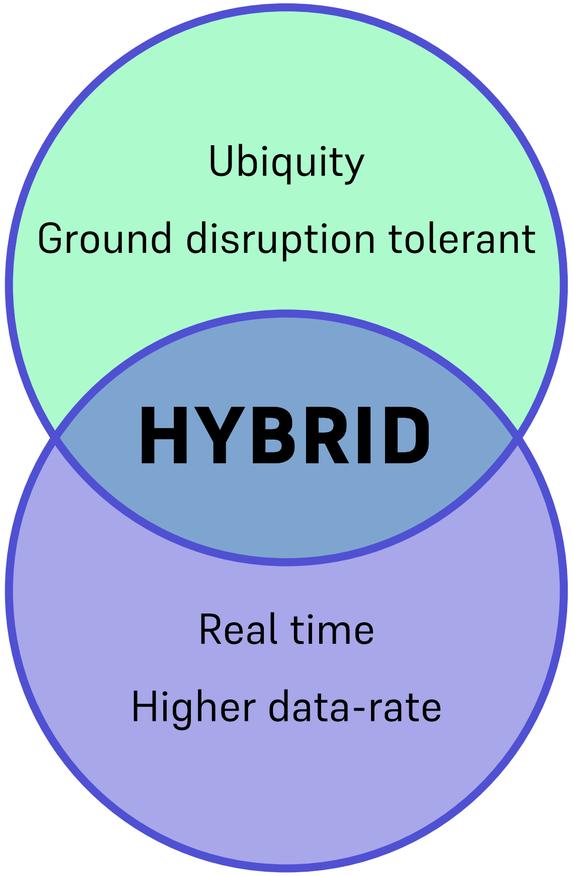
On the other hand, in situations where nodes are within 100 kilometers from our boosters, a terrestrial service is considered suitable.

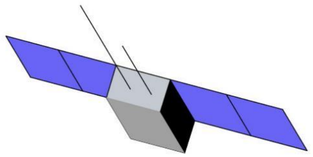
# ADVANTAGES

The implementation of boosters offers several advantages:

- **Seamless integration with satellite**, no need to change setting to pass from one system to another
- it proves to be a **cost-effective solution**, optimizing operational expenses while maintaining service quality
- the **bigger capacity** afforded by gateways ensures the efficient handling of data traffic, facilitating performance and responsiveness
- the **real-time capabilities** inherent in our booster infrastructure contribute to a swift and seamless user experience, meeting the demands of a dynamic and interconnected landscape
- approach those verticals (smart cities) where boosters associated with our technology/protocol can offer a **better performance** vs. other existing ones
- **testing option** in controlled scenarios

## The best of two worlds

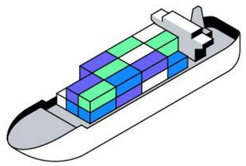


Satellite

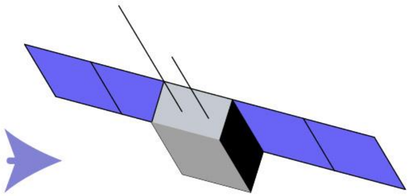
Booster

# HOW IT WORKS



Assets

Assets



Satellite

Booster

Ground Station

Final Customer

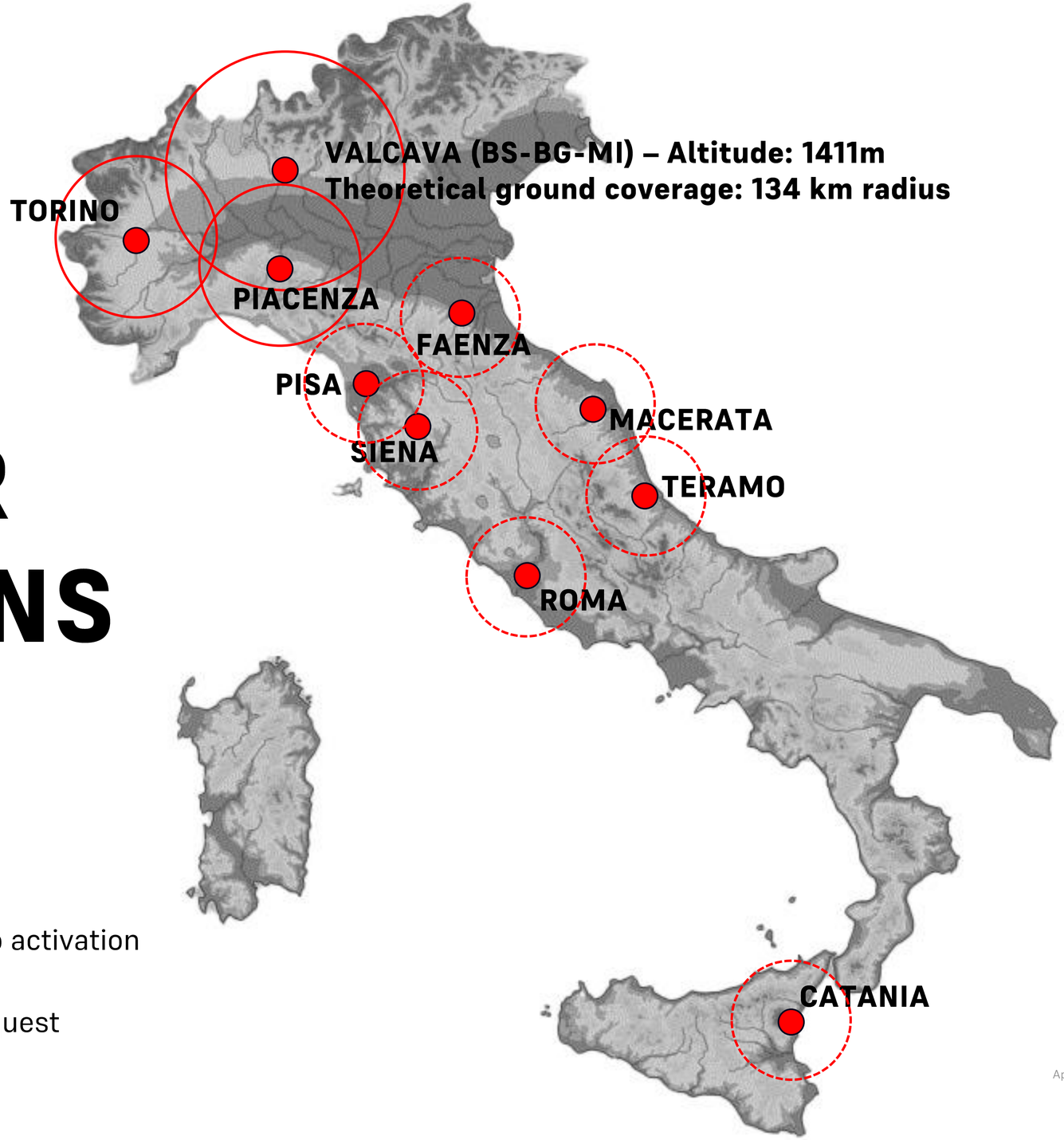
Cloud

APPLICATION NODES

COMMUNICATION MEDIUM

USER SEGMENT

# BOOSTER LOCATIONS




Active boosters / close to activation

Booster on prospects' request

Case Study 01

# Smart cities

In the realm of smart cities, our hybrid service technology, with the use of gateways, emerges as particularly suitable in addressing urban connectivity challenges and monitoring infrastructure performances (frequency used is originally leveraged for gas metering). This innovative approach offers a multitude of advantages:

- **Signal penetration** and **obstacle mitigation** for uninterrupted communication;
- Real-time coverage to **address emergencies** faster;
- **Optimize resources** and **improve service delivery**.

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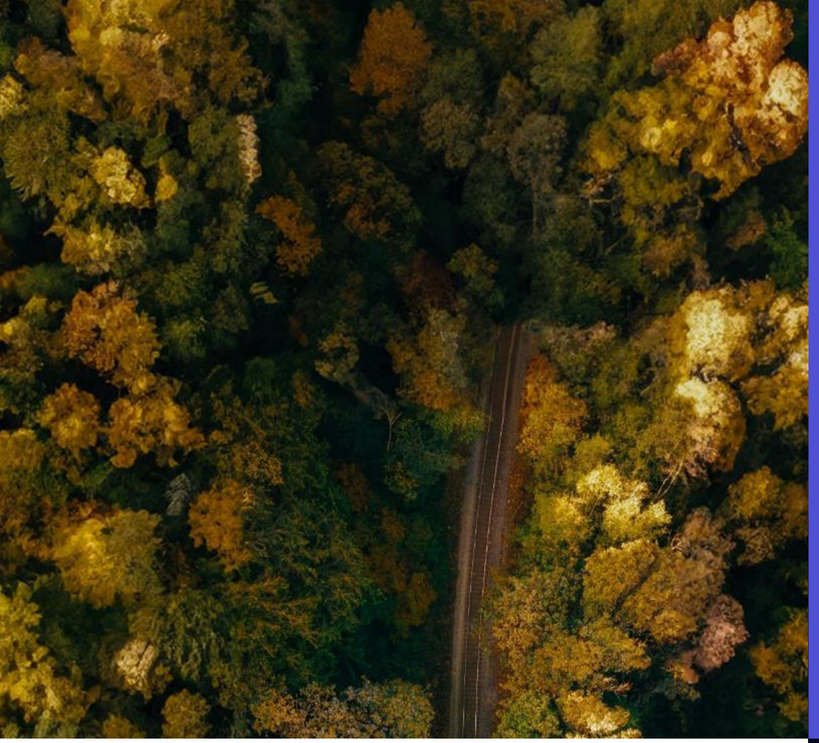

Case Study 02

# Fire Monitoring in forests

Apogeo Space is developing a compact device, autonomous and with satellite connectivity for near-real time monitoring of natural resources in remote areas.

It can be used to protect forests from wildfire events, allowing early coordination of local support. It also allows owners and managers to monitor their assets remotely, providing a data-based approach to natural resources management.

- Sensors can be deployed globally also in areas with no connectivity; they run on batteries and **broadcast data** to Apogeo Space's picosatellites network;
- **Reduces risk** associated to extreme events such as wildfires;
- Provides to management and operations departments relevant near-real time information on their assets.

APOGEO SPACE

Case Study 03

# Glaciers monitoring and water infrastructures

The use of technology in glaciers and water infrastructures relies on connectivity, which allows monitoring remote areas, enabling efficient data collection and analysis for scientific research, resource management, and early warning systems. The PiCo modem can be flexibly integrated into any hardware and sensor enabling:

- **Climate change research**, facilitating the collection of long-term data on e.g. glacier melting rates, ice thickness, and aquifer depletion;
- **Water resource planning**, providing insights into water availability and streamflow patterns;
- The **assessment of infrastructure stability**, including hydroelectric dams, underground pipelines, and checking city pipelines for leaks.

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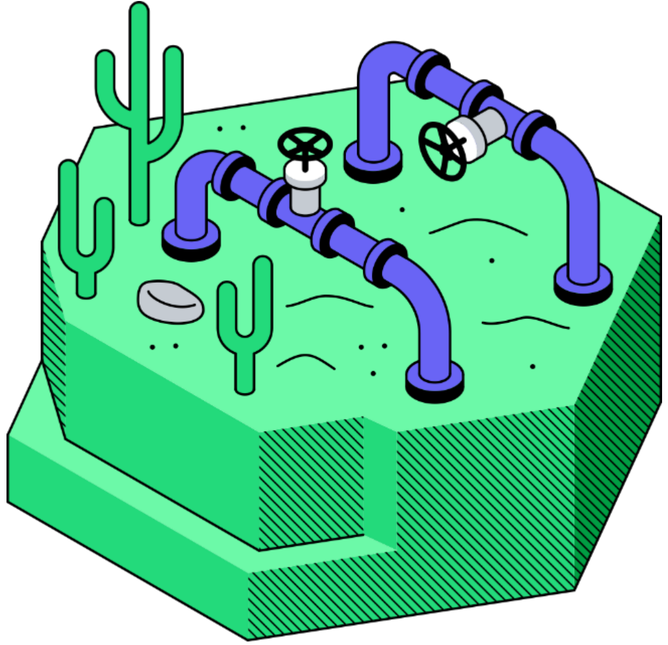

Case Study 04

# Oil & Gas

The integration of advanced technology in oil & gas settings relies on robust connectivity, enabling efficient monitoring of remote areas and facilitating comprehensive data collection and analysis. The PiCo modem offers flexible integration into various hardware and sensors, enabling the tracking of critical parameters and conditions. This would allow:

- Provision of data about infrastructures located in remote areas (e.g. pipeline pressure/temperature, flow rate, humidity, ...);
- Using collected data to predict when maintenance is needed, thus preventing unexpected failures (e.g. gas leaks, corrosion, ...) and optimizing maintenance schedules.

Apogeo Space partner leverages our **IoT hybrid connectivity** to monitor their gas pipelines. This enables the **detection of leaks and parasitic currents**, ensuring greater control over the entire infrastructure and allowing for prompt action in case of any detected issues.

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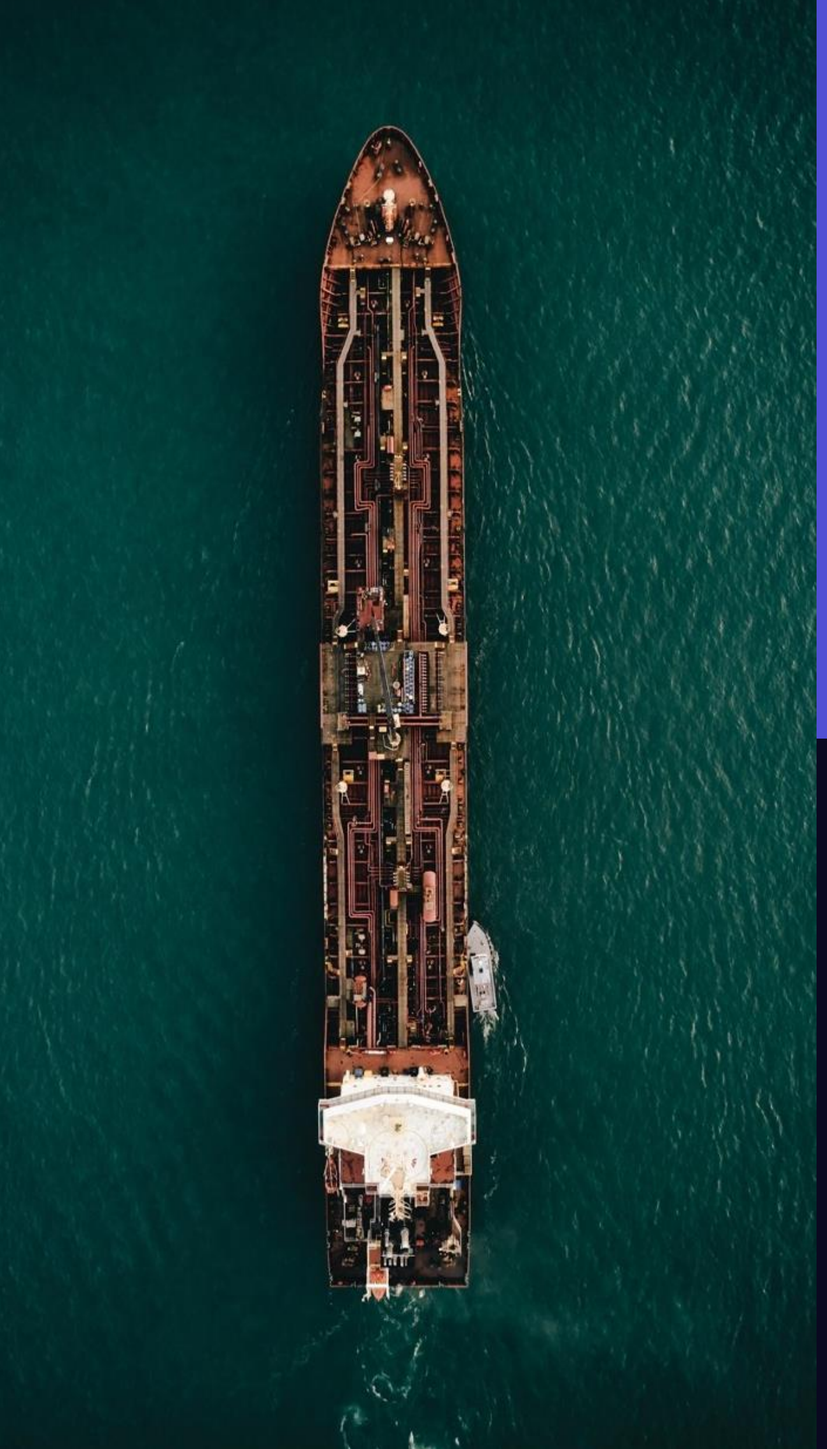

Case Study 05

# Maritime Transportation

The use of technology in maritime transportation relies on connectivity which is often lacking in oceans. The PiCo modem can be flexibly integrated in any hardware and sensor enabling:

- The operations and **track record of the container** is broadcasted through Apogeo Space's PiCo satellite network;
- Operations and track record data is available to shipping companies **supporting management and operations** activities;
- Enforces **ubiquitous control** over goods.

APOGEO SPACE

Case Study 06

# Agritech

The use of technology in agriculture relies on connectivity which is often lacking in large crop land. The PiCo modem can be flexibly integrated in any hardware and sensor enabling:

- Retrieval data from a variety of **sensors** (humidity, temperature etc..)
- Application of **precision farming** support in remote areas and large crop lands by being independent from phone network and possibly running on batteries or solar cells.

APOGEO SPACE

Case Study 07

# Renewable energy

The use of technology in the renewable energy sector relies on connectivity, which allows monitoring remote areas, enabling efficient data collection and analysis for resource management. The PiCo modem can be flexibly integrated into any hardware and sensor enabling:

- Provision of data about infrastructures located in remote areas (e.g. wind and solar panel, dams);
- Monitoring energy generation and its fluctuation (e.g. power grids).

APOGEO SPACE

Case Study 08

# Waste management

The use of technology in the waste management sector relies on connectivity, which offers several significant advantages, enabling efficient data collection and analysis. The PiCo modem can be flexibly integrated into any hardware and sensor enabling:

Apogeo Space partner leverages our **IoT hybrid connectivity** by developing sensors to monitor the position and waste level of bins and detect harmful gasses, enabling the prevention of fires.

LYNK® GROUP

- **Waste level monitoring** which helps determine when bins and containers are full and need to be emptied, optimizing collection schedule and preventing overflow;
- Monitor **bin usage patterns** to identify high-demand areas and adjust bin placement and collection frequency accordingly;
- Track the **presence of harmful gases** (e.g. methane, carbon dioxide) at waste disposal sites, ensuring compliance with environmental regulations;

APOGEO SPACE

# Some of our commercial, technical and institutional partners

# Thanks!

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