

IN ORBIT SERVICING MATURATION PHASE

2022 Clean Space Industrial Days – 11/10/2022

START-€, the first Space Alliance in-orbit servicing demonstration with a direct commercial application

Authors

BEHAR-LAFENETRE Stéphanie (TAS)

DUBOIS Loïc (TPZF)

LEPIDI Milena (TPZ S.p.a.)

Co-authors

DURAND Gautier (TAS)

LOYANT Brendan (TPZF)

MICHETTI Antonio Agostino (TPZ S.p.a.)

PAOLILLO Fabrizio (TPZ S.p.a.)



AGENDA

Why

Business case justification

What

Company Overview

START-€ Mission Statement / Assumptions

How

CONOPS (Mission phases/timeline)

Mission Concept Design Description

Who

Customer status



In Orbit Servicing START-€, Space Alliance IOS Mission 2022 Clean Space Industrial Days

Why

Business Case Justification



Business Case Justification

Market

- **Market opportunities** of In Orbit Servicing are forecasted to grow generating a potential multi-billion-dollar market achieving \$ **5.1 bln*** over the **next ten years**
- Even though the business growth is forecasted across all services and applications in all orbits, **life extension applications** as well as **deorbiting services** are projected to be the main market segments especially in **GEO orbit**

Total market

Total **Active** satellites
& **EoL** satellites

- Application of **adoption %** and **sats mass constraint**
- Application of **anomalies %** only on **Active sats**

Addressable market

- Application of **market penetration %**

Target market

GEO IoS Services

According to market reports, below a list of potential IoS applications/services:

- **Life extension services**
 - Orbit raising and positioning
 - Relocation and positioning
 - Station keeping
- **Decommission service**
 - Deorbiting
- **Life enhancement**
 - Refuelling
 - Robotics

According to **customers' requirements** and at least in the **short-term** (from 2027), the Station Keeping would be the **most attractive and potentially profitable** IoS service



In Orbit Servicing

START-€, Space Alliance IOS Mission

2022 Clean Space Industrial Days

What

Company Overview

START-€ Mission Statement / Assumptions



Company Overview



Service Provider **Telespazio**

- Business development
- Contract, legal
- Service mission engineering
- Service operation

Space Segment Provider

Thales Alenia Space

- Space segment architecture
- Servicer design and manufacturing
- Management, product assurance and contingencies
- AITV
- Engineering support
- Servicer transport to launch pad

Ground Segment and Operations Provider **Telespazio**

- Ground segment maintenance and evolution
- Management, product assurance and contingencies
- AITV
- Ground communication network
- Servicer operations

Launch Service Provider

- Baseline Ariane 6



START-€ Mission Statement / Assumptions



- **Goals:**
 - To undertake rendez-vous and capture with Customers satellites in GEO orbits in order to provide a life extension service
 - To take over the client satellite station keeping and operate the composite to provide the customer main mission and to extend life time
- **Targeted date:** Before 2027
- **Duration:** Life extension for 14 years (target) and a minimum of 10 years
- **Scalability:** The business model is robust and enables to develop additional servicers and services.
- **Efficiency:** No interruption of Customer operations for more than 2 hours
- **Development:**
 - TAS Geo-telecommunication product line (ECSS with a limited tailoring)
 - TRL = 5 for baseline technologies => Maturation plan ensures TRL 6 by the end of 2023



START-€ Mission Statement / Assumptions

- **Launch:**
 - Compliant with VEGA-C
 - But to properly address the GEO market, A6 co-manifested launch envisaged
 - Insertion in GTO orbit and transfer on its own
- **Security:** Compliant to Space Operation Law
 - End its life with its last customer in the graveyard orbit
 - Inspection before docking
 - Validation of capture in graveyard
 - Demonstration of rendezvous capabilities prior to the first servicing mission
- **Involvement:** Need of initial investments, above the 20%
⇒ Planned to be supported by the Space Alliance team



In Orbit Servicing

START-€, Space Alliance IOS Mission

2022 Clean Space Industrial Days

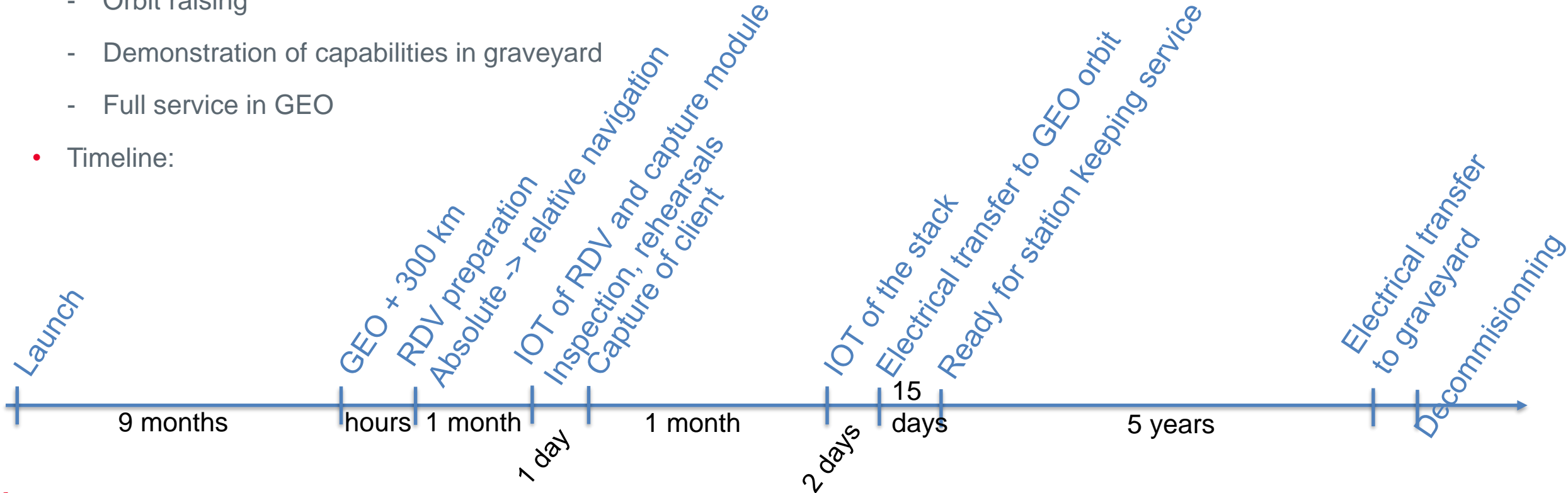
How

CONOPS (Mission Phases / Timeline)
Mission Concept Design Description

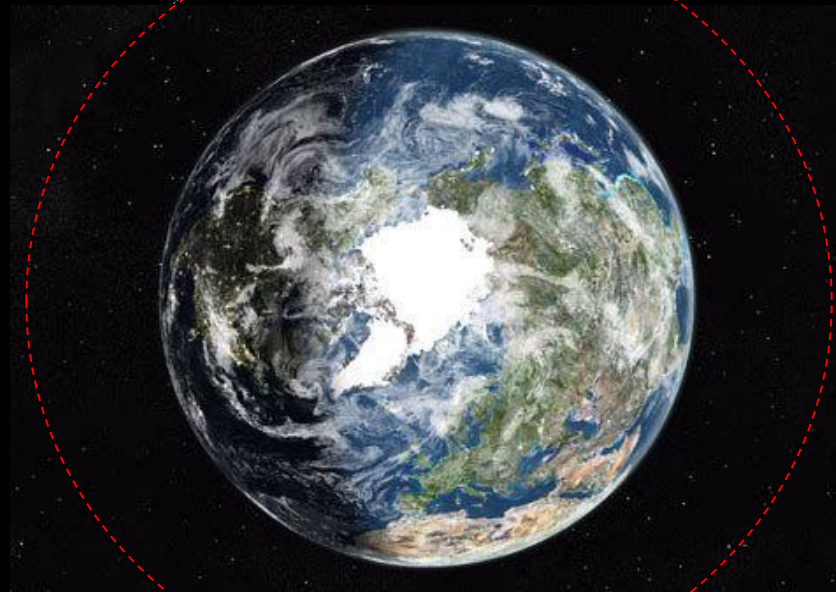


CONOPS (Mission Phases / Timeline)

- The proposed mission: Life Extension in GEO for existing satellites
- Launch targeted before 2027
- Phases :
 - Orbit raising
 - Demonstration of capabilities in graveyard
 - Full service in GEO
- Timeline:



CONOPS (Mission Phases / Timeline)



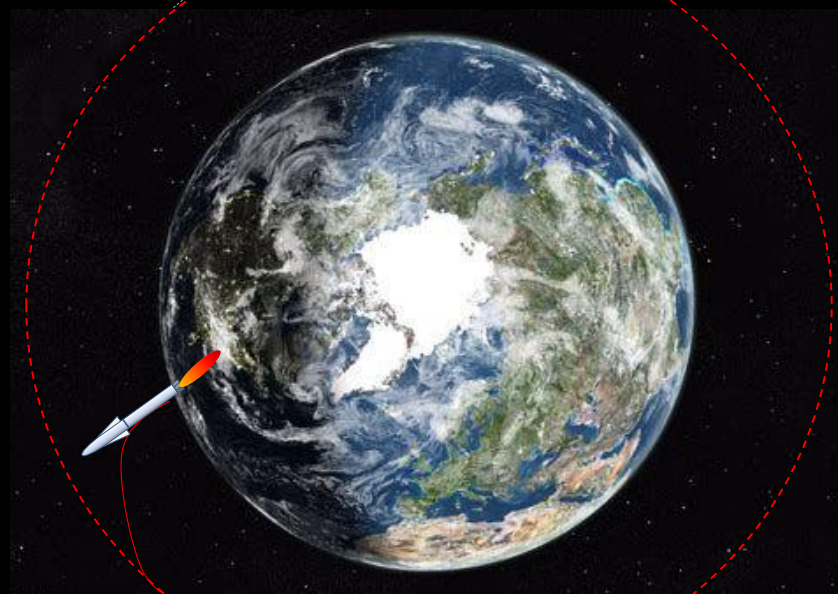
GTO

GEO

Graveyard



CONOPS (Mission Phases / Timeline)



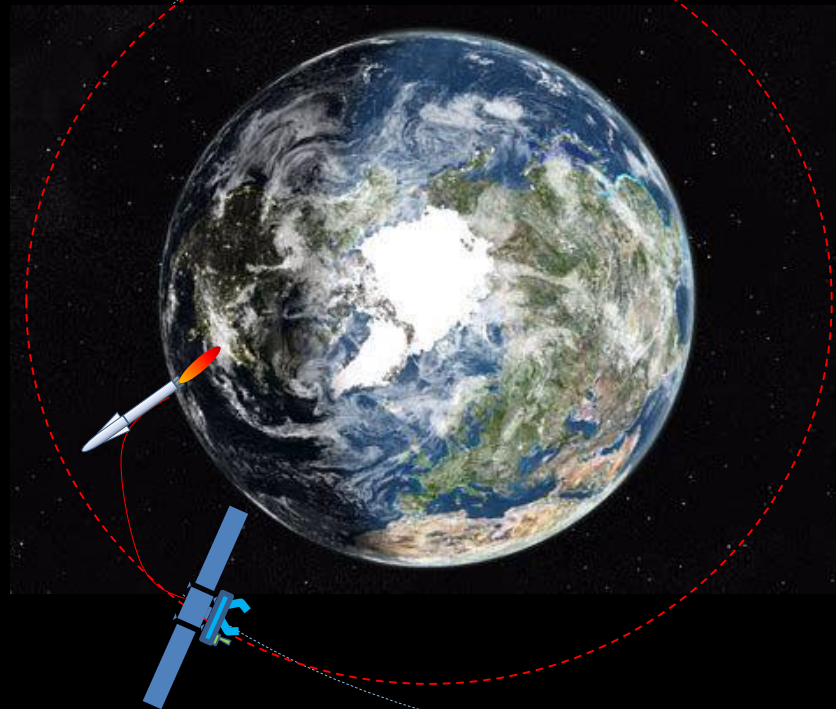
GTO

GEO

Graveyard



CONOPS (Mission Phases / Timeline)



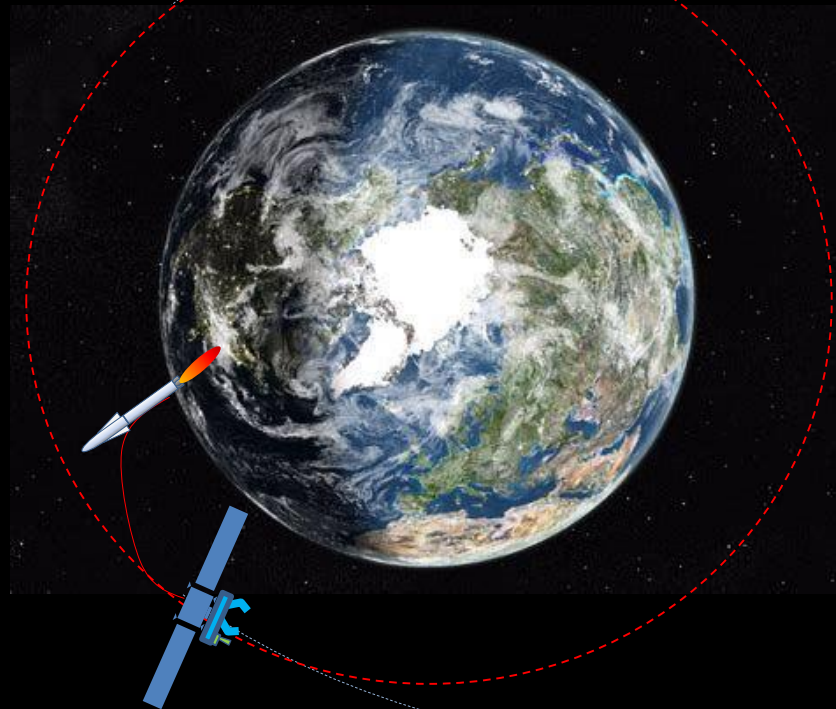
GTO

GEO

Graveyard



CONOPS (Mission Phases / Timeline)

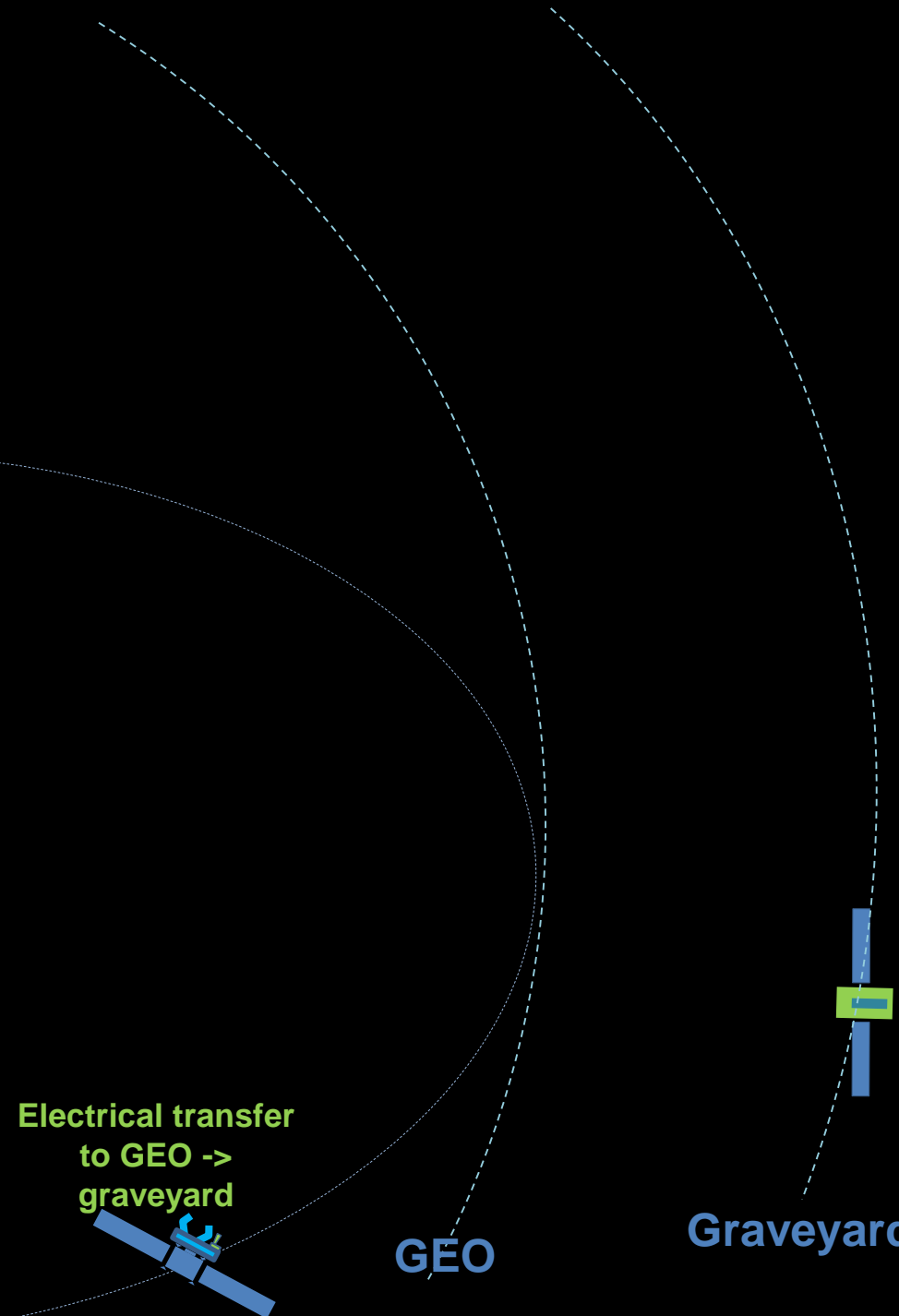


GTO

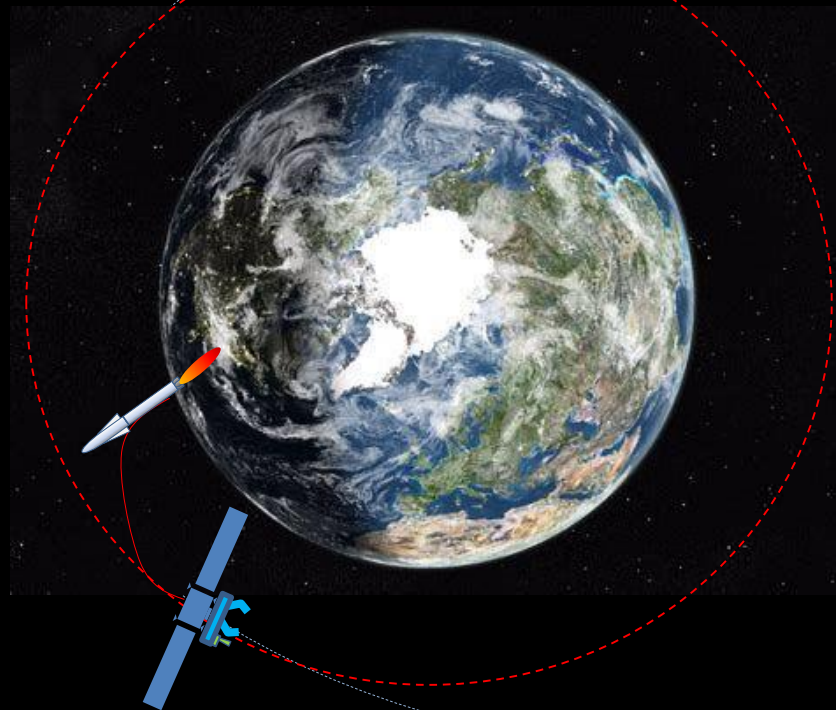
Electrical transfer
to GEO ->
graveyard

GEO

Graveyard



CONOPS (Mission Phases / Timeline)

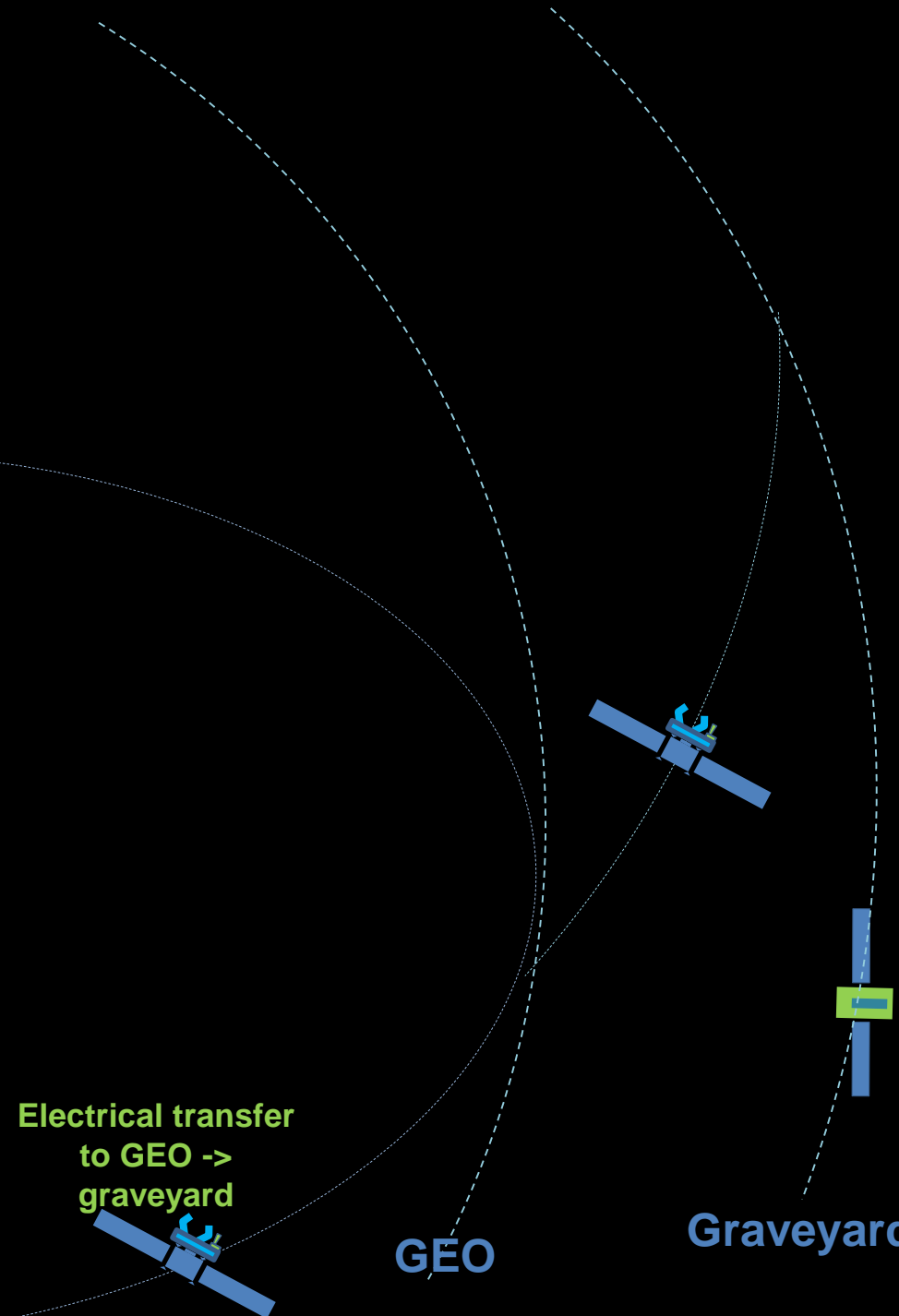


GTO

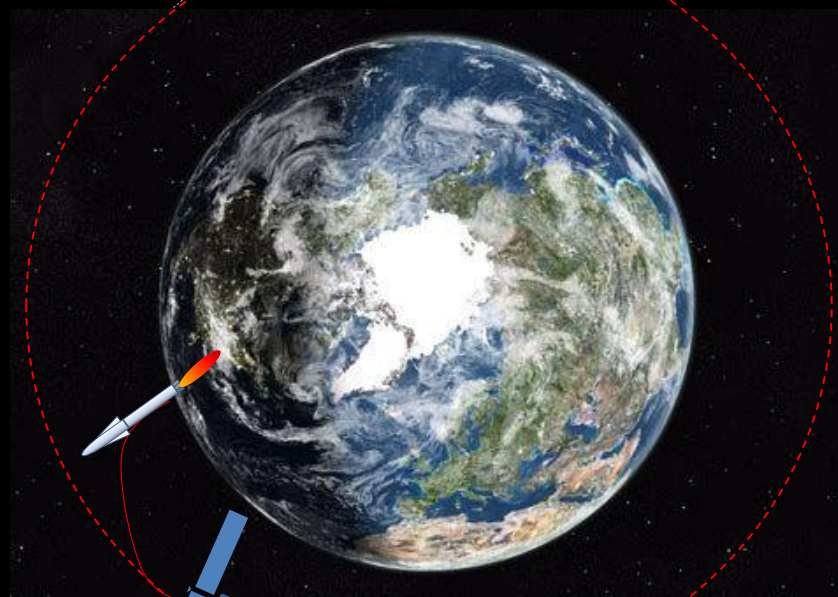
Electrical transfer
to GEO ->
graveyard

GEO

Graveyard



CONOPS (Mission Phases / Timeline)



GTO

Electrical transfer
to GEO ->
graveyard

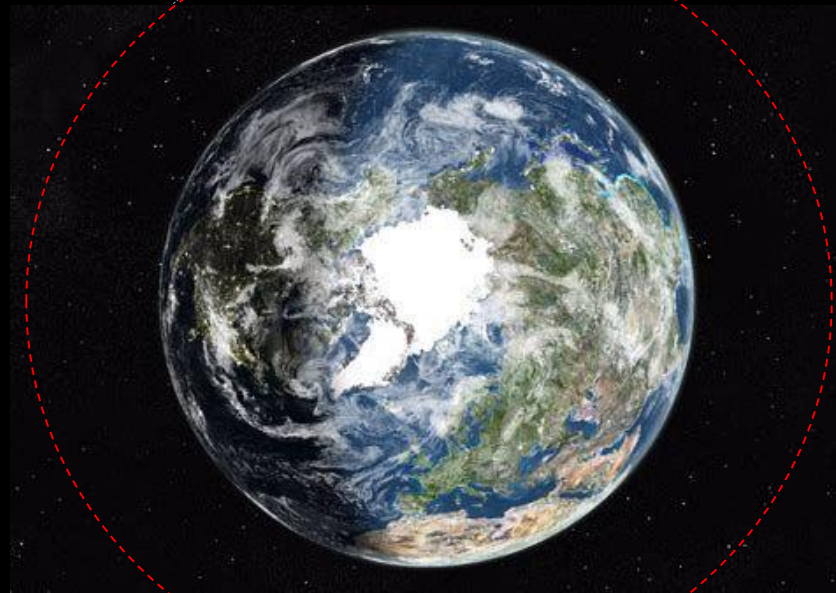
GEO

Graveyard

Demo with SB4000:

- Rendezvous
- Capture
- Station keeping

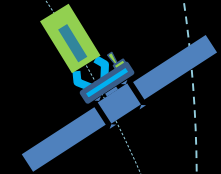
CONOPS (Mission Phases / Timeline)



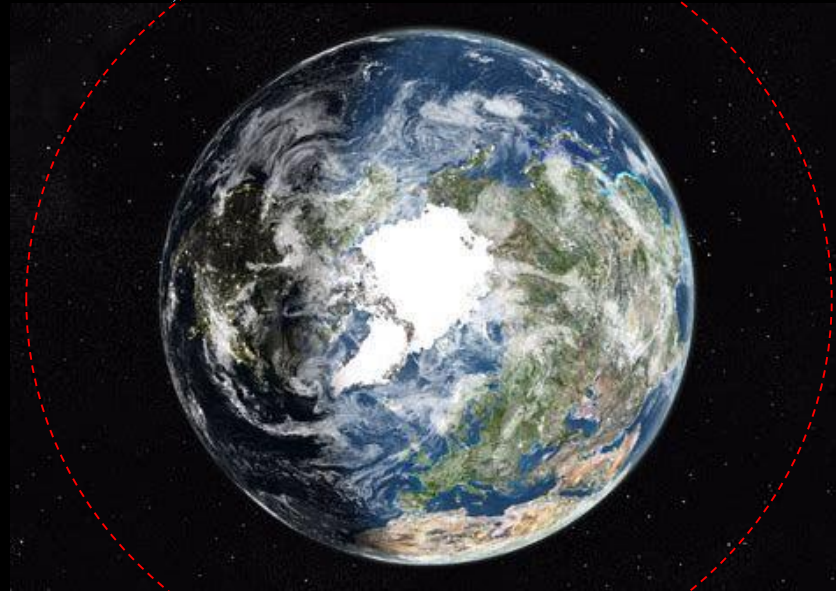
GTO

GEO

Graveyard



CONOPS (Mission Phases / Timeline)

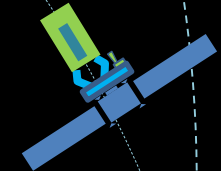


GTO

Station Keeping
Service
for Life Extension

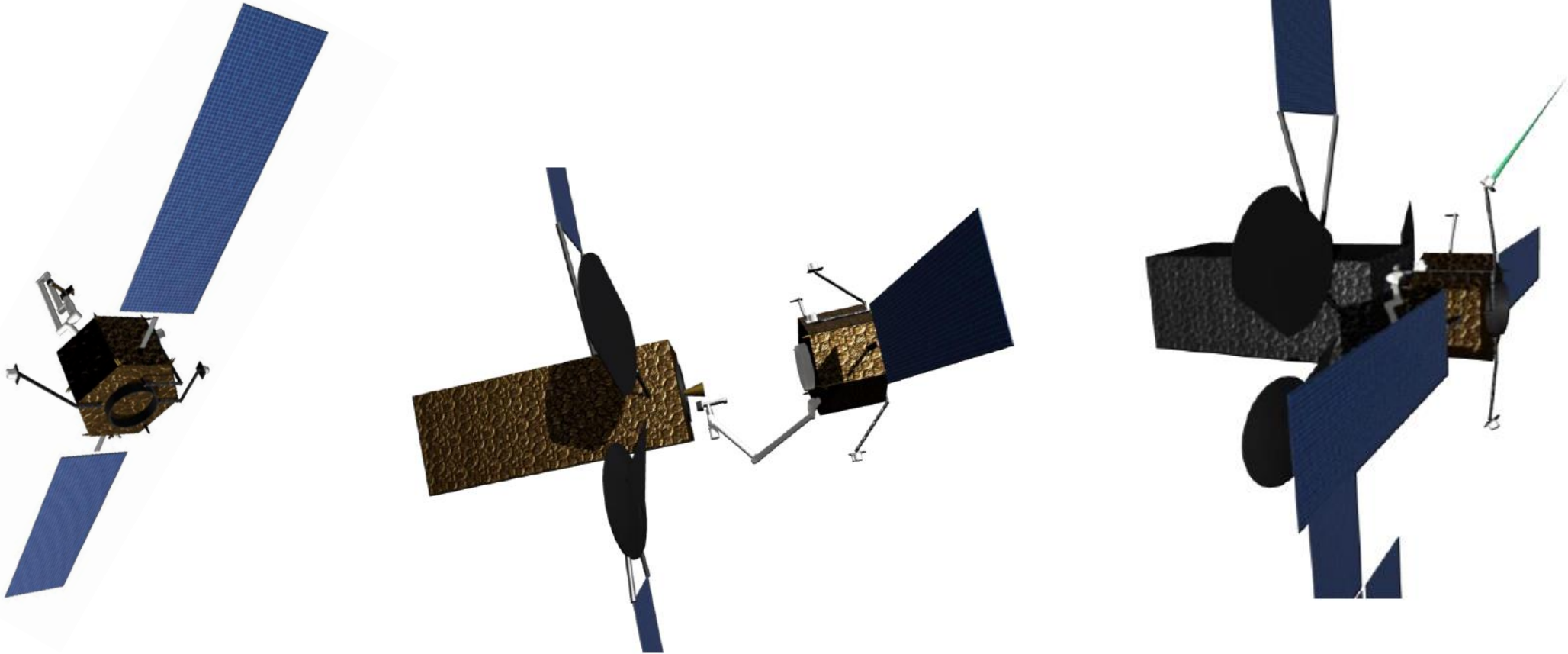
GEO

Graveyard



Mission Concept Design Description

- System architecture description / product tree / consortium / supplier identification



Mission Concept Design Description

- System architecture description / product tree / consortium / supplier identification
 - Platform : classical spacecraft elements – supply chain already existing, but open to any suggestion allowing schedule/cost optimization
 - Mission : partnering still open for :
 - Narrow-Angle camera
 - Wide-Angle camera
 - Lidar
 - Direct docking system



In Orbit Servicing START-€, Space Alliance IOS Mission 2022 Clean Space Industrial Days

Who

Customer Status



Customer Status

- Two Telecom Satellites Operators involved in the maturation phase
- Current status of discussions:
 - Market: interest for the station keeping confirmed
 - Concept of operations committed
 - Involvement schedule under finalisation
 - Technical specification consolidated
 - Contractual aspects under finalisation
- Involvement in the next phases of the project





THANK YOU
FOR YOUR ATTENTION

