



**We help
Earth benefit
from Space**

SSC Connect - Global Ground Station Network Services - Optimizing your ground stations for your operations

Ravit Sachasiri

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SSC Business Areas



A broad range of advanced space services across the space value chain

UP-STREAM



Launch

MID-STREAM



Ground-to-Space
Connectivity



Spacecraft
Operations &
Engineering

DOWN-STREAM



Space Data

Launch



Ground Station



Spacecraft Operations & Engineering



LSE GmbH, Aurora

Space Safety



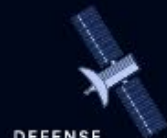
UPSTREAM

OPERATIONS

DOWNSTREAM



LUNAR & DEEP SPACE MISSION COMMUNICATION



DEFENSE



SATELLITE COMMUNICATION



ROCKET ENGINE TESTS

BUSINESS

ESRANGE SPACE CENTER

UNIVERSITY

PAYLOAD DESIGN

ROCKET REUSABILITY TESTS

LAUNCH VEHICLE INTEGRATION

DROP TESTS

SOUNDING ROCKETS



STRATOSPHERIC BALLOONS



SCIENCE

ORBITAL LAUNCH

SATELLITE OPERATIONS



INCUBATOR

TRACKING AND TELEMETRY COMMAND (TT & C)



SPACE DOMAIN AWARENESS

PROCESSING

DATA MANAGEMENT



GLOBAL GROUND STATION NETWORK

DATA COLLECTION

APPLICATIONS

DATA USAGE

DATA ANALYTICS



SPACE SITUATIONAL AWARENESS

SSC customers & partners





Esrange center and Orbital launch capabilities

Esrange Space Center

The most versatile Space Center in the World

Established services

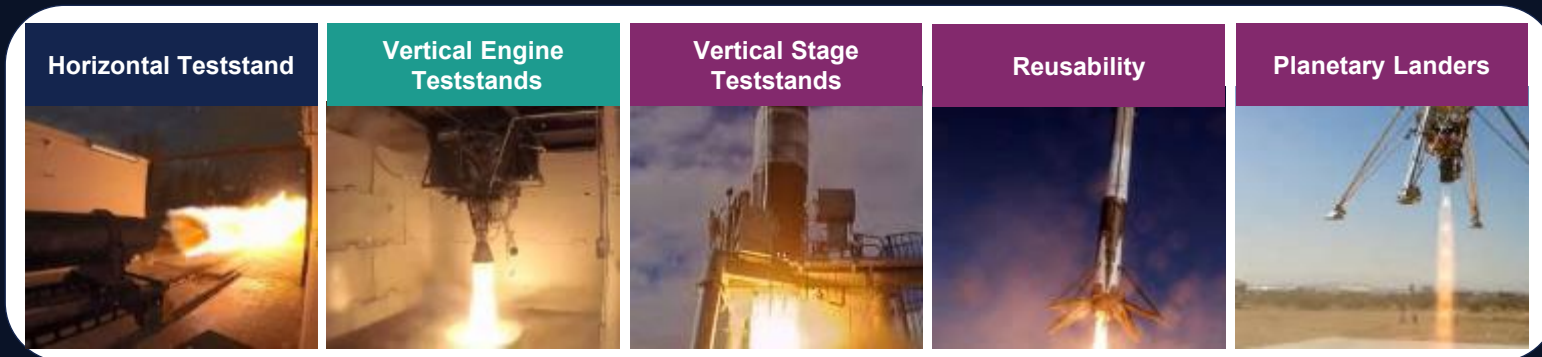
Recent services

Coming services

Sounding Rockets



Testbed Esrange



Ground stations



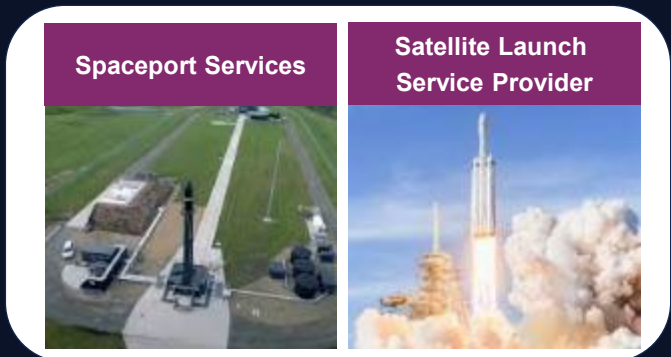
UAS



Stratospheric Balloons

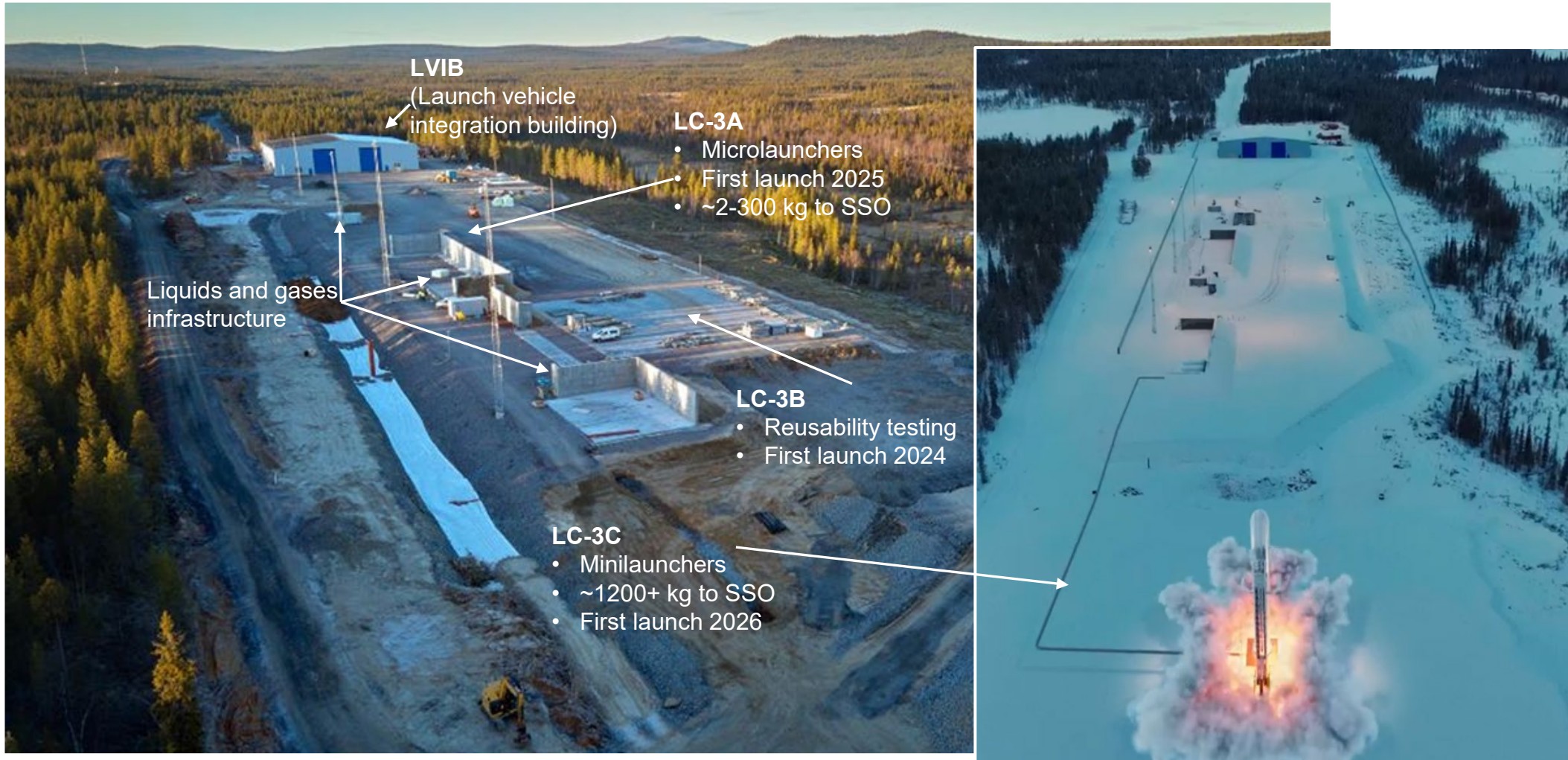


SmallSat Express



Spaceport Esrange

Europe's polar gateway to space





SSC Connect – A global ground station network

SSC CONNECT Ground Station Network

Global connectivity for reliable spacecraft operations – SSC owned and Partner stations



Comprehensive All-Altitude Multi-Mission GSN capable of serving any mission with high-quality standards

- 10 SSC Stations complemented by 11 carefully selected Partner Stations
- Constantly growing
- A redundant ground network positioned to reduce operational latency
- S, X, and Ka-band globally
- High availability in a proven multi-mission concept
- Service availability > 99.8 %
- Cloud agnostic



Overview of SSC Stations' Capabilities



SSC Ground stations	Esrang Space Center, Kiruna, Sweden	Inuvik, Canada	North Pole, Alaska USA	South Point, Hawaii, USA	Western Australia Space Center	Santiago, Chile	Punta Arenas, Chile	Clewiston, Florida, USA	Si Racha, Thailand	Ågesta Teleport, Stockholm Sweden
LAT	67° 53'N	68° 19'N	64° 48'N	19° 00'N	29° 02'N	33° 09'N	52° 56'N	26° 45'N	13° 06'N	59° 12'N
LONG	21° 04'E	133° 32'W	147° 30'W	155° 39'W	115° 21'E	70° 40'W	70° 51'W	81° 03'W	100° 56'E	18° 05'E
Antenna class	2.4 - 13 m	7 - 13 m	5 - 13 m	13 m	7 - 13.6 m	9 - 13 m	7 m	9 m	7 m	1.9 - 9 m
Receive RF bands (Down)	S, X, Ka	S, X, Ka	S, X	S, X, Ku	S, X, Ku	S	S, X, Ka	X	S, X, Ka	Ku
Transmit RF Bands (Up)	S	S	S	S, X, Ku	S, X, Ku	S	S	S	S	Ku

SSC CONNECT Ground Station Network

Global connectivity for reliable spacecraft operations – Lunar and Deep Space capable stations



Robust and readily available Lunar capabilities for advanced LEGS standards operations

Connect Lunar

Ground Sites

- SSC 13m apertures with both S/X up/down available in 2024
- Completed by large Partner Lunar antennas (16-32m)



SSC CONNECT Ground Station Network

Global connectivity for reliable spacecraft operations – Future stations for constellation operators



Connect Go global network for efficient operations in LEO

Connect Go

Ground sites

Service available in Q4 2024

- 4 initial stations/sites
 - Small antenna network (3.7m)
 - 7 Antennas already operational
- Additional 6 Antennas being installed in 2024
 - Aggressive growth plan



SSC CONNECT Ground Station Network

Global connectivity for reliable spacecraft operations – Ka-Band capable stations



Global Ka-Band capabilities for EO large throughput operations

Ka-Band

Ground sites



SSC CONNECT Ground Station Network

Global connectivity for reliable spacecraft operations – Optical stations



Connect Optical capabilities in developments for advanced Direct-To-Earth communications

Optical

Ground sites

- Development of the ESA optical communication project NODES (Network of Optical Stations for Data Transfer to Earth from Space)
- Trials starting in 2024 with the first optical ground station (OGS) in Western Australia, and the second OGS to be installed in Santiago, Chile and added to the optical ground network in 2025.
- Additional optical ground stations will be added to the global network to provide a full optical data service when the concept is proven.



SSC's Future Optical Comms Ground Network Services



Swedish Space Corporation (SSC) is currently deploying an optical ground network to complement the space-to-ground payload data portfolio. The project, named NODES, is supported by ESA's Scylight programme and the new service validation will start around Q1 2025 with two optical ground stations.



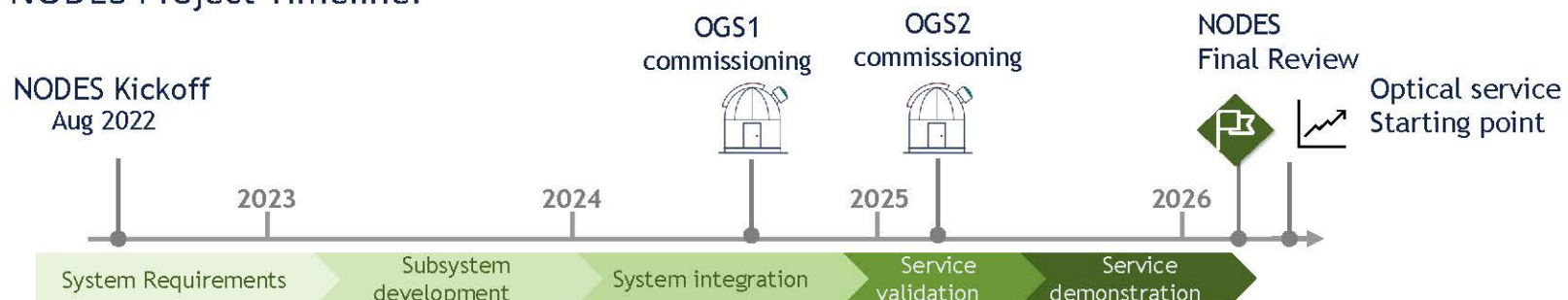
Get in touch if interested. We are looking for partners and early customers!

	OGS1	OGS2
Bi-static design (aperture \varnothing)	✓ (60 cm)	✓ (50 cm)
1.5 μm band (communications)	✓ (TX + RX up to 10 Gbps)	✓ (TX + RX up to 10 Gbps)
Multi-mission (standards)	✓ (CCSDS O3K + SDA OCT)	✓ (CCSDS O3K + SDA OCT)
Location	Western Australia	Santiago, Chile
Manufacturer	Cailabs	Safran
Commissioning	CCSDS: Q3 2024 SDA: Q1 2026	CCSDS: Q1 2025 SDA: Q2 2025

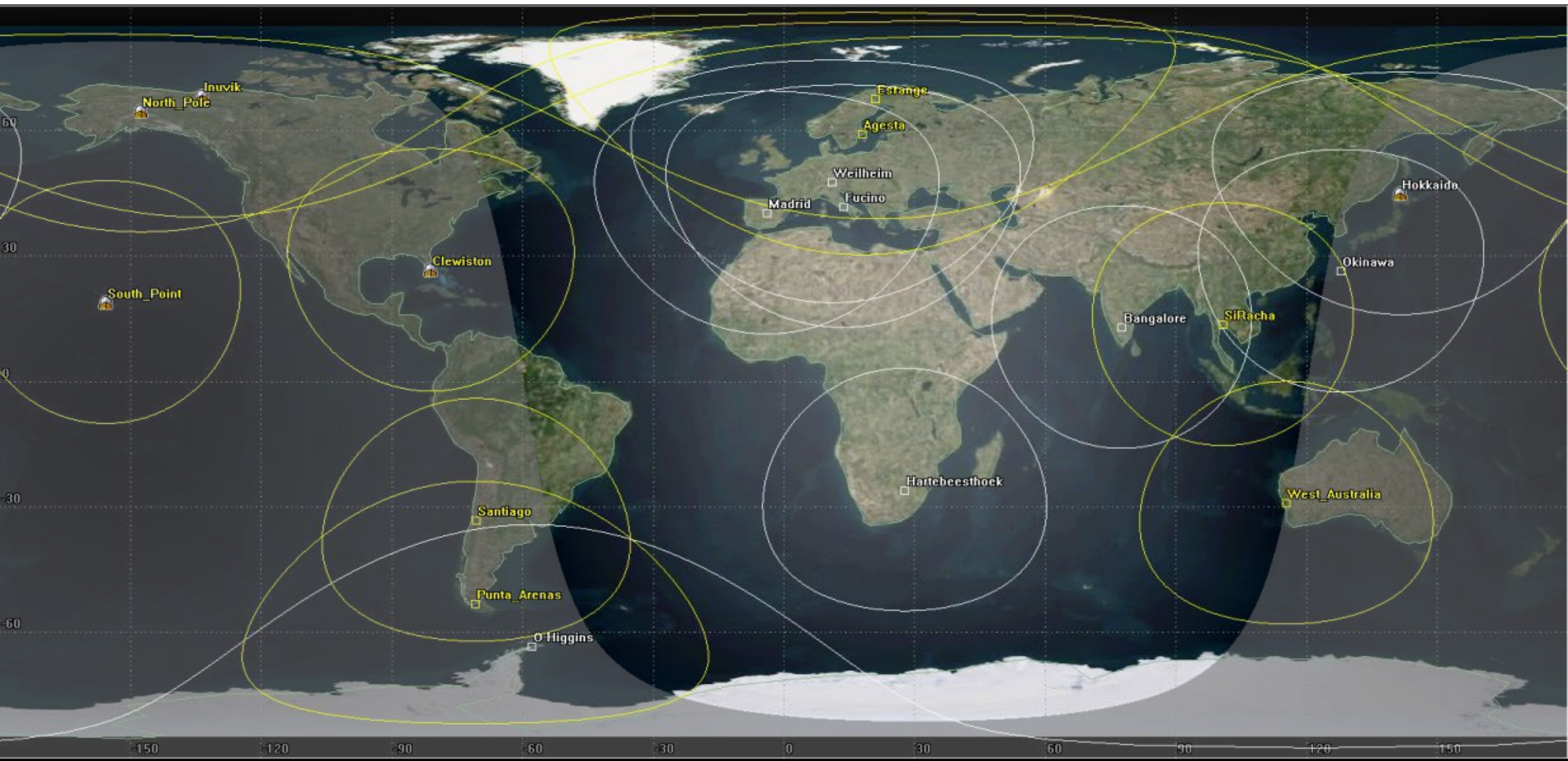


SSC's OGS1 in Western Australia (Jan 2024)

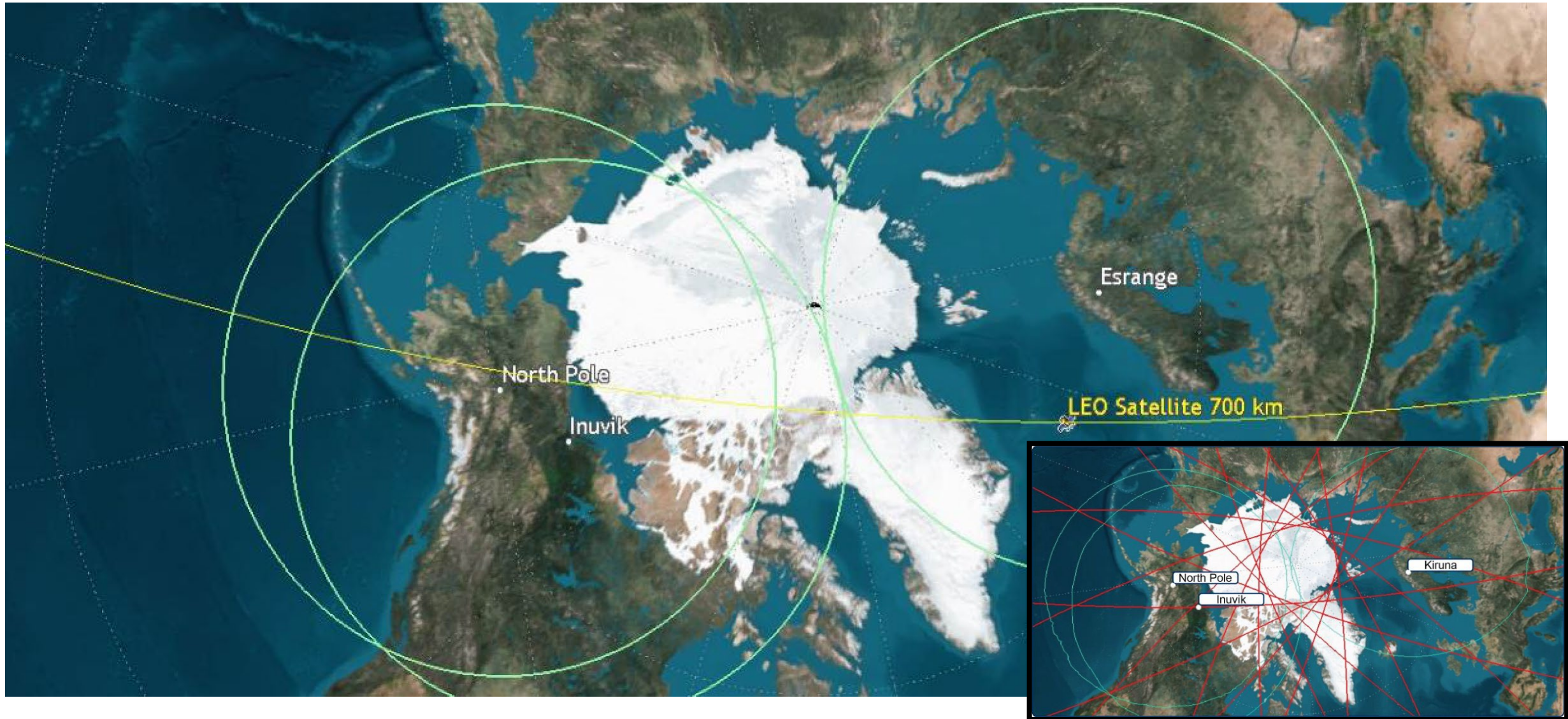
NODES Project Timeline:



Global Ground Station Network, Global Connectivity for Space Operations



NORTHERN HEMISPHERE COVERAGE





Services for all your Ground Station needs

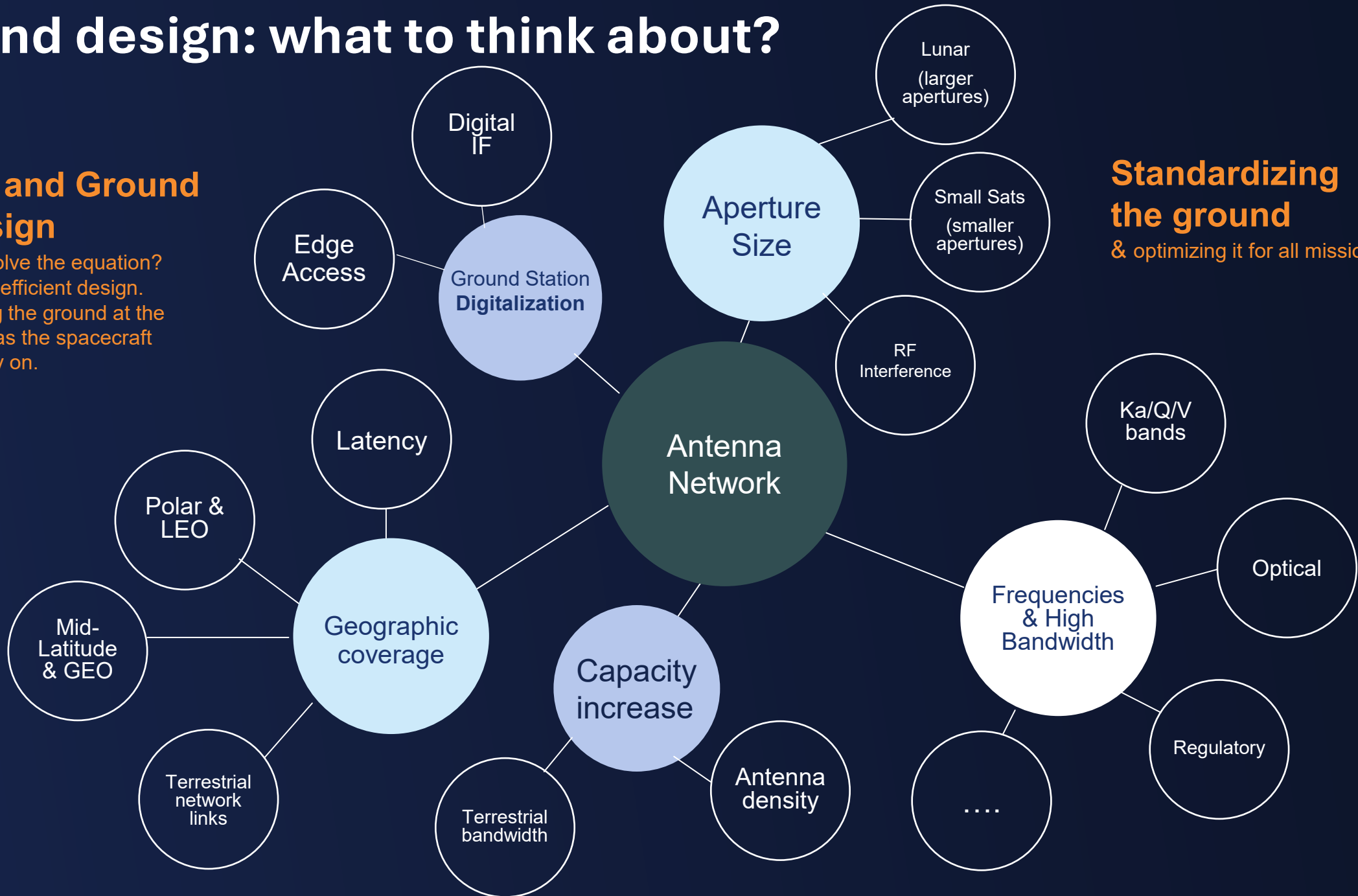
Ground design: what to think about?



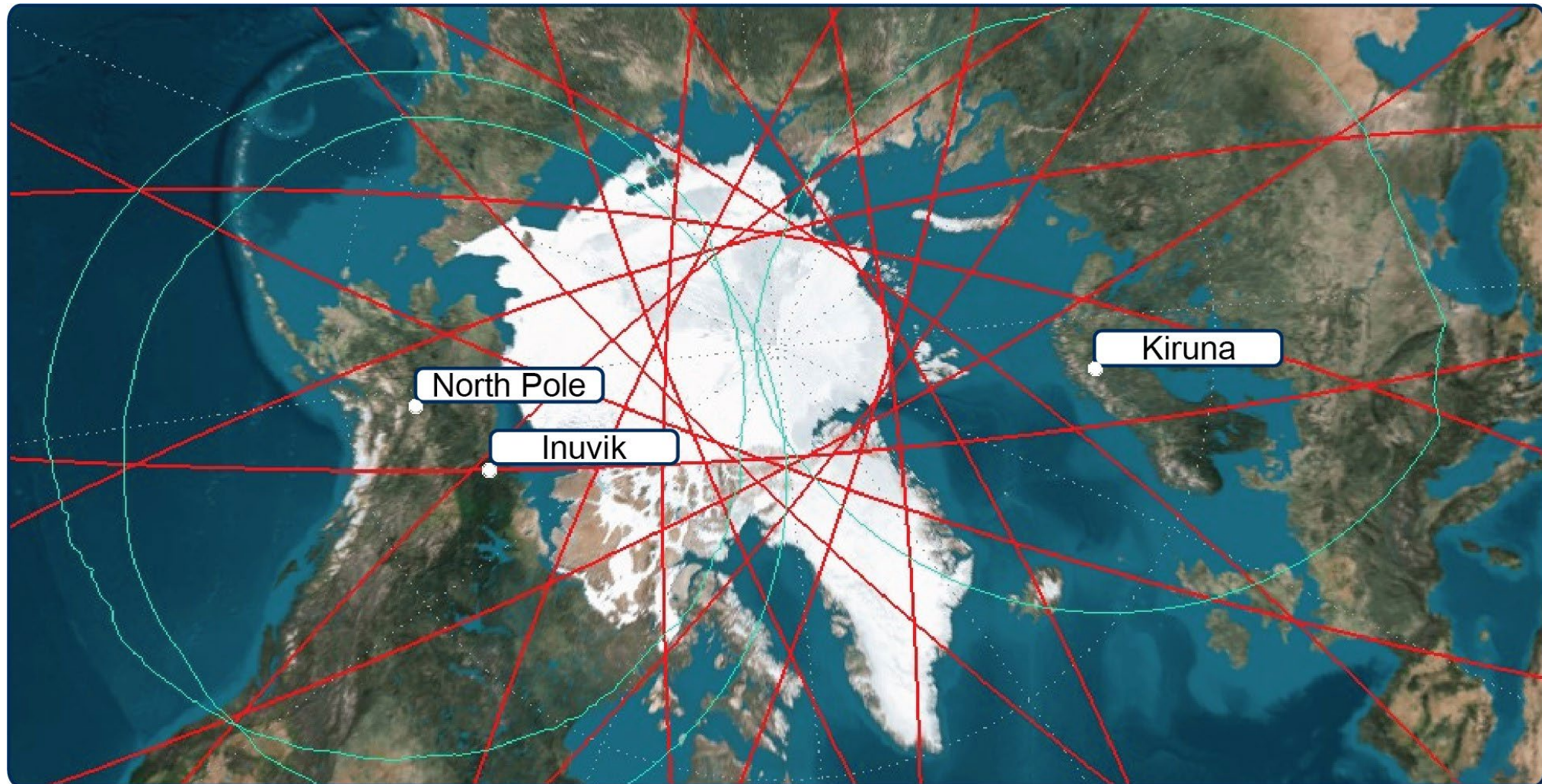
Space and Ground co-design

– How to solve the equation?
Building an efficient design.
Considering the ground at the same time as the spacecraft design early on.

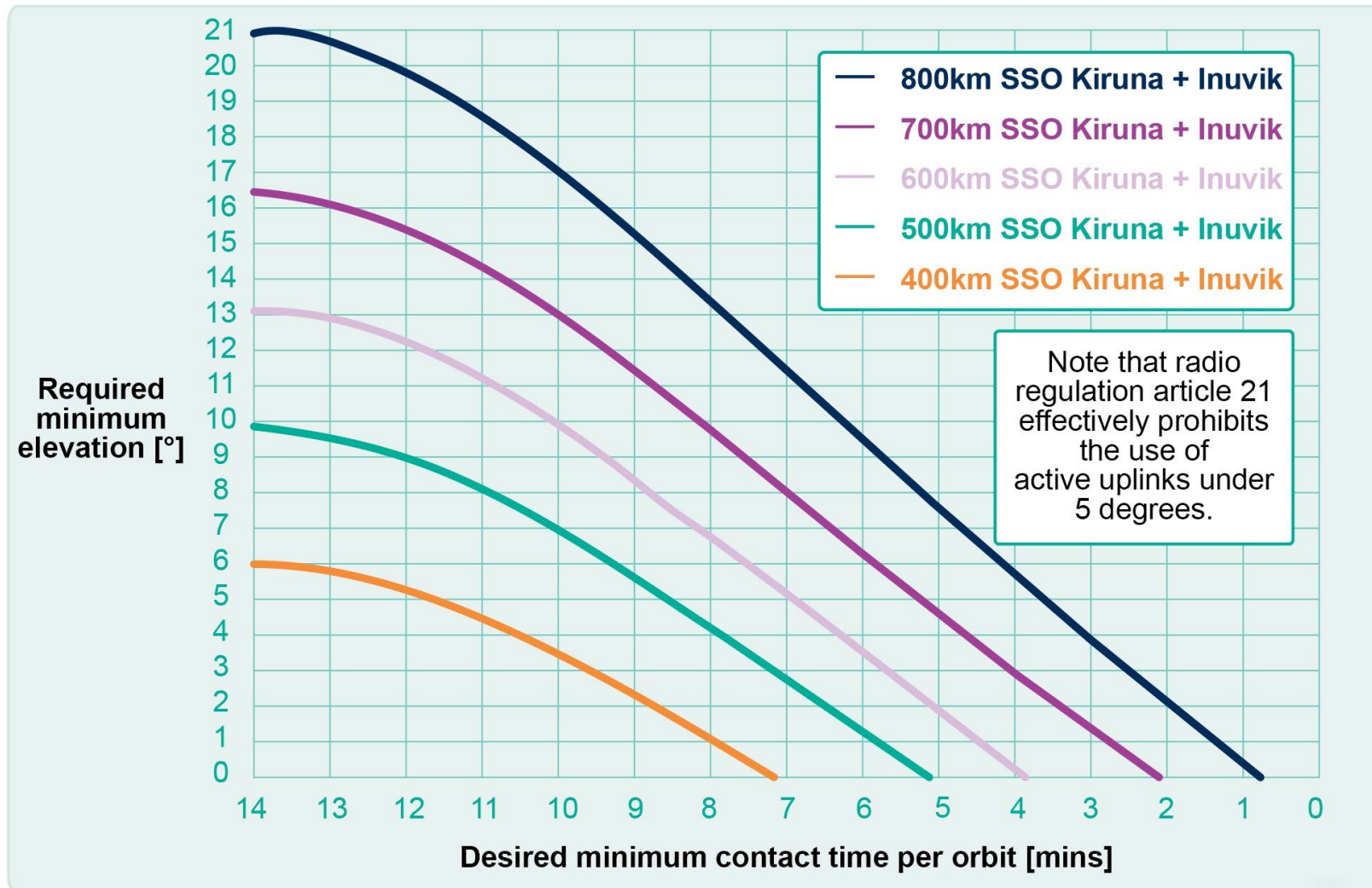
Standardizing the ground
& optimizing it for all missions



Polar Coverage



Polar Coverage

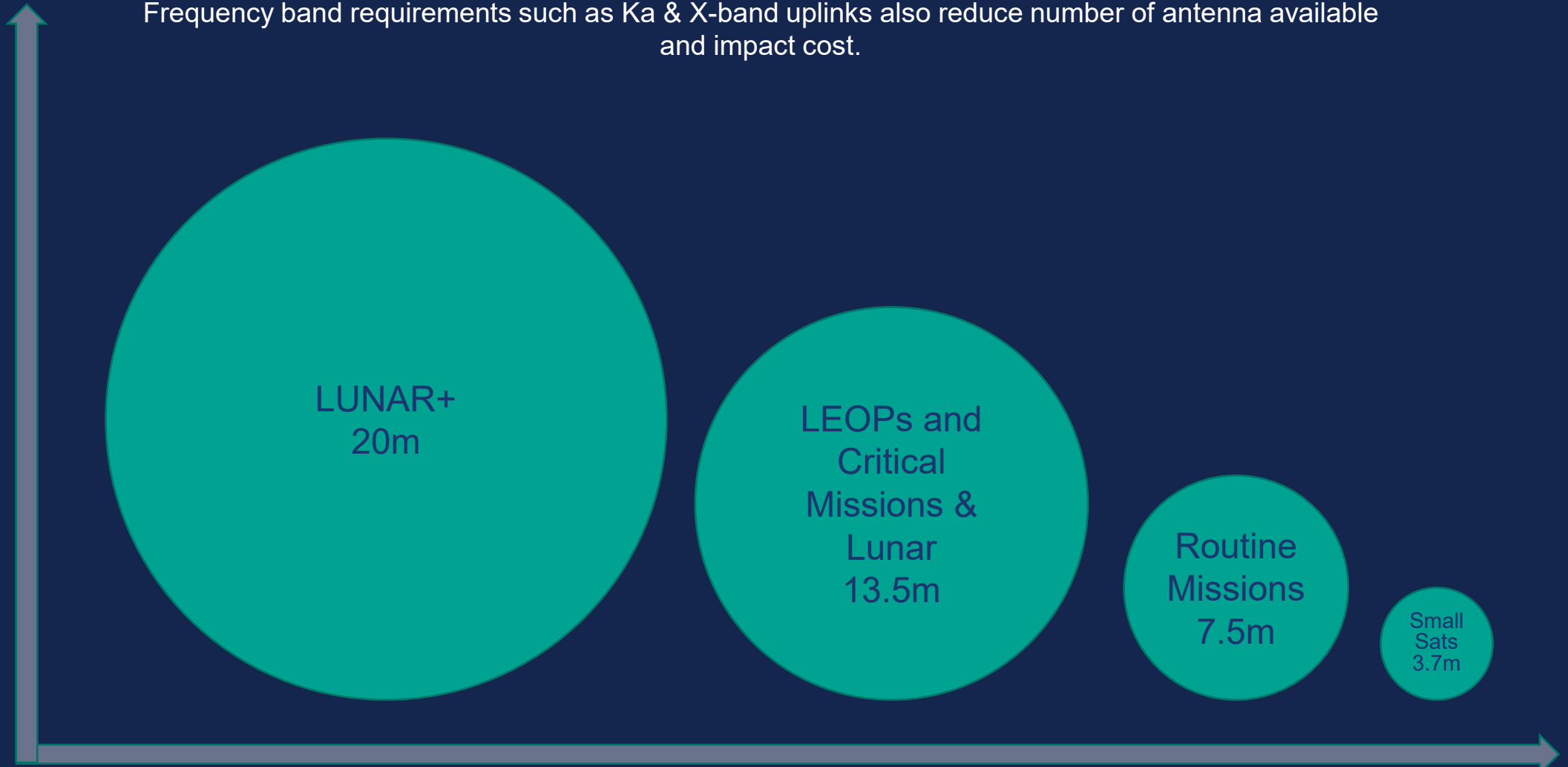


Network Evolution – Aperture size and capability



Frequency band requirements such as Ka & X-band uplinks also reduce number of antenna available and impact cost.

- Increasing link budgets
- Less RFI
- Higher cost



Increasing volume – decreasing pass prices

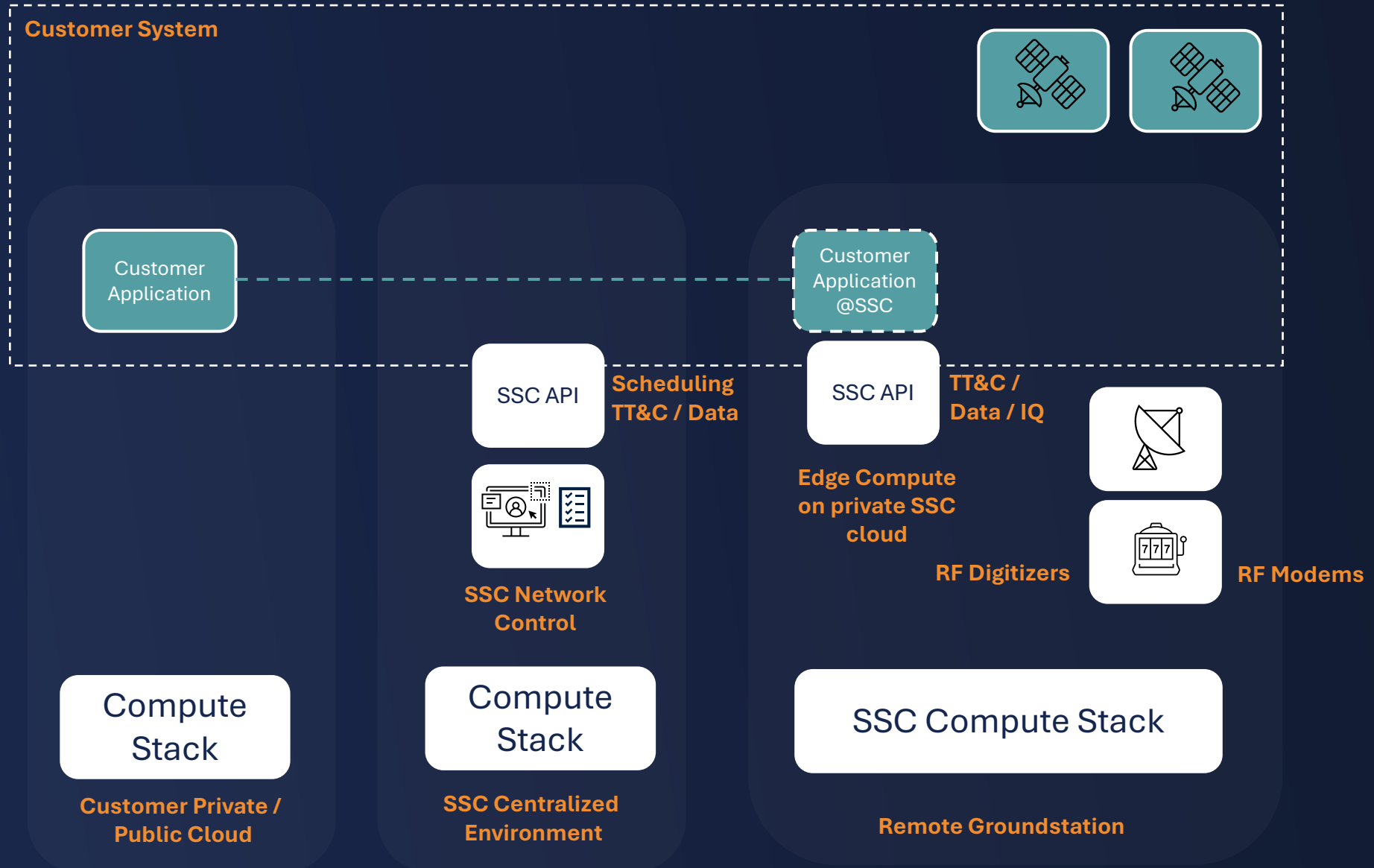
Software role in Ground Station Services



- The SSC Connect Ground Station Services delivery system consists of a set of assets, software and operations
- The software has a critical role in efficiently sharing Infrastructure in a robust way in a multi-mission environment and delivering the service to the customer
- Traditional hardware components are transitioning into software functions
- We see an overall increase in network utilization, growth and capacity needs
- Automation is key to run this efficiently



Architecture Roadmap Digitalized System - Ground Station as a Service



Well-designed and functional API's



In addition to the well-established protocols SLE CCSDS, Cortex native

SSC API for Scheduling passes

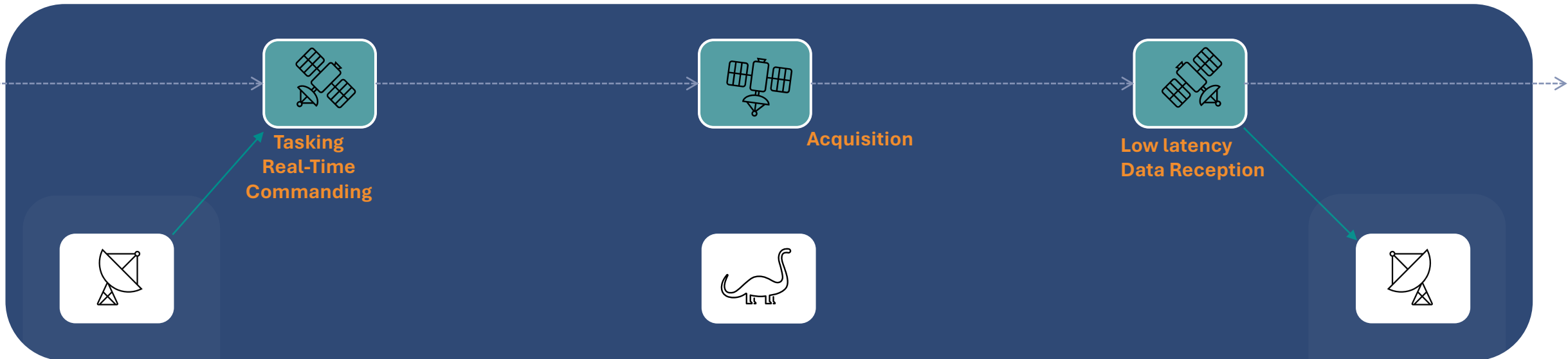
- RESTful API for scheduling requests

SSC WebSocket for real time data - TM/TC

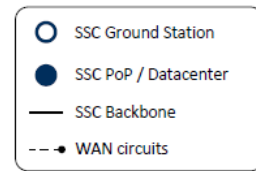
- Ground station M&C parameter streaming
- Quick customer onboarding
- Sandboxed environment for customer testing

Near-real time – Data Delivery

- Pickup-points in cloud provider or server in SSC infrastructure
- Data can be sliced in small segments at ground station to support low latency scenarios
- Standard IT protocols for file / data transfer (S3, SFTP, FTPS, https, ...)

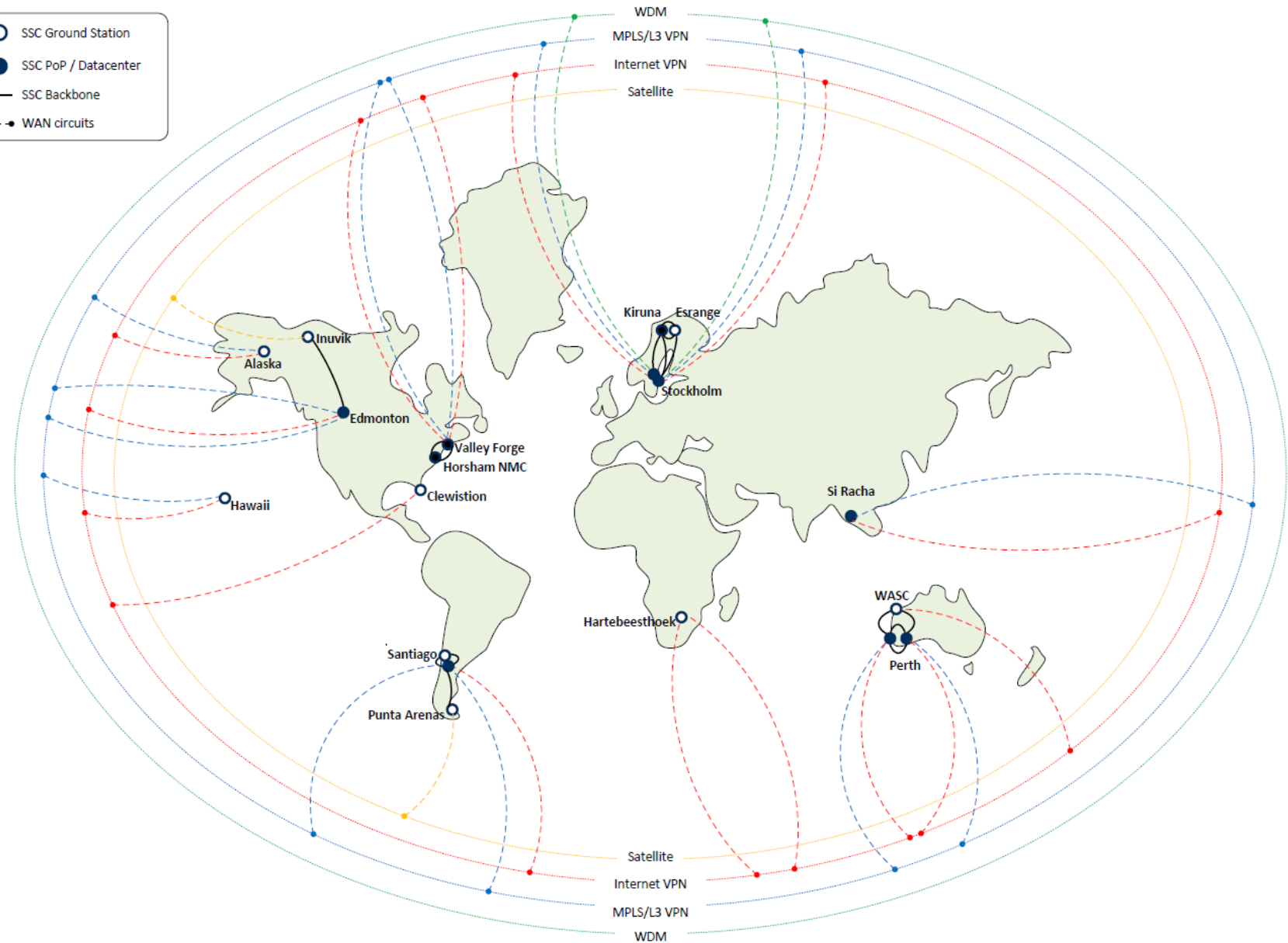


Terrestrial Communication



Bandwidth connection in the SSC CONNECT network may vary depending on the ground site's location best fitting the satellite support.

- From 1Mbps to 1 Gbps
- Cloud interface available for data-handling



RF LICENSE ITU PUBLICATION

REQUIREMENTS OF ITU PUBLICATION PER SITE



- SSC shall apply for the Receive and Transmit RF license at each ground station location, however, the satellite owner/operator must file its ITU publication through its national authority for the satellite/spacecraft.
- The national authorities have a strict unconditional requirement that before a licence application is processed, the satellite network must be published in the ITU to mitigate any risk of interference for satellites in orbit.
- The satellite filing in the ITU is the responsibility of the satellite owner/operator.
- The requirement differs between the national authorities.
- The satellite operator should contact SSC to get information and ensure to identify potential ground station in the Service Area as well as Reference to Earth Station in its ITU Filing.

Administration	Publication at the ITU	Service Area	Reference to Earth Station
Australia	Mandatory	Mandatory	Mandatory
Canada	Mandatory	Mandatory	Mandatory
Chile	Mandatory	Optional	Optional
Sweden	Mandatory	Mandatory	Highly recommended
Thailand	Recommended	Mandatory	Recommended (Remark: License only for EO or scientific missions.
US	Mandatory	Mandatory	Highly recommended

RF LICENSE APPLICATION FOR SSC STATIONS



APPLICATION LEAD TIMES

Country Administration	Licensing Administration Lead Time	Valid period and comments
Australia	<ul style="list-style-type: none"> • On-going license - 4 months • Non-ongoing license - 2 months 	<ul style="list-style-type: none"> • On-going license – Automatic yearly renewal if fee is paid. • Non-ongoing license – Is temporary and expires at the end date. Valid period is longest 12 months.
Canada	<p>At least 6 months in total</p> <ul style="list-style-type: none"> • Foreign Satellite Approval - 130 days • Earth Station license - 7 weeks • RSSSA license - 180 days 	<ul style="list-style-type: none"> • Foreign Satellite Approval - Temporary or continuous • Earth Station license – Automatic Yearly renewal • RSSSA - continuous
Chile	<ul style="list-style-type: none"> • Standard (S-band) – Up to 2 months • Non Standard (X-band, Ka-band) – Up to 4 months 	10 years
Sweden	<ul style="list-style-type: none"> • 42 days + FMV review 	10 years
USA	<ul style="list-style-type: none"> • 30-day authorization - about 2 months. • 60-day authorization - about 2 months • 180-day authorization - about 4 months. • Authorization for reception only – about 1 month • Long-term license - at least 1 year 	<ul style="list-style-type: none"> • 30 days • 60 days • 180 days • Long-term about 10 years
Thailand	At least 6 months	1 year

The above presented time is only the external lead time and does not include internal time required for SSC to prepare the application.



**Swedish Space
Corporation**



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Earth benefit
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www.sscspace.com