The Journey of O3b

The World's First Broadband NGSO Constellation

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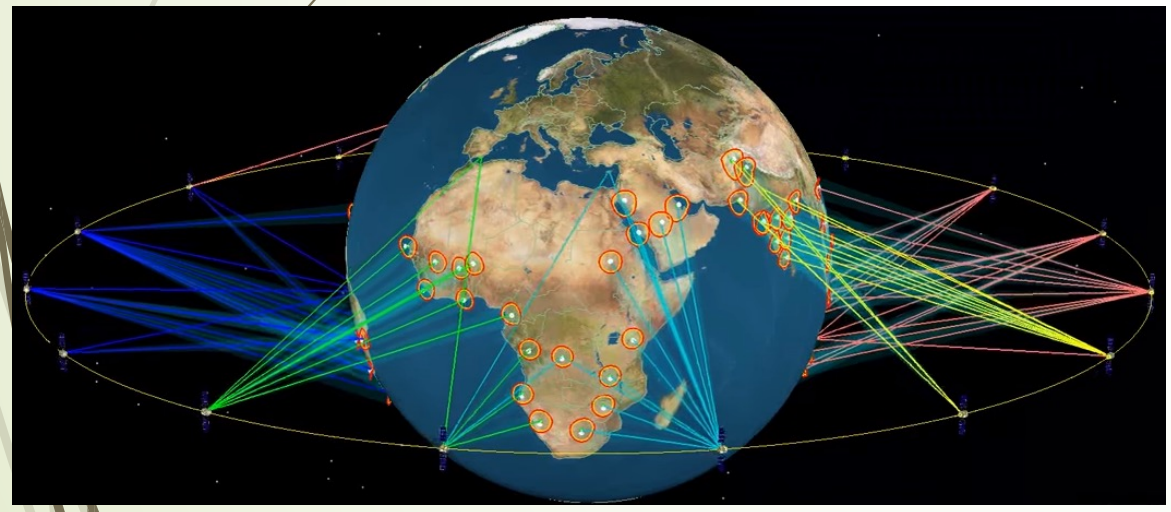
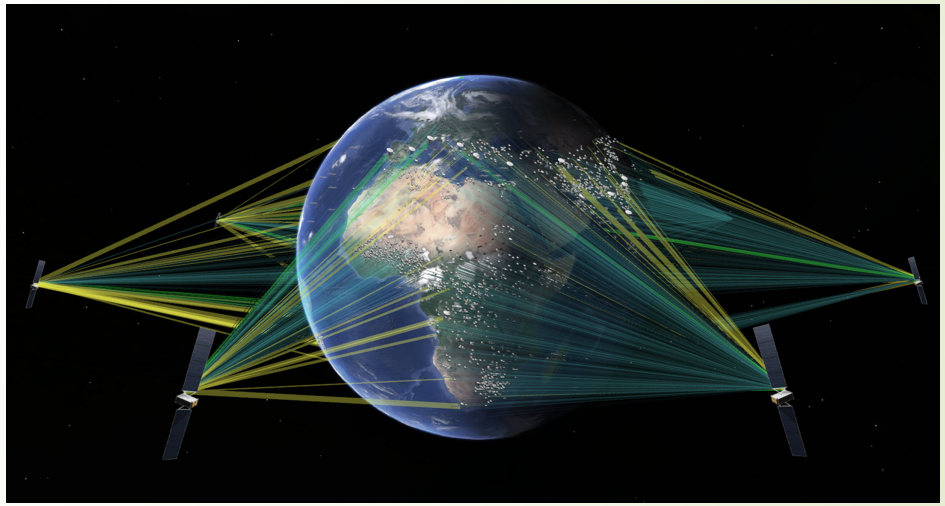
The Path

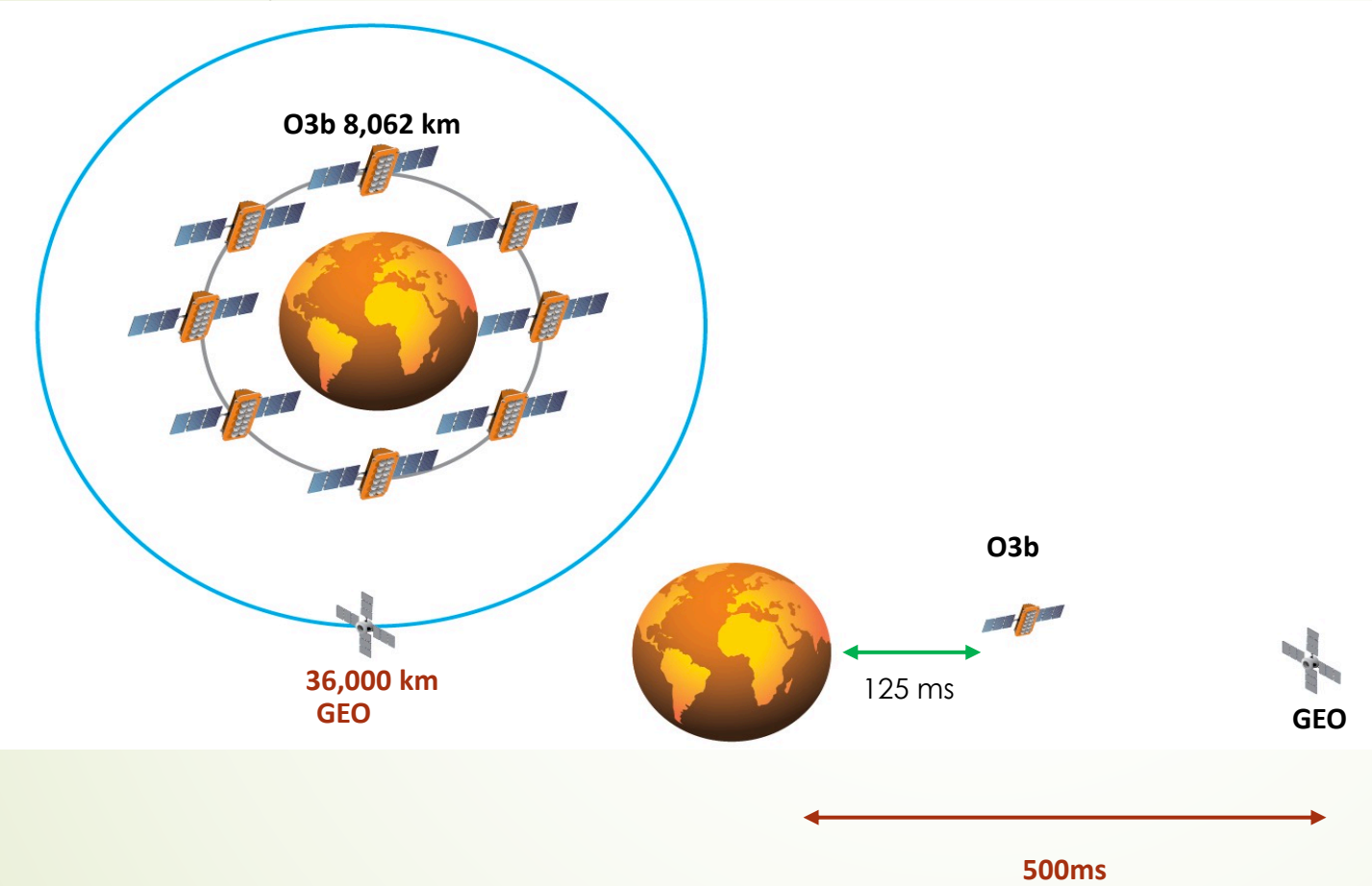
2007	2008	2009	2013	2016	2018	2017	2020	4Q' 2022
O3b founded by Greg Wyler	Investments from Google, Liberty, HSBC	SES Invests in O3b	First 4 satellites launched	SES Acquires O3b	Expands to 20 total satellites	Boeing contracted for mPOWER	O3b mPOWER development	O3b mPOWER start of service





O3b mPOWER evolution
massive scale, performance, & flexibility

O3b Classic compared to GEO

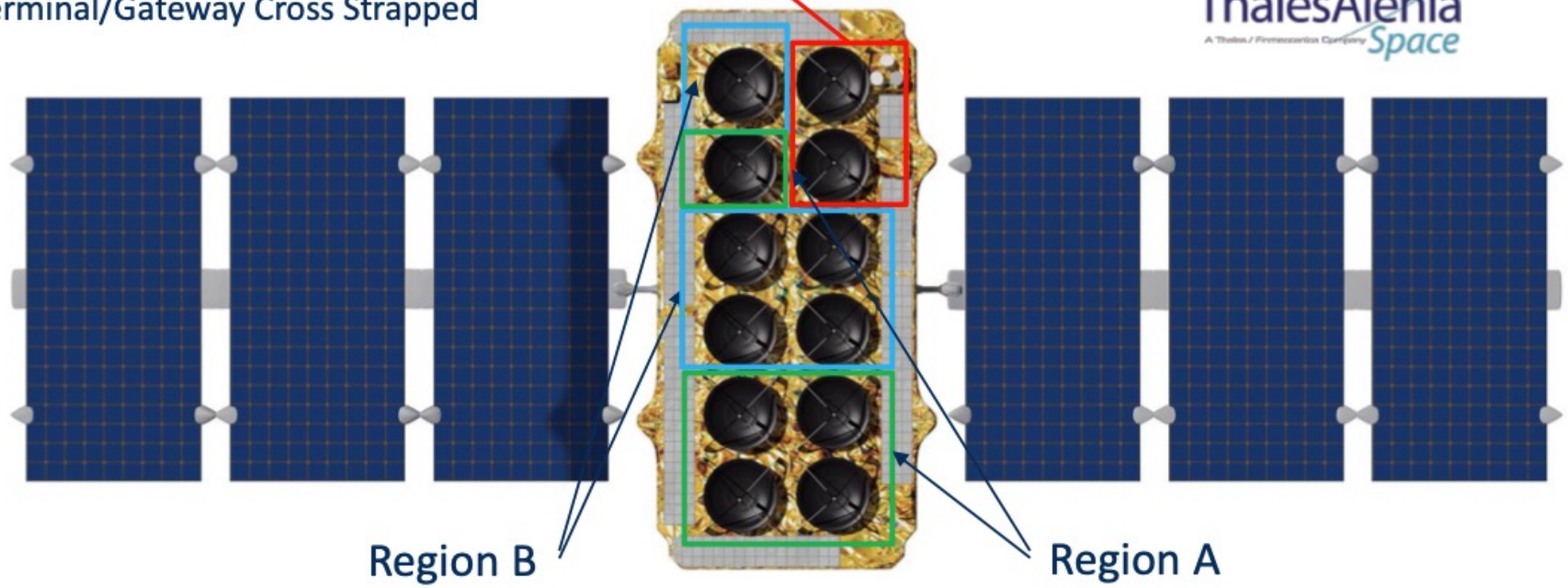


- A different kind of satellite:
  - The Medium Earth Orbit reduces delay by 75% compared with GEO – round trip delay less than 125 msecs
  - O3b's low latency improves the quality of voice and data services
  - Much lower cost to build and launch compared with GEO
  - Do not need to apply for orbital slots – can launch tens or hundreds of satellites into the equatorial arc at that altitude
  - Fully steerable beams are ideal for hot spot applications

O3b Classic Satellite Architecture

- 2 Gateway Antennas per satellite; one for each region and independently steerable ±26°
- Circular polarization is used RHCP and LHCP for each Gateway antenna
- The Antennas typical configuration is Terminal/Gateway Cross Strapped

- The Space Vehicle is designed, integrated and tested, by Thales Alenia Space.
- Leveraging the Globalstar 2 heritage with redundant Satellite/payload platforms.



- 10 independently steerable Customer Beam Antennas which are used to point a customer beam to any location within +/- 45° latitude.
- 5 beams per Region, 2 regions per satellite. Circular polarization is used RHCP and LHCP for each region
- Each customer beam is configured with a 216 MHz Ka-band transponder in the forward direction
- a 216 MHz Ka-band transponder in the return direction
- Each Satellite has 10 x 65 W Ka Band TWT Amplifiers providing 46dBW EIRP

The Comsat Connection

Viasat Comsat Labs Developed MEOLink Modem

- DVB-S2 SCPC and Point to Multipoint
- Symbol Rates From 10 Msps to 180Msps in 1Msps steps
- All Modulations and Codes (QPSK, 8PSK, 16APSK, 32APSK)
- 810Mbps Peak Data Rate Each Direction

Dual DVB-S2 Receivers

- Make-Before-Break Operation During Satellite Handover
- No Lost or Repeated Packets
- Only single unit required for handover

O3b Classic vs O3b mPower

O3b Classic (F1~F20)

- Dedicated User and GW Beams, users connect to one of two GWs per region (limited flexibility)
- 10 User Beams (700 km/beam)
- 4-7M km^2 of coverage
- 4.4 GHz total spectrum
- 6 Gbps per Spacecraft (to 1.2m terminals)

Markets best served:

- Trunk
- Maritime (local)
- Government

10 to 25x Improvement

mPower:

- Full flexibility: up to 5,000 formed beams per spacecraft >> any antenna to any antenna connectivity
- +/- 26° FOV Phased Array ubiquitous coverage
- Each beam can get up to 2x2.5 GHz of bandwidth – Frequencies can be reused
- Beams share power
- Allocate bandwidth and power to beam as necessary
- 100 million km^2 of coverage per spacecraft
- 100 Gbps per Spacecraft (to 1.2m terminals)

Markets targeted:

- Trunk
- Maritime (regional)
- Government (ISR, Navy, COTP)
- Aviation (regional)
- Aviation (global)
- Backhaul
- Enterprise
- Energy

User Terminals

GW/NOC

In-Country GW

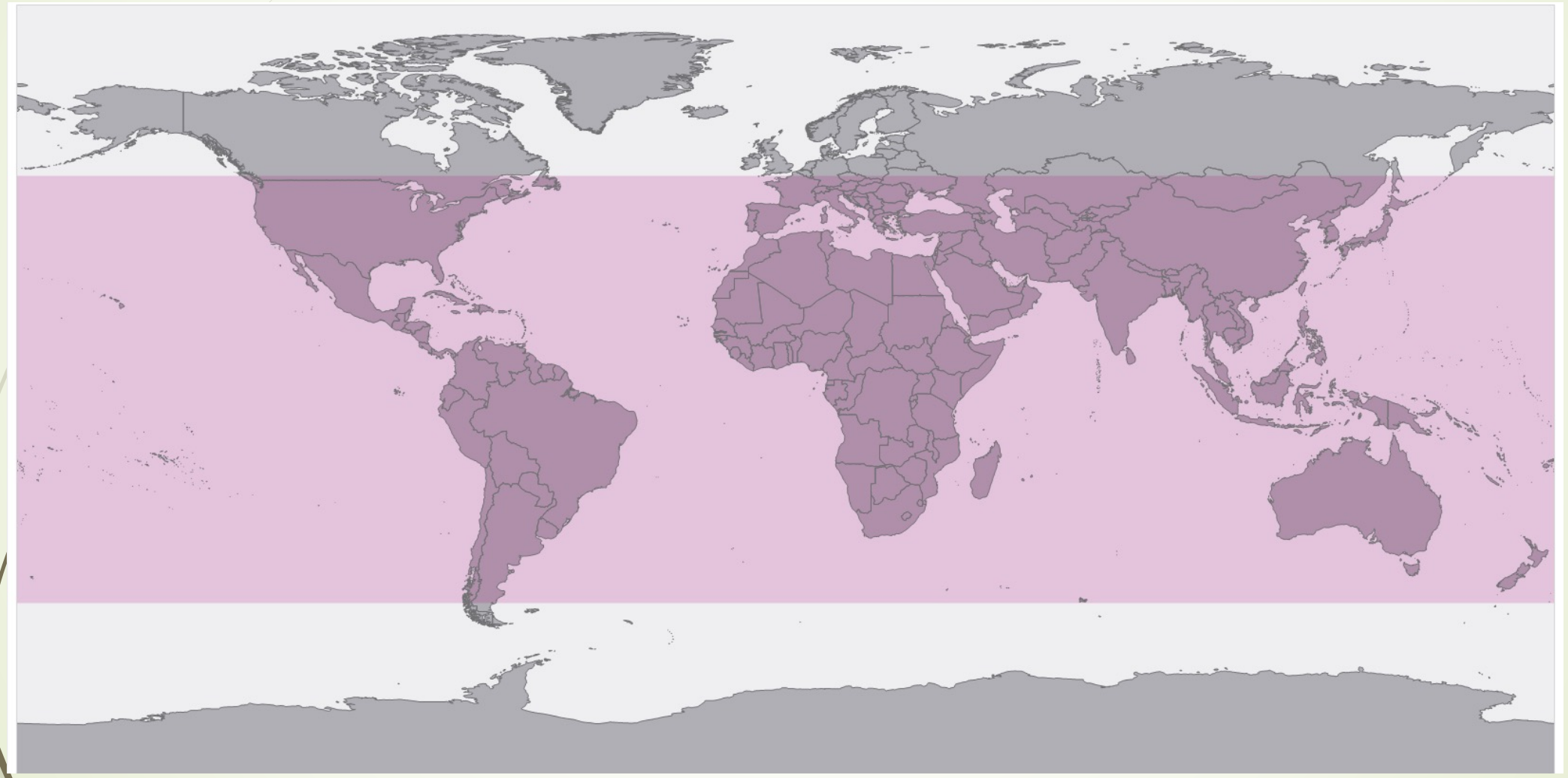
User Terminals

O3b mPOWER Summary*

O3b mPOWER	
Mission duration	12 years (planned)
Spacecraft properties	
Spacecraft type	All-electric propulsion
Bus	BSS-702X
Manufacturer	Boeing
Launch mass	1700 kg
Start of mission	
Launch date	Q2 2022
Rocket	Falcon 9
Launch site	Cape Canaveral,
Contractor	SpaceX
Orbital parameters	
Reference system	Geocentric orbit
Regime	Medium Earth orbit
Altitude	8,030 km (5,000 mi)

* *Wikipedia, March 2022*

mPOWER Coverage



O3b mPOWER Deployment Schedule

LAUNCH SpaceX Falcon 9		
O3b mPOWER	1-3	April ‘22
O3b mPOWER	4-6	May ‘22
O3b mPOWER	7-9	H2 ‘22
O3b mPOWER	10-11	H2 ‘24