What's new in the satellite world

Robert Suber | Managing Sales Director

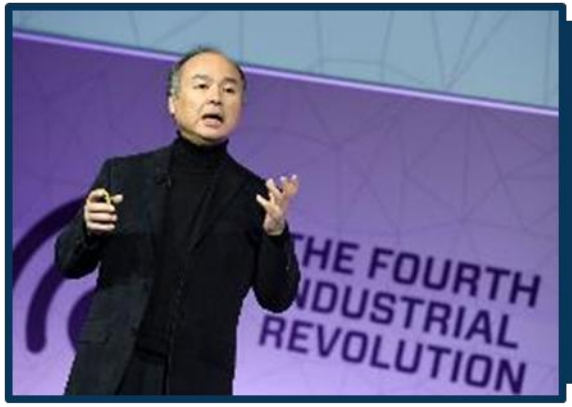
Renaissance: Internet giants turned space entrepreneurs

Google and Fidelity invested $1 billion in SpaceX

Sundar Pichai

SpaceX
– Commercial launch services
– Mars Colony Plan

Elon Musk



Softbank to invest over $1 billion in OneWeb

Masayoshi Son

Virgin Orbit
– Small satellites

Virgin Galactic
– Space tourists

First round investor of OneWeb

Richard Branson

Owns Blue Origin
– Private spaceflight services & science missions

Jeff Bezos

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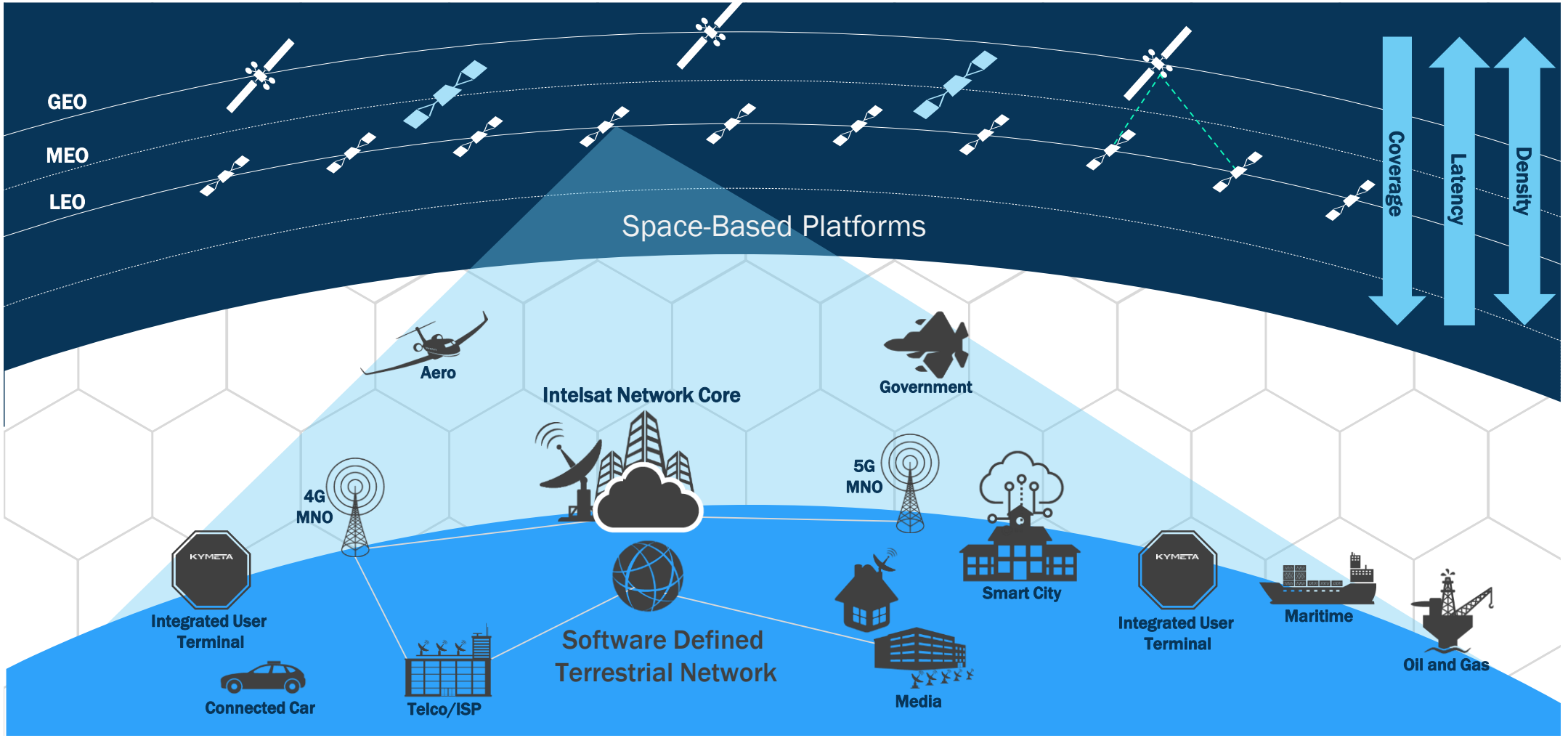
The network of tomorrow

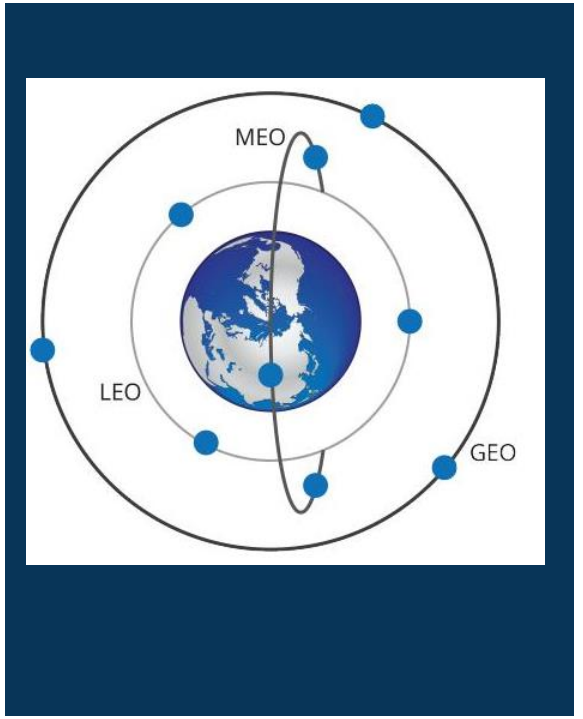


Building Blocks of Transformation

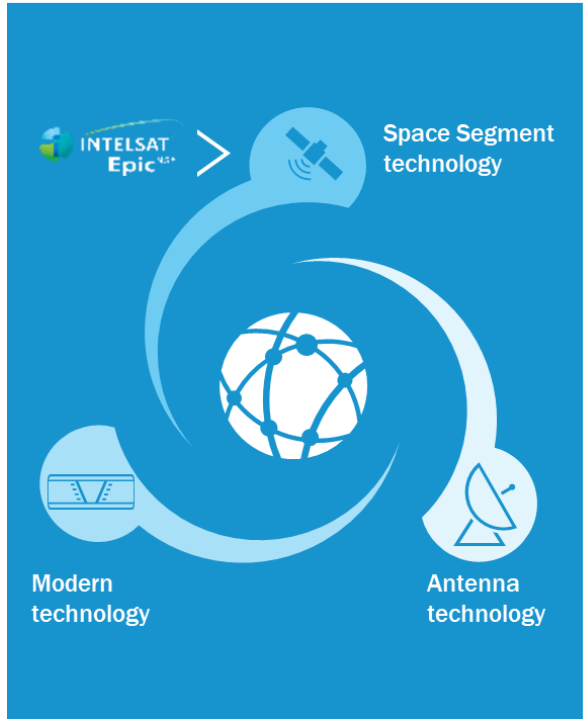
Satellite Launch Innovation

Spacecraft Innovation

Constellation Innovation



Ecosystem Innovation



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Innovations in Rocket design

- Space X (Musk)
- Blue Origin (Bezos)
- Virgin Galactic (Virgin)

- More options
- Re-usable technology
- Cleaner/cheaper launches

The disruptors: in a space industry worth >$300bn this decade

Relativity

Intelligent Robotics

Worlds largest metal 3D printing robot

100 percent 3D printed

Revolutionizing how rockets are made and flown

Target build in 60 days

ROCKET LAB

Rocket Lab is the only rocket firm in the world with its own launch complex (on North Island's Mahia Peninsula).

The Electron satellite test program launched 3 shoe-boxed satellites in Jan 2018, and projected to cost <$5 million per launch.

Virgin ORBIT

Virgin Orbit will launch small satellites using its LauncherOne orbital launch vehicle.

Essentially LauncherOne is a Boeing 747-400 airplane designed to hold a rocket under its wing. Once it reaches an altitude of ~35,000 feet, the rocket would be fired into space.

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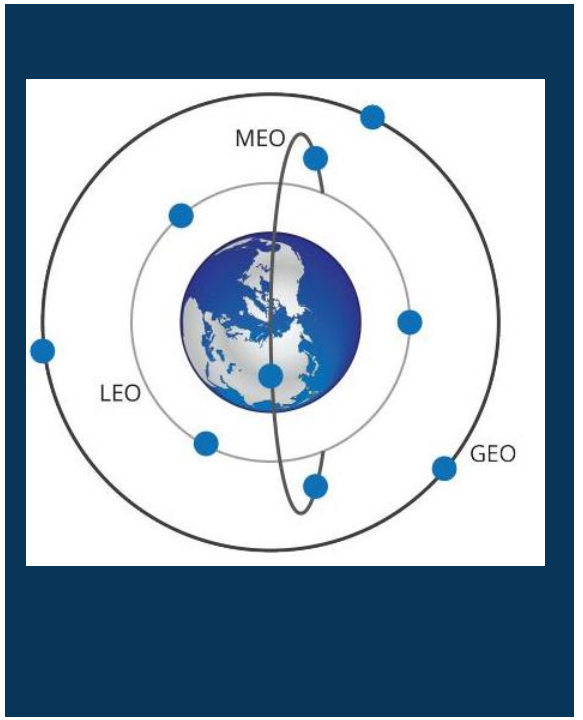
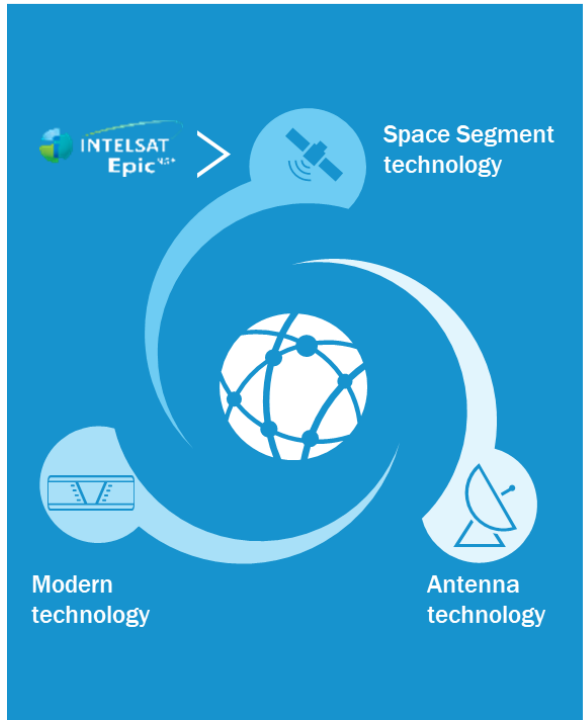


Ecosystem Innovation



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Redefining GEO communication satellites with HTS

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Redefining communication satellites
High Throughput (HTS) satellites

- Frequency reuse
- Concentration of power
- Digital payload

- More flexibility & scalability
- More throughput (40Gbps- 500Gbps)
- Smaller antennas

What's on the Horizon for GEO Software Defined Payloads

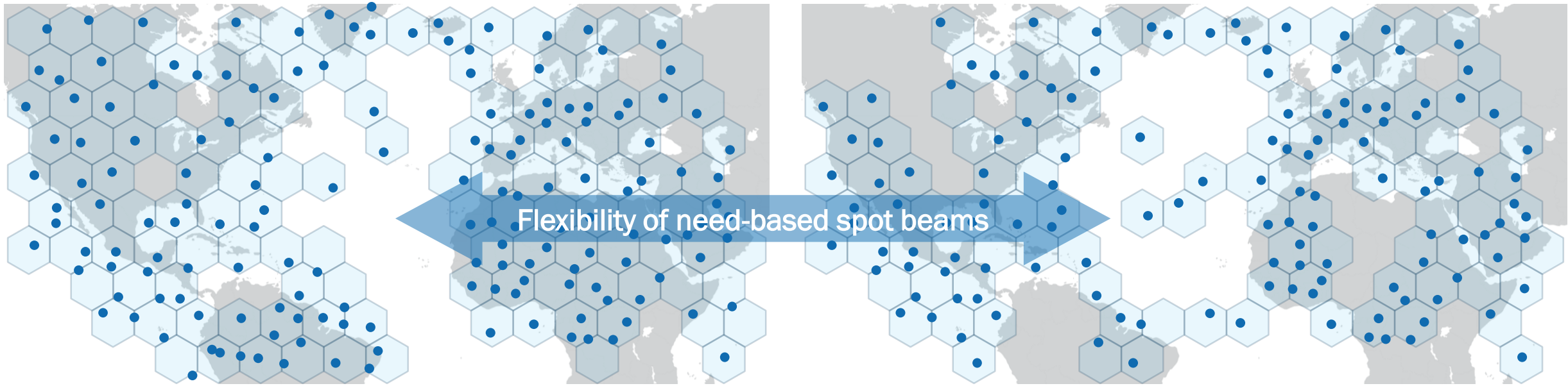
- Change configuration once launched
- Incredibly flexible, change beam power, shape, frequency from the ground
- Shorter time to build, 18 months as opposed to 2.5 to 3 years
- Very complex ground system to manage the SDP

- On the ground several advances continue
- Backward compatibility with existing ground segment
- SD universal & interoperable modems & terminals – the breakdown of proprietary terminals

The next level of flexibility and performance

Concept of operation

- Replace wide beams with high performing spot beams without dedicating continuous resources
- Benefits are better performance and utilization



Adjust beam deployment based on demand. Bandwidth in each beam can be different

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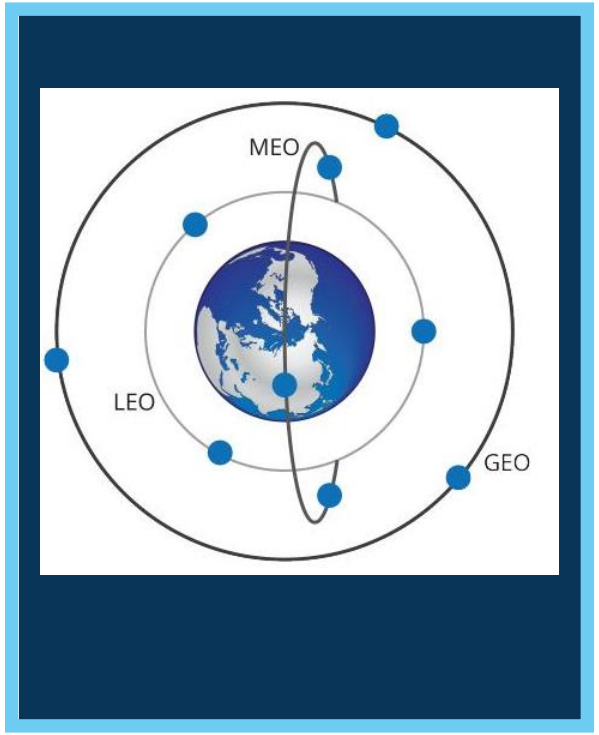
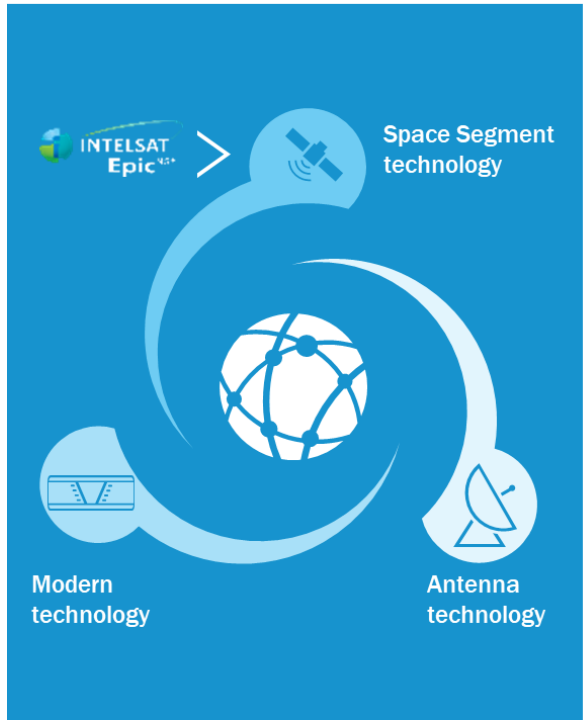


Ecosystem Innovation



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Different Constellations

OneWeb (Softbank/Airbus/Qualcom…)

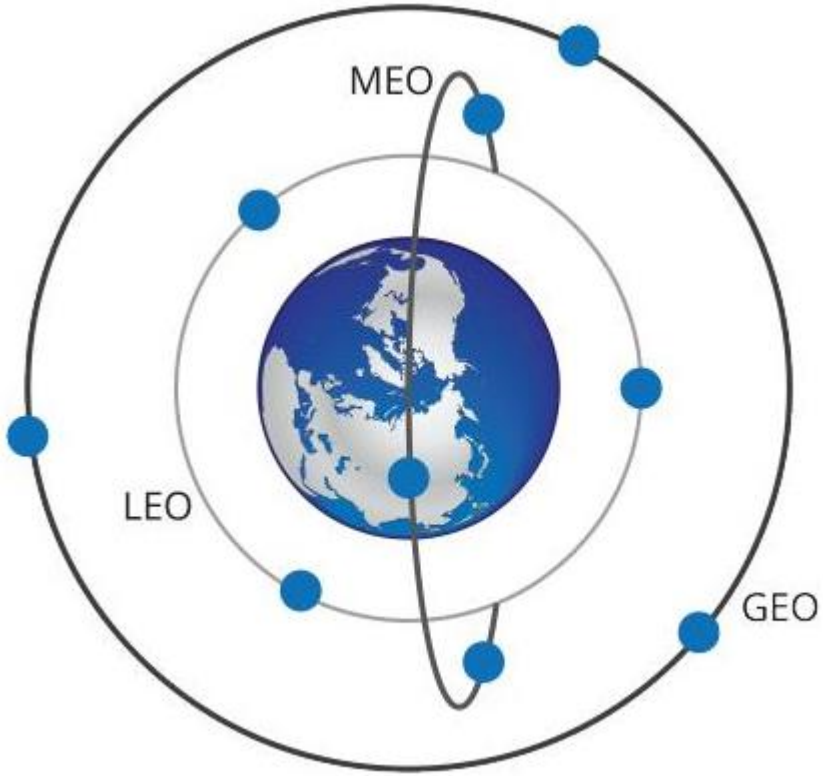
- 640 satellites
- 1,200km
- 8 launched to date
- Ku/Ka Band
- Bent pipe
- 1.2 Tbps (approx. 50 ground stations)
- In service 2021/2022

Starlink (Space X)

- 12,000 satellites to be launched by mid 2020's
- 1,600 Ku/Ka at 550km
- 2,800 Ku/Ka at 1,150km
- 7,500 V Band at 340km
- 182 launched to date (550 km orbit)
- 23.7 Tbps (71 ground stations for Ku/Ka band. Does not include V Band
- Partial Start of service 2020

Project Kuiper (Jeff Bezos)

- 3,236 Satellites
- Use of Intersatellite links
- Very hush on spec
- In service 2024?



GEO/Geostationary: 36,000 km
- Intelsat, SES, Eutelsat, Inmarsat, Viasat

MEO/Mid Earth Orbiting:2,000 to 12,000km
- O3B (part of SES) ….

LEO/Low Earth Orbiting: 400km to 1,200km
- Iridium, OneWeb, Starlink …

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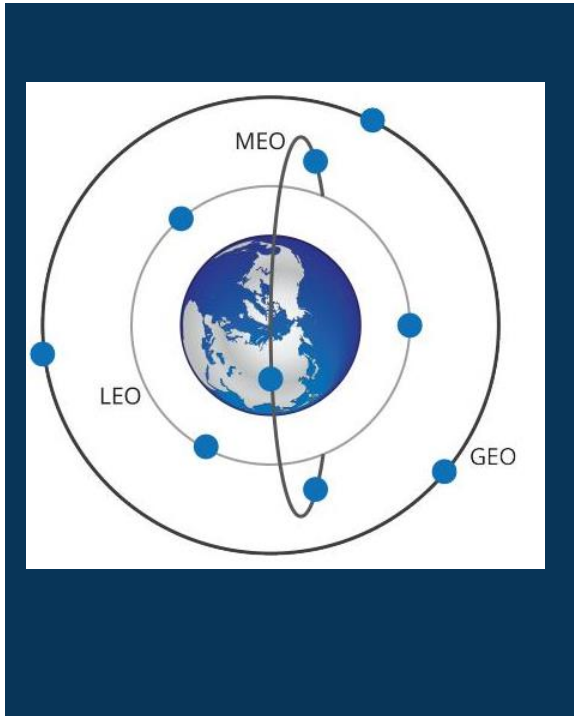

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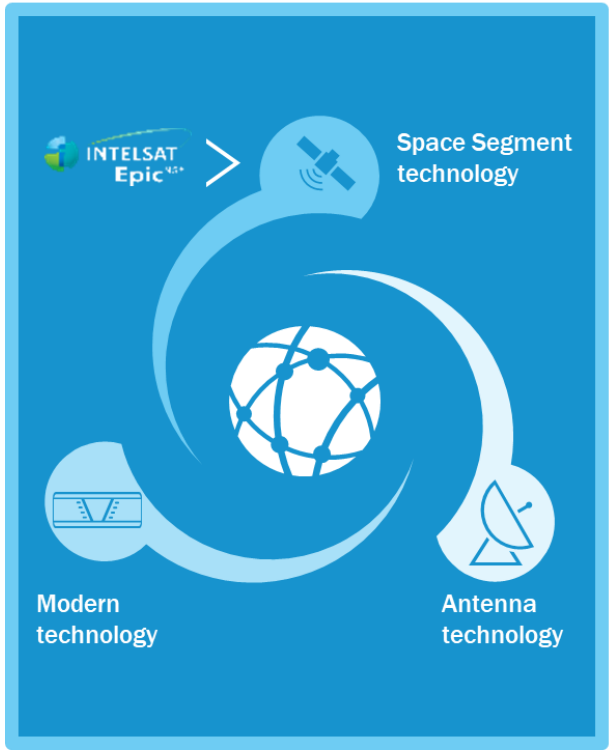

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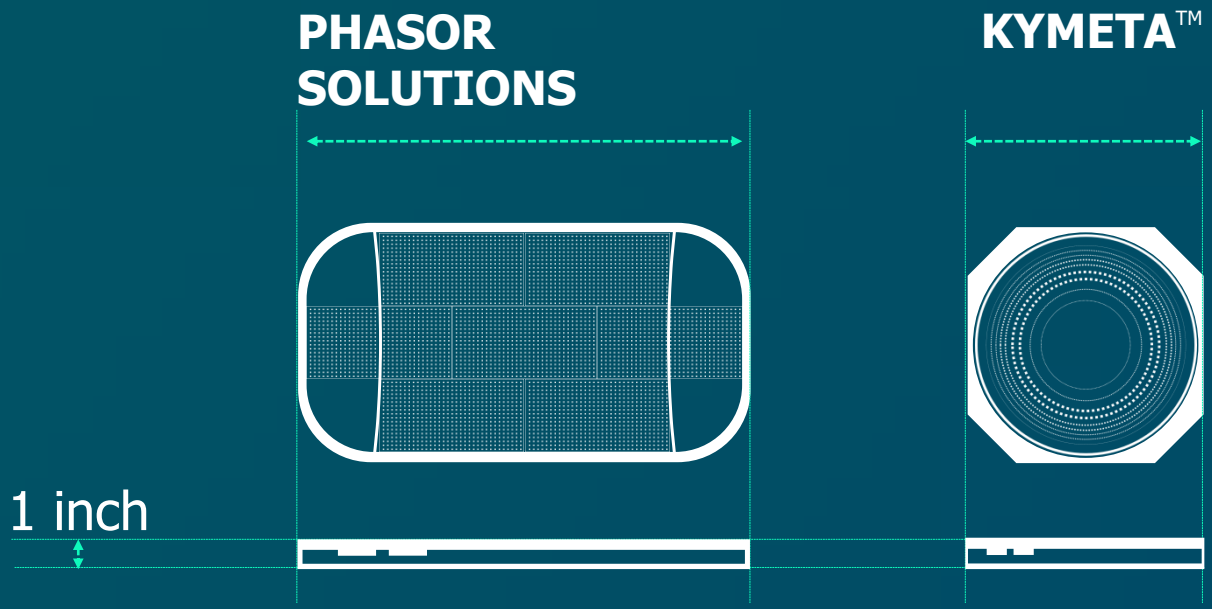
Electronically Steered Antennas (ESA)

No moving parts

Ultrathin and light

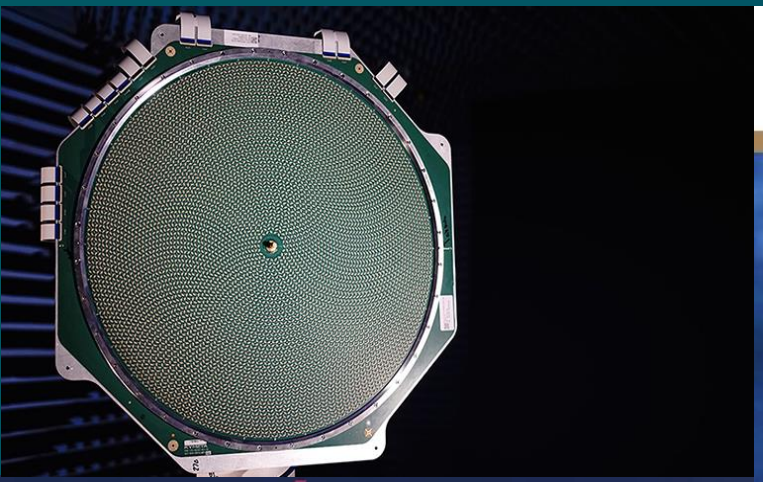


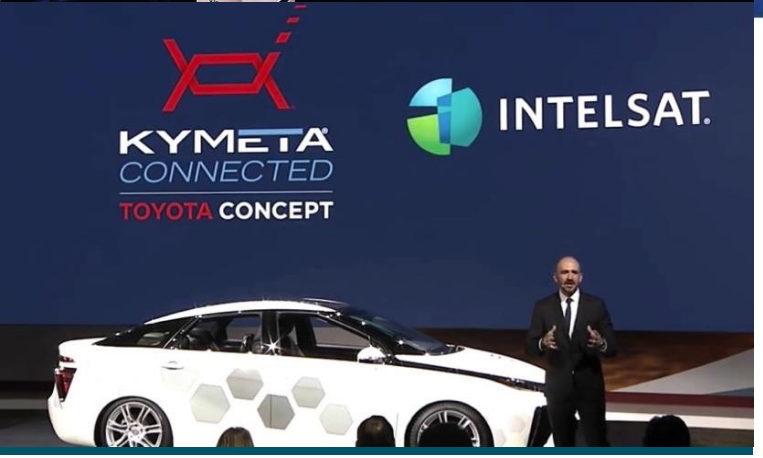
- Active phased array
- Modules can conform and be shaped to a curved surface

- Metamaterial
- Passive array

Intelsat and Kymeta

Changing how satellites are accessed





KYMETA

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Kymeta and Intelsat Announce KĀLO™, a New Service to Revolutionize How Satellite Services Are Purchased

Kymeta's KĀLO redefines satellite connectivity with services purchased in familiar, flexible data packages combined with radical pay-for-what-you-use pricing. KĀLO to leverage Intelsat's IntelsatOne® Flex managed services platform and address the

Intelsat Buys Equity Stake in Kymeta; Stephen Spengler Joins Antenna Manufacturer's Board

Anna Forrester | March 8, 2017 | M&A Activity, News | 112 Views

Intelsat has purchased an equity stake in satellite communications antenna manufacturer **Kymeta** following joint efforts to develop the *Kalo* satellite services and *mTenna* antenna technology.

The satellite operator said Tuesday the transaction comes with the appointment of Intelsat CEO Stephen Spengler into Kymeta's board of directors.

"The demand for fast, reliable broadband connectivity requires innovation in-orbit and across the entire satellite ecosystem to unlock new growth opportunities," said Spengler.

Next generation modems and antenna innovation

- Easier integration and scalability of networks with next generation modems
- Modems that support broadband, IoT, connected car and that are backward compatible

- Electronically steered antennas, more powerful with smaller form factors
- New antenna capabilities drive emergence of new verticals including: coms on-the-move (COTM) and coms on-the-pause (COTP), internet of things (IoT)

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Thank you

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