A New Satellite Paradigm

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Telecommunication Challenges

Global Fiber Not Ubiquitous

Traditional SatCom Architecture Is Inefficient

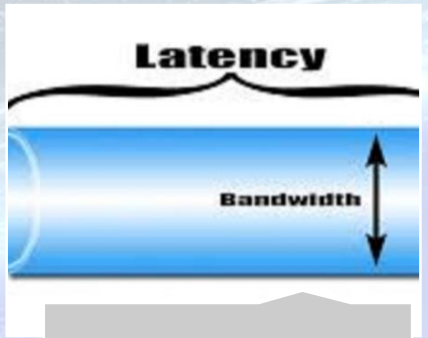
Polar Coverage Requirements Unmet and Growing

Military ISR and Comms Requirements Growing

Global Telecom Infrastructure Fragmented

Data and Application Growth Outpacing Infrastructure

Critical Infrastructures At Risk



Latency Matters

Opportunity for Satellites that are *designed for Data*

Current Satellite Architecture

- The 60’
- The 70’
- The 80’
- The 90’
- The 00’
- The 10’

- The 60’
- The 70’
- The 80’
- The 90’
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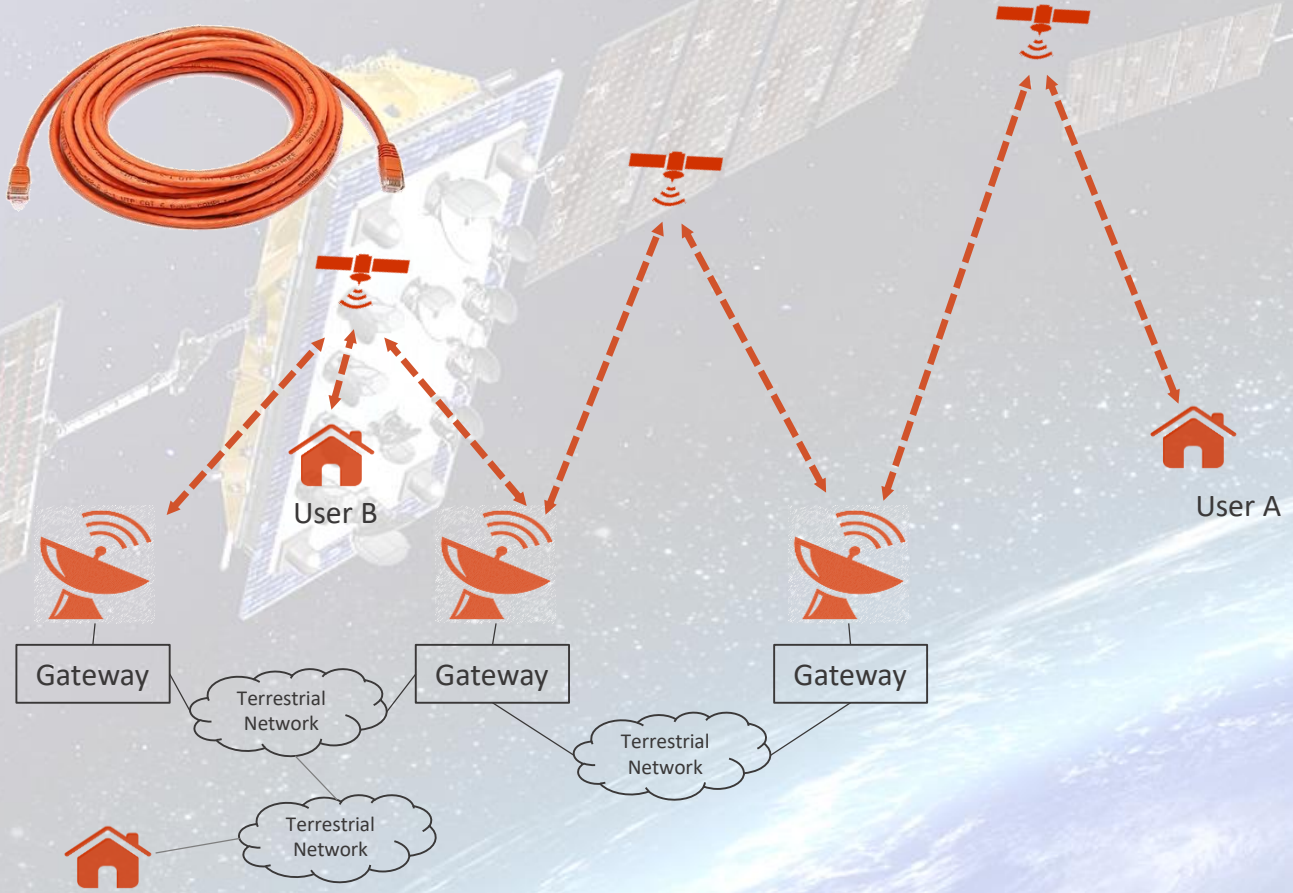
Traditional ‘Bent Pipe’ Architecture for Voice and Video…

Current Satellite Architecture (Cont'd)

- The 60'
- The 70'
- The 80'
- The 90'
- The 00'
- The 10'

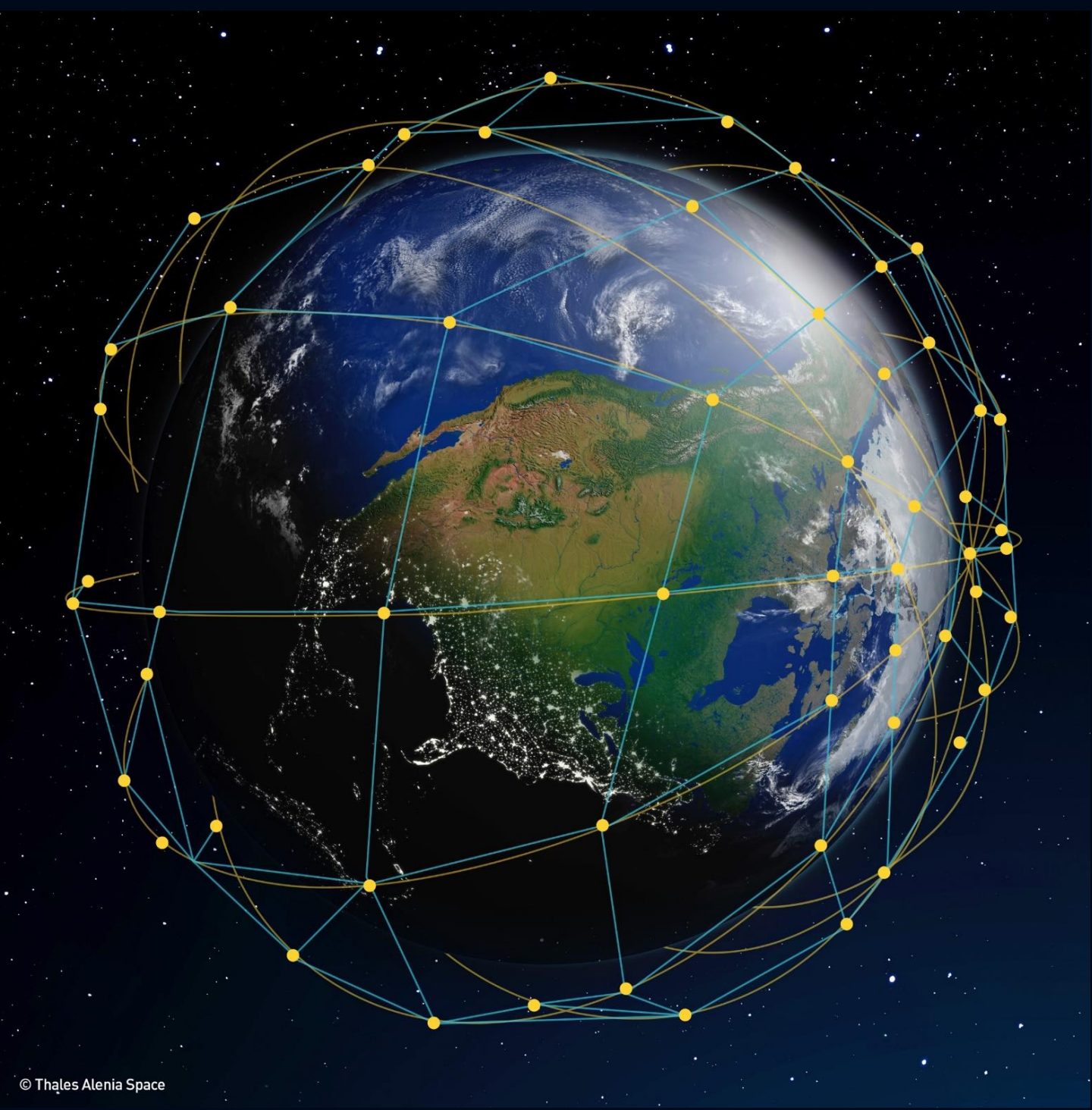


… does not at all work well for Data

Requirements for Data

Requirements		*Satellite Capabilities*
Capacity	Add Power & Spot beams	**HTS satellites**
Low Latency	Closer to earth	**MEO and LEO**
Reach Gateway independency	Inter Satellite Links	**Interconnected Satellites**
Terrestrial Integration Seamless & Global	On Board Processing & Networking	LEOSAT™

LeoSat is designed for Data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LeoSat – a new satellite architecture for data

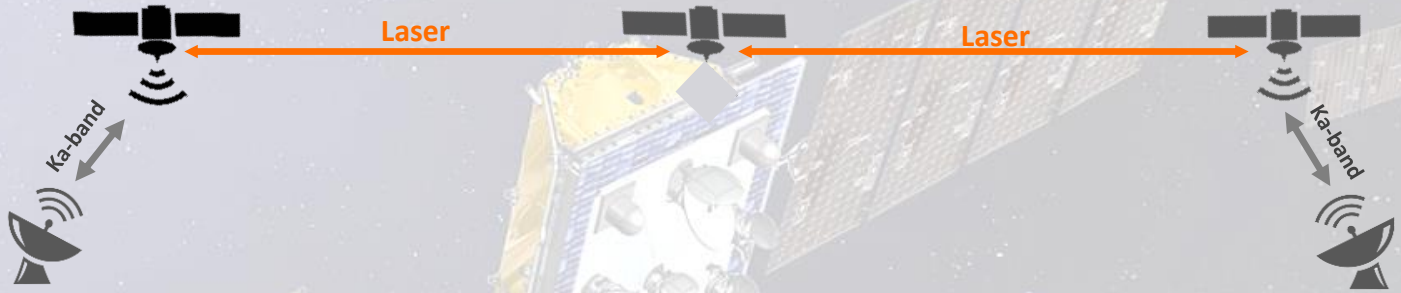
Global Constellation of up to 108 Satellites

LEO altitude of 1400 km

Inter-Satellite Links (ISLs) and on-board MPLS switching create an **Optical Backbone in Space**

Customer access in **Ka-band**

LeoSat's Unique Attributes



Premise-to-premise with no terrestrial touchpoint

Fiber-like **symmetric connectivity** up to **1.6 Gbps** and even **5.2 Gbps** where needed

Global reach

Total network **security**

Ultra **low latency**

The most advanced commercial satellite system ever built

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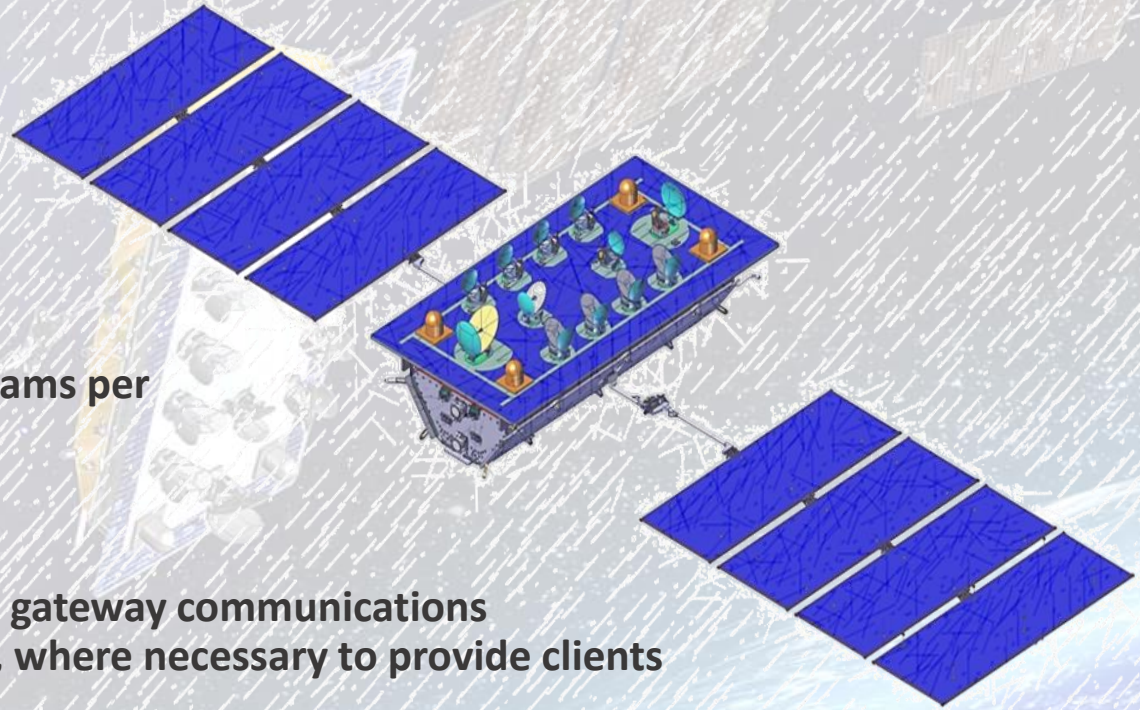
The Satellites



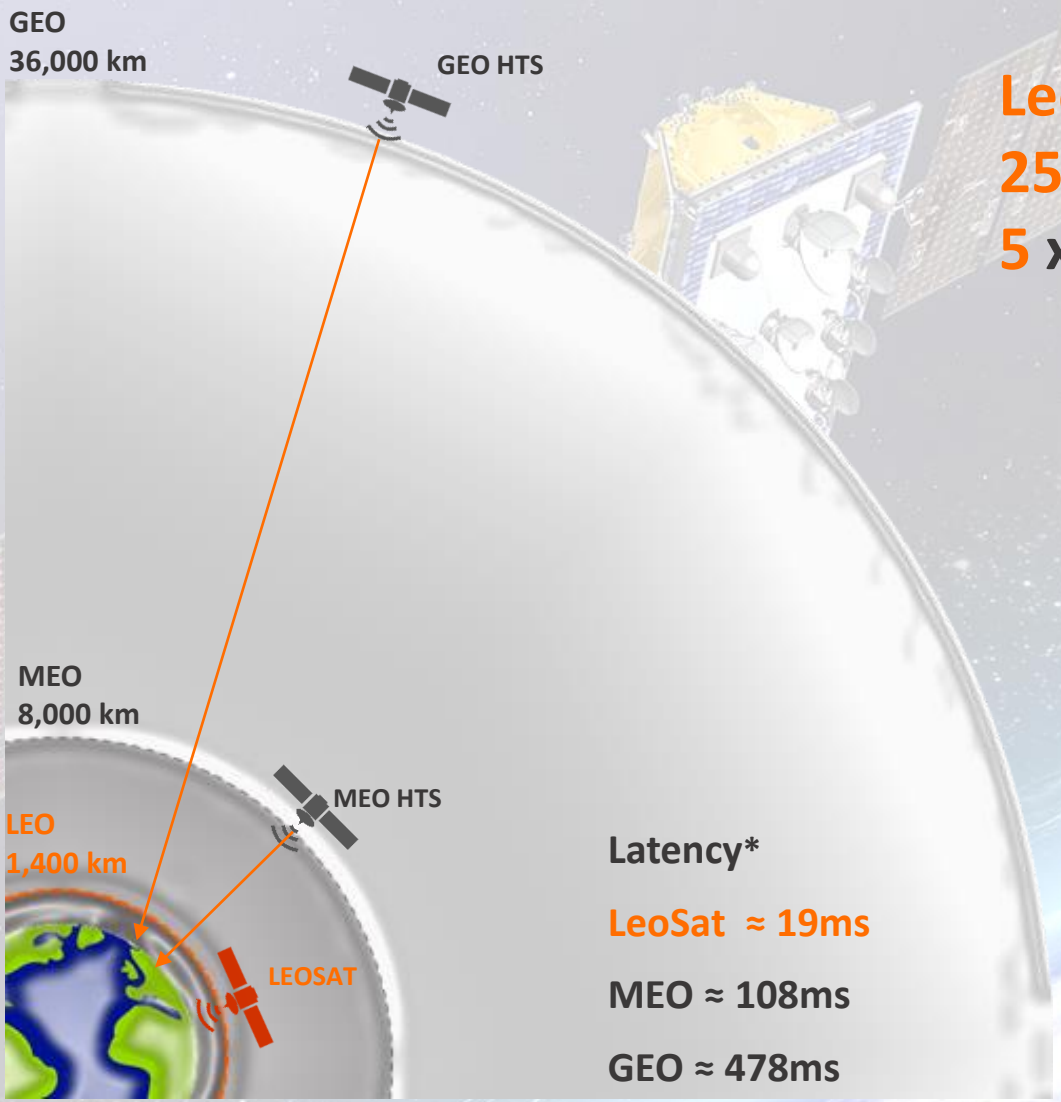
Ten 1.6 Gbps client-dedicated Ka spot beams per satellite – bandwidth can be modulated to meet customer needs

2 additional Ka beams used primarily for gateway communications can be deployed for direct customer use, where necessary to provide clients up to 5.2 Gbps of symmetrical data

Four 10 Gbps optical inter-satellite links

Use of spot beams and alternate polarizations allowing the satellites to reuse the same 3.5 GHz of frequency in the Ka band

Closer to Earth, Lower Latencies



LeoSat is
25 x closer to earth than GEOs
5 x closer to earth than MEOs

Latency*

LeoSat ≈ 19ms

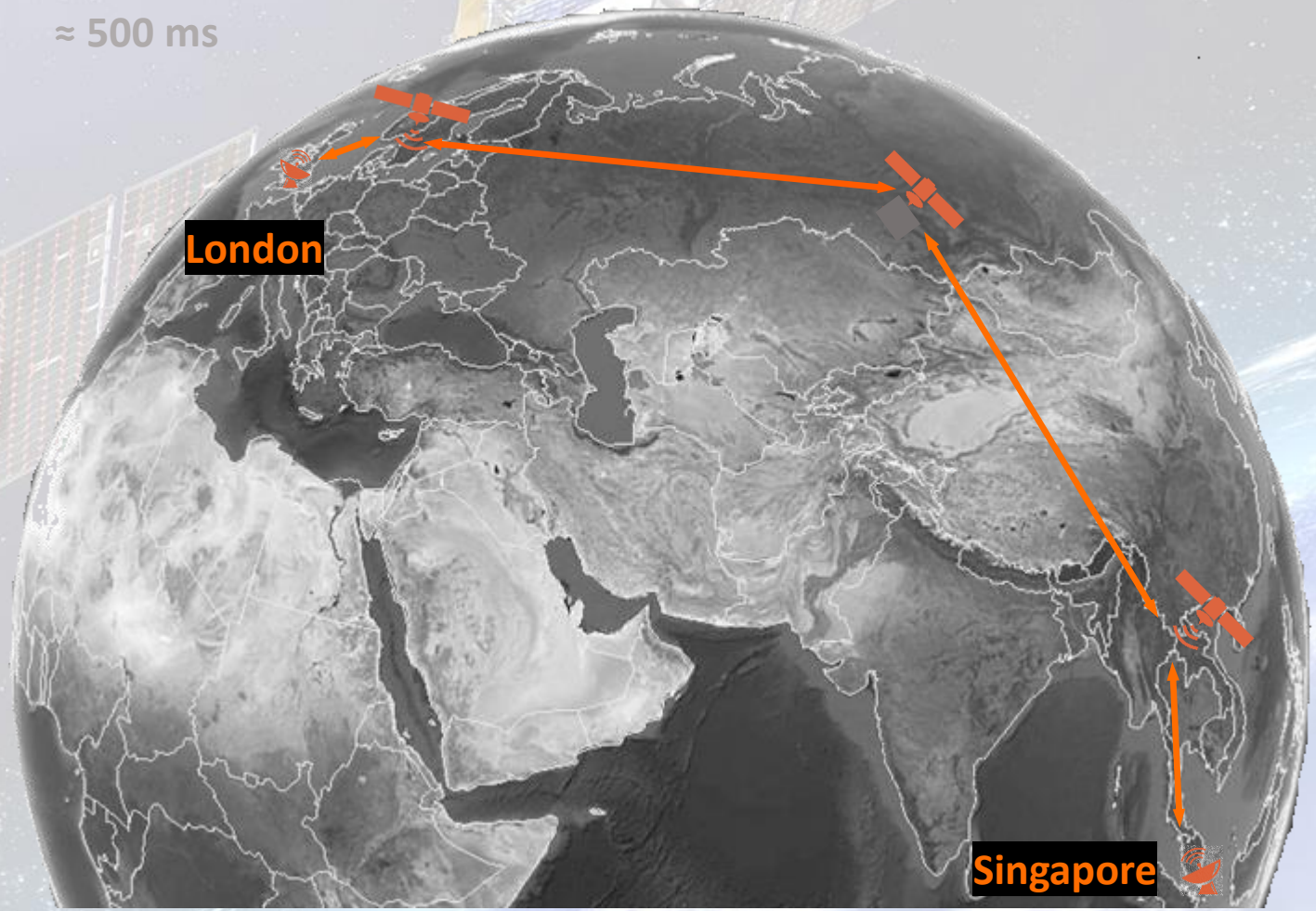
MEO ≈ 108ms

GEO ≈ 478ms

* RTT - Round Trip Time at boresight

Example: London - Singapore averaging 119 ms

LeoSat	**≈ 119 ms**
Fiber	≈ 192 ms
MEO	≈ 150 ms + fiber from Gateway to London
GEO	≈ 500 ms



Estimated RTT - Round Trip Time

What does LeoSat offer its customers?

Capacity – comparable to fiber

Symmetry – identical to fiber

Latency – often better than fiber

Security – always better than fiber

Rapid Deployment – always better than fiber

Ubiquity – much improved compared to GEO/MEO

Redundancy – always better than GEO/MEO

Applications

Enterprise 	LeoSat offers Gbps local LAN performance globally Ideal for cloud based, latency sensitive applications Worldwide star- or meshed network Ideal for customers with high security requirements
Backhaul and Trunking 	4G and 5G backhaul in native form Can accommodate star- or meshed network Can handle latency sensitive applications
Media 	High throughput low-latency Video Contribution Rapid deployment to connect venues globally Remote Production now possible for all events
Government 	Support field missions with near real-time command and control capabilities High throughput secure connections Rapid deployment in harsh environments
Maritime 	Cruise line customers expect on-board broadband Cloud based office at sea for large commercial vessels Ideal in cases were existing solutions offer limited bandwidth
Oil & Gas 	Ongoing transformation to Digital Oilfield requires high throughput and low latency, especially in upload path Increases efficiency by supporting command and control type applications

Focus: Telco Use Cases

Challenge
Ensure all foreign missions remain online and reachable with fiber-like capabilities during times of global disarray.

Opportunity for Telco
Offer rooftop to rooftop connections, linking ministry of foreign affairs to any embassy mission in one single hop.

Challenge
Business cases for fibre are hard to close, delaying decisions and sometimes cancelling entire projects.

Opportunity for Telco
Prior to laying fibre, offering fibre like infrastructure using satellites can advance the local economy and benefit its society thereby advancing the economic prerequisites for a fibre build out.

Challenge
Mobile sites and sites in harsh environments have limited access to cloud services, but at the same time they are growing equally dependant on it.

Opportunity for Telco
Roll out satellite based infrastructure with the capacity and performance of fibre, to sites in rural and harsh environments as well as mobile sites. This will effectively create a new, secure and high performance access network for the unconnected locations worldwide..

Flat Panel Antennas

Both conventional parabolic tracking antennas as well as low-cost, electronically-steered phased array flat panel antennas (FPAs) can be used.

FPAs will accelerate customer adoption due to ease and cost of installation, location flexibility and reduced maintenance

Phasor appears to be the most commercially advanced FPA solution but several other companies are making rapid advancements

Conventional Parabolic Tracking Antennas

A Phasor Electronically Steered Flat Panel Phased Array Antenna

Key Differentiators

Attribute	GEO	MEO	Fiber	LeoSat
Gigabit+ connections	○	◗	●	●
Low Latency- Long distances	○	◔	◕	●
Ubiquity	◕	◗	◗	●
Client-to-client direct data transmission	◔	○	◕	●
Multi-level redundancy	◔	◔	◕	●
Strong link budgets	◔	◗	●	●
Security: single end-to-end network provider	◔	◔	◗	●
Provide 4G and 5G native backhaul	○	○	●	●

LeoSat offers a unique combination of service attributes to address your communication requirements

Availability of LeoSat

2019 Launch of two Early Birds

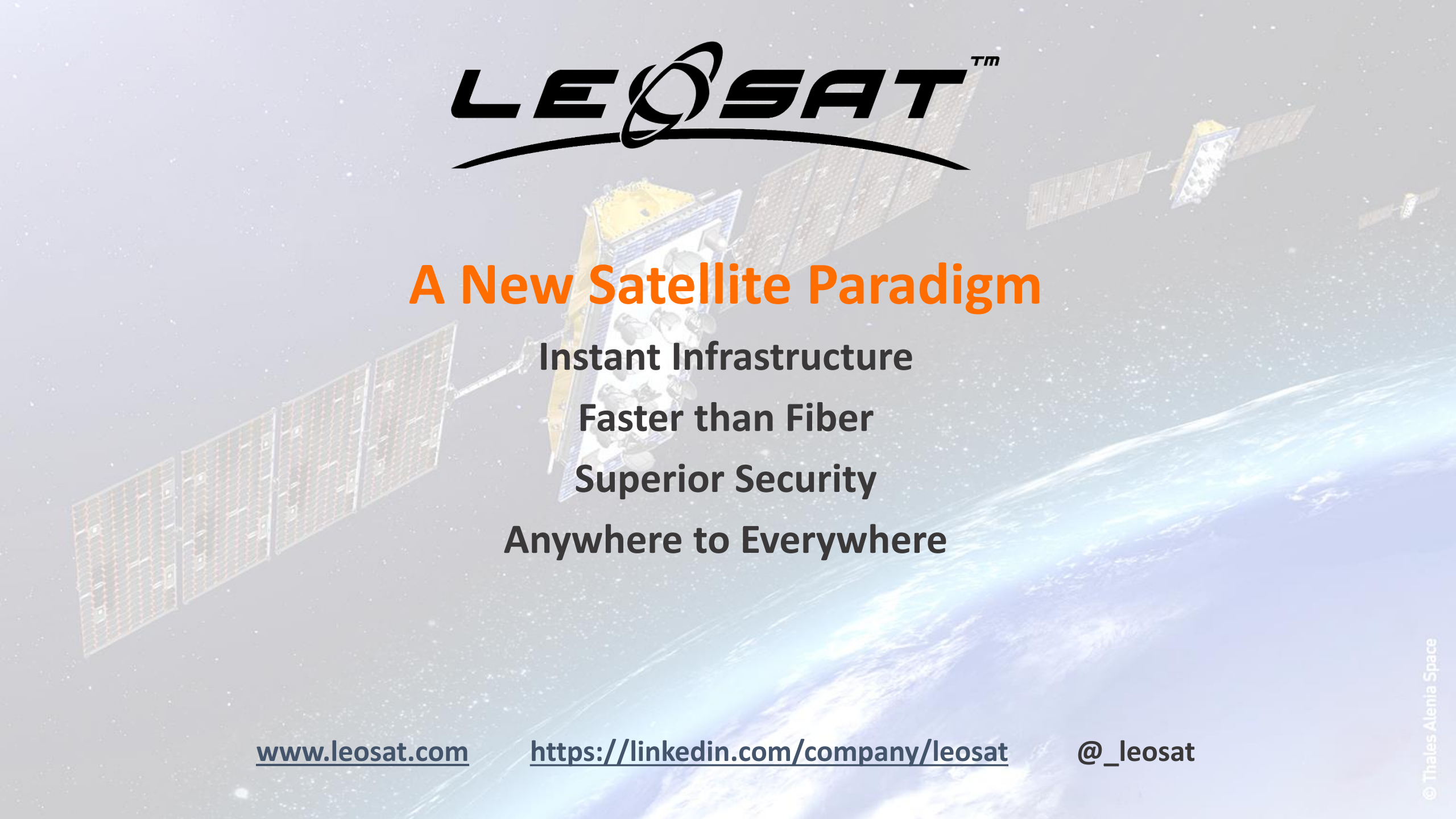
Offering Gigabyte store & forward

2020 Start of launch of Constellation

Global Data Courier Services

Full service at higher latitudes

2021 Full Service Available



A New Satellite Paradigm

Instant Infrastructure

Faster than Fiber

Superior Security

Anywhere to Everywhere

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