Thales Alenia Space optical communications

July 12th 2017

ThalesAlenia Space
a Thales / Leonardo company

Use cases for Space-based Optical Communications

1 Optical Inter Sat link

- Trunking
- Real time

✓High data rates
✓ Low latency
✓ Low Ground Segment CAPEX for point to point communication

2 Data Relay

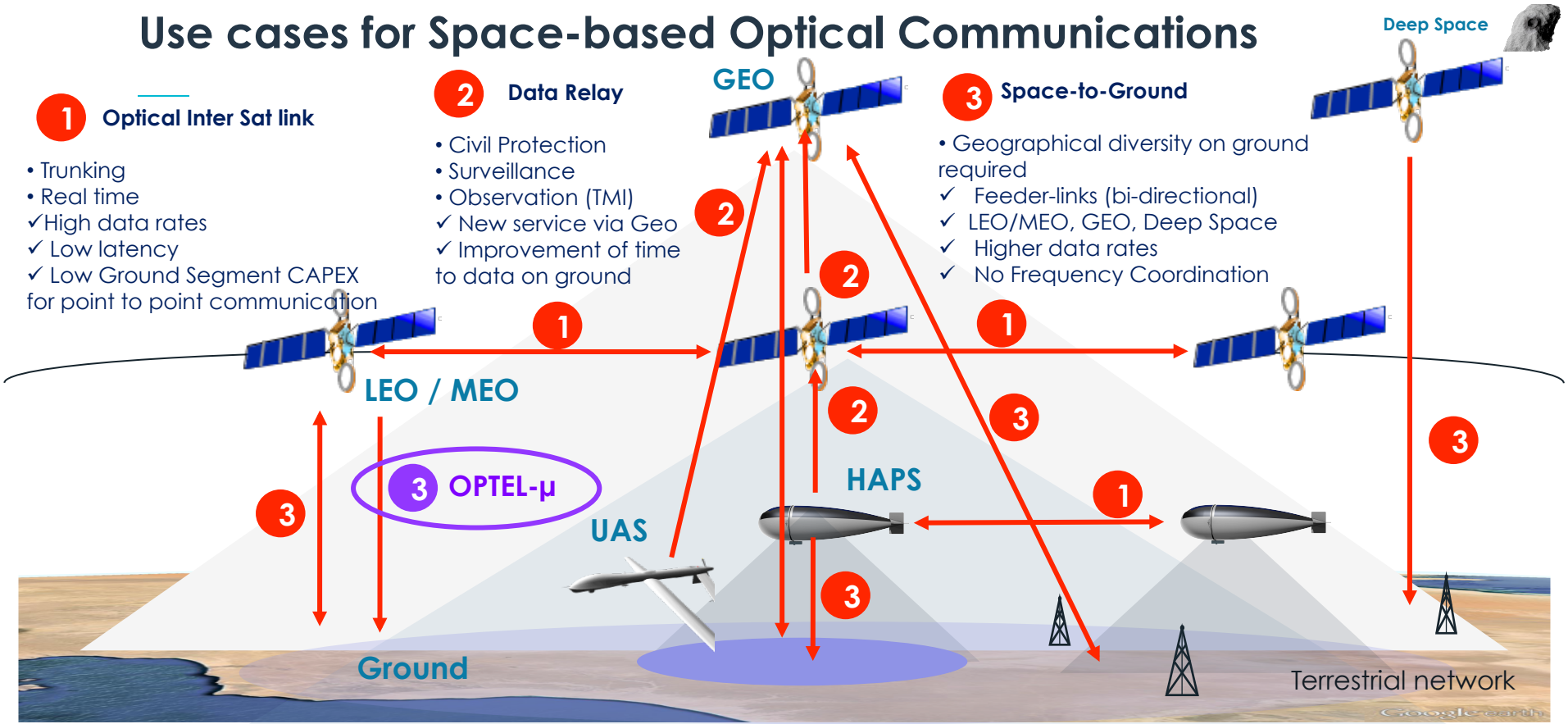
- Civil Protection
- Surveillance
- Observation (TMI)

✓ New service via Geo
✓ Improvement of time to data on ground

3 Space-to-Ground

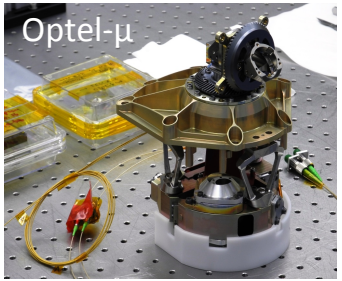
- Geographical diversity on ground required

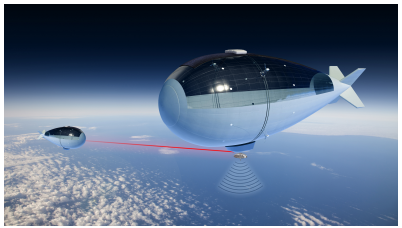
✓ Feeder-links (bi-directional)
✓ LEO/MEO, GEO, Deep Space
✓ Higher data rates
✓ No Frequency Coordination

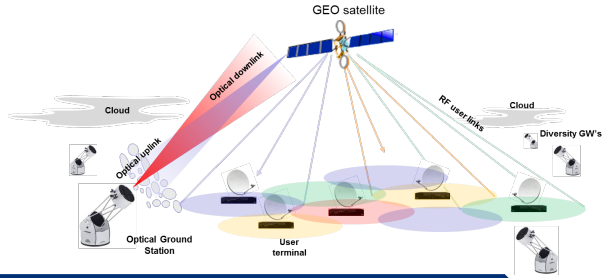


Free Space Optical Communications

- Satellite constellation
- EO data transmissions
- Inter-orbit / inter-platform optical links
- Optical feeder links
- Quantum Key Distribution
- Deep space

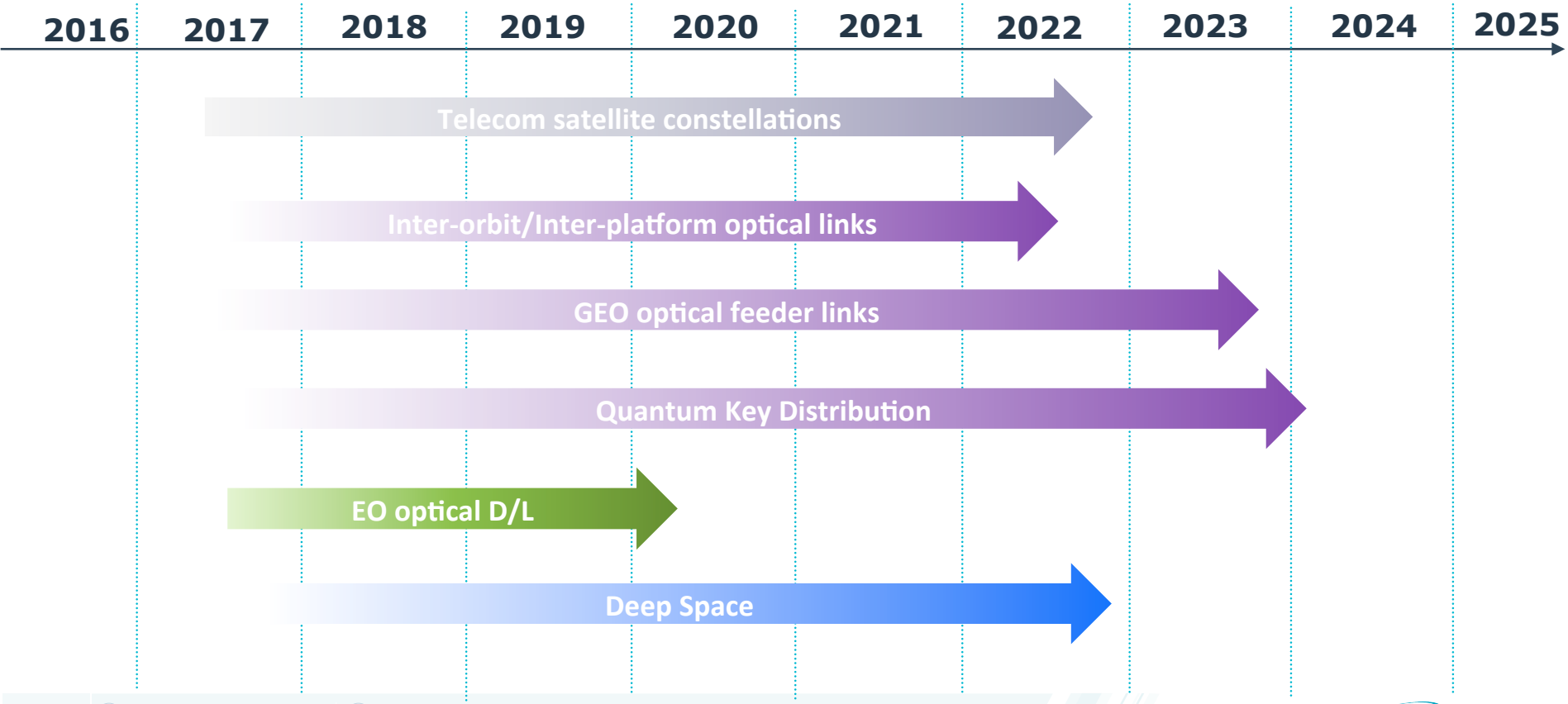






Thales Alenia Space studies and develop optical communications for a large panel of applications

Optical communication – Potential markets



Optical inter-satellite links for constellations

Thales Alenia Space signs phase B contract with LeoSat to develop high throughput, low orbit satellite constellation (September 2016)

Initial phase resulting in the preliminary definition of LeoSat constellation

Phase B concerns the detailed definition of the overall system architecture and performance specifications, including both the ground and the space segment

LeoSat will feature innovative technologies such as optical inter-satellite links

Thales Alenia Space is prime contractor for the development of LeoSat constellation

TAS Approach for optical communications

Technology

Optical link architectures based on the 1.5 µm technology (even if not compatible with current EDRS operational system)

- Highest potential for growth towards high throughput
- Potential for synergies with on-ground networks (possibly fully integrated)
- Potential for synegies with on-board photonic technologies
- Benefit of large R&D efforts for on-ground telecom networks
- Levering on cost reduction due to large scale production for ground applications
- Largely adopted by space systems manufacturers

Product policy

A modular approach

- Identification of generic system architecture
- Development of building blocks allowing optimum reuse depending on applications
- Cost reduction (cheaper terminals)
- Flexibility to respond to future trends (feeder links, QKD…)

A modular approach to meet customer needs

Optical Communications development

Thales Alenia Space in Switzerland is specialized in scientific satellite instruments and in equipment for optical communications in space

This acquisition contributes to reinforce Thales Alenia Space offer for optical communication systems

Thales Alenia Space in Switzerland is fully integrated in the industrial scheme based on leveraging on heritage, expertise and synergy among

- Thales Alenia Space sites for systems and products development
- Partners for subsystems and products development and manufacturing
- Thales industrial capacities for manufacturing

Thales Alenia Space is fully open to cooperations with new partners to build and deliver the best optical coms solutions

Thales Alenia Space in Switzerland enlarges Thales Alenia Space portefolio and brings new capabilities to its space system offer

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On-going and way forward

OISL for constellations

Main trends
- LEO/MEO constellation concepts
- World wide coverage, low latency
- Mesh connectivity at high capacity
- Limited mass and power

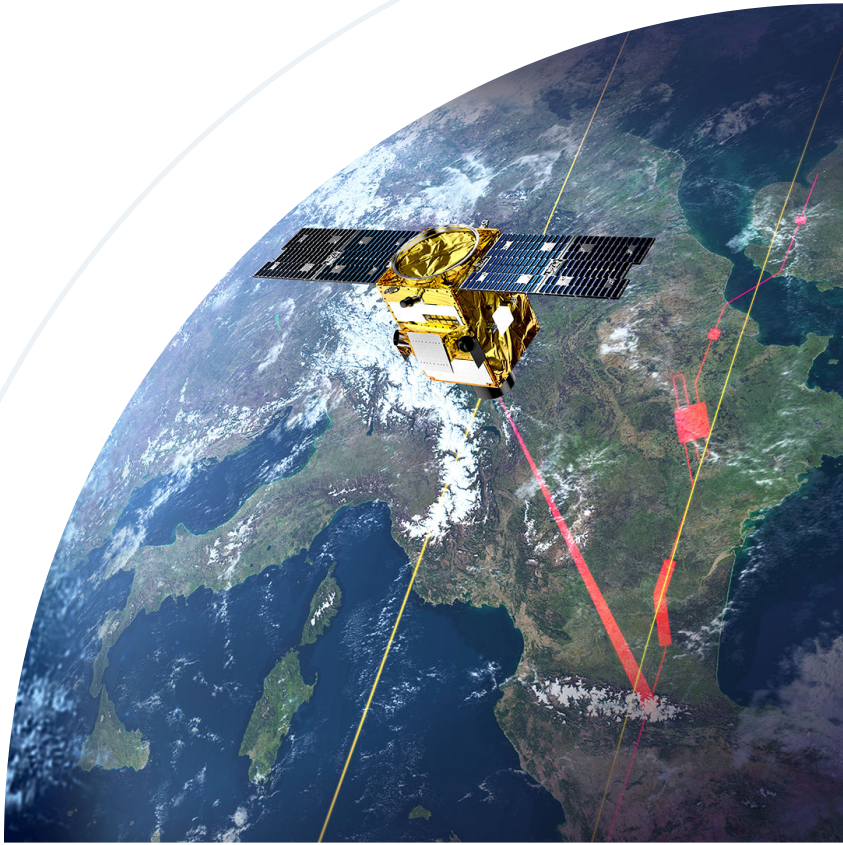
Trades and challenges
- Overall constellation architecture
- Payload architectures
- Optical communication architecture
- Compact terminals at high power efficiency
- Digital processing technologies
- Qualification of optical technologies

On-going and way forward

EO Downlink

Main trends
- Need for increased bit rate
- Increased instantaneous (10's Gbps) and daily capacity
- Adaptive rate w.r.t link budget
- Other applications: FSO links from/to UAVs, from/to HAPs

Trades and challenges
- Sizing of network ground stations
- Reduced cost optical ground stations
- Mitigation of atmospheric propagation effects
- Compact terminals at high power efficiency
- Qualification of optical technologies

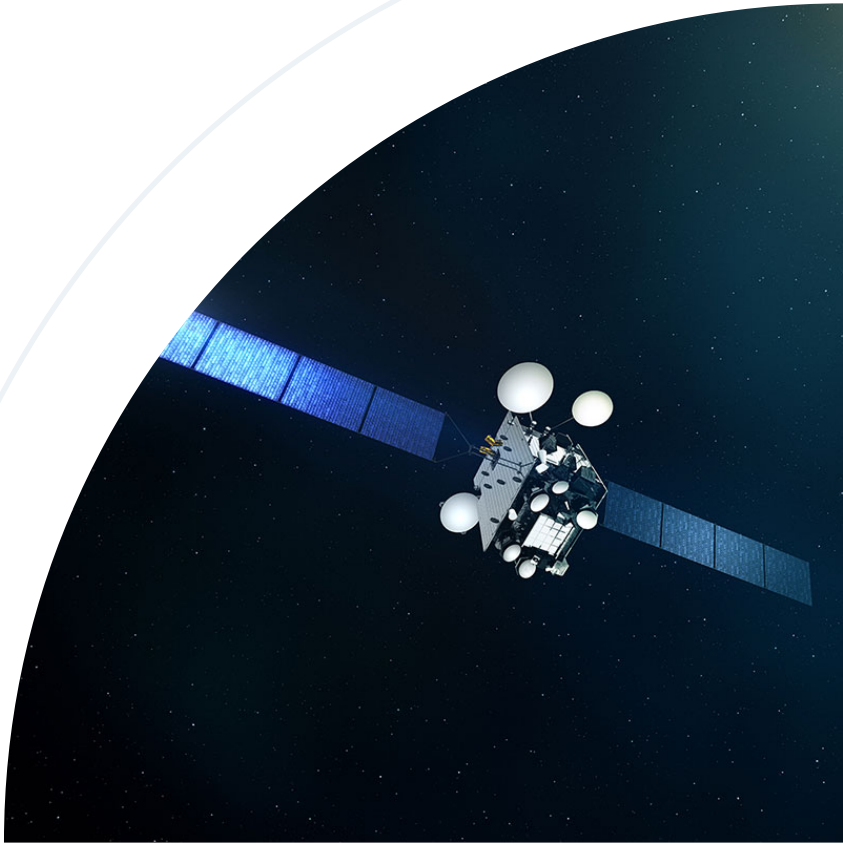


On-going and way forward

V/HTS optical feeder links

Main trends
- Increase of capacity
- Availability
- Reduction of number of ground stations (GW)
- Discretion, resistance to jamming

Trades and challenges
- Ground diversity network for availability > 99.9 %,
- Technical feasibility, economical interest
- Communication architecture
- Atmospheric turbulence perturbation mitigation at affordable complexity
- Drastic optical technology improvements for GEO terminal high power efficiency
- High speed digital processing
- Qualification of optical technologies



Thank you !

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