

# ACCELERATING BEYOND FRONTIERS

Company overview





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# WE ARE SES

We are the world's leading satellite-enabled solutions provider.

Our network reaches 99% of the world's population. We connect and enable broadcast, telecom, corporate and government customers, powering the development of connectivity across the world.

Our global network is built on a foundation of more than 50 satellites in Geostationary Earth Orbit (GEO), 12 satellites in Medium Earth Orbit (MEO), and an expansive ground infrastructure.

We offer a full suite of powerful end-to-end solutions that optimally deliver to market demands.

SES has two business units, SES Video – focused on the needs of our media and broadcast customers, and SES Networks – focused on the needs of our connectivity customers.

Our mission is to connect, enable, and enrich.

## GLOBAL INFRASTRUCTURE

54

satellites in geostationary orbit

20

satellites under procurement

12

active satellites in medium earth orbit

12

satellites in inclined orbit

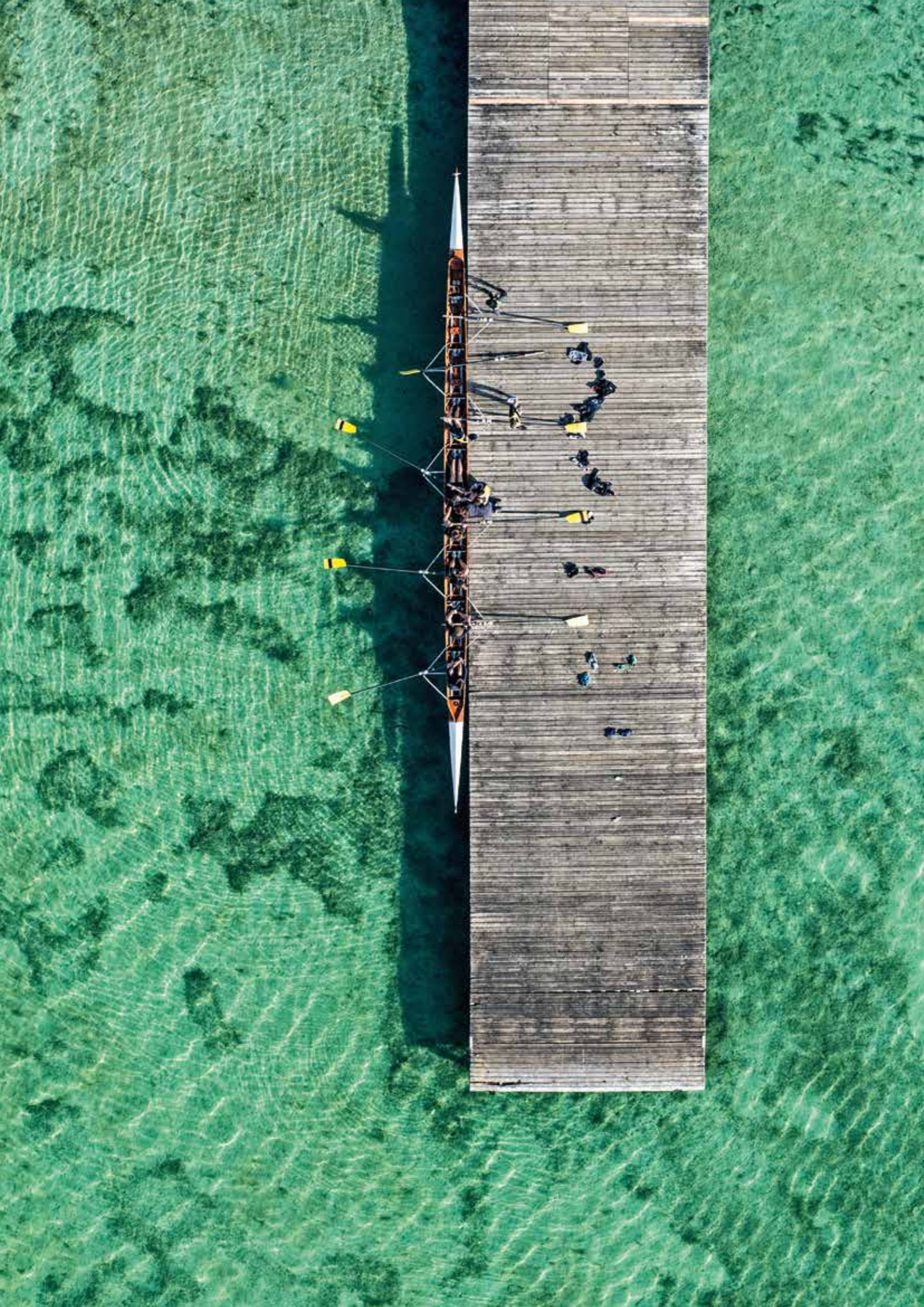
33

orbital locations

15

satellites performing secondary missions





# WHAT WE DO

## WE FUEL HIGH-QUALITY VIDEO EXPERIENCES AROUND THE WORLD

- Our satellite networks reach 325 million homes, totaling over 1 billion people
- With more than 40 DTH platforms, over 700 broadcasters trust us to deliver a wide range of media content to their customers' homes – including standard definition, High Definition (HD), and now Ultra HD (UHD)
- We distribute over 7,500 TV channels, and are by far the largest HD and UHD platform
- We provide a range of solutions for both linear and non-linear content as well as delivery on multiple screens
- We offer global end-to-end media solutions, including playout of content and distribution for video-on-demand, streaming via internet, and satellite broadcasting

## WE SUPPLY SCALABLE BANDWIDTH FOR CONNECTIVITY WORLDWIDE

- Satellite technology enables us to deliver connectivity to aircraft, ships and fixed telecom sites around the world
- Our flexible network is fast to deploy, making it ideal for highly differentiated applications in industries such as aeronautical, maritime and cellular networks, as well as government and institutional operations
- We serve all four major inflight connectivity providers – Global Eagle Entertainment (GEE), Gogo, Panasonic Avionics and Thales
- Our network bridges the digital divide by delivering connectivity to those people and industries across the globe that are the hardest to connect
- Together with our wholly-owned subsidiary SES Government Solutions, which focuses completely on the US government market, we serve 62 governmental and institutional entities globally

## OUR BUSINESS DRIVES TECHNOLOGICAL INNOVATION ON THE GROUND AND IN SPACE

- On the ground, we work closely with our customers and partners to develop tailored solutions that enable the connectivity they need
- In space, we provide a fleet availability rate of 99.99936%
- We continually support ground-breaking new technologies, such as reusable launchers, satellite refuelling and in-orbit satellite payload exchange, fueling innovation in the space industry

# OUR HISTORY

## 1985

SES, Europe's first private satellite operator, is founded in Luxembourg and signs launch agreement with Arianespace

## 1991

Co-location – an innovation by SES. SES's first satellite co-located to multiply the number of services that could be transmitted from one orbital position

## 1995

SES goes digital – a huge attraction for channel providers was SES's pioneering offer of digital broadcasting technology

## 2001

SES acquires Americom from GE. SES GLOBAL is established with two operating companies: SES ASTRA and SES Americom

## 2006

SES acquires New Skies satellites and coverage of 99% of the world. This geographical expansion goes in parallel with the continuous diversification of its commercial offering

## 2009

SES launches HD+, the German HD platform, offering viewers more than 50 channels in HD quality, including 23 of the largest commercial broadcasters in Germany

## 2013

SES broadcasts its first Ultra HD Demo Channel. The launch of the SES-8 satellite marks SpaceX's first geosynchronous transfer mission

## 2016

SES forms MX1 and acquires O3b to significantly enhance existing Video and Networks capabilities

## 2017

SES ushers in a new chapter of space history, being the first to launch a satellite on a SpaceX flight-proven Falcon 9 rocket

# OUR STRUCTURE

In addition to satellite infrastructure, we provide a differentiated global offer with a complete range of value-added services delivered through dedicated service companies.



**100%**

O3b Networks delivers carrier-grade Data Networking Solutions to ISPs, telcos, mobile network operators, governments and enterprises in the most remote and inaccessible places on the planet.

[www.o3bnetworks.com](http://www.o3bnetworks.com)



**100%**

MX1 delivers linear and non-linear audiovisual content to the highest standard in all formats and via all distribution channels.

[www.mx1.com](http://www.mx1.com)



**100%**

HD+ broadcasts popular free-to-air TV channels in high definition to the German market.

[www.hd-plus.de](http://www.hd-plus.de)



**100%**

SES Techcom Services provides integrated end-to-end satellite solutions, ground infrastructure, and operational services, as well as broadband connectivity worldwide.

[www.ses.com/techcom](http://www.ses.com/techcom)



**100%**

SES Government Solutions provides total communications capacity for the US government and related agencies, from satellite bandwidth to customised end-to-end solutions with hosted payloads.

[www.ses-gs.com](http://www.ses-gs.com)



**100%**

QuetzSat is a Mexican satellite operator which serves Mexico and the US with DTH TV services. QuetzSat operates from the orbital position 77°W.

[www.quetzsat.com](http://www.quetzsat.com)



**70%**

Ciel is a Canadian satellite service that works to bring the highest quality digital television and broadband services to homes and businesses throughout North America. Currently using orbital positions 129°W, 103°W and 86.5°W.

[www.cielsatellite.ca](http://www.cielsatellite.ca)



**50%**

GovSat is a 50/50 public-private partnership between SES and the Luxembourg government. GovSat-1 will be a multi-mission satellite that will use X-band and Military Ka-band frequencies on high-power and fully steerable mission beams to support multiple government related operations.

[www.govsat.lu](http://www.govsat.lu)



**35%**

YahLive is a partnership between SES and YahSat in Abu Dhabi. YahLive owns and commercialises 23 Ku-band transponders on the Yahsat 1A satellite to provide direct-to-home television capacity and services to numerous countries in the Middle East, North Africa and Southwest Africa.

[www.yahlive.com](http://www.yahlive.com)

# OUR MANAGEMENT TEAM



The SES executive management team combines decades of experience in a wide variety of disciplines.

We have 2,000 employees of more than 65 nationalities in over 20 locations worldwide.

From left to right:

- **Ferdinand Kayser** – Chief Executive Officer, SES Video
- **Padraig McCarthy** – Chief Financial Officer
- **Christophe De Hauwer** – Chief Strategy & Development Officer
- **Karim Michel Sabbagh** – President & CEO
- **Evie Roos** – Chief Human Resources Officer
- **Martin Halliwell** – Chief Technology Officer
- **Steve Collar** – Chief Executive Officer, SES Networks
- **John Purvis** – Chief Legal Officer

# LAUNCH MANIFEST 2017 - 2021:

We have invested in a number of new satellites to be launched in the years to come to increase opportunities for both customers and end-users. In the fast-growing economies of Asia, Africa and Latin America, the new satellites will enable new service possibilities. In established markets, they will deliver to increasingly bandwidth-hungry services. The new satellites complement our expanding global fleet of more than 65 satellites and our network of teleports.

Satellite	Region	Application	Launch Date
<b>SES-10</b>	Latin America	Video, Networks	Q1 2017
<b>SES-15*</b>	North America	Video, Networks	H1 2017
<b>SES-11</b>	North America	Video, Networks	H2 2017
<b>SES-14*</b>	Latin America	Video, Networks	H1 2018
<b>SES-12*</b>	Asia-Pacific	Video, Networks	H1 2018
<b>SES-16 GovSat-1**</b>	Europe/MENA	Government	H2 2017
<b>O3B (SATELLITES 13-16)</b>	Global	Networks	H1 2018
<b>O3B (SATELLITES 17-20)</b>	Global	Networks	H2 2019
<b>SES-17</b>	Americas	Networks	2021
<b>O3b mPOWER</b>	Global	Networks	2021

\* SES-12, SES-14 and SES-15 to be positioned using electric orbit raising, entry into service typically four to six months after launch  
 \*\* procured by LuxGovSat

# NETWORK MAP

## SES SATELLITE FLEET

- In orbit
- Future launch
- In orbit HTS satellite (High-throughput satellite)
- Future HTS satellite (High-throughput satellite)
- Inclined
- Expected orbital position
- To be relocated

## SES NETWORK

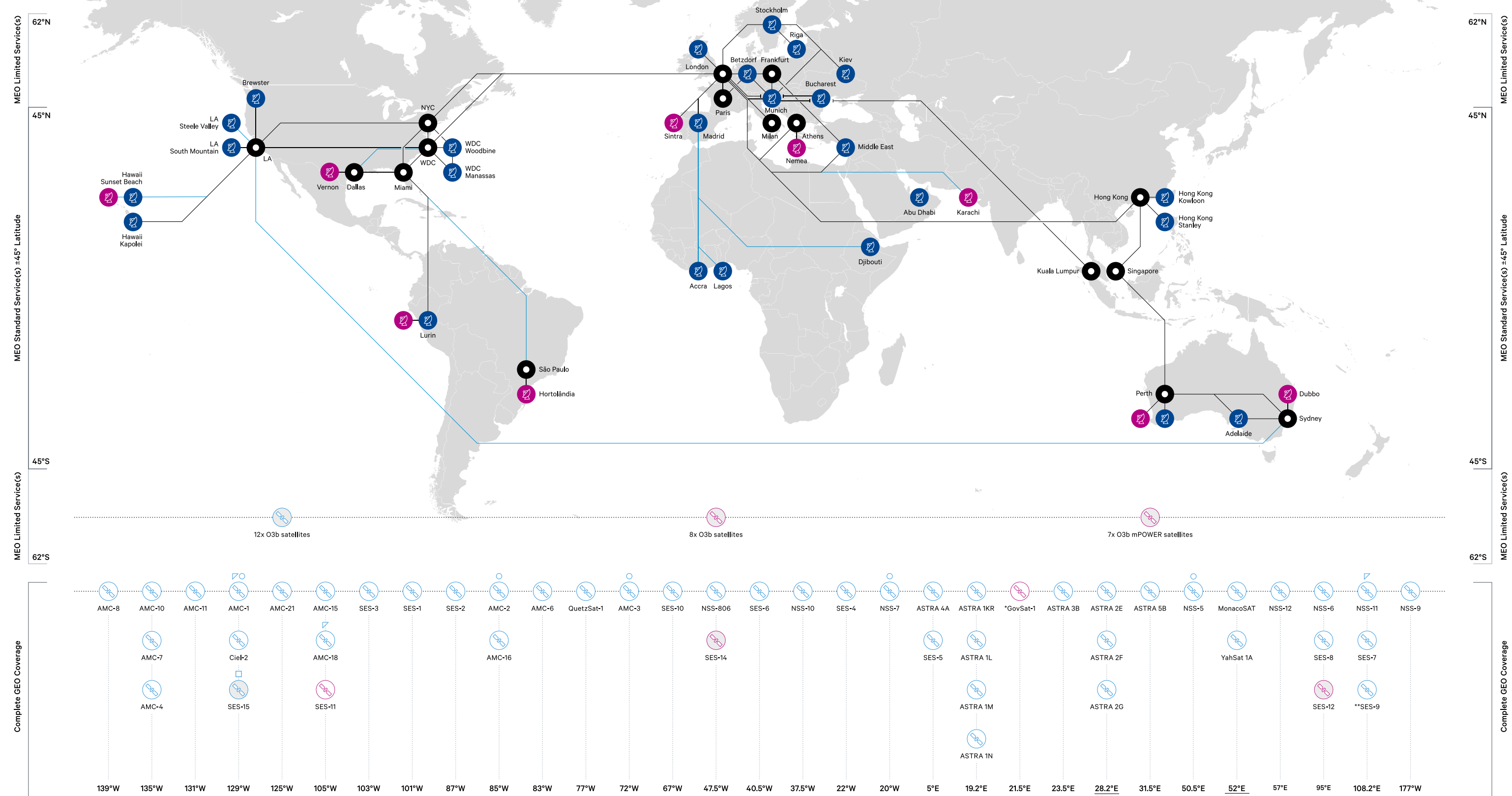
- GEO gateway
- MEO gateway
- Point of presence (POP)
- Existing link
- Future link

## Additionally, we have nine satellites flying secondary missions:

ASTRA 1D, ASTRA 1F, ASTRA 1G, ASTRA 1H, ASTRA 2A, ASTRA 2B, ASTRA 2C, ASTRA 2D, ASTRA 3A.

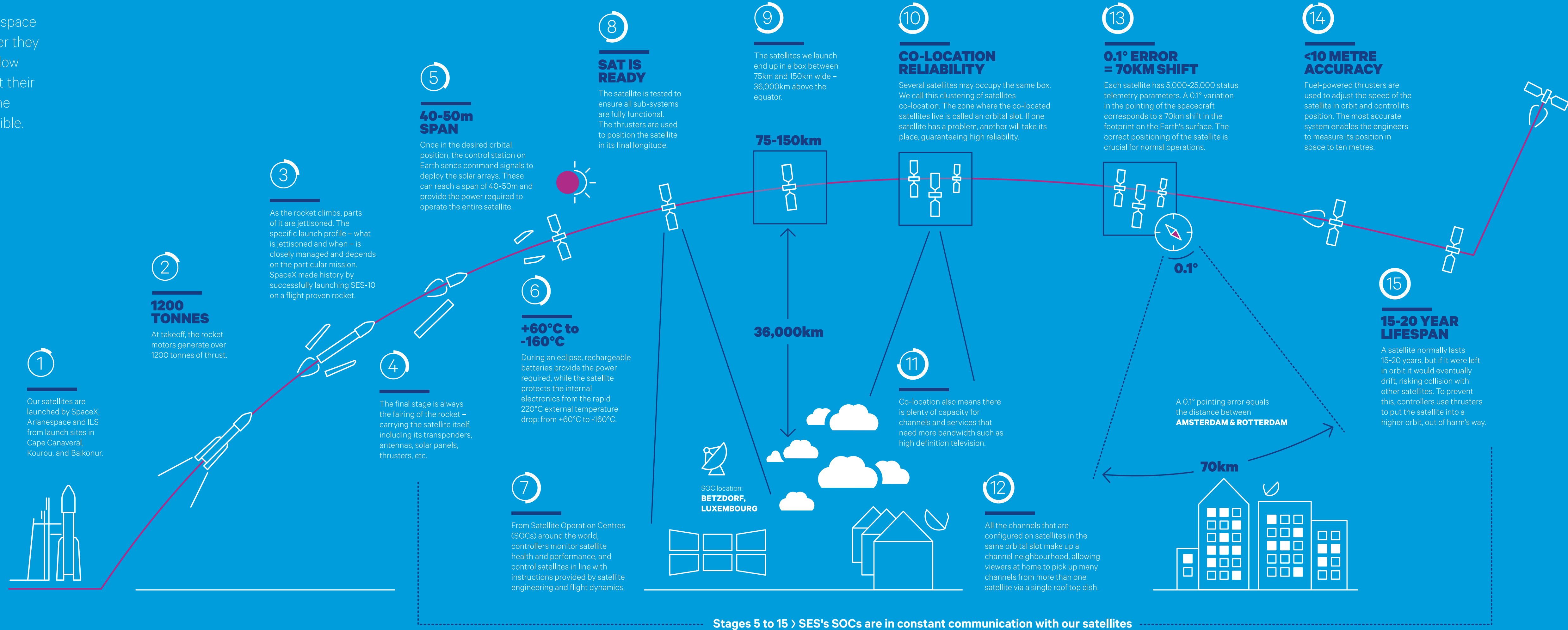
MEO satellites orbit at 8000km above the Earth's surface; they rotate faster than the Earth and, therefore, hand-off their service as they orbit. Fleet configuration is based on current planning and is subject to change. SES holds a 70% interest in Ciel Satellite Limited Partnership and a 100% ownership interest in QuetzSat. Yahsat 1A's Ku-band payload is owned by YahLive, where SES holds a 35% ownership interest. MonacoSAT is a partner satellite with transponders onboard TurkmenAlem at 52°E. SES-17 expected to launch in 2021.

\* Procured by LuxGovSat  
\*\* SES-9 at 108.2E vicinity



# LIFE OF A SATELLITE

Satellites are launched into space in a matter of hours, however they live on for years in orbit. Follow stages 1 to 16 to learn about their orbit, the technology, and the people who make it all possible.



1

Our satellites are launched by SpaceX, Arianespace and ILS from launch sites in Cape Canaveral, Kourou, and Baikonur.

2

**1200 TONNES**  
At takeoff, the rocket motors generate over 1200 tonnes of thrust.

3

As the rocket climbs, parts of it are jettisoned. The specific launch profile – what is jettisoned and when – is closely managed and depends on the particular mission. SpaceX made history by successfully launching SES-10 on a flight proven rocket.

4

The final stage is always the fairing of the rocket – carrying the satellite itself, including its stowpanders, antennas, solar panels, thrusters, etc.

5

**40-50m SPAN**

Once in the desired orbital position, the control station on Earth sends command signals to deploy the solar arrays. These can reach a span of 40-50m and provide the power required to operate the entire satellite.

6

**+60°C to -160°C**

During an eclipse, rechargeable batteries provide the power required, while the satellite protects the internal electronics from the rapid 220°C external temperature drop: from +60°C to -160°C.

7

From Satellite Operation Centres (SOCs) around the world, controllers monitor satellite health and performance, and control satellites in line with instructions provided by satellite engineering and flight dynamics.

8

**SAT IS READY**

The satellite is tested to ensure all sub-systems are fully functional. The thrusters are used to position the satellite in its final longitude.

9

The satellites we launch end up in a box between 75km and 150km wide – 36,000km above the equator.

**75-150km**

**36,000km**

SOC location:  
**BETZDORF, LUXEMBOURG**

10

**CO-LOCATION RELIABILITY**

Several satellites may occupy the same box. We call this clustering of satellites co-location. The zone where the co-located satellites live is called an orbital slot. If one satellite has a problem, another will take its place, guaranteeing high reliability.

11

Co-location also means there is plenty of capacity for channels and services that need more bandwidth such as high definition television.

12

All the channels that are configured on satellites in the same orbital slot make up a channel neighbourhood, allowing viewers at home to pick up many channels from more than one satellite via a single roof top dish.

13

**0.1° ERROR = 70KM SHIFT**

Each satellite has 5,000-25,000 status telemetry parameters. A 0.1° variation in the pointing of the spacecraft corresponds to a 70km shift in the footprint on the Earth's surface. The correct positioning of the satellite is crucial for normal operations.

**70km**

A 0.1° pointing error equals the distance between **AMSTERDAM & ROTTERDAM**

14

**<10 METRE ACCURACY**

Fuel-powered thrusters are used to adjust the speed of the satellite in orbit and control its position. The most accurate system enables the engineers to measure its position in space to ten metres.

15

**15-20 YEAR LIFESPAN**

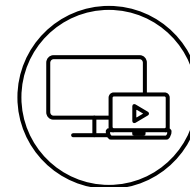
A satellite normally lasts 15-20 years, but if it were left in orbit it would eventually drift, risking collision with other satellites. To prevent this, controllers use thrusters to put the satellite into a higher orbit, out of harm's way.

Stages 5 to 15 > SES's SOC are in constant communication with our satellites



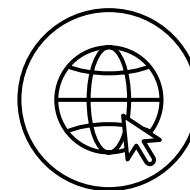
# FOCUSED ON OUR CUSTOMERS

In 2017 we restructured our go-to-market organisation model with the creation of two business units, SES Video and SES Networks, focusing on the video and data-centric segments that SES serves. This structure was devised with the aim of gathering all go-to-market capabilities and allowing us to deliver increasingly differentiated and essential satellite-enabled communication solutions to our customers. SES Networks integrates O3b Networks to provide connectivity for telecom, maritime, aero, energy, and government customers.



## VIDEO

We reach **325 million** TV households worldwide, delivering over **7,500** TV channels and **>2,500** HD channels, **33%** of all SES channels are HD\*

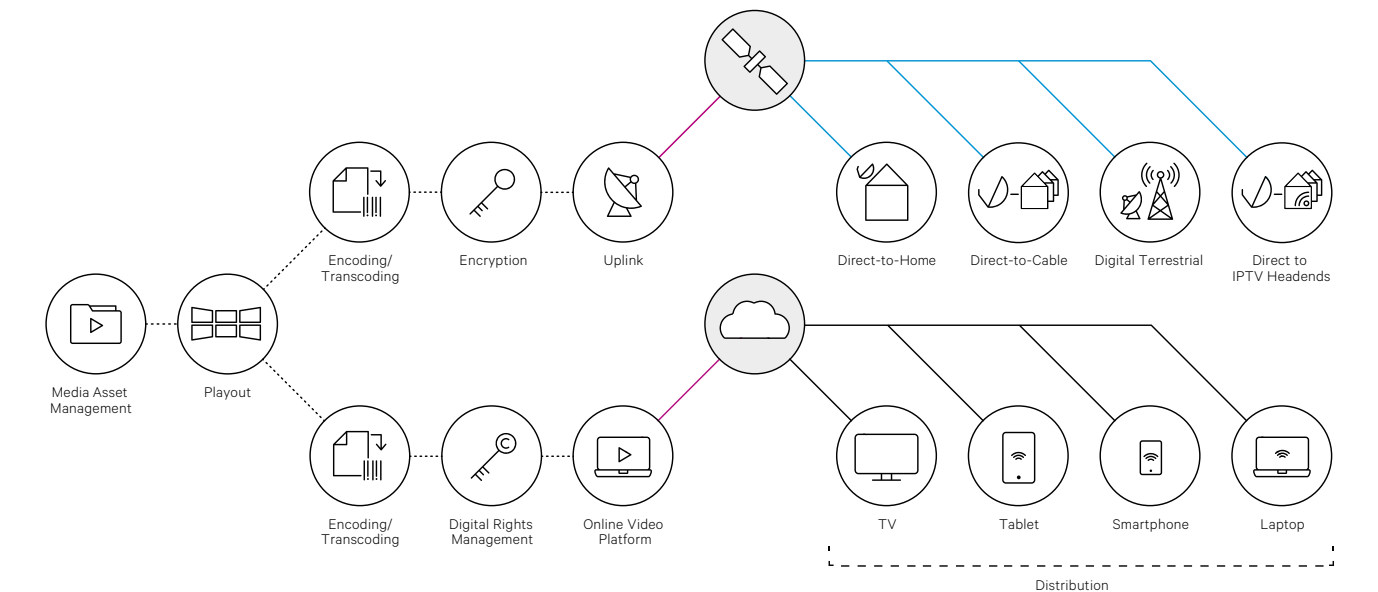


## NETWORKS

We provide widebeam and GEO/MEO HTS capacity and teleport services for **>300 Fixed Data customers**, **99%** global coverage of global maritime and aeronautical routes and **62 governments** in **28 countries\***

# VIDEO

As the world's leading video platform, we enable broadcasters to deliver over 7,500 TV channels to 325 million TV homes and nearly one billion people worldwide. With 30 years of experience, we provide high-quality broadcasting and OTT services, including direct-to-home (DTH), Cable, IPTV, and digital terrestrial TV (DTT) distribution, as well as Video on Demand (VOD) services for OTT platforms. Beyond providing capacity, our value-added services include management, play-out and encryption services, as well as tailored engineering services.



\*Based on 2016 end-of-year figures



## VIDEO SOLUTIONS

MX1 provides fully managed playout and turnaround services, such as channel origination and management, content processing, and delivery to TV service providers across the globe. Additionally MX1 offers a complete suite of next generation video services to deliver video to VOD and OTT platforms through its media service platform MX1 360. This suite of capabilities cover the complete video value chain, from the content producer to the viewer, who is watching on any screen, at any time.

## 4K ULTRA HD

We are the first satellite operator to broadcast a commercial Ultra High Definition (UHD) channel, and the satellite operator broadcasting the largest share of High Definition (HD) channels. Today we broadcast 34 Ultra HD channels and continue to drive forward the development HDR (High Dynamic Range), as part of Ultra HD phase 2.



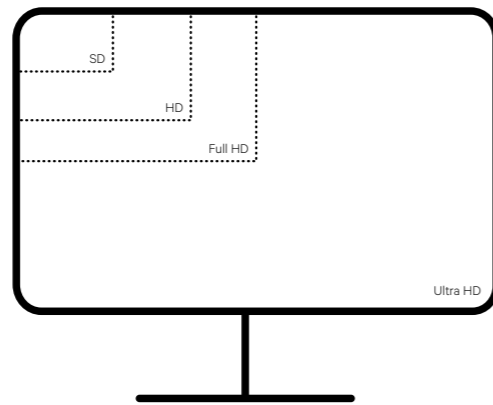
## HD+

Founded in 2009, HD+ provides broadcasters in Germany with a platform to deliver their HD content to paying audiences via satellite. HD+ is a B2C company, interacting directly with customers to bring HD quality content into their homes. Users of HD+ have access to more than 50 channels in HD quality, including 23 of the largest commercial broadcasters in Germany. Today HD+ has over two million paying subscribers, and in February 2017 launched HD+ ExtraScreen, which uses Sat>IP technology to enable viewers to enjoy HD quality video delivered via satellite on their tablets or smartphones.



## SAT>IP

Sat>IP is an innovative technology that converts satellite signals into Internet Protocol (IP) standard, enabling viewers to watch high-quality satellite TV programmes on multiple IP-enabled devices throughout their household. This enables HD quality video delivered via satellite for multi-screen and multi-room viewing.



## 4x

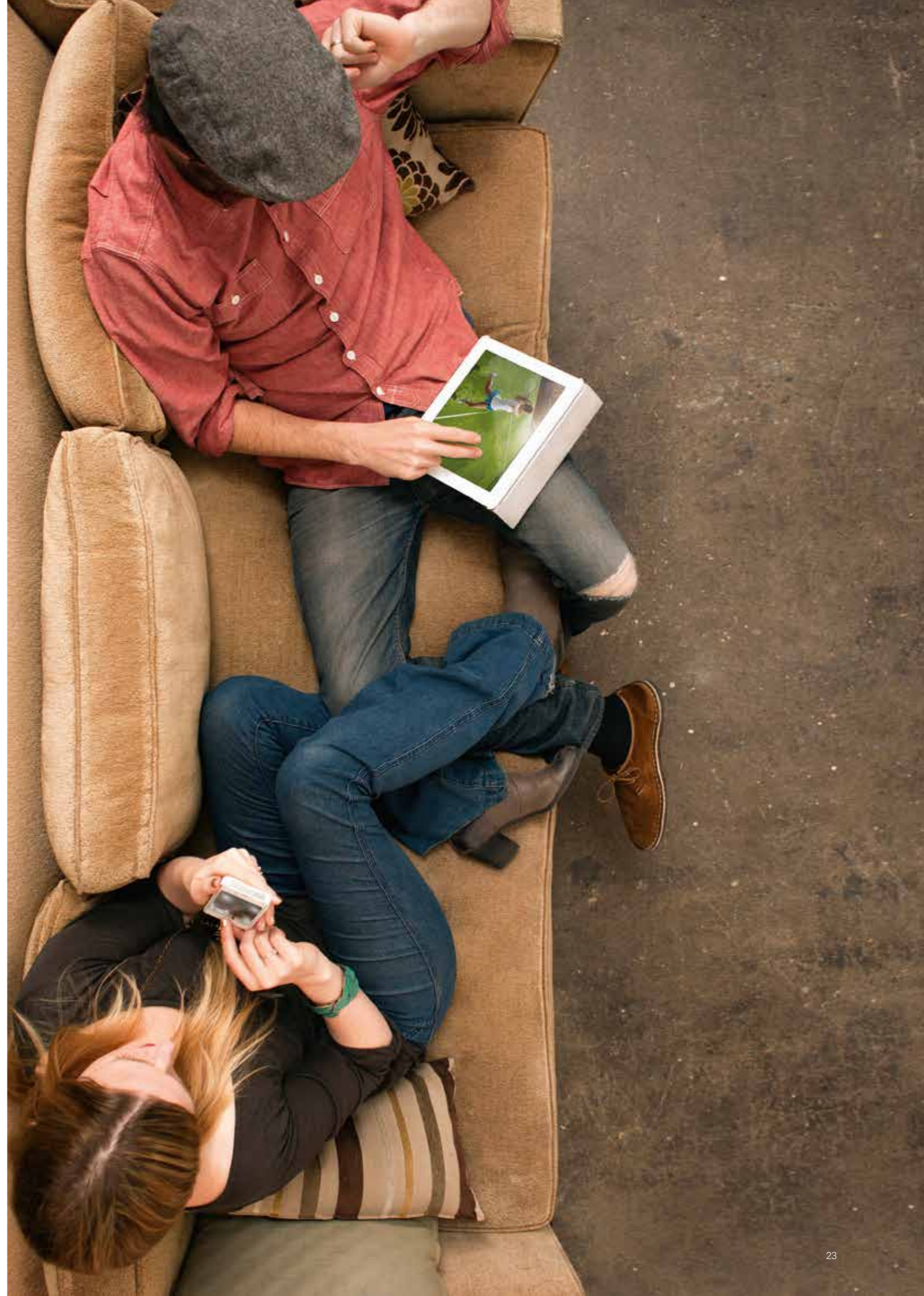
the number of pixels on today's HDTV

SD / 750 x 576px

HD / 1280 x 720px

Full HD / 1920 x 1080px

Ultra HD / 3840 x 2160px



# VIDEO SES in numbers

**>7,500**  
channels

**UHD** **21** commercial  
Ultra HD channels

**HD** **>2,500**  
HD channels

**SD** **>5,000**  
SD channels

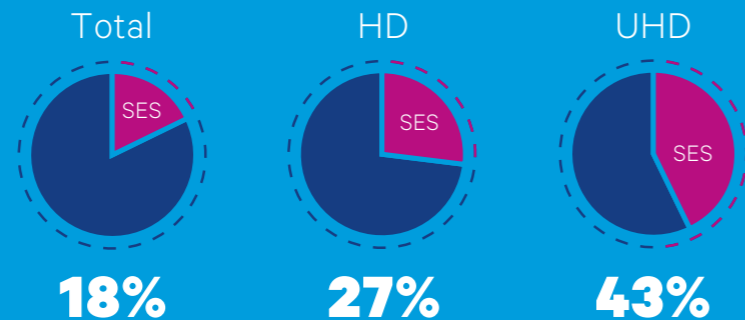
**HD** **33%**  
of all SES channels are HD

**>2,750** **MX1**  
broadcast TV channels  
distributed

**>500**  
Managed playout channels

**>120**  
VOD platforms

SES share of global channels broadcast via satellite



HD growth Europe\*

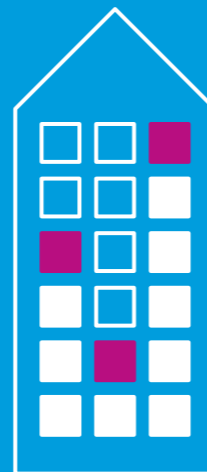
**14%** >750 channels

HD growth North America\*

**5%** >1,360 channels

HD growth developing markets\*

**2%** >370 channels



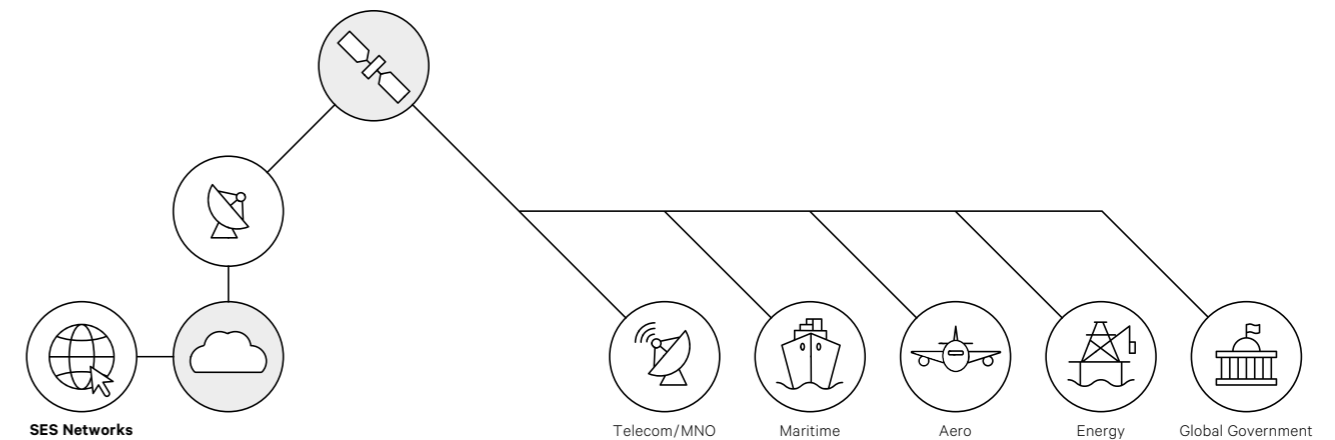
**>600**  
Broadcast clients with long-term contracts

2017 increasing capacity for developing markets



# NETWORKS

We deliver globally available, intelligent and dynamically scalable satellite-enabled communications and network services underpinned by rock-solid, next-gen global infrastructure to make the most of every opportunity, and guarantee the best digital experience. Through SES Networks, we take a highly consultative approach to customer engagement. We tailor industry-focused network solutions that are powered by our MEO and GEO satellite fleet, and extensive ground infrastructure. And we deliver them as a managed service so that our customers can stay focused on how best to maximize their business. We operate across five main domains:



## TELECOM

For telcos, Mobile Network Operators (MNOs), internet service providers, and cloud service providers, we deliver reliable, high-performance network infrastructure and services. This includes capacity on demand, and cost-effective mobile backhaul solutions anywhere on the planet.

## AERO

We provide next generation, satellite-enabled mobility solutions fuelled by our global GEO/MEO satellite network that transmits in multiple bands to reliably deliver the highest possible data throughputs and quality of experience.

## GOVERNMENT

We provide reliable and critical connectivity for defence, civil, and humanitarian operations that is rapidly deployable, often in the most challenging situations and remote places imaginable.

## MARITIME

With satellites in multiple orbits transmitting in multiple bands, our global data network and communications solutions for maritime provide broadband connectivity to vessels of every size in any body of water or port in the world.

## ENERGY

Oil and gas, mining, hydro, wind and solar energy companies and their ecosystems rely on SES Networks' multi-orbit, multi-band GEO and MEO satellite fleets to provide secure, high-performance network connections – no matter how remote or widespread.

# UNLEASHING THE POTENTIAL OF AN EMPOWERED WORLD

O3b mPOWER is a unique system of advanced communication satellites and innovative ground infrastructure. Fully integrated with the existing SES fleet and extended through an ecosystem of partners, it will empower exponentially more people, communities and businesses with opportunities created by truly global cloud-scale connectivity.



## O3b mPOWER

The passion of the SES Networks team has always been to connect more people with more opportunities. We've proven that we can transform lives around the world, as well as the satellite industry itself. As part of SES, we have both the experience and the resources to continue delivering on this vision, and with O3b mPOWER we're taking it to the next level.

With O3b mPOWER, SES Networks is laying out its blueprint to transform the communications industry and unlock pent-up demand for high-growth data services. The original O3b MEO constellation was always envisioned as the first step in a bold and strategic evolution in global data services, and now O3b mPOWER facilitates the rapid shift to a cloud-based world – anywhere in the world.

To meet the demand, O3b mPOWER scales the proven O3b model to deliver a ubiquitous, low-latency “virtual fibre” network to 30,000+ endpoints while seamlessly integrating with all other network infrastructure – from GEO satellites to fibre to microwave and new innovations from service and content providers aimed at connecting more people than ever.

O3b mPOWER challenges the conventional wisdom of what satellite services can do. As a high-powered, highly distributed network, O3b mPOWER has the ability to provide millions more people, businesses, content, cell towers and data centres with high-performance cloud-scale connectivity. As a result, it expands the role of satellite in an increasingly seamless global networking environment, and it opens a world of digital opportunity for people and organisations of all sizes regardless of their location or application requirements.

In short, O3b mPOWER is the highest-capacity, farthest-reaching, and most flexible satellite-based communications system ever. And it has the potential to empower more people with the opportunities that come with high-performance connectivity than ever before.

### O3B mPOWER TECHNOLOGY

A system unlike any other, O3b mPOWER includes step change technology advancements, including a new constellation of advanced MEO satellites, ground infrastructure innovation and convergence, and new software intelligence. The result is cloud-scale connectivity for low latency, application-aware services virtually anywhere in the world.

### CUSTOMERS & MARKETS

Data services are the growth engine for the industry as customers across markets look to low-latency networks and to facilitate the massive shift from local storage to cloud-based, network-centric operations. O3b mPOWER is designed to meet the global demand for an “on-demand” experience in the digital economy.

### PARTNER ECOSYSTEM

O3b mPOWER represents an open invitation and a major business opportunity for the entire industry to innovate and grow. From leading technology providers to value-add service partners, SES Networks envisions an ecosystem of suppliers that will collaborate and leverage the capabilities of O3b mPOWER to create the most compelling, cost-effect, end-to-end experience for customers.

# NETWORKS in numbers

Serves Fixed Data customers in



Reaches

**>1M**



enterprise-grade data terminals

Serves

**>300**

enterprise customers



**≈80%**

of enterprise revenue from Tier-1 applications/managed services

Connecting the unconnected

Provides more than **10 Gbps** to remote islands around the globe



Industry-leading latency for any satellite-based broadband system

**<150 ms**



Can enable up to

**150 Mbps**

of LTE backhaul per tower

Capable of delivering

**1 Gbps**

per cruise ship



Provides over

**99%**

coverage of global maritime and aeronautical traffic



Scalable connectivity ranging from

**100 Mbps to 1 Gbps**

per cruise ship

Provides connectivity to about

**2,500**

connected planes today

Serves

**>1,000,000**



passengers of Royal Caribbean Cruises per year

Our customers serve about

**90%**

of all global connected planes



- 24** Europe
- 13** US served by SES GS\*
- 12** Africa
- 4** Middle East
- 4** Other
- 3** Asia
- 2** UN

**28** countries served



**5**

New global customers under contract in 2016



**>10**

Ground Infrastructure and Managed Services Projects in 2016



**5**

hosted payloads since 2011

- USAF CHIRP** SES-2
- EGNOS-GEO 1** SES-5
- EGNOS-GEO 2** ASTRA 5B
- FAA WAAS** SES-15
- NASA GOLD** SES-14

Participant in **>5 PPP's\*\***

- **GovSat**
  - 50%** SES
  - 50%** Luxembourg Government
- European 5G PPP
- Electra
- emergency.lu
- SATMED

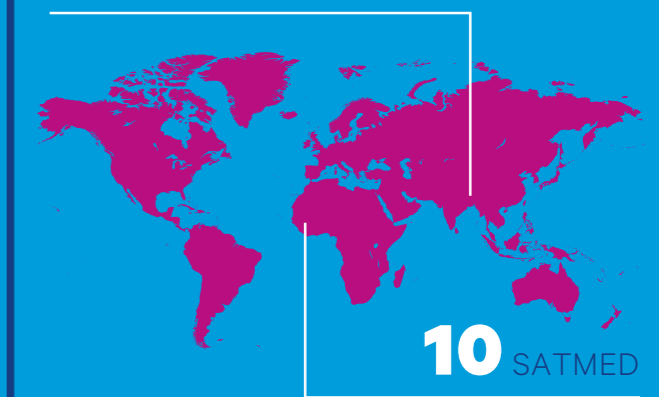


**68**

GovSat-1 transponders



**>40** emergency.lu



project deployments from 2013 to 2016

# OUR COMMITMENT

Connectivity can fuel life changing applications such as e-emergency, e-health, e-learning, e-elections, and e-banking, and the reach of satellite gives us the power to bring these services to people anywhere in the world.

## **emergency.lu**

When a natural disaster strikes, one of the top concerns is establishing a reliable means of communication. First responders, government services and humanitarian organisations rely on their link to the world to coordinate effective relief efforts. This is why we collaborate with the Luxembourg Government and other organisations in Luxembourg to provide emergency.lu, a satellite based communications platform to deliver connectivity during disaster response.

- emergency.lu serves as the lead agency for the Emergency Telecommunications Cluster of the World Food Programme
- Offered by Luxembourg as a free public good to the global humanitarian community
- Has been deployed over 40 times in countries including Haiti, Nepal, Vanuatu, the Philippines, Sierra Leone, Dominica, and Saint Martin

## **E-HEALTH: SATMED**

Improving access to health care around the world is crucial to development, which is why SATMED is enabling access to, and simplifying, e-health. The Luxembourg Government and SES collaborated to make SATMED a reality, and the platform is delivered with the support of medical NGOs and technology partners around the world.

- SATMED reaches isolated areas with poor connectivity to improve public health in emerging and developing countries
- It has been deployed in Sierra Leone, Benin, Philippines, Bangladesh, Niger

## **E-LEARNING**

Our e-learning initiatives provide Internet connectivity to e-learning facilities in isolated areas to bridge the digital and information gap.

## **E-ELECTIONS**

We worked with local partners in Burkina Faso to enable the secure digital transmission of the electoral results from 368 locations across the country for the Burkinabe Presidential Election in 2015.

## **E-BANKING**

Our satellite connectivity is providing fast and reliable e-banking services in remote and isolated areas in Africa, making improved financial services available.

## **IMPRESSUM**

All brand and product names may be registered trade marks and are hereby acknowledged. It is our policy to produce the document with a minimum impact on the environment. To this end the paper used is 100% chlorine free woodpulp from sustainable forests, using thinnings and waste from the timber industry and is totally recyclable and biodegradable. Our printers are fully accredited to the ISO 14001 environmental management system. They utilise vegetable based inks and operate a direct computer to plate repro system, eliminating the need for film with its chemicals such as developer and acid fixers. This report is printed on Heaven 42, an environmentally responsible 100% recycled paper made from 100% post-consumer waste and bleached chlorine free (PCF).

Designed by Bizart  
Printed by Print Solutions  
Photo credit: SES, Getty Images

# SES HEADQUARTERS

Château de Betzdorf  
L-6815 Betzdorf  
Luxembourg

## REGIONAL OFFICES

Accra | Ghana  
Addis Ababa | Ethiopia  
Bucharest | Romania  
Dubai | United Arab Emirates  
The Hague | The Netherlands  
Istanbul | Turkey  
Johannesburg | South Africa  
Kiev | Ukraine  
Lagos | Nigeria  
London | UK  
Madrid | Spain  
Mexico City | Mexico  
Moscow | Russia  
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Stockholm | Sweden  
Warsaw | Poland  
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