ACCELERATING BEYOND FRONTIERS

Company overview

SES

beyond frontiers

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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.

Our two business verticals target specific markets – one focused on Video, and one focused on Networks for Fixed Data, Mobility and Government.

Our mission is to connect, enable, and enrich.

GLOBAL INFRASTRUCTURE

54
active satellites in geosynchronous orbit

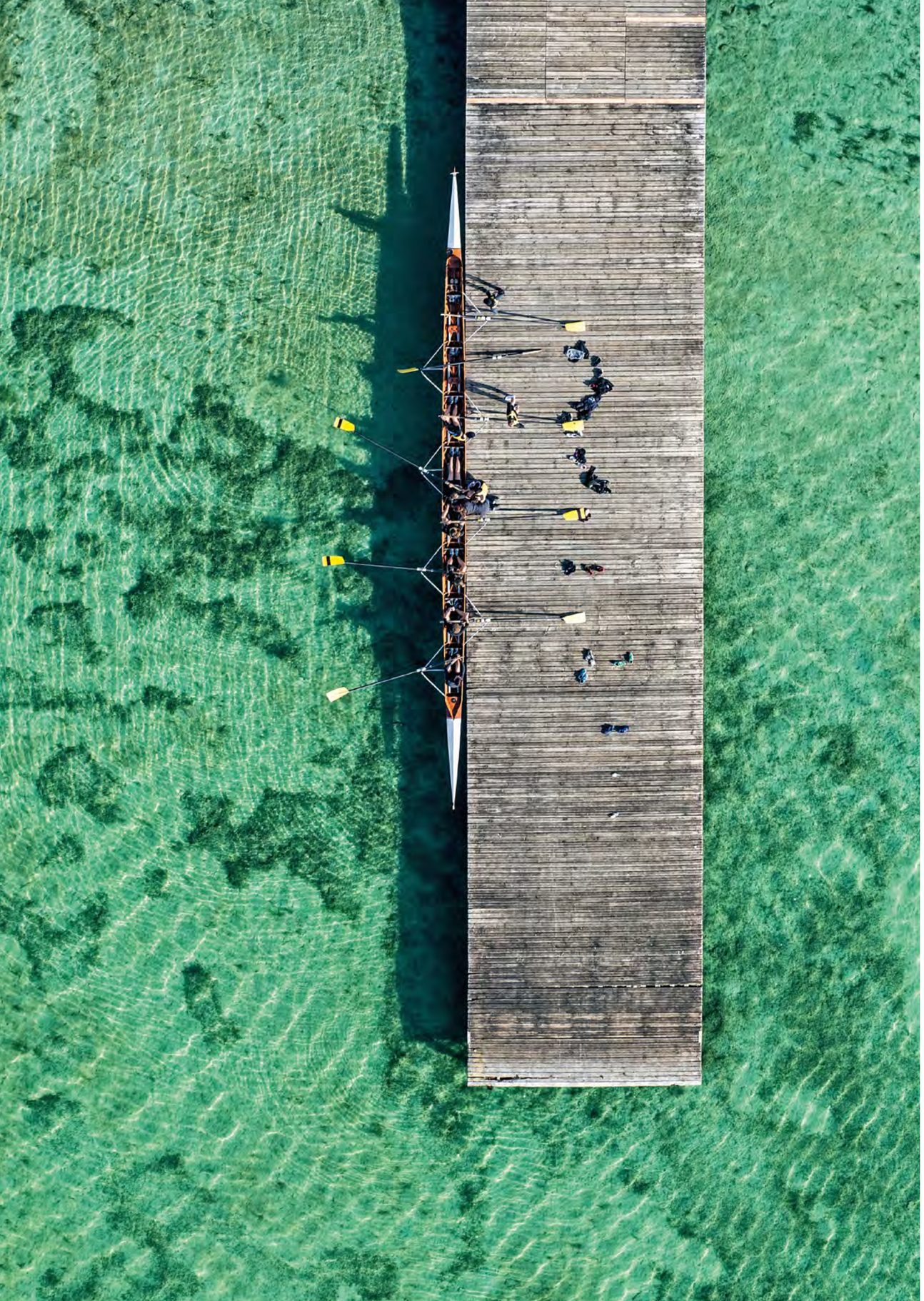
12
satellites flown in inclined orbit

12
active satellites in medium earth orbit

14
satellites flying secondary missions

33
orbital locations

15
new satellites under procurement



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 99.9999552%
- 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. In concert with the acquisition, the company takes the name SES

2009

SES launches HD+, the Germany 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 geo-synchronous 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

100%

MX1 delivers linear and non-linear audiovisual content to the highest standard in all formats and via all distribution channels.
www.mx1.com

100%

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

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

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

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

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

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

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

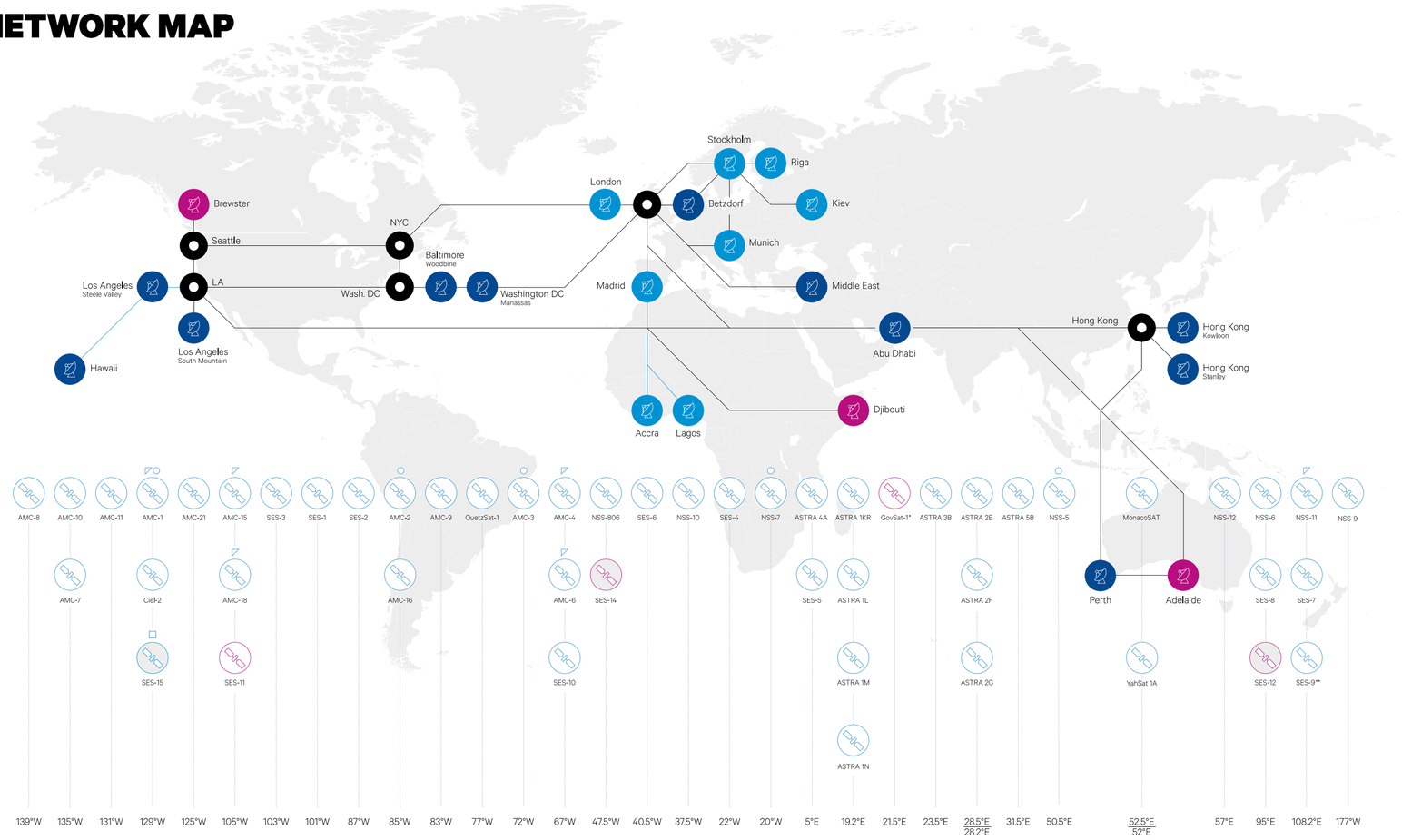
LAUNCH MANIFEST 2017 - 2020:

We have invested in a number of new satellites to be launched in 2017 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
SES-10	Latin America	Video, Networks	Q1 2017
SES-11	North America	Video, Networks	H1 2017
SES-12*	Asia-Pacific	Video, Networks	H2 2017
SES-14*	Latin America	Video, Networks	H2 2017
SES-15*	North America	Video, Networks	H1 2017
SES-16 GovSat-1**	Europe/MENA	Government	H2 2017
O3B (SATELLITES 13-16)	Global	Networks	H1 2018
O3B (SATELLITES 17-20)	Global	Networks	H2 2019
SES-17	Americas	Networks	2020

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

SES NETWORK

- Teleport
- Video location teleport
- IP-Platform teleport
- Point of presence (POP)
- Existing link
- Future link

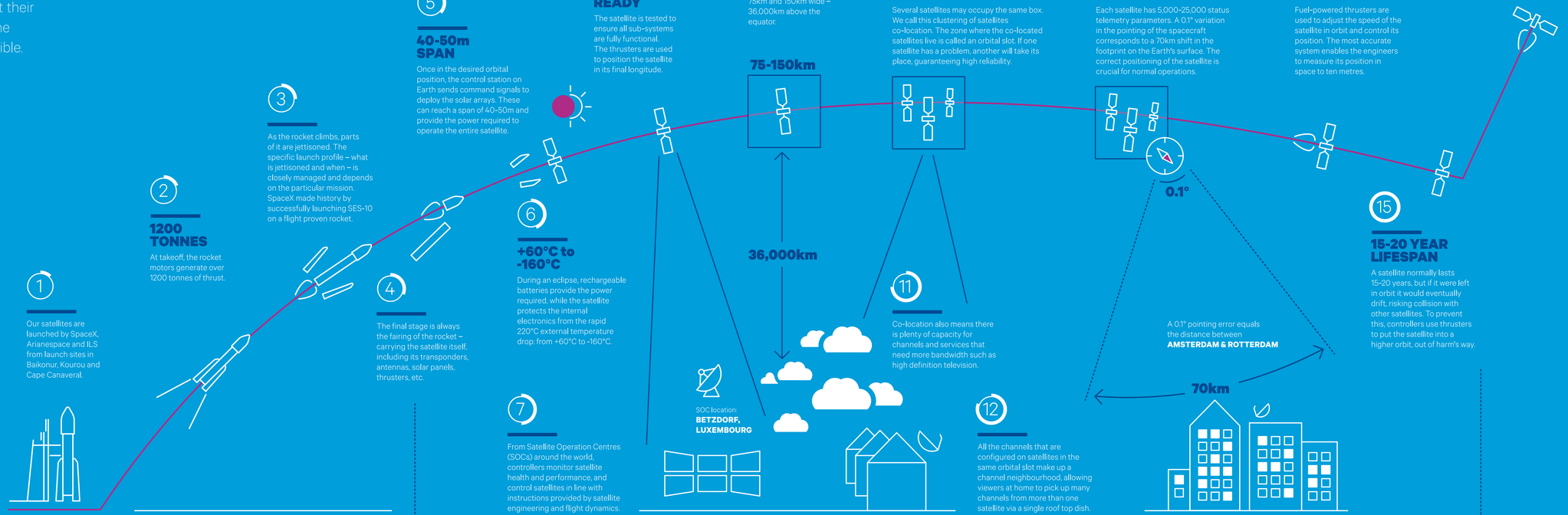
Additionally, we have nine satellites flying secondary missions:
ASTRA 1D, ASTRA 1F, ASTRA 1G, ASTRA 1H, ASTRA 2A, ASTRA 2B, ASTRA 2C, ASTRA 2D, ASTRA 3A.

The SES network also includes 12 MEO HTS satellites – not reflected in this map. 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 will be launched in 2020.

* 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 Baikonur, Kourou and Cape Canaveral.

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 transponders, 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.

SOC location:
BETZDORF, LUXEMBOURG

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

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.

0.1°

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

70km

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 SOCs 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 Fixed Data, Mobility, and Government businesses organisations.

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**

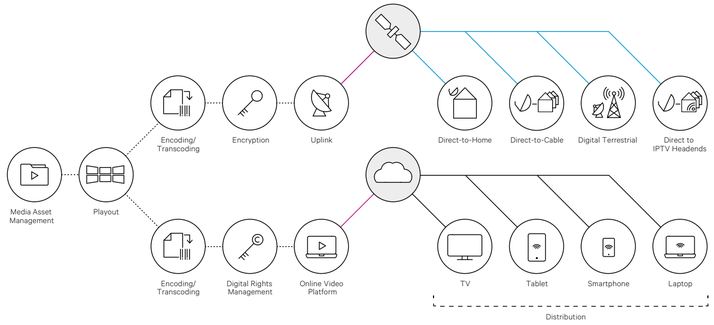
FIXED DATA

MOBILITY

GOVERNMENT

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.



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 to 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.

HD+

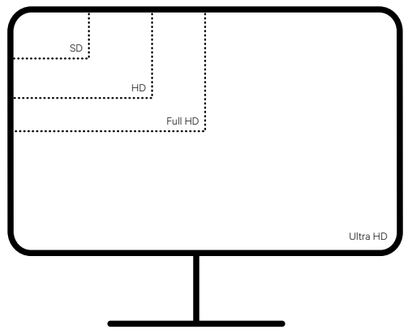
Founded in 2009, HD+ provides broadcasters in Germany with a platform to deliver their HD content to paying audiences via satellite. HD+ is a B2C company, interacting directly with customers to bring HD quality content into their homes. Users of HD+ have access to more than 50 channels in HD quality, 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.

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.



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

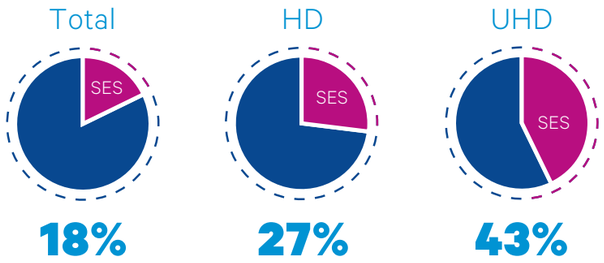
>2,750
broadcast TV channels distributed

MX1

>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

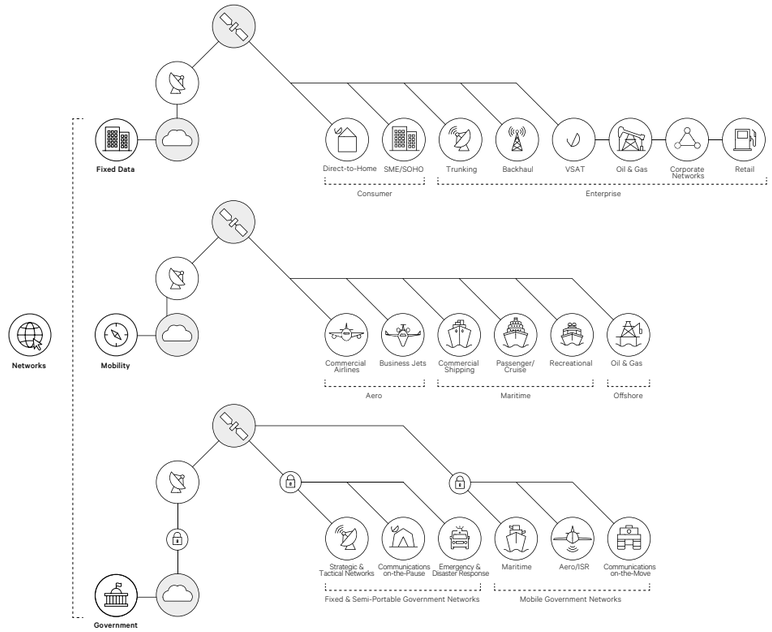
2017 increasing capacity for developing markets

SES-10 SES-12 SES-14 SES-15

* 2015 to 2016 growth

NETWORKS

We provide reliable and secure connectivity with an industry leading latency of less than 150 milliseconds, so that we can deliver the high quality broadband experience our customers expect. This is enabled through our global fleet of over 65 satellites, and high-performance network of over 20 teleports, 6000 POPs and tier-1 IP backbone peering partners. Our fixed data, mobility and government customers use SES capabilities to provide communication in rural areas, connect aircraft, ships and offshore platforms, as well as provide secure links for government organisations around the world.



FIXED DATA

With 65 GEO and MEO satellites and a global networks structure, we serve customers in sectors such as telecommunications, oil & gas, banking, transportation, health and education with unprecedented access to a unique, ubiquitous, future-proof and high-performing network. We offer:

- Widebeam and GEO/MEO HTS capacity and teleport services
- Network/platform services
- Managed networks for consumer/ SME applications
- Industry-leading latency for any satellite-based broadband system

MOBILITY

Our services enable connectivity for thousands of airplanes, ships, and trains traveling across the sky, oceans, and continents. While in transit our network provides links to corporate offices, high-quality live inflight entertainment, and fast broadband access, regardless of location. We offer:

- Trans-oceanic and landmass widebeam and GEO/MEO HTS capacity and teleport services
- Mobility network/Platform services
- Scalable connectivity ranging from 100 Mbps to 1 Gbps per ship

GOVERNMENT

We serve 62 government entities in 28 countries and participate in more than five Public Private Partnership initiatives offering end-to-end solutions in security, defence, and information-gathering as well as for humanitarian purposes such as natural disaster response. We offer:

- Widebeam and GEO/MEO HTS capacity and secure teleport services
- C/Ku/Ka and Military frequency capacity
- Fully managed end-to-end service to the end customer (Mbps + services)
- Advanced high power satellites and state of the art facilities

FIXED DATA
SES in numbers

SES serves Fixed Data customers in

>130
countries

SES serves

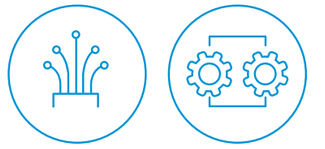
>300
enterprise customers

≈80%
of enterprise revenue from Tier-1 applications/managed services

Flexible and scalable global network/ solutions

>50 GEO

12 MEO



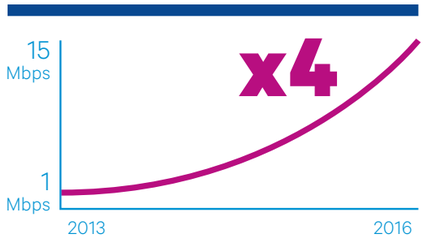
The SES network reaches

>1M
enterprise-grade data terminals

Connecting the unconnected

O3b provides more than **10 Gbps** to remote islands around the globe

Can enable up to **150 Mbps** of LTE backhaul per tower



Growth of average bitrate per site

Industry-leading latency for any satellite-based broadband system

<150 ms

99.99%
measured service availability

Compared to **99.97%** benchmark service availability

MOBILITY
SES in numbers

Provides over **99%** coverage of global maritime and aeronautical traffic

SES customers serve about

90%
of all global connected planes

SES today provides connectivity to about

2,500
connected planes

Capable of delivering

1 Gbps
per cruise ship

Scalable connectivity ranging from **100 Mbps** to **1 Gbps** per cruise ship

O3b serves

>1,000,000
passengers of Royal Caribbean Cruises per year

70% GROWTH
in committed mobility capacity since 2014

GOVERNMENT
SES in numbers

28 countries

62 government entities

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

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

Growing SATCOM-enabled ISR** requirements

Predator	Reaper	Opt. Piloted SATCOM Enabled Aircraft	Global Hawk	Aerostat
3-5 Mbps	**5-10** Mbps	**5-10** Mbps	**10-50** Mbps	**70** Mbps

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

- **GovSat**
  - **50%** SES
  - **50%** Luxembourg Government

68 GovSat-1 transponders

- European 5G PPP
- Electra
- emergency.lu
- SATMED

>40 emergency.lu

10 SATMED

project deployments from 2013 to 2016

* SES Government Solutions
** Intelligence, Surveillance and Reconnaissance
*** Public Private Partnership

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, and Sierra Leone

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

 It is our policy to produce the document constituting our annual report 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

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REGIONAL OFFICES

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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
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Warsaw | Poland
Washington DC | USA

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For more information about SES,
visit www.ses.com or email info@ses.com

SES
beyond frontiers