



ACCELERATING BEYOND FRONTIERS

Company Brochure



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WHAT WE DO

WE FUEL HIGH-QUALITY VIDEO EXPERIENCES AROUND THE WORLD

- We distribute over 7,700 TV channels to 351 million homes worldwide, totaling over 1 billion people, and are by far the largest HD and UHD platform
- 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 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-based technology enables us to deliver connectivity to aircraft, ships and fixed telecom sites around the world through a holistic managed service approach
- 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
- We are trusted by government clients across 30 countries around the world. SES Networks Global Government division serves 58 governmental and institutional customers, and the wholly-owned subsidiary of SES, SES Government Solutions, serves 50 U.S. Department of Defense customers

OUR BUSINESS DRIVES TECHNOLOGICAL INNOVATION ON THE GROUND AND IN SPACE

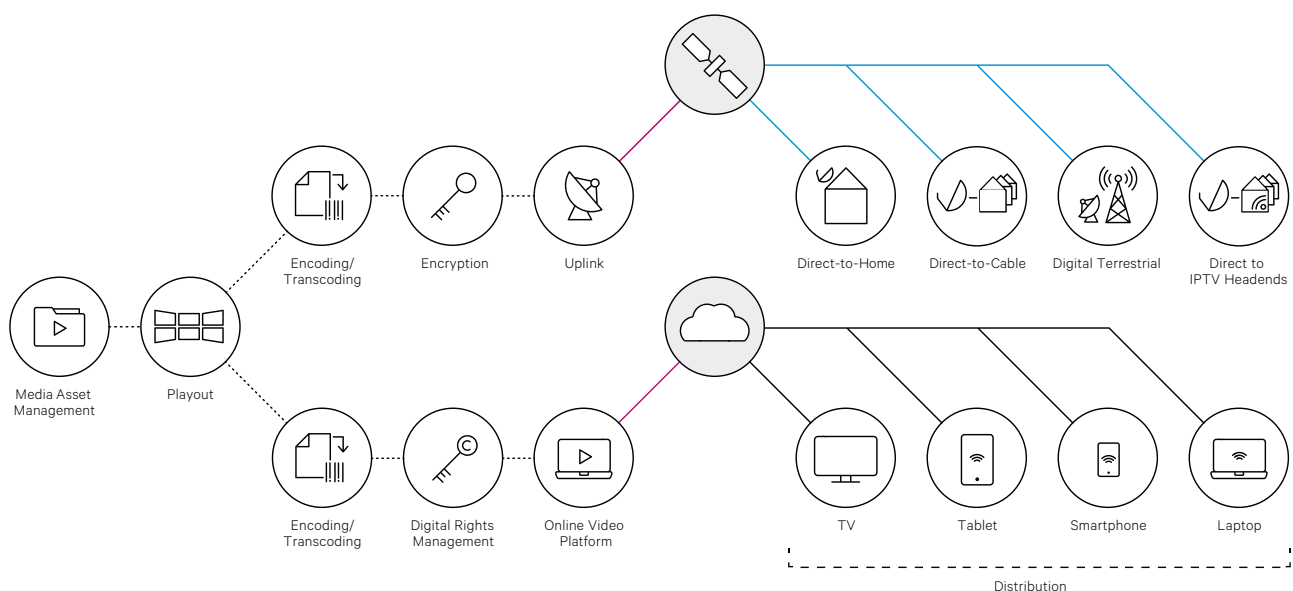
- We are the only provider of low-latency, fibre-equivalent satellite-based data services
- On the ground, we work closely with our customers and partners to develop tailored solutions that enable the connectivity they need
- In space, we provide a fleet availability rate of 99.99936%
- We continually support innovative technologies, such as reusable launchers, satellite refuelling, on-board microprocessors and in-orbit satellite payload exchange, fueling innovation in the space industry



VIDEO

SES Video covers the complete video value chain, with a comprehensive suite of distribution solutions using satellite, terrestrial, and IP networks. Our satellites serve more than 7,700 channels to more than one billion people in 351 million homes, ensuring complete quality control of the end product for our customers. With more than 41 DTH platforms, broadcasters trust us to deliver a wide range of media formats to their customers' homes – including Standard Definition (SD), High Definition (HD), and Ultra HD channels. In tandem our subsidiary MX1 offers a complete range of solutions to distribute content via satellite as well as terrestrial and IP networks.

Today's video customer needs more than just broadcast, and this range of solutions includes the preparation and transmission of content for both linear and non-linear platforms, as well as a full suite of media services including digital distribution and playout of content for video-on-demand, streaming, and satellite TV.



An aerial night view of a city, likely Johannesburg, with illuminated buildings and streets. A video player interface is overlaid on the image. The title 'BEYOND THE NORM' is in large white letters at the top. Below it, the text 'Cell C, South Africa' and 'SES/MX1 and Vubiquity' is displayed. At the bottom left of the video player, there is a play button icon and a timestamp '03:52'. At the bottom right, there are icons for signal strength, settings, and full screen.

BEYOND THE NORM

Cell C, South Africa
SES/MX1 and Vubiquity

BEYOND THE NORM

Vubiquity & Cell C

Together with Vubiquity and Cell C, we bring live and linear video content to the South African market.

The telecommunications landscape is changing as the focus shifts from voice services to data-driven revenues. With so much of the data flowing through mobile providers' networks carrying video, these companies are looking for ways to further monetise their data by providing video services.

With over 16 million subscribers, Cell C is one of South Africa's leading mobile operators. The company focuses on providing their customers with new solutions that are different from anything the market had seen before. With this strategy, they were the first to offer subscriber-centric solutions

for Facebook and Whatsapp, and were eager to develop an on-demand entertainment solution – black. Black goes beyond typical video-on-demand packages to combine live and linear TV, movies, sports, betting, gaming, and more – in a wide variety of content packages that can be purchased via a pre-paid air-time account.

Vubiquity is a leading global content provider that aggregates and distributes content from nearly 650 creators to more than 1,000 video distributors and 109 million households around the world. Cell C chose to partner with Vubiquity because of its relationships with premium content providers, global reach, and partnerships with SES and MX1 that enable the delivery of content on any platform or device.

Vubiquity supplies the content, while SES and MX1 take care of the delivery – with the technical capabilities to get the content from anywhere in the world to Johannesburg, and to seamlessly deliver the content to consumers on multiple devices.

Our partnership has enabled us to offer Cell C a one-price solution that includes licensing the content from a wide variety of sources, as well as a full suite of video services that ensures the content can be delivered wherever it's needed and on any device. With a solution up and running in three months, Cell C can now cast its sights on expanding its market north of the South African border to offer black to consumers in other African countries.



BEYOND HIGH DEFINITION

CANAL+ launched Ultra HD with SES in France

BEYOND HIGH DEFINITION

Canal+ and SES

Today's consumers care more about picture quality than ever before – especially when they're watching their favourite sporting events. As sales of 4K Ultra HD screens continue to grow, consumers in France are asking for content they can fully enjoy on their TV sets. Yet less than a quarter of the population is covered via fibre connectivity, and more than three quarters of ADSL subscribers don't have sufficient bandwidth to receive Ultra HD video.

As France's leading pay-TV provider, Canal+ has over 8 million subscribers in France, as well as pay-TV operations around the world. The company wanted to offer its subscribers the 4K Ultra HD content they are seeking, and to make the service available to 100% of the French population. Making the change required upgrading all its broadcasting facilities, changing its payout, investing

heavily in 4K Ultra HD content, and developing a completely new decoder.

SES and Canal+ began our partnership more than 20 years ago. We worked together to launch the first digital satellite bouquet in Europe in 1996. We brought HD TV to the French market. And now we are partnering to bring viewers 4K Ultra HD TV. Canal+ began its 4K Ultra HD trials with SES in June 2015, with the transmission of the final game of the Champions League. Since then, the company launched a permanent Ultra HD channel on our satellites, and has started offering Ultra HD on its IPTV and OTT platforms.

Driving mass adoption of new TV standards takes all of the elements coming together to build a new ecosystem. As the screens begin shipping, there needs to be content available, and broadcasting

technology that can get the content to the customers' homes. It takes a key player to drive collaboration across the entire industry – a role we played for HD TV, and which we are proud to take on with Ultra HD as well.

Since our satellites cover 100% of the French territory, every single household in France is able to receive Ultra HD quality television via a 60cm dish – with no exceptions. We have worked with Canal+ in the development of the new Ultra HD satellite decoder, which will improve the entire TV-viewing experience, with a compact and beautiful set-top box design, fast zapping, a simple user interface, and multi-room capabilities. We have also worked to support the rollout of Ultra HD across France by bringing together more than 200 Canal+ premium retailers for a kick-off event, where we could train them on the new decoder and the Ultra HD offer.

SES VIDEO

in numbers

99%

Coverage of the globe



351M

HOMES

SES global reach



431*

Video customers
with long-term
contracts

10 years

Typical
contract length



€5.3

billion

of contract
backlog

SES AND MX1 COVER THE COMPLETE VIDEO VALUE-CHAIN



>5M

Media
assets***



>500

Managed playout
channels



>3,200

Broadcast TV channels distributed
over satellite, fibre, and IP**



* This number excludes occasional use

** This includes SES and third party capacity

*** Media assets are any video file (SD/HD/4K/ etc), programme, audio file, subtitle file, graphic file, etc



SES global reach
into homes per
reception mode



145M

DTH



147M

Direct-to-Cable



18M

DTT



40M

IPTV

>7,700
channels



~5,100
SD channels



>2,600
HD channels



28
commercial Ultra HD channels

33.8%

of all SES
channels
are HD



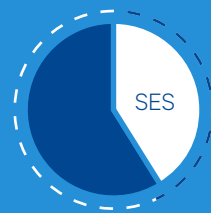
SES share of global channels broadcast via satellite



Total
18%



HD
24.4%



UHD
41.3%

>560

hours of premium sports
& live events daily

>120

VOD
platforms

>8,400

hours of streaming video
delivered daily





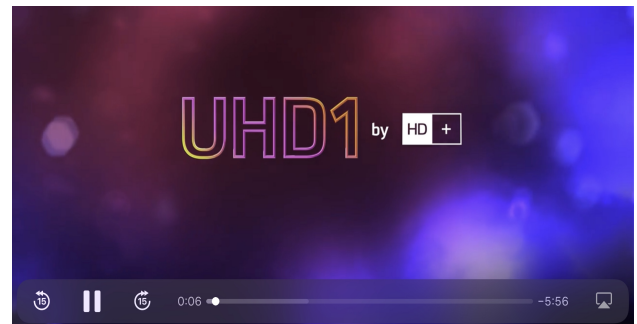
VIDEO SOLUTIONS

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 covers 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.





NETWORKS

SES Networks is revolutionising connectivity. We provide managed data services from a satellite based system that powers global connectivity for everyone - from organisations moving big data, to people who have never had internet before getting access. We fuel the heart of opportunity by working with customers to realise the full potential of their connectivity, driving bigger, more fulfilling, and more productive outcomes. We take a highly consultative approach to customer engagement to tailor industry-focused network solutions in the telecommunications, maritime, aeronautical, energy, and government sectors.

Customers in each of these markets are using our unique MEO and GEO satellite fleet, and extensive ground infrastructure, to fuel powerful, data-hungry applications. It is in this race for more and more data that our global reach, scale, and know-how provide unrivalled convenience, low cost, low latency and high reliability for customers.

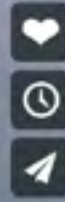
We go the extra mile, also delivering our network as a managed service so that our customers are able to stay focused on how to best maximise their business whether on land, at sea, or in the air.



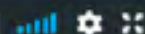


BEYOND CONNECTION

SES and Satcom Global



02:54



BEYOND CONNECTION

Satcom Global

The life of a seafarer can be very isolating. To be thousands of miles away from day-to-day interactions with the people who matter most. Today, connectivity is the key to crew welfare, and to recruiting and retaining the most experienced seafarers.

Founded in 1973, Satcom Global is a leading provider of global VSAT communications services to people working in remote regions beyond the reach of mobile and terrestrial networks. The company focuses on providing value-added services, such as communications services that improve crew welfare, and network services that enable companies to move mission-critical data from ship to shore, or from remote regions to headquarters. Built on SES's roaming maritime product, Satcom Global's

Aura VSAT network enables bespoke connectivity packages tailored to each customer's precise needs.

Aura provides the steady, always-on connectivity ships and crew need to stay connected with headquarters, their friends and family. Its network services include local number dialing to save on long distance charges, large data transfers of crucial sensor data to reduce ship downtime, TV broadcasts to keep crew up-to-date on the latest news and sports, and bring your own device wifi connectivity that keeps crew intimately connected to what's going on at home.

"A few years ago, I had been onboard for about two weeks when I got a message from home that my wife was very sick and had to be hospitalised,"

says Captain Yaris, Master of the Ardeche at Euronav. "In that situation, you want to have a connection on the spot, so you can get the information you need – even when you are a long distance from home."

Our partnership has enabled Satcom Global to provide omnipresent connectivity to ships and their crew. The company continues to migrate customers to Aura – a roaming network that provides high-speed broadband connectivity across shipping lanes without the need to stitch together access across various footprints. They are now looking at provisioning television across the same network, with future plans to bundle content and share smart ship data.

EMPOWERING COMMUNITIES

SES in The Cook Islands



BEYOND CONNECTION

BlueSky Cook Islands

Delivering high-speed connectivity to remote islands presents a number of challenges. In the Cook Islands, communities in the middle of the Pacific Ocean enjoy the same services as people do in any major city thanks to the fibre-like, always-on broadband services provided by SES Networks.

In 2014, the Cook Islands became the first market to use SES's innovative O3b Medium Earth Orbit (MEO) satellite system. Bluesky, the sole provider of fixed phone, mobile and broadband services to the Cook Islands, tapped the O3b fleet and SES Networks' managed services to launch 3G/4G services, transforming the way people interact, whether in tourism, education, healthcare or banking sectors.

Since then, Bluesky has further leveraged the O3b system to roll out an even faster 4G+ network that provides an enhanced mobile data experience, resulting in better productivity, more business opportunities, and new exciting entertainment options across the islands.

In addition, the Cook Islands Ministry of Education now uses the high-speed service to deliver educational programs, hence elevating the learning experience for students of all ages across the country.

Bluesky and the Ministry of Education are jointly developing a virtual education network portal, enabling students, teachers and institutions to exchange educational and teacher training material, develop additional curricular content, and promote a new culture of information and communication.

Connectivity is the 'heart of opportunity' on The Cook Islands.



BRIDGING THE DIGITAL DIVIDE

Connectivity fuels life changing applications such as e-government, e-health, e-learning, e-elections, e-agriculture and e-banking. 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 participate in emergency.lu, a public-private partnership between the Luxembourg Government and three Luxembourg companies (SES Networks, HITEC Luxembourg and Luxembourg Air Ambulance). emergency.lu is a satellite-based communications platform that delivers connectivity during disaster response.

- emergency.lu is deployed in close collaboration with the World Food Programme, the global lead agency of the Emergency Telecommunications Cluster
- Offered by Luxembourg as a free public good to the global humanitarian community
- Has been deployed over 50 times in places like 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.



O3b mPOWER

In 2021 we will add a new constellation of seven next-generation satellites to our MEO fleet which will transform the market once again – challenging the conventional wisdom of where and how satellite is used in a world of seamless networking. Once completed, this system will be the most powerful, flexible and scalable satellite-based system ever launched. It will combine innovative space and ground technology advancements, as well as software intelligence, enabling SES to deliver fully managed services to meet exponentially accelerating demand in the dynamic fixed data, mobility and government markets.

O3b mPOWER will interface with our current fleet seamlessly. The O3b mPOWER system, supported by these seven satellites, will set new industry benchmarks across multiple performance metrics. The O3b mPOWER system will be capable of delivering multiple terabits of throughput globally.

The o3b mPOWER system will define flexibility, including system intelligence and beamforming capabilities that will allow it to shape, moderate, route, shift, and switch more than 4,000 beams per satellite in real time, to tailor and deliver bandwidth virtually anywhere. O3b mPOWER will have complete coverage, with more than 30,000 formed beams available system-wide.

The constellation will provide unrivaled coverage within +/- 50 degrees of latitude for nearly 400 million kilometres squared, with full global MEO coverage possible via inclined planes. Finally, the Software that will integrate O3b mPOWER with the SES fleet enables truly global resiliency and the ability to dynamically route application-optimised traffic over GEO, MEO or terrestrial networks. This combination of market-leading capacity, flexibility and coverage means O3b mPOWER is capable of being fully productive 100% of the time – directing bandwidth to customers and content, not empty territory.



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

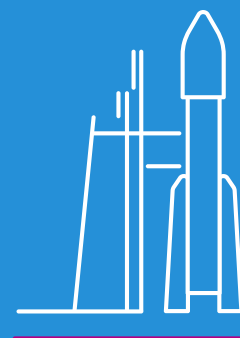
O3b mPOWER represents an open invitation and a major business opportunity for the entire industry to innovate and grow. From leading technology providers to value-add service partners, SES Networks envisions an ecosystem of suppliers that will collaborate and leverage the capabilities of O3b mPOWER to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

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
TON

At takeoff
motors
1200 to

0 INES

off, the rocket
generate over
nnes 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.

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.

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.

6

+60°C to -160°C

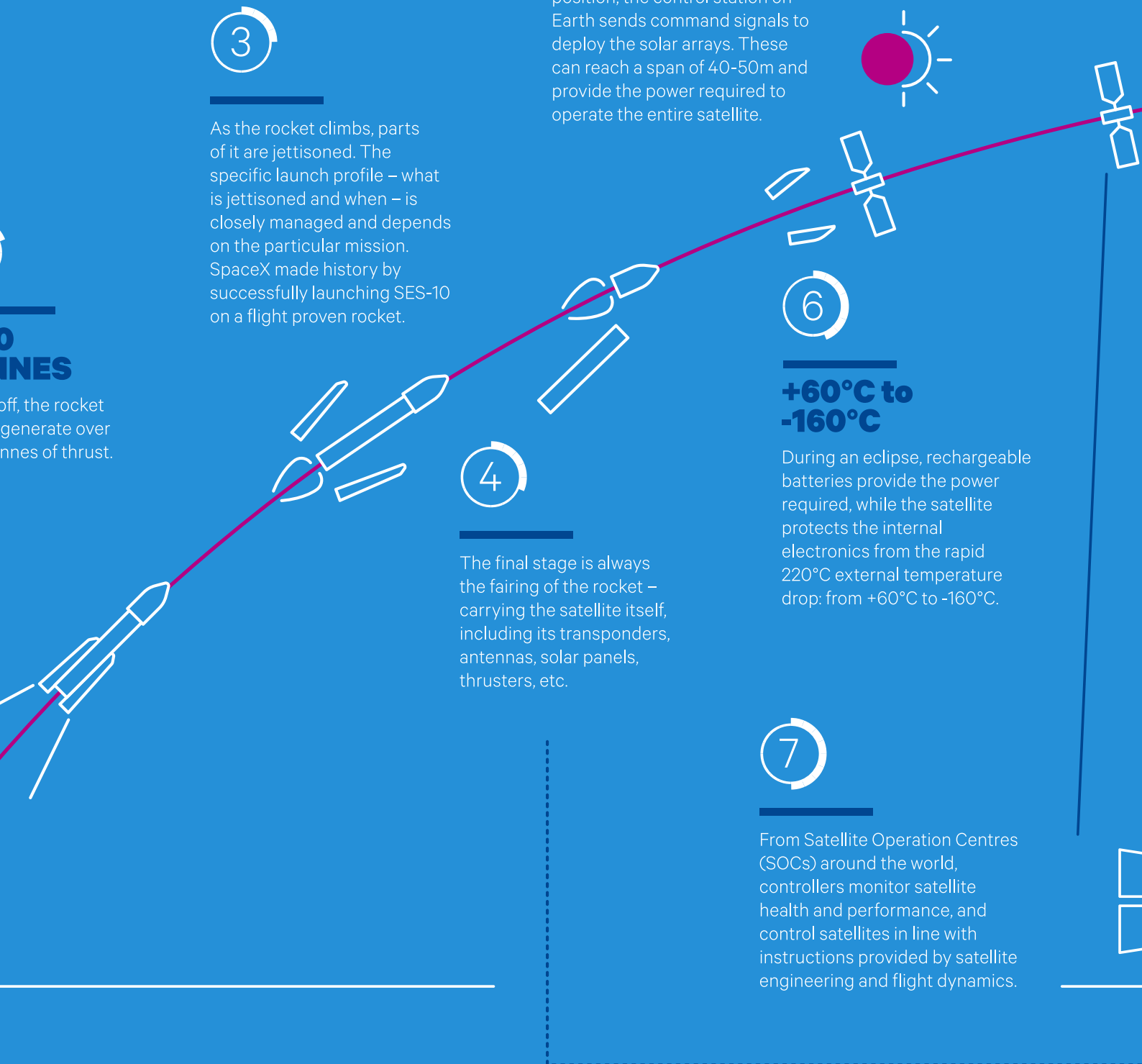
During an eclipse, rechargeable batteries provide the power required, while the satellite protects the internal electronics from the rapid 220°C external temperature drop: from +60°C to -160°C.

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.

4

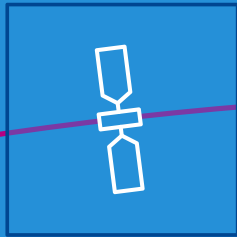
The final stage is always the fairing of the rocket – carrying the satellite itself, including its transponders, antennas, solar panels, thrusters, etc.



9

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

75-150km

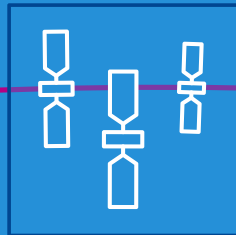


36,000km

10

CO-LOCATION RELIABILITY

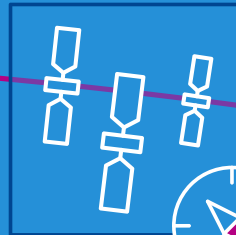
Several satellites may occupy the same box. We call this clustering of satellites co-location. The zone where the co-located satellites live is called an orbital slot. If one satellite has a problem, another will take its place, guaranteeing high reliability.



13

0.1° ERROR = 70KM SHI

Each satellite has 5,000 telemetry parameters. In the pointing of the satellite, a 0.1° error corresponds to a 70km footprint on the Earth's surface. Correct positioning of the satellite is crucial for normal operation.



11

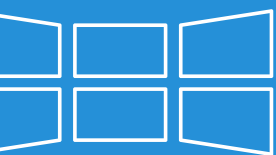
Co-location also means there is plenty of capacity for channels and services that need more bandwidth such as high definition television.

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.



SOC location:
**BETZDORF,
LUXEMBOURG**



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

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.

FT

0-25,000 status
A 0.1° variation
pacecraft
n shift in the
s surface. The
the satellite is
ations.

0.1°

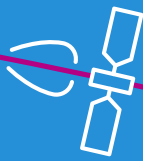
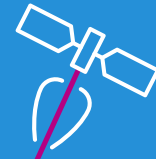
0.1° pointing error equals
the distance between
AMSTERDAM & ROTTERDAM

15

15-20 YEAR LIFESPAN

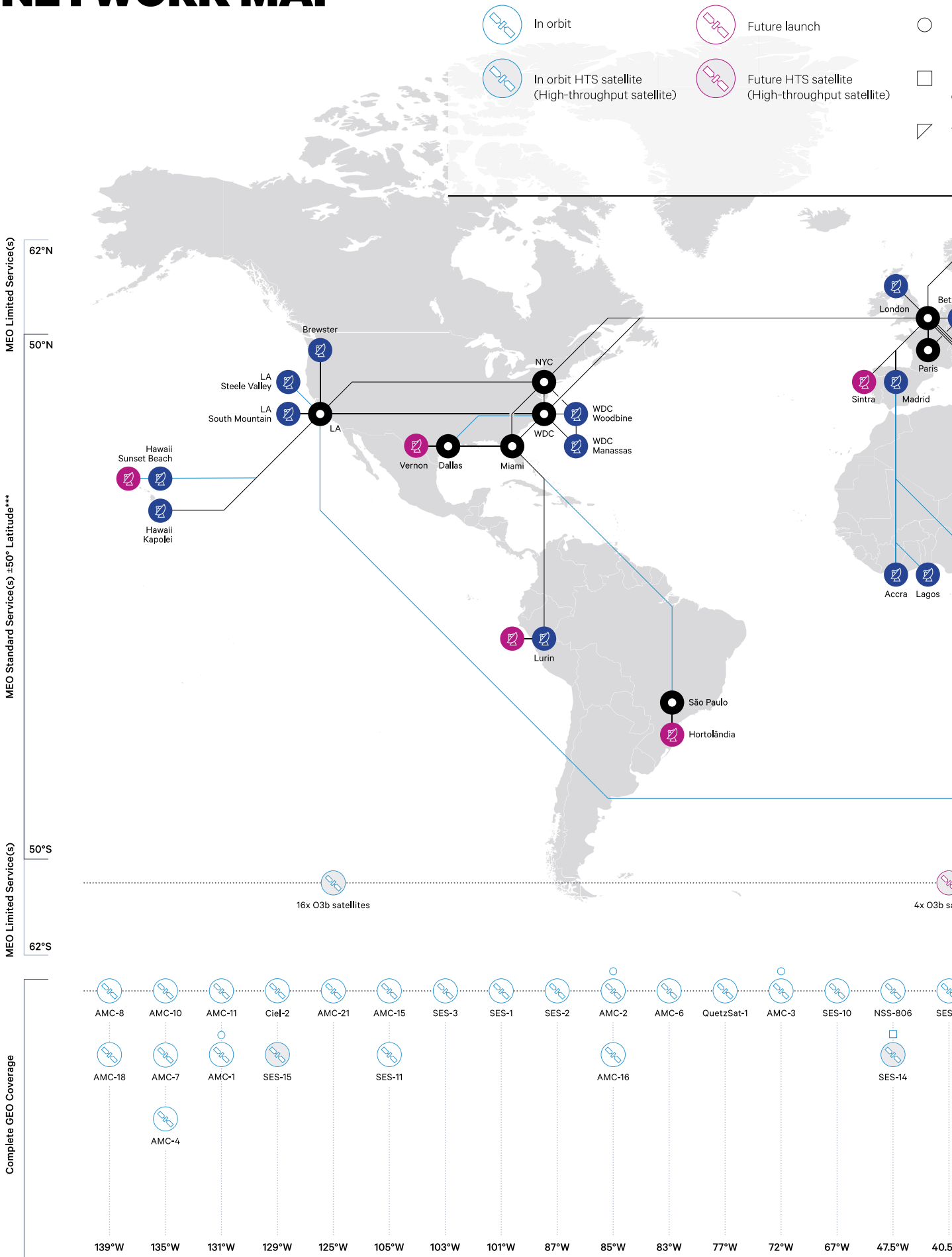
A satellite normally lasts 15-20 years, but if it were left in orbit it would eventually drift, risking collision with other satellites. To prevent this, controllers use thrusters to put the satellite into a higher orbit, out of harm's way.

70km



NETWORK MAP

SES SATELLITE FLEET



SES NETWORK



Additionally, we have nine satellites flying secondary missions:

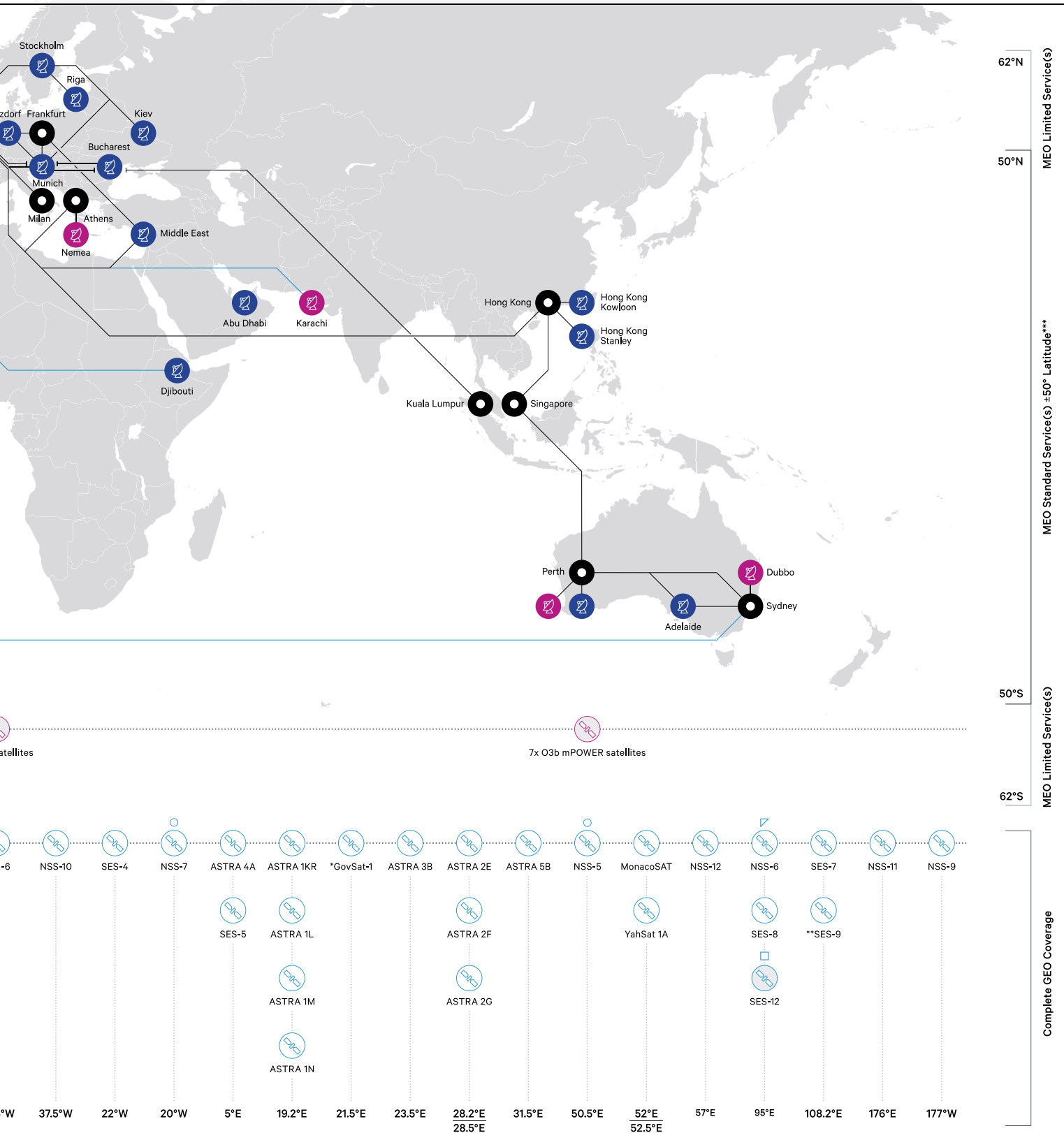
ASTRA 1D, ASTRA 1F, ASTRA 1G, ASTRA 1H, ASTRA 2A, ASTRA 2B, ASTRA 2C, ASTRA 2D, ASTRA 3A.

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

*** MEO standard service area extended to ±50 degrees post launch & integration of the next four O3b satellites (exp. June '18)



SPACE ECOSYSTEM INNOVATION

Expected growth of the
GLOBAL SPACE ECONOMY
in USD

323M

2015

329M

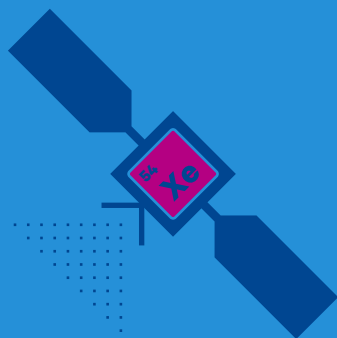
2016

1,1T

2040

ELECTRIC PROPULSION

to increase a
satellite's payload



Analogue satellites

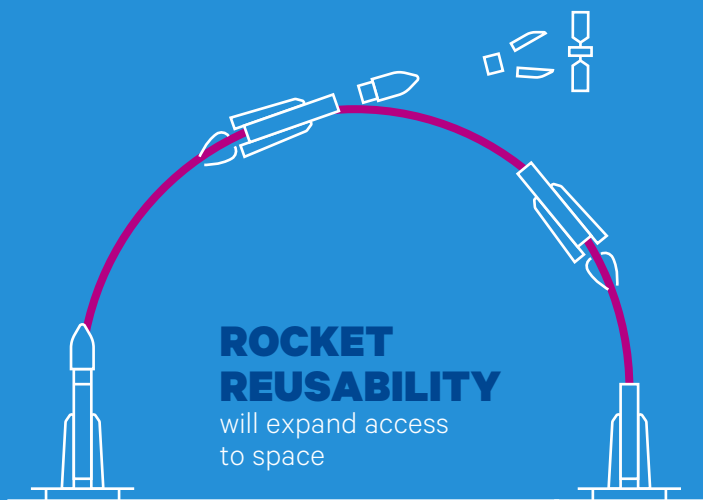
GOING DIGITAL

to allow for more powerful
and flexible payloads



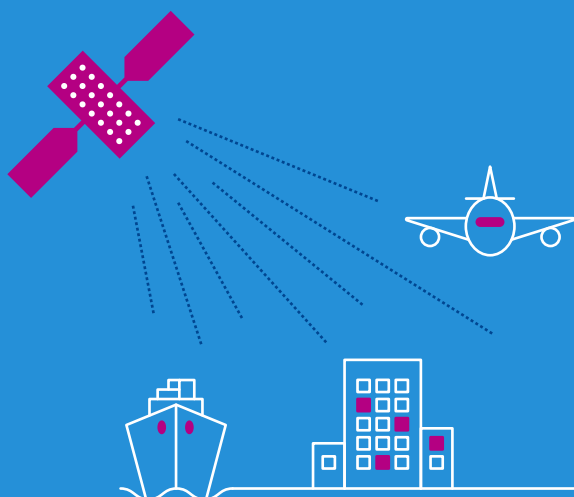
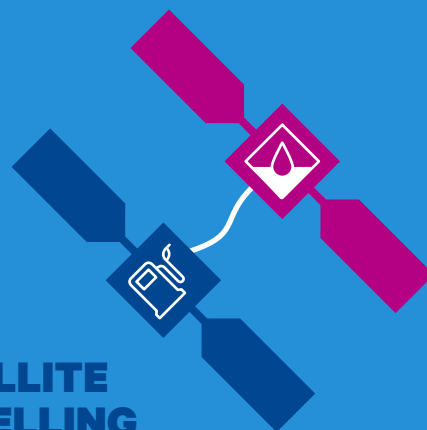
ROCKET REUSABILITY

will expand access
to space



SATELLITE REFUELLING

will make it possible
to extend fleet life



O3b mPOWER

A unique system of advanced
communication satellites and next
generation ground infrastructure

- **multi-terabit** capacity
- **+4,000** beams per satellite
- **~400M** square kilometres covered
- **100%** productive

LAUNCH MANIFEST 2018 - 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 70 satellites and our network of teleports.

Satellite	Region	Application	Launch Date
<u>SES-14</u> ^{*/***}	Latin America	Video, Networks	Q1 2018
<u>SES-16</u> <u>GovSat-1</u> ^{**/*}	Europe/MENA	Government	Q1 2018
<u>O3b</u> ^{***} (SATELLITES <u>13-16</u>)	Global	Networks	H1 2018
<u>SES-12</u> ^{*/***}	Asia-Pacific	Video, Networks	H1 2018
<u>O3b</u> (SATELLITES <u>17-20</u>)	Global	Networks	H1 2019
<u>SES-17</u>	Americas	Networks	2021
<u>O3b</u> <u>mPOWER</u> (SATELLITES 1-7)	Global	Networks	2021

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

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
Munich | Germany
Paris | France
Princeton | USA
Riga | Latvia
São Paulo | Brazil
Singapore | Singapore
Stockholm | Sweden
Warsaw | Poland
Washington DC | USA

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