



SES White Paper September 2017

TRANSCENDING CONNECTIVITY

SES's mission to produce positive change through networks

Against the backdrop of sweeping changes caused by the adoption of data-driven applications and cloud services, SES has charted a path to maximise the opportunities that connectivity offers. There is no doubt that access to networks is vital to expand possibilities for people and businesses across the globe. Thanks to connectivity, a family spread across continents can interact face to face, a business can gather powerful analytics that fuel growth in real-time, and a government can deliver better services to its citizens. Connectivity

that is global, reliable, easy, and high performance is the key to making the most of these opportunities, and this is not always available through terrestrial networks. Therefore, SES, the world's leading satellite enabled solutions provider, created a dedicated arm of its business to provide global managed data services: SES Networks. SES Networks is reducing the complexity for clients by delivering fully managed back-end infrastructure solutions, maximising their business, and driving meaningful impact for end-users.

Providing customers with the support they need to maximise their business opportunities is the most important thing for SES Networks. In order to ensure such a high-level of customer centricity, SES Networks is defined by four elements. First, a unique

satellite infrastructure to deliver resilient and high-speed connectivity across the globe. Second, industry-tailored solutions designed to fuel new opportunities in customer and partner markets. Third, a consultative engagement model that delivers tools and expert analysis to support customers. Fourth, a managed service approach that offers the scalability and reliability of an end-to-end network that ensures those opportunities are maximised.

Together, these defining elements bring lasting impact not only for SES Networks customers but also for their end-users around the world, for which SES Networks is breaking limitations, enabling business, and empowering change.

SES[▲]
beyond frontiers

NETWORK DEMAND

In creating SES Networks, SES is responding to systemic change in the way that people and organisations use connectivity, and therefore the way networks operate. Networks across the board are becoming more integrated; for the express purpose of meeting the rising demand for bandwidth. This demand is created by changes in the way that we are communicating, accessing entertainment, doing business, and adopting applications. Increasingly, these applications are hosted in the cloud and the need for secure, scalable, and high-performance connectivity becomes ever more critical.



COMMUNICATION

The way we communicate has experienced a dramatic shift in the past years. Now we expect to be able to text, talk, upload and download anywhere, and at any time. This is seen in such small acts of making a video call instead of a phone call, only one example among so many that demonstrate how more people across the world are accessing data services through mobile networks than ever before. According to Cisco's report, *The Zettabyte Era: Trends and Analysis*, by 2021 wired

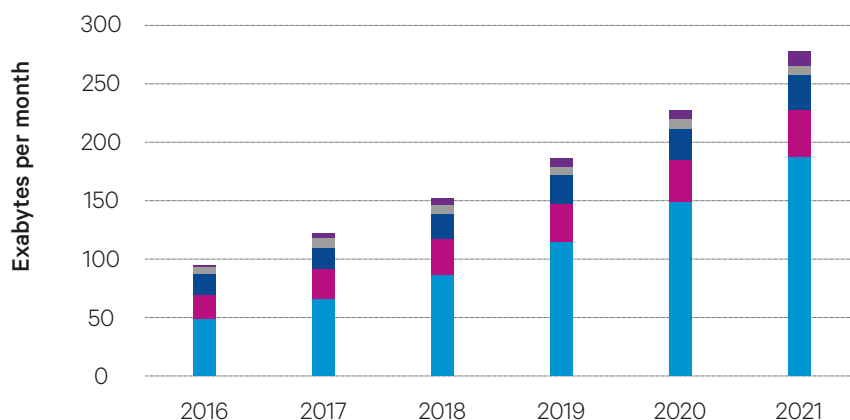
networks will only account for 37% of IP traffic, whereas Wi-Fi and mobile networks will make-up 63% of IP traffic. This trend is already materialising, with Wi-Fi accounting for 41% and mobile networks making up 7.5% of total global IP traffic in 2016, and causing strain on terrestrial networks. In 2016 the bandwidth usage of smartphones grew by 38% from 2015¹, showing that this pressure on networks to deliver to such demand will continue to increase.



ENTERTAINMENT

As people around the world demand more flexible and adaptable entertainment formats, bandwidth needs have skyrocketed. Online video is the biggest driver of this development, and by 2021 it is expected that IP video traffic will account for 82% of all traffic.² IP video is made up of a variety of different online video formats, including

OTT services such as Netflix and Amazon, as well as video conferencing, and video-streamed gaming. Online gaming in its own right is another entertainment format that is using increasing amounts of bandwidth. Cisco also expects that by 2021 gaming downloads will reach 8% of peak usage traffic.



Figures (n) refer to 2016, 2021 traffic shares. Source: Cisco VNI Global IP Traffic Forecast, 2016-2021

24 % CAGR

2016-2021

Gaming (1%, 4%)

File Sharing (8%, 3%)

Web/Data (18%, 11%)

IP VOD (22%, 14.5%)

Internet Video (51%, 67.4%)

¹ Cisco Systems, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021 White Paper (White Papers, 28 March 2017)

² Cisco Systems, *The Zettabyte Era: Trends and Analysis* (White Papers, 7 June 2017)



BUSINESS

As we are increasingly using the Internet to connect to one another, businesses are following the same model. The changes that increased data usage are causing in businesses means that the role of the Chief Information Officer (CIO) is gaining more visibility and becoming a more influential voice during board meetings.³ Connectivity is now so important that maximising its potential can completely change the structure and success of a company, which is why IT departments, once the forgotten corner of helpdesks, are becoming key innovators and strategists in leadership

teams. IT departments now go beyond just using the latest technology and instead research ways that a company's processes and products can be exponentially improved by connectivity. This trend implies that businesses will increase their IP traffic, and Cisco predicts that it will grow at a Compound Annual Growth Rate (CAGR) of 21% from 2016 to 2021. An increased use of advanced video communications is the second factor in this growth, causing enterprise traffic to grow almost by a factor of three from 2016 to 2021.



APPLICATIONS

The change in communications behaviour and business processes is paired with growth in application usage. The Internet of Things (IoT), Virtual Reality (VR), and Augmented Reality (AR) are all new applications predicted to use increasing amounts of connectivity, but surpassing all of these currently is Cloud based computing. It is expected that enterprise cloud spending will increase at a 19% CAGR run rate between 2016 and 2026.⁴ Cloud computing includes three main categories, the first being very familiar, Software-as-a-Service (SaaS). SaaS gives users the possibility to access a software package from anywhere, and uses a pay-as-you-go model. This is the area of cloud computing that people are the most familiar with as services like Microsoft 360 are SaaS. The second, Infrastructure-as-a-Service (IaaS) is the ability to access, manage, and monitor a data centre remotely. Both SaaS and IaaS are growing, but according to KPMG, the third category Platform-as-a-Service (PaaS) is predicted to be the fastest-growing sector of

cloud platforms, growing from 32% in 2017 to 56% adoption in 2020.⁵ PaaS is the category that defines the ability to develop and manage software remotely, and Amazon Web Services is one of the better-known PaaS. These growth predictions clearly show that Cloud computing is becoming a strategic enabler, making it possible for businesses to respond to increasingly complex markets. Subsequently, in a business landscape relying on Cloud computing, connectivity will become more and more important.

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Together these new trends in communications, entertainment, business, and applications require networks to feed ever increasing amounts of bandwidth. Yet much of the world's population remains unconnected. According to the International Telecommunication Union's (ITU) ICT Development Index (IDI) the average value for developed countries is 3.33 points higher than that for developing countries.⁶ When it comes to a specific metric such as household internet access, the penetration may be 53.6% globally, yet this works out to be 84.4% penetration in developed countries, and 42.9% in developing countries.⁷ The speed of the access is another important metric, and despite rising penetration of the internet at large, only 6% of the developing world has high-speed connections, compared to 24% in developed countries. These statistics clearly demonstrate the work that is left to do to bridge the digital divide.

³ Marshall, Maxine-Laurie. CIOs hit a new high as business influencers (I-CIO, July 2017)

⁴ Burris, Peter. Wikibon report preview: How big can Amazon Web Services get? (SiliconAngle, 20 February 2017)

⁵ KPMG. Journey to the Cloud (KPMG, 2017)

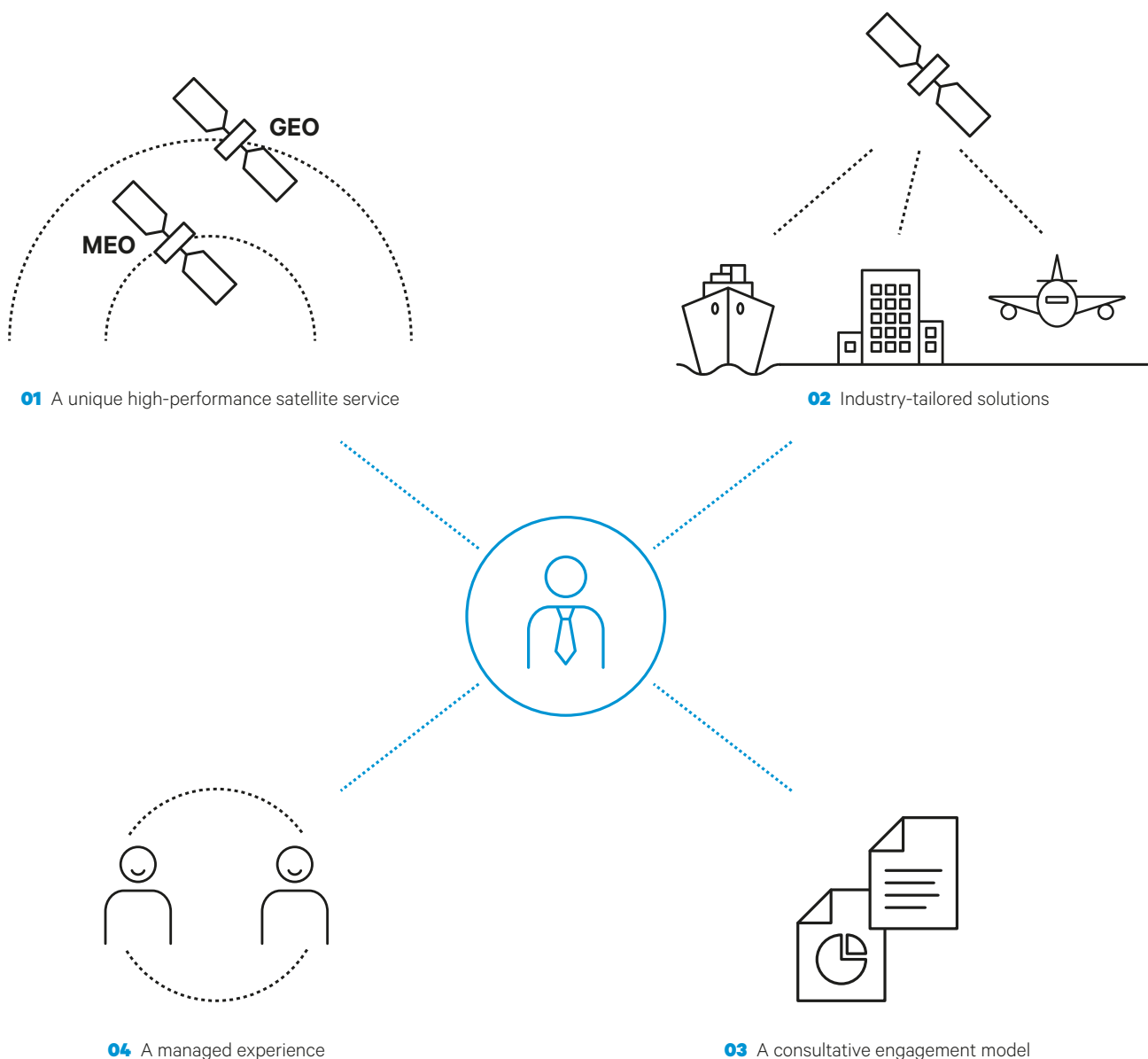
⁶ International Telecommunication Union. Measuring the Information Society Report 2016 (ITU, 2016)

⁷ International Telecommunication Union. ICT Facts and Figures 2017 (ITU, 2017)

SES NETWORKS

The journey to create SES Networks started a number of years ago, and was a two-pronged approach. One point of focus was SES's procurement of Geostationary Earth Orbit (GEO) High-Throughput Satellites (HTS), which would allow SES to bring the scale and efficiency that data customers look for. The second focus point was an investment in the start-up company O3b Networks, which intended to disrupt and expand the satellite industry by creating a powerful, low-latency network in Medium Earth Orbit (MEO). O3b Networks went on to be the fastest growing satellite operator in history, providing high-performance internet to remote areas, and in 2016 SES fully acquired the company. Today, SES and O3b satellites work in concert with powerful ground infrastructure to fuel SES Networks, which is focused on providing services and solutions that enable its customers to maximise their opportunities.

There are four defining elements of the way that SES Networks serves its customers:



01

A unique high-performance satellite service – SES

Networks is the only provider of networked communications across both GEO and MEO satellites, providing more flexibility and enabling a far greater array of optimised applications for customers, wherever they are. Because of the combined power of GEO and MEO satellites, SES Networks has the unique capability to provide high-performance connectivity where it is needed from MEO, as well as the large scale distribution that GEO brings. The ability to manage seamless integration over this multi-orbit infrastructure, via Software Defined Networking (SDN) techniques, allows SES Networks to offer ubiquitous IP and Ethernet Network Services on a global basis, right sized and matched to the business and application needs. Low-latency is one of the unique factors of SES Networks capabilities, and makes it the ideal solution for high performing, real-time, or quasi real-time applications such as video communications, cloud data centre connectivity, cell backhaul, and content delivery. In addition, the increasing use of encrypted, secure data requires much lower-latency since traditional optimisation and acceleration methods cannot be easily used with encryption.

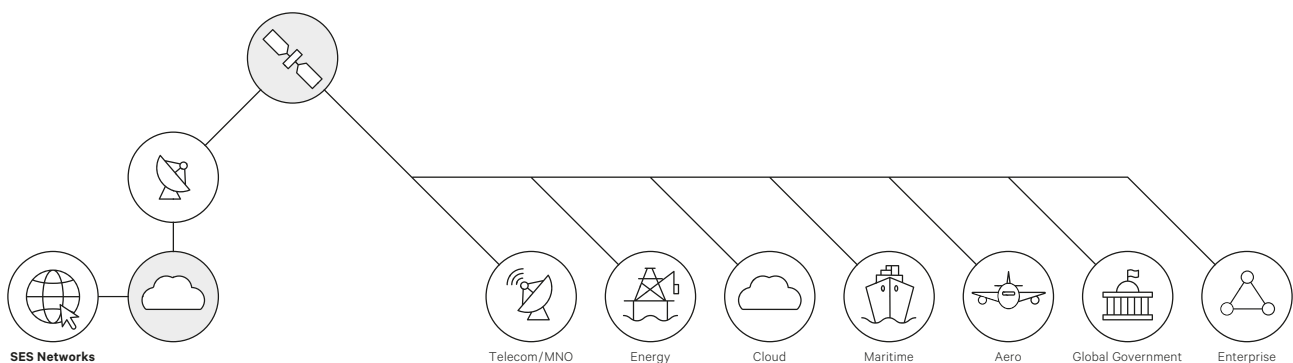
By optimising services across a hybrid orbit infrastructure customers benefit from increased cost-efficiencies. Ultimately, both customers and end-consumers will all benefit from the tailored network capabilities. One example of an SDN enabled used case for the GEO-MEO combination is the SES Networks Hybrid Resiliency Platform, which uses the strength of both orbits to ensure that connectivity is extremely reliable.

» **Palau Telecoms** has been powering its network via the O3b fleet for many years, and became the first customer to join the Hybrid Resiliency platform. The new solution represents fully-managed 'bandwidth-on-demand' connectivity, with intelligent routing and resiliency. The platform provides a service unique to SES Networks, leveraging the GEO and MEO orbits to enable an availability of services that is virtually 100%. This satellite-based solution is ideal for Palau Telecoms, and it is helping to bridge the digital divide. The link over SES Networks fuels Palau Telecoms customers to enable new solutions for consumers, schools, the tourism industry, and other businesses across the islands.

02

Industry-tailored solutions – customised to leverage specific opportunities in customer and partner markets. SES Networks serves customers in a variety of market verticals – Telecom/Mobile Network Operator (MNO), Energy, Cloud, Maritime, Aero, Global Government, and Enterprise. To ensure that its services respond to the individual dynamics of each industry, SES Networks has built internal centres of expertise, which liaise directly with customers on their projects to better serve their requirements. This kind of interface ensures that the needs of each market are met throughout the entire chain, including product development, partner ecosystems, and the delivery of services. As the industries vary so do SES Networks solutions. For the mobility markets SES Networks focuses on optimising seamless,

global connectivity. In the Cloud and Enterprise markets, SES Networks focuses on secure Ethernet Cloud Access. And in the Telecom sector SES Networks tailors its quality of service and bandwidth consumption rules for specific 2G, 3G and 4G/LTE migration plans. Customising service to particular industries has already resulted in many successful business relationships for SES Networks. It provides connectivity to the fixed data customers in over 130 countries. And in the Global Government sector SES Networks serves over 60 government entities in nearly 30 countries. SES Networks has customer centricity at its core, and investing in the internal capacity to tailor solutions to each industry it serves is just one way it enables customers to maximise their opportunities.



03

A consultative engagement model – delivering the *right* solutions that capitalise on each SES Networks customer's unique opportunities. The team at SES Networks always endeavours to go beyond basic requirements in its conversations with customers. Instead it uses a consultative method, where it searches out potential opportunities in concert with customers. One way that SES Networks does this is by sending its customer enablement specialists to work directly with customers in a consulting capacity. They apply a variety of analytical tools and global best practices to assess data about a customer's business and opportunities

for growth. Based on this they can then create business cases, specify new product platforms, and design/execute marketing plans with customers to maximise the opportunities enabled by the network. In all its customer interactions SES Networks works to consistently build their business, as a trusted partner, investing itself in the business growth of its customers. By applying this approach and working closely with customers, SES Networks is able to implement its industry specific solutions in a way that respects each particular customer's business objectives. This is how SES Networks is able to focus in on what a customer is truly working to achieve.

04

A managed experience – offering a fully managed network service so customers can focus on doing more with it. To ensure the best quality of service SES Networks uses a combination of technical and customer relationship processes throughout the delivery of any solution. SES Networks manages the quality of experience in three ways. First, it leverages a world class network operations capability offered through its Lifecycle Services portfolio, delivering industry recognised service level agreements readily integrated into a customer's own operational models. Second, it manages all touch points in the organisation for any customer, making interactions with sales, services, finance, etc easy to initiate and streamlined. Third, SES Networks has a customer engagement model built into its process, which includes thought-leading approaches in the industry. One example of this is its Customer Advisory Board, where select customers advise the company about the future strategies it should take, and therefore embeds customer feedback into the business decisions of SES Networks. On the technical side, SES Networks provides intelligent connectivity solutions. It can advise customers about how to use their networks, so that the quality of experience is optimised, maintained, and managed. SES Networks is able to do this by managing the

network end-to-end, as well as the services running over it. This makes it possible to proactively monitor a customer network, identify and find solutions to any delivery challenges, and in doing so provide the optimal quality of experience in alignment with each customer's business objectives. End-to-end visibility also gives SES Networks the ability to apply analytics to inform customers about their network usage, so that they can further monetise their offering.

» **Timor Telecom** was not only one of the first customers to connect their network using the O3b fleet services, but also the first to use its analytics services to improve their network performance. Timor Telecom is the largest telecommunications operator in East Timor. It serves about 600,000 clients, and because of the capabilities of SES Networks Timor Telecom is able to meet their increasing needs. By advising Timor Telecom about their customers' traffic, SES Networks was able to consult them about how to grow their business, maximising their connectivity. Using the capabilities of SES Networks enables Timor Telecom's fibre-equivalent internet performance, which has allowed the company to provide a differentiated 3G service to customers across the country.



Having defined these four elements of its business approach, SES Networks is planning for the future, opening a new era in global cloud-scale connectivity with O3b mPOWER, a unique system that will empower

customers to make the most of every opportunity. This is SES Networks' transformative strategy to redefine the role of satellite in an increasingly seamless networking world. It enables a new model for delivering truly global, high-performance data services to exponentially more users. This new fleet will leverage a totally unique system of advanced communication satellites across multiple orbits, together with innovative ground infrastructure and network intelligence. O3b mPOWER integrates a roadmap of revolutionary technology advances, including a new constellation of advanced MEO satellites, innovations in flat panel antennas, ground infrastructure convergence, intelligent software, and managed virtual applications. By doing so, it encompasses an ecosystem of technology and value-added service partners, unleashing the potential of an empowered world.



THE HEART OF OPPORTUNITY

The creation of SES Networks not only benefits customers of SES, but is also contributing to meaningful improvements in the lives of millions of people around the world. By making reliable and high-performance connectivity accessible regardless of location or ground infrastructure, the digital divide will decrease exponentially. SES Networks delivers networked communication services where none existed before. This brings three positive outcomes - breaking limitations on performance, enabling businesses globally to participate in the digital economy, and empowering people and governments to accelerate development.

BREAKING LIMITATIONS

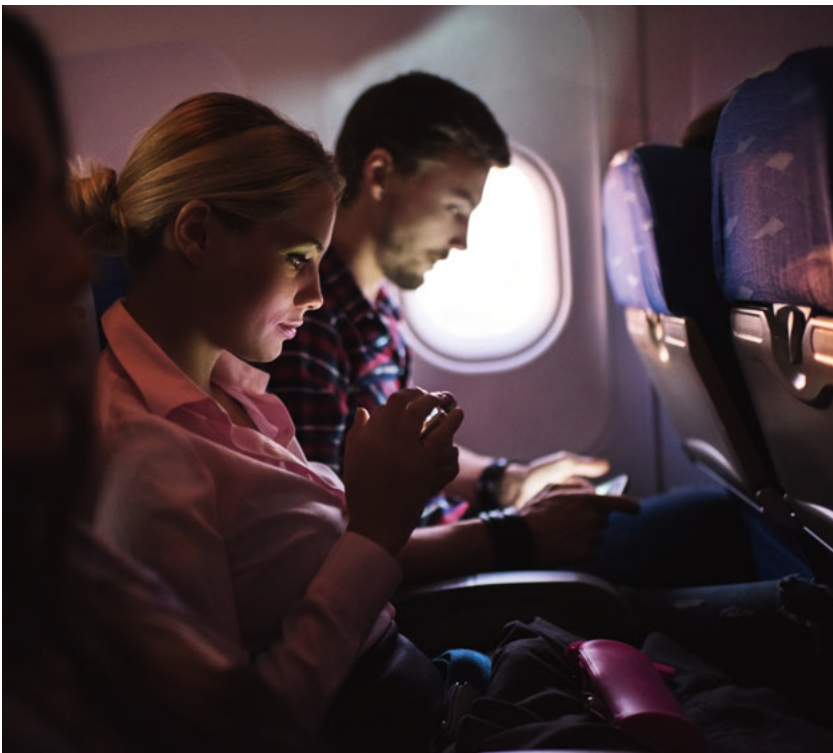
With SES Networks, SES is eliminating the network performance limitations normally associated with hard-to-reach locations. Whether it is a remote island in the Pacific, sub-Saharan Africa, a boat on the Atlantic, or a plane over the US, SES Networks is fuelling connectivity that goes beyond the limitations of terrestrial networks, because it believes in universal high-quality connectivity for everyone. By integrating seamlessly with terrestrial networks, people around the world will be able to get connected where they couldn't before, without being aware of the change in infrastructure.

» **Royal Caribbean International:**

when it comes to connectivity at sea, cruise passengers can be particularly demanding. Guests want to see the same kind of connectivity that they are used to at home, and out at sea this can be challenging. That is why Royal Caribbean International (RCL) worked with SES Networks to acquire high-speed internet on board. Today, thanks to this connectivity, cruise passengers and ship crew can chat with their loved ones back home, stream video, and even play video games. SES Networks now serves over one million RCL passengers with connectivity per year. The low-latency connectivity gives RCL a powerful tool to differentiate itself in a competitive market, and attract those people that see connectivity as a requirement on a cruise.



RCL ship Quantum of the Seas



Inflight connectivity is becoming a passenger expectation

» **Panasonic:** the impact of connectivity is not only changing the maritime industry, but also the aero sector, as inflight connectivity becomes a passenger expectation. Panasonic Avionics Corporation is the world's leading supplier of inflight entertainment and communications systems. Covering 99.8% of all commercial flight hours, its services fully integrate with the cabin, enabling its customers to deliver the ultimate travel experience in a competitive market. By partnering with SES Networks it is possible for them to provide a global footprint that ensures ubiquitous coverage. Connectivity provided by SES Networks enabled 95% of Lufthansa passengers to watch a live-stream of Germany winning the FIFA World Cup Finals, while the live-stream of Super Bowl 50 made it the sporting event with the largest airborne audience to date.

ENABLING BUSINESS

As the world of work changes, business becomes more and more dependent on distributed site connectivity, seamless enterprise applications adoption, access to global online marketplaces, and access to Cloud Enterprise Applications (SaaS, IaaS and PaaS). The connectivity and network application services SES Networks delivers fuel the growth of the end-user businesses it connects, which in turn fuels economic progress and aids development goals. This is vital in countless industries, some of which include finance, farming, mining, energy, and machine-to-machine communications. SES Networks enables any business, regardless of location, to participate in the digital economy and access to the pace of innovation that cloud enterprise applications enable.

» **Presta Bist:** SES Networks customer Presta Bist is bringing high-speed connectivity to the people of Chad. As an Internet Service Provider (ISP) and Pay TV operator, Presta Bist is delivering high-availability broadband to wholesale and enterprise customers across the country. Presta Bist's wholesale capacity business has grown steadily based on the improved performance of the connectivity. One wholesale customer grew its enterprise customer base from around 10

major clients to more than 30 in a short space of time. For these wholesale businesses having connectivity that is fibre-like makes doing business faster and more efficient, in addition to increasing their competitiveness. Presta Bist Enterprise customers include organisations such as the African Development Bank, which uses the low-latency to enable a number of services including IP phone calls, a Virtual Private Network (VPN), SAP based applications, and most notably, video-conferencing.

Presta Bist's own operations have also been improved thanks to the high-performance, as the number of complaints related to the service quality has been significantly reduced, enabling resources to be focused on other areas of the business. Presta Bist has been able to increase its competitiveness in the market so much that in 2017 it upgraded its capacity from SES Networks by 66%, so that it could continue to fulfil the growing connectivity needs of its customers.

Having connectivity that is fibre-like makes doing business faster and more efficient, in addition to increasing competitiveness.



Presta-Bist training workshop

EMPOWERING CHANGE

Just as connectivity can have a profound impact on a traveller's experience, or a business' growth, it does the same when it comes to government. By increasing the access to connectivity, SES is making it possible for people, communities, and governments around the world to accelerate their development. SES Networks is actively engaged in this process, supplying connectivity for disaster response and other humanitarian efforts, e-health, e-education, government, as well as defence and security missions.

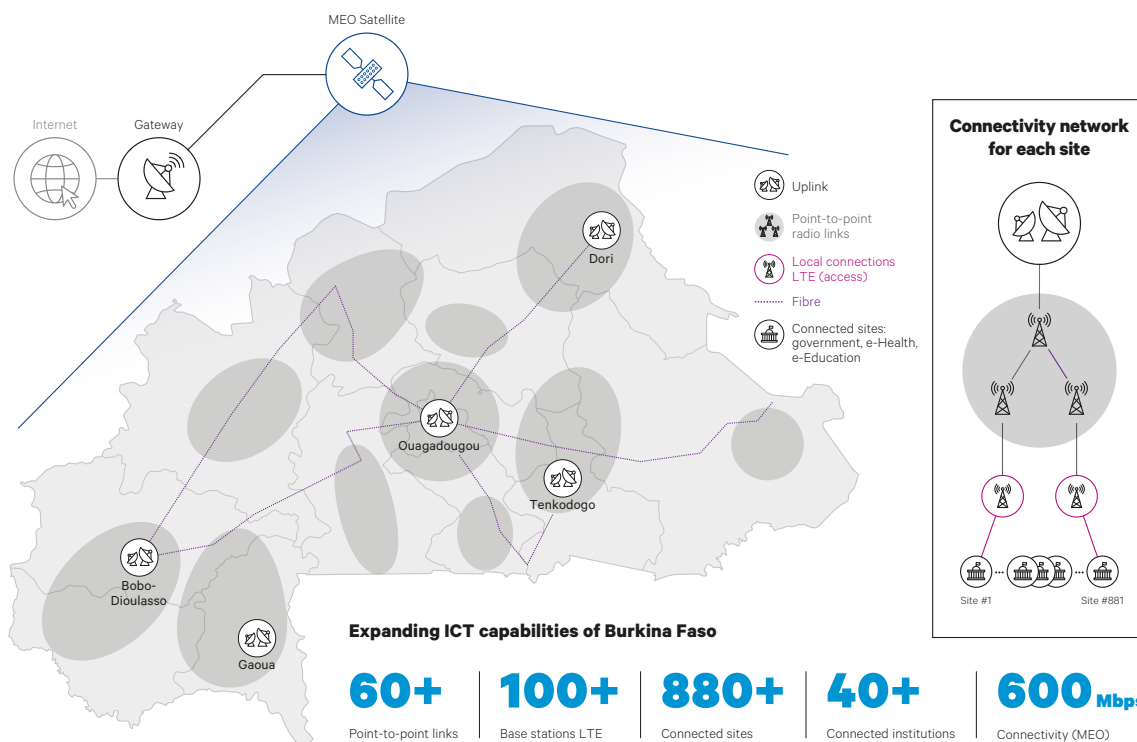
» **SATMED:** SES Networks is helping to make healthcare more accessible thanks to SATMED, an e-health platform which allows multiple medical applications and tools to operate together on a single integrated, cloud-based platform. It is designed to facilitate everyday work of doctors and nurses in remote locations that lack technical resources. SES created SATMED with the valuable cooperation of e-Medical Communication (eMC), and funding from the Luxembourg Government. SATMED was developed with the support of innovative technologies established by leading universities and IT companies, and in close cooperation with NGOs such as Friendship, ArcheMed, Fondation Follereau Luxembourg, German Doctors and CURE, to ensure that real needs on the ground are met. SATMED offers the tools doctors in remote

areas need, including access and storage of patient e-records, medical imaging, e-learning, virtual consultation, remote monitoring and e-health management, combined with video conferencing applications. In areas where internet access via the terrestrial infrastructure is not available, SES Networks provides vitally important satellite-enabled connectivity via its GEO fleet. SATMED has been deployed 10 times so far, and is already making a significant impact on the lives of the local people in Sierra Leone, Bangladesh, and the Philippines, among others.

» **Burkina Faso:** SES Networks is leading a project to extend high-speed communications infrastructure throughout Burkina Faso. Upon conclusion of the project, Burkina Faso's administration will enjoy the benefits of a cutting-

edge, next-generation network. SES Networks will provide the full end-to-end solution, including wireless terrestrial communication and integration with the available optical fibre backbone, to connect 881 sites for e-government, education, and health across Burkina Faso. The solution is specifically designed for the Support Programme of the Reinforcement of Communication Infrastructures (PARICOM) and supports the Burkina Faso e-governance policy through a Luxembourg development cooperation project. This project is part of the Indicative Cooperation Programme established for the period 2017-2021 between Luxembourg and Burkina Faso. It aims to improve the quality, reliability and accessibility of IT and communication infrastructure throughout the country.

Providing Connectivity Across Burkina Faso





A Friendship hospital ship in Bangladesh that is enabled with SATMED

It is in these stories of SES Networks that its core vision can be found, not only to provide connectivity, but to push the boundaries of what that means, and find the most value that is at the heart of each opportunity. Every situation is different, as are every customer and end-user, but SES Networks will constantly search out the ways to maximise those differences with new solutions and approaches. In doing so it will ensure high-quality service, close relationships with its customers, and innovative experiences across the globe.

SES IS PRODUCING POSITIVE CHANGE THROUGH NETWORKS

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