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The Power of Hybrid Connectivity

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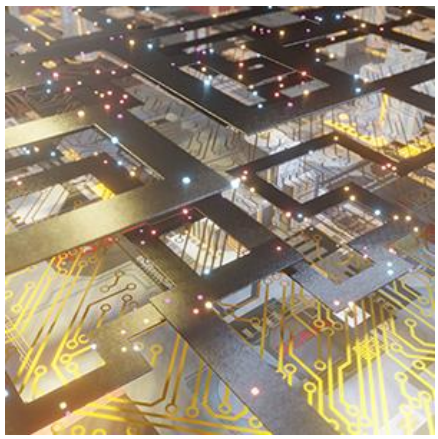

Communication is so fundamental to our daily lives, yet something that many of us living in the more developed parts of the world take for granted. Where would we be without our cellphones, Netflix and social media? Or more seriously, how would many companies and workers have fared without reliable broadband when they were forced to turn to remote working during Covid lockdowns?

It is easy for us to expect consistent, reliable connectivity from all of our devices when going about our daily lives. If one is temporarily unavailable, we have other options to remain connected.

Yet in many parts of the world, there is only a single “pipe” for Internet connectivity, if any access at all. The direct consequences to limited communications can be life-threatening, such as in the case of natural disasters, which may isolate even previously connected areas; or they can be crucial to a company’s operational livelihood, on remote oil and gas assets for example, where an outage can mean millions of dollars’ worth of operational damages and a serious safety hazard to all onsite.

Direct consequences of inadequate connectivity

According to an October 2020 report from the United Nations, in recent years, extreme weather events have dominated the disaster landscape. In the period 2000 to 2019, there were 7,348 major recorded disaster events claiming 1.23 million lives and affecting 4.2 billion people. As climate change continues to wreak havoc on weather systems, major disasters are likely to continue at an ever-increasing pace.

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Frequently, when these disasters occur, terrestrial communications that depend on a network of overhead cables are severed, severely hampering rescue efforts. In the worst cases, they result in loss of life, as emergency services are unable to communicate and get the resources they need. Satellite communications can solve this problem. Following the devastation caused by Hurricane Iota in 2020, the Colombian government immediately adopted a satellite solution to facilitate rescue operations. WiFi hotspots served by VSAT antennas were set up in affected areas. In addition, satellite phones and broadband global area network (BGAN) terminals were given to government officials, providing multiple communication paths.

But it's not just weather than can precipitate a suddenly urgent need for communications. During the early stages of the pandemic, temporary hospitals and clinics were quickly built in regions with inadequate medical facilities. Equipping these with satellite communications permitted the rapid transfer of data—chest x-rays, for example—to offsite medical personnel for rapid diagnosis.

Across the globe, many developing nations are still unable to reach the rest of the world. For example, while there are variations between countries, Internet penetration in Africa overall is only 43 percent and in rural areas this drops to just 15 percent. For these underdeveloped parts of the world, connectivity, which usually arrives in the form of mobile networks, brings tremendous benefits. It facilitates trading, enables mobile banking, helps with education by promoting distance learning, and also allows for remote medical care. A study from the ITU indicates that just a 10 percent increase in mobile broadband penetration leads to GDP growth of close to 2.5 percent in some countries.

Offshore, it's only recently that anything other than basic narrowband networks have been available. Many mariners and offshore energy crew members are regularly away from family and friends for months at a time, and as Covid interruptions caused unexpected delays and quarantines, the need for video communication came to the fore as many three-month voyages turned into six months or even longer at sea. Broadband connectivity is now regarded as so important that at the end of 2021 The Seafarers Happiness Index, a regular quarterly survey of seafarers, indicated that many seafarers will check whether a vessel has Internet access before signing on for a voyage. This however, is set to change as The Maritime Labor Convention 2006 was amended in May, granting seafarers mandatory social connectivity, including Internet access.

Many cruise passengers are even more demanding and expect their digital lives at sea to be indistinguishable from their digital lives at home. As the industry returns to normal passenger loads, the demand for broadband at sea is slated to explode. According to NSR, demand for maritime broadband will increase to 1,500Gbps by 2031, from under 100Gbps last year. While most of this demand will come from the cruise industry and merchant shipping, some of it will also come from fishing vessels and the leisure market.

Indirect consequences

The indirect consequences of limited connectivity, on the other hand, occur when communication to devices or machines breaks down. Consider examples including when an

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autonomous vehicle stops; faulty refrigeration at sea goes undetected, ruining the perishable produce being transported; credit card transactions can't be made; oil

exploration has to stop—all because there is no way to transmit and analyze the data. The requirement for reliable, flexible communication has never been greater. No longer is communication just between people. It is between people and machines, and now with the rise in Internet of things (IoT), machine-to-machine (M2M) as well. Modern ships and drilling platforms rely on communications to manage and transmit data from equipment sensors and secure onboard networks, sending information back to offices on shore, so that any malfunctions are promptly identified, and remedial action taken immediately. In many instances, narrowband communication is adequate for monitoring, but this is often supplemented with the ability to switch to broadband if an exception occurs.

Pipelines that traverse thousands of miles of deserted landscape are equipped with digital sensors for early identification of any problems. Without these sensors, if a pipe was damaged and started to leak, the entire line would have to be inspected to find out where the problem was located. With digital sensors sending regular updates to a central point, it becomes easy to pin the problem down to a few miles, saving considerable time and money.

Remote mines are as dependent on a reliable communications infrastructure as offshore drilling rigs. Many mines rely on remotely operated or autonomous machinery, and the crews located at these sites have much in common with mariners, often spending many months away from family and friends. Reliable connectivity—to keep in touch, entertain themselves and stay safe in challenging environments—is crucial to maintaining a happy, healthy workforce.

The importance of hybrid networks

Built-in redundancy is essential, as fiber gets broken, overhead cables fall down, bandwidth availability from WiFi and cellular networks can be inconsistent depending on usage, and satellite signals may be subject to interference or rain fade in harsh weather. Yet 100 percent uptime is a requirement in these remote environments.

There are now more access technology and network choices than ever before. Cellular networks vary from 2 and 3G in less developed regions, to LTE and 5G in developed countries. WiFi hotspots continue to increase in number, as some of them now connect to satellite. Fiber networks are expanding their reach and capacity as dark fiber is lit up. Traditional wide beam geostationary satellites (GEOs) have been joined by high throughput GEOs (HTS), medium earth orbit (MEO) and low earth orbit (LEO) satellites.

MEO and LEO satellites bring additional benefits to users besides enhanced capacity. First, lower latency; GEOs orbit the earth at 36,000 kilometers, while current LEO and MEO constellations operate at orbits varying from 550 kilometers to 8,000 kilometers, translating to fiber-like latency. This is very important for applications such as autonomous and remotely controlled vehicles, and M2M communications. Second, LEOs operating in polar orbits enable connectivity to extreme northern and southern latitudes that can't be served by GEOs.

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In addition to redundancy, hybrid networks provide flexibility. As needs change during oil or gas exploration and construction, vast amounts of seismic data and streaming footage needs to be transmitted, and large crews operating critical infrastructure need to be supported. When production starts on an energy site, crew size diminishes, as does the amount of data needing to be transmitted.

The reverse, however, happens at mining sites. At one mining camp in Africa, a hybrid network using fiber, LTE cellular and MEO connectivity was created to support a site that will scale from 7 to 34,000 people. Leveraging a hybrid solution allows connectivity to scale with demand, keeping the solution cost-effective and efficient.

More immediate needs for hybrid connectivity occur as planes and ships move out of the footprint of one satellite into another or move out of reach of port WiFi or cellular (LTE or 5G) into areas that can only be served by satellite. Savvy cruise lines are taking advantage of partnerships with global service providers that are able to provide this seamless hybrid connectivity on multiple paths and orbits, so the onboard experience is continuous and smooth.

For all these reasons, hybrid communication networks are essential for remote site operations both onshore and offshore. Equally essential is the need to ensure that the transition between one connectivity source to the next is seamless, and for this a software-defined wide area network (SD-WAN) is needed. SD-WAN creates a virtual WAN using capacity from all the paths available in the network, and checks every few milliseconds for reliability, bandwidth, latency and interference, and automatically routes traffic to the highest quality link available.

This is the hybrid network of the future—and the present. Major connectivity service providers offer customers access to an integrated, global network that includes all available cellular, fiber and satellite options, including the new generation of MEO and LEO satellites, with automatic, seamless switching, to continually provide the best communication path for their customers.

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