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SATELLITES AND SEA CABLES: THE OWNERSHIP OF DATA CARRIERS AND GEO-POLITICAL IMPLICATIONS

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Dependencies on technology, risks in supply chains, and vulnerabilities in critical infrastructure create opportunities for foreign interference. In addition, current geopolitical struggles for power often involve competition in the technological and digital spheres, as different states and tech companies strive for technological dominance and control of the global digital order.

39.1 Satellites: Data Carrier Services

The usage of satellite communication for international traffic is minimal compared to fiber optic cables. Approximately 95% of international

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communication and data traffic is carried through undersea fiber-optic cable networks. Whereas satellites only make up a very insignificant percentage.

Satellites can provide coverage in areas without fiber optic infrastructure and can transmit content to multiple locations and can complement the cable networks in achieving a digital revolution. They can also transmit content to multiple locations simultaneously, which can be useful for broadcasting or distributing data to a wide audience.

Additionally, satellites can complement fiber optic networks by providing an additional layer of connectivity and redundancy. Together, fiber optic cables and satellites can enable the transmission of large amounts of data, including internet traffic, at high speeds globally. They both play important roles in the digital revolution by providing the infrastructure necessary for fast and reliable communication.

39.2 Submarine Cables: The Arteries for Data

In recent years, there has been a significant increase in the deployment of submarine cables around the world to support the growing demand for data, cloud-based services, and the "Internet of Things." These cables, which are operated and owned by a variety of state and private entities, are critical infrastructure for the digital age, supporting everything from government communications to societal needs.

However, undersea cables are also vulnerable to attacks and interference, and their governance is often unclear, as legal ownership is divided among co-owners with different nationalities and jurisdictions under international law. The submarine cable sector is currently undergoing a major shift, with tech giants like Alphabet, Facebook, Amazon Web Services, and Microsoft seeking to reshape the ecosystem by building their own private undersea cable networks to connect their data server farms and reduce their reliance on traditional carriers. This trend has

significant implications for global connectivity, data security, and the balance of power in the tech industry.

The concentration of undersea cables in certain regions has led to the emergence of internet chokepoints, or bottlenecks in the global communication network. These chokepoints can be politically and economically significant, as they represent points of vulnerability in the global communication infrastructure.

For example, the Red Sea region, which includes Egypt and the Suez Canal, is a major internet chokepoint due to the high concentration of undersea cables passing through the area. This has implications for the geopolitical power dynamics in the region, as any disruption to the cables could have significant impacts on the global communication network.

The Asia-Africa-Europe-1 (AAE-1) internet cable, which stretches 15,500 miles along the ocean floor, was damaged on June 7, 2021, in an incident that caused temporary internet outages and disconnections for millions of people in several countries. The cause of the damage is unknown, but the impact was immediate, with many African countries losing 90% of their connectivity and cloud services belonging to Google, Amazon, and Microsoft .

The SeaMeWe-4 cable: In December 2006, the SeaMeWe-4 cable, which connects Southeast Asia to Europe, was damaged by a ship's anchor in the Mediterranean Sea, causing widespread internet outages in India, Bangladesh, and the Middle East.

In December 2008, the FLAG FEA cable, which connects Europe to Asia, was damaged by a ship's anchor in the Mediterranean Sea, causing internet outages in the Middle East and India.

These incidents highlight the fragility of the world's 550-plus subsea internet cables and the importance of Egypt, the Red Sea, the Mediterranean Sea, and the Pacific and Atlantic Oceans in internet infrastructure. These cables form a large part of the internet's backbone, carrying the

majority of data around the world and connecting to networks that power cell towers and Wi-Fi connections.

Sixteen submarine cables, which are vulnerable to damage from anchors and earthquakes and are no thicker than a hosepipe, pass 1,200 miles through the Red Sea before reaching land in Egypt and continuing on to the Mediterranean Sea, connecting Europe to Asia. The route has become one of the world's largest internet chokepoints in the past two decades and is potentially the internet's most vulnerable point due to its concentration of global movement.

39.3 The Convergence of the Two Markets

Satellites can still play an important role in the overall telecommunications infrastructure and could act as ‘feeder nodes’ into submarine cables. Specifically, satellites can act as a way to connect to submarine cables, allowing submarine cable operators to extend their services beyond the landing stations where the cables reach the shore. This can be beneficial for both satellite and submarine cable operators, as it allows them to maximize the capacity of their networks by working together and ensuring that end users have the connectivity they need.

The potential of the combined use of subsea cable infrastructure and low-orbit satellites could shift this paradigm in the years to come. By combining the two technologies, it may be possible to create a communication network that is more resilient to disruptions and has the capacity to serve more people and businesses around the world. Low-orbit satellites could potentially be used to provide connectivity to areas that are difficult or expensive to reach with subsea cables, such as remote or disaster-affected regions. This could help to bridge the digital divide and bring more people online.

The technical capabilities of submarine cables and low earth orbit (LEO) satellites complement each other in a number of ways. One of the

main areas of convergence is in the extension of submarine cables into new markets beyond the landing station.

LEO satellites can be used to connect inland enterprises and internet service providers (ISPs) in regions where inland connectivity is expensive or unavailable, such as in many rural areas of Africa & Asia.

They can also provide landlocked countries with an alternative means of connecting to submarine cables and can enable competition among submarine cable operators by allowing connection to various ingress points or terrestrial transit points.

When landlocked countries have strained relationships with their neighboring coastal countries or when those coastal countries are facing disruptions and difficulties in maintaining the undersea cables, it leads to internet disruptions and blackouts for the landlocked countries. This has significant negative impacts on the economy and businesses and can lead to internet censorship and throttling as the neighboring countries may use their control over internet access as a political tool.

One example is Afghanistan, a landlocked country that is dependent on neighboring Pakistan and Iran for internet connectivity. Due to political tensions between Afghanistan and these countries, internet connectivity in Afghanistan has been affected in the past. Another example is Belarus, which is a landlocked country in Eastern Europe. Belarus is dependent on neighboring Russia for internet connectivity and due to political tensions between Belarus and Russia, internet connectivity in Belarus has been affected. Also, Ethiopia due to the political tensions between Ethiopia and Eritrea, internet connectivity in Ethiopia has been affected in the past.

This highlights the importance of stable political relations and a well-maintained infrastructure for internet connectivity in these landlocked countries.

In order to minimize the impact of geopolitical tensions on internet connectivity, it is important to have a diverse and redundant infrastructure in place such as satellite connectivity as a backup option. This can

increase the resilience of internet connectivity in the face of political tensions or disruptions to submarine cable systems. Additionally, enhance competition and lower the cost of internet access for businesses and consumers.

Furthermore, *LEO satellites can be used to connect islands* or areas where the traffic density and economics of undersea fiber optic cables are not attractive.

In some cases, *LEO satellites can offer lower latency* compared to submarine cables, which is especially valuable for certain types of traffic that require fast data transfer speeds. As a result, it may be beneficial for submarine and satellite operators to work together to identify and route this high-value, low-latency traffic over satellite infrastructure while keeping the rest of the traffic on submarine cables. The LEO satellite operator could then offer preferential quality of service for this traffic at a higher price than regular traffic. By partnering in this way, both types of operators can benefit from the strengths of each other's networks and maximize the value of their respective infrastructure.

By using *LEO satellites as a redundant connection*, it is possible to minimize the impact of cable failures and ensure that end users have access to reliable connectivity. The use of LEO satellites can be leveraged to offload traffic from submarine cables. In the event of a cable failure, a small portion of the traffic can be redirected to the LEO constellation to ensure that connectivity is maintained. This can be particularly useful in situations where the failure of a submarine cable would result in significant disruption to the flow of data.

39.4 Conclusion: Shift of Power?

In conclusion, satellite operators have traditionally focused on providing connectivity in areas where terrestrial networks are not available, such as remote rural areas, as well as in the maritime and aviation sectors. These types of applications are not typically relevant to subma-

rine cable operators and are not likely to be a catalyst for closer integration between the two industries. However, new markets are emerging that may drive further collaboration between satellites and submarine cables, particularly in the area of security and privacy. It is not yet clear to what extent these applications will contribute to satellite traffic or whether they will lead to additional synergies between the two industries.

Going forward, the development and deployment of new technologies, such as the potential combination of satellite and undersea cable infrastructure, may also shift the balance of power in the global communication landscape.