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**The Data Roads under the Seas.  
American Hegemony over the Global Undersea  
Cable Network and its Potential Challengers**

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## **Abstract**

The global undersea cable network is the backbone of the internet and hence of contemporary numeric-based civilization, as it carries 99% of all transoceanic communications. The main goal of this thesis is to understand how the U.S., the current cable network hegemon, maximizes its power and interests by leveraging the global undersea cable network, and whether China or Russia threatens American hegemony over the global undersea cable network? In the first part, I will show that great powers have throughout history behaved as hegemony-seekers leveraging the global undersea cable network to maximize their power. In the second part, I will examine the current American hegemony over the global undersea cable network. In the third part, I will examine the potential challengers or threats to U.S. hegemony, namely Russia and China. In the conclusion, I will provide some recommendations for the U.S. in order to address these threats.

[...] μέγα γὰρ τὸ τῆς θαλάσσης κράτος  
([...] that is the greatness of the sea power),  
Thucydides, *The Peloponnesian War* I, 143, 5.

## Introduction

Conventional wisdom holds that satellites carry most, if not all, transoceanic communications.<sup>1</sup> In fact, undersea cables carry 99% of all transoceanic communications in terms of civilian and military digital data, which includes telephone and communication data, the internet, including emails, social media, online research or private administrative data, and finance and high-frequency trading—only 1% of the data is carried by satellites.<sup>2</sup> In 2014, the Society for Worldwide Interbank Financial Telecommunications transmitted more than 15 million daily messages by means of these cables to more than 8,300 banking organizations, securities institutions and corporate customers in 195 economies.<sup>3</sup> The daily global transactional value of the traffic carried by undersea cables was estimated to be over 10,000 billions of dollars in 2012 but it is certainly higher today.<sup>4</sup> Thus, the global undersea cable network—henceforth GUCN—is the physical condition of possibility of global interdependence. The GUCN can therefore be called a transnational infrastructure—a geographically dispersed and physically coupled system

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<sup>1</sup> (Starosielski 2015, xi) and (Burnett, Carter 2017, 4–5).

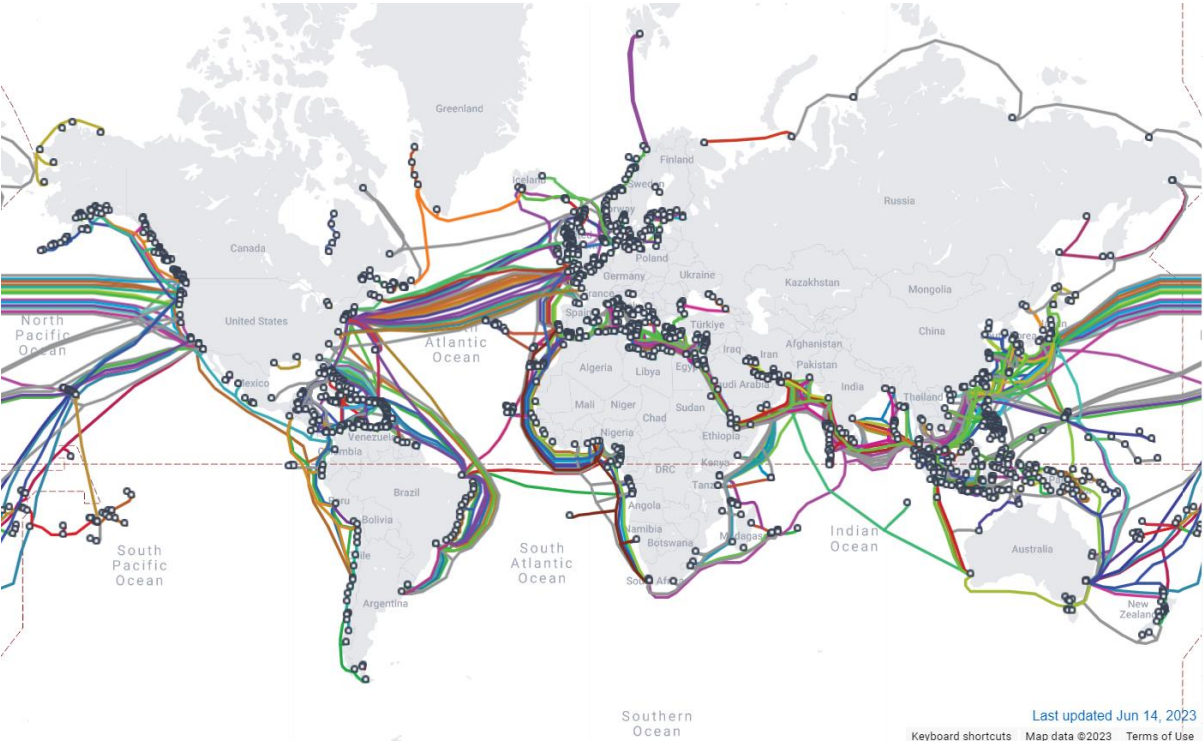
<sup>2</sup> (Burnett, Carter, 2017, 5). Current best high-throughput satellites can transmit 140Gbs. The whole high-throughput satellite network transmits 60Tbs—(Spacewatch 2022)—which is nowadays a somewhat average capacity for an undersea cable. The most powerful undersea cable, Juno (expected in 2024), will transmit six times this capacity—360Tbs.

<sup>3</sup> (Burnett, Davenport, Beckman 2014, 1).

<sup>4</sup> (FCC 2015, 2).

that connects nation-states, and which guarantees the circulation of information, creating many ties among nation-states and institutional links between them.<sup>5</sup>

Thus, almost all internet traffic and the global financial system depend on the reliability and the resilience of undersea cables, to the extent that the GUCN was described by Ambassador Menon from Singapore as “the true skeleton and nerve of our world, linking our countries together in a fiber optic web”.<sup>6</sup> In other words, the GUCN is one of the critical infrastructures of our contemporary models of society and economy.<sup>7</sup> Below is a map of the GUCN:



**Figure 1: Map of the GUCN.<sup>8</sup>**

<sup>5</sup> (Schot 2003, 2–3).

<sup>6</sup> (Menon 2010).

<sup>7</sup> The US Patriot Act defines a critical infrastructure as “a system or asset [...] so vital to the [a country] that the incapacity or destruction of such system and asset would have a significant weakening impact on security, national economic security, national public health or safety, or any combination of those matters”— (USA Patriot Act, 2001, Sec.1016).

<sup>8</sup> (Telegeography 2023). For a larger map, see Annex 4.

The main goal of this thesis is to explore and understand the strategic importance of the GUCN and the way in which states have leveraged it. I will focus in particular on the case of the U.S., the current hegemon of the GUCN. The research questions that I will answer are as follows: How does the U.S. maximize its power and interests by leveraging the global undersea cable network, and are China or Russia threats to American hegemony over the global undersea cable network?

In the first part, I will begin with providing a theoretical background to the examination of the GUCN. I will then establish a definition of hegemony in the undersea cable sector and will set forth a short history of the GUCN. I will show that as soon as undersea cable was invented, these cables were used to leverage the great powers' interests and to maximize their power. This history will consist of three stages: the telegraph era (from 1851 to the early 1950s), the coaxial era (from the early 1950s to the early 1980s), and the fiber-optic era (from the early 1980s to the present).

In the second part, I will describe current American hegemony over the GUCN: the length and the technology used by American suppliers, the importance of SubCom, the U.S.'s main supplier of undersea cables, the way in which American over-the-top content provider internet giants, especially Google, Facebook, and Microsoft, dominate the global transfer of data, and the American ability to spy by means of undersea cables (I will examine here in particular the Snowden disclosures pointing out that massive amounts of data are collected on undersea cables as data flows through them).

In the third part, I will examine the potential challengers or threats to U.S. hegemony. There are four potential competitors to U.S. hegemony, namely France, Japan, Russia, and China. France and Japan are primarily commercial competitors of the U.S.: neither of these has the capability to strategically target the GUCN in the event of a conflict while Russia and China do. Furthermore, the war in Ukraine and a potential war in Taiwan are proxy wars of Russia

and China primarily with the U.S., and these could imply strategies from Russia and China to threaten or disrupt the GUCN, especially the cables connecting the U.S. to Asia and to Europe. This is why I will focus on Russia and China. The first section of this part will focus on Russia. Although Russia is a minor power in terms of undersea cable and does not have the capacity to be a challenger to U.S. hegemony in the long term, Russia nevertheless has the capacity to sever cables, which could represent an effective short-term strategy in the Ukraine war. I will examine the scenarios where Russia might consider the cutting of undersea cables to be a good strategy, and which undersea cables might be good targets for Russia to seriously disrupt the Western economy. In the second section, I will examine the case of China, which is a potential challenger to U.S. hegemony. China's short-term agenda with respect to undersea cables is dominated by potential conflict with Taiwan: I will examine the scenarios where China might cut cables around Taiwan in the event of conflict. I will then examine the long-term Chinese agenda to compete with the U.S. in terms of undersea cables and show that the U.S.-centric internet, namely the predominance of the U.S. over all other states regarding control of internet infrastructures, will remain the case for the near future, but that China could represent a threat towards the U.S. security, especially in terms of espionage.

In the conclusion, I will provide some recommendations to the U.S. in order to address these threats, discuss the limitations of my research, and identify venues for future research.

# **I. The History of the Global Undersea Cable Network**

## **1) Introduction: a theoretical background**

The history of the GUCN is part of the history of great power politics. As soon as undersea cable was invented, the GUCN was used to leverage the great powers' interests and to maximize their power. Throughout this history, great powers have operated as hegemony-seekers within the undersea cable sector or have at least attempted to counterbalance the hegemony of another great power. This is because the GUCN represents the data and information routes. Control of these routes is as important today as the control of roads and highways was for the Roman Empire, or the control of sea routes for the Spanish Empire. There are three reasons for this. First, these routes provide a state with political and economic information from other parts of the world which can be used to adapt foreign policy or economic strategy. Second, it offers a state the chance to spy or hack and to know more about the intentions of other states—as I shall introduce later, governments have fallen and conflicts were won due to the hacking of undersea cables. Third, cables are very good strategic targets during war time an effective means of isolating the adversary.

History makes manifest the bedrock assumptions defining the structure of the GUCN in the international system. Firstly, the GUCN is an anarchical environment since there is no global governance. Some international conventions regiment, in peacetime only, basic rules relating to damage to undersea cables or to which the signals vessels engaged in laying or repairing undersea cables must conform. Some organizations exist too, such as the International

Telecommunication Union (ITU) but they have a purely technical role.<sup>9</sup> Neither these minimal international conventions, nor these purely technical organizations could be considered as a global governance of the GUCN. Secondly, states (and non-state-actors such as private telecommunication companies) within the system pursue narrow self-interest. Thirdly, states leverage the GUCN in order to maximize their power, their security, and their prosperity.

The history of the GUCN consists of three interlocked features. First, a history of great power politics (primarily, the U.K., U.S., France, Germany, Japan, more recently China and, to a lesser extent, Russia, and prior to WWII, Italy and Denmark). Second, geography, since the main powers in this sector all have significant access to the sea, and most of the time to several seas. Third, a history of technology, because the great power competition was also a technological competition to build the best cables, i.e. cables transmitting the largest quantity of data at the best speed.

## **2) Definition of hegemony**

Before introducing the history of the GUCN, I will establish a definition of hegemony in the undersea cable sector. Although the technology has changed considerably over time, the criteria that can be used to define hegemony in the undersea cable sector have barely changed.<sup>10</sup> The criteria that I consider to be the most relevant are the following—I will attempt to specify later the quantifier terms used in this definition:

- (1) To have an undersea cable supplier able to build reliable and state-of-the-art undersea cables

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<sup>9</sup> A consequence of the absence of global governance is that there is no harmonization of laws as regards undersea cables: some countries are purported to have a very complex law covering the authorization for some undersea cable to cross their maritime area, such as India—(Sugadev 2016)—while others regard the simplicity of their public policy to be asset, attracting investors to lay new undersea cables in their waters, such as Denmark—(Schvets 2020, 202–204).

<sup>10</sup> The only factor that has significantly changed is the importance of datacenters.

- (2) To have an undersea cable supplier that builds and sells a large number of undersea cables, particularly the majority of strategic cables
- (3) To have companies that own a large number of cables, particularly the majority of strategic cables
- (4) To have datacenters on your own territory that receive most data
- (5) To have intelligence services able to spy by means of these undersea cables
- (6) To have the capacity to sever undersea cables in deep water
- (7) To have a long undersea cable network
- (8) To have a large flotilla of cable vessels

By strategic undersea cables, I refer to the transatlantic, transpacific, and the Europe – East-Asia cables. These are particularly important routes for three reasons. First, most of the global data is carried by these cables. Second, they connect the major economic centers to each other, especially the major stock exchanges. Third, they may connect countries participating in spying-program partnerships.<sup>11</sup>

To be a hegemon in the undersea cable sector, a state must fulfill all the criteria listed above. Throughout the history of the GUCN, as I will introduce in the next section, the U.K. was the hegemon in the undersea cable sector from 1850 to the 1950s, and since then the U.S. has been the hegemon. Since the invention of undersea cables, there was no period during which there was no GUCN hegemon: British hegemony was soon challenged by France, Germany, and later the U.S., but U.K. hegemony, while gradually diminished by competition, continued to exist until the 1950s when the U.S. became the hegemon. American hegemony is currently challenged but, as I will show in the third part, there are grounds for thinking that American hegemony will remain for a long time.

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<sup>11</sup> I will not consider here the U.S. – South America network as a strategic network because it does not connect major stock exchanges.

Criterion (1) reflects technological competition as regards undersea cables. The hegemon needs to rely on high-capacity and solid cables, and on the possibility of improving the technology while the global influx and demand for data is continuously increasing.

Criteria (2) and (3) refer to the capacity of the hegemon to control the GUCN: the more a state builds and owns cables, the more it maximizes its control over the GUCN.<sup>12</sup> However, a distinction must be made between regular cables, such as domestic cables, which connect, for example, islands to the mainland, and strategic cables which are the GUCN's most important cables. A state which builds and owns many domestic cables but only a few strategic cables, as in the case of China today, does not rise to the level of a hegemon because most of data is primarily carried by strategic cables. I will consider that a country that has built and owns the largest number of strategic cables could be regarded as the hegemon.

Criteria (4) and (5) refer to the fact that the hegemon must be the physical center of the GUCN. If the majority of data pass through datacenters located in a state's territory, and the state has the intelligence and technological capacity to analyze and spy on this data, the state will have access to most of the data transmitted worldwide. For example, many strategic cables land in France which has datacenters on its territory and intelligence services able to spy by means of these undersea cables. The U.S. however has not only many more datacenters and more powerful intelligence services, but more critically, the vast majority of data pass through the U.S. territory. This is why France cannot be considered a hegemon as regards (4) and (5) compared with the U.S.

Criterion (6) refers to the capacity of a state to target undersea cables in deep water—I will introduce this in Part III, Section 3.2, namely that the cutting of undersea cables in deep

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<sup>12</sup> I will examine the problem of owner-consortium in Part III, Section 4.4.

water is a better strategy than to do so on the continental shelves. Today, only the U.S., China, and Russia have these capabilities.

Criteria (7) and (8) refer to building and maintaining a long network. Throughout history, the hegemon, namely the U.K. and the U.S., have had a long network, and at some point, the longest network, although in both cases their share of the GUCN has declined to the advantage of other competitors, the U.S. and France in the case of the U.K., France, Japan, and China in the case of the U.S. The hegemon does not necessarily need to have the longest network—it is not the case of the U.S. today although its network is very close to being the longest one—but its network must cover at least a third of the total length of the GUCN.<sup>13</sup> A large flotilla—at least six vessels—is required because the hegemon needs to be able to quickly and reliably repair its network in the event of a natural incident or in the event of intentional attack.

### **3) The telegraph era**

The first undersea cable was laid on the Channel seabed between Dover, the U.K., and Cap Gris-Nez, France on August 28<sup>th</sup> 1850. It was a simple telegraphic cable framed in gutta-percha latex with gutta-percha insulation and no armoring. The cable functioned for only 11 minutes. A new better insulated cable was laid between Dover and Calais, France, on October 19<sup>th</sup> 1851 and it functioned for forty years.<sup>14</sup> On August 5<sup>th</sup> 1858, only eight years after the first undersea cable was laid, a first transatlantic cable connected Valentia Island (Ireland) to Trinita Bay (Canada). A message from Queen Victoria was sent to President Buchanan who reciprocated.<sup>15</sup>

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<sup>13</sup> This rather arbitrary data stems from the fact that the British network became clearly less dominant when it extended for over a third of the GUCN.

<sup>14</sup> (Salvador, Fouchard, Rolland, Leclerc 2006, 21–22) and (Glover, Burns 2022).

<sup>15</sup> See Annex 2.

The transmission speed was quite low—it took more than an hour to transmit the message from Queen Victoria to President Buchanan. The connection functioned for only twenty days.

The first time an undersea cable was specifically used in a conflict was during the Siege of Sevastopol: in 1855, in order to ease the transmission of information, Napoleon III ordered from a British company an undersea cable to be installed between Balaklava, close to Sevastopol, and Varna, Bulgaria, in order to have a direct connection with Paris via Vienna. The first cable ever severed during a conflict was the cable, owned by a British company, between Odessa, at that time part of the Russian Empire, and Constantinople (now Istanbul): it was cut by the Ottomans during the Russo-Turkish War in 1877.

At that time, British industry dominated the undersea cable sector and only four British suppliers divided the market among themselves. The British relied on an extensive control over raw materials and significant technological advance over their competitors. The geographic particularities of the British Empire, more extensive and also more widely distributed around the world than the French Empire, for example, which was more centered on North Africa, made the undersea cable network a vital infrastructure of its political and economic hegemony. First, it reinforced the international position of the City of London among the international financial exchanges. Second, the undersea cable network allowed the British Empire to be well-informed of all events happening both within the boundaries of the Empire and also in the rest of the world.<sup>16</sup>

Competing with the British network became a high-stake endeavor in the global political competition. The three main nations to take a stand against British hegemony were the U.S., France, and Denmark. The U.S. had a twofold strategy. First, the U.S. federal government established controls on the prices offered by the telecommunication companies in order to stop

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<sup>16</sup> (Hugill 1999, 32).

the infringement of competition practiced by British companies. Second, it attempted to build a vast network, especially given the specific geography of the U.S., bordering the Atlantic and Pacific oceans, and also given the fact that until 1917—the invention of radio—undersea cable was the only way to transmit communications across oceans. France, Germany, and Italy, determined that their communications should not be carried by cables supplied or owned by other countries, and thereby set up networks built by private companies but supervised by the state. This competition implied the progressive, though linear, reduction in the share of the British network in the world: in 1887, the British network represented almost 68% of the GUCN and was 52.5% in 1910. Some countries even became allies to challenge British hegemony: on March 26<sup>th</sup> 1910, only five years after the Tanger crisis and four years before the outbreak of WWI, France and Germany signed a deal to develop joint telegraphic communications towards Africa and America.<sup>17</sup> The following table represents the evolution of the length of the networks from 1877 to 1931:

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<sup>17</sup> (Morel 2020, 212–213).

| <b>Networks (mi)</b> | <b>1877</b>     | <b>1887</b>     | <b>1901</b>      | <b>1910</b>      |
|----------------------|-----------------|-----------------|------------------|------------------|
| <b>U.K.</b>          | 64,044 (86.97%) | 87,847 (67.75%) | 136,925 (61.56%) | 159,589 (52.47%) |
| <b>U.S.A</b>         | 0 (0%)          | 18,829 (14.52%) | 32,424 (14.58%)  | 57,811 (19.01%)  |
| <b>France</b>        | 776 (1.05%)     | 7603 (5.86%)    | 21,328 (9.59%)   | 27,842 (9.16%)   |
| <b>Germany</b>       | 468 (0.64%)     | 1866 (1.43%)    | 9,081 (4.08%)    | 22,894 (7.53%)   |
| <b>Italy</b>         | 252 (0.34%)     | 707 (0.55%)     | 1,221 (0.55%)    | 1,466 (0.48%)    |
| <b>Denmark</b>       | 4843 (6.58%)    | 7172 (5.53%)    | 9,494 (4.27%)    | 11,204 (3.68%)   |
| <b>Other</b>         | 3258 (4.42%)    | 5641 (4.35%)    | 11,961 (5.38%)   | 23,341 (7.67%)   |
| <b>Total</b>         | <b>73,641</b>   | <b>129,665</b>  | <b>222,434</b>   | <b>304,147</b>   |

| <b>Networks (mi)</b> | <b>1922</b>      | <b>1928</b>      | <b>1934</b>      | <b>1939</b>      |
|----------------------|------------------|------------------|------------------|------------------|
| <b>U.K.</b>          | 180,019 (49.19%) | 212,032 (51.86%) | 187,358 (44.86%) | 187,356 (47.22%) |
| <b>U.S.A</b>         | 100,672 (27.5%)  | 105,626 (25.84%) | 109,379 (26.19%) | 113,090 (28.50%) |
| <b>France</b>        | 28,601 (7.81%)   | 28,601 (7%)      | 34,969 (8.37%)   | 38,322 (9.66%)   |
| <b>Germany</b>       | 2,035 (0.55%)    | 2,468 (0.60%)    | 7,158 (1.71%)    | 7,158 (1.80%)    |
| <b>Italy</b>         | 3,625 (0.99%)    | 16,742 (4.1%)    | 17,971 (4.30%)   | 17,971 (4.53%)   |
| <b>Denmark</b>       | 10,305 (2.81%)   | 9,316 (2.28%)    | 10,269 (2.46%)   | 10,269 (2.59%)   |
| <b>Other</b>         | 40,802 (11.14%)  | 34,031 (8.32%)   | 50,492 (12.09%)  | 22,622 (5.70%)   |
| <b>Total</b>         | <b>366,131</b>   | <b>408,816</b>   | <b>417,596</b>   | <b>396,788</b>   |

**Figure 2: Evolution of the length (in miles) of the networks from 1877 to 1931<sup>18</sup>**

However, the British domination of the GUCN continued and had political implications, especially in the competition with France, the other major empire at that time. In 1885, a telegram stated a surprising and strategically unfortunate retreat by French forces from Lang-Son in Tonkin (Vietnam) during the Sino-French War. This was considered to be a scandalous event but the telegram stating that the situation was in fact stabilized was delayed for a couple of days by the British at the station. In the meantime, the scandal became so momentous that it caused the fall of the Ferry's French government. Another example is the Fashoda incident which took place in 1898. The Fashoda crisis consisted of a colonial conflict between the U.K. and France for control of Sudan. Field Marshal Kitchener received orders to crush the Mahdist resistance in Sudan, which was regarded as a potential threat to the future of British colonization. He discovered that Fashoda was already held by the French General Marchand.

<sup>18</sup> (Salvador, Fouchard, Rolland, Leclerc 2006, 51 and 118), (Morel 2020, 597), and (French Diplomatic Archives 1934, 24).

In the context of extreme nationalist tensions between the two countries, and while the two governments negotiated, Kitchener was able to communicate extensively with his government, whereas Marchand had no contact with Paris because the only undersea cable he could use was controlled by the British.<sup>19</sup> Undersea cables were also strategic targets apart from competition with the U.K. In 1898 in the context of the Spanish-American war, the U.S. severed all the cables (mostly manufactured or owned by British and French companies) connecting Spain to its colonies in order to disrupt the enemy's ability to command and control its forces overseas.

At the start of WWI, German cables were severed in the Channel and the British navy destroyed three terminal stations in the Pacific. Immediately following these actions, on September 7<sup>th</sup> 1914, German cruisers attacked a British cable station on Fanning Island, a relay station connecting Vancouver to Australia and New Zealand in order to cut off communications in the Pacific, and, in November 1915, severed a cable between Britain and Russia to isolate Russia. In November 1914, the British navy cut the German undersea cables connecting Tenerife and Monrovia, Liberia, in order to jeopardize the reliability of German international communications and isolate Germany and on September 1915, a British cable ship cut the German cable to Brazil so Germany was subsequently completely dependent on secret messages transmitted through Allied cables.<sup>20</sup> German transatlantic cables were diverted to France and the U.K., and the French walked off with the German cables in Africa. In 1917, German U2s severed three transatlantic cables. During WWI, one of the most famous espionage operations based upon undersea cables occurred. In early 1915, the British intercepted a German diplomatic message sent from Zimmermann, the German Minister of Foreign Affairs, to Eckhardt, the German Ambassador in Mexico, which was carried by the American cable network, and which called on Mexico to join an alliance against the U.S. in exchange for Texas,

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<sup>19</sup> (Margerie 1909, 37–38).

<sup>20</sup> (Winkler 2008, 27–30).

Arizona, and New Mexico. As soon as the message became common knowledge, it generated tremendous public indignation and undercut the arguments of those urging peace.<sup>21</sup> The Treaty of Versailles ended extension of the German undersea network: according to the terms of the treaty, Germany “renounced on her own behalf and on behalf of her nationals in favor of the Principal Allied and Associated Powers all rights, titles or privileges of whatever nature” to many of its undersea cables mostly to the benefit of France.<sup>22</sup>

After WWI, the level of U.S. investment in this sector became comparable to that of the U.K.<sup>23</sup> At the same time, until 1928, France tended to neglect its undersea cable network in favor of radio, while Italy’s network became the fourth longest network in the world. The 1929 economic crisis resulted in a general decrease in communication traffic, both in radio and undersea cable networks, which explains why some networks, for example the American and the British, developed at a slower pace between 1929 and 1936 than between 1918 and 1929.

A few hours after the declaration of war in 1939, German Atlantic cables in the Azores and from Portugal were severed while the Germans cut through many of the French cables in the Mediterranean. However, these cable disconnections undermined the Germans less than during WWI because the German radio system was well-developed and compensated somewhat for the loss of their undersea cable network, which was not that extensive in any case. As the British navy became increasingly involved in the war on sea, British cable vessels reconditioned the network, with the assistance of U.S. vessels when the U.S. joined the war. In the meantime, Japan took possession of 21,127mi of the British network and of eleven terminal stations in the Pacific because the British were unable to protect them.<sup>24</sup>

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<sup>21</sup> (Headrick 1991, 167–171) and (Winkler 2008, 101–102).

<sup>22</sup> *Treaty of Versailles*, art. 244 and Annex VII (that I quote here). It is mentioned that the value of cables that are privately owned “shall be credited to Germany on the reparation account”.

<sup>23</sup> (Hugill 1999, 19).

<sup>24</sup> (Salvador, Fouchard, Rolland, Leclerc 2006, 123).

#### **4) The coaxial era**

Neither the invention of radio nor WWII greatly changed the balance of power in the undersea cable sector: although the U.S. network came to resemble to the British network in terms of length, the British network continued to remain the longest. The change stems from a technological revolution, namely the invention of coaxial undersea cables in the early 1950s. This technology was able to transmit telephone communication overseas. It replaced the telegraph and led to a major shift in the balance of power. In the 1960s, the American network, supervised by AT&T, was 23,317mi long, while the British network was 6,708mi long, the German network 6,635mi long, and the French network 1,519mi long. In 1964, the first transpacific cable was laid by AT&T between Hawaii and Japan. In the 1970s, technical enhancements permitted the improvement of the capacities of undersea cables. These improvements were rapidly implemented by British suppliers and became popular, especially for connection with the Commonwealth adding 32,603mi of undersea cables to the British network. At the same time, fueled by the Space Race with the Soviets, the U.S. tended to invest more in satellite infrastructure, which is why it built only 9,049mi of new cables. While Germany did not invest in this new technology, France added 9,719mi to its network and the Japanese built a 9,543mi long network.<sup>25</sup> The British network was therefore ultimately on a par with the American network in terms of length.

#### **5) The fiber-optic era**

The late 1980s and the 1990s led to the embodiment of the GUCN we know today. There are three aspects to it. First, in the late 1980s, the invention of fiber optic and its use in undersea

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<sup>25</sup> (Salvador, Fouchard, Rolland, Leclerc 2006, 150–156 and 185–204).

cable permitted any numerical data, such as texts, videos, music, administrative data, financial and economic information to be carried at the speed of light. The technological evolution was very rapid: at first, in the early 1990s, undersea cables were able to carry 0,1 Gigabits per second—the size of a movie; nowadays, undersea cables can carry 360 Terabits per second. The table below shows the evolution of capacities of undersea cables:

|             |             |             |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>1860</b> | <b>1920</b> | <b>1954</b> | <b>1955</b> | <b>1987</b> | <b>1994</b> | <b>1998</b> | <b>1999</b> |
| 0.00001 Gbs | 0.0005 Gbs  | 0.0008 Gbs  | 0.001 Gbs   | 0.01 Gbs    | 0.1 Gbs     | 1 Gbs       | 10 Gbs      |

|             |             |             |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>2001</b> | <b>2003</b> | <b>2010</b> | <b>2016</b> | <b>2018</b> | <b>2021</b> | <b>2022</b> | <b>2024</b> |
| 100 Gbs     | 3.2 Tbs     | 7.68 Tbs    | 130 Tbs     | 160 Tbs     | 300 Tbs     | 352 Tbs     | 360 Tbs     |

**Figure 3: Evolution of the capacities of undersea cables (the orange refers to the telegraph age, the green to the coaxial age, and the blue to the fiber optic age)**

The second aspect is deregulation. Allowing private companies to possess their own network is not new. During the telegraph era, the U.S. had no public cable but the legal framework regimenting undersea cables was adapted to accommodate national interest. European countries have national networks (mostly somewhat limited) and conceded the majority of their networks to private companies within a legal framework serving the national interest.<sup>26</sup> The more recent phenomenon of deregulation began when AT&T’s monopoly was broken by the Federal Communication Commission in 1984 and then extended to all countries producing undersea cables. Today, 99% of undersea cables are privately owned.<sup>27</sup> The only publicly-owned undersea cables in the U.S. that I know of are the GTMO-1 connecting Dania Beach, Florida, to Guantanamo Bay (laid in 2016), and the GTMO-PR, connecting Guantanamo

<sup>26</sup> Here is a table of public and private networks in 1901(in mi)—(Salvador, Fouchard, Rolland, Leclerc 2006, 88):

|                | <b>Public network</b> | <b>Private network</b> |
|----------------|-----------------------|------------------------|
| <b>France</b>  | 6,048                 | 15,279                 |
| <b>Germany</b> | 3,033                 | 6,047                  |
| <b>U.K.</b>    | 1,136                 | 135,789                |
| <b>U.S.</b>    | 0                     | 32,424                 |

<sup>27</sup> (Gallagher 2022, 2).

Bay to Punta Salina, Porto Rico (laid in 2019).<sup>28</sup> Currently, the main cable suppliers are: SubCom (U.S.), ASN—Alcatel Submarine Network—(France), NEC (Japan), and more recently HMN—Huawei Marine Network—(China). Currently, the longest undersea cable network is the one built by ASN, closely followed by those of SubCom, then NEC, and HMN:

| <b>Supplier</b> | <b>Network Length (miles)</b> |
|-----------------|-------------------------------|
| ASN             | 370,173                       |
| SubCom          | 326,285                       |
| NEC             | 135,535                       |
| HMN Tech        | 43,415                        |

**Figure 4: An approximation of the network length of main suppliers.**<sup>29</sup>

The main cable owners are the major over-the-top content providers, namely Google, Facebook (Meta), Amazon, and Microsoft but also telecommunication companies such as Verizon (U.S.), Orange (France), Vodafone (U.K.), China Telecom (China). The main cable-laying ship-owners, devoted to laying and repairing cables are: Orange Marine (France), SubCom (U.S.), Global Marine (U.K.), and E-Marine (United Arab Emirates).

The third aspect is a shift in the domination of the undersea cable sector. In the 1980s, one of the main British suppliers, Standard Telephones and Cables, suffered economic difficulties and, with an ageing workforce, loss of business to the newly privatized British Telecom and Cable & Wireless Communications, production spread over too many expensive sites and no clear leadership succession, the company was sold. Neither British Telecom nor Cable & Wireless Communications was an undersea cable supplier (although they do own some cables) and only Global Marine, historically the other main supplier, remained as a British supplier. However, it too faced economic difficulties in the early 2000s and stopped producing

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<sup>28</sup> This does not mean that the U.S. does not invest in some projects. For example, in 2020, SubCom announced that it was building an undersea cable from Australia to Oman. This project included a link to a U.S. Navy base on the remote island of Diego Garcia in the India Ocean, which was founded by the Pentagon—(Brock 2023b).

<sup>29</sup> This is an approximation because many cables are supplied by more than one company. When an undersea cable is shared by several suppliers, I attribute to each supplier the length of the cable divided by the number of suppliers.

undersea cables, which almost took the U.K. off the table with regard to the supply of undersea cables.

## **6) A note on undersea cables during wars**

The history of the undersea cable network shows that undersea cables have been considered as potential strategic targets during peacetime and have been targeted during wars. One may wonder whether the severing of undersea cables matters that much in wartime and whether the use of cable-cutting as a coercive tool in the prewar period would not be more effective than doing so in wartime. I will try to answer these questions based on WWI and WWII, on which I have most information, and will try to understand whether these two wars are informative with regard to the contemporary situation.

It is hard to measure how decisive the cutting of undersea cables during WWI was to the victory of the Triple Entente, including the U.S. from 1917, and in the defeat of the Triple Alliance. Most of the conflict occurred in Europe between mostly land-neighbor belligerents and, while the destruction of the German prewar network significantly affected the ability of the Triple Alliance to communicate with countries outside their geographical area, it did not affect communications between Germany, the Austro-Hungarian Empire, Russia, and Italy. On the other hand, the destruction of several British and French cables, and the corresponding imposition of censorship on British-controlled cables, also affected the Entente. For example, as a result of British censorship, the U.S. was substantially unable to communicate freely with areas of commercial or political importance. This situation prompted the research efforts by industry to develop a reliable alternative to undersea cables for international communications, which explains the considerable development of radio at this time. It is also why the damage to the GUCN during WWII might not have been as important as it was during WWI, since all

belligerents had a competitive alternative to undersea cable for sending and receiving their international communications. This argument concerning WWII has limitations because I do not have sufficient information about the Pacific side of WWII and how effective the severing of the Japanese and the U.S. networks was at that time. Based on these two cases, it seems clear that cutting cables as a coercive tool in peacetime or prewar is more effective than cable cutting during an actual war.

The above argument may be slightly nuanced, however, as regards our contemporary era. First, contrary to the end of WWI and WWII, there is no real option other than undersea cable for the international carriage of data. Satellites may be used as a temporary makeshift solution in the event of war, but they are far from being able to carry as much data as undersea cable does.<sup>30</sup> Thus, in the event of war, military data could be transmitted by means of satellite but the vast majority of other types of data, especially economic data, could not be transmitted via satellite. Second, the evolution of technology has made undersea cables even more critical than in the past. Back in the age of the telegraph, only messages could be sent by means of undersea cable. During the age of coaxial cable, telephone communications were also carried. Nowadays, the whole content of the internet can potentially be transmitted by these cables, including emails, financial data, notably trading and high-frequency trading, which makes the GUCN the backbone of the internet, and hence of contemporary numeric-based civilization. This implies that attacking the undersea cable network of a country today would affect its economy much more than in the past, because the contemporary economical system relies much more on data transmitted by undersea cables than it did during the periods of WWI and WWII, which means that cutting the undersea cable network of a country could be an effective way to isolate it and, significantly, its economy. This is why if cutting cables as a coercive tool in

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<sup>30</sup> An example of this is Starlink used by the U.S. to maintain the internet network in Ukraine whose network—essentially land-based—has been affected during the war.

peacetime or prewar remains a good strategy, it is also likely that cable cutting during an actual war might have become a good strategy too, given the growing importance of the GUCN for the contemporary era. However, there is no instance of a war that would have affected the fiber-optic GUCN, and thereby no record or historical example on which definitive conclusions can be drawn.

## II. American Hegemony

### 1) The length of the network, SubCom, and the flotilla

I will show here that the U.S. is a hegemon by examining each of the criteria mentioned above.

The U.S. network is the second longest in the world, in fact quite close to the longest: it extends over 333,527mi (I have combined here the length of the networks of SubCom, Xtera, AT&T), almost on a par with that of the French supplier ASN.<sup>31</sup> This represents around 38.5% of the GUCN whose length is estimated to be 869,620mi. SubCom provides the most advanced cables in technological terms such as the recent Dunant connecting Virginia Beach, the US, to Saint Hilaire de Riez, France, delivering 300 Terabits per second. SubCom's flotilla of cable vessels is one of the largest in the world—eight vessels—yet slightly smaller than the French flotilla with ten vessels (ASN has seven ships and Orange six with three placed under the French flag).<sup>32</sup>

The domination of SubCom is particularly noticeable when we consider the most strategic undersea cables, which are those transmitting the most data, namely the transatlantic, the transpacific cables, and the cables connecting Europe to East Asia:

| <b>Supplier</b> | <b>Number of cables</b> | <b>Percentage</b> |
|-----------------|-------------------------|-------------------|
| ASN             | 4                       | 26.6%             |
| SubCom          | 10                      | 66.6%             |
| Unknown         | 1                       | 6%                |

**Figure 5: Suppliers of the transatlantic network**

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<sup>31</sup> Xtera is a company based both in the U.S. and in the U.K. but its headquarters appears to be in Texas (at least, according to its LinkedIn profile). It is the company that supplied the U.S. government with the two Guantanamo cables.

<sup>32</sup> (Glover 2023) and (Morel 2020, 357–358).

| <b>Supplier</b> | <b>Number of cables</b> | <b>Percentage</b> |
|-----------------|-------------------------|-------------------|
| ASN             | 7                       | 21.9%             |
| Fujitsu         | 2                       | 6.25%             |
| NEC             | 9                       | 28.13%            |
| SubCom          | 10                      | 31.25%            |
| Unknown         | 3                       | 9.38%             |
| Xtera           | 1                       | 3.12%             |

**Figure 6: Suppliers of the transpacific network**

| <b>Supplier</b> | <b>Number of cables</b> | <b>Percentage</b> |
|-----------------|-------------------------|-------------------|
| ASN             | 3                       | 25%               |
| Fujitsu         | 2                       | 16.6%             |
| HMN Tech        | 1                       | 8.3%              |
| NEC             | 2                       | 16.6%             |
| SubCom          | 4                       | 33.3%             |

**Figure 7: Suppliers of Europe – East Asia network<sup>33</sup>**

SubCom has thus participated in building 66.6% of the transatlantic network, 31.25% of the transpacific network, and 33.3% of the Europe-East Asia network, which is more and, in the case of the transatlantic network, significantly more than its competitors. Furthermore, SubCom not only builds many cables but also manufactures powerful cables: SubCom has built cables representing 79.96% (1158.64Tbs) of the capacity of the transatlantic route, 23.22% (574.49Tbs) of transpacific network—which is less than NEC—and 50.13% (220.12Tbs) of the Europe-East Asia network.<sup>34</sup>

American companies own or co-own more than 90 cables—I include here the OTTs (Google, Facebook, Microsoft, Amazon), the main telecommunication companies (Verizon, AT&T, T-Mobile), other important telecommunication companies (such as Aqua Communication, Lumen, Xchange), some local telecommunication providers, especially in Alaska and Hawaii, and governmental cables. The OTTs plus the main telecommunication

<sup>33</sup> See Annex 6 to 8. When a cable C is built by two suppliers  $S_1$  and  $S_2$ , I attribute 1 to both  $S_1$  and  $S_2$ .

<sup>34</sup> See Annex 6 to 8. I take here the Peace cable to have a capacity of 192Tbs, although in fact some portions of it have a lesser capacity.

companies own or co-own 67 cables which is far more than the ownership of the major British telecommunication companies (34 by Vodafone and British Telecom combined), and the French main telecommunication company (39 by Orange). American companies own or co-own many strategic cables:

|                                 | OTTs | Other U.S. companies | Total U.S. companies | Total number of cables on the network |
|---------------------------------|------|----------------------|----------------------|---------------------------------------|
| <b>Transatlantic network</b>    | 5    | 6                    | 9                    | 15                                    |
| <b>Transpacific network</b>     | 12   | 8                    | 20                   | 28                                    |
| <b>Europe–East-Asia network</b> | 1    | 3                    | 4                    | 7                                     |

**Figure 8: Number of strategic cables owned or co-owned by OTTs, other U.S. companies, the total of cables owned or co-owned by U.S. companies**

|                                 | OTTs   | Other U.S. companies | Total U.S. companies |
|---------------------------------|--------|----------------------|----------------------|
| <b>Transatlantic network</b>    | 82.9%  | 9.3%                 | 92.21%               |
| <b>Transpacific network</b>     | 58.39% | 1.71%                | 60.1%                |
| <b>Europe–East-Asia network</b> | 33.6%  | 0.06%                | 33.65%               |

**Figure 9: Percentage of U.S. companies in terms of capacity of the strategic networks.**

These two tables show that American companies own or co-own 9 transatlantic cables (out of 15), representing 92.21% of the capacity of the transatlantic network, 20 transpacific cables (out of 28), representing 60.1% of the capacity of the transpacific network, and 4 (out of 7) cables connecting Europe to East-Asia, representing 33.65% of the capacity of the Europe–East-Asia network.<sup>35</sup> Thus, they own or co-own 66% of all strategic undersea cables, representing 67.53% of the capacity of these cables.

## 2) The espionage programs

The U.S. has two military vessels specifically devoted to undersea cables. The first is Zeus (USNC T-ARC-7), a forty-year old ship whose mission is to carry, deploy, retrieve, and repair

<sup>35</sup> See Annex 6 to 8.

undersea cables—it is unarmed.<sup>36</sup> The second is the USS Jimmy Carter, a Seawolf-class nuclear-powered submarine modified so as to be able to tap undersea cables and eavesdrop thanks to a “moon well”—a floodable chamber which allows divers, robots and machinery to move between the interior of the submarine and the water, retrieving objects off the seafloor or carrying monitoring devices and other surveillance equipment.<sup>37</sup> In the context of competition with China and the laying of the Peace cable between Europe and Singapore supplied by Huawei, it was announced that USS Jimmy Carter will soon be replaced by a state-of-the-art modified Virginia Block VI submarine, designated as a Subsea and Seabed Warfare submarine (Mod VA SSW). It is expected to carry specialized unmanned underwater vehicles, remote-operated vehicles, and special operations submarines, and to be able to sever or tap undersea cables.<sup>38</sup>

Besides this spy-submarine, the U.S. has other ways of spying by means of undersea cables using a combination of exertion of its influence on cable owners, which may provide the intelligence services with some data, and on cable suppliers by requesting that they install backdooring equipment. The Snowden disclosures showed that several programs under the control of National Security Agency (NSA) collect internet and phone communications. Among the programs that were disclosed, one of them is particularly important for our purposes, namely Upstream. As indicated in the following slide from the Snowden disclosures, the aim of the Upstream program is to collect communications from undersea cables as the data flows:

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<sup>36</sup> (NavSource 2020).

<sup>37</sup> (Reuters 2013) and (The New York Times 2005).

<sup>38</sup> (Honrada 2023).



Figure 10: Slide from the Snowden disclosure: Upstream.<sup>39</sup>

Upstream is an umbrella term uniting four different surveillance programs. The first is Fairview, which is the name of an extensive cooperative program between the NSA and AT&T. The program uses devices built to intercept and analyze internet traffic at very high speed laid directly on fiber optic lines, and line splitters. The Snowden documents pointed out that Fairview had access to nine undersea cable landing points, with seven others planned at the time, controlling the transatlantic and transpacific networks but also the network connecting the U.S. to South America:

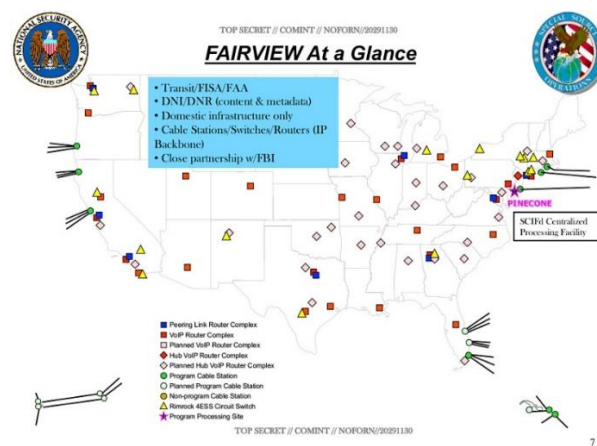


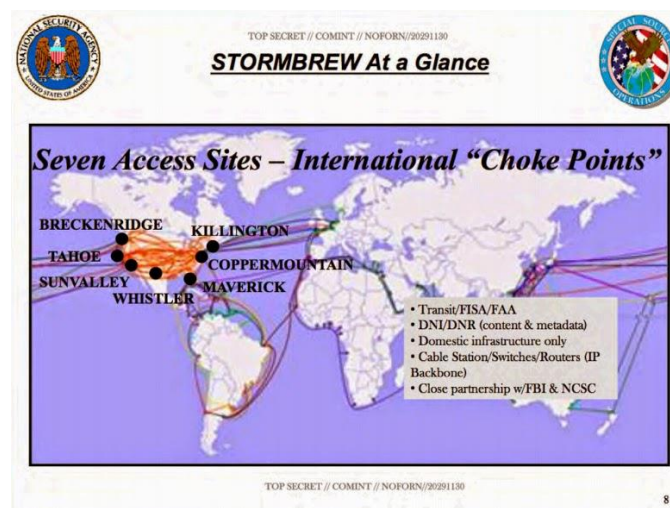
Figure 11: Slide from the Snowden disclosure: Fairview surveillance program.<sup>40</sup>

<sup>39</sup> (Nsa.gov 2023).

<sup>40</sup> (Electrospaces 2015).

The second Upstream subprogram is Blarney. Apparently, Blarney works the same way as Fairview but is specifically designed to categorize and store data from the diplomatic establishment, counterterrorism, foreign governments, and economic world. In 2010, the list of countries targeted by Blarney included Brazil, France, Germany, Greece, Israel, Italy, Japan, Mexico, South Korea, and Venezuela, as well as the European Union and the United Nations.<sup>41</sup>

The third Upstream subprogram is Stormbrew. It is a Fairview-like program, providing an extensive cooperative program between the NSA and Verizon. It also tapes undersea cables at six “choke-points” connecting the U.S. to Europe, East-Asia, and South America to obtain its data:



**Figure 12: Slide from the Snowden disclosure: Stormbrew surveillance program.<sup>42</sup>**

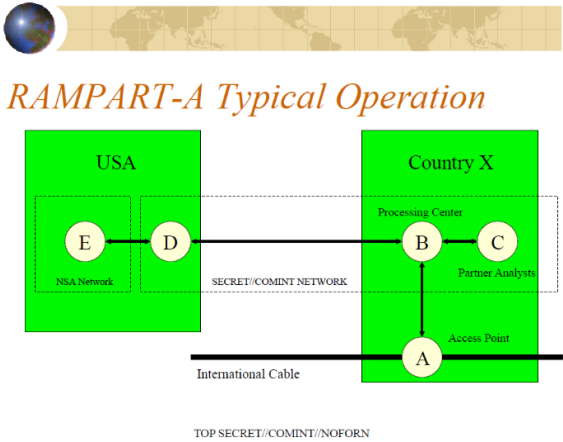
The fourth Upstream subprogram is Oakstar. It is similar to the Fairview and Stormbrew programs and exploits the access of one of the NSA’s corporate partners to foreign telecommunications. This partner has not yet been identified—its code name is Steelknight.<sup>43</sup>

<sup>41</sup> (Greenwald 2014, 104).

<sup>42</sup> (Greenwald 2014, 107).

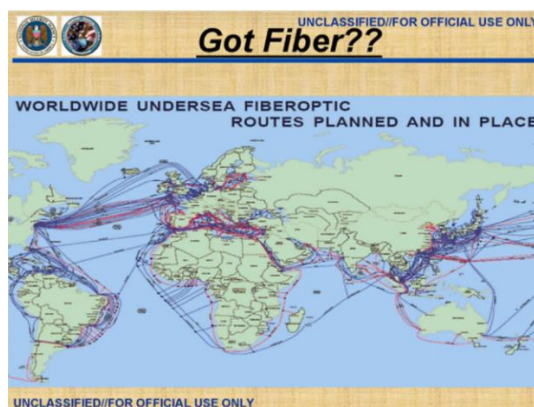
<sup>43</sup> (Greenwald 2014, 106).

The NSA global surveillance programs, such as Upstream, are not operated solely on American soil. The NSA has foreign partners assisting it in the collection of data. The main partnership program is called Rampart-A. It is a global mass surveillance led by the NSA in cooperation with several foreign intelligence services. The aim of this program is to “gain access to high-capacity international fiber-optic cables that transit at major congestion points around the world”.<sup>44</sup> Foreign partners host U.S. equipment and provide access to the undersea cables, while the U.S. provides equipment for transport, processing and analysis. The host partner is not supposed to use the equipment provided by the NSA to spy on American citizens and the NSA is not supposed to use access granted by the partner country to spy the host country’s citizens—the project overview concedes that there are exceptions to this clause.<sup>45</sup> The graph below shows how Rampart-A works and provides the map of the GUCN as presented in the Rampart-A project overview:



**Figure 13: Rampart-A typical operation.**<sup>46</sup>

<sup>44</sup> (Rampart-A Overview 2010, 3).  
<sup>45</sup> (Rampart-A Overview 2010, 3).  
<sup>46</sup> (Rampart-A Overview 2010, 9).



**Figure 14: The GUCN map as presented in the Rampart-A project.<sup>47</sup>**

The quantity of data collected by the NSA is huge: it has potentially access to any communication in the world. This is made possible for three reasons. First, at a purely domestic level, the U.S. has two sets of major hubs—landing points accommodating many undersea cables: one, located in California, accommodates cables from Asia and one accommodates cables from Europe, often called “Data Center Alley” located in Ashburn, Virginia. It is claimed that the latter routes at least 70% of all daily internet traffic in the world.<sup>48</sup> Second, since 2021, 97% of the communication flows between Europe and Asia passes through American boundaries first, especially via these two major hubs—this situation will probably change somewhat because of the Peace cable connecting France and China, although a single cable is unlikely to dramatically modify the picture of the Europe – East-Asia network.<sup>49</sup> As stated in the Snowden disclosure, “much of the world’s communications flow through the U.S.”:

<sup>47</sup> (Special Source Operations 2014, 3).

<sup>48</sup> (Klein 2019) and (Izambart 2019).

<sup>49</sup> (Morel 2020, 217).



Figure 15: Slide from the Snowden disclosure: The quantity of data collected on American soil.

Third, by being able to access not only undersea cables with terminal stations on foreign soil, “Rampart-A has access to international communications from anywhere around the world”, as stated by the Rampart-A project overview.<sup>50</sup> It is remarkable to note that the quantity of data exchanged (and thus the quantity of data the NSA is likely to collect) has massively increased: in 2011, the transatlantic network traffic represented 4,972Gbps while today it is 1,449.04Tbs, and the transpacific network traffic represented 2,721Gbps while nowadays it is 2,474.01Tbs, which means that they represented 0.34% and 0.11% of the current traffic. This means that the NSA has potential access to much more data than in the past.

### 3) Weaponizing interdependence

All of these facts show that the U.S. fulfills all criteria I used to establish a definition of hegemony in Part I, Section 2. It has a supplier able to build reliable and state-of-the-art undersea cables, which sells a large number of undersea cable and more strategic cables than its competitors. It has companies owning a large number of cables and especially more strategic

<sup>50</sup> (Rampart-A Overview 2010, 23).

cables than its competitors. It has datacenters on its territory receiving most data and has intelligence services able to spy by means of undersea cables. It has the capacity to cut undersea cables in deep water. It also has a long network and large flotilla to repair and maintain it.

The U.S. is therefore the hegemon of the GUCN, the center of the global internet, and the center of the GUCN. This hegemony arises for various reasons. First, the massive investments made by the U.S. in order to have the best technologies. Second, the fact that the U.S. has become the most powerful country in the world in terms of its economy, and that all major stock exchanges need to remain closely in touch, and at the highest speed, with the U.S. stock exchange, since, in a highly interdependent world and, in order to maximize long-run returns, markets tend to be led towards winner-take-all equilibria in which a small number of countries dominate the network of relationships between economic actors. Third, the desire to keep an eye on all communications transmitted in the world so as to maintain a hegemonic position before the unipolarity moment (1989 to 2017), during the unipolarity moment, and also after it. Fourth, the fact that much of the data used and, somehow “consumed”, in Europe, East-Asia, South America, and other parts of the world are stored on American soil. In fact, the vast majority of the data produced and used by the OTTs, including streaming platforms, social medias, and the clouds, are stored in datacenters based on the U.S. soil. In other words, the map of the GUCN reflects the data needs of countries, and the map clearly shows that the U.S. is at the center of those needs and that the main areas where the U.S. sells its data are Europe and East-Asia. This is why OTTs aim to have more and more cables, because they need to have the capacity to respond to the needs of potential customers.

This latter fact indicates that there is an interdependence between those countries which depend on the U.S. for the use of the data stored in its territory and the U.S., which needs to sell this data to other countries as a major part of its economy. However, this phenomenon of interdependence can be weaponized by the U.S. in accordance with three strategies.

The first strategy is spying on the data collected by means of the GUCN, which may help the U.S. to observe the activities of its adversaries and allies and to better know their intentions, from an the economic, diplomatic, or strategic point of view.<sup>51</sup> The U.S. is not the only country able to adopt this weaponizing-interdependence strategy—the U.K., France, Germany, China, and Russia also have this ability. The U.S. however is the only country to have access to such a large amount of information.

The second strategy is to use its huge capacity to receive and transmit data at some undersea cable hubs to limit or penalize the use of these hubs to third parties.<sup>52</sup> As we saw previously, the U.K. leveraged its monopoly of the GUCN extensively so as to take strategic and military advantage over its peer-competitors by hacking or withholding information transmitted in the telegraph network. This strategy is somewhat less relevant today because the only way to implement it is to be the only country to master a technology as the U.K. did until WWI. This is hardly the case anymore, and the U.S. may use this strategy only on some countries which do not have this technology but are connected to the GUCN.

The third strategy is to use the threat of decreasing the flow of data or of filtering the data transmitted to a country unless certain economic or strategic demands are met—I would call this strategy blackmail. The U.S. could use the huge stock of data, for which there is a clear demand from other countries, as a weapon in order to have the advantage over a country in a specific economic or strategic competition. For example, suppose that Country *C* is unwilling to accept a deal with the U.S., then the U.S. could slow down internet traffic or filter the data transmitted (that is, for example, reduce the offer on streaming platforms or disrupt the activities on social medias, in collaboration with OTTs). This strategy nevertheless presents some risks. First, the disruption of the internet on a connection between Country *C* and the U.S. may not

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<sup>51</sup> This strategy is called “panopticon effect” by (Farrell, Newman 2019, 55).

<sup>52</sup> This strategy is called “chokepoint effect” by (Farrell, Newman 2019, 55–56).

only affect Country *C* only but also other countries connected to the same cables as Country *C*. Second, in the event that several cables land in the same country, it is today impossible to predict which data will be transmitted in which cable—data take the cheapest path, not the physically direct path.<sup>53</sup> This implies that it is impossible to maintain the transmission of data to the detriment of certain other data that were selected for slow down.

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<sup>53</sup> Undersea cables, as are land cables are rented by their owners such as the OTTs and telecommunications providers. Rental costs depend on the quantity of rented bandwidth and the distance traversed by data. Operators may also require an exclusive use of some optic fibers in undersea cables in exchange for their help in the supply of a cable. An example is the French operator Orange which helped Google (the only owner) and SubCom (the supplier) in installing on the French side the cable Dunant, connecting the U.S. to France. Orange has the exclusive use of two pairs of optic fibers in the cable—(Lausson 2021).

### **III. Potential challengers to U.S. hegemony**

#### **1) Introduction**

Both Russia and China are working to reshape the topology of the internet, but have different agendas as regards undersea cables with the aim of challenging U.S. hegemony. Although, state-owned digital-service provider Rostelecom, President Mikhail Oseyevsky, told Russian President Vladimir Putin, in an August 2020 meeting, that the company saw “opportunities for working on international markets”, and that “Russia can provide the simplest and most reliable method for transmitting these volumes [of internet traffic] from Europe to Asia”, the Ukraine War will probably rule out this long-term goal of laying undersea cable between Europe and Asia.<sup>54</sup> Meanwhile, the Ukraine War has raised the possibility that Russia may attempt to disrupt the GUCN as strategic retaliation. China may have a short-term agenda as regards the GUCN since it could threaten it in case of war with Taiwan, but it also has a long-term agenda in its attempt to challenge the U.S.-centric internet.

In this part, I will examine the case of Russia within the context of the Ukraine War by examining its undersea cable capabilities, and asking, why disrupting the GUCN might be a good strategy for Russia, and which strategy would be best for Russia. I will then examine the case of China by first introducing scenarios where China might sever cables around Taiwan in the event of a conflict and then by focusing on the long-term Chinese agenda dominated by competition with the U.S.

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<sup>54</sup> (Kremlin 2020).

## **2) A note on attacking undersea cable as a just cause for war**

Since some of the sections below will include the notion of cutting undersea cables, I will provide a short preliminary section on the legal framework regarding this issue. The damage inflicted on undersea cables is covered by three conventions: the 1884 Convention for the Protection of Submarine Telegraph Cables, the 1958 Convention on High Seas, and the 1982 United Nations Convention on the Law of the Sea. The 1884 Convention established that cutting an undersea cable is a “punishable offense” leading to penalties. However, this rule applies only in peacetime. The 1958 Convention replicates that of 1884 and decrees that damaging a cable requires states to “take the necessary legislative measures” to make it a “punishable offense”. The 1982 Convention replicates the 1958 convention. In a nutshell, damaging an undersea cable is an offense only in peacetime. In 2016, it was established that, in the event that a nation intentionally damages another nation’s undersea cable, severely affecting its ability to communicate, then war is a proportional response. Hence, attacks on undersea cables may well be just cause for war.<sup>55</sup>

## **3) Russia**

### **3.1 Introduction: Russia’s undersea cable capabilities**

Despite its immediate access to the Pacific Ocean, the North Sea, and the Mediterranean via the Black Sea, Russia (and, previously, the Soviet Union) has never been a major actor in the

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<sup>55</sup> (Kurtz 2016).

domain of undersea cables. The main reason is that Russia did not need to play this role. Its gigantic territory gives it easy land-access to most Asian and European countries.

Currently, there are four domestic cables in Russia and six international cables connecting Russia to Georgia, Finland, Japan, and Crimea (a part of Ukraine annexed by Russia in 2014). Contrary to controversial wisdom, the cable connecting Russia to Crimea was not severed in 2014—however, a new and more powerful cable, supplied by the Chinese HMN, was installed in 2017.<sup>56</sup> All international cables and two domestic cables, were supplied by non-Russian suppliers, mostly by HMN. The Polar Express is the spearhead of Russia’s technology in terms of undersea cables: it is a 7,860mi long cable connecting Murmansk to Vladivostok entirely across the Arctic Ocean, wholly financed by the Russian government, which will be completed in 2026, and which has a relatively powerful capacity (104 Tbs). It is manufactured by a new Russian supplier called JSC Advanced Technologies Management, which confirms that Russia has the technology to undertake ambitious undersea cable projects. Russia has at least one intelligence-collection ship, which can act as mothership to mini-sub and which is allegedly able to spy on and cut undersea cables—its name is Yantar (two sister-ships are in construction).<sup>57</sup> It is suspected that other perform in the same way.

Russia has been suspected of preparing operations which targets undersea cables at least since 2015 at least.<sup>58</sup> The Russian invasion of Ukraine, launched in 2022, has reinforced this suspicion, since Russian vessels have been periodically seen following the paths of undersea cables. In 2023, allegations were made that Russia has a program to sabotage wind farms and undersea cables in the North Sea and that such a sabotage plan, regarded as highly important by Russia, is being prepared in event of a full conflict with the West.<sup>59</sup> In April 2023, in the

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<sup>56</sup> (Datacenterdynamic 2022).

<sup>57</sup> (Peter 2018).

<sup>58</sup> (Sanger, Schmitt 2015).

<sup>59</sup> (BBC 2023).

North Sea, a BBC reporter approached the Admiral Vladimirsky, a vessel that is officially an expeditionary oceanographic ship—an underwater research vessel—but is widely believed to be spy vessel. He was confronted by a masked individual carrying a military assault rifle.<sup>60</sup>

The questions I will now attempt to answer are the following: Why are undersea cables good targets for Russia? Which cables would be the best targets for Russia? In what circumstances would Russia sever undersea cables?

### **3.2 The global undersea cable network as a potential target for Russia**

The GUCN is a good potential target for Russia for four reasons. First, as I wrote before, the GUCN is the backbone of the internet internationally transmitting thousands of terabits of data per second, including most financial data. Thus, the GUCN is also the backbone of the global economy. Repairing undersea cables is a long process: it takes three to five days once the repair ship is on site, but if the breaking point of the cable is distant and if the weather is poor—the repair ship needs to remain stationary with the cable suspended in the water—this process may take longer. This means that the disruption might entail economic consequences for the targeted countries for a sufficiently long enough period that these consequences become severe. Second, these cables are fragile infrastructures whose locations are relatively easy to determine. Russia has not only the technology to map the undersea cables but also to cut them in deep sea—cutting an undersea cable on continental shelves is easy (a fisherman’s anchor would suffice), but the vessels are also much more identifiable and the felony much easier to establish. Third, many cables, or parts thereof, are difficult to monitor constantly, which makes an aggression against this infrastructure harder to prove. Fourth, retaliation by the West could not take the form of

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<sup>60</sup> (BBC 2023).

severing Russians cables for two reasons: first, Russia has very few cables and none of these is indispensable to its economy; second, Russia aims to depend less and less on the internet and is ready for an internet blackout as the 2019 “sovereign Internet” law states: in order to prevent potential U.S. cyberattacks, Russia's government can cut off the Internet completely or from traffic outside Russia in case of emergency (this requires Internet service providers to install software that can track, filter, and reroute internet traffic).<sup>61</sup>

There are possibilities of escalation in the Ukraine War such as massive bombing of Ukrainian cities, use of tactical nuclear weapons, and use of strategic nuclear weapons. I will show that severing Western undersea cables is a further option.

Russia has so far maintained the invasion of Ukraine at the scale of a conventional war in the sense that no nuclear weapon, either strategic or tactical, has been used. Russia appears to be well aware that a limited nuclear conflict (that is a war where conventional forces are supplemented by tactical nuclear weapons, while strategic nuclear weapons are employed as a last retaliatory recourse) could easily escalate into the use of strategic nuclear weapons, as it is very hard to prevent a country that is already using tactical nuclear weapons from using strategic nuclear weapons if it is cornered to the extent that it has no other option but to use them as a last recourse.<sup>62</sup> This is why it is unlikely that tactical nuclear weapons are will be used at all, except in the scenario of a profound defeat on the Russian side. Furthermore, although the extent of bombing is quite significant in Ukraine, as for instance during the Mariupol siege, Russia has so far not used its main heavy strategic bombers (such as the Tupolev Tu-160) to massively and systematically raze all major Ukrainian cities, as took place, for example, during the Rotterdam blitz in the course of WWII, probably because this could also lead to a potential escalation of the conflict.

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<sup>61</sup> (Kennedy 2019).

<sup>62</sup> I here follow Kissinger’s definition of a limited war in (Kissinger 1961, 86–87).

Cutting Western undersea cables, which is very damaging for Western economies but not harmful in terms of the sacrifice of human lives, could represent a first step in the escalation of the Ukraine conflict before considering massive bombing or even tactical nuclear weapons. There are five scenarios where severing undersea cables could be a strategic option for Russia during the Ukraine War. First, cutting undersea cables could be a first step in the escalation of the conflict (before other steps such as massive bombing or use of tactical nuclear weapon), since it would give Russia the opportunity to severely disrupt the Western economy, in the event that Russia is being defeated on the Ukrainian battlefield, but is not yet cornered. Second, it could be retaliation in the event that Ukraine is provided with weapons of such a quality (bombers, destroyers...) or in such a quantity that Russia perceives that this might severely jeopardize its chances of success in Ukraine (whatever the term 'success' means here). Third, if NATO countries, acting independently of NATO, send troops on the battlefield.<sup>63</sup> Fourth, in the case of intense Ukrainian bombing of Russian cities, cutting Western undersea cables could represent a retaliatory action. Fifth, it could also represent the addition of a retaliatory military program in the event of a full conflict with the West.

While the GUCN is a good strategic target for Russia, severing undersea cables would present some risks. The most obvious one is that, although intentional damage to undersea cables could be hard to prove, suspicions would incline towards Russia (which is one of the rare countries to have the technology to sever a cable in deep water) and such a disruption could be viewed as a *casus bello* by the West leading to escalation of the conflict a step further in an even more dangerous and potentially nuclear conflict. The second risk is that the disruption might affect Russia's allies or Russia itself. Although sanctions against Russia have entailed the removal of Russia from the main economic framework of the globalized interdependence (such as the Swift system, which provides services related not only to the execution of financial

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<sup>63</sup> (Wintour 2023).

transactions between banks but also to deals relating to the supply of gas and oil of many Western countries), Russia remains in a state of high interdependence with certain other states (such as China), and a severe disruption of the Western economy would necessarily affect these countries and, by chain reaction, Russia itself.

### **3.3 Which cables represent the best targets for Russia?**

The question now is to determine how many and which cables should be severed by the Russians in order to seriously disrupt the Western economy. Cutting one cable, even one with a great capacity, would not represent a major disruption. Damage to undersea cables is in fact very common as this happens a hundred times per year, mostly due to the following causes. First, natural causes, namely earthquakes, tsunamis, submarine volcanic eruptions, friction on the seabed because of excessive flows, and even shark attacks. Second, inadvertent human actions represented by commercial fishing nets or anchors dragged along the seafloor. Third, intentional human actions by thieves, damaging and stealing cables for scrap—cases have been reported, notably a few in Vietnam where fishermen, scavenging for scrap copper, damaged a cable which provided the bulk of the country's connection to the internet and which significantly affected Vietnam's capacity to connect to the internet and resulted in its economy suffering the consequences for several weeks.<sup>64</sup> Suppliers and repairers are accustomed to these incidents. Furthermore, except in the case where one cable provides almost all the international data to a country, as in the case of Vietnam where fishermen damaged the cable, which is not the case of Western countries, the disruption of one cable does not imply major economic consequences, since it is possible to reroute the data traffic on other cables—traffic might be

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<sup>64</sup> (Sechrist 2010) provides a taxonomy of threats towards undersea cables. Natural threats against the GUCN are examined in (Pope, Talling, Carter 2017). Inadvertent human threats are examined in depth by (Ardelean, Minnebo 2015).

slower, but it would be maintained. However, if cables with significant capacities are cut when the network on this route consists of a few powerful cables and some less powerful cables, traffic could not be easily rerouted because the other cables would not have the capacity to carry as much data. The consequence would be a dramatic reduction in the speed of the traffic and thus a major economic crisis. For example, suppose that a given network between two countries consists of three cables with a capacity of 200Tbs and four with the capacity of 5Tbs—the network therefore carries 620Tbs of data. If the three 200Tbs cables are cut, the other four 5Tbs cables, which combined together can carry at best 20Tbs of data, would not have the capacity to carry all the remaining data at the same speed—in this case it would be 31 times slower. As of 2023, the transatlantic network and the transpacific network represent the best targets for Russia, not only because the aforementioned situation might specifically occur, but also because these are the networks where most data are transmitted. I will examine each situation.

As regards the transatlantic network, there are currently 14 undersea cables transmitting 1449.04Tbs. A closer look at the statistics shows that, in fact, 6 cables alone carry 91.87% of the data—the AEC-1 (130Tbs), the Amitie (241.2Tbs), the Dunant (300Tbs), the Grace Hopper (352Tbs), the Havfrue (108Tbs), the Marea (200Tbs). If all these 6 cables were cut at one time, the quantity of data would basically be impossible to reroute: the traffic would become extremely slow and the disruption would continue for as long as it took the cables to gradually be repaired. Satellites could not serve as an extra-router either, since their transmission capacity is far too low given the huge amount of data that would need to be carried.

As regards the transpacific network, there are currently 20 undersea cables transmitting 935.21Tbs. Two of these cables—the New Cross Pacific and the Trans-Pacific—land in China, an ally of Russia, which means that these two cables should not be cut by Russia. A closer look at the statistics shows that, in fact 6 cables alone carry 77% of data—the Echo (144Tbs), the Faster (60Tbs), the Jupiter (60Tbs), the Pacific Light Cable (144Tbs), the Southern Cross Next

(72Tbs), and the Topaz (240Tbs). As in the case of the transatlantic network, if all these 6 cables were severed at the same time, the traffic would become extremely slow for as long as it took the cable to be repaired.

Other networks might be considered, such as the Europe – East-Asia network or, the U.S.-South America network. However, attacking the Europe – East-Asia network would disrupt the connection to the internet of China, Moscow’s ally, as well as that of many Gulf countries, which have good relationships with Russia, within the framework of OPEC. Inflicting damage to the U.S.-South America network would affect access to the internet by Brazil, which is a close commercial business partner of Russia (Brazil depends to a great extent on Russian fertilizers to render its agriculture productive).

I will now examine the other potential challenger to the U.S. hegemony, namely China.

## **4) China**

### **4.1 Introduction: China’s undersea cable capabilities**

China has significant advantages in all criteria I mentioned to characterize hegemony in the undersea cable sector. First, China has an undersea cable supplier that builds and sells a great deal of undersea cable, namely Huawei Marine (HMN). Huawei Marine is a somewhat new supplier. It was established in 2008 as a joint-venture with the British undersea cable supplier, Global Marine, historically a major actor in the sector—it has a legacy of over 160 years of cable installations—which, at the time, was facing economic problems.<sup>65</sup> This cooperation and

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<sup>65</sup> (Lightwave 2008).

shared ownership favored HMN, which was able to access the skills, technology, and capabilities of Global Marine, but did not entirely rescue Global Marine which today primarily focuses on power cables and on the telecoms, oil, and deep sea research.<sup>66</sup> HMN's spearhead cable is to date a 13,360mi cable called Peace, connecting Marseille (France) to Singapore, with a capacity of 96Tbs in the Pakistan-Egypt segment and 192Tbs in the Mediterranean segment from Egypt to France, which is close to the current state-of-the-art standards of SubCom, NEC, and ASN. In the first half of 2020, HengTong Group, the leading Chinese supplier of the land-based communication network sector, completed the 81% shareholding acquisition of HMN but HMN remains an independent joint-venture entity with an independent board and management team.<sup>67</sup>

HMN has laid or is projected to lay 34 undersea cables which is 45% of SubCom's total cables, 24% of ASN's, but almost the same number of cables as NEC. The total length of the network built by HMN is 43.415mi which represents 4.99% of the length of the GUCN—SubCom's is 38.5%. In terms of capacity, as we will see, most of the cables laid by HMN are for domestic or regional purposes, and do not require high-speed technology. HMN's fleet of 12 cable-laying vessels provides installation and maintenance of cables.<sup>68</sup> China has 443 datacenters, representing a 5% share of the global total.<sup>69</sup>

China may have a vessel specialized in undersea cables.<sup>70</sup> However, I do not know whether this vessel can sever undersea cables or not. China has a class of unmanned underwater vehicles whose class-name is HSU-001. Although their actual capabilities are quite unknown, it is accepted that their purpose includes marine reconnaissance, mine warfare and

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<sup>66</sup> (Morel 2020, 225, 229, 561).

<sup>67</sup> (HMN Tech 2020).

<sup>68</sup> This also includes oil and gas cables—I was unable to determine how many vessels HMN specifically devotes to undersea cables—(Energy, oil & gas magazine 2013).

<sup>69</sup> (Cloud Scene 2023) and (Daigle 2021, 2).

<sup>70</sup> (Morel 2020, 281).

countermeasures, and undersea cable inspection, which also implies the tapping or severing of undersea cables.<sup>71</sup>

Aside from the U.S., China is therefore the only state to have strengths in all criteria of hegemony: Russia has strengths only in Criterion 6, France and Japan lacks of capabilities in Criterion 6 and their proportion are far lesser than the U.S. in Criteria 2 to 5. This does not mean however that China is today a hegemon because the Chinese network is way shorter than the U.S.'s, as we will see in 4.3, the Chinese supplier and owners build and own less strategic cables than the U.S. However, as I will introduce in this section, China has already major strengths in the undersea cable sector to be a competitor of the American hegemony.

#### **4.2 The short-term agenda: Taiwan**

In April 2023, during the major Chinese military rehearsal exercise of the encirclement of Taiwan, China was suspected of having cut the TPKM2 and the TPKM3, two undersea cables connecting mainland Taiwan to the Matsu islands—officially, fishing vessels are being held responsible for the damage. This may be part of the strategy of harassment directed at Taiwan and shows that the Chinese are well-aware of the need to control the telecommunications cables during a potential invasion of Taiwan. In response, Taiwan immediately announced the installation of two more cables.

Taiwan is a major undersea cable hub. As of 2023, Taiwan is connected to 12 cables, including 3 Taiwan-China cables, 4 intra-Asia cables, 4 transpacific cables, and one Europe – East-Asia—in 2025, it will be connected to two more intra-Asia cables and one transpacific

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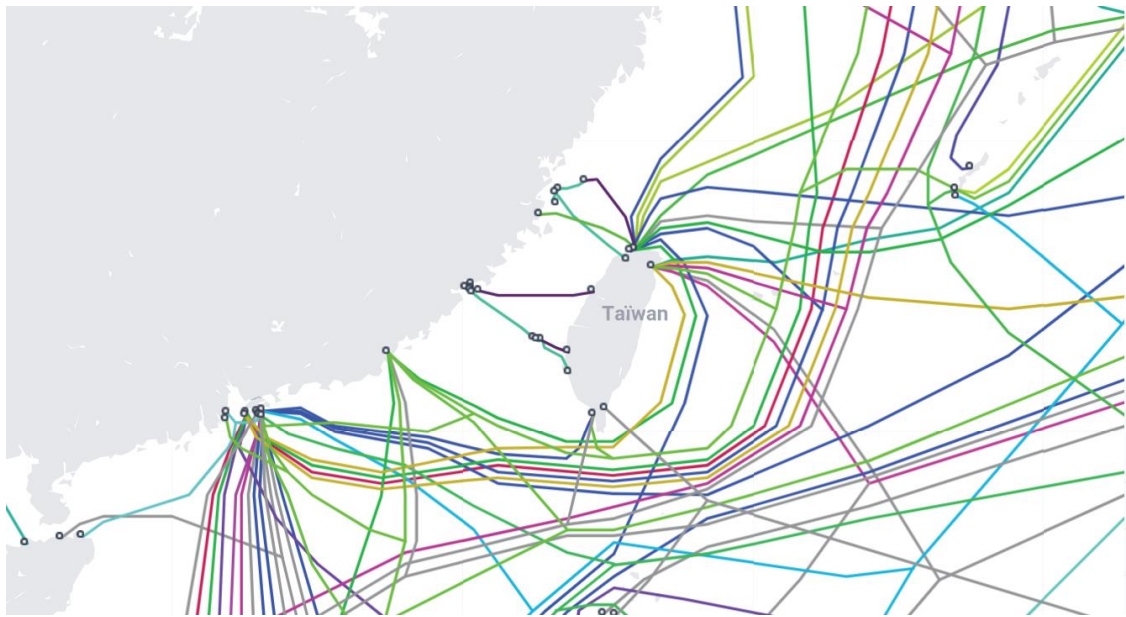
<sup>71</sup> (Fedasiuk 2021).

cable. Ten of these cables make one or more stops in China too. Only one—the TSE-1 connecting Taiwan to China—was supplied by HMN.

Isolating Taiwan from the rest of the world by cutting undersea cables is clearly good strategy in the event of invasion: Taiwan is an island and would have to depend on satellites to provide essential communication but its economy would be severely disrupted. Estimates show that the cost of such a disruption would be \$1.69 billion per month, although the cost would escalate over time and the amount might be much higher.<sup>72</sup> However, if the Chinese, in the event of a Taiwan War, only cut the undersea cables around Taiwan following the topology of the island, the disruption would not necessarily lead to an extreme economic crisis—an almost total shutdown of the Western economy, as in the above mentioned cases regarding Russia but rather to a major crisis. This is because, although Taiwan is primarily the final destination of the transpacific cable, data would still be transmitted from the U.S. to Japan, South Korea, and China. The crisis would still be a major one because it would severely affect the regional economy, since Taiwan is an important node for intra-Asia cables. Thus, the economic crisis would primarily stem from the disruption of data transmission in East-Asia and between the U.S. and Taiwan.

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<sup>72</sup> (McDaniel, Zhong 2022, 7).



**Figure 16: Taiwan's hubs.<sup>73</sup>**

Such action by China would nevertheless involve the same risks of escalation as in the above-mentioned case of Russia. First, cutting these cables might be regarded as a *casus bello* by other belligerents, especially the U.S., resulting in a war between the two nuclear-armed superpowers. As of 2023, 5 cables connecting Taiwan are supplied by SubCom, 3 by ASN, 7 by NEC, and only one by HMN. Furthermore, 8 are owned or co-owned by American companies (and 9 by Chinese companies). Some cables, such as the PLCN, and in the near future, the Apricot and the TPU, represent a huge investment for American OTTs and cutting these might severely affect the U.S.'s ability to communicate, and this is why then war could a proportional response.

The second risk is that the disruption might affect China's allies or China itself. China is very interdependent with other states, primarily the U.S. and the E.U., but also its neighbors in Asia. Furthermore, a severe disruption of the Western economy would necessarily affect these countries and also, by chain reaction, China itself. Thus, in the scenario where China cut

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<sup>73</sup> (Telegeography 2023).

undersea cables around Taiwan, China would be ready to risk the disruption of its economic ties with some of its main commercial partners. There are here two cases. First, China would engage in new economic alliances less dependent on the Westerns countries, which would involve a profound redistribution of political and economic alliances. Second, China would assume provisional policy based on autarky during a conflict with Taiwan.

Another even worse scenario would be that China would not only cut the cables around Taiwan but also the transatlantic or transpacific cables, as in the previous Russian scenario. This scenario, which would very likely lead to a war between the U.S. and China, is in fact similar to the one that occurred during WWI when, because of the outbreak of war, states decided to break up the global interdependence represented and made possible by undersea cables into two blocs, each with its own economic interdependence. However, given the gravity of its aftermath, this scenario is unlikely.

### **4.3 The long-term agenda: challenging U.S. hegemony**

As regards the long-term Chinese strategy relating to undersea cables, China may increase its influence by means of its supplier—HMN—and its state-owned or state-controlled cable owners.

There are two ways in which HMN could help China increase its influence. The first is by installing backdoor spying equipment. The second is by extending the Chinese-supplied network. This could be done by following four courses of actions. First, by increasing the Chinese network in East-Asia: so far, HMN has built 15 cables in this region. Second, by building cables beyond East-Asia: HMN has, for example, built seven domestic cables in Africa and four cables in South America. Third, by helping some BRICS countries to reduce their

dependence on the powerful American cable network by circumventing American territory and thus diminishing the U.S. position as the center and hegemon of the global internet.<sup>74</sup> The first cable built by HMN was the Sail (South Atlantic Inter Link) between Brazil and Cameroon, laid in 2020 and owned by an American and a Chinese telecommunications company. Officially, the purpose of this cable was to save time in the transfer of data between South America and Africa since the data would not have to first be carried to the U.S.;<sup>75</sup> (iv) By attempting to lay strategic undersea cables: HMN's main achievement here is Peace connecting Marseille (France) to Singapore.

However, many countries are unlikely to agree to be connected to cables supplied by HMN, since they fear the possibility that the data transmitted could be spied upon. The U.S. has an informal organization specifically dedicated to the inspection of projects for international communication cables, namely the Committee for the Assessment of Foreign Participation in the United States Telecommunications Services Sector, formerly and more commonly called Team Telecom. In 2013, Team Telecom suspected potential foreign espionage by the Chinese supplier HMN and cancelled the Hibernia Express project, a state-of-the-art cable connecting the New York and London stock exchanges—it was eventually successfully completed by SubCom.<sup>76</sup> Another similar case occurred in Australia, which ultimately removed HMN from the construction of a cable between Sydney and the Solomon Islands as it suspected the equipment would provide opportunities for foreign espionage.<sup>77</sup> In 2022, the completion of Peace, a Europe–East-Asia cable, connecting Marseille (France) to Singapore and supplied by

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<sup>74</sup> A first step in this process was the cable EllaLink, funded mostly by the E.U. and supplied by the French ASN, connecting Brazil directly to Europe without first going to the U.S. Originally, it was a mere scientific cable transmitting the data produced by the astronomic observatory in Chili to Europe, and the project was not supposed to implement any political motives. However, in 2014, the Brazilian President Dilma Rousseff chose to use this cable project as evidence of Brazil's intent to reduce its dependency on U.S. influence.

<sup>75</sup> Interview with an anonymous Huawei representative in (Morel 2020, 561).

<sup>76</sup> (Buckley, 2013).

<sup>77</sup> (Perper, 2019).

HMN, raised concerns in the U.S.<sup>78</sup> At the same time, HMN and SubCom were competing in the deal for the Sea-Me-We-6, connecting Marseilles, France, to Singapore. HMN’s offer was \$200 million below SubCom’s. Team Telecom forced the American supplier SubCom to match HMN’s offer (thus accepting a loss of \$200 million), and forced Singtel, the main partner of the consortium which owned the cable, to choose SubCom as the supplier—SubCom could not refuse to because it would have jeopardized its deal for the construction of undersea cables for the Department of Defense.<sup>79</sup> President Biden immediately thereafter announced that the U.S. has committed to provide \$200 million to the project over the next five years through grants, federal financing, and leveraging of private sector investments.

As I set forth above in the case of the U.S., states may use telecommunication providers and undersea cable owners to spy on data, either by requiring that they share the data, or by mandating the installation of monitoring equipment or backdoors. China has three state-owned telecommunication providers, China Telecom, China Mobile, and China Unicom, and two state-controlled providers, CITIC Telecom International and CTM. Combined, they own 43 shares in 27 different undersea cables—two providers are sole-owners of four short domestic cables:

| <b>Company</b> | <b>Number of sole-owned cables</b> | <b>Number of co-owned cables</b> |
|----------------|------------------------------------|----------------------------------|
| China Mobile   | 1                                  | 11                               |
| China Telecom  | 3                                  | 18                               |
| China Unicom   | 0                                  | 13                               |
| CITIC          | 0                                  | 1                                |
| CTM            | 0                                  | 1                                |

**Figure 17: Ownership of Chinese companies**

These Chinese companies have shares in four cables connecting Europe to East-Asia, four transpacific cables, six cables connecting to Japan, South Korea, or Singapore, and two cables

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<sup>78</sup> (Fouquet 2021).  
<sup>79</sup> (Brock 2023a) and (Tagare 2022).

to Europe. Many of the investments made by China Telecom, China Mobile, and China Unicom concern cables with no landing station in China. This should not necessarily be interpreted as the will by Beijing to spy abroad by means of its telecommunication companies and most of these shares in cables abroad are simply economic investments.<sup>80</sup>

However, the potentiality is being advanced increasingly that the Chinese government might spy by means of state-owned or state-controlled companies. In 2019, Team Telecom decided that the Chinese companies which, together with Google and Facebook, were in charge of implementing the PLCN, connecting the U.S. to Taiwan via the Philippines and Hong Kong, was a potential security threat to the U.S. The license was eventually granted to Google and Facebook with no ownership or control by a Chinese entity, and the cable has no connection with Hong Kong.<sup>81</sup>

#### **4.4 Is China a serious threat to U.S. hegemony?**

China is a very recent actor in the undersea cable sector and up to now still places behind the U.S., Japan, and France, the main competitors in this sector. However, many features may favor China in the near future. First, China is catching up in terms of technology and will soon be able to produce state-of-the-art cables similar those of the U.S.'s, Japan's, and France's. Second, the development of Chinese influence in the undersea cable sector is a major part of the Digital Silk Road. The Digital Silk Road is part of the Belt and Road Initiative which is a global infrastructure development strategy to invest in more than 150 countries and organizations. The purpose of the Digital Silk Road is to provide an alternative to U.S. information and communications technology by investing in foreign telecommunications

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<sup>80</sup> (Sherman 2021, 14).

<sup>81</sup> (Harris, 2020).

networks, AI, cloud computing, and surveillance capabilities. As regards undersea cables, the aim is to erode U.S., European, and Japanese dominance, to break up the U.S.-centric internet and to create new strategic undersea cable routes centered on China.<sup>82</sup> Chinese investment in undersea cables within the framework of the Digital Silk Road is huge—estimates indicate at least \$7 billion in loans and direct foreign investment was completed between 2013 and 2019.<sup>83</sup>

There are some factors, however, that might restrict these ambitions. First, the GUCN is primarily a concretization of global need in terms of data: the transatlantic and the transpacific networks have been developed primarily because the Europeans and East-Asians (especially the Japanese and the South Koreans) need data stocked in datacenters localized in the U.S. (and also because the U.S. needs to sell this data), but also because the international economic and financial traffic of data is the greatest on these particular routes. Thus, if China aspires to compete with the U.S. in the undersea cable sector, it will first have to become an unavoidable economic center with an unavoidable stock exchange, but it will also have to produce similar data as the U.S. (such as the content produced by the OTTs), create an interest in these data, and sell these data. In fact, China is already trying to do so as the launch of TikTok, which soon became very popular, is an attempt to challenge the American OTTs. TikTok also attracted disapproval as regards user privacy, misinformation, and addiction to the extent that many Western countries are starting to ban it from governmental devices, and are started thinking of banning it outright.

Second, while Europe appears to be more accommodating as regards connection with cables built by HMN, as shown by the existence of the Peace cable in Cyprus, Malta, and France, this will be viewed by the U.S. as an attempt to usurp their position at the center of the

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<sup>82</sup> (Burdette 2021).

<sup>83</sup> (Eder, Arcesati, Mardell 2019).

GUCN and the internet, and the U.S. will certainly put pressure in the near future on the Europeans to prevent cables being built by Chinese suppliers or owned by Chinese companies.

Third, India, a competitor of China, is viewing China's growth in the undersea sector with growing anxiety. India itself is increasingly interested in undersea cable infrastructure. Firstly, India wishes to connect every part of the country, including small islands, in order to improve internet access. Secondly, India's major telecommunications companies wish to expand globally by means of undersea cables, and two projects are particularly important: a cable connecting India with Asia-Pacific countries, and one connecting India with Europe via the Middle East and North Africa.<sup>84</sup> India has received massive investments from American OTTs and from the Japanese NTT to create datacenters in the country.<sup>85</sup> Thus, India appears reluctant to have HMN-built cables on its soil: while all Europe – East-Asia cables make a stop in India, the HMN-supplied Peace does not, and in the case of the Sea-Me-We-6, which saw HMN replaced by SubCom at a loss, the company with some shares in the cable, Bhart Airtel, appeared to have been pressured by the Government of India to take HMN off the table fearing the risk of potential U.S. retaliation.<sup>86</sup>

Lastly, competition with the U.S. supplier and companies is unlikely to be easy. Estimates show that, while OTTs consumed 6.3% of total international cable capacity in 2010 and by 2021, that number had climbed to 69%, it is expected that the number will increase again to 78% by 2027.<sup>87</sup> One could argue, however, that a look at the way in which OTTs own cables complicates the picture, as they tend to invest in consortia, which could be interpreted as evidence that the core material infrastructure of the internet is becoming more plentiful outside

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<sup>84</sup> (Sharma 2023).

<sup>85</sup> (Press Trust of India 2022).

<sup>86</sup> (Brock 2023a).

<sup>87</sup> (Blum, Baraka 2022) based on Telegeography's predictions.

of, and less dependent on, the U.S., since U.S.-based internet companies, though important, are becoming subordinate players in consortia of state-owned national carriers.<sup>88</sup>

I will examine this point. A consortium is a joint ownership property deal used by companies to define certain rules of investment, the distribution of the costs of construction of undersea cable, the choice of landing points... The consortium model of investment has the advantage of reducing construction and operating expenses for the associated companies. While customary until the 2000s, this model of investment was challenged by a different model, namely the private cable model. With the rise of the internet, new actors anticipating a greater demand in data carriage capacity, invested massively in undersea cables in order to resell capacity on their cables anywhere along their network to anyone who wanted to use it. However, the overcapacity thus produced resulted a severe decrease in price, and most companies that owned private cables went bankrupt.<sup>89</sup> Subsequently, owners again created consortia to own undersea cables, especially the OTTs, which took their first steps in this economic sector by building consortia with local telecommunication actors.<sup>90</sup>

The OTTs are nevertheless unlikely to continue to invest in large consortia as before. The most recent and upcoming projects point to two kinds of economic model. The first is mini-consortia, called “club-cables”, mostly formed between OTTs. For example, the four Transpacific cables are either owned by mini-consortia between Facebook and Google—as was the case of the PCLN and the Echo—or between Amazon and Facebook—as was the case of the Jupiter and the Cap1. The second model of investment is a consortium between OTTs and local telecommunications operators, which are stakeholders in the cable but mostly manage

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<sup>88</sup> This is an argument held by Winseck in (Winseck 2017, 255 and 261).

<sup>89</sup> A typical example was the bankruptcy of Global Crossing, a multinational telecommunications provider, which was, a major independent owner and operator of undersea cables and land-based network at the end of the 1990s, at that time the fourth-largest provider in U.S. history and which declared bankruptcy in 2001.

<sup>90</sup> Examples of these are the Asia Pacific Gateway, the Indigo-West, the Southeast Asia Japan Cable, the Unity, and the Hawaiiki cables—(Report Telegeography 2017).

administrative tasks at cable landing points. For example, Facebook and Google associated the Spanish operator Telxius with the transatlantic cable Marea project, which lands in Spain, and Google associated the French operator Orange with the project of the transatlantic cable Dunant, which lands in France.

I think that, in the future, the choice of investment model will be considered on a case-by-case basis. A few patterns may be noted. The very long cables connecting many countries together, such as the SeaMeWe-5, connecting Marseille (France) to Singapore via 15 countries, are likely to be owned in the future by large consortia of local telecommunications providers, which might include OTTs, simply because the countries hosting the cable may also wish to have a share in the cable. There are exceptions. For example, the Equiano cable connecting Portugal to South Africa, and linking six countries, was originally supposed to be owned by Google within the framework of a consortium including various African operators. However, the negotiations failed and Google eventually became the sole owner of the cable.<sup>91</sup> This pattern is not repeated with the nine most recent cables connecting only a few countries, such as the transatlantic and transpacific cables, where the OTTs have some shares in the ownership. Of these, three are owned by one OTT only<sup>92</sup>, three are owned by a consortium of two OTT companies<sup>93</sup>, two are owned by a consortium of two OTTs and a few other telecommunication providers<sup>94</sup>, and one is owned by one OTT company within a small consortium of a few telecommunication providers.

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<sup>91</sup> (Sokol 2019) and (Hartling 2019).

<sup>92</sup> The Dunant, the Grace Hopper, and the Topaz.

<sup>93</sup> The Pacific Light Cable, the Echo, and the Cap1.

<sup>94</sup> The Havfrue and the Amitie.

## General Conclusion

The purpose of this thesis is to understand the strategic importance of the GUCN, which is the backbone of the internet and hence of contemporary numeric-based civilization, since it carries 99% of all transoceanic communications. My research question is: How does the U.S., the hegemon over the GUCN, maximize its power and interests by leveraging the GUCN, and are China or Russia threats to American hegemony over the GUCN?

My argument consists of three parts. In the first historical and theoretical part, I have shown that the history of the GUCN demonstrates that the GUCN itself is an anarchical environment, as there is no global governance, and great-power competition prevails. History shows that great powers have leveraged the GUCN to maximize their power, their security, and their prosperity, and continue to do so. Throughout the history of this sector, great powers have behaved as hegemony-seekers in this sector, spied on their enemies, competitors, and allies so as to gain better information about their intentions, hacked cables to disrupt competitors' domestic politics, and considered the GUCN as a potential target so as to disrupt other economies.

In the second part, I have shown that the U.S. is the current hegemon over the GUCN (and at the center of it) for eight reasons. First, it has an undersea cable supplier (SubCom) able to build reliable and state-of-the-art undersea cables. Second, SubCom sells many undersea cables including the majority of strategic cables (transatlantic, transpacific, and Europe – East-Asia cables). Third, the OTTs own or co-own the majority of strategic undersea cables which represents most of the capacity of the GUCN. Fourth, the vast majority of all the data in the world will go to or pass through the many datacenters situated on American soil. Fifth, the U.S. has intelligence programs designed for espionage by means of these undersea cables and has

access to almost any communication in the world. Sixth, the U.S. has vessels specifically designed to cut undersea cables in deep water. Seventh, the U.S. has one of the longest networks in the world (almost on a par with the longest in fact). Eighth, it also has a large flotilla of vessels to lay or repair cables. Thanks to its hegemony, the U.S. is also in a position to weaponize interdependence by means of its hegemony over the GUCN.

In the third part, I have pointed out that some states are potential challengers of American hegemony. Although Russia is unable to challenge the U.S. in the long term, there are scenarios within the context of the Ukraine War where Russia could consider certain undersea cables, especially the transatlantic and the transpacific, as potential targets. China might consider cutting undersea cables connecting Taiwan to the rest of the world in the event of a war with Taiwan as a short-term agenda with regard to undersea cables. Its long-term agenda will be to challenge U.S. hegemony by developing its network, by challenging the U.S.-centric internet, and by creating new strategic undersea cable routes centered on China. Although I have noted some factors that might restrict its ambitions, China is likely to become a major actor in the domain of undersea cables in the future, which could represent a threat to the U.S. in terms of security, e.g. espionage and possibly sabotage.

I have listed below some practical recommendations to be implemented by the U.S. in order to address these threats, from both Russia and China:

1. The U.S. should implement legislation covering attacks on American owned or co-owned undersea cables, considering that damage to an undersea cable is a possible just cause for war when the damage is intentional and is inflicted by a nation.
2. The U.S. should authorize the Committee for the Assessment of Foreign Participation in the United States Telecommunications Services Sector (Team Telecom) and provide

it with funding and a formal structure to better screen foreign telecoms that own cables.<sup>95</sup>

3. The U.S. should adopt a combination of militaristic and competitive responses to potential threats, i.e. utilize force and new technologies to ensure cable security and invest in a U.S.-backed global cable network.<sup>96</sup>
4. The U.S. should coordinate its armed forces in the use of satellites to observe and track vessels which inappropriately follow the route of strategic cables, particularly transatlantic and transpacific cables, in order to summon naval forces which would be able to intercept such vessels.
5. The U.S. should promote the use and improvement by its armed forces of underwater drones, such as the Norwegian Hugin Superior used in October 2022 by the French Navy, which organized a seabed surveillance operation, named Calliope, employing this capability to monitor the ocean floor.<sup>97</sup>
6. The U.S. should promote the use of sensors on undersea cables to detect abnormal movement of the seabed close to the undersea cables. The data provided by these sensors can also be used for scientific purposes such as the detection of submarine earthquake and volcanic eruptions.<sup>98</sup>
7. The U.S. Congress should require the OTTs to publish strategies for protecting the security and the resilience of their undersea cables because, given their direct ownership stake and the profit they make, the owners have a greater responsibility to protect the security of undersea cables.<sup>99</sup>

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<sup>95</sup> I agree with (Sherman 2021, 25).

<sup>96</sup> I agree with (Burdette 2022).

<sup>97</sup> (SeaWaves Press 2022).

<sup>98</sup> (Landers 2022).

<sup>99</sup> (Sherman 2021, 28).

There are of course limitations to the research I have undertaken and overcoming them would represent interesting venues for future research. First, some data as regards the capacity or the name of the supplier or owners of some cables are unavailable and the conclusions I draw are based on the information I was able to find.

Second, I have focused my research on the examination of the GUCN. This network is, however, connected necessarily to the land-based network of each country connected to the GUCN, and a better understanding of the GUCN might also need to be based on an examination of the land-based network. For example, the fact that HengTong, the leading Chinese supplier of the land-based communication network sector, completed the majority of the shareholding acquisition of HMN under the supervision of the Chinese state shows not only Beijing's will to improve HMN's image after many suspicions of spying it faced from Western countries, and primarily from the U.S. It also shows China's intentions to make the undersea and land-based networks closely interrelated and centralized which might lead to economies of scale by diminishing the number of actors in the production of cables and networks. France is considering a similar fusion of its main land-based cable supplier—Orange—and its undersea cable supplier—ASN.<sup>100</sup>

Third, as I mentioned in Part I, Section 6, I have not found much information about how effective cutting the Japanese and the U.S. networks was during WWII and how important this “undersea-cable war” may have mattered during WWII. As regards Japan, although the Japanese manufacturer, NEC is one of the leading companies in the world, and despite Japan's strategic geographical position, between China and the U.S., and although it represents a major hub for the location of many undersea cables, the geopolitics of Japan with regard to undersea

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<sup>100</sup> (Serrano 2019).

cables is seldom examined in the literature and would represent an interesting venue for future research.

Fourth, I have seldom considered the E.U. as an actor in the undersea cable sector, primarily because the E.U. does not act in this sector as a state—there is no real uniformized governance at the scale of the E.U. as regards undersea cables, and no plan to have a European supplier of undersea cables, or for the E.U. to be an undersea cable owner. However, the E.U. faces several challenges to its digital sovereignty. The first of these challenges is the improvement of its regulations to protect the personal data of its citizens, especially the data carried outside the E.U. A second challenge is the creation of datacenters within E.U. territory designed to store some of the content that is currently stored in datacenters in the U.S. So far, it seems that the U.S. weaponizes its interdependence with the E.U., as described in Part II, Section 3, so as not to give the E.U. the data that the U.S. stores and “sells” to European countries.

Fifth, the way in which China can spy by means of undersea cables is quite unknown. Although there are suspicions that Chinese intelligence services operate in the same way as the American services described in Part II, Section 2, most of the information related to this subject is classified.

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# Annex 1: Glossary of acronyms and technical terms

**ASN:** Alcatel Submarine Networks—France’s undersea cable supplier<sup>101</sup>

**AT&T:** American Telephone and Telegraph Company—an American multinational telecommunications

**Bit:** Binary Digit—the most basic unit of information in computing and digital communications corporation

**Gbs:** Gigabit per second (billion of bits per second)

**GUCN:** Global undersea cable network

**HMN Tech:** Huawei Marine Networks—China’s undersea cable supplier

**OTT:** Over-the-top media service companies offering directly-to-viewers content. In this thesis, OTT will refer to Google, Facebook (Meta), Microsoft, and Amazon.

**NEC:** Nippon Electrical Corporation—Japan’s undersea cable supplier

**SubCom:** The U.S.’s undersea cable supplier

**Tbs:** Terabit per second (trillion of bits per second)—1,000Gbs

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<sup>101</sup> In 2016, ASN, the historic French undersea cable company, was bought by Nokia (Finland). Its headquarters, factories, and harbors remain in France and the CEO is French. The French state seeks to rebuy ASN by rebecoming a major shareholder again and by including Orange Marine in the share.

## **Annex 2: First messages transmitted by a transatlantic undersea cable**

*Queen Victoria to President James Buchanan—August 5<sup>th</sup> 1858*

To the President of the United States, Washington -

The Queen desires to congratulate the President upon the successful completion of this great international work, in which the Queen has taken the deepest interest.

The Queen is convinced that the President will join with her in fervently hoping that the electric cable which now connects Great Britain with the United States will prove an additional link between the nations, whose friendship is founded upon their common interest and reciprocal esteem.

The Queen has much pleasure in thus communicating with the President, and renewing to him her wishes for the prosperity of the United States.

*The response of James Buchanan to Queen Victoria—August 10<sup>th</sup> 1858*

Washington City, August 10<sup>th</sup> 1858

To her Majesty, Victoria, the Queen of Great Britain

The President cordially reciprocates the congratulations of her Majesty the Queen, on the success of the great international enterprise accomplished by the science, skill and indomitable energy of the two countries.

It is a triumph more glorious, because far more useful to mankind, than was ever won by conqueror on the field of battle.

May the Atlantic telegraph, under the blessing of Heaven, prove to be a bond of perpetual peace and friendship between the kindred nations, and an instrument destined by Divine Providence to diffuse religion, civilization, liberty and law throughout the world.

In this view, will not all nations of Christendom spontaneously unite in the declaration that it shall be for ever neutral, and that its communication shall be held sacred in passing to their places of destination, even in the midst of hostilities?

## Annex 3: Fiber-optic cables and their installation

Two kinds of cables are laid on the seabed: undersea power cables and undersea telecommunication cables. An undersea power cable is a transmission cable carrying electric power below the surface of fresh or salt water. An undersea communications cable is one whose purpose is to carry telecommunication signals and data across oceans and seas.

Since the 1980s, undersea cables have been made of optic fiber encased in a multi-layer water-barrier sheath. Modern cables are typically about one inch in diameter (like a garden hose) and weigh around 2,2 long tons per mile. Below is a representation of the parts of an undersea cable:

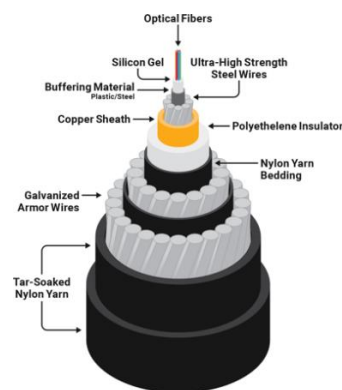


Figure 1: Parts of an undersea cable.<sup>102</sup>

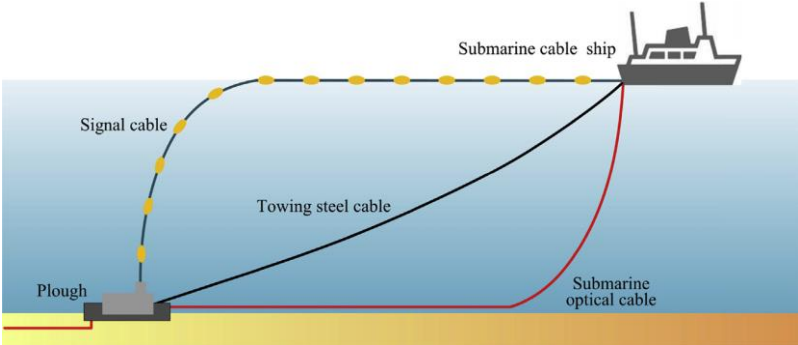
Undersea cables are laid on the seabed between terminal stations on land, which are usually located in the vicinity of the landing point and which house all equipment specific to a given undersea cable and the ancillary equipment used for the operation of undersea cables (terminal transmission requirement, power feeding equipment, maintenance controller). A undersea cable system is a set of equipment designed to allow the interconnection of two or

---

<sup>102</sup> (TeleGeography, FAQ 2022).

more terminal stations. It is usually composed of terminal equipment (terminal transmission equipment, power feeding equipment and a maintenance controller) and submersible equipment (cable, repeaters, branching units, gain equalizers). An undersea cable network is a network which interconnects three or more terminal stations using a single undersea cable system.<sup>103</sup>

Undersea cables are installed on the seabed by means of a specific type of vessel. When there is no issue with the topography of the seabed, the cable is simply uncoiled on the seabed. When the topography is steeper, the vessel uses a plough to dig an undersea trench to protect the cable beneath sediment. The cable is then uncoiled in the trench following the furrow of the plough. Repeaters are placed every 30-60mi to amplify signals. A transatlantic cable requires 70 repeaters to be able to carry the signal from one side of ocean to the other.



**Figure 2: Scheme of an undersea cable installation.**<sup>104</sup>

<sup>103</sup> (ITU 2020, p.2).

<sup>104</sup> (Ye, Jiang, Pan, Jiang 2018, 188).

# Annex 4: Undersea cable map

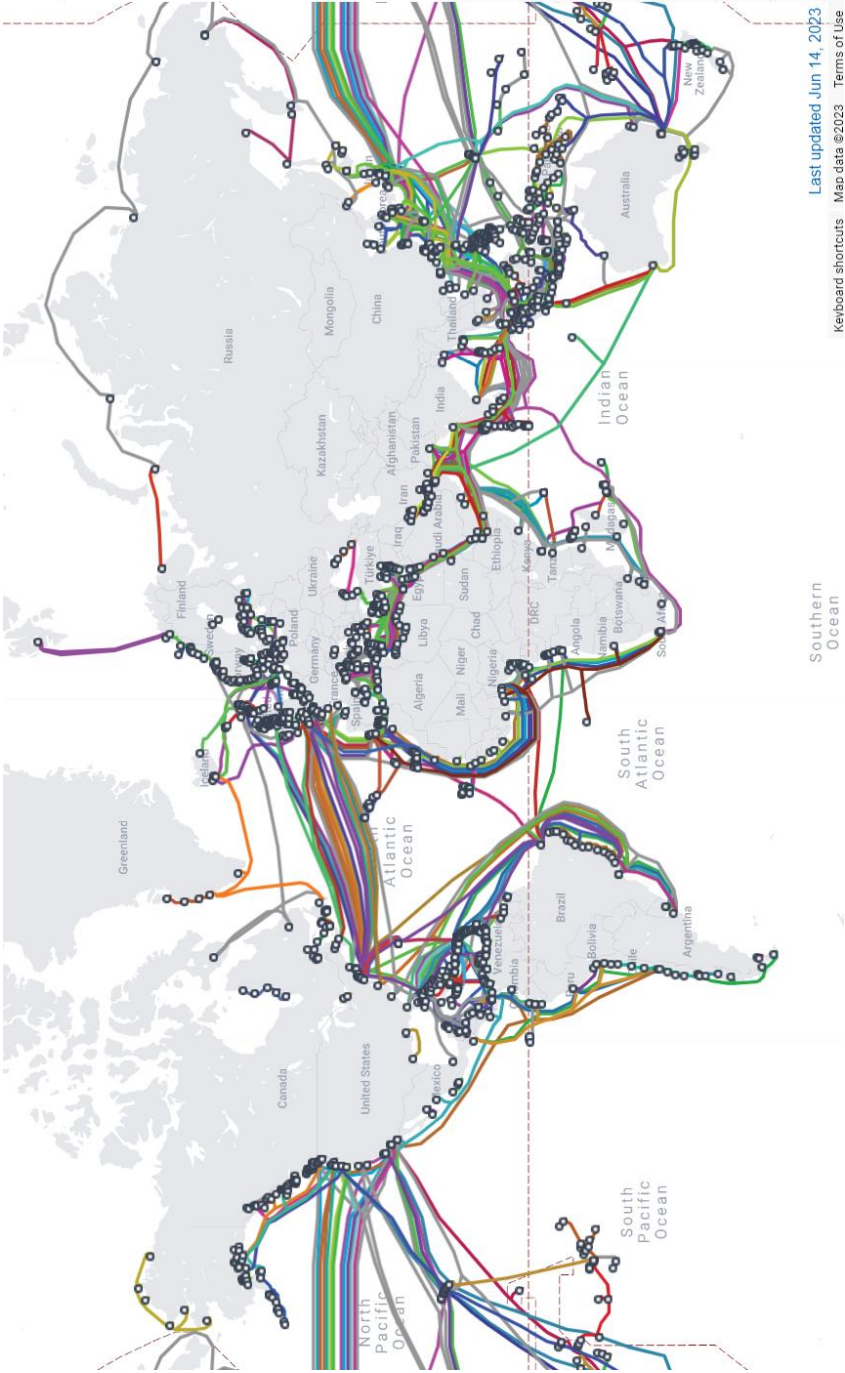


Figure 3: Undersea cable map.<sup>105</sup>

<sup>105</sup> (Telegeography 2023).

## Annex 5: Table of all undersea cables

This table presents all undersea cables ready for service in 2026 with their names, length (in miles), owners, suppliers, and final landing points (by convention, one is taken to be the starting point and another the ending point). Some cables present many ‘ending points’. For example, 2Africa may be said to end in Barcelona (Spain), Marseille (France), Mumbai (India), or Kuwait City (Kuwait). In this case, the ending point is primarily conventional and chosen to provide an idea of the general contour of the cable—here a cable closely following the contour of the African continent. All data have been collected on (TeleGeography 2023), a telecommunication market research and consulting firm. A ‘\_’ means that I have not found the information or that the information is not yet available. ‘Meta’ is the new name of Facebook, Inc, which owns Facebook, Instagram, and WhatsApp among other products and services.

| <b>Undersea Cable</b>             | <b>Cable Length (mi)</b> | <b>Owners</b>  | <b>Suppliers</b> | <b>Starting Point</b> | <b>Arrival Point</b> |
|-----------------------------------|--------------------------|--|------------------|-----------------------|----------------------|
| 2Africa                           | 27,963                   | China Mobile, MTN, Meta, Orange, Saudi Telecom, Telecom Egypt, Vodafone, WIOCC   | ASN              | Bude, UK              | Barcelona, Spain     |
| ACS Alaska-Oregon Network (AKORN) | 1,864                    | Alaska Communications  | SubCom           | Florence, OR          | Anchorage, AK        |
| Aden-Djibouti                     | 167                      | Djibouti Telecom, Orange, Tata Communications, TeleYemen, Telecom Italia Sparkle | ASN              | Djibouti              | Aden                 |
| Adria-1                           | 273                      | ALBtelecom, Hrvatski Telekom   | ASN              | Dubrovnik, Croatia    | Corfu, Greece        |

|  |        |   |        |                                    |                                    |
|--|--------|---|--------|------------------------------------|------------------------------------|
| AEC-1                                    | 3,431  | Aqua Comms  | SubCom | Killala,<br>Ireland                | Shirley, NY                        |
| Africa-1                                 | 6,214  | Etisalat UAE,<br>G42, Mobily,<br>Pakistan<br>Telecommunicatio<br>ns Company Ltd.,<br>Telecom Egypt  | ASN    | Marseille,<br>France               | Karachi                            |
| Africa Coast<br>to Europe<br>(ACE)       | 10,564 | Benin ACE GIE,<br>Cable Consortium<br>of Liberia,<br>Canalink, Dolphin<br>Telecom,<br>GUILAB, Gambia<br>Submarine Cable<br>Company,<br>International<br>Mauritania<br>Telecom, MTN,<br>Orange, Orange<br>Cameroun, Orange<br>Cote d'Ivoire,<br>Orange Mali,<br>Republic of<br>Cameroon,<br>Republic of<br>Equatorial Guinea,<br>Republic of<br>Gabon, Republic<br>of Guinea Bissau,<br>STP Cabo, Sierra<br>Leone Cable<br>Company, Sonatel,<br>Zamani Telecom | ASN    | Penmarch,<br>France                | Duynfontein,<br>South Africa       |
| Alaska United<br>East (AU-<br>East)      | 2,331  | GCI<br>Communication<br>Corp  | SubCom | Lynnwood,<br>WA                    | Valdez, AK,                        |
| Alaska United<br>Southeast<br>(AU-SE)    | 389    | GCI<br>Communication<br>Corp  | SubCom | Ketchikan,<br>AK                   | Sitka, AK,                         |
| Alaska United<br>Turnagain<br>Arm (AUTA) | 33     | GCI<br>Communication<br>Corp  | -      | McHugh<br>Point, AK                | Portage, AK                        |
| Alaska United<br>West (AU-<br>West)      | 1,544  | GCI<br>Communication<br>Corp  | NEC    | Ketchikan,<br>AK, United<br>States | Warrenton,<br>OR, United<br>States |
| ALBA-1                                   | 1,156  | Telecom<br>Venezuela,<br>Transbit   | ASN    | La Guaira,<br>Venezuela            | Ocho Rios,<br>Jamaica              |

|   |        |   |         |  |  |
|---|--------|---|---------|--|--|
| Aletar  | 489    | Liban Telecom,<br>Syrian<br>Telecommunicatio<br>ns Establishment,<br>Telecom Egypt  | ASN     | Alexandria,<br>Egypt                       | Tartous, Syria                         |
| Almería-<br>Melilla<br>(ALME)                                 | 123    | Telefonica  | Nexans  | Almería,<br>Spain                          | Melilla, Spain                         |
| Alonso de<br>Ojeda  | 80     | -   | ASN     | Baby Beach,<br>Aruba                       | Willemstad,<br>Curaçao                 |
| ALPAL-2   | 194    | Algerie Telecom,<br>Orange, Telecom<br>Italia Sparkle,<br>Telxius   | Pirelli | El Djamila,<br>Algeria                     | Ses Covetes,<br>Spain                  |
| America<br>Movil<br>Submarine<br>Cable<br>System-1<br>(AMX-1) | 11,061 | América Móvil<br>(Claro)  | ASN     | Jacksonville,<br>FL, United<br>States      | Rio de<br>Janeiro,<br>Brazil           |
| Americas-I<br>North   | 1,250  | AT&T  | SubCom  | Vero Beach,<br>FL, United<br>States        | Magen's Bay,<br>VI, US                 |
| Americas-II   | 5,203  | AT&T, Altice<br>Portugal, C&W<br>Networks,<br>CANTV,<br>Corporacion<br>Nacional de<br>Telecomunicacion<br>es (CNT),<br>Embratel, Lumen,<br>Orange, T-Mobile,<br>Tata<br>Communications,<br>Telecom Italia<br>Sparkle, Verizon | SubCom  | Hollywood,<br>FL, United<br>States         | Fortaleza,<br>Brazil                   |
| Amerigo<br>Vespucci   | 53     | Antelecom   | ASN     | Willemstad,<br>Curaçao                     | Kralendijk,<br>Bonaire,<br>Netherlands |
| Amitie  | 4,221  | Aqua Comms,<br>Meta, Microsoft,<br>Orange, Vodafone   | ASN     | Le Porge,<br>France                        | Lynn, MA,<br>United States             |
| Antillas 1  | 404    | AT&T, C&W<br>Networks,<br>Embratel, Orange,<br>T-Mobile, Tata<br>Communications,<br>Telecom Italia<br>Sparkle, Verizon  | SubCom  | Santo<br>Domingo,<br>Dominican<br>Republic | Isla Verde,<br>PR, United<br>States    |

|                      |        |  |        |                                      |                                      |
|----------------------|--------|--|--------|--------------------------------------|--------------------------------------|
| APCN-2               | 11,807 | AT&T, BT, China Telecom, China Unicom, Chunghwa Telecom, HKBN Enterprise Solutions, KDDI, KT, LG Uplus, NTT, Orange, PCCW, PLDT, Singtel, Singtel Optus, Softbank Corp, Starhub, Tata Communications, Telekom Malaysia, Telstra, Verizon, Vodafone   | NEC    | Katong, Singapore                    | Kuantan, Malaysia                    |
| Apollo               | 8,078  | Vodafone   | ASN    | Lannion, France Bude, United Kingdom | Manasquan, NJ, US / Shirley, NY, US  |
| Apollo East and West | 416    | Grid Telecom   | -      | Korakia, Greece                      | Pachi, Greece                        |
| Apricot              | 7,439  | Chunghwa Telecom, Google, Meta, NTT, PLDT  | -      | Tuas, Singapore                      | Minamiboso, Japan                    |
| Aqualink             | -      | Vodafone New Zealand   | -      | Christchurch New Zealand             | Auckland, New Zealand                |
| ARCOS                | 5,344  | AT&T, Alestra, Bahamas Telecommunicatio ns Company, Belize Telemedia, C&W Networks, CANTV, Claro Dominicana (Codetel), Enitel, Hondutel, Instituto Costarricense de Electricidad, Internexa, Orbinet Overseas, RACSA, Telecomunicacion es Ultramarinas de Puerto Rico, Telepuerto San Isidro, Tigo Colombia, Tricom USA, United Telecommunicatio n Services (UTS), Verizon | SubCom | North Miami Beach, FL, United States | North Miami Beach, FL, United States |

|   |        |  |             |                                    |                            |
|---|--------|--|-------------|------------------------------------|----------------------------|
| ARIMAO                                  | 1,535  | Empresa de Telecomunicaciones de Cuba, Orange  | -           | Cienfuegos, Cuba                   | Schoelcher, Martinique     |
| ARSAT Submarine                         | 25     | ARSAT  | -           | Cabo Espiritu Santo, Argentina     | Punta Dungeness, Argentina |
| Asia Africa Europe-1 (AAE-1)            | 15,535 | China Unicom, Djibouti Telecom, Etisalat UAE, Hyalroute, Metfone, Mobily, National Telecom, OTEGLOBE, Omantel, Ooredoo, PCCW, Pakistan Telecommunications Company Ltd., Reliance Jio Infocomm, Retelit, TIME dotCom, TeleYemen, Telecom Egypt, VNPT International, Viettel Corporation | NEC, SubCom | Marseille, France                  | Cape D'Aguilar, China      |
| Asia-America Gateway (AAG) Cable System | 12,428 | AT&T, Airtel (Bharti), BT, BayanTel, Eastern Telecom, Ezecom, Indosat Ooredoo, National Telecom, PLDT, Saigon Postel Corporation, Spark New Zealand, Starhub, Telekom Malaysia, Telkom Indonesia, Telstra, Unified National Networks (UNN), VNPT International, Viettel Corporation    | ASN, NEC    | San Luis Obispo, CA, United States | Changi North, Singapore    |
| Asia Connect Cable-1 (ACC-1)            | 11,185 | Inligo Networks  | -           | Hermosa Beach, CA, United States   | Batam, Indonesia           |

|  |       |   |          |                              |  |
|--|-------|---|----------|------------------------------|--|
| Asia Direct Cable (ADC)                              | 6,090 | China Telecom, China Unicom, National Telecom, PLDT, Singtel, Softbank Corp, Tata Communications, Viettel Corporation                               | NEC      | Maruyama, Japan              | Tuas, Singapore                              |
| Asia Link Cable (ALC)                                | 3,728 | China Telecom, DITO Telecommunity, Globe Telecom, Singtel, Unified National Networks (UNN)  | HMN Tech | Changi South, Singapore      | Hong Kong, China                             |
| Asia Pacific Gateway (APG)                           | 6,463 | China Mobile, China Telecom, China Unicom, Chunghwa Telecom, KT, LG Uplus, Meta, NTT, Starhub, TIME dotCom, VNPT International, Viettel Corporation | NEC      | Maruyama, Japan              | Kuantan, Malaysia                            |
| Asia Submarine-cable Express (ASE)/Cahaya a Malaysia | 5,063 | NTT, PLDT, Starhub, Telekom Malaysia  | NEC      | Changi South, Singapore      | Maruyama, Japan                              |
| Atisa  | 173   | Docomo Pacific  | -        | Piti, Guam                   | Sugar Dock, Saipan, Northern Mariana Islands |
| Atlantic Crossing-1 (AC-1)                           | 8,887 | Lumen   | SubCom   | Sylt, Germany                | Brookhaven, NY, United States                |
| Atlas Offshore                                       | 1,015 | Maroc Telecom   | ASN      | Marseille, France            | Asilah, Morocco                              |
| AU-Aleutian  | 815   | GCI Communication Corp  | -        | Kodiak, AK                   | Unalaska, AK                                 |
| Australia-Japan Cable (AJC)                          | 7,892 | AT&T, NTT, Softbank Corp, Telstra, Verizon  | SubCom   | Oxford Falls, NSW, Australia | Shima, Japan                                 |
| Australia-Singapore Cable (ASC)                      | 2,858 | Vocus Communications  | ASN      | Perth, WA, Australia         | Tanah Merah, Singapore                       |
| Avassa   | 162   | Comores Telecom, STOI   | HMN Tech | Mamoudzou, Mayotte           | Moroni, Comoros                              |

|  |       |  |          |                                 |                                       |
|--|-------|--|----------|---------------------------------|---------------------------------------|
| Azores Fiber Optic System (AFOS)             | 684   | Azores Fiber Optic System (AFOS)           | NSW      | Ponta Delgada, Portugal         | Ponta Delgada, Portugal               |
| B2JS (Jakarta-Bangka-Batam-Singapore)        | 472   | Triasmitra                                 | -        | Tanah Merah, Singapore          | Jakarta, Indonesia                    |
| Bahamas 2                                    | 292   | AT&T, Telefonica, Verizon                  | SubCom   | Vero Beach, FL, United States   | Nassau, Bahamas                       |
| Bahamas Domestic Submarine Network (BDSNi)   | 1,750 | Bahamas Telecommunications Company, Teleco | SubCom   | Fresh Creek, Bahamas            | Port-au-Prince, Haiti                 |
| Bahamas Internet Cable System (BICS)         | 684   | Caribbean Crossings                        | -        | Boca Raton, FL, United States   | Spanish River Park, FL, United States |
| Balalink                                     | 170   | IslaLink                                   | -        | Palma, Spain                    | Valencia, Spain                       |
| BALOK  | 37    | XL Axiata                                  | -        | Senggigi, Indonesia             | Seraya, Indonesia                     |
| Baltic Sea Submarine Cable                   | 647   | CITIC Telecom International                | ASN      | Stockholm, Sweden               | Tallinn, Estonia / Helsinki, Finland  |
| Bass Strait-1                                | 150   | Telstra                                    | ASN      | Boat Harbour, TAS, Australia    | Sandy Point, VIC, Australia           |
| Bass Strait-2                                | 149   | Telstra                                    | ASN      | Stanley, TAS, Australia         | Inverloch, VIC, Australia             |
| Basslink                                     | 185   | Basslink Telecoms                          | -        | Four Mile Bluff, TAS, Australia | McGaurans Beach, VIC, Australia       |
| Batam Dumai Melaka (BDM)                     | 219   | Moratelindo, Telekom Malaysia              | HMN Tech | Melaka, Malaysia                | Batam, Indonesia                      |
| Batam-Rengit Cable System (BRCS)             | 40    | XL Axiata                                  | -        | Tanjung Pinggir, Indonesia      | Rengit, Malaysia                      |
| Batam Sarawak Internet Cable System (BaSICS) | 474   | PP Telecommunications Sdn Bhd, XL Axiata   | -        | Tanjung Bemban, Indonesia       | Kampung Buntal, Malaysia              |
| Batam Singapore                              | 45    | Telkom Indonesia                           | NEC      | Batam, Indonesia                | Changi North, Singapore               |

|  |        |   |          |                        |                                |
|--|--------|---|----------|------------------------|--------------------------------|
| Cable System (BSCS)                            |        |   |          |                        |                                |
| Bay of Bengal Gateway (BBG)                    | 5,033  | AT&T, China Telecom, Dialog Axiata, Etisalat UAE, Omantel, Reliance Jio Infocomm, Telekom Malaysia, Telstra, Vodafone | ASN      | Penang, Malaysia       | Fujairah, United Arab Emirates |
| BCS East                                       | 60     | Arelion (formerly Telia Carrier)  | Ericsson | Liepaja, Latvia        | Sventoji, Lithuania            |
| BCS East-West Interlink                        | 135    | Arelion (formerly Telia Carrier)  | Ericsson | Sventoji, Lithuania    | Katthammarsvik, Sweden         |
| BCS North - Phase 1                            | 319    | Arelion (formerly Telia Carrier)  | Ericsson | Helsinki, Finland      | Stavsnas, Sweden               |
| BCS North - Phase 2                            | 174    | Arelion (formerly Telia Carrier)  | Ericsson | Helsinki, Finland      | Logi, Russia                   |
| BERYTAR  | 83     | Lebanese Ministry of Telecommunications, Syrian Telecommunications Establishment                                      | ASN      | Saida, Lebanon         | Tartous, Syria                 |
| Bharat Lanka Cable System                      | 202    | Bharat Sanchar Nigam Ltd. (BSNL), Sri Lanka Telecom   | NEC      | Tuticorine, India      | Mt. Lavinia, Sri Lanka         |
| Bicentenario                                   | 155    | Antel Uruguay, Telecom Argentina  | ASN      | Las Toninas, Argentina | Maldonado, Uruguay             |
| Bifrost  | 12,358 | Keppel T&T, Meta, Telin   | ASN      | Rosarito, Mexico       | Tuas, Singapore                |
| Biznet Nusantara Cable System-1 (BNCS-1)       | 508    | Biznet  | CCSI     | Anyer, Indonesia       | Muntok, Indonesia              |
| Blue   | 2,918  | Google, Omantel, Telecom Italia Sparkle   | -        | Marseille, France      | Aqaba, Jordan                  |
| Bodo-Rost Cable                                | 68     | Telenor   | Nexans   | Bodø, Norway           | Røst, Norway                   |
| Boracay-Palawan Submarine Cable System (BPSCS) | 206    | Globe Telecom   | HMN Tech | San Jose, Philippines  | Taytay, Philippines            |

|   |       |                                  |        |  |  |
|---|-------|----------------------------------|--------|--|--|
| Boriken Submarine Cable System (BSCS)               | 416   | Blackburn Technologies, LLC.     | –      | Frederiksted, Virgin Islands (U.S.)      | Macao Beach, Dominican Republic                              |
| Botnia  | 58    | Arelion (formerly Telia Carrier) | ASN    | Vaasa, Finland                           | Umeå, Sweden   |
| Brazilian Festoon                                   | 1,586 | Embratel                         | –      | Natal, Brazil                            | Rio de Janeiro, Brazil                                       |
| Bridge One  | 205   | DCT Telecom                      | –      | Itoshima, Japan                          | Pohang, South Korea  |
| BRUSA   | 6,835 | Telxius                          | ASN    | Virginia Beach, VA, United States        | Rio de Janeiro, Brazil                                       |
| BT Highlands and Islands Submarine Cable System     | 250   | BT                               | –      | Ardmair, United Kingdom                  | Ardneil Bay, United Kingdom                                  |
| BT-MT-1   | 50    | BT, Manx Telecom                 | –      | Silecroft Beach, United Kingdom          | Ballyhornan, United Kingdom                                  |
| BT North Sea  | –     | BT                               | SubCom | Ostend, Belgium/Callantsoog, Netherlands | Broadstairs, United Kingdom/Winterton-on-Sea, United Kingdom |
| BUGIO   | 50    | Altice Portugal                  | –      | Carcavelos, Portugal                     | Sesimbra, Portugal   |
| C-Lion1   | 728   | C-Lion1                          | ASN    | Rostock, Germany                         | Helsinki, Finland  |
| Cabo Verde Telecom Domestic Submarine Cable Phase 1 | –     | Cabo Verde Telecom (CVT)         | ASN    | Murdeira, Cape Verde                     | Praia, Cape Verde  |
| Cabo Verde Telecom Domestic Submarine Cable Phase 2 | –     | Cabo Verde Telecom (CVT)         | –      | Porto Novo—Santo Antao, Cape Verde       | Tarrafal—Santiago, Cape Verde                                |
| Cabo Verde Telecom Domestic Submarine Cable Phase 3 | –     | Cabo Verde Telecom (CVT)         | –      | Porto Novo—Santo Antao, Cape Verde       | Sal Rei, Cape Verde  |

|   |       |   |        |   |  |
|---|-------|---|--------|---|--|
| CADMOS  | 143   | A1 Telekom Austria, AT&T, Cyta, Deutsche Telekom, Lebanese Ministry of Telecommunications, Orange, Syrian Telecommunications Establishment, Tata Communications, Telecom Italia Sparkle | SubCom | Jdaide, Lebanon                               | Pentaskhinos, Cyprus                   |
| CADMOS-2  | n.a.  | Cyta, Lebanese Ministry of Telecommunications   | –      | Pentaskhinos, Cyprus                          | Beirut, Lebanon                        |
| CAM Ring  | 696   | Altice Portugal   | ASN    | Porto Santo, Portugal                         | Ponta Delgada, Portugal                |
| Canalink  | 1,140 | IT3   | ASN    | Santa Cruz de La Palma, Canary Islands, Spain | Asilah, Morocco                        |
| CANDALTA  | 68    | Telefonica  | –      | Alta Vista, Canary Islands, Spain             | Candelaria, Canary Islands, Spain      |
| CANTAT-3  | 1,554 | Shefa   | ASN    | Sylt, Germany                                 | Vestmannaeyjar, Iceland                |
| CAP-1   | 7,457 | Amazon Web Services, Meta   | NEC    | Grover Beach, CA, United States               | Pagudpud, Philippines                  |
| Caribbean-Bermuda U.S. (CBUS)                                     | 994   | C&W Networks  | –      | St. David's, Bermuda                          | Tortola, Virgin Islands, UK            |
| Caribbean Express (CX)  | 2,128 | Ocean Networks  | –      | Cartagena, Colombia                           | Boca Raton, FL, United States          |
| Caribbean Regional Communications Infrastructure Program (CARCIP) | 140   | Digicel   | –      | Conference, Grenada                           | Owia, Saint Vincent and the Grenadines |
| Carnival Submarine Network-1 (CSN-1)                              | 2,796 | Telconet  | ASN    | Naples, FL, United States                     | Ancon, Ecuador                         |

|   |       |   |          |                                 |                                      |
|---|-------|---|----------|---------------------------------|--------------------------------------|
| Caucasus Cable System                     | 746   | Caucasus Online   | SubCom   | Balchik, Bulgaria               | Poti, Georgia                        |
| Cayman-Jamaica Fiber System (CJFS)        | 541   | C&W Networks  | ASN      | Bull Bay, Jamaica               | Half Moon Bay, Cayman Islands        |
| Ceiba-1                                   | 178   | GITGE (Gestor de Infraestructuras de Telecomunicaciones de Guinea Ecuatorial) | -        | Bata, Equatorial Guinea         | Malabo, Equatorial Guinea            |
| Ceiba-2                                   | 180   | GITGE (Gestor de Infraestructuras de Telecomunicaciones de Guinea Ecuatorial) | HMN Tech | Bata, Equatorial Guinea         | Malabo, Equatorial Guinea            |
| Celtic Norse                              | 1,248 | Eidsiva Energi, NTE, TrønderEnergi  | -        | Killala, Ireland                | Øysanden, Norway                     |
| CeltixConnect -1 (CC-1)                   | 81    | Aqua Comms  | ASN      | Holyhead, United Kingdom        | Dublin, Ireland                      |
| Challenger Bermuda-1 (CB-1)               | 900   | One Communications  | ASN      | Charlestown, RI, United States  | Paget, Bermuda                       |
| Channel Islands-9 Liberty Submarine Cable | -     | JTGlobal  | -        | Blackpool Sands, United Kingdom | L'Ancrese Bay, Guernsey              |
| Chennai-Andaman & Nicobar Islands Cable   | 1,429 | Bharat Sanchar Nigam Ltd. (BSNL)  | NEC      | Chennai, India                  | Great Nicobar, India                 |
| Chuuk-Pohnpei Cable                       | 746   | Federated States of Micronesia Telecommunications Company                     | NEC      | Pohnpei, Micronesia             | Weno, Chuuk, Micronesia              |
| Circe North                               | 126   | Zayo, euNetworks  | ASN      | Zandvoort, Netherlands          | Lowestoft, United Kingdom            |
| Circe South                               | 71    | Zayo, euNetworks  | ASN      | Cayeux-sur-Mer, France          | Pevensey Bay, United Kingdom         |
| COBRAcable                                | 189   | Relined   | -        | Endrup, Denmark                 | Eemshaven, Netherlands               |
| COGIM                                     | 272   | Télébec   | -        | L'Anse-à-Beaufils, QC, Canada   | Les Îles-de-la-Madeleine, QC, Canada |
| Colombia-Florida Subsea Fiber (CFX-1)     | 1,491 | C&W Networks  | SubCom   | Boca Raton, FL, United States   | Cartagena, Colombia                  |

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|---|-------|---|----------|---|--|
| Colombian Festoon                                 | 249   | -   | -        | Tolu, Colombia                            | Parque Isla de Salamanca, Colombia                 |
| Columbus-II b                                     | 1,285 | AT&T, Setar   | SubCom   | Magen's Bay, VI, United States            | West Palm Beach, FL, United States                 |
| Columbus-III Azores-Portugal                      | -     | Altice Portugal   | -        | Carcavelos, Portugal                      | Ponta Delgada, Portugal                            |
| Comoros Domestic Cable System                     | -     | Comores Telecom   | ASN      | Chindini, Comoros                         | Mutsamudu, Comoros                                 |
| Concerto  | 342   | EXA Infrastructure  | ASN      | Zeebrugge, Belgium/Zandvoort, Netherlands | Sizewell, United Kingdom/Thorpness, United Kingdom |
| Confluence-1                                      | 1,257 | Confluence Networks   | SubCom   | Wall Township, NJ, United States          | Sunny Isles, FL, United States                     |
| Connected Coast                                   | -     | CityWest, Government of Canada                              | -        | Tlell, BC, Canada                         | Vancouver, BC, Canada                              |
| Continente-Madeira                                | 733   | Altice Portugal   | -        | Carcavelos, Portugal                      | Funchal, Portugal                                  |
| Converge Domestic Submarine Cable Network (CDSCN) | 808   | Converge ICT  | HMN Tech | Taytay, Philippines                       | Cagayan de Oro, Philippines                        |
| Cook Strait                                       | 25    | Transpower NZ   | -        | Fighting Bay, New Zealand                 | Oteranga Bay, New Zealand                          |
| Coral Sea Cable System (CS <sup>2</sup> )         | 2,921 | PNG DataCo Limited, Solomon Island Submarine Cable Company  | ASN      | Sydney, NSW, Australia                    | Port Moresby, Papua New Guinea                     |
| Corse-Continent 4 (CC4)                           | 118   | Orange  | ASN      | Cannes, France                            | L'Île-Rousse, France                               |
| Corse-Continent 5 (CC5)                           | 186   | Orange  | ASN      | La Seyne, France                          | Ajaccio, France                                    |
| Cross-Straits Cable Network (CSCN)                | 13    | China Mobile, China Telecom, China Unicom, Chunghwa Telecom | -        | Dadeng Island, China                      | Guanyin Mountain, China                            |

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|---------------------------------------|-------|--|------------|---|----------------------------------|
| CrossChannel Fibre                    | 93    | Crosslake Fibre                                      | Hexatronic | Veules-les-Roses, France                      | Brighton, United Kingdom         |
| Crosslake Fibre                       | 37    | Crosslake Fibre                                      | Hexatronic | Buffalo, NY, United States                    | Toronto, ON, Canada              |
| Curie                                 | 6,510 | Google   | SubCom     | El Segundo, CA, United States                 | Valparaíso, Chile                |
| Dalian-Yantai Cable                   | 91    | China Telecom  | ASN        | Dalian, China                                 | Yantai, China                    |
| DAMAI Cable System                    | 357   | Triasmitra   | –          | Dumai, Indonesia                              | Medan, Indonesia                 |
| Danica North                          | 16    | Arelion (formerly Telia Carrier)                     | Ericsson   | Tuborg, Denmark                               | Barsebäck, Sweden                |
| DANICE                                | 1,432 | Farice   | SubCom     | Blaabjerg, Denmark                            | Landeyjar, Iceland               |
| Darwin-Jakarta-Singapore Cable (DJSC) | 621   | Vocus Communications                                 | –          | Connected to Australian-Singapore Cable (ASC) | Port Hedland, WA, Australia      |
| Deep Blue One                         | 1,243 | Digicel  | ASN        | Cayenne, French Guiana                        | Chaguaramas, Trinidad and Tobago |
| Denmark-Poland 2                      | 68    | Arelion (formerly Telia Carrier), TDC Group, Telenor | –          | Gedebak Odde, Denmark                         | Mielno, Poland                   |
| Denmark-Sweden 15                     | 3     | Arelion (formerly Telia Carrier), TDC Group          | –          | Helsingør, Denmark                            | Helsingborg, Sweden              |
| Denmark-Sweden 16                     | 9     | TDC Group  | –          | Mosedede, Denmark                             | Velling, Sweden                  |
| Denmark-Sweden 17                     | 7     | TDC Group, Tele2                                     | –          | Alsgarde, Denmark                             | Kristinelund, Sweden             |
| Denmark-Sweden 18                     | –     | TDC Group, Telenor                                   | –          | Helsingør, Denmark                            | Helsingborg, Sweden              |
| Denpasar-Waingapu Cable Systems       | 506   | Moratelindo  | –          | Padang Galak, Indonesia                       | Waingapu, Indonesia              |
| Dhiraagu Cable Network                | 779   | Dhiraagu   | NEC        | Kulhudhufushi, Maldives                       | Hithadhoo, Maldives              |
| Dhiraagu-SLT Submarine Cable Network  | 528   | Dhiraagu, Sri Lanka Telecom                          | NEC        | Male, Maldives                                | Colombo, Sri Lanka               |
| Didon                                 | 106   | Ooredoo Tunisie, Orange Tunisie                      | ASN        | Mazara del Vallo, Italy                       | Kelibia, Tunisia                 |

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| Djibouti Africa Regional Express 1 (DARE1)           | 3,016  | Djibouti Telecom, Hormuud Telecom Somalia, Somtel International, Telkom Kenya   | SubCom               | Mombasa, Kenya                             | Djibouti City, Djibouti           |
| DOS CONTINENT ES I & II                              | 59     | GTD España  | –                    | Playa de Benitez/Playa de la Ribera, Spain | La Línea/Tarifa, Spain            |
| Dumai-Melaka Cable System                            | 99     | Telekom Malaysia, Telkom Indonesia  | NEC                  | Dumai, Indonesia                           | Melaka, Malaysia                  |
| Dunant   | 3,977  | Google  | SubCom               | Saint-Hilaire-de-Riez, France              | Virginia Beach, VA, United States |
| E-LLAN   | –      | Manx Electricity Authority  | –                    | Blackpool, United Kingdom                  | Douglas, Isle of Man              |
| EAC-C2C  | 22,681 | Telstra   | ASN, KDD-SCS, SubCom | Changi South, Singapore                    | Ajigaura, Japan                   |
| East Coast Cable System                              | 994    | Vocus Communications  | –                    | Brisbane, QLD, Australia                   | Melbourne, VIC, Australia         |
| East-West  | 1,087  | C&W Networks  | Xtera                | Harbour View, Jamaica                      | Nanny Cay, Virgin Islands (U.K.)  |
| East-West Submarine Cable System                     | 590    | Sacofa  | –                    | Kuching, Malaysia                          | Mersing, Malaysia                 |
| Eastern Africa Submarine System (EASSy)              | 6,525  | Airtel (Bharti), BT, Botswana Fibre Networks, Comores Telecom, Djibouti Telecom, Etisalat UAE, Liquid Intelligent Technologies, MTN, Mauritius Telecom, Orange, Saudi Telecom, Sudan Telecom Company, Tanzania Telecommunication Corporation, Telkom Kenya, Telkom South Africa, Telma (Telecom Malagasy), Vodacom DRC, WIOCC, Zambia Telecom | ASN                  | Port Sudan, Sudan                          | Mtunzini, South Africa            |
| Eastern Arctic Undersea Fibre Optic Network (EAUFON) | 1,286  | Kativik Regional Government   | ASN                  | Kangiqsujuaq, QC, Canada                   | Chisasibi, QC, Canada             |

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| Eastern Caribbean Fiber System (ECFS)  | 1,075  | AT&T, C&W Networks, Claro Dominicana (Codetel), Guyana Telephone and Telegraph (GT&T), Orange, Verizon | ASN                   | Tortola, Virgin Islands (U.K.)   | Chaguaramas, Trinidad and Tobago |
| Eastern Light Sweden-Finland I         | –      | Eastern Light  | –                     | Kotka, Finland                   | Stockholm, Sweden                |
| Eastern Light Sweden-Finland II        | –      | Eastern Light  | –                     | Kista, Sweden                    | Espoo, Finland                   |
| Echo                                   | 10,678 | Google, Meta   | NEC                   | Eureka, CA, United States        | Tanjung Pakis, Indonesia         |
| ECLink                                 | 613    | C&W Networks   | SubCom                | Chaguaramas, Trinidad and Tobago | Willemstad, Curaçao              |
| Elektra-GlobalConnect 1 (GCI)          | 27     | GlobalConnect  | –                     | Gedser, Denmark                  | Rostock, Germany                 |
| EllaLink                               | 3,853  | EllaLink   | ASN                   | Sines, Portugal                  | Fortaleza, Brazil                |
| Emerald Bridge Fibres                  | 75     | ESB Telecoms, Zayo   | Nexans                | Clonshaugh, Ireland              | Holyhead, United Kingdom         |
| Energinet Laeso-Varberg                | –      | Energinet  | –                     | Laeso, Denmark                   | Varberg, Sweden                  |
| Energinet Lyngsa-Laeso                 | –      | Energinet  | –                     | Lyngsa, Denmark                  | Laeso, Denmark                   |
| Epic Malta-Sicily Cable System (EMSCS) | 162    | Epic   | ASN                   | Catania, Italy                   | Balluta Bay, Malta               |
| Equiano                                | –      | Google   | ASN                   | Sesimbra, Portugal               | Melkbosstrand, South Africa      |
| ESAT-1                                 | 162    | Esat BT  | Pirelli               | Kilmore Quay, Ireland            | Sennen Cove, United Kingdom      |
| ESAT-2                                 | 152    | Esat BT  | SubCom                | Sandymount, Ireland              | Southport, United Kingdom        |
| Estepona-Tetouan                       | 70     | Estepona-Tetouan   | STC Submarine Systems | Estepona, Spain                  | Tétouan, Morocco                 |

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| Europe India Gateway (EIG)      | 9,321 | AT&T, Airtel (Bharti), Altice Portugal, BT, Bharat Sanchar Nigam Ltd. (BSNL), Djibouti Telecom, Gibtelecom, Libya International Telecommunications Company, MTN, Omantel, Saudi Telecom, Telecom Egypt, Telkom South Africa, Verizon, Vodafone, | ASN, SubCom | Bude, United Kingdom             | Mumbai, India               |
| Eviny Digital                   | 130   | BKK Digitek   | –           | Stavanger, Norway                | Bergen, Norway              |
| EXA Express                     | 2,858 | EXA Infrastructure  | SubCom      | Brean, United Kingdom            | Halifax, NS, Canada         |
| EXA North and South             | 7,581 | EXA Infrastructure  | SubCom      | Lynn, MA, United States          | Southport, United Kingdom   |
| FALCON                          | 6,400 | Global Cloud Xchange  | ASN         | Suez, Egypt                      | Male, Maldives              |
| Far East Submarine Cable System | 1,153 | Rostelecom  | HMN Tech    | Ola, Russia                      | Ust-Bolsheretsk, Russia     |
| FARICE-1                        | 749   | Farice  | –           | Seydisfjörður, Iceland           | Dunnet Bay, United Kingdom  |
| Farland North                   | 93    | BT  | –           | Domburg, Netherlands             | Aldeburgh, United Kingdom   |
| FASTER                          | 7,226 | China Mobile, China Telecom, Google, KDDI, Singtel, TIME dotCom   | NEC         | Bandon, OR, United States        | Tanshui, Taiwan             |
| Fehmarn Bält                    | 12    | Arelion (formerly Telia Carrier)  | –           | Rodbyhavn, Denmark               | Puttgarden, Germany         |
| Fiber Optic Gulf (FOG)          | 808   | Batelco, Etisalat UAE, Kuwait Ministry of Communications, Ooredoo   | Fujitsu     | Kuwait City, Kuwait              | Dubai, United Arab Emirates |
| Fibra Óptica al Pacífico        | 733   | Entel Bolivia   | HMN Tech    | Ilo, Peru                        | Lurin, Peru                 |
| Fibra Óptica Austral            | 1,740 | Subtel  | HMN Tech    | Puerto Montt, Chile              | Puerto Williams, Chile      |
| Fibralink                       | 621   | C&W Networks  | ASN         | Puerto Plata, Dominican Republic | Montego Bay, Jamaica        |
| Finland-Estonia 2 (EESF-2)      | 61    | Arelion (formerly Telia Carrier), Telia Eesti   | –           | Helsinki, Finland                | Tallinn, Estonia            |

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|  |        | (formerly Eesti Telekom, EMT, Elion)   |              |                                 |  |
| Finland-Estonia 3 (EESF-3)                 | 65     | Arelion (formerly Telia Carrier), Telia Eesti (formerly Eesti Telekom, EMT, Elion)   | -            | Helsinki, Finland               | Meremõisa, Estonia                       |
| Finland Estonia Connection (FEC)           | 155    | Elisa Corporation  | ASN          | Helsinki, Finland               | Tallinn, Estonia                         |
| Firmina                                    | 9,021  | Google   | SubCom       | Myrtle Beach, SC, United States | Las Toninas, Argentina                   |
| FLAG Atlantic-1 (FA-1)                     | 9,010  | Global Cloud Xchange   | ASN          | Plerin, France                  | Island Park/Northport, NY, United States |
| FLAG Europe-Asia (FEA)                     | 17,399 | Global Cloud Xchange   | SubCom       | Porthcurno, United Kingdom      | Miura, Japan                             |
| FLAG North Asia Loop/REACH North Asia Loop | 5,906  | Global Cloud Xchange, formerly Reliance Globalcom, owns 3 fiber pairs which it refers to as FLAG North Asia Loop. Of the three remaining fiber pairs comprising the REACH North Asia Loop, Telstra owns one fiber pair, PCCW owns one fiber pair, with the final fiber pair is jointly owned by Telstra and PCCW | ASN, Fujitsu | Tong Fuk, China                 | Wada, Japan                              |
| Flores-Corvo Cable System                  | 426    | Viatel   | HMN Tech     | Corvo/Flores Portugal           | Graciosa/Faial, Portugal                 |
| FLY-LION3                                  | 249    | Comoros Cables, Orange, Société Réunionnaise du Radiotéléphone   | ASN          | Moroni, Comoros                 | Kaweni, Mayotte                          |
| FOS Quillon-Chacabuco                      | 217    | Grupo Gtd  | -            | Puerto Chacabuco, Chile         | Quillon, Chile                           |
| Galapagos Cable System                     | 777    | Galápagos Cable Systems  | Xtera        | Manta, Ecuador                  | Puerto General Villamil, Ecuador         |
| Gemini Bermuda                             | 800    | C&W Networks   | -            | Manasquan, NJ, United States    | St. David's, Bermuda                     |

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| Geo-Eirgrid                     | 116    | Eirgrid                                    | Nexans   | Deeside Clwyd, United Kingdom      | Lusk, Ireland               |
| Georgia-Russia                  | 269    | DanTelco, FOPTNET, Rostelecom              | ASN      | Novorossiysk, Russia               | Poti, Georgia               |
| Germany-Denmark 3               | –      | TDC Group                                  | –        | Gedser, Denmark                    | Markgrafenhede, Germany     |
| GigNet-1                        | 686    | GigNet                                     | Xtera    | Boca Raton, FL, United States      | Cancún, Mexico              |
| Glo-1                           | 6,090  | Globacom Limited                           | ASN      | Bude, United Kingdom               | Lagos, Nigeria              |
| Global Caribbean Network (GCN)  | 553    | Leucadia National Corporation, Loret Group | –        | Jarry, Guadeloupe                  | San Juan, PR, United States |
| GlobalConnect 2 (GC2)           | 59     | GlobalConnect                              | –        | Saeby, Denmark                     | Kungsbacka, Sweden          |
| GlobalConnect 3 (GC3)           | 12     | GlobalConnect                              | –        | Korsor, Denmark                    | Nybor, Denmark              |
| GlobalConnect-KPN               | 27     | GlobalConnect                              | –        | Gedser, Denmark                    | Rostock, Germany            |
| GlobeNet                        | 14,603 | GlobeNet                                   | ASN      | Tuckerton, NJ, United States       | Rio de Janeiro, Brazil      |
| GO-1 Mediterranean Cable System | 180    | GO plc                                     | ASN      | Mazara del Vallo, Italy            | St. Paul's Bay, Malta       |
| Gold Data-1                     | 1,450  | Gold Data                                  | ASN      | Naples, FL, United States          | Veracruz, Mexico            |
| Gondwana-1                      | 1,337  | OPT  | ASN      | Sydney, NSW, Australia             | Noumea, New Caledonia       |
| Gondwana-2/Picot-2              | 941    | OPT  | ASN      | Noumea, New Caledonia              | Suva, Fiji                  |
| Grace Hopper                    | 4,468  | Google                                     | SubCom   | Bude, United Kingdom/Bilbao, Spain | Bellport, NY, United States |
| Greenland Connect               | 2,846  | Tusass A/S                                 | ASN      | Milton, NL, Canada                 | Landeyjar, Iceland          |
| Greenland Connect North         | 423    | Tusass A/S                                 | ASN      | Nuuk, Greenland                    | Aasiaat, Greenland          |
| Groix 4                         | 4      | Orange                                     | Prysmian | Petit Perello, France              | Port Nâl, France            |

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| GTMO-1  | 949   | U.S. Government  | Xtera    | Guantanamo Bay, Cuba        | Dania Beach, FL, United States  |
| GTMO-PR   | 870   | U.S. Government  | Xtera    | Guantanamo Bay, Cuba        | Punta Salina, PR, United States |
| Guadeloupe Cable des Iles du Sud (GCIS)   | 73    | Regional Council of Guadeloupe   | –        | Beausejour, Guadeloupe      | Terre-de-Haut, Guadeloupe       |
| Guam Okinawa Kyushu Incheon (GOKI)  | 2,637 | AT&T   | Xtera    | Kita-kyushu, Japan          | Tumon Bay, Guam                 |
| Guernsey-Jersey-4   | 22    | Sure   | –        | Saints Bay, Guernsey        | Greve de Lecq, Jersey           |
| Gulf Bridge International Cable System (GBICS)/Middle East North Africa (MENA) Cable System | 3,275 | Gulf Bridge International  | SubCom   | Al Khobar, Saudi Arabia     | Mumbai, India                   |
| Gulf of California Cable  | 155   | Megacable  | HMN Tech | La Paz, Mexico              | Topolobampo, Mexico             |
| Gulf of Mexico Fiber Optic Network  | 746   | Tampnet  | SubCom   | Freeport, TX, United States | Pascagoula, MS, United States   |
| Gulf2Africa (G2A)   | 932   | Golis Telecommunications, Omantel, Telesom   | ASN      | Salalah, Oman               | Berbera, Somalia                |
| Haikou-Beihai Cable   | 123   | China Telecom  | ASN      | Beihai, China               | Lingao, China                   |
| Hainan to Hong Kong Express (H2HE)  | 419   | China Mobile   | HMN Tech | Chung Hom Kok, China        | Wenchang, China                 |
| HANNIBAL System   | 111   | Tunisia Telecom  | HMN Tech | Mazara del Vallo, Italy     | Kelibia, Tunisia                |
| HANTRU1 Cable System  | 1,813 | Federated States of Micronesia Telecommunications Company, Hannon Armstrong, Marshall Islands Telecommunications Authority | SubCom   | Piti, Guam                  | Majuro, Marshall Islands        |
| Havfrue/AEC-2   | 4,754 | Aqua Comms, Bulk, Google, Meta   | SubCom   | Blaabjerg, Denmark          | Wall Township,                  |

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|  |        |                             |            |                                | NJ, United States           |
| Havhingsten/CeltixConnect-2 (CC-2)                   | 187    | Aqua Comms, Bulk, Meta      | ASN        | Blackpool, United Kingdom      | LoughShinny, Ireland        |
| Havhingsten/North Sea Connect (NSC)                  | 411    | Aqua Comms, Bulk, Meta      | ASN        | Newcastle, United Kingdom      | Houstrup, Denmark           |
| Havsil   | 696    | Bulk                        | -          | Hanstholm, Denmark             | Kristiansand, Norway        |
| Hawaiki  | 8,700  | Hawaiki Submarine Cable LP  | SubCom     | Hillsboro, OR, United States   | Christchurch, New Zealand   |
| Hawaiki Nui  | 15,535 | Hawaiki Submarine Cable LP  | -          | Los Angeles, CA, United States | Batam, Indonesia            |
| Hawk   | 2,113  | Global Cloud Xchange        | Fujitsu    | Marseille, France              | Alexandria, Egypt           |
| HDR1   | -      | Bell Canada Enterprise      | -          | Cape Ray, NL, Canada           | Sydney Mines, NS, Canada    |
| HDR2   | -      | Bell Canada Enterprise      | -          | Saint John, NB, Canada         | Codroy, NL, Canada          |
| HICS (Hawaii Inter-Island Cable System)              | 298    | Hawaiian Telcom             | -          | Kawaihae, HI, United States    | Lihue, HI, United States    |
| HIFN (Hawaii Island Fibre Network)                   | 329    | Hawaiian Telcom, Lumen      | -          | Lihue, HI, United States       | Kawaihae, HI, United States |
| High-capacity Undersea Guernsey Optical-fibre (HUGO) | 264    | Sure, Vodafone              | -          | Lannion, France                | Porthcurno, United Kingdom  |
| Hokkaido-Akita Cable                                 | 478    | NTT, Rakuten, Softbank Corp | -          | t.b.d., Japan                  | t.b.d., Japan               |
| Hokkaido-Sakhalin Cable System (HSCS)                | 354    | NTT, TTK                    | Ciena, NEC | Ishikari, Japan                | Nevelsk, Russia             |
| Honotua  | 2,986  | OPT French Polynesia        | ASN        | Vaitape, French Polynesia      | Kawaihae, HI, United States |
| Hronn  | 168    | Shefa                       | -          | Fano, Denmark                  | TotalEnergies Tyra, Denmark |
| i2i Cable Network (i2icn)                            | 1,988  | Airtel (Bharti)             | ASN        | Chennai, India                 | Tuas, Singapore             |

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| IMEWE  | 7,513 | Airtel (Bharti),<br>Etisalat UAE,<br>Ogero, Orange,<br>Pakistan<br>Telecommunicatio<br>ns Company Ltd.,<br>Saudi Telecom,<br>Tata<br>Communications,<br>Telecom Egypt,<br>Telecom Italia<br>Sparkle | ASN, NEC | Marseille,<br>France             | Mumbai,<br>India                        |
| India Asia<br>Xpress (IAX)                     | 3,599 | Reliance Jio<br>Infocomm  | SubCom   | Mumbai,<br>India                 | Tuas,<br>Singapore                      |
| India Europe<br>Xpress (IEX)                   | 3,599 | Reliance Jio<br>Infocomm  | SubCom   | Savona, Italy                    | Mumbai,<br>India                        |
| INDIGO-<br>Central                             | 3,014 | Australia's<br>Academic and<br>Research Network<br>(AARNET),<br>Google, Indosat<br>Ooredoo, Singtel<br>Optus, Superloop   | ASN      | Alexandria,<br>NSW,<br>Australia | Perth, WA,<br>Australia                 |
| INDIGO-<br>West                                | 2,858 | Australia's<br>Academic and<br>Research Network<br>(AARNET),<br>Google, Indosat<br>Ooredoo, Singtel,<br>Superloop, Telstra  | ASN      | Perth, WA,<br>Australia          | Tuas,<br>Singapore                      |
| Indonesia<br>Global<br>Gateway<br>(IGG) System | 3,293 | Telin, Telkom<br>Indonesia  | NEC      | Tuas,<br>Singapore               | Manado,<br>Indonesia                    |
| INGRID   | 40    | CIEG  | –        | Surville,<br>France              | Havelet Bay,<br>Guernsey                |
| Interchange<br>Cable<br>Network 1<br>(ICN1)    | 782   | Interchange   | ASN      | Suva, Fiji                       | Port Vila,<br>Vanuatu                   |
| Ionian   | 199   | IslaLink  | –        | Preveza,<br>Greece               | Crotone, Italy                          |
| IP-Only<br>Denmark-<br>Sweden                  | –     | IP-Only   | –        | Brondby,<br>Denmark              | Klagshamn,<br>Sweden                    |
| IRIS   | 1,100 | Farice  | SubCom   | Thorlakshofn,<br>Iceland         | Galway,<br>Ireland                      |
| Isles of Scilly<br>Cable                       | –     | BT  | –        | Porthcurno,<br>United<br>Kingdom | Porthcressa<br>Beach, United<br>Kingdom |
| Italy-Albania                                  | 149   | ALBtelecom,<br>Telecom Italia<br>Sparkle  | –        | Bari, Italy                      | Durres,<br>Albania                      |

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| Italy-Croatia                                | 143   | Hrvatski Telekom, Telecom Italia Sparkle   | –            | Mestre, Italy             | Umag, Croatia              |
| Italy-Greece 1                               | 105   | WIS Telecom  | –            | Otranto, Italy            | Aethos, Greece             |
| Italy-Libya                                  | 354   | Libya International Telecommunications Company, Telecom Italia Sparkle           | ASN          | Mazara del Vallo, Italy   | Tripoli, Libya             |
| Italy-Malta                                  | 148   | GO plc, Telecom Italia Sparkle   | ASN          | Catania, Italy            | Msida, Malta               |
| Italy-Monaco                                 | 101   | Monaco Telecom, Telecom Italia Sparkle   | –            | Savona, Italy             | Monte Carlo, Monaco        |
| Ixchel                                       | 12    | Telmex   | ASN          | Isla de Cozumel, Mexico   | Playa del Carmen, Mexico   |
| JaKa2LaDeMa                                  | 1,056 | Telkom Indonesia   | Fujitsu, NSW | Pontianak, Indonesia      | Toweli, Indonesia          |
| JAKABARE                                     | 808   | Indosat Ooredoo  | NEC          | Changi North, Singapore   | Tanjung Pakis, Indonesia   |
| Jakarta-Bangka-Bintan-Batam-Singapore (B3JS) | 641   | Moratelindo  | –            | Tanah Merah, Singapore    | Jakarta, Indonesia         |
| Jakarta Surabaya Cable System (JAYABAYA)     | 552   | Triasmitra   | –            | Banyu Urip, Indonesia     | Tanjung Pakis, Indonesia   |
| Jambi-Batam Cable System (JIBA)              | 166   | Indosat Ooredoo, Moratelindo, XL Axiata  | –            | Kuala Tungkal, Indonesia  | Tanjung Pinggir, Indonesia |
| Janna  | 394   | EXA Infrastructure, Regione Sardegna, Tiscali, WINDTRE (incl. Wind and 3 Italia) | NSW          | Civitavecchia, Italy      | Mazara del Vallo, Italy    |
| Japan-Guam-Australia North (JGA-N)           | 1,616 | RTI  | NEC          | Minamiboso, Japan         | Piti, Guam                 |
| Japan-Guam-Australia South (JGA-S)           | 4,400 | Australia's Academic and Research Network (AARNET), Google, RTI                  | ASN          | Brookvale, NSW, Australia | Piti, Guam                 |

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|-------------------------------------|--------|--|--------------|--|-------------------------------|
| Japan Information Highway (JIH)     | 3,200  | KDDI   | –            | Akita, Japan                                       | Okinawa, Japan                |
| Japan-U.S. Cable Network (JUS)      | 14,095 | AT&T, BT, China Telecom, China Unicom, Chunghwa Telecom, HKBN Enterprise Solutions, KDDI, KT, LG Uplus, Lumen, NTT, Orange, PCCW, PLDT, SK Broadband, Singtel, Softbank Corp, Starhub, T-Mobile, Tata Communications, Telekom Malaysia, Telstra, Verizon, Vodafone | ASN, Fujitsu | Shima, Japan                                       | Morro Bay, CA, United States  |
| JASUKA                              | 6,748  | JASUKA   | –            | Rantu Prapat, Indonesia                            | Bandar Bukit Tinggi, Malaysia |
| Java Bali Cable System (JBSCS)      | 25     | Triasmitra   | –            | Candi Kusuma, Indonesia                            | Muncar, Indonesia             |
| Java-Kalimantan-Sulawesi (JAKASUSI) | 684    | Indosat Oore   | ASN          | Aeng Batu Batu, Indonesia                          | Takesung, Indonesia           |
| Jerry Newton                        | –      | C&W Networks   | –            | North Salina, Bonaire, Sint Eustatius and Saba     | Willemstad, Curaçao           |
| Jonah                               | 1,427  | Bezeq International Ltd.   | ASN          | Tel Aviv, Israel                                   | Bari, Italy                   |
| JSCFS                               | –      | C&W Networks   | –            | Bull Bay, Jamaica                                  | Negril, Jamaica               |
| Junior                              | 242    | Google   | Padtec       | Rio de Janeiro, Brazil                             | Santos, Brazil                |
| JUNO                                | 7,277  | Seren Juno Network Co., Ltd.   | NEC          | Grover Beach? Ca/Harbour Pointe, WA, United States | Shima, Japan                  |
| JUPITER                             | 9,046  | Amazon Web Services, Meta, NTT, PCCW, PLDT, Softbank Corp  | SubCom       | Hermosa Beach, CA/Cloverdale, OR, United States    | Daet, Philippines             |
| KAFOS                               | 334    | Turk Telekom International   | ASN          | Istanbul, Turkey                                   | Mangalia, Romania             |
| Kaliningrad Cable                   | 693    | Rostelecom   | –            | Kaliningrad, Russia                                | Kingisepp, Russia             |

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| Kanawa  | 1,085 | Orange   | ASN          | Kourou,<br>French<br>Guiana                                | Schoelcher,<br>Martinique             |
| Kattegat 2                                      | 47    | TDC Group  | –            | Skalvik,<br>Sweden   | Lyngsa,<br>Denmark                    |
| Kattittuq<br>Nunavut<br>Fibre Link              | –     | Government of<br>Nunavut   | –            | Iqaluit, NU,<br>Canada                                     | Milton, NL,<br>Canada                 |
| Kerch Strait<br>Cable                           | 29    | Miranda Media  | –            | Ilyich, Russia   | Kerch,<br>Ukraine                     |
| KetchCan1<br>Submarine<br>Fiber Cable<br>System | 104   | Ketchican Public<br>Utilities  | –            | Prince Rupert,<br>BC, Canada                               | Ketchikan,<br>AK, United<br>States    |
| Kochi-<br>Lakshadweep<br>Islands Cable          | 1,236 | Bharat Sanchar<br>Nigam Ltd.<br>(BSNL)   | NEC          | Cochin, India  | Minicoy,<br>India                     |
| Kodiak Kenai<br>Fiber Link<br>(KKFL)            | 600   | GCI<br>Communication<br>Corp   | ASN          | Anchorage,<br>AK, United<br>States                         | Seward, AK,<br>United States          |
| Korea-Japan<br>Cable<br>Network<br>(KJCN)       | 311   | KT, NTT, QNet,<br>Softbank Corp  | ASN, Fujitsu | Fukuoka/Kita<br>-kyushu,<br>Japan                          | Busan, South<br>Korea                 |
| Kumul<br>Domestic<br>Submarine<br>Cable System  | 3,402 | PNG DataCo<br>Limited  | HMN Tech     | Jayapura,<br>Indonesia                                     | Daru, Papua<br>New Guinea             |
| Kupang-Alor<br>Cable<br>Systems                 | 170   | Moratelindo  | –            | Alor,<br>Indonesia   | Kupang,<br>Indonesia                  |
| Kuwait-Iran                                     | 236   | Kuwait Ministry of<br>Communications,<br>Telecommunicatio<br>n Infrastructure<br>Company of Iran | –            | Kuwait City,<br>Kuwait                                     | Ganaveh, Iran                         |
| La Gomera-El<br>Hierro                          | –     | Telefonica   | –            | San Sebastian<br>de la Gomera,<br>Canary<br>Islands, Spain | Valverde,<br>Canary<br>Islands, Spain |
| Labuan-<br>Brunei<br>Submarine<br>Cable         | 32    | Common Tower<br>Technologies Sdn<br>Bhd  | –            | Tungku,<br>Brunei  | Kiamsam,<br>Malaysia                  |
| Lanis-1   | 70    | Vodafone   | –            | Blackpool,<br>United<br>Kingdom                            | Port<br>Grenagh,<br>Isle of Man       |
| Lanis-2   | 42    | Vodafone   | –            | Ballywater,<br>United<br>Kingdom                           | Peel, Isle of<br>Man                  |

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| Lanis-3  | 76    | Vodafone  | –   | Troon, United Kingdom      | Whitehead, United Kingdom |
| Latvia-Sweden 1 (LV-SE 1)  | 189   | Arelion (formerly Telia Carrier), Tele2, Telecom Italia Sparkle, Tet                                      | –   | Ventspils, Latvia          | Nynashamn, Sweden         |
| Lazaro Cardenas-Manzanillo Santiago Submarine Cable System (LCMSSCS) | 200   | Telmex  | –   | Ixtapa-Zihuatanejo, Mexico | Manzanillo, Mexico        |
| Leif Erikson   | 2,610 | Bulk  | –   | Goose Bay, NL, Canada      | Kristiansand, Norway      |
| LFON (Libyan Fiber Optic Network)                                    | 1,018 | Libyan Post, Telecommunications and Information Technology Company (LPTIC Holding)                        | ASN | Tubruq, Libya              | Zuwara, Libya             |
| Libreville-Port Gentil Cable   | 123   | Republic of Gabon   | –   | Libreville, Gabon          | Port Gentil, Gabon        |
| Link 1 Phase-1   | 229   | XL Axiata   | –   | Bulobulo, Indonesia        | Kawinda Nae, Indonesia    |
| Link 1 Phase-2   | 58    | XL Axiata   | –   | Sanur, Indonesia           | Senggigi, Indonesia       |
| Link 2 Phase-1   | 175   | XL Axiata   | –   | Sangatta, Indonesia        | Towale, Indonesia         |
| Link 2 Phase-2   | 137   | XL Axiata   | –   | Jimbaran, Indonesia        | Puger, Indonesia          |
| Link 3 Phase-1   | 171   | XL Axiata   | –   | Kawinda Nae, Indonesia     | Senggigi, Indonesia       |
| Link 3 Phase-2   | 213   | XL Axiata   | –   | Ancol, Indonesia           | Mentigi, Indonesia        |
| Link 4 Phase-2   | 186   | XL Axiata   | –   | Mentigi, Indonesia         | Sungailiat, Indonesia     |
| Link 5 Phase-2   | 227   | XL Axiata   | –   | Kuala Tungkal, Indonesia   | Sungailiat, Indonesia     |
| Lower Indian Ocean Network 2 (LION2)                                 | 1,678 | Emtel, Mauritius Telecom, Orange, Orange Madagascar, Société Réunionnaise du Radiotéléphone, Telkom Kenya | ASN | Nyali, Kenya               | Kaweni, Mayotte           |

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| Lower Indian Ocean Network (LION)      | 659   | Mauritius Telecom, Orange, Orange Madagascar   | ASN      | Toamasina, Madagascar            | Terre Rouge, Mauritius            |
| Luwuk Tutuyan Cable System (LTCS)      | 277   | Telkom Indonesia   | –        | Luwuk, Indonesia                 | Tutuyan, Indonesia                |
| Lynn Canal Fiber                       | 86    | Alaska Power & Telephone Company (AP&T)  | –        | Haines, AK, United States        | Lena Point, AK, United States     |
| MainOne                                | 4,350 | MainOne - An Equinix Company   | SubCom   | Seixal, Portugal                 | Lagos, Nigeria                    |
| Malaysia-Cambodia-Thailand (MCT) Cable | 808   | DTAC, Ezecom, Symphony, Telekom  | HMN Tech | Cherating, Malaysia              | Rayong, Thailand                  |
| Malbec                                 | 1,616 | GlobeNet, Meta   | ASN      | Las Toninas, Argentina           | Rio de Janeiro, Brazil            |
| Maldives Sri Lanka Cable (MSC)         | 536   | Dhiraagu, Dialog Axiata, Ooredoo Maldives  | HMN Tech | Hulhumale, Maldives              | Mt. Lavinia, Sri Lanka            |
| Malta-Gozo Cable                       | 8     | Gozo Fibre Optic Cable Ltd.  | Elettra  | Golden Bay, Malta                | Mgarr ix-Xini, Malta              |
| Malta-Italy Interconnector             | 59    | Government of Malta  | –        | Marina di Ragusa, Italy          | Bahar ic-Caghaq, Malta            |
| Manatua                                | 2,258 | Avaroa Cable Ltd., OPT French Polynesia, Samoa Submarine Cable Company, Telecom Niue | SubCom   | To'ahotu, French Polynesia       | Apia, Samoa                       |
| Mandji Fiber Optic Cable               | 31    | GITGE (Gestor de Infraestructuras de Telecomunicaciones de Guinea Ecuatorial)        | –        | Cabo San Juan, Equatorial Guinea | Corisco, Equatorial Guinea        |
| MAREA                                  | 4,104 | Meta, Microsoft, Telxius   | SubCom   | Bilbao, Spain                    | Virginia Beach, VA, United States |
| Mariana-Guam Cable                     | –     | PTI Pacifica   | –        | Saipan, Northern Mariana Islands | Tanguisson Point, Guam            |
| Maroc Telecom West Africa              | 5,158 | Maroc Telecom  | ASN      | Casablanca, Morocco              | Libreville, Gabon                 |
| Mataram Kupang Cable                   | 819   | Telkom Indonesia   | HMN Tech | Kupang, Indonesia                | Pringgabaya, Indonesia            |

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| System (MKCS)  |       |  |             |                                    |                                   |
| Matrix Cable System  | 656   | Matrix Networks Pte. Ltd.  | SubCom      | Changi South, Singapore            | Jakarta, Indonesia                |
| Mauritius and Rodrigues Submarine Cable System (MARS)                  | 421   | Mauritius Telecom  | HMN Tech    | Baie Jacotet, Mauritius            | Grand Baie (Rodrigues), Mauritius |
| Maya-1   | 2,734 | AT&T, América Móvil (Claro), Axtel, BICS, C&W Networks, ETB, Embratel, Hondutel, Instituto Costarricense de Electricidad, Orange, Prepa Networks, RSL Telecom, T-Mobile, Telecom Italia Sparkle, Telefonica, Tricom, Verizon | ASN, SubCom | Hollywood, FL, United States       | Tolu, Colombia                    |
| Med Cable Network  | 808   | Orascom Telecom Holding  | ASN         | Marseille, France                  | Oran, Algeria                     |
| Medloop  | –     | SIPARTECH Sarl   | –           | Genoa, Italy                       | Barcelona, Spain                  |
| MedNautilus Submarine System   | 4,350 | Telecom Italia Sparkle   | ASN         | Catania, Italy                     | Tel Aviv, Israel                  |
| Medusa Submarine Cable System  | 5,443 | AFRIX Telecom  | ASN         | Carcavelos, Portugal               | Port Said, Egypt                  |
| Melita 1   | 60    | Melita   | NSW         | Pozzallo, Italy                    | Bahar ic-Caghaq, Malta            |
| Meltingpot Indianoceanic Submarine System (METISS)                     | 1,988 | CEB Fibernet, Canal+ Telecom, Emtel, SFR, Telma (Telecom Malagasy), Zeop (incl. Reunicable)  | ASN         | Umbogintwini, South Africa         | Baie du Tombeau, Mauritius        |
| Mid-Atlantic Crossing (MAC)  | 4,661 | Cirion Technologies  | ASN         | Brookhaven, NY/Hollywood, FL, U.S, | St. Croix, Virgin Islands (U.S.)  |
| Middle East North Africa (MENA) Cable System/Gulf Bridge International | 4,971 | Gulf Bridge International, Telecom Egypt   | ASN         | Mazara del Vallo, Italy            | Al Seeb, Oman                     |
| Minoas East and West   | 168   | Grid Telecom   | –           | Neapoli, Greece                    | Nopigeia, Greece                  |

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| MIST   | 5,033 | Orient Link   | NEC      | Mumbai, India                   | Tuas, Singapore           |
| Miyazaki-Okinawa Cable (MOC)                         | –     | KDDI  | –        | Miyazaki, Japan                 | Okinawa, Japan            |
| Monet  | 6,559 | Algar Telecom, Angola Cables, Antel Uruguay, Google                                       | SubCom   | Boca Raton, FL, United States   | Santos, Brazil            |
| Moratelindo International Cable System-1 (MIC-1)     | 43    | Moratelindo   | –        | Batam, Indonesia                | Changi North, Singapore   |
| Nor5ke Viking  | 503   | NOR5KE Fibre AS   | –        | Trondheim, Norway               | Bergen, Norway            |
| Nor5ke Viking 2                                      | 559   | NOR5KE Fibre AS   | –        | Lagunen, Sweden                 | Bergen, Norway            |
| National Digital Transmission Network (NDTN)         | 870   | Telecoms Infrastructure Corporation of the Philippines (TelicPhil)                        | –        | Dumaguete, Philippines          | Lucena, Philippines       |
| Nationwide Submarine Cable Ooredoo Maldives (NaSCOM) | 706   | Ooredoo Maldives  | HMN Tech | Hithadhoo, Maldives             | Kulhudhufushi, Maldives   |
| Natitua  | 1,665 | OPT French Polynesia  | ASN      | Nuku Hiva, French Polynesia     | Hitia'a, French Polynesia |
| Natitua Sud  | 510   | OPT French Polynesia  | ASN      | Hitia'a, French Polynesia       | Rurutu, French Polynesia  |
| Nelson-Levin   | 132   | Spark New Zealand   | –        | Nelson, New Zealand             | Levin, New Zealand        |
| New Cross Pacific (NCP) Cable System                 | 8,462 | China Mobile, China Telecom, China Unicom, Chunghwa Telecom, KT, Microsoft, Softbank Corp | SubCom   | Pacific City, OR, United States | Toucheng, Taiwan          |
| Nigeria Cameroon Submarine Cable System (NCSCS)      | 684   | Camtel  | HMN Tech | Lagos, Nigeria                  | Kribi, Cameroon           |
| Ningbo-Zhoushan Cable                                | 22    | China Telecom   | ASN      | Mamu, China                     | Xiepu, China              |

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| NO-UK                                 | 443   | Altibox   | Xtera  | Stavanger, Norway                         | Newcastle, United Kingdom   |
| NordBalt                              | 249   | Lietuvos Energija, Svenska Kraftnät   | –      | Klaipeda, Lithuania                       | Nybro, Sweden               |
| Norfest                               | 465   | Tampnet   | Nexans | Stavanger, Norway                         | Strömstad, Sweden           |
| North West Cable System               | 1,305 | Vocus Communications  | ASN    | Darwin, NT, Australia                     | Port Hedland, WA, Australia |
| Northern Lights                       | 42    | BT  | –      | Dunnet Head, United Kingdom               | Skail, United Kingdom       |
| NorthStar                             | 2,007 | Alaska Communications   | ASN    | Hillsboro, OR, United States              | Whittier, AK, United States |
| Nzadi Cable System                    | 590   | Kakike, Lda., KumoxiCom, Lda.   | –      | Cabinda, Angola                           | Luanda, Angola              |
| Okinawa Cellular Cable                | 472   | Okinawa Cellular Telephone Company  | NEC    | Kagoshima, Japan                          | Nago, Japan                 |
| Olisipo                               | 68    | EllaLink  | –      | Carcavelos, Portugal                      | Sines, Portugal             |
| Oman Australia Cable (OAC)            | 6,090 | SUB.CO  | SubCom | Perth, WA, Australia                      | Muscat, Oman                |
| OMRAN/EPE G Cable System              | 373   | Omantel, Vodafone   | –      | Chabahar, Iran                            | Khasab, Oman                |
| Oran-Valencia (ORVAL)                 | 478   | Algerie Telecom   | ASN    | Valencia, Spain                           | Algiers/Oran, Algeria       |
| OTEGLOBE Kokkini-Bari                 | 435   | OTEGLOBE  | ASN    | Kokkini, Greece                           | Bari, Italy                 |
| Pacific Caribbean Cable System (PCCS) | 3,728 | C&W Networks, Setar, Telconet, Telxius, United Telecommunication Services (UTS) | ASN    | Jacksonville, FL, United States           | Manta, Ecuador              |
| Pacific Crossing-1 (PC-1)             | 1,305 | Pacific Crossing  | SubCom | Grover Beach, CA/Harbour Pointe, WA, U.S. | Ajigaura/Shima, Japan       |
| Pacific Light Cable Network (PLCN)    | 7,336 | Google, Meta  | SubCom | El Segundo, CA, United States             | Toucheng, Taiwan            |
| Palapa Ring East                      | 3,915 | Indonesian Government, Moratelindo,   | –      | Waingapu, Indonesia                       | Kota Mappi, Indonesia       |

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|                                    |        | Telekom PT SmartFren                       |          |                                     |                                     |
| Palapa Ring Middle                 | 1,305  | Indonesian Government                      | HMN Tech | Tobelo, Indonesia                   | Raha, Indonesia                     |
| Palapa Ring West                   | 1,230  | Indonesian Government                      | –        | Singkawang, Indonesia               | Dumai, Indonesia                    |
| Palawan-Iloilo Cable System        | 186    | PLDT                                       | –        | San Jose de Buenavista, Philippines | Taytay, Philippines                 |
| Pan-American Crossing (PAC)        | 6,214  | Cirion Technologies                        | SubCom   | Grover Beach, CA, United States     | Fort Amador, Panama                 |
| Pan European Crossing (UK-Belgium) | 73     | Lumen                                      | –        | Bredene, Belgium                    | Dumpton Gap, United Kingdom         |
| Pan European Crossing (UK-Ireland) | 308    | Lumen                                      | –        | Ballinesker/Ballygrangans, Ireland  | Bude/Whitesands Bay, United Kingdom |
| Paniolo Cable Network              | 358    | Paniolo Cable Company                      | –        | Kekaha, HI, United States           | Kawaihae, HI, United States         |
| PASULI                             | 25     | FiberStar, XL Axiata                       | –        | Muntok, Indonesia                   | Sungsang, Indonesia                 |
| PEACE Cable                        | 13,360 | Peace Cable International Network Co. Ltd. | HMN Tech | Marseille, France                   | Tuas, Singapore                     |
| Penbal-4                           | 197    | Telefonica                                 | –        | Valencia, Spain                     | Valencia, Spain                     |
| Penbal-5                           | 196    | Telefonica                                 | –        | Gavá, Spain                         | Ses Covetes, Spain                  |
| Pencan-8                           | 870    | Telefonica                                 | ASN      | Candelaria, Canary Islands, Spain   | Conil, Spain                        |
| Pencan-9                           | 869    | Telefonica                                 | –        | Chipiona, Spain                     | Tarahales, Spain                    |
| Persona                            | 497    | EastLink                                   | NEXANS   | New Victoria, NS, Canada            | Rose Blanche, NL, Canada            |
| Petropavlovsk-Kamchatsky - Anadyr  | 1,350  | Rostelecom                                 | –        | Anadyr, Russia                      | Petropavlovsk-Kamchatsky, Russia    |
| PGASCOM                            | 164    | PGASCOM                                    | –        | Kuala Tungkal, Indonesia            | Sakra Island, Singapore             |

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| Philippine Domestic Submarine Cable Network (PDSCN) | 1,554 | Eastern Telecom, Globe Telecom, Infinivan Inc | Nexans   | Boracay, Philippines     | Zamboanga City, Philippines     |
| Picot-1   | –     | OPT   | ASN      | Poindimie, New Caledonia | Xepenehe, New Caledonia         |
| PIPE Pacific Cable-1 (PPC-1)                        | 4,288 | TPG Corporation (incl. iiNet and Internode)   | SubCom   | Sydney, NSW, Australia   | Piti, Guam                      |
| Pishgaman Oman Iran (POI) Network                   | 249   | Pishgaman Kavir                               | –        | Jask/Chabaha r, Iran     | Barka, Oman                     |
| PLDT Domestic Fiber Optic Network (DFON)            | 6,898 | PLDT  | –        | Dumaguete, Philippines   | Nasugbu, Philippines            |
| PNG LNG   | 124   | Telikom Papua New Guinea                      | –        | Kikori, Papua New Guinea | Port Moresby, Papua New Guinea  |
| Polar Circle Cable                                  | 624   | KystTele                                      | –        | Narvik, Norway           | Trondheim, Norway               |
| Polar Express                                       | 7,768 | Russian Government                            | –        | Teriberka, Russia        | Vladivostok, Russia             |
| POSEIDON  | 497   | Ocean Specialists, Inc (OSI)                  | –        | Pentaskhinos, Cyprus     | Yeroskipos, Cyprus              |
| Prat  | 2,175 | Grupo Gtd                                     | Prysmian | Arica, Chile             | Puerto Montt, Chile             |
| Qatar-U.A.E. Submarine Cable System                 | 62    | Etisalat UAE, Ooredoo                         | –        | Doha, Qatar              | Abu Dhabi, United Arab Emirates |
| Quintillion Subsea Cable Network                    | 1,181 | Quintillion                                   | ASN      | Nome, AK, United States  | Prudhoe Bay, AK, United States  |
| Raman   | 4,367 | Google, Omantel, Telecom Italia Sparkle       | –        | Aqaba, Jordan            | Mumbai, India                   |
| Rønne-Rødvig  | 95    | TDC Group                                     | –        | Rødvig, Denmark          | Rønne, Denmark                  |
| Rockabill   | 137   | euNetworks                                    | –        | Portrane, Ireland        | Southport, United Kingdom       |
| Romulo  | 147   | Red Electrica                                 | –        | Sagunto, Spain           | Santa Ponsa, Spain              |
| Roquetas-Melilla (CAM)                              | 112   | Telefonica                                    | –        | Roquetas de Mar, Spain   | Melilla, Spain                  |

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| Russia-Japan Cable Network (RJC�)           | 1,119 | KDDI, Rostelecom  | NEC      | Naoetsu, Japan              | Nakhodka, Russia                  |
| S-U-B Cable System                          | 1,248 | Telkom Indonesia  | –        | Banjarmasin, Indonesia      | Makassar/Surabaya, Indonesia      |
| Saba, Statia Cable System (SSCS)            | 123   | Government of the Netherlands   | –        | Gustavia, Saint Barthélemy  | Basseterre, Saint Kitts and Nevis |
| SAFE  | 8,389 | AT&T, Angola Telecom, BICS, Camtel, China Telecom, Chunghwa Telecom, Ghana Telecommunications Company, KPN, KT, Liquid Intelligent Technologies, Maroc Telecom, Mauritius Telecom, NATCOM (Nigeria), OPT, Orange, Orange Cote d'Ivoire, PCCW, Singtel, Sonatel, T-Mobile, Tata Communications, Telecom Italia Sparkle, Telecom Namibia, Telefonica, Telekom Malaysia, Telkom South Africa, Telstra, Verizon, Vodafone | SubCom   | Melkbosstrand, South Africa | Penang, Malaysia                  |
| Sagres                                      | 188   | Altice Portugal   | –        | Burgau, Portugal            | Sesimbra, Portugal                |
| Sakhalin-Kuril Islands Cable                | 584   | Rostelecom  | HMN Tech | Yuzhno-Sakhalinsk, Russia   | Krabozavodskoye, Russia           |
| Samoa-American Samoa (SAS)                  | 155   | American Samoa Government, Elandia  | –        | Pago Pago, American Samoa   | Apia, Samoa                       |
| San Andres Isla Tolu Submarine Cable (SAIT) | 513   | Energía Integral Andina   | –        | Tolu, Colombia              | San Andres, Colombia              |
| Sape-LabuanBajo-Ende-Kupang Cable Systems   | 295   | Moratelindo   | –        | Kupang, Indonesia           | Sape, Indonesia                   |

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| SAT-3/WASC                   | 8,917 | AT&T, Altice Portugal, Angola Telecom, BICS, BT, Benin Telecoms, Camtel, China Telecom, Chunghwa Telecom, Cyta, Deutsche Telekom, Ghana Telecommunications Company, KPN, KT, Liquid Intelligent Technologies, Maroc Telecom, Mauritius Telecom, NATCOM (Nigeria), OPT, Orange, Orange Cote d'Ivoire, PCCW, Singtel, T-Mobile, Tata Communications, Telecom Italia Sparkle, Telecom Namibia, Telekom Malaysia, Telkom South Africa, Telstra, Telxius, Verizon, Vodafone | ASN      | Sesimbra, Portugal         | Melkbosstrand, South Africa |
| Saudi Arabia-Sudan-1 (SAS-1) | 207   | Saudi Telecom, Sudan Telecom Company, The Arab Investment Company  | ASN      | Jeddah, Saudi Arabia       | Port Sudan, Sudan           |
| Saudi Arabia-Sudan-2 (SAS-2) | 205   | Saudi Telecom, Sudan Telecom Company   | -        | Jeddah, Saudi Arabia       | Port Sudan, Sudan           |
| Saudi Vision                 | 666   | Saudi Telecom  | ASN      | Haql, Saudi Arabia         | Jeddah, Saudi Arabia        |
| Scandinavian Ring North      | 3     | Arelion (formerly Telia Carrier)   | Ericsson | Helsingør, Denmark         | Helsingborg, Sweden         |
| Scandinavian Ring South      | 13    | Arelion (formerly Telia Carrier)   | Ericsson | Dragør, Denmark            | Bunkeflostrand, Sweden      |
| Scotland-Northern Ireland 1  | 22    | BT   | -        | Donaghadee, United Kingdom | Portpatrick, United Kingdom |
| Scotland-Northern Ireland 2  | 51    | BT   | -        | Girvan, United Kingdom     | Larne, United Kingdom       |
| Scotland-Northern Ireland 3  | 26    | BT   | -        | Donaghadee, United Kingdom | Portpatrick, United Kingdom |
| Scotland-Northern Ireland 4  | 53    | BT   | -        | Girvan, United Kingdom     | Larne, United Kingdom       |
| Scylla                       | 127   | euNetworks   | -        | Ijmuiden, Netherlands      | Lowestoft, United Kingdom   |

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| SEA-H2X                 | 3,107  | China Mobile, China Unicom, Converge ICT, PP Telecommunication Sdn Bhd  | HMN Tech             | Chung Hom Kok, China             | Tuas, Singapore                      |
| SEA-US                  | 9,010  | GTA TeleGuam, Globe Telecom, Hawaiian Telcom, RTI, Telin  | NEC                  | Hermosa Beach, CA, United States | Kauditán, Indonesia                  |
| Sea2shore               | 20     | National Grid   | -                    | Narragansett, RI, United States  | Crescent Beach, RI, United States    |
| Seabras-1               | 6,711  | Seaborn Networks, Telecom Italia Sparkle  | ASN                  | Wall Township, NJ, United States | Praia Grande, Brazil                 |
| SEACOM/Tata TGN-Eurasia | 9,321  | SEACOM, Tata Communications   | SubCom               | Zafarana, Egypt                  | Mumbai, India/Mtunzini, South Africa |
| SEALink                 | 214    | Alaska Power & Telephone Company (AP&T)   | Prysmian             | Lena Point, AK, United States    | Coffman Cove, AK, United States      |
| SeaMeWe-3               | 24,235 | AI Telekom Austria, AT&T, Altice Portugal, BICS, BT, CTM, China Telecom, Chunghwa Telecom, Cyta, Deutsche Telekom, Djibouti Telecom, Embratel, Etisalat UAE, Indosat Ooredoo, Jabatan Telekom Brunei, KDDI, KPN, KT, LG Uplus, Maroc Telecom, Myanmar Post and Telecommunication (MPT), National Telecom, OTEGLOBE, Omantel, Orange, Orange Polska, PCCW, PLDT, Pakistan Telecommunications Company Ltd., Rostelecom, Saudi Telecom, Singtel, Singtel Optus, Softbank Corp, Sri Lanka Telecom, Tata Communications, Telecom Argentina, Telecom Egypt, Telecom Italia Sparkle, Telekom Malaysia, Telkom South Africa, Telstra, Tunisia Telecom, Turk | ASN, Fujitsu, SubCom | Ostend, Belgium                  | Geoje, South Korea                   |

|           |        |   |              |                   |                 |
|-----------|--------|---|--------------|-------------------|-----------------|
|           |        | Telekom, Ukrtelecom, VNPT International, Verizon, Vocus Communications, Vodafone, eir   |              |                   |                 |
| SeaMeWe-4 | 12,428 | Airtel (Bharti), Algerie Telecom, Bangladesh Submarine Cable Company Limited (BSCCL), Etisalat UAE, National Telecom, Orange, Pakistan Telecommunications Company Ltd., Saudi Telecom, Singtel, Sri Lanka Telecom, Tata Communications, Telecom Egypt, Telecom Italia Sparkle, Telekom Malaysia, Tunisia Telecom, Verizon                           | ASN, Fujitsu | Marseille, France | Tuas, Singapore |
| SeaMeWe-5 | 12,428 | Bangladesh Submarine Cable Company Limited (BSCCL), China Mobile, China Telecom, China Unicom, Djibouti Telecom, Myanmar Post and Telecommunication (MPT), Ooredoo, Orange, Saudi Telecom, Singtel, Sri Lanka Telecom, TeleYemen, Telecom Egypt, Telecom Italia Sparkle, Telekom Malaysia, Telkom Indonesia, TransWorld, Turk Telekom International | ASN, NEC     | Toulon, France    | Tuas, Singapore |

|   |        |  |          |                               |   |
|---|--------|--|----------|-------------------------------|---|
| SeaMeWe-6   | 11,931 | Airtel (Bharti), Bangladesh Submarine Cable Company Limited (BSCCL), China Unicom, Dhiraagu, Djibouti Telecom, Microsoft, Mobily, Orange, PCCW, Singtel, Sri Lanka Telecom, Telecom Egypt, Telekom Malaysia, Telin, TransWorld | SubCom   | Marseille, France             | Tuas, Singapore                             |
| SEAX-1  | 155    | SEAX   | HMN Tech | Tanah Merah, Singapore        | Mersing, Malaysia                           |
| SednaLink Fibre                                       | 1,258  | CanArctic Inuit Networks   | –        | Goose Bay, NL, Canada         | Iqaluit, NU, Canada                         |
| Segunda FOS Canal de Chacao                           | 25     | Segunda FOS Canal de Chacao  | –        | Linao, Chile                  | Meimen, Chile                               |
| Senegal Horn of Africa Regional Express (SHARE) Cable | 447    | Agence De L'informatique del'Etat  | HMN Tech | Dakar, Senegal                | Praia, Cape Verde                           |
| Seychelles to East Africa System (SEAS)               | 1,199  | Seychelles Cable System Ltd.   | ASN      | Victoria, Seychelles          | Dar Es Salaam, Tanzania                     |
| SHEFA-2   | 621    | Shefa  | Xtera    | Banff, United Kingdom         | Torshavn, Faroe Islands                     |
| Silphium  | 264    | Libya International Telecommunications Company   | HMN Tech | Chania, Greece                | Derna, Libya                                |
| Singapore India Gateway (SING) Cable                  | 6,331  | Datawave Networks  | –        | Tuas, Singapore               | Salalah, Oman                               |
| Singapore-Myanmar (SIGMAR)                            | 1,384  | Campana Group  | HMN Tech | Thanlyin, Myanmar             | Tuas, Singapore                             |
| Sint Maarten Puerto Rico Network One (SMPR-1)         | 233    | Dauphin Telecom, TelEm Group   | –        | Isla Verde, PR, United States | Philipsburg, Sint Maarten                   |
| Sir Abu Nu'ayr Cable                                  | 52     | Etisalat UAE   | –        | Sharjah, United Arab Emirates | Sir Abu Nu'Ayr Island, United Arab Emirates |
| Sirius North  | 91     | Virgin Media Business  | –        | Carrickfergus, United Kingdom | Saltcoats, United Kingdom                   |

|  |        |  |          |                            |                              |
|--|--------|--|----------|----------------------------|------------------------------|
| Sirius South   | 136    | Virgin Media Business  | –        | Dublin, Ireland            | Blackpool, United Kingdom    |
| Sistem Kabel Rakyat 1Malaysia (SKR1M)                                    | 2,361  | TIME dotCom, Telekom Malaysia  | NEC      | Cherating, Malaysia        | Mersing, Malaysia            |
| SJKK   | 337    | XL Axiata  | –        | Ujung Pankah, Indonesia    | Takesung, Indonesia          |
| Skagenfiber West   | 106    | Altibox  | –        | Hirtshals, Denmark         | Larvik, Norway               |
| Skagerrak 4  | 85     | Statnett   | –        | Tjele, Denmark             | Kristiansand, Norway         |
| SMPCS Packet-1   | 1,961  | Telkom Indonesia   | ASN      | Manado, Indonesia          | Fakfak, Indonesia            |
| SMPCS Packet-2   | 2,174  | Telkom Indonesia   | NEC      | Jayapura, Indonesia        | Merauke, Indonesia           |
| Solas  | 144    | Vodafone, eir  | –        | Kilmore Quay, Ireland      | Oxwich Bay, United Kingdom   |
| Sorsogon-Samar Submarine Fiber Optical Interconnection Project (SSSFOIP) | 13     | National Grid Corporation of the Philippines                               | HMN Tech | Allen, Philippines         | Santa Magdalena, Philippines |
| South America-1 (SAM-1)  | 15,535 | Telxius  | SubCom   | Las Toninas, Argentina     | Valparaíso, Chile            |
| South American Crossing (SAC)  | 12,428 | Cirion Technologies, Telecom Italia Sparkle                                | ASN      | Las Toninas, Argentina     | Valparaíso, Chile            |
| South Atlantic Cable System (SACS)                                       | 3,831  | Angola Cables  | NEC      | Sangano, Angola            | Fortaleza, Brazil            |
| South Atlantic Inter Link (SAIL)   | 3,604  | Camtel, China Unicom   | HMN Tech | Kribi, Cameroon            | Fortaleza, Brazil            |
| South Pacific Cable System (SPSC)/Mistral                                | 4,536  | América Móvil (Claro), Telxius   | SubCom   | Puerto San Jose, Guatemala | Valparaíso, Chile            |
| Southeast Asia-Japan Cable 2 (SJC2)                                      | 6,525  | China Mobile, Chunghwa Telecom, DongHwa Telecom, KDDI, Meta, SK Broadband, | NEC      | Changi South, Singapore    | Chikura, Japan               |

|  |        |  |              |  |                                   |
|--|--------|--|--------------|--|-----------------------------------|
|  |        | Singtel, Telin, True Corporation, VNPT-Vinaphone   |              |  |                                   |
| Southeast Asia-Japan Cable (SJC)           | 5,530  | China Mobile, China Telecom, Chunghwa Telecom, Globe Telecom, Google, KDDI, National Telecom, Singtel, Telkom Indonesia, Unified National Networks (UNN) | NEC, SubCom  | Tuas, Singapore                            | Chikura, Japan                    |
| Southern Caribbean Fiber                   | 1,864  | Digicel  | ASN, SubCom  | San Juan, PR, United States                | Chaguaramas, Trinidad and Tobago  |
| Southern Cross Cable Network (SCCN)        | 18,642 | Southern Cross Cable Network   | ASN, Fujitsu | Hillsboro, OR/Morro Bay, CA, United States | Alexandria, NSW, Australia        |
| Southern Cross NEXT                        | 8,513  | Southern Cross Cable Network   | ASN          | Los Angeles, CA, United States             | Alexandria, NSW, Australia        |
| St. Pierre and Miquelon Cable              | 124    | French Authority of St. Pierre and Miquelon  | ASN          | Saint-Pierre, Saint Pierre and Miquelon    | Fortune, NL, Canada               |
| St. Thomas-St. Croix System                | 114    | St. Thomas-St. Croix System  | -            | Frederiksted, Virgin Islands (U.S.)        | Banana Bay, Virgin Islands (U.S.) |
| Strategic Evolution Underwater Link (SEUL) | 15     | Belize Telemedia   | HMN Tech     | Bomba, Belize                              | San Pedro, Belize                 |
| Subcan Link 1                              | 89     | Cable Submarine de Canarias  | SubCom       | Las Caletillas, Spain                      | Piedra Santa, Spain               |
| Subcan Link 2                              | 85     | Cable Submarine de Canarias  | SubCom       | Las Caletillas, Spain                      | Piedra Santa, Spain               |
| Sumatera Bangka Cable System (SBCS)        | 35     | Telkom Indonesia   | -            | Muntok, Indonesia                          | Palembang, Indonesia              |
| Suriname-Guyana Submarine                  | 776    | Guyana Telephone and Telegraph (GT&T), Telesur   | HMN Tech     | Totness, Suriname                          | Chaguaramas, Trinidad and Tobago  |

|   |       |  |          |                                     |                                 |
|---|-------|--|----------|-------------------------------------|---------------------------------|
| Cable System (SG-SCS)                   |       |  |          |                                     |                                 |
| Svalbard Undersea Cable System          | 1,686 | Telenor  | SubCom   | Breivika, Norway                    | Breivika, Norway                |
| Sweden-Estonia (EE-S1)                  | 149   | Arelion (formerly Telia Carrier), GN Great Nordic, Telia Eesti (formerly Eesti Telekom, EMT, Elion)                      | ASN      | Stavsnas, Sweden                    | Tallinn, Estonia                |
| Sweden-Finland 4 (SFS-4)                | 158   | Arelion (formerly Telia Carrier), Elisa Corporation  | –        | Turku, Finland                      | Norrthalge, Sweden              |
| Sweden-Finland Link (SFL)               | 88    | Arelion (formerly Telia Carrier), Elisa Corporation  | –        | Mariehamn, Finland                  | Väddö, Sweden                   |
| Sweden-Latvia                           | 243   | Latvia State Radio and Television Centre   | –        | Stockholm, Sweden                   | Ventspils, Latvia               |
| Taba-Aqaba                              | 8     | National Electric Power Company of Jordan  | –        | Taba, Egypt                         | Aqaba, Jordan                   |
| Taino-Carib                             | 81    | AT&T, C&W Networks, Embratel, Orange, T-Mobile   | AT&T SSI | Condado Beach, PR, United States    | Magen's Bay, VI, United States  |
| Taiwan Penghu Kinmen Matsu No.3 (TPKM3) | 317   | Chunghwa Telecom   | NEC      | Kinmen, Taiwan                      | Taoyuan, Taiwan                 |
| Taiwan Strait Express-1 (TSE-1)         | 162   | China Mobile, China Unicom, Chunghwa Telecom, Far EasTone (FET), Taiwan International Gateway Corporation, Taiwan Mobile | HMN Tech | Tanshui, Taiwan                     | Fuzhou, China                   |
| Tamare North                            | 214   | Tamare UK Group  | –        | Haifa, Israel                       | Yeroskipos, Cyprus              |
| Tampnet Offshore FOC Network            | 1,088 | Tampnet  | ASN      | Aberdeen/Lo westoft, United Kingdom | Farsund/Kårstø/Øygarden, Norway |
| Tangerine                               | 70    | Lumen  | –        | Ostend, Belgium                     | Broadstairs, United Kingdom     |

|   |        |   |        |   |                                   |
|---|--------|---|--------|---|-----------------------------------|
| Tanjung Pandan-Sungai Kakap Cable System      | 216    | Moratelindo   | -      | Sungai Kakap, Indonesia                       | Tanjung Pandan, Indonesia         |
| Tannat  | 1,243  | Antel Uruguay, Google   | ASN    | Maldonado, Uruguay                            | Santos, Brazil                    |
| Tarakan Selor Cable System (TSCS)             | 52     | Tarakan Selor Cable System (TSCS)                                       | -      | Tanjung Selor, Indonesia                      | Tarakan, Indonesia                |
| Tasman Global Access (TGA) Cable              | 1,422  | Spark New Zealand, Telstra, Vodafone                                    | ASN    | Oxford Falls, NSW, Australia                  | Raglan, New Zealand               |
| Tata TGN-Atlantic                             | 8,078  | Tata Communications   | SubCom | Highbridge, United Kingdom                    | Wall Township, NJ, United States  |
| Tata TGN-Gulf                                 | 2,505  | Tata Communications   | SubCom | Al Khobar, Saudi Arabia                       | Qalhat, Oman                      |
| Tata TGN-Intra Asia (TGN-IA)                  | 4,163  | Tata Communications   | SubCom | Changi North, Singapore                       | Ballesteros, Philippines          |
| Tata TGN-Pacific                              | 13,857 | Tata Communications   | SubCom | Los Angeles, CA, United States                | Piti, Guam                        |
| Tata TGN-Tata Indicom                         | 1,973  | Tata Communications   | SubCom | Chennai, India                                | Changi North, Singapore           |
| Tata TGN-Western Europe                       | 2,223  | Tata Communications   | SubCom | Highbridge, United Kingdom                    | Seixal, Portugal/Bilbao, Spain    |
| TE North/TGN-Eurasia/SEA COM/Alexandros/Medex | 2,258  | Algerie Telecom, Cyta, PCCW, SEACOM, Tata Communications, Telecom Egypt | ASN    | Marseille, France                             | Pentaskhinos, Cyprus              |
| TEGOPA  | 138    | Telefonica  | -      | Santa Cruz de La Palma, Canary Islands, Spain | Granadilla, Canary Islands, Spain |
| Telstra Endeavour                             | 5,670  | Telstra   | ASN    | Paddington, NSW, Australia                    | Keawaula, HI, United States       |
| Tenerife-Gran Canaria                         | 68     | Telefonica  | -      | El Médano, Canary Islands, Spain              | Sardina, Canary Islands, Spain    |

|   |        |   |          |   |                                     |
|---|--------|---|----------|---|-------------------------------------|
| Tenerife-La Palma                         | –      | Telefonica  | –        | Santa Cruz de La Palma, Canary Islands, Spain | Los Realejos, Canary Islands, Spain |
| TERRA SW                                  | –      | GCI Communication Corp  | –        | Homer, AK, United States                      | Igiugig, AK, United States          |
| Thailand-Indonesia-Singapore (TIS)        | 602    | National Telecom, Singtel, Telkom Indonesia                           | NEC      | Songkhla, Thailand                            | Changi North, Singapore             |
| The East African Marine System (TEAMS)    | 3,141  | Etisalat UAE, TEAMS Ltd.  | ASN      | Mombasa, Kenya                                | Fujairah, United Arab Emirates      |
| Thetis                                    | 410    | Vodafone  | Nexans   | Aetos, Greece                                 | Sitia, Greece                       |
| Timor-Leste South Submarine Cable (TLSSC) | 373    | Government of Timor-Leste   | ASN      | Dili, Timor-Leste                             | Connecting to North West Cable      |
| Tobrok-Emasaed Cable System               | 111    | Libya International Telecommunications Company                        | HMN Tech | El-Quawef, Libya                              | Tubruq, Libya                       |
| Tokelau Submarine Cable                   | 155    | Teletok   | ASN      | Atafu, Tokelau                                | Fakaofu, Tokelau                    |
| Tonga Cable                               | 514    | Digicel Tonga, Government of Tonga, Tonga Communications Corporation  | ASN      | Nuku'alofa, Tonga                             | Suva, Fiji                          |
| Tonga Domestic Cable Extension (TDCE)     | 255    | Tonga Cable Limited   | ASN      | Nuku'alofa, Tonga                             | Neiafu, Tonga                       |
| Topaz                                     | –      | Google  | –        | Vancouver, BC, Canada                         | Shima, Japan                        |
| Trans Adriatic Express                    | 66     | EXA Infrastructure, TAP AG  | –        | San Foca, Italy                               | Seman, Albania                      |
| Trans-Pacific Express (TPE) Cable System  | 11,165 | AT&T, China Telecom, China Unicom, Chunghwa Telecom, KT, NTT, Verizon | SubCom   | Nedonna Beach, OR, United States              | Tanshui, Taiwan                     |
| TRANSCAN-2                                | 148    | Telefonica  | –        | Aguimes, Canary Islands, Spain                | Arrecife, Canary Islands, Spain     |

|                      |       |   |        |                                   |                                     |
|----------------------|-------|---|--------|-----------------------------------|-------------------------------------|
| TRANSCAN-3           | 130   | Telefonica  | -      | Alta Vista, Canary Islands, Spain | Playa Blanca, Canary Islands, Spain |
| Transworld (TW1)     | 808   | TransWorld  | SubCom | Fujairah, United Arab Emirates    | Karachi, Pakistan                   |
| Trapani-Kelibia      | 130   | Telecom Italia Sparkle, Tunisia Telecom   | -      | Trapani, Italy                    | Kelibia, Tunisia                    |
| TT-1                 | 30    | Alliance Telecommunications, C&W Networks, TSTT   | -      | Pigeon Point, Trinidad and Tobago | Toco, Trinidad and Tobago           |
| Tui-Samoa            | 1,052 | Samoa Submarine Cable Company   | ASN    | Apia, Samoa                       | Suva, Fiji                          |
| Turcyos-1            | 68    | Turk Telekom  | ASN    | Bozyazi, Turkey                   | Girne, Cyprus                       |
| Turcyos-2            | 132   | Turk Telekom  | -      | Samandag, Turkey                  | Iskele, Cyprus                      |
| Tverrlinken          | -     | KystTele  | -      | Mo I Rana, Norway                 | Nesna, Norway                       |
| UAE-Iran             | 106   | Etisalat UAE, Telecommunication Infrastructure Company of Iran  | ASN    | Fujairah, United Arab Emirates    | Jask, Iran                          |
| UGARIT               | 149   | A1 Telekom Austria, AT&T, BT, Cyta, Deutsche Telekom, Lebanese Ministry of Telecommunications, Orange, Singtel, Syrian Telecommunications Establishment, Tata Communications, Telecom Italia Sparkle, Telefonica, Vivacom | SubCom | Pentaskhinos, Cyprus              | Tartous, Syria                      |
| UK-Channel Islands-7 | 77    | BT, Sure  | -      | Dartmouth, United Kingdom         | L'Ancrese Bay, Guernsey             |
| UK-Channel Islands-8 | 147   | -   | -      | Goonhilly Downs, United Kingdom   | St. Ouens Bay, Jersey               |
| Ultramar GE          | 163   | GITGE (Gestor de Infraestructuras de Telecomunicaciones de Guinea Ecuatorial)   | ASN    | Sao Tome, Sao Tome and Principe   | Annobon, Equatorial Guinea          |
| Ulysses 2            | -     | Verizon   | -      | Lowestoft, United Kingdom         | Ijmuiden, Netherlands               |

|  |       |  |             |   |                                   |
|--|-------|--|-------------|---|-----------------------------------|
| Unisur                                       | 165   | Antel Uruguay,<br>Telxius  | ASN, SubCom | Las Toninas,<br>Argentina                 | Maldonado,<br>Uruguay             |
| Unitel North<br>Submarine<br>Cable<br>(UNSC) | 712   | Unitel (Angola)  | HMN Tech    | Cacongo,<br>Angola                        | N'zeto,<br>Angola                 |
| Unitirreno<br>Cable                          | 553   | Unidata  | ASN         | Genoa, Italy                              | Mazara del<br>Vallo, Italy        |
| Unity/EAC-<br>Pacific                        | 5,978 | Airtel (Bharti),<br>Google, KDDI,<br>Singtel, TIME<br>dotCom, Telstra  | NEC, SubCom | Redondo<br>Beach, CA,<br>United States    | Chikura,<br>Japan                 |
| Venezuelan<br>Festoon                        | 746   | CANTV  | –           | Carúpano,<br>Venezuela                    | Cabimas,<br>Venezuela             |
| Vodafone<br>Greece<br>Domestic               | 57    | Vodafone   | NSW         | Porto Rafti,<br>Greece                    | Syros, Greece                     |
| WALL-LI                                      | 37    | Crosslake Fibre  | –           | Wall<br>Township,<br>NJ, United<br>States | Westbury,<br>NY, United<br>States |
| West Africa<br>Cable System<br>(WACS)        | 9,029 | Altice Portugal,<br>Angola Cables,<br>Broadband Infracore,<br>Camtel, Cape Verde<br>Telecom, Congo<br>Telecom, Liquid<br>Intelligent<br>Technologies, MTN,<br>Office Congolais de<br>Poste et<br>Télécommunication,<br>PCCW, Tata<br>Communications,<br>Telecom Namibia,<br>Telkom South Africa,<br>Togo Telecom,<br>Vodacom DRC,<br>Vodafone, Vodafone<br>Espana, Vodafone<br>Ghana | ASN         | Seixal,<br>Portugal                       | Yzerfontein,<br>South Africa      |
| X-Link<br>Submarine<br>Cable                 | 482   | E-Networks Inc.  | –           | Georgetown,<br>Guyana                     | Pegwell,<br>Barbados              |
| Yellow                                       | 4,350 | Lumen  | SubCom      | Bellport, NY,<br>United States            | Bude, United<br>Kingdom           |
| Zeus   | –     | Zayo   | Hexatronic  | Zandvoort,<br>Netherlands                 | Lowestoft,<br>United<br>Kingdom   |

## Annex 6: Table of transatlantic cables

This table presents all transatlantic undersea cables ready for service in 2026 with their names, length (in miles), owners, suppliers, capacity, and final landing points (I use the same conventions as those in Annex 4). Transatlantic cable here means the cables connecting the U.S. and Canada to the E.U. plus the U.K., Norway, Iceland, and Greenland. All data have been collected on (TeleGeography 2023). Capacities have been collected on (Submarine Cable Networks 2023)—in some few cases where capacities were not available on (Submarine Cable Networks 2023), I have taken the actual or projected capacity of cables on their dedicated websites. A ‘\_’ means that I have not found the information or that the information is not yet available. ‘Meta’ is the new name of Facebook, Inc, which owns Facebook, Instagram, and WhatsApp among other products and services.

| <b>Undersea Cables</b> | <b>Date</b> | <b>Supplier</b> | <b>Owner</b>                                  | <b>Capacity</b> |
|------------------------|-------------|-----------------|---|-----------------|
| AEC-1                  | 2016        | Subcom          | Aqua Comms                                    | 130Tbs          |
| Amitie                 | 2023        | ASN             | Aqua Comms, Meta, Microsoft, Orange, Vodafone | 241.2Tbs        |
| Apollo                 | 2003        | ASN             | Vodafone                                      | 32Tbs           |
| Atlantic Crossing-1    | 1998        | Subcom          | Lumen   | 40Gbs           |
| Dunant                 | 2021        | Subcom          | Google  | 300Tbs          |
| EXA Express            | 2015        | Subcom          | EXA Infrastructure                            | 53Tbs           |
| EXA North and South    | 2001        | Subcom          | EXA Infrastructure                            | 10.16Tbs        |
| Flag Atlantic 1        | 2001        | ASN             | Global Cloud Xchange                          | 4.8Tbs          |
| Grace Hopper           | 2022        | Subcom          | Google  | 352Tbs          |
| Greenland Connect      | 2009        | ASN             | Tusass A/S                                    | 12.4Tbs         |
| Havfrue                | 2020        | Subcom          | Aqua Comms, Bulk, Google, Meta                | 108Tbs          |
| Leif Erikson           | 2026        | _               | Bulk  | _               |
| Marea                  | 2018        | Subcom          | Meta, Microsoft, Telxius                      | 200Tbs          |
| Tata TGN               | 2001        | Subcom          | Tata Communications                           | 5.12Tbs         |
| Yellow                 | 2000        | Subcom          | Lumen   | 320Gbs          |

## Annex 7: Table of transpacific cables

This table presents all transpacific undersea cables ready for service in 2026 with their names, length (in miles), owners, suppliers, capacity, and final points (I use the same conventions as those in Annex 4). Transpacific cable here means cables connecting the U.S. and Canada to East-Asian countries, Australia, and New Zealand. Cables connecting Guam to East-Asian countries are taken to be transpacific. All data have been collected on (TeleGeography 2023). Capacities have been collected on (Submarine Cable Networks 2023)—in some few cases where capacities were not available on (Submarine Cable Networks 2023), I have taken the actual or projected capacity of cables on their dedicated websites. A ‘\_’ means that I have not found the information or that the information is not yet available. ‘Meta’ is the new name of Facebook, Inc, which owns Facebook, Instagram, and WhatsApp among other products and services.

| <b>Undersea Cables</b>      | <b>Date</b> | <b>Supplier</b> | <b>Owner</b>  | <b>Capacity</b> |
|-----------------------------|-------------|-----------------|---|-----------------|
| Apricot                     | 2024        | –               | Chunghwa Telecom, Google, Meta, NTT, PLDT   | 190Tbs          |
| Asia Connect Cable 1        | 2025        | –               | Inligo Network  | 256Tbs          |
| Asia-America Gateway        | 2005        | ASN, NEC        | AT&T, Airtel (Bharti), BT, BayanTel, Eastern Telecom, Ezecom, Indosat Ooredoo, National Telecom, PLDT, Saigon Postel Corporation, Spark New Zealand, Starhub, Telekom Malaysia, Telkom Indonesia, Telstra, Unified National Networks (UNN), VNPT International, Viettel Corporation | 1.92Tbs         |
| Australia Japan Cable (AJC) | 2001        | Subcom          | AT&T, NTT, Softbank Corp, Telstra, Verizon  | 10Tbs           |
| Bifrost                     | 2024        | ASN             | Meta, Keppel T&T, Telin   | 124.8Tbs        |
| Cap 1                       | 2025        | NEC             | Amazon, Meta  | 108Tbs          |
| Echo                        | 2023        | NEC             | Google, Meta  | 144Tbs          |
| Faster                      | 2016        | NEC             | Google, China Mobile, China Telecom, KDDI, Singtel, TIME dotCom   | 60Tbs           |
| Goki                        | 2013        | Xtera           | AT&T  | –               |
| Hawaiki                     | 2018        | Subcom          | Hawaiki   | 30Tbs           |

|                                    |      |              |  |         |
|------------------------------------|------|--------------|--|---------|
| Hawaiki Nui                        | 2025 | Subcom       | Hawaiki Submarine Cable LP   | 240Tbs  |
| Japan-Guam-Australia North (JGA-N) | 2020 | NEC          | RTI  | 24Tbs   |
| Japan-Guam-Australia South (JGA-S) | 2020 | ASN          | Australia's Academic and Research Network (AARNET), Google, RTI  | 36Tbs   |
| Japan-U.S. Cable Network           | 2001 | ASN, Fujitsu | AT&T, BT, China Telecom, China Unicom, Chunghwa Telecom, HKBN Enterprise Solutions, KDDI, KT, LG Uplus, Lumen, NTT, Orange, PCCW, PLDT, SK Broadband, Singtel, Softbank Corp, Starhub, T-Mobile, Tata Communications, Telekom Malaysia, Telstra, Verizon, Vodafone | 1.28Tbs |
| Juno                               | 2024 | NEC          | Seren Juno Network Co., Ltd.   | 360Tbs  |
| Jupiter                            | 2010 | Subcom       | Amazon Web Services, Meta, NTT, PCCW, PLDT, Softbank Corp  | 60Tbs   |
| New Cross Pacific                  | 2018 | Subcom       | Microsoft, China Mobile, China Telecom, China Unicom, Chunghwa Telecom, KT, Softbank Corp  | 70Tbs   |
| Pacific Crossing 1                 | 1999 | Subcom       | Pacific Crossing   | 10Gbs   |
| Pacific Light Cable                | 2022 | Subcom       | Google, Meta   | 144Tbs  |
| Sea-US                             | 2017 | NEC          | GTA TeleGuam, Globe Telecom, Hawaiian Telcom, RTI, Telin   | 20Tbs   |
| Southern Cross Cable Network       | 2000 | ASN, Fujitsu | Southern Cross Cable Network   | 240Gbs  |
| Southern Cross Next                | 2022 | ASN          | Southern Cross Cable Network   | 72Tbs   |
| Tata TGN                           | 2002 | Subcom       | Tata Connection  | 7.68Tbs |
| Telstra Endeavour                  | 2008 | ASN          | Telstra  | 1.28Tbs |
| Topaz                              | 2023 | -            | Google   | 240Tbs  |
| TPU                                | 2025 | NEC          | Google   | 260Tbs  |
| Trans-Pacific Express              | 2008 | Subcom       | AT&T, China Telecom, China Unicom, Chunghwa Telecom, KT, NTT, Verizon  | 5.12Tbs |
| Unity                              | 2010 | Subcom, NEC  | Google, Airtel (Bharti), KDDI, Singtel, TIME dotCom, Telstra   | 7.68Tbs |

## Annex 8: Table of Europe – East-Asia cables

This table presents all Europe – East-Asia undersea cables ready for service in 2026 with their names, length (in miles), owners, suppliers, capacity, and final points (I use the same conventions as those in Annex 4). Europe – East Asia cables here mean cable connecting the E.U. plus the U.K. to East-Asia countries (China, South Korea, Japan, Singapore...). A cable with a starting point in the E.U. and an arrival point in India or in Pakistan is not a Europe – East-Asia cable. All data have been collected on (TeleGeography 2023). Capacities have been collected on (Submarine Cable Networks 2023)—in some few cases where capacities were not available on (Submarine Cable Networks 2023), I have taken the actual or projected capacity of cables on their dedicated websites. A ‘\_’ means that I have not found the information or that the information is not yet available. ‘Meta’ is the new name of Facebook, Inc, which owns Facebook, Instagram, and WhatsApp among other products and services.

| <b>Undersea Cables</b> | <b>Date</b> | <b>Suppliers</b> | <b>Owner</b>   | <b>Capacity</b> |
|------------------------|-------------|------------------|--|-----------------|
| AAE-1                  | 2017        | Subcom, NEC      | China Unicom, Djibouti Telecom, Etisalat UAE, Hyalroute, Metfone, Mobily, National Telecom, OTEGLOBE, Omantel, Ooredoo, PCCW, Pakistan Telecommunications Company Ltd., Reliance Jio Infocomm, Retelit, TIME dotCom, TeleYemen, Telecom Egypt, VNPT International, Viettel Corporation | 100Tbs          |
| FLAG Europe-Asia       | 1997        | Subcom           | Global Cloud, Xchange  | 80Gbs           |
| Peace                  | 2022        | HMN Tech         | Peace Cable International Network Co. Ltd.   | 192Tbs          |

|           |      |                      |   |        |
|-----------|------|----------------------|---|--------|
| SeaMeWe-3 | 1999 | ASN, Fujitsu, Subcom | A1 Telekom Austria, AT&T, Altice Portugal, BICS, BT, CTM, China Telecom, Chunghwa Telecom, Cyta, Deutsche Telekom, Djibouti Telecom, Embratel, Etisalat UAE, Indosat Ooredoo, Jabatan Telecom Brunei, KDDI, KPN, KT, LG Uplus, Maroc Telecom, Myanmar Post and Telecommunication (MPT), National Telecom, OTEGLOBE, Omantel, Orange, Orange Polska, PCCW, PLDT, Pakistan Telecommunications Company Ltd., Rostelecom, Saudi Telecom, Singtel, Singtel Optus, Softbank Corp, Sri Lanka Telecom, Tata Communications, Telecom Argentina, Telecom Egypt, Telecom Italia Sparkle, Telekom Malaysia, Telkom South Africa, Telstra, Tunisia Telecom, Turk Telekom, Ukrtelecom, VNPT International, Verizon, Vocus Communications, Vodafone, eir | 40Gbs  |
| SeaMeWe-4 | 2005 | ASN, Fujitsu         | Airtel (Bharti), Algerie Telecom, Bangladesh Submarine Cable Company Limited (BSCCL), Etisalat UAE, National Telecom, Orange, Pakistan Telecommunications Company Ltd., Saudi Telecom, Singtel, Sri Lanka Telecom, Tata Communications, Telecom Egypt, Telecom Italia Sparkle, Telekom Malaysia, Tunisia Telecom, Verizon   | 100Gbs |
| SeaMeWe-5 | 2016 | ASN, NEC             | Bangladesh Submarine Cable Company Limited (BSCCL), China Mobile, China Telecom, China Unicom, Djibouti Telecom, Myanmar Post and Telecommunication (MPT), Ooredoo, Orange, Saudi Telecom, Singtel, Sri Lanka Telecom, TeleYemen, Telecom Egypt, Telecom Italia Sparkle, Telekom Malaysia, Telkom Indonesia, TransWorld, Turk Telekom International   | 17Tbs  |

|           |      |        |  |        |
|-----------|------|--------|--|--------|
| SeaMeWe-6 | 2025 | SubCom | Airtel (Bharti), Bangladesh Submarine Cable Company Limited (BSCCL), China Unicom, Dhiraagu, Djibouti Telecom, Microsoft, Mobily, Orange, PCCW, Singtel, Sri Lanka Telecom, Telecom Egypt, Telekom Malaysia, Telin, TransWorld | 120Tbs |
|-----------|------|--------|--|--------|