Introduction

Google welcomes the opportunity to submit comments regarding the Body of European Regulators for Electronic Communications (BEREC) draft "Report on the General Authorisation and Related Frameworks for International Submarine Connectivity."

Google is an investor in a number of international submarine cables connecting Europe to the rest of world, including **Havfrue** (linking Ireland-Denmark-US), **Dunant** (France-US), **Grace Hopper** (Spain-UK-US), **Equiano** (Portugal-Nigeria-Togo-Saint Helena-South Africa), **Blue** (Italy-France-Greece-Israel), and most recently **Nuvem** (Portugal-Bermuda-US). Google also supports European submarine cable systems owned by other operators through its lease of capacity on such systems.

Submarine cables are the backbone of the global Internet. Indeed, over 95 percent of international data flows over submarine cables. Moreover, these cables have the potential to transform economies. A recent study by Copenhagen Economics of the impact of the Equiano and Ellalink cables into Portugal, for example, concluded that:

> "The cables are expected to lower the latency and increase the internet bandwidth for internet users in Portugal, which increase the internet usage and subsequently increase Portuguese GDP by up to €500 million per year. This impact arises from several fundamental economic enablers:
>
> - Trade impacts: Equiano lowers the cost of trading data between Europe and Africa and thus reduces the barrier to trade, allowing more Portuguese firms to trade with Africa.
>
> - Investment impacts: Equiano is expected to have a positive impact on foreign direct investments going to Portugal, as Portugal becomes a more attractive investment location as a digital gateway to Africa.
>
> - Productivity impacts: Key digital infrastructure, such as Equiano, enable and support possibilities for teleworking and online meetings, thereby maximising the time spent working."

Given the critical importance of submarine cables to the global Internet, and to the countries and communities they connect, Google strongly supports the stated goal of

the BEREC report to promote investment in this sector. Google offers the following comments with that goal in mind.

A. Submarine Cable Systems – Ownership and Operation

As the BEREC report notes, over the last few decades, companies other than telecommunications providers, particularly technology companies, have become significant investors in submarine cable systems connecting Europe. The increased investment by technology companies into submarine cable systems has helped to fill gaps in investment by telecommunications providers, particularly as the data needs of European citizens, businesses and governments have grown.

There are, however, two aspects that are not sufficiently addressed in the BEREC report – specifically, (1) the diverse ecosystem of co-investment and partnerships that has evolved as the participation of technology companies has increased and (2) the significant investment that technology companies such as Google have made in submarine cable technology, not just in the cables themselves. These factors are important to an understanding of the industry and should inform future discussions around appropriate regulatory approaches.

An Ecosystem of Co-investment and Partnerships: Importantly, not all investment in submarine cables has tracked with BEREC's observation that the industry trend is towards single ownership of cables. Indeed, Google'e experience with submarine cables in Europe and elsewhere has often been different, with most investments reflecting a diverse ecosystem of co-investment and partnership. For example, the very first transatlantic cable system investment by Google – the Havfrue cable, which went into service in 2019, connecting Ireland, Denmark and the United States – included two European partners, AquaComms and Bulk Infrastructure. Similarly, the Blue cable that is currently being built to connect Italy, France, Greece and Israel includes a number of other telecommunication providers as co-investors like Telecom Italia Sparkle.

For the Dunant cable, Google partnered with telecommunication provider Orange, which served as the French landing partner, built and operated the landing station on the French Atlantic coast, and provided backhaul service to Paris. Orange also invested in a fiber pair on the system, enabling Orange to "boost its capacity to meet massive growth in data and content demands between Europe and the U.S for several years." (Orange press release, Oct. 12, 2018) In describing the importance of the collaboration, Orange stated:

> "Thanks to this partnership, Orange will be in a stronger position to support the development of new uses for its consumer and enterprise customers in Europe and America. This will also reinforce its international leadership position on the

> wholesale market with respect to content-providers and third-party operators." (Orange press release, Oct. 12, 2018)

The Equiano cable connecting Portugal to points along the West Coast of Africa down to South Africa perhaps provides the richest picture of the spectrum of different types of partners that can be involved in a submarine cable project. To build the cable, Google partnered with Alcatel Submarine Networks headquartered in France. In Lisbon, Equiano's landing station, beach manholes and ducts are owned and operated by MEO - Serviços de Comunicações e Multimédia, S.A., Equiano's landing party in Portugal. For the Togo branch of Equiano, Google partnered with multiple key telecommunications players, including Société d'infrastructures numériques (SIN) and CSquared. For the Nigeria branch of Equiano, Google partnered with the West Indian Ocean Cable Company (WIOCC), which serves as the landing party for the cable in Lagos and also owns a fiber pair on the system. For the Namibia branch, Google partnered with the telecommunications provider, Paratus, which also serves as the local landing party. For the South Africa branch, Google worked with Openserve as the landing partner. And for the branch to St. Helena, one of the remotest islands on earth, the infrastructure is owned by the St. Helena Government, which funded the branch using an award from the European Development Fund.

Investment in Submarine Cable Technology, Not Just Systems: The participation of technology companies in the industry has also resulted in significant investment in cable technology, in partnership with submarine cable suppliers, not just in the systems themselves. So, for example, with the Dunant cable Google debuted cutting-edge space-division multiplexing (SDM) design. SDM technology allowed the delivery of a record-breaking capacity of 250 terabits per second across the ocean—enough to transmit the entire digitized Library of Congress three times every second. While previous subsea cable technologies relied on a dedicated set of pump lasers to amplify each fiber pair, the SDM technology used in Dunant allowed pump lasers and associated optical components to be shared among multiple fiber pairs. This 'pump sharing' technology enabled more fibers within the cable while also providing higher system availability.

On Equiano, Google launched important new capabilities allowing optical switching at the fiber-pair level, rather than the traditional approach of wavelength-level switching. This greatly simplified the allocation of cable capacity, giving operators the flexibility to add and reallocate it in different locations as needed. On another European cable, Grace Hopper, Google introduced an evolution of the same technology, allowing for more configuration options, and hence greater flexibility and resilience.

More recently, Google has begun implementing multi-core fiber (MCF) technology, starting with the Taiwan-Philippines-US (TPU) cable. MCF builds on the current generation of single-core optical fibers, which rely on a rounded glass core that is

surrounded by a glass cladding to confine and propagate light. MCF allows the doubling of the number of cores in the cladding, meaning a single fiber strand can carry more light and information at a reduced cost per bit. MCF technology also enables faster manufacturing, testing, and maintenance operations because it involves fewer fibers compared to an equivalent number of cores implemented via traditional single-core fibers.

This steady investment in technological advancement, working with submarine cable suppliers, has moved the entire submarine cable industry forward. Moreover, the resulting improvements in networking speed, resilience and reliability have served all downstream users of data, including European citizens, businesses and governments.

B. The Electronic Communications Regulatory Framework

Google agrees with BEREC's assessment of the lack of "robust harmonisation in the definition – where it exists – and the interpretation of what qualifies as a publicly available [electronic communications service (ECS) under national legislation]." (BEREC report at p.16) This definition, and that of public electronic communications network (ECN), "are crucial for determining the regime applicable to each ECN or ECS, as most of the rights and obligations [in ECNS national legislation] are applied solely to public ECN and to publicly available ECS." (BEREC report at p. 2). Clarity and harmonisation in the interpretation of these critical definitions could help to mitigate regulatory uncertainty and bring more investment into the industry.

BEREC notes that currently the majority of national regulatory authorities consider that the definition of "public" ECS apply to the operation of submarine cable systems to support retail national telecommunications businesses and to sell capacity to third parties at the wholesale and/or retail level. BEREC also notes that submarine cable systems operated for other purposes, such as to connect exclusively for the sole use of the operator (for example to connect the operator's data centers) would likely be classified as a non-publicly available ECS.

As BEREC and European policymakers consider possible clarification of the interpretation of legislation applicable to ECNs, we urge preservation of this important distinction between providing network services to the public in a particular jurisdiction and self-provisioning of network services (including between affiliates). Regulatory obligations should continue to apply at the service level, when a provider intersects with the public. This is the point at which the public interest becomes most significantly implicated, supporting more robust regulatory oversight. Earlier in the supply chain, and where network services are not offered to the public in a particular jurisdiction, more limited obligations, such as technical, health and safety and environmental standards compliance and reporting, are more appropriate.

C. Measures to Promote the Development of International Submarine Connectivity

Google also appreciates BEREC's assessment of national measures to promote the development of international submarine connectivity, including the adoption of measures to strengthen institutional capacity and improve cable security. Google agrees with the measures identified by BEREC and would support addition of some other measures to the list:

- Establishing simplified licensing regimes for submarine cables.

- Creation of single points of contact for parties interested in making submarine cable investment and for cooperation between competent authorities of different countries.

- Creating sea and land corridors for the installation of cables. It is important, if this approach is taken, to ensure that adequate geographic diversity is enabled, clear restrictions are established on activities that could endanger the cables (e.g., activities resulting in anchor dropping/dragging within such corridors) and that robust enforcement efforts are undertaken.

- Undertaking measures to ensure geographic diversity of routes and landings to avoid single points of failure. This could include periodically reviewing established cable corridors to avoid over-concentration and creating new landing areas/corridors where such concentration is evident.

- Ensuring spatial separation of submarine cable systems from other maritime activities, regularly updating nautical maps and charts and designating submarine cable protection zones, to avoid cable incidents.

- Minimizing regulatory barriers to building and repairing cables, including avoiding cabotage or crewing restrictions for such activities.

- Establishing surface surveillance of civil maritime activities and enhancing submarine surveillance, to enhance prevention and to gain threat intelligence. Establishing procedures for sharing threat information with allied countries also could help maximize impact.

- Enlisting the use of AI/ML technologies to help detect potential threats to submarine cables from sea vessels in the area of underwater infrastructure.

- Ensuring an open investment policy that allows, *inter alia,* submarine cable ownership and operation by foreign investors without mandatory local partnership requirements.

Conclusion

Google appreciates the opportunity to provide the above comments on the BEREC draft report. As an active participant in the submarine cable ecosystem, Google shares the interest in further development and expansion of the industry. We stand ready to support BEREC in further exploration of these issues.