FEATURE

OPTICAL NETWORKS IN CHILE

Prepared For The Future

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1. INTRODUCTION

The geographical and topological characteristics of Chile constitute a great obstacle for the development of telecommunications networks. Indeed, its long and thin territory plus the extreme southern region full of fjords and channels are unmatched in the world. This article presents a summary description of the evolution of the telecommunications cable industry in Chile, from the installation of the first of them in 1852 to the current scenario where 99% of the inhabited territory will soon be connected through fiber optic cables.

2. GEOGRAPHY AND POPULATION OF CHILE

Chile has 19 million inhabitants and is in the south of the South American west coast, a country of middle income, with a territory of more than 4,100 km long with north-south orientation, and no more than 200 km wide at its largest part. The population is mainly settled along some 1,000 km located in the center of the country and presents a medium-high degree of digital development. The country is experiencing the effects of the pandemic and its pressure for more and better Internet connections, as everywhere.

3. BEGINNING OF TELECOMMUNICATIONS IN CHILE

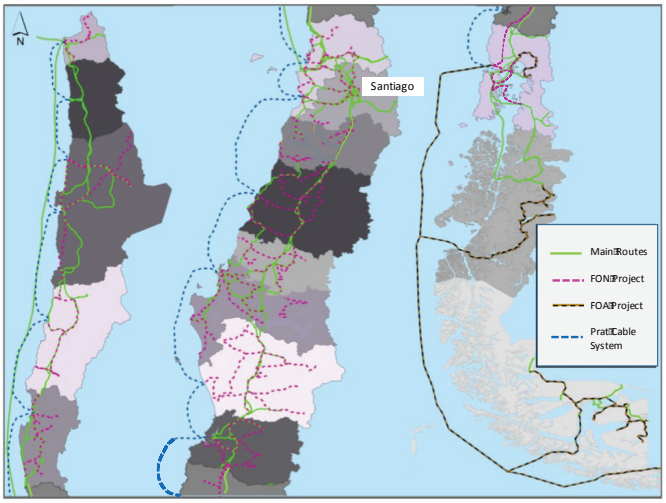
At the beginning of the Republic, during the first half of the 19th century, the main economic activities were mining, agriculture, trade, and an incipient international trade by sea. For this reason, the first telegraph cable in the country was installed in 1852 linking the capital Santiago and the main port, Valparaíso. From that moment on, the deployment of telegraph cables did not stop and culminated well into the twentieth century with the "All America Cable" that linked Chile and the United States along the Pacific coast. An important milestone occurred in 1968 when the Longovilo Earth Station, the first in Latin America, was put into service, thus initiating the era of international satellite communications. Chile also built a national microwave and satellite network that allowed the beginning of the massification of telecommunications throughout the country.

4. MODERN TELECOMMUNICATIONS

Starting in the late 1980s, the Chilean market was opened to private investment, while the old state-owned long distance and home telephone companies were privatized. Thus, market conditions were generated that attracted investments to build, as of 1990, the first national and international optical networks, initially covering the most densely populated areas of the country. The first submarine fiber optic cable was the PanAmerican Cable in 1997, which connects Arica, Chile with the US Virgin Islands in the Caribbean Sea, and countries in between.

However, the less densely populated rural and remote areas of Chile were left behind and were not connected by fiber optics, their population counting only on mobile telephony, data, and Internet services. Even though mobile services have achieved coverage of 99% of the inhabited territory over time, successive governments understood the importance of having a country also connected by fiber optics, in all inhabited urban and rural areas. In this way, as of 2015, state subsidies became available to connect the missing rural areas, through the Fibra Optica Austral, FOA, a submarine project, and through the Fibra Óptica Nacional, FON project, a collection of terrestrial segments along the country.

Thus, through public and private investment, Chile will have within a couple of years all its communes connected by fiber optics, a huge achievement given the geographic and topological conditions that the country presents. The long coastline of more than 4,000 km has favored the installation of submarine cables as well, which allow the mutual restoration with terrestrial cables to offer route diversity, robustness, and quality of service to the country's telecommunications.



Fiber optic network coverage in Chile
(Source: Undersecretariat of Telecommunications, Chile)

5. CURRENT SCENARIO

The market has developed in 2021 to levels of competition never seen before in Chile, characterized by the drop in prices of services for the population and the multiple operators present. In addition, the country has already awarded the 5G radio spectrum throughout the national territory.

The first fiber optic cables installed early in the 1990s are near to the end of life so that after completing the rural connections, the country will probably have to begin a process of renovating the first optical networks.

5.1 FIBER OPTIC DOMESTIC NETWORKS, SUBMARINE AND TERRESTRIAL

The current situation of Chile appears in the following diagram, in which the main routes currently used by the different operators are shown in green, as a reference, and are shown the domestic submarine cables and the fiber project FON. The country is divided into three main areas: North, Central, and South.

Currently, there are seven telecommunications companies that own optical networks covering these areas, totally or partially:

1. CLARO (América Móvil subsidiary) Network coverage: north and central
2. ENTEL Network coverage: north, central, and south

3. INTERNEXA: Network coverage: central, south
4. MOVISTAR Network coverage: north, central, and south
5. MUNDO PACÍFICO Network coverage: central, south
6. GTD / TELEFÓNICA DEL SUR: Network coverage: north, central, south
7. SILICA NETWORKS CHILE: Network coverage: central, south

Apart from these telecom companies, there are other optical networks owned by utility companies for their purposes (companies in the electricity, mining, and railway sectors), which are not described in this article.

North Zone

Three companies operate in this area and mutual restoration agreements have been signed between terrestrial networks to protect the traffic.

In addition, these three companies jointly built an additional fiber optic cable between Santiago and La Serena via a diverse route. This cable has 96 fibers cable where each company owns 32 fibers.

The Prat submarine cable owned by GTD is also another key player beginning its service and adding a fourth operator in the north area.

Central Zone

Five companies operate in this area providing connectivity services for the 5th and Metropolitan regions, and to Argentina. Several of them provide mutual backups or by their own means through rings by various routes.

South Zone

Six companies operate in the southern zone, three of them providing connectivity services between Santiago and Valdivia with mutual support agreements.

The other companies own partial sections and use the networks of other operators to complete the connectivity in this southern zone. In addition, two companies connect Punta Arenas, Chile, and Río Gallegos, Argentina.

Special mention is due to our two domestic submarine cables that cover the whole coast of the country:

Cable Prat

This is a non repeatered, festoon-type submarine cable owned by GTD, which connects 12 coastal cities in Chile, starting in the extreme north of Arica to Puerto Montt in the southern zone. In this city it is connected to the existing submarine cables of GTD covering up to Coyhaique, passing through Chaitén and Chiloé. It has a total length of 3,500 kilometers and is composed of 36 fiber filaments with a capacity of 9.6 Tbps per pair of filaments. The installation of this cable was completed in 2020 and it is close to starting its commercial operation.

FOA (Fibra Optica Austral)

This a repeatered submarine cable that connects the cities of Puerto Montt (located 1,000 km south of the capital Santiago) with Punta Arenas in the Strait of Magellan (a city without a land route through Chilean territory), and with the town of Puerto Williams in the extreme south of the country, near Cape Horn. In addition, it has an intermediate bypass in Caleta Tortel, which will allow connectivity to various isolated locations such as Cochrane, Chile Chico, and Río Ibáñez through terrestrial networks.

The total length of the submarine cable is approximately 3,000 km and it has two pairs of fiber optics. It was built through a subsidy from the Chilean government of approximately US $ 100 million and awarded the concession in its marine section at the end of 2017 to CTR company, completing its construction in 2020.

Before this cable started operation, communications with the city of Punta Arenas at the southern end had to be conducted through Argentine territory or by satellite.

FON (Fibra Optica Nacional) project

The FON project recently awarded state subsidies for about US $ 120 million and will come into operation during 2022, for the deployment of about 10,000 kilometers of fiber optics in rural areas with low or no fiber coverage, which will benefit more of 3 million users from 203 communes from the Arica and Parinacota Region to the Los Lagos Region in the south.

The main objective is to improve the digital connectivity of all the citizens of Chile. The project was divided into six macro zones, of which five were awarded to the company WOM and the sixth to Movistar.

5.2 INTERNATIONAL FIBER OPTIC LAND CABLES

Several crossings of the Andes mountains allow the optical connection from Chile to Argentina:

- Punta Arenas – Río Gallegos, 2 cables
- Coyhaique – Neuquén, 2 cables
- Temuco – Junín de los Andes 1 cable
- Osorno – Bariloche, 3 cables
- Santiago – Mendoza, 2 cables
- Santiago – Buenos Aires, 1 cable

In the northern part of the country, Entel owns two cables: Arica - La Paz (Bolivia) and Arica - Tacna (Peru), and Movistar has another Arica – La Paz optical link.

5.3 INTERNATIONAL SUBMARINE FIBER OPTIC CABLES

There are currently four submarine cables that interconnect Chile with the rest of the world (one of them for the private use of its owner, Google), and there are at least two in a construction project, and another in the feasibility study phase.

The cables currently in operation are:

On the one hand, there are the oldest cables: PAN AM (PanAmerican), South American Crossing (SAC)/Latin American Nautilus (LAN), and South Americas-1 (SAm-1).

The PAN AM cable was the first submarine cable in Chile and is close to its end of life.

The second, SAC, is a ring along South America. The companies Lumen and Telecom Italia Sparkle participate in the ownership of this cable. In addition, ISA leases 2 lambdas of 2.5 Gbps. each to LAN Nautilus. The current capacity of the cable is 1.2 Tbps. The year of entry into operation was 2001 and its estimated date of termination of service is 2026. The overseas connectivity provided by Lumen in Chile is complemented by the land cables between Valparaíso – Santiago, and Santiago - Buenos Aires.

The third of the oldest cables, SAm-1, is also a South American ring. The cable is owned by Telefónica through its subsidiary Telxius. The current capacity of the cable is 1.92 Tbps. The year of entry into operation was 2001 and the estimated date of termination of service is 2026. The overseas connectivity provided by Telxius in Chile is complemented by a 2,100 km terrestrial network link that connects Buenos Aires in Argentina with Valparaíso in Chile.

Latest submarine cables and new projects:

- Curie: This cable is owned by Google with landing points at the Equinix IBX data center located in El Segundo, Los Angeles (USA) and Valparaíso, (Chile), from where it connects to the Google data center in Quilicura, Santiago. The cable has four pairs of fibers and contemplates a potential future derivation in Panama; its total length is 10,500 km and a total capacity of 72 Tbps., of which the Telecom Italia subsidiary Sparkle, acquired rights to a fiber pair with a capacity of 19 Tbps.

  Its installation was completed in mid-2019, being the first submarine cable to connect to Chile in the last 19 years.

- South Pacific Submarine Cable (SPSC) Mistral: The construction of this cable was announced by the consortium formed by América Móvil and Telxius (a subsidiary of Telefónica) in mid-2019, and it will have an estimated initial capacity of 108 Tbps. with 6 pairs of fibers, and it will be ready this year. In its 7,300 km of extension, it will connect Puerto San José (Guatemala) with Salinas (Ecuador), Lurín (Peru), Arica, and Valparaíso in Chile. The laying of this cable has been completed very recently.

- SAPL (South America Pacific Link): This new cable is a project by Ocean Networks, Inc., announced in 2016 to be operational in its first stage (Florida - Valparaíso), at the beginning of 2019, which has not happened to date. Its initial advertised capacity was 10 Tbps. To date, there is no clarity on the status of this project.

- Humboldt Cable System: In mid-2020, the Chilean government completed the first phase of feasibility studies on a project for a submarine cable from the Pacific to Asia, opting for a 13,000 km route from Valparaíso (near the capital Santiago), to Auckland, New Zealand, and then continue to Sydney, Australia. Chile hopes to then be able to take advantage of the Australian submarine cables leading to Asia. The cable could include branches on the Chilean islands of Juan Fernández and Easter Island.

  The project is now in its engineering study stage of the selected route and should then lead to the tender for the construction of the cable. To date, two other countries in the region have confirmed their participation in the financing of this project, and they are looking for a strategic partner to begin its construction at the end of 2022, or the beginning of 2023.

6. DATA CENTER MARKET

The data centers market in Chile is made up of more than twenty companies that own infrastructure to offer services to third parties, in addition to about fifteen providers that offer services, but only through applications in the cloud, that is, without infrastructure.

Within the first group, the following companies stand out (some of them with several buildings): ADEXUS, Lumen, CLARO, MOVISTAR, ENTEL, NETGLOBALIS, GTD, S&A, Hewlett Packard, SONDA, IBM, SYNAPSIS, SINTESIS. In addition, Huawei was recently added with a first data center inaugurated in 2019 and a second under construction; the North American company EdgeConneX, and the Brazilian company Ascenty; In addition, a data center of the also Brazilian company, Odata, is in the process of environmental permissions. Another large company

that has announced a new data center in Chile is Oracle.

Additionally, there are the private data centers of different organizations used for their purposes, without offering services to third parties.

In this category, those of Google stand out, with a first data center in Quilicura since 2018 and a second under construction in the district of Cerrillos; These two data centers complement the Curie submarine cable of that company that connects Los Angeles, California with Valparaíso.

Similarly, Microsoft announced late last year the implementation of a data center network in Chile and the creation of a new data center region in the country that will join Microsoft's global cloud infrastructure.

Amazon company has postponed its decision on where to locate a data center for the southern cone, whether in Argentina or Chile. In any case, AWS announced last year that it would at least install an Edge Location in our country.

Most data centers in our country are located in the metropolitan region, but recently some companies such as GTD and Silica Networks have built data centers in the southern part of the country. The start of the FOA cable operation together with the development of some scientific or academic applications could promote the construction of a data center in the Magallanes region, taking advantage of its proximity to Chilean Antarctica.

7. 5G DEPLOYMENT

The spectrum tender for 5G networks in Chile ended in February with US $ 453 million raised for the award of 1,400 MHz in total. In that tender, the new entrant company WOM was awarded 20 MHz in the 700 MHz band and 30 MHz in the AWS band. In the other two bands, WOM together with the incumbents Movistar and Entel were awarded each one 50 MHz in the 3.5 GHz band and 400 MHz in the 26 GHz band.

Starting in May of this year, the deployment of 5G and the commitments of the compensation will begin. In addition to the commitment to deploy this technology in three years, the operators awarded with different bands must comply with the requirements that accompany the respective technical projects, which implies that in the first 12 months after the award, they will have to connect 100% of the primary hospitals. At 18 months, WOM, owner of the 700 MHz band, must have 100% of the connected rural towns that are part of the benefits of that spectrum, where a population of 322,000 inhabitants is calculated for each area, in 9,170 km throughout Chile.

On the other hand, WOM, Movistar, and Entel, as winners of the 3.5 GHz frequency, will have to connect hospitals, ministries, regional and provincial capitals, as well as other areas of interest. The Undersecretariat of Telecommunications estimates that 5G investments will mean about US $ 4,000 million in the next 5 years to meet the technical requirements of the tenders, plus marketing. It is expected that in three years there will be a minimum deployment of 6,500 new antennas.

8. FUTURE SCENARIO AND CONCLUSIONS

Considering the described fiber optic trunk cable infrastructure, it can be assured that the country is well prepared to provide next-generation digital services in 99% of the inhabited territory.

It is expected that isolated areas, often indigenous, will develop at a slower rate and will integrate into digital modernity more slowly. On the other hand, the urban population, already digitally integrated, does not stop demanding more and better digital services.

The existence of fiber optic cables installed in this way, according to the technical specifications, following the best engineering practices, makes it possible to expect a network useful life of 25 years, during which several generations of optical transmission equipment will be developed, allowing a constant increase in bandwidth available on the network with each equipment update.

In this way, the data center, internet, last mile, mobile and fixed telephony industries can develop on solid foundations, mounted on the available national and international, submarine, and terrestrial, fiber optic layers.

On the other hand, the Humboldt project linking Chile - Oceania - Asia, will allow Chile to position itself as a digital hub for the entire Southern Cone and the rest of Latin America, also connected through the national and international optical infrastructure of the 21st century that we have described. STF

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