

## The World Demands More from the Backbone of the Internet—Bertrand Clesca

*Bertrand Clesca is director of client solutions at Pioneer Consulting. Pioneer's new report "Suppliers of Undersea Telecommunications Systems" analyzes the submarine fiber-optic systems supply market. It identifies key market dynamics and technology evolutions, profiles key market participants, and allows for comparison of the competitive positions of suppliers in the repeated and unrepeated market segments.*



Supporting 99 percent of intercontinental data and voice traffic and \$10 trillion worth of transactions daily, submarine fiber-optic cable systems are essential network infrastructure for consumers, businesses and governments. To track these critical systems and take stock of supporting infrastructure, Pioneer Consulting released its new report, "Suppliers of Undersea Telecommunications Systems." It identifies notable trends: demand and investment spikes, changes in cable construction, and shifting market share.

With the COVID-19 pandemic, subsea telecommunications systems have become even more critical as the world relies more on internet traffic to support social, business, educational, cultural, gaming and entertainment activities. Submarine cable systems are key in this growing demand for content, cloud and streaming services, and in maintaining the cohesion of entire societies. Thus, submarine cable systems and data centers are gaining more attention from investors ready to support digital infrastructure.

International submarine cable systems form a submerged information superhighway to move data between large data centers. The insatiable need for more capacity in the past few years comes from content providers operating at a scale unimagined by telcos and carriers 10 years ago. Today, there is no

plan B for submarine networks, as there is simply no viable alternative networking technology that comes close to optical networks in terms of capacity, scalability, latency, reliability and economies of scale. This means, as an industry, the supplier community must continue to innovate with submarine optical networking technology. For their part, buyers must ensure that they maintain a minimum number of sellers for the sake of a robust, competitive and innovative supply chain.

Although invisible to the vast majority of bandwidth users, subsea infrastructure is a unique engineering marvel combining optical communication, information science, high-end photonics, nonlinear optics, electrical engineering, material science, engineering practices, multidimensional project management, high reliability standards, marine expertise, regulatory matters, adherence to local and international jurisdictions, and complex slowly changing operations in an adverse sea environment.

Subsea cable infrastructure can send over 25 Tbit/s (about the same as 125 single-layer Blu-ray disks or 665 single-layer DVDs per second) across the Atlantic Ocean in a single strand of optical fiber. To achieve this, submarine cable systems rely on a technical ecosystem for optical communications based on three pillars invented and developed in the past 60 years: the semiconductor laser in 1962, the optical fiber concept in the mid-1960s, and the fiber-based optical amplifier design of 1986/87, all of them operating simultaneously in the spectral region where optical fiber attenuation is minimal (around 1,550 nm, i.e., in the near-infrared region). More recently, terminal transmission equipment, connected at each end of the submarine cable, adopted coherent technology; an old concept in radio communications that made its way into optical communications at the

end of the 2000s and in subsea cable systems at the beginning of the 2010s.

While sophisticated (and expensive) system designs can maximize per-fiber capacity and minimize the gap between their operation and the fundamental Shannon-limited capacity, system designers can better use the limited electrical power fed to the wet plant from the cable landing stations by increasing the number of fiber pairs inside the cable and operating them at lower capacity (typically 16 to 20 Tbit/s per fiber pair). This high fiber count approach (HFC), or spatial division multiplexing (SDM), offers lower costs per transported bit and enables the construction of 320 Tbit/s transatlantic cable systems that will enter commercial service in 2022, while maintaining the electrical design of the cable and submerged equipment.

The cable system market is mostly supplied by four companies with 98 percent of market share: ASN (France), NEC (Japan), SubCom (U.S.) and HMN Tech of China. ASN is the only fully integrated cable system supplier providing terminal transmission equipment, power feed equipment, submarine cable and submerged repeaters, plus a fleet of six cable ships for installation and maintenance. SubCom is similar to ASN, with the exception of terminal transmission equipment. NEC and HMN offer terminal transmission equipment, cable and repeaters, but rely on subcontractors for marine installation services.

As demand for submarine cable infrastructure only grows, its supply and maintenance must expand. It is crucial for potential investors, developers, purchasers or operators of this infrastructure to remain well informed of industry trends to make educated decisions about these systems on which the world relies. You can find more information at: [www.pioneerconsulting.com/reports](http://www.pioneerconsulting.com/reports). **ST**