

# An Observatory for the Submarine Cable Network

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The on-going demand for international bandwidth has driven exponential growth of the total capacity of the submarine cable network (SCN). Today, a complex mesh of hundreds of cables stretching over 1 million kilometers connects nearly every region in the world, carrying ninety-nine percent of all international data and serving as both the operational backbone of global services like those of Google and Microsoft, and a critical piece in closing connectivity gaps in underserved regions.

In prior work, we have made the case for a new research agenda focused on developing a thorough understanding of the criticality of the SCN [1] and presented an early methodology for the analysis of end-user criticality [2]. These studies point to a broader research program on the SCN to address questions related to its performance and robustness, and its critical role in services. To address these questions we argue for a new infrastructure focused on assessing the SCN criticality by measuring and monitoring traffic and routing behaviors on submarine cable deployments worldwide. We call this new infrastructure -- UNO, the Undersea Network Observatory.

The criticality of the SCN depends on a wide range of factors that, in turn, provide us with an initial set of design requirements for UNO and a set of challenges to address, from deployment and interaction with preexisting platforms to supported functionality. For starters, UNO must support the study of criticality from the perspective of different applications, from Web and VoD to video conferencing and gaming, as different classes of applications may require a different definition of criticality and potentially different proxy experiments. Second, given the global scale of the SCN and the differences in preferred applications, network providers, and available infrastructure across regions, UNO must have broad coverage, across and within countries around the world. Third, defining criticality in terms of common services or popular websites will require a periodic re-evaluation of criticality to account for changes on most common services, web sites, and their popularity. Last, rather than building from scratch, UNO should leverage existing infrastructure -- from VPNs, RIPE Atlas, and commercial proxy services -- to gain an immediately large, if perhaps functionally limited, measurement footprint.

This list of requirements is by no means exhaustive. We envision the realization of UNO as a set of measurement capabilities, a large data repository, and analysis and visualization tools that will be brought together and made openly available via a web portal. We also envision developing a community of researchers and network operators around UNO to inform its on-going development and to facilitate its transition to practice.

[1] Z. S. Bischof, R. Fontugne, F. E. Bustamante. Untangling the world-wide mesh of undersea cables Workshop, Proc. ACM HotNets, 2018

[2] S. Liu, Z. S. Bischof, I. Madan, P. K. Chan, and F. E. Bustamante. Out of sight, not out of mind - a user-view on the criticality of the submarine cable network conference. In Proc. of IMC, 2020.