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# A TRADESPACE EXPLORATION OF SATELLITE SYSTEMS TO OFFER CONNECTIVITY TO UNCONNECTED AND UNDERSERVED COMMUNITIES

**Abstract**

Satellite systems are considered essential technology to bridge the digital divide, by providing coverage in remote locations, and connecting unconnected and underserved communities around the globe. Although most existing systems focus on serving high-paying customers (e.g., enterprise, maritime, aeronautical markets) as opposed to providing service to less developed regions, the proliferation of broadband capacity form space, advances in network and hardware technology, and the reduced costs are causing big shifts within the industry, such that the broadband market in unserved regions is now considered a major strategical market.

In this paper, we study different constellation architectures which provide connectivity to unconnected and underserved communities. To that end, we first identify the most relevant architectural decisions for communications satellites systems, resulting in a large design-space of thousands of potential architectures (all in LEO, MEO, and GEO). Next, we develop a techno-economical model to evaluate the performance, cost, and potential impact (in terms of people connected) for each of these systems. This techno-economical model is composed of a statistical performance model that evaluates the total capacity of the system, a demand model that identifies those regions of Earth where unconnected and underserved communities are located, and an economic model that evaluates the feasibility of the constellation from a business perspective, taking into account both the cost of the system as well as the purchasing power of potential customers. The paper concludes by analyzing the main bottlenecks and technological challenges that will need to be overcome before satellite systems can be used to provide connectivity to unconnected communities.