

Summary only, Full Draft to be posted soon.

## An Open Access Market for Global Communications

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### *Summary*

Today's satellites allow intersatellite communication via lasers. A laser-equipped low-earth-orbit mesh network can provide global broadband communications independent of terrestrial fiber networks. Benefits of the technology include 1) global connectivity, 2) low latency since the communications travel 50 percent faster through the air (299,792 km/s) than fiber (200,000 km/s), and 3) optimized, internet-independent routing for improved reliability and security.

Satellite networks come with one limitation. Capacity is much more constrained than terrestrial fiber networks. The planned optical mesh networks' capacities are limited by laser throughput. Maximum throughput is 100 Gbps. By comparison, a state-of-the-art fiber cable has a throughput of 100,000 Gbps, hundreds of times the capacity of the proposed optical mesh networks. Network congestion is much more severe for satellite communications, so its management is critical.

This paper develops an open access market to manage network congestion, building on recent advances in wholesale electricity markets (Cramton et al., 2024). The wholesale market includes a real-time market and a forward market. The physical real-time market ensures supply and demand balance at each time and location. The product is gigabytes of high- or low-priority communication in a one-hour time window at a location, say, New York City, hour 10 (9-10am) on 14 August 2026. The scarce capacity is used by those who value it the most at a price that balances supply and demand. High-priority use is served first; low-priority service occurs with some rationing. The real-time market is the foundation for the financial forward market. The forward market enables market participants to take capacity positions in advance of real-time, consistent with their anticipated real-time needs. Participants manage risk and profit through gradual trade as uncertainties resolve. Participants can efficiently convert global communication rights into their realized communication needs at each time and place. An independent market operator conducts the market.

The open access market operates without friction using flow trading (Budish et al., 2023). Participants bid persistent piecewise-linear downward-sloping net demand curves for portfolios of products. The market operator clears the market every hour, finding unique prices and quantities that maximize as-bid social welfare. Prices, aggregate quantities, and the slope of the aggregate net demand are public. The market operator observes positions, enabling it to optimize collateral requirements to minimize default risk.

Participants employ powerful trade-to-target strategies with only a handful of portfolio orders, enabling the efficient trade of millions of interrelated time-and-location products. In each hour, the participant has a current position—the quantity held of each product—and a target position—the desired portfolio. The trade-to-target strategy specifies the rate at which the participant moves from its current position toward its target. To best manage risk and avoid adverse price impact, participants trade gradually, updating their target positions as circumstances change. Participants' strategies depend on their communication needs, risk attitude, capital cost, and market fundamentals. Fundamentals are richly conveyed in the market operator's hourly clearing reports. The market operator provides tools for participants to translate their preferences into an effective strategy. Despite the complexity of the market, participation is easy.

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