Beyond optical communications: What next?

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Optical communications, first launched some 25 years ago, has realized since then an impressive increase in transmission speed from 100 Mb/s to 1 Pb/s, an enormous seven order-of-magnitude boost. This achievement has supported not only the exponentially growing telecommunications traffic but also the growth of the Internet in general. Yet, today this area – optical communications – is nearing its fundamental and technological limits in terms of significant breakthroughs. As the volume of telecommunications traffic rises exponentially, developments in optical communications are not keeping pace. The upshot: the dire need for a steady increase in the capacity, the transmission rate, of optical networks. So, the question is, will transmission speeds of these networks no longer be able to meet this increasingly rapacious demand? The jury is still out. But if the answer turns out to be negative, as it very well may be, to what other technology or technologies might we turn?

This paper discusses the fundamental and technological limits of optical communications and considers possible alternatives to foster the growth of the Internet.