

## **Broadband Communications: Overview and Access**

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Broadband communications have become a revolution that will probably be seen in retrospect to have had an impact on human affairs equivalent to the inventions of writing, metallurgy, steam power, electronics, and computers. Broadband communications extend the previous development of writing, electronics, and computers by fusing information and computational power into networks that circumvene the globe. The result has been to synergistically fuse together much of humanity's collective intellect. This technology allows individuals to participate in the total human community as never before. The full ramifications of broadband communications remain to be seen, but if the present situation is any indication, they will be significant and enduring.

The key to using broadband communications to full advantage is to achieve synergy between individual intellects and computers via a vast network. Synergistic systems must, by definition, involve the widest possible number and range of people with the maximum possible flexibility for the use of individual thoughts. Simply put, the success of broadband communications as a method for improving the human condition will be fully realized only if the widest possible number of people on our planet are able to access the global broadband communications network. Universal access is critical to the success of broadband communications.

In principle, every person can be reached by broadband communications. Wirelines (coaxial cable and fiber) can in principle be laid everywhere across the earth's surface. The major oceans have been criss-crossed by cables for well over a century. Satellites can provide coverage for areas that are not economical to link with cables, albeit with less total bandwidth. Much of our planet's population now resides within relatively close proximity to wideband links. There is no technical reason why any person on the globe must be intellectually isolated from the rest of humanity.

But at this point we come to the great paradox in the broadband communications revolution: While long-range broadband links are generally available, short-range connections between the global network and the individuals who need access are often lacking. Ironically, this shortfall in last-mile communications may prove more difficult to overcome than has been the wiring of the planet overall.

Many technical solutions exist for the last-mile access problem. These include modified cable and telephone systems, short-range terrestrial radio systems, and satellite networks. But ultimately the problem of providing universal access is difficult to solve because it depends for its solution upon more than technical improvements. It also depends upon the economics and societal priorities attached to the development of universal access. As engineers and scientists, it is our responsibility to do everything possible to invent economical and efficient access methods that will in turn ensure universal participation on our planet's broadband communications network.