

## Developing and deploying a state-wide, **leading-edge network infrastructure**

The Corporation for Education Network Initiatives in California (CENIC) has conceived and constructed a powerful optical infrastructure to meet the networking needs of California’s research and education institutions—ensuring flexibility and capacity for the future. An optical infrastructure offers cost-effective network connectivity now, while providing a foundation for the long-term future of networking in California.

The California Research and Education Network (CaIREN)—owned and operated by CENIC—established a multitiered advanced network-services fabric to serve research and education. The platform for CaIREN is fiber-optic-based, with the fiber purchased from Level-3 and other providers. CENIC owns and manages the high-speed, high capacity optical communications equipment running over that fiber. This optical platform enables customization of the network layers to match the capacity and capabilities to the specific needs of CENIC’s members and associates—from research and higher education institutions to K-12 schools. In essence, CENIC can create multiple, yet independent, networks over a common physical infrastructure.

In January 2003, CENIC began deployment of the nation’s first multitiered, statewide optical network. The network comprises 1,100 miles of fiber and long-haul optical equipment to support multiple 10 Gigabit Ethernet connections as well as large numbers of separate links at speeds of one gigabit/second or

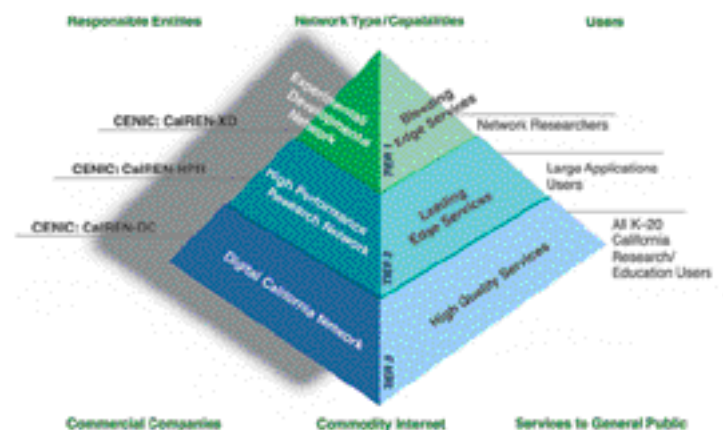
greater. Cisco Systems was selected through a competitive process to supply the optronic and router equipment. As a result, Cisco and CENIC have formed a multifaceted, strategic relationship that includes Cisco and university network researchers working together to provision CaIREN-XD in support of the network research and experimental program.

CaIREN furnishes California’s research and education community with the most robust connections available. It also affords them the most economical solution—while network capacity has grown by 1,600 percent, the network connection costs for CENIC’s original members has remained constant since 1997.

### The Three Levels of CaIREN

CaIREN’s optical infrastructure equips California’s research and education community with the most cost-effective advanced services network available.

**NETWORK DEVELOPMENT AND EVOLUTION**  
FOR CALIFORNIA RESEARCH AND EDUCATION COMMUNITY



**CaIREN-DC, CENIC's Digital California network**, provides high-quality services for students, faculty, researchers and staff at California's universities, community colleges and K-12 schools.

**CaIREN-HPR, CENIC's high-performance research network**, provides leading-edge services for large-application users and CENIC associates sites. CaIREN-HPR is an integral component of the national Internet2.

**CaIREN-XD, CENIC's experimental and developmental network**, supplies the high-level network services needed to successfully conduct high-performance research activities. Moreover, projects with applications dependent upon access to adaptive, lambda level network capabilities are now possible, as well as distributed petascale computing and wide-area collaboration. It will also provide network researchers in California with the infrastructure needed to conduct critical investigations into optical networking technology.

## Connecting Schools to CaIREN

Leveraging the buying power of the entire Statewide education system, CENIC contracts with major telecommunications carriers for more than 200 circuits that connect schools, districts, county offices of education, colleges and universities to the CaIREN backbone. Through a partnership with SBC, CENIC provides customized last-mile connections to meet the needs of CENIC and California's research and education community.

## Why Is an Optical Network Better?

Educational networks in California, and nationwide, have traditionally depended upon managed services provided by both traditional telephone companies and nontraditional companies like cable companies.

Utilizing these companies' networks has required careful long-term planning to allow for the development of detailed specifications, bidding, and then the building of the network. This process can easily take two years from the start of planning to the first segment of a new network becoming operational. The growing dependence on telecommunications networks, the explosive growth of traffic and peer-to-peer applications, and rapid changes in technology mean that by the time a network upgrade is completed, it may be obsolete and the long-term contracts needed to be cancelled or renegotiated.

By making the transition to an "owned" fiber-optic infrastructure with scalable network components, additional bandwidth may be added incrementally without the need to redesign the underlying technology. For example, the CaIREN/HPR network uses 10 Gigabit channels across CENIC's optical backbone to interconnect the HPR network components. If additional bandwidth is needed CENIC can add another 10 Gigabits to the backbone, basically overnight, by adding the appropriate interface cards to the network. Compared to a managed services model in which it takes anywhere from three months to a year for a new service to be delivered, the optical network's configuration flexibility will outfit California's educational and research institutions with the best network feasible—one that will keep California at the forefront of network design and development.



5757 Plaza Drive  
Cypress, California 90630  
info@cenic.org • www.cenic.org