

In the economic climate currently facing our State, the nation, and the world, the most precious resources in California are Californians themselves. California's legendary education systems both public and private have historically been the most powerful engines behind the State's equally legendary economy, still one of the largest in the world even compared to entire nations.

As a tool with which California's brightest minds continue to maintain the State's global leadership, CalREN plays a vital role by facilitating innovation in areas as diverse as remote healthcare, digital media, ocean exploration, astronomy, broadband delivery across the "digital divide," and scalable, cost-effective distance education, to name

only a few. Many such examples are described in this Annual Report.

However, CalREN's role in helping California's research and education community prevail over budget challenges encompasses more than just empowering high-profile innovation. Many of the day-to-day administrative and support functions carried out by CENIC Associates must also be performed in a radically changed landscape, which CalREN can facilitate.

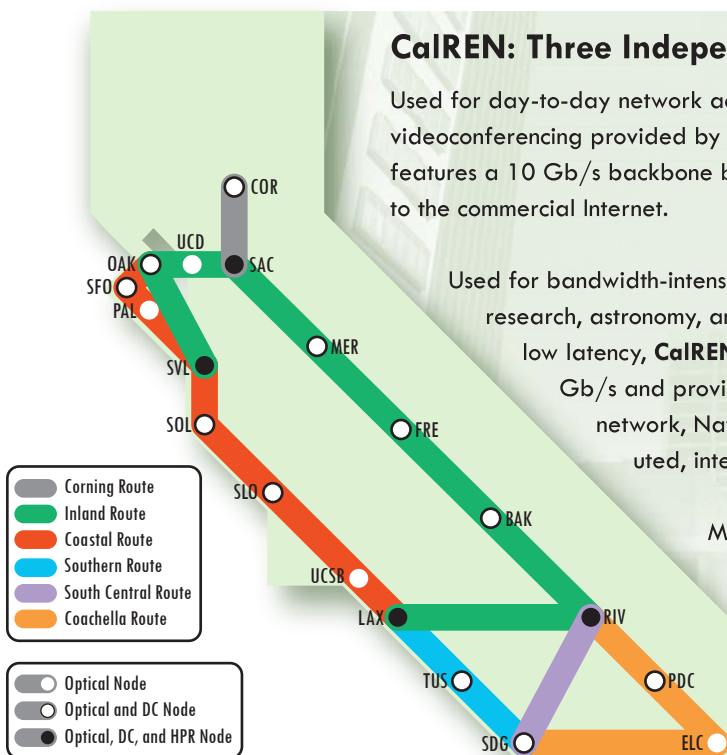
CalREN stands ready to help the CENIC Associates continue to provide the services they need to provide to their faculty, students, and staff – and even enhance these services – in cost-effective ways.

### CalREN: Three Independent Networks, One Infrastructure

Used for day-to-day network activities such as accessing the web, e-mail, and high-quality videoconferencing provided by CalREN Video Services (later K20 Video), **CalREN-XD** features a 10 Gb/s backbone bandwidth and provides connectivity for all CENIC Associates to the commercial Internet.

Used for bandwidth-intensive research applications such as metagenomics, ocean research, astronomy, and other disciplines requiring very high bandwidth and very low latency, **CalREN-HPR** features a backbone bandwidth capable of up to 40 Gb/s and provides research universities with connectivity to the Internet2 network, National LambdaRail's PacketNet, and the Pacific Wave distributed, international peering facility.

More a collection of services than a fixed network, **CalREN-XD** consists of a set of network resources which can be earmarked for particular bleeding-edge research needs, including research carried out on CalREN itself. This tier has no fixed backbone bandwidth, and connects to NLR's FrameNet and WaveNet.



CalREN backbone updates for the 2010-11 fiscal year include the completion of the CalREN-HPR Refresh. In the previous Annual Report, readers learned of this project, which was undertaken to future-proof the High-Performance Research tier of the network and to provide additional services to the Associates using this network tier. The Refresh was comprised of two phases, a refresh of the existing Layer 3 (routed) network and the addition of Layer 2 10 Gigabit Ethernet switching services. The Layer 3 refresh was completed during the 2009-10 fiscal year, and we're pleased to report that the Layer 2 refresh was completed during this past fiscal year.

Another significant upgrade to the CalREN backbone was slated to take place on the Coachella Valley Route, a ring extending from San Diego to Riverside through El Centro and Palm Desert, and also extending into Yuma, AZ as well. This upgrade was to provide 10 Gigabit connectivity throughout this region. During the past fiscal year, this upgrade was completed, providing Associates with greatly increased capacity in that area of the state as well as increased network robustness. Progress was also made toward the creation of a second regional aggregation point in the San Diego metropolitan area, which will allow Associates in that area to enjoy cost-effective diverse connectivity.

## CENIC Networking Relationships

► **Internet2 • [www.internet2.edu](http://www.internet2.edu)**

Internet2 is a not-for-profit advanced networking consortium comprising more than 200 US universities in cooperation with 70 leading corporations, 45 government agencies, laboratories, and other institutions of higher learning as well as over 50 international partner organizations.

Internet2 members leverage the organization's high-performance network infrastructure and extensive worldwide partnerships to support and enhance their educational and research missions. Beyond just providing network capacity, Internet2 actively engages its community in the development of important new technology including middleware, security, network research, and performance measurement capabilities which are critical to the progress of the Internet.

► **National LambdaRail • [www.nlr.net](http://www.nlr.net)**

National LambdaRail is advancing the research, clinical, and educational goals of its members and other institutions by establishing and maintaining a unique owned nationwide network infrastructure. Ownership of the underlying optical infrastructure ensures unprecedented control and flexibility in meeting the requirements of the most advanced network applications and providing the resources demanded by cutting-edge network research.

► **Western Regional Network • [www.westernregional.net](http://www.westernregional.net)**

In 2010, Pacific Northwest GigaPoP, Front Range GigaPoP, the University of New Mexico, and CENIC announced the formation of the Western Regional Network, a multi-state partnership to ensure robust, advanced, high-speed networking availability for research, education, and related uses through the sharing of network services. These RONS provide networking services to the following states: Alaska, California, Colorado, Idaho, Montana, Nevada, New Mexico, Washington, Hawaii, Oregon, and Wyoming.

WRN will provide access to shared NLR, Internet2, Pacific Wave, and other regional fiber- and IP-based services for instruction, research, medical education and clinical care, and economic development purposes.