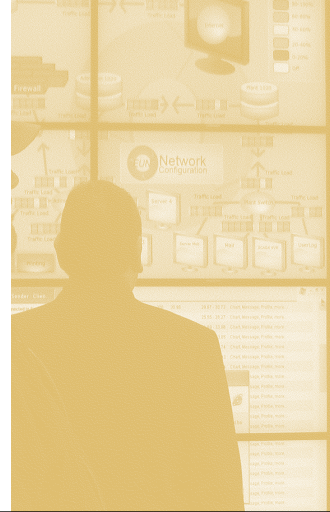


**The Corporation
for Education
Network Initiatives
in California**



**2010-11
Annual Report**

Letter from the President



Jim Dolgonas
President & CEO

Major economists are of the opinion that the economy is heading in the right direction at last, but this doesn't mean that our research and education community doesn't have to adjust to a new definition of normal as we begin the hard work of recovery together. Funding for our members is likely to remain severely constrained for the foreseeable future. Nor does the current economic condition mean that the responsibility of our community to build on an already astonishing foundation for the creation of innovation has lessened. In this, the 2010-11 CENIC Annual Report, I invite readers to learn of the ways in which CENIC plays a critical role in helping our member community to create the basis for future economic growth and innovation.

For decades, CENIC member institutions have been the destination of choice for brilliant people eager to realize their ideas. California's legacy in technology innovation has been due in large part to this spirit of experimentation – a spirit that has reached even greater heights with the benefits of the advanced networking provided by CENIC. However, enabling research-based innovation is only one way in which CENIC promotes a strong State and national economy. The continuing integration of technology into teaching and learning have reshaped the concept of both the classroom and the laboratory such that California's educators can reach out to all 30 million of the State's citizens and create a workforce primed to function in the 21st century. In this Annual Report, readers will discover ways in which the CENIC member community has used CENIC's advanced networking to explore new frontiers in both research and education; the 2011 Innovations in Networking Award winners highlighted in this Report are excellent examples of such uses.

With fifteen years of experience at providing advanced networking and supporting the services that it makes possible, CENIC is also in a position to help member institutions manage their own internal costs in order to refocus scarce resources on meeting the institutions' core missions. Thus, in this Annual Report readers will also find ways in which CENIC and CalREN have created cost savings for members while improving service and reliability. We're confident that the next Annual Report will list even more ways in which CENIC has helped increase cost-effectiveness for members by leveraging CalREN to support a broad range of cloud-based services.

Thus CENIC, as a small corporation, is in an enviable position in that we can help California and the other Western states we serve to continue the legacy of innovation that the 20th century has bequeathed to us into the century to come; help the education community meet the challenges of creating the workforce of the future; help institutions to maintain their internal services and restructure to function in this new landscape while increasing service levels; and also help lead the way on the road to recovery by carrying out opportunity-creating infrastructure projects.

Few relatively small organizations like CENIC are in a position of having such a vital role to play in helping an entire State and nation prevail over such daunting challenges. I'm personally proud that the education and research community has seen fit to entrust us with this responsibility, and I'm proud to be a part of a community so farsighted as to have created CENIC in the first place.

Of course, as CENIC is composed of the very community it serves, I encourage our members to take special pride in this vital role, as it is yours as well. Together with our corporate partners, CENIC is perfectly positioned to accelerate the nascent recovery and ensure that not only California and the West but the US and the world all receive benefits from leading-edge networking.

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Associate Vice President & Chief
Information Officer
Information Resources & Communications
University of California Office of the
President

Patrick Perry, Vice Chair
Vice Chancellor
California Community Colleges

Todd Finnell, Secretary (before 12/7/10)
CEO, High Speed Network

Anne Mallory, Secretary (after 12/7/10)
Superintendent
Imperial County Office of Education

John Charles, Treasurer
Chief Information Officer
CSU East Bay

Ruben Armiñana
President
Sonoma State University

Keric Ashley
Director
Data Management Division
California Department of Education

Bruce Briggs
Interim Assistant Vice Chancellor & Chief
Information Officer
Information Technology
CSU Office of the Chancellor

Bill Clebsch
Associate Vice President
Information Technology Services
Stanford University

John Dundas
Director, Information Management
Systems & Services
California Institute of Technology

Elazar Harel
Vice Chancellor & Chief Information Officer
UC San Francisco

Darryl LaGace
Chief Information & Technology Officer
San Diego Unified School District

Deborah Ludford
District Director
Information Services
North Orange County Community
College District

Catherine McKenzie
Director, Technology Unit
California Community Colleges

Ilee Rhimes
Chief Information Officer & Vice Provost
USC Information Technology Services
University of Southern California

Peter M. Siegel
Chief Information Officer & Vice Provost
Information & Educational Technology
UC Davis

Richard N. Katz

Ron Johnson
Vice President & Chief Technology Officer
University of Washington

Larry Smarr
Director
California Institute of Telecommunications
& Information Technology
UC San Diego

The CENIC Mission

California's education and research communities leverage their networking resources under CENIC, the Corporation for Education Network Initiatives in California, in order to obtain cost-effective, high-bandwidth networking to support their missions and answer the needs of their faculty, staff, and students.

CENIC designs, implements, and operates CalREN, the California Research & Education Network. CalREN is a high-bandwidth, high-capacity Internet network specially designed to meet the unique requirements of these communities, and to which the vast majority of the state's K-20 educational institutions are connected. In order to facilitate collaboration in education and research, CENIC also provides connectivity to CalREN for non-California institutions and industry research organizations with which CENIC's Associate researchers and educators are engaged.

CENIC is governed by its member institutions. Representatives from these institutions also donate expertise through their participation in various committees designed to ensure that CENIC is managed effectively and efficiently, and to support the continued evolution of the network as technology advances.

The CENIC Goals

- ▶ Continuously improving a robust, cost-effective, state-of-the-art communications network, accessible to participating education and research institutions,
- ▶ Working with member institutions to define a value chain of services, and developing innovative ways to deliver scalable solutions to members,
- ▶ Leading efforts of participating institutions to provide end-to-end service quality and interoperability among member institutions, and promoting adoption across network boundaries,
- ▶ Advancing the collective interests of the institutions by leveraging their diversity and relationships to accrue benefits to individual members,
- ▶ Providing a competitive advantage in the global marketplace to the education and research communities,
- ▶ Communicating the value of CENIC as California's recognized provider of network services for education and research,
- ▶ Providing opportunities for innovation in teaching, learning, and research through use of the network, and
- ▶ Strengthening participation in the state, national, and international education and research networking communities.

Business Advisory Council Chair

Doug Hartline
Director, Core Technologies
UC Santa Cruz

HPR Network Advisory Council Chair

Tom Hutton (before 1/1/2011)
Network Architect
San Diego Supercomputer Center

DC Network Advisory Council Chair

Jeremy Powell
Manager, Technical Services
San Bernardino County
Superintendent of Schools

Rodger Hess (after 1/1/2011)

Network Architect
UC Davis

Audit Committee

Deborah Ludford, Chair
(after 12/7/2010)
Todd Finnell, Chair
(before 12/7/2010)
Mark Crase
Doug Hartline
Catherine McKenzie
Peter Siegel

XD/HPR Committee

John Dundas, Chair
Jim Davis
Tom DeFanti
Christine Haska
Rodger Hess
Greg Hidley
Russ Hobby
Tom Hutton (before 1/1/2011)
Ron Johnson
Tad Reynales
Pete Siegel
John Silvester
Larry Smarr
Jim Dolgonas*
Dave Reese*
Brian Court*

Finance Committee

John Charles, Chair
Keric Ashley
Elazar Harel
Doug Hartline
Patrick Perry
Sam Steinhardt
Trevor Stewart
Jim Dolgonas*

* Non voting

CENIC Professional Relationships

▶ **EDUCAUSE** • www.educause.edu

EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. EDUCAUSE programs include professional development activities, applied research, strategic policy advocacy, teaching and learning initiatives, online information services, print and electronic publications, special interest collaborative communities, and awards for leadership and innovation.

▶ **Global Lambda Integrated Facility** • www.glif.is

GLIF, the Global Lambda Integrated Facility, is an international virtual organization that promotes the paradigm of lambda networking. The GLIF participants are National Research and Education Networks (NRENs), consortia, and institutions working with lambdas.

GLIF members provide lambdas internationally as an integrated facility to support data-intensive scientific research, and support middleware development for lambda networking.

▶ **Internet Educational Equal Access Foundation** • www.ieeaf.org

The Internet Educational Equal Access Foundation (IEEAF) is a non-profit corporation created by its member institutions to accept assets donated to the global education community by a broadly defined telecommunication industry and corporate community. Founding member institutions include the Corporation for Education Network Initiatives in California (CENIC), the Pacific Northwest GigaPoP, the Pacific Internet2 Coalition, the University of Maryland, and GEO.

▶ **StateNets** • www.statenets.org

State Research and Education Networks (StateNets) provide increasingly vital infrastructure services that extend beyond networking into enterprise applications, middleware, broadband policy, and statewide procurement in support of education, research and development, health care, state and local government, and university outreach and public service. The mission of StateNets is to provide a national forum for collaboration among individual state networks; to develop and support a community of practice; to build consensus with colleagues across the country and to provide a leadership role in articulating a unified vision in the research and education networking community.

▶ **The Quilt** • www.thequilt.net

The Quilt, a coalition of advanced regional network organizations, is a dynamic forum where leaders from throughout the advanced research and education network community build on the intellectual capital and best practices of network service providers worldwide. Based on the participants' combined experiences in operations and development of leading edge technologies, the Quilt aims to influence the national agenda on information technology infrastructure, with particular emphasis on networking.

The 2010-11
CENIC
Associates

California
K-12 System



Juan de Anza Elementary School
Inglewood, CA



Richard Henry Dana Middle School
Hawthorne, CA



Heritage High School
Brentwood, CA

Alameda COE
Alpine COE
Amador COE
Bishop Union Elementary
Butte COE
Calaveras COE
CA Department of Education
Chaffey Joint UHSD
Chowchilla School District
Colusa COE
Contra Costa COE
Del Norte COE
Dos Palos High School
El Dorado COE
Fresno COE
Glenn COE
Humboldt COE
Imperial COE
Kern COE
Kings COE
Lake COE
Lake Tahoe USD
Lassen COE
Los Angeles COE
Los Angeles USD
Loyalton High School
Madera COE
Mammoth High School
Marin COE
Mariposa COE
Mendocino COE River Center
Merced COE
Modoc COE
Monterey COE
Napa Valley USD
Nevada Joint UHSD
Northern Humboldt UHSD
Orange County DoE
Placer COE
Plumas COE
Red Bluff High School
Riverside COE
Riverside COE Indio Office
Sacramento COE
San Benito COE
San Bernardino CSS
San Diego COE
San Francisco COE
San Joaquin COE
San Luis Obispo COE
San Mateo COE
Santa Barbara CEO
Santa Clara COE
Santa Cruz COE
Santa Maria JUHSD
Shasta COE
Sierra COE West
Siskiyou COE
Solano COE
Sonoma COE
Stanislaus COE
Sutter County Schools
Tehama COE
Trinity COE
Truckee Donner PUD
Tulare COE
Tulelake Basin Joint USD
Tuolumne COE
Ventura COE
Victor Valley CC
Yolo COE
Yuba COE

CCC Chancellor's Office	Escondido Education Center	Moorpark
CCC Chancellor's Office	Evergreen Valley	Mt. San Antonio
Data Center	Feather River	Mt. San Jacinto
Alameda	Folsom Lake	Napa Valley
Allan Hancock	Foothill	North Orange County CCD
American River	Fresno City	Ohlone
Antelope Valley	Fullerton	Orange Coast
Bakersfield	Garfield Center	Oxnard
Barstow	Gavilan	Palomar
Berkeley City	Glendale	Palo Verde
Butte	Golden West	Pasadena City
Cabrillo	Grossmont	Porterville
Cañada	Hartnell	Redwoods
Canyon Country Education	Imperial Valley	Reedley
Center	Irvine Valley	Rio Hondo
College of the Canyons	Lake Tahoe	Riverside
Cerritos	Laney	Sacramento City
Cerro Coso	Las Positas	Saddleback
Chabot	Lassen	San Bernardino Valley
Chaffey	Long Beach City	San Diego Centers for
Citrus	Los Angeles City	Education & Technology
Coastline	Los Angeles Harbor	San Diego City
Columbia	Los Angeles Mission	San Diego Mesa
Compton	Los Angeles Pierce	San Diego Miramar
Contra Costa	Los Angeles Southwest	San Francisco City
Copper Mountain	Los Angeles Trade Tech	San Joaquin Delta
Cosumnes River	Los Angeles Valley	San Jose City
Crafton Hills	Los Medanos	San Mateo
Cuesta	Marin	Santa Ana City
Cuyamaca	Mendocino	Santa Barbara City
Cypress	Merced	Santa Monica
De Anza	Merritt	Santa Rosa
Desert	MiraCosta	Santiago Canyon
Diablo Valley	Mission	Sequoias
East Los Angeles	Modesto Junior	Shasta
El Camino	Monterey Peninsula College	Sierra

California Community Colleges



Fullerton College
Fullerton, CA



Santa Rosa Junior College
Santa Rosa, CA

Siskiyou
Skyline
Solano
Southwestern
Taft
Ventura
Victor Valley
West Hills College Coalinga
West Hills College Lemoore
West Los Angeles
West Valley
Woodland
Yuba

California State University

CSU Chancellor's Office
Office of Advocacy and State Relations
California Maritime Academy
California State Polytechnic University
San Luis Obispo
California State Polytechnic University
Pomona
CSU Bakersfield

CSU Channel Islands
CSU Chico
CSU Dominguez Hills
CSU East Bay
CSU East Bay Concord Campus
CSU Fresno
CSU Fullerton
CSU Long Beach
CSU Los Angeles
CSU Monterey Bay
CSU Northridge

Sacramento State University
CSU San Bernardino
CSU San Marcos
CSU Stanislaus
CSU Stanislaus Stockton Center
Humboldt State University
Moss Landing Marine Laboratories
San Diego State University
San Francisco State University
San Jose State University
Sonoma State University

University of California

UC Office of the President
UC Office of State Governmental Relations
UC Berkeley
Lawrence Berkeley National Laboratory
UC Berkeley International House
UC Davis
UC Irvine

UC Los Angeles
UC Merced
UC Riverside
UC San Diego
UC San Francisco
UC Santa Barbara
UC Santa Cruz

Charter Private Universities

California Institute of Technology
Jet Propulsion Laboratory
Stanford University
Stanford Hopkins Marine Station
Stanford Linear Accelerator Center
Stanford Medical Center

University of Southern California
Health Sciences Campus
Information Sciences Institute

CalREN Associates

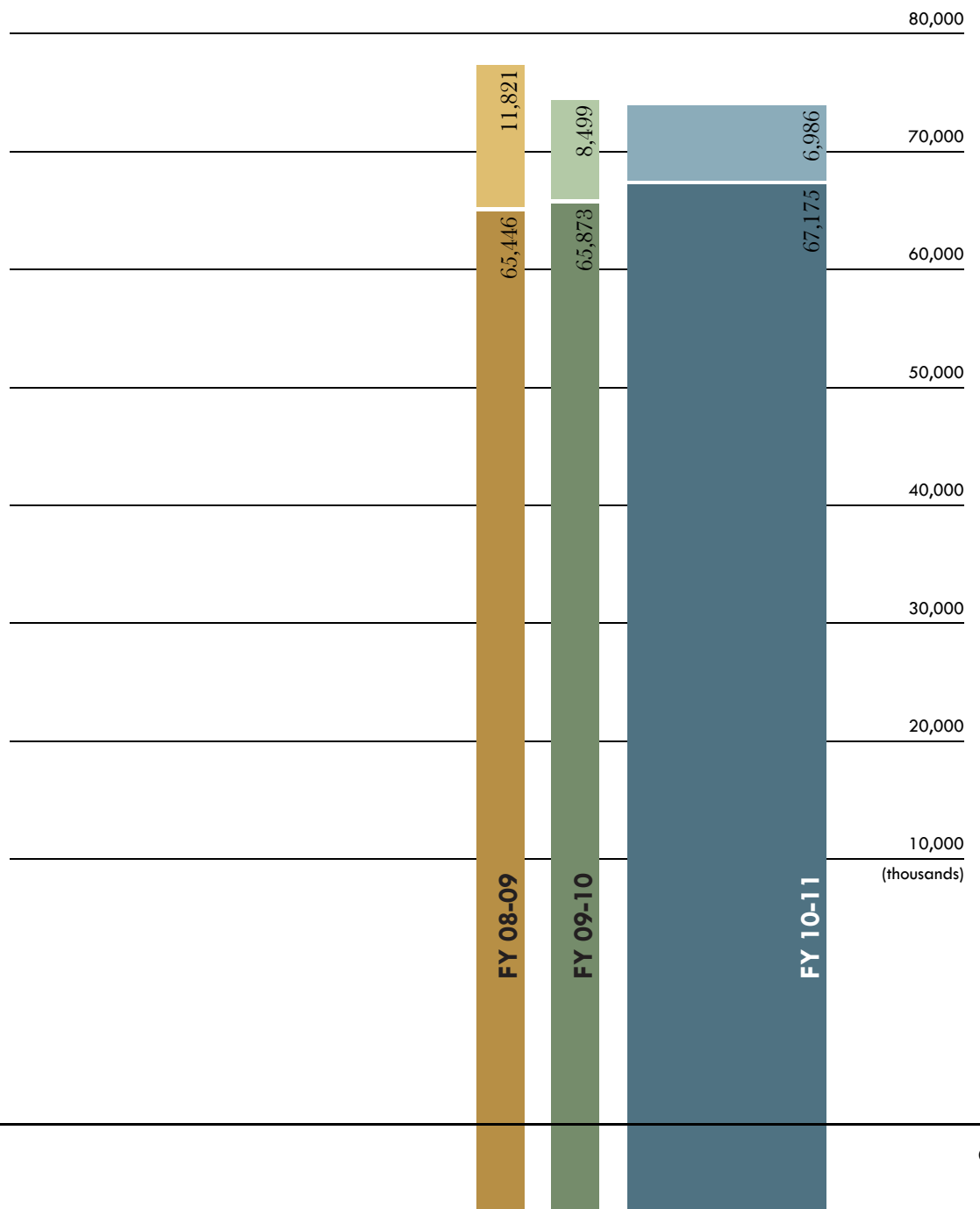
Arizona State University
Carnegie-Mellon University West
Chapman University
Monterey Bay Aquarium
Research Institute
NASA Ames Research Center
The Naval Postgraduate School

Nevada System of Higher Education
Northern Arizona University
Pepperdine University
West Los Angeles Graduate Campus
Malibu Campus
University of Arizona
University of Pennsylvania
Wharton West Campus
University of San Diego
University of San Francisco



NASA Ames Research Center
Moffett Field, CA

	FY 08-09	FY 09-10	FY 10-11
Total Assets:	77,267	74,372	74,162
Liabilities:	11,821	8,499	6,986
Net Assets:	65,446	65,873	67,175



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.

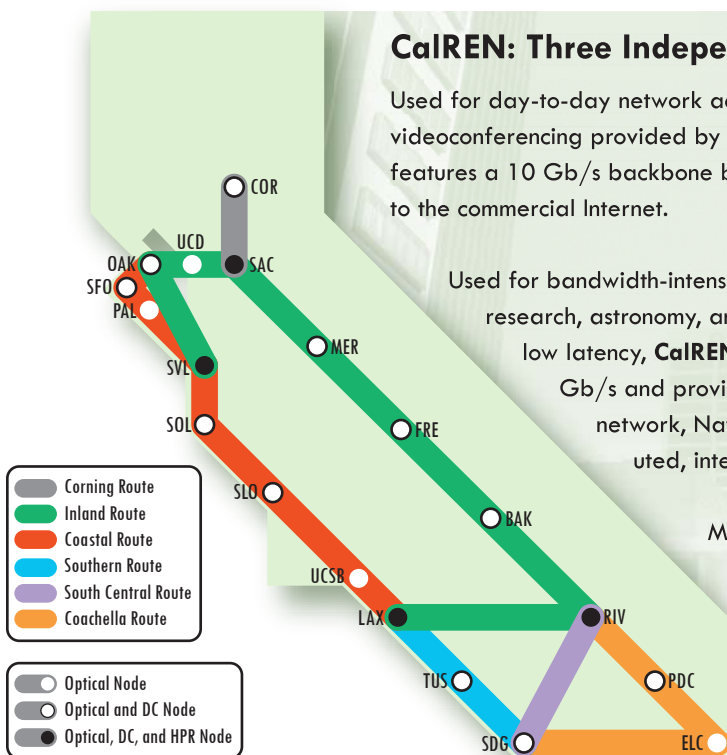
CalREN stands ready to help the CENIC Associates continue to provide the services they need to provide to their faculty, students, and staff – and even enhance these services – in cost-effective ways.

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**

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**

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**

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.

California
K-12 System

1 Gb/s	Santa Maria Joint Union High School District
1 Gb/s	Tehama County Office of Education
1 Gb/s	San Joaquin County Office of Education
1 Gb/s	Humboldt County Office of Education
10 Gb/s	Sacramento County Office of Education
1 Gb/s	Lake Tahoe Unified School District
10 Gb/s	Los Angeles County Office of Education
10 Gb/s	Riverside County Office of Education
1 Gb/s	Glenn County Office of Education
1 Gb/s	Siskiyou County Office of Education

California Community
Colleges

1 Gb/s	Imperial Valley College
1 Gb/s	Monterey Peninsula College
1 Gb/s	Mt. San Jacinto College
1 Gb/s	Allan Hancock College
1 Gb/s	Yuba College
1 Gb/s	Los Rios Community College District:
	American River College
	Cosumnes River College
	Folsom Lake College
	Sacramento City College
1 Gb/s	Chaffey College
1 Gb/s	Contra Costa Community College District:
	Contra Costa College
	Diablo Valley College
	Los Medanos College
	San Ramon Campus
	Brentwood Center
DS-3	CCC Community Based Online Learning Connections:
	Karuk Tribe Community Center, Orleans
	Aspiranet DBA Sunset Neighborhood Beacon Center, San Francisco
	Proteus, Inc., Sacramento
	Boys and Girls Club, Goleta
	Foundation for Successful Solution, Los Angeles
	Center for Academic and Social Advancement, Solana Beach
	Amador-Tuolumne Community Action Agency, Ione

California State
University

DS-3	CSU Office of Advocacy and State Relations	CENIC also completed a transition of campus-managed to CENIC-managed routers
1 Gb/s	CSU Fullerton Irvine Campus	at various CSU campuses connecting to
1 Gb/s	Humboldt State University	CalREN via SONET circuits.
1 Gb/s	Sonoma State University	

University of California

1 Gb/s UC Irvine CalREN-DC
1 Gb/s UC Irvine CalREN-HPR
200 Mb/s UC Berkeley International House

Charter Private Universities

1 Gb/s Caltech Thirty Meter Telescope Pasadena Headquarters

CalREN Associates

100 Mb/s University of Pennsylvania Wharton West
250 Mb/s University of San Diego
10 Gb/s University of Arizona/Arizona State University
1 Gb/s California Telehealth Network

CalREN: Creating Cost Savings in Tough Times

The responsibility felt by the CENIC Associate community to continue their tradition of innovation and meet operational needs does not decrease during challenging budgetary times. Thus CENIC is proud to have achieved so much during this past fiscal year to enable the Associate community to “do more with less,” fostering innovation and providing services to their faculty, students, and staff in more cost-effective ways.

- ▶ In July 2010, CENIC and **Pacific Northwest GigaPoP** announced 10 Gigabit peering connections with Amazon Simple Storage Service (S3) and Amazon Elastic Compute Cloud (EC2). Research and education are increasingly global in scope, and these connections enable sharing, accessing and manipulating data from anywhere in the world. With these connections to Amazon Web Services, both the CENIC and PNWGP communities obtain maximum speed and benefit from AWS cloud services and can take advantage of their rapid scalability without investing scarce time or money in the creation of project-specific infrastructure.
- ▶ The **California Teleconnect Fund** program or CTF provides a 50% discount on selected telecommunications services to qualifying schools, libraries, government-owned and operated hospitals and health clinics, and community based organizations. While California’s Community College System began to receive CTF discounts on last- and middle-mile circuits in 2008, the 2010-11 fiscal year saw CENIC begin to receive CTF discounts on backbone infrastructure on behalf of the state’s community colleges and K-12 system, resulting in a significant cost savings for those segments.
- ▶ As part of an ongoing pursuit of efficiency and minimizing Associate costs, CENIC carried out a large-scale analysis of Associate network traffic on circuits used by certain sites to connect to the CalREN backbone. During the 2010-11 fiscal year, the consolidation of traffic that resulted from this analysis together with the installation of new point-to-point circuits resulted in significant cost savings as well.
- ▶ CENIC operates multiple connections to the commodity Internet from CalREN, and thanks to CENIC, the price of such traffic has been steadily falling for the past decade. As a result of continued aggregation and negotiations, ISP traffic at last become too cheap to meter during the 2010-11 fiscal year. As a result, from \$260/Mb/month in 2002, CENIC Charter Associates now enjoy unmetered access to the commodity Internet, the cost of which to CENIC is low enough to include in their annual Charter Associate fees.

CENIC, together with private sector partner CVIN (the Central Valley Independent Network LLC), assembled a project plan for the Central Valley Next Generation Broadband Infrastructure Project, designed to improve the availability of broadband networking infrastructure for 18 counties within the California Central Valley area: Amador, Calaveras, Colusa, El Dorado, Fresno, Kings, Kern, Mariposa, Merced, Madera, Nevada, Placer, Tuolumne, Tulare, San Joaquin, Stanislaus, Sutter, and Yuba.

The Central Valley Next Generation Broadband Infrastructure Project involves building, operating, and maintaining a fiber-optic network infrastructure that will traverse 1,371 miles of California's Central Valley in addition to last-mile wireless capability over parts of four counties (Fresno, Kern, Kings, and Tulare). Initially, the CVNGBIP will focus on connecting community anchor institutions via fiber, including 19 county office of education sites, 14 community college sites, 3 California State University campuses, 20 county/main libraries, and 7 public safety sites. The full list of these anchor institutions is available on the Project website at www.cvngebip.org. Once connected, these non-profit anchor institutions will be supported by CENIC and become an integral part of the CalREN network.

CVIN will utilize the new infrastructure for commercial purposes enabling businesses, residences, and county, local, state, and federal government agencies located in the

listed counties to purchase a full range of telecommunications services.

In August of 2010, this project received \$46.6 million of funding from the American Recovery and Reinvestment Act (ARRA), one of the pillars of which is the belief that access to broadband services will increase economic development and improve the quality of life for all Americans. With that \$46.6 million plus \$6.66 million from the California Public Utilities Commission's California Advanced Services Fund and an additional \$13.32 million from the CVIN affiliates, CENIC and CVIN began design and planning, with substantial input and assistance from Central Valley stakeholders and community leaders from all 18 counties.

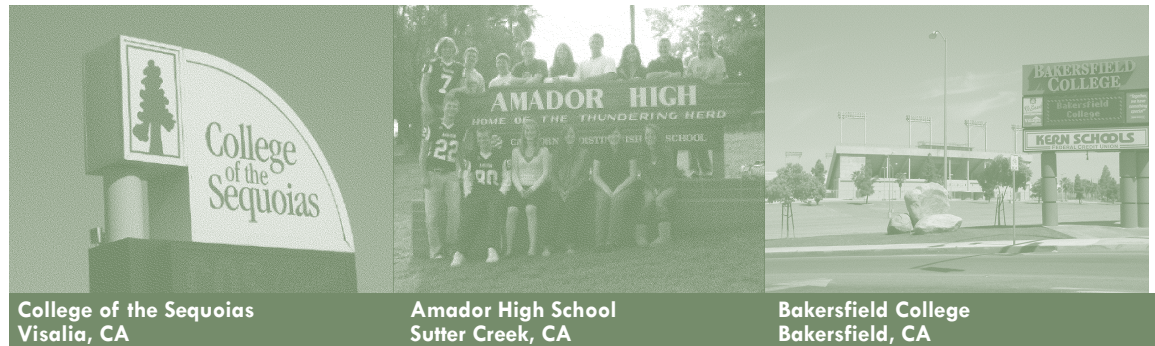
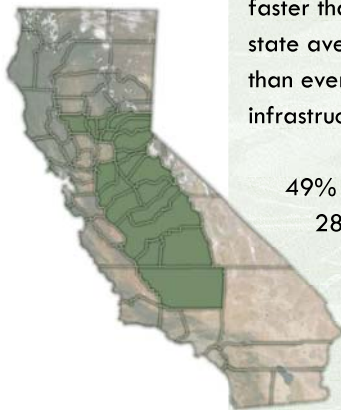
CVIN, LLC is a joint enterprise comprised of affiliates of eight Independent Telephone Companies located in central and northern California. These companies cover over 7,000 square miles and operate more than 1,700 miles of fiber and have vast experience in providing broadband services.

The hardworking Californians in these 18 counties – the agricultural heartland of one of the most productive breadbaskets in the US – have historically been on the wrong side of the “digital divide,” and together, CENIC and CVIN look forward to enabling them to move forward and take their place in the coming 21st century global information-based economy.



BROADBANDUSA
CONNECTING AMERICA'S COMMUNITIES

The Need for Broadband Infrastructure in the Central Valley: Quick Facts



College of the Sequoias
Visalia, CA

Amador High School
Sutter Creek, CA

Bakersfield College
Bakersfield, CA

▶ The Central Valley is one of the world's most productive agricultural regions. On less than 1 percent of the total farmland in the United States, the Central Valley produces 8 percent of the nation's agricultural output by value: \$17 billion in 2002 alone. And yet, with all this abundance, close to 57% of the Valley is classified as either unserved or underserved by broadband infrastructure.

▶ With a per capita income in 2007 of \$29,790 (29% below the state average), a labor force growing faster than job growth with unemployment rates from 2002 to 2008 averaging 2.6% higher than the state average, and wages in the region in every industry being lower than the state average, now more than ever this region requires the tools, resources, and potential job growth that a robust network infrastructure built throughout the region could provide.

49% of the households and 15% of the communities do not have broadband.

285 communities do not have access.

Only 20% of the users have more than a 10Mb/s connection.

Cost to user is most often distance-sensitive.

There is no middle mile fiber-based infrastructure linking these counties together and to the larger worldwide Internet.

The goals of the Central Valley Next Generation Broadband Infrastructure Project are to:

- ▶ **Connect** via fiber 19 county office of education sites, 14 community college sites, 3 CSU universities, 20 county/main libraries, and 7 public safety sites as anchor institutions to this new network infrastructure that will connect to CENIC's existing statewide fiber-based backbone and to the worldwide Internet;
- ▶ **Expand** CVIN's fiber-based infrastructure and wireless capabilities to facilitate the ability of the other anchor-related institutions in the community including school sites, healthcare facilities, community-based organizations, and public safety entities, to enhance their existing high speed networking capability;
- ▶ **Enable** CVIN and other providers to use the new network infrastructure to facilitate businesses, residences, and government agencies to have access to high speed networking capacity;
- ▶ **Forge** strategic relationships between CVIN and existing local Internet providers, enabling them to connect their business and resident customers to Internet services at more reasonable costs, cost being one of the largest broadband adoption obstacles faced by most rural or underserved communities; and,
- ▶ **Enhance** the ability to reach the economic development goals of the 18 counties by having the required network capacity available for new businesses that might locate in these counties.

Services Beyond the Network

CENIC has consistently provided much more than advanced networking services to its Associate community. One of these valuable additional services is a 24x7x365 Network Operations Center staffed with engineering professionals who are specially trained to address the unique requirements of the research and education community.

These engineers are much more than the primary points of contact for customer requests from the CENIC Associate community for all services provided via CalREN, by itself a large part of the Associate experience of CENIC. They coordinate and actively participate in site network upgrades, as well as planning and communicating network maintenance events and responding to abuse complaints. Their duties extend further to managing the Layer 1, 2, and 3 components of all CalREN network tiers, providing Layer 1 support for National LambdaRail; resolving equipment failures and aiding in the decom-

missioning of retired equipment throughout the network; and supporting circuit installations and backbone upgrades as listed elsewhere in this Annual Report.

In addition to providing network support, CENIC's network engineers also work to enhance many aspects of the NOC itself, including continually improving support processes and documentation, actively planning and meeting the professional development and training goals of the entire team.

Created by the community it serves, CENIC is truly interested in providing that community with the best possible customer service. Thanks to CENIC's network engineers, we can offer the following statistics from Customer Service surveys completed by our customers as a clear demonstration of the level of service that CENIC provides to the California research and education community.

The NOC representative I worked with was ...

"... helpful."	100%
"... courteous."	100%
"... knowledgeable."	97%
"... patient."	98%
"... thorough."	99%
"... articulate."	100%

The NOC representative I worked with ...

"... understood my problem."	99%
"... handled my problem with an appropriate level of urgency."	99%
"... was able to resolve my problem on the initial contact."	90%
"... followed through with requested information."	98%
"... confirmed that I was satisfied with the resolution."	97%
"... was able to assist even though I had previously worked with another representative on the same incident."	100%
"The response time for my initial request for support was faster than or met my expectations."	99%
"Communications providing the status of my request for support were timely."	99%
"The time to resolution for my support request was faster than or met my expectations."	97%
"Please rate your overall satisfaction with the handling of your request for support."	97%

Integrated Statewide Video with K-20 Video

K20Video is a statewide videoconference system designed for use over CalREN and serving all CCC, CSU, K-12 and UC sites. This newly integrated videoconferencing service is a collaborative effort between CENIC and the Imperial County Office of Education (ICOE), combining CENIC's CalREN Video Services with ICOE's K12Video.org.

Service was successfully launched in October 2010, thereby providing greater opportunities for the K-20 education community in California to utilize multi-point videoconferencing for both academic and administrative needs. K20Video seeks to encourage increased collaboration between segments and facilitate both new and ongoing distance learning programs.

New features offered by K20Video include:

- ▶ Support for video + content (H.239 protocol), enabling users to share slides and desktop views as well as video and audio
- ▶ Support for HD videoconferencing
- ▶ Support for real-time Web streaming of videoconferences
- ▶ Recording and archiving of videoconferences for on-demand viewing
- ▶ A new, enhanced scheduling program

Additional information may be found at video.cenic.org.



Innovation knows no boundaries, and the advanced networking that empowers it is no different.

While the CalREN network provides high-performance connectivity among California's research and education community, CENIC provides connectivity beyond the State in order to facilitate the global collaboration that innovation demands. This includes not only connectivity to the US research and education backbones of Internet2 and National LambdaRail (NLR) but also to many international networks. Through this connectivity, a high-performance network path exists between researchers and educators in California and their colleagues throughout Europe, the Americas, Asia, and Oceania.

While connectivity to Europe is provided by CalREN's connections to the Internet2 and NLR backbones, connectivity to the Pacific Rim, as well as to advanced networks in the Americas, is provided via the distributed international peering facility Pacific Wave, a joint project between CENIC and the Pacific Northwest GigaPoP with the support of USC and the University of Washington.

By connecting at any one of three US locations (Seattle, Sunnyvale, and Los Angeles), participating networks can share traffic and thus enable the creation of a high-bandwidth network path between researchers and educators in more than 40 countries, including the combined networks of GLORIAD, redCLARA, and TransPAC2 which connect to 7, 17, and 11 countries respectively.

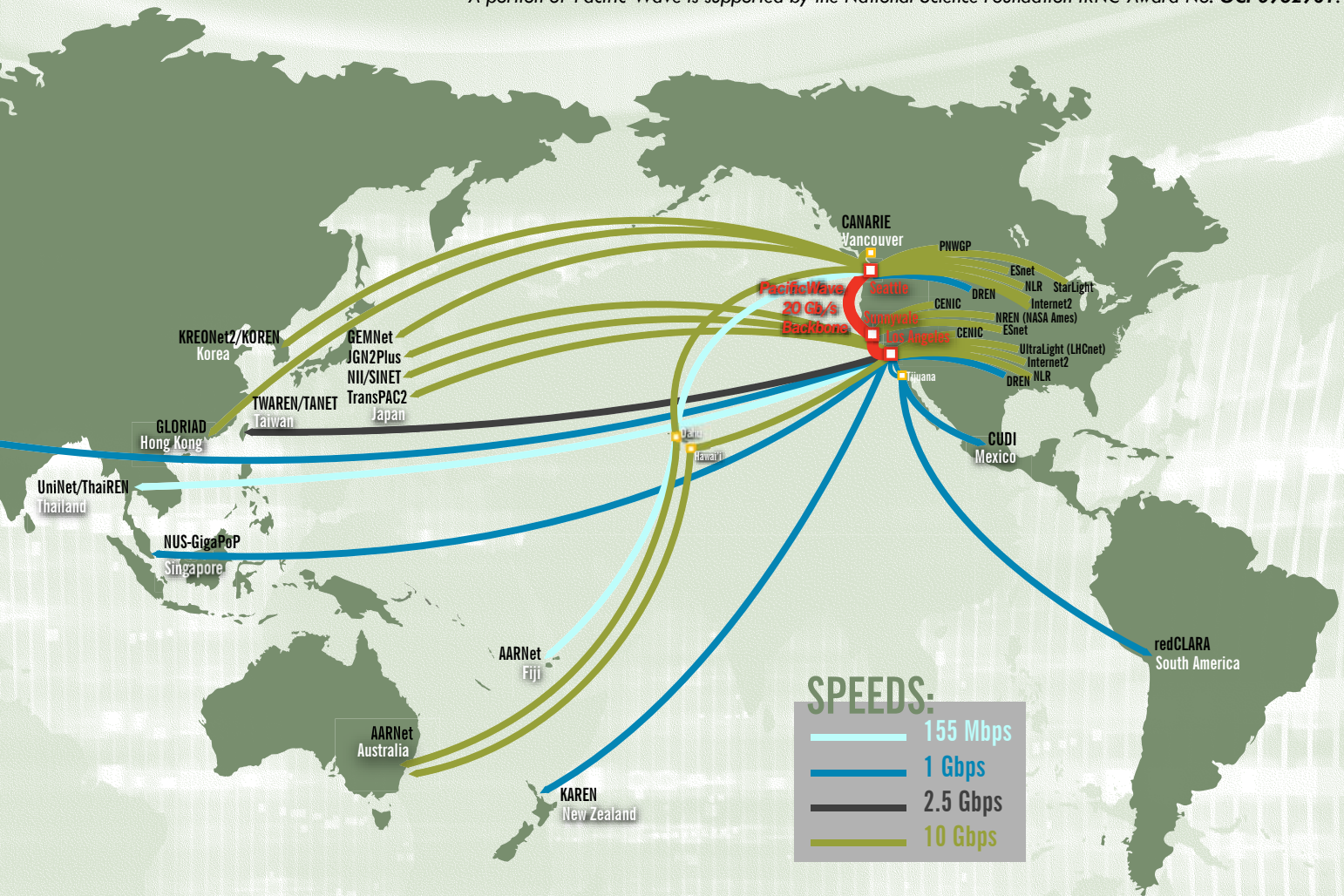


In order to facilitate connectivity not only internationally but for regional networks within the United States, CENIC and PNWGP also created the distributed national peering facility TransitRail. This national peering structure featured facilities in Los Angeles and Palo Alto, CA; Chicago, IL; New York, NY; Ashburn, VA; and Seattle, WA.

During the 2010-11 fiscal year, TransitRail merged with the Internet2 Commercial Peering Services (CPS), created a new combined distributed national peering structure, TR-CPS. Connection facilities are located in Ashburn, VA; Atlanta, GA; Chicago, IL; Kansas City, MO; Houston, TX; Los Angeles, CA; New York, NY; Salt Lake City, UT; and Seattle, WA.

Pacific Wave International Connectivity

A portion of Pacific Wave is supported by the National Science Foundation IRNC Award No. OCI-0962931.



Connects at	Network	Nation(s)	Connects at	Network	Nation(s)
STL • LA	AARNet	Australia	LA	Los Nettos	USA
STL	CANARIE	Canada	STL	Microsoft Corporation	USA
SVL • LA	CaIREN	California	LA	NII/SINET	Japan
LA	redCLARA	Latin America*	STL • LA	National LambdaRail	USA
LA	CUDI	Mexico	SVL	NASA Research & Education Network	USA
STL • LA	Defense Research & Engineering Network	USA	LA	NUS-Gigapop	Singapore
STL • SVL	Energy Science Network	USA	STL	Pacific Northwest GigaPoP	USA
STL	GEMnet	Japan	LA	Qatar Foundation	Qatar
STL	GLORIAD	Northern Hemisphere**	SVL • LA	Softbank Telecom	Japan
STL • SVL • LA	Google	USA	LA	TransPAC2	Asia***
STL • LA	Internet2	USA	LA	TWAREN	Taiwan
LA	JGN-X	Japan	LA	UltraLight	USA
LA	KAREN	New Zealand	LA	Uninet/ThaiREN	Thailand
STL	KISTI/KREONet2	South Korea			

* Members nations include Argentina, Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Guatemala, Mexico, Panama, Paraguay, Peru, Uruguay, and Venezuela.

** Member nations include China, South Korea, Russia, the United States, Canada, the Netherlands, and the NORDUnet combined network serving Denmark, Finland, Iceland, Norway, and Sweden.

*** Member nations include Japan, South Korea, China, Philippines, Hong Kong, South Vietnam, Thailand, Malaysia, Singapore, Indonesia, and Pakistan.

The 2011 conference marks the first time CENIC has held the entire annual conference at a Member institution: in this case, the beautiful [University of California, Irvine \(UCI\)](#) campus. At UCI, attendees enjoyed three days of presentations, demos, and a tour of the groundbreaking research taking place at the “other half” of the [CA Institute for Telecommunications and Information Technology, Calit2@UCI](#). As always, the face-to-face networking between attendees made the CENIC Annual Conference one of the not-to-be-missed research and education networking events of the year.

The conference program offered presentations on a wide variety of topics, from big science to the arts, from the latest in teaching and learning to the nuts and bolts of network technology, from policy to the practical aspects of network applications. And thanks to the efforts of Gold Sponsor [NCast](#), interested parties can still enjoy this program on-line at the [conference program](#), where archived high- and medium-resolution video of most presentations can be viewed on demand.

The Keynote Addresses were provided by the [NSF Office of Cyberinfrastructure's Alan Blatecky](#) and [Carnegie-Mellon's Jon M. Peha](#), formerly of the [White House Office of Science and Technology Policy](#). Where Alan's presentation centered on the current and future state of cyberinfrastructure, including detailed descriptions of the NSF's efforts in this direction, Jon's talk gave attendees valuable information on the practical aspects of representing, in political arenas, advanced networks and the innovations they enable.

A popular event at past conferences has been the “field trips” to [Calit2@UCSD](#) and the [Naval Postgraduate School](#), where attendees enjoyed talks and demonstrations showcasing the full potential of advanced networks like [CalREN](#). This year, demonstrations at the Irvine division of Calit2 included the debut of [live streaming of 4k video](#) to this site. A full list of demonstrations can also be found online at the [conference program](#).

And as always, the Innovations in Networking Award winners served wonderfully to demonstrate what can be achieved by the CENIC community with robust broadband networking. Teaching and learning, high-performance research, bleeding-edge innovation, and public policy initiatives have all been able to expand their horizons in 2011 thanks to advanced networks -- not a small feat considering the budgetary constraints within our community.

Another major part of the annual conference's success is CENIC's corporate allies enabling us to serve the interests of the California research and education community, including:

Titanium Sponsor:

[Cisco Systems](#)

Platinum Sponsors:

[AT&T](#), [Brocade](#), and [Level3 Communications](#)

Gold Sponsors:

[Abtech Systems](#), [Cedar Crestone](#), [Charter Business](#), [NCast](#), [NE Systems, Inc.](#), and [Network Hardware Resale](#)

Silver Sponsor:

[Time Warner Business Class](#)

Archived Video of the Most Popular Presentations



Archived video of all presentations can be found at the [conference website](#), but among the most viewed are:

Brian Shepard from USC's General Session presentation on the uses of high-bandwidth networking for audio musical collaborations.

Shepard showed how the most common forms of high-performance videoconferencing are insufficient for musical performances. Because musical videoconferences require more responsive microphones and loudspeakers than those used in a typical videoconference, the sound produced by the loudspeakers is often picked up by the microphones and retransmitted back to the original site as an echo. After nearly 10 years of research into issues of audio quality and echo control for musical videoconferencing, Shepard released EchoDamp to educational and performing arts institutions around the world. This breakthrough software application allows participants to control echo in a videoconference without sacrificing audio quality, and musicians may now experience the sound of a full, uncompressed frequency spectrum, without echo, even after the audio has traveled thousands of miles.

2011 Innovations in Networking Award winner Lee Thompson of CSU East Bay and Alex Kaplan of IBM on creating a cloud-based computing lab that can achieve the impossible: dramatically increase service to students and researchers while saving money.

The Virtual Computing Lab Initiative began as a joint project between CSU East Bay and CSU Northridge. This shared cloud environment allows students and faculty at multiple CSU campuses access to a variety of resources and results in cost savings for the University. More information is available by viewing the Awardee Presentation given by Thompson at the CENIC Conference.

Kent Wada at UCLA on the topic of illegal file sharing, illustrating the pitfalls and complexities of attempting to solve the problems presented by a highly socially-rooted behavior with IT tools.

Early intervention, swift action, and involving the existing student judicial process, according to Wada, are all crucial in order to shift behavior and raise awareness of the legal and ethical issues surrounding illegal file sharing.

2011 Innovations in Networking Awards



Virtual Computing Lab Initiative
Award Winners



Digital 395 Award Winners



Tele-Immersion for Physicians
Award Winner



CineGrid@Disney Demonstration
Award Winner

Every year, CENIC accepts and reviews award nominations in four areas – Educational, Gigabit/Broadband, High-Performance Research, and Experimental/Developmental Applications – and selects awardees whose projects showcase the benefits, both potential and realized, of advanced networks in the arenas of research and education. An awards ceremony was held on Tuesday, March 8 during the conference. Conference presentations about their projects were given by the award winners and can be found on the [conference program](#).

Educational Applications: [Virtual Computing Lab Initiative](#)

Begun as a pilot program at the California State University's Northridge and East Bay campuses, the [Virtual Computing Lab \(VCL\)](#) allows students to access the software applications their coursework demands from anywhere they have a browser and Internet connectivity, 24/7. Faculty use this same infrastructure for high-performance computing for activities and research. Complex, expensive software can run on the VCL and be accessed via older computers since the hardware in the VCL handles the processing.

This initiative to create a shared VCL cloud over CalREN for students and faculty at multiple CSU institutions enables significant cost savings and performance increases for the CSU. Expensive software need only be bought once and the Lab scaled to make it available to users in many locations without duplicating effort. Also, this infrastructure extends the life of older and legacy equipment, which can be used to access applications hosted by the Lab.

Gigabit/Broadband Applications: [The Digital 395 Project](#)

CENIC's Gigabit/Broadband award recognizes projects that promise to aid in closing the "digital divide" separating the most connected Californians from their fellow citizens living in unserved or underserved areas.

This year's winner, the California Broadband Cooperative's [Digital 395 Middle Mile Project](#), aims to close that gap east of the Sierras, between Nevada and Barstow, along Interstate 395. Much of this region is dependent on decades-old telephone infrastructure and has limited, insufficient broadband middle-mile capabilities, leaving wide swaths of the Central Valley and eastern California unserved. The relative lack of connectivity in the area also leaves some sections vulnerable to isolation in case of fiber cuts or other events due to a lack of diverse fiber paths.

The Project proposes to build a new 553-mile 10 Gb/s middle-mile fiber network that predominantly follows US Route 395 between southern and northern California. In addition to thirty-six municipalities, the project's proposed service area encompasses six Indian reservations and two military bases. More than 230 community anchor institutions will be provided access to 10 Mb/s broadband connectivity, with fiber-based service at 2.5 Gb/s and higher capacity offered to the region's last mile providers to expand or enhance service to households and businesses.

High-Performance Research Applications: Tele-Immersion for Physicians

Advanced networks are increasingly being used to empower medical professionals to extend their reach to colleagues and patients at a distance. UC Berkeley and UC Davis have partnered on **Tele-Immersion for Physicians**, a project that promises to use advanced networks to unite medical professionals with one another as well as their data, so that the interaction can include the data in question (imaging data, for example). Doctors can see the same data at the same time, bringing about faster and more productive collaborations.

Through this project the Tele-Immersion Lab at UC Berkeley and the Institute for Data Analysis and Visualization (IDAV) at UC Davis are jointly developing tele-immersion infrastructure, real-time video capturing systems, and the algorithms needed to capture, visualize, and transmit such data.

Experimental/Developmental Applications: CineGrid@Disney Demonstration

The CineGrid@Disney Demonstration on October 13, 2010 was the result of a nine-month effort involving more than fifty participants from seven CineGrid member organizations: Disney Studios, NTT Network Innovation Laboratory, Skywalker Sound, Digital Domain, Calit2@UCSD, UIC/EVL, and Pacific Interface.

Specific use cases that were demonstrated include: a 4k/60p telepresence virtual conference room; critical viewing of digitally restored archival film elements at 4k and 2k resolutions, streaming from a remote server; Digital Intermediate (DI) color grading; critical viewing

of 3D HD stereoscopic visual effects; collaborative audio editing and mixing; and use of a SAGE multi-panel display walls for collaborative review of multimedia marketing materials.



Doug Hartline (UCSC), Greg Scott,
Jim Dolgonas (CENIC)

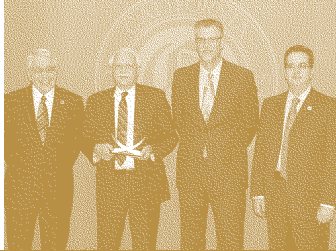
Outstanding Individual Contribution: Greg Scott

Greg Scott, this year's Outstanding Individual Contribution awardee, has been a foundational member of CENIC since 2001, when he was hired to assist with the Optical Network Initiative, a project which culminated in the creation of the CalREN optical backbone.

The critical work that he performed included coordinating the physical connections of the CalREN network, largely in colocation facilities located throughout California, each presenting unique challenges. This work was extraordinarily complex and required an understanding of different types of fiber, optical equipment, and facilities issues. Significantly, this work also involved the ability to interact and negotiate with a variety of companies and organizations on behalf of the CENIC community, from commercial firms to facilities and network managers at CalREN connected institutions.

Nearly ten million California students, staff, and faculty owe him a significant debt of gratitude for helping make possible the network that enriches their lives every day.

CENIC CEO Recognized for Service to Community Colleges



CCC Chancellor Jack Scott, Jim Dolgonas, CCCCO's Patrick Perry, and CCC Board of Governors' Scott Himmelstein

Since 2000, the California Community Colleges Chancellor's Office Technology Awards program has honored individual leaders who have identified and solved significant problems with ingenuity and resourcefulness. Through these awards, the **California Community Colleges Chancellor's Office** seeks to acknowledge individuals within or external to the California Community College System who have made significant contributions to the California Community College System.

In 2010, the California Community College System decided to honor CENIC President and CEO Jim Dolgonas with its CCC Chancellor's Office "Excellence in Technology Leadership" award.

As originally developed, the CCC system was not a part of CENIC. When Jim took over as COO in 2002, he quickly realized that the networking services procured by the CCC system could be easily aggregated under CENIC, thus providing CCCs with a much lower cost of operation and expanded bandwidth to all campuses. Thus in FY 2002-03, the CCCs were transitioned to CENIC.

Shortly thereafter, Jim requested that the CENIC Board add the Community College System as a full charter member. Since then, the CCCs have played a major role in the ongoing governance of CENIC.

Facing major budgetary challenges in 2009, the CCC system had its Telecommunications and Technology budget reduced from \$26 million to \$15 million. In response to this,

Jim developed an action plan to have all CCC circuit costs reduced by 50% by having them reimbursed through the CA Public Utility Commission's California Teleconnect Fund (CTF). This action alone moved \$5 million per year out of the CCC system budget and onto another funding source ongoing. A few years later, under Jim's vision and leadership, all CENIC backbone fees were moved to a 50% discount model supported by the CTF, saving another \$2 million annually.

Over the past decade, CCC district offices, campuses, and offsite centers have greatly benefited from excellent service, steadily increasing bandwidth, and increased network efficiency while greatly reducing the amount of CCC funds necessary to provide connectivity. Under Jim's leadership, the CCC system has been given equal access and governance rights and a key role in the network hierarchy. It is estimated that the CCC system has saved tens of millions of dollars in the past decade under Jim's leadership.

The Excellence in Technology Leadership Award recipients are nominated and selected by the members of the Telecommunications and Technology Advisory Committee (TTAC). Leadership Awards are selected on the basis of effective educational technology leadership at the institution, district, region or system level. Also considered, is the mentoring of other professionals, visionary achievements and effectiveness in identifying and advancing technology opportunities for the various needs of higher education.

Thus CENIC, as a small corporation, is in an enviable position in that we can help California and the other Western states we serve to continue the legacy of innovation that the 20th century has bequeathed to us into the century to come; help the education community meet the challenges of creating the workforce of the future; help institutions to maintain their internal services and restructure to function in this new landscape while increasing service levels; and also help lead the way on the road to recovery by carrying out opportunity-creating infrastructure projects.

Few relatively small organizations like CENIC are in a position of having such a vital role to play in helping an entire State and nation prevail over such daunting challenges. I'm personally proud that the education and research community has seen fit to entrust us with this responsibility, and I'm proud to be a part of a community so farsighted as to have created CENIC in the first place.

Of course, as CENIC is composed of the very community it serves, I encourage our members to take special pride in this vital role, as it is yours as well. Together with our corporate partners, CENIC is perfectly positioned to accelerate the nascent recovery and ensure that not only California and the West but the US and the world all receive benefits from leading-edge networking.

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In a series of live programs and museum installations, the [Exploratorium](#), in partnership with the [National Oceanic and Atmospheric Administration \(NOAA\)](#), connected audiences in San Francisco (and around the world) to the high seas from aboard the Okeanos Explorer. The Okeanos Explorer is the newest vessel in NOAA's fleet and the first to be dedicated solely to exploration and discovery missions. While on its maiden expedition, the Okeanos Explorer streamed live data from the ocean floor off Indonesia using high-tech mapping systems and HD cameras on its remotely operated vehicle (ROV). In three exclusive webcasts – viewed live at the Exploratorium and streamed on its website on July 28, August 3, and August 5 at 3pm PDT – audiences in the museum and on the Web joined in the conversation with crew members, scientists and technicians aboard the Okeanos Explorer. Webcasts (both live and archived) can be found at the [Exploratorium's website](#).

The ship's mission was a joint expedition between NOAA and the Republic of Indonesia to explore the deep ocean north of Sulawesi, an area known for its extensive volcanic activity and rich underwater ecosystems. The Exploratorium allowed audiences to peek over the shoulders of these ocean explorers in a special installation on the museum floor that streams the ship's live video and data thanks to the Exploratorium's connection to CalREN.



NOAA's Okeanos Explorer
Research Vessel

The Okeanos Explorer is NOAA's most sophisticated exploration vessel, equipped with an ROV, state-of-the-art multibeam sonar technology for mapping the sea floor as deep as 6000 meters (nearly 20,000 feet), and 24-hour satellite telecommunications equipment to beam images in real time from the ship and ROV to destinations on shore. The Okeanos Explorer will map and explore the world's ocean depths, primed for making new discoveries with every mission it undertakes. With its continuous telepresence during missions, the ship provides opportunities for scientists, students and public audiences to experience these discoveries as they happen.

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