

# Digital 395

## Project Description

Digital 395 is a major broadband infrastructure investment by the California Public Utilities Commission and the National Telecommunications and Information Administration to bring high-speed Internet and associated benefits to the Eastern Sierra region of California. The network is comprised of three major components: (1) a 450-mile long “Middle Mile” backbone between Reno Nevada and Barstow California, (2) 174 miles of local distribution fiber in over 20 communities along the route, and (3) more than 300 service connections to various community institutions and service providers. The project was conceived in 2009, received final funding in 2010, obtained permits in 2012 and was completed in 2014. The project’s total budget was approximately \$109.1 Million, 24.6% of which was funded through the California Advanced Services Fund.

The project was developed, designed and constructed by Praxis Associates, Inc. California Broadband Cooperative, Inc. was created to serve as the owner-operator of the network. Inyo Networks, Inc. is under a long-term Network Services Agreement to manage daily operations.

The Digital 395 project was undertaken in pursuit for four main goals. On an immediate basis, the project was part of the American Recovery and Reinvestment Act of 2009, with the expressed intent of creating jobs, improving America’s infrastructure, and aiding in economic recovery during the Great Recession. Broader goals included (1) improve communications infrastructure reliability to ensure public safety, (2) promote economic development by expanding the infrastructural base of the region, and (3) to more generally bring the benefits of high-speed Internet and the Information Age to residents and businesses of the region. The project achieved all of these goals.

Protecting the Environment: The sensitive nature of the environment in the Eastern Sierra was a major factor contributing to the design, timing and execution of the project. Over 50 local, state and federal agencies had regulatory oversight of the project in some capacity and had a say in how it was to be executed. Due to environmental sensitivity, for example, the network was designed to meet the “ultimate” requirements of the area with a “dig once” policy. This meant that the project should be constructed so that it would be unnecessary to disturb the environment in the future for increased capacity. To meet this requirement, the project installed a 432-strand fiber optic cable and added additional conduit, should future cable be needed. Similarly, access vaults were installed every 4500 feet so that future connections to the network would be available close by, economically and without adversely impacting the environment. To assure the preservation of cultural and historical sites horizontal boring techniques rerouted cable deeper underground without disturbing the surface so that over 465 culturally sensitive sites would not be adversely impacted. The result is that the project had no adverse impacts on the natural or cultural environment. No sensitive plants or animals were harmed and the work environment remained safe with no injuries to workers, motorists or local residents.

Building the Network: Once permitting allowed, the Digital 395 network was constructed in nineteen months. The 624 linear miles of fiber optic cable was installed in a conduit system designed and built for the project. The conduit system consisted of 668 vaults, 8,680,320 feet of conduit, and required 3,453,040 feet of underground plowing, trenching and boring. Over one and one-quarter billion feet of fiber optic strands were installed, spliced and tested during construction.

In addition to this so-called “outside plant” (conduit, cable, and vaults), the network consists of 11 node buildings used for signal regeneration and central points of local distribution. The nodes are prefabricated 12’ x 25’ buildings, complete with power systems, security and electronics. Power is provided on a fully redundant basis by a combination of commercial power, batteries, and 75 to 125 kV generators. If commercial power fails, the electronics will operate on battery alone for several weeks, and once the generators kick in they will keep the network running as long as fuel is periodically replenished. The transport electronics, using four fibers, operate bi-directionally over 15 wavelengths (channels) at 150Gbps. The system is expandable to 88 wavelengths to allow another 7.3 terabytes of bandwidth to be added (with currently available electronics). In short, as currently configured, by adding shelves and cards, the network is able to expand current capacity 50 times. End-to-end transport latency is 5.5 milliseconds. Two nodes, one each in Reno and Barstow, tie into the national Internet backbone, which roughly follow the I-80 and I-15 corridors, respectively.

The network is physically secured by 24/7 remote monitoring. Building access is remote controlled and all nodes are enclosed with video surveillance.

The construction of the network created an equivalent 750 of job-year employment for hundreds of employees and contractors. In addition, an estimated \$30 million was spent on sales tax, supplies, equipment, fuel, meals and hospitality services – generating more employment.

Network Services. The project connected 251 Community Anchor Institutions (CAIs) such as schools, libraries, hospitals, public safety, and other government institutions. Among these are three military bases, seven Indian reservations, and three college campuses. The results, for example, have been that schools throughout the region upgraded their connectivity from 3 Mbps to 1Gbps at about half the price and all seven Indian reservations are actively served by broadband in exchange for passage through tribal lands.

In addition to the community anchors, the project connected to other service provider (telephone, cable, wireless) networks at 65 Points of Interconnection (POIs). Where higher bandwidth was connected, not only was broadband made available to significantly more commercial and residential customers, but the speeds offered increased at least 10-fold with no change to end-user pricing.

Legacy. The Digital 395 network was intended to provide a platform for entrepreneurialism and economic development. The network operates as a carrier-neutral, open access network to which any service provider can interconnect on a non-discriminatory, equal basis. Because of its vast capacity, new service providers have entered the market and those who already existed have improved their products, services, and financial viability. Fiber-to-the-Premises (FTTP) projects are being planned in at nearly a dozen adjacent communities.

City and County governments are working hard to promote further development so that the Eastern Sierra can boast of being a Gigabit Region. Regional and local planning initiatives have explored new business models to bring the benefits of broadband to remote communities. And recent fires in Round Valley have tested Digital 395 as a reliable network that can be depended on for public safety in the face of disaster.

Governance. Digital 395 is owned and operated by the California Broadband Cooperative, Inc., an organization set up exclusively for the region. As a cooperative, the network serves at the convenience of its members, who are patrons throughout the region. The Board of Directors includes representatives from local government and customers directly purchasing services from CBC. Digital 395 is thus structured to be an on-going asset for the region and meet the evolving needs of the local population.