

# Multi-Use Network/MNT



# **Multi-Use Network (MNT)**

## **FY 2005–2006 Annual Report**

Submitted to:

Colorado Information Management Commission

Submitted by:

Division of Information Technologies

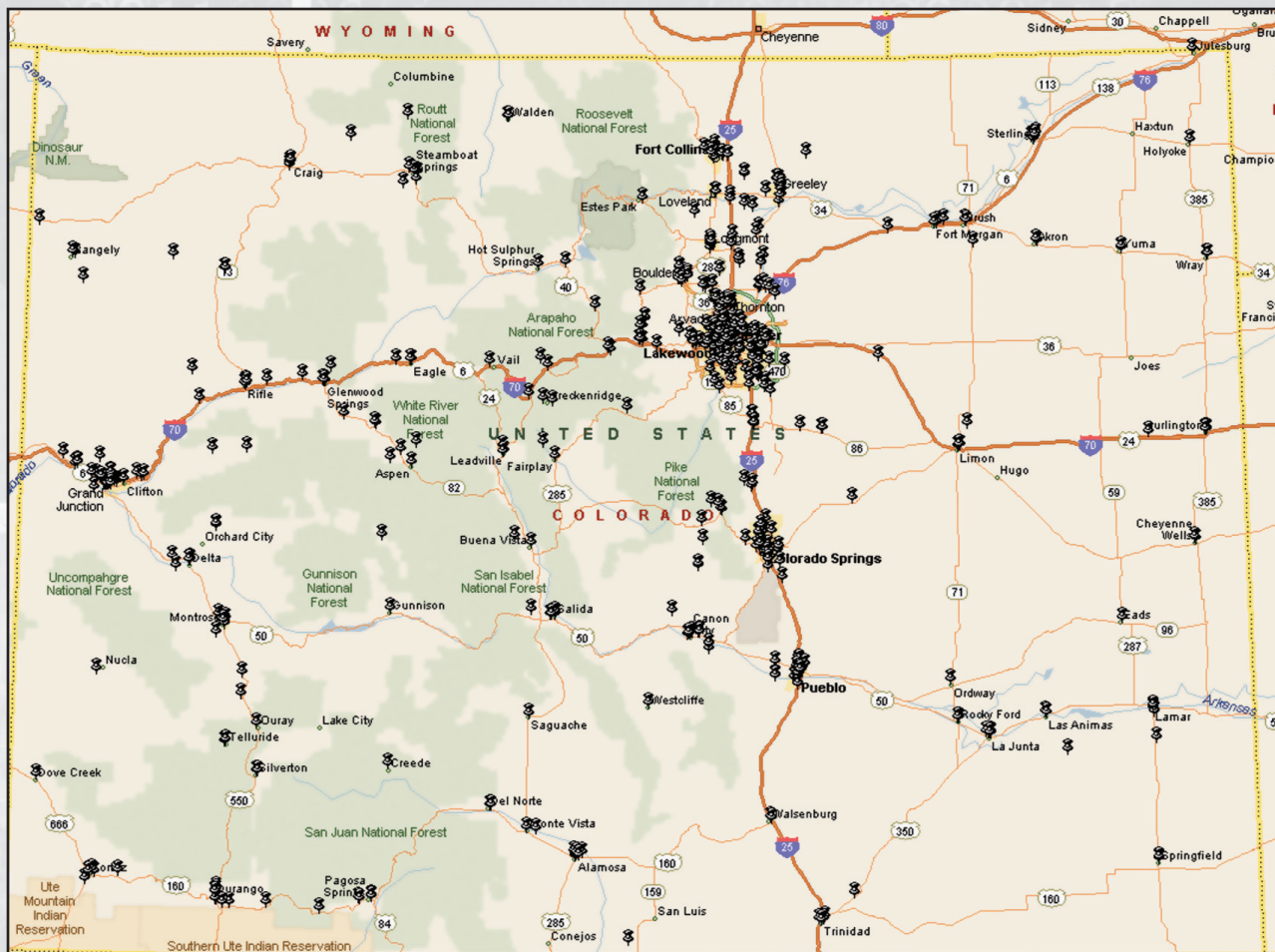
Department of Personnel & Administration

State of Colorado

October 2006



# MNT SITE LOCATIONS



## TESTIMONY FROM A HAPPY MNT CUSTOMER

August 11, 2006, Cortez Colorado—Reprinted with permission

"My name is Jim Snow and I am the IT Director for the city of Cortez. I would like to tell you how much I appreciate two of your employees. Cortez is a small town 8,500 population in the southwest corner of Colorado. The city supplies Internet services through MNT to all schools in the county, the county government, city government, fire department, sanitation district, technical school, dispatch center, and hospital. The closest radiologist is in Durango, which is 50 miles east of Cortez. When the Internet is down a carrier has to take the x-rays on a 100-mile roundtrip to get read which can happen numerous times. A down Internet also straps our dispatch center, as we have only one terminal to share with a frame relay to CBI for plate and warrant look ups without the Internet."

"We had a 3550 switch go down Tuesday at 2:00 p.m. Frank White went above and beyond the call of duty getting us back up as soon as possible. He worked many hours along with Getachew Mekonnen trying to get the switch back up and when that proved fruitless they boxed up a pre-configured replacement, and Frank dashed to FedEx to overnight it to me. The next morning he also worked with me to try to configure an old switch of mine to put in place temporarily until FedEx arrived. I was in a real jam, and finally got the system back up by 1:05 on Wednesday. Frank was very patient and understanding in working with me, and Getachew was there at times bouncing ideas off of, and confirming suggestions. They both are very knowledgeable about Cisco equipment, and make me feel comfortable that we have experienced help with the state equipment when we are in a jam. I would like to recommend them for a pat-on-the-back, and sincere thanks for all of their help."



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# EXECUTIVE SUMMARY

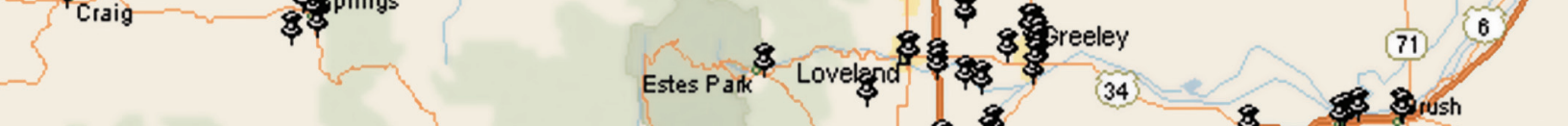
The state is nearing the 10-year anniversary since the authorization of the Multi-Use Network (MNT) Program. With the successful completion of the MNT in 2003, fiber-optic connectivity is now available to every county seat in the state, except Silverton, which is served by reliable high-speed microwave. This has stimulated private carrier offerings of last-mile broadband (DSL, cable, wireless) to homes and businesses in 97% of county seats.

Thus, the MNT has met its strategic goal to bridge the Digital Divide. Its method was to use the public sector as an anchor tenant for telecommunications investment through a public-private partnership with private telecommunications carriers.

The table below lists the five measurable goals of the MNT Program and quantitative metrics used to assess progress. The dashboard indicates that the MNT Program has met or exceeded all goals, and identifies areas where additional progress is possible.

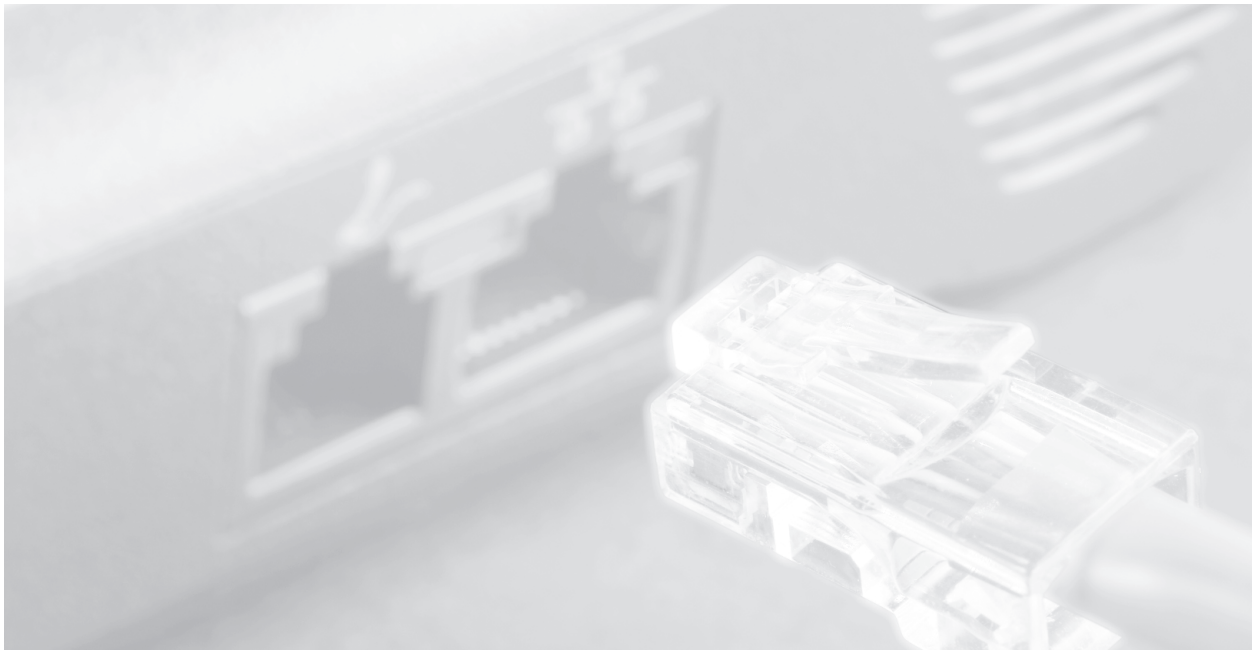
## MNT GOALS AND STATUS AS OF JUNE 30, 2006

	Dashboard	Goal	Metric	Status
1		Aggregate all state data communications	Participation of state agencies	All State data circuits are on the MNT. Usage has grown at 20% per year for the past 3 years. Current total subscribed bandwidth is now 5.1 gigabits per second.
2		Serve as anchor tenant	Participation of non-state agencies (NSAs)	The MNT is universally available to all NSAs. The MNT currently has 67 NSA customers comprising the 6th largest MNT customer group. There is significant potential for further growth of NSA participation, but the MNT will need to reduce its prices to be competitive.
3		Enhance access for the private sector	Availability of last-mile broadband (DSL/cable/wireless)	97% of all county seats have DSL access available to their residents.
4		Promote rural economic development	Gap in percentage workforce employed by high technology firms, rural vs. metro	Rural high tech jobs are growing at 6% per year vs. -2% in metro areas. A 5-to-1 gap remains in high tech job concentration between metro and rural.
5		Improve educational opportunity	Participation of schools in federal E-rate program	Since 1998, Colorado school districts have spent \$7 million of federal E-rate funds on Internet access. The year-to-year trend in E-rate participation is upward. About two-thirds of schools participate.



## FUTURE PLANS

The MNT will continue in its role of anchor tenant to stimulate telecommunications investment in underserved areas of the state. This role will be renewed with the 2010 competitive re-procurement of telecommunications services to meet the State's data communications needs. A key business goal for the re-competition will be to achieve price discounts for MNT circuits commensurate with the large scale of state government business (~\$10 million/year). A key technical goal of the re-competition will be to move from the current megabit per second (Mbps) speeds of the MNT backbone and last-mile circuits toward gigabit per second (Gbps) speeds more appropriate to the anticipated applications needs of 2010-2020. These needs will include video and voice over IP. A second technical objective of the re-competition will be to procure *services*, not just *connections*, therefore minimizing the need for the State and its users to own, operate or maintain telecommunications network equipment.





## PROGRAM OVERVIEW

The MNT concept was formulated in the February 1998 “Strategic Plan for a Statewide Telecommunications Infrastructure.” It was authorized as a state program by SB 96-102. Its goal was to connect urban and rural communities across the state, bridging the Digital Divide. Its method was to use the public sector as an anchor tenant for telecommunications investment.

The Department of Personnel and Administration, Division of Information Technologies (DoIT), launched the MNT Program in June 2000 by formally entering into a public-private partnership with Qwest Communications. As anchor tenant, the State of Colorado agreed to aggregate its data telecommunications circuits onto the MNT. Qwest agreed to build a high-speed digital network comprised, where possible, of fiber-optic infrastructure, spanning every county seat in the state. A sister program to the MNT, the Beanpole Project, authorized by HB 99-1102, addressed the “last-mile” issue. The Beanpole Project was managed by the Department of Local Affairs.

Under the MNT Program, Qwest and its partners built a statewide fiber-optic network spanning all of Colorado’s county seats, with the exception of Silverton to which high-speed, reliable microwave was deployed. This network, owned and operated by Qwest and its partners and available to all Qwest customers, is called the Colorado High Speed Digital Network (CHSDN). Traffic originating within county seats is routed to anywhere in

the network without mileage charges, using the telecommunications routing protocol called Asynchronous Transfer Mode (ATM).

The State serves as the anchor tenant on the CHSDN. Using ATM, five large telecommunications switches and wholesale access to the Internet, DoIT has created the MNT as a sub-network of the CHSDN.

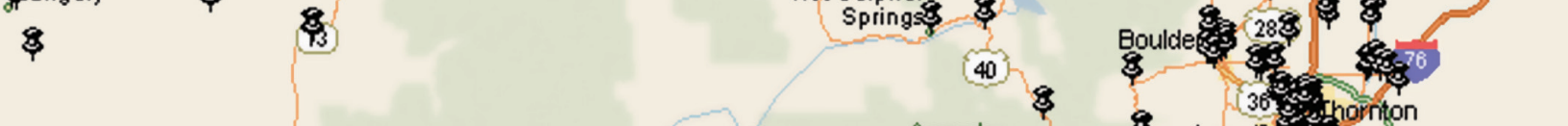
The MNT provides cost-effective, quality, high-speed broadband data communications and Internet access to Colorado’s public sector: e.g., state agencies, schools, colleges, libraries, hospitals and local government.

Project build-out was successfully completed in three years. Qwest and its strategic partners (CenturyTel, Phillips Telephone and Eastern Slope) established a total of 65 points of service (termed ANAPs or Aggregated Network Access Points) throughout Colorado. Qwest and its strategic partners have invested approximately \$60 million in the infrastructure for the MNT, and the State dedicated its annual data circuit business to the MNT (approximately \$7 million per year) and agreed to pay fees of \$9.5 million over five years to

reserve 20 Mbps of bandwidth at each ANAP for public sector use.

This income stream allowed Qwest and its partners to make the capital investment necessary to deploy fiber-optic points of presence in rural parts of Colorado where an adequate business case did not exist prior to the MNT.

**As a result of  
the MNT Program,  
in Colorado we  
have bridged  
the Digital Divide  
with a network  
that is capable  
of delivering  
voice, video and  
data services to  
every county  
in the state.**



In addition to the 65 ANAPs operated by Qwest and its partners, the State has installed five Super ANAP sites to route internal state traffic utilizing MGX 8850 carrier grade switch equipment. The State installed 39 Edge sites at circuit aggregation points among the larger state agency operations throughout Colorado. (An “Edge” site is an end-user access point to the MNT designed to be shared among high-bandwidth public sector users.) The State also installed an additional 15 county points of presence to aggregate circuits

at the county level that are not sufficient to justify a full Edge site.

As a result of the MNT Program, Colorado has bridged the Digital Divide with a network that is capable of delivering voice, video and data services to every county in the state. This network provides a pipeline to the state’s rural areas capable of supporting growth in both existing and New Economy industries while also providing access for public sector services in healthcare, education and government.





## NETWORK OVERVIEW

The MNT is an enterprise-class service providing secure, high-speed broadband access over carrier-class infrastructure owned and operated by Qwest and its partners. The network spans every county seat in Colorado. It is exclusively fiber optic, except in Silverton, where a reliable high-speed microwave link has been deployed. The MNT network is self-healing. If any one path is cut, traffic is automatically re-routed. The MNT network receives a much higher level of service commitment from its carriers (Qwest and its partners) than is provided by common commercial enterprise services, or for DSL or cell services. All internal state traffic remains

**The MNT  
network  
manages  
5.1 Gbps of  
subscribed  
bandwidth...**

inside of the network and does not traverse the Internet. As such, the MNT is an intranet for state government and its political subdivisions. The MNT maintains two independent connections to the Internet and two separate connections across the area code (i.e., LATA) boundary between northern and southern Colorado. The MNT Information Security Operations Center provides monitoring and early warning

to our customers on malicious code active on the network. In summary, the MNT network architecture and support provides a highly robust, reliable, available and survivable network that is well-suited to mission-critical state operations.

MNT services include both circuit and Internet access in one bundled price. Both ATM and Frame Relay access are supported. Subscription rates vary by the MNT teleco partner involved and are based on the cost of the circuit plus a fee to recover audited costs of operating the network. The State pays retail tariffed rates for its MNT circuits.

Exact service quotes are available at <http://www.mnt.state.co.us>. Sample monthly rates offered at the Qwest ANAPs include:

<b>1 Mbps burstable bit rate</b>	<b>\$535.93</b>
<b>1 Mbps constant bit rate</b>	<b>\$603.24</b>
<b>6 Mbps burstable bit rate</b>	<b>\$2,347.95</b>
<b>6 Mbps constant bit rate</b>	<b>\$2,751.84</b>

The MNT also offers DSL service, with the current rates ranging from \$24.51 up to \$80.09 depending on type of service. The MNT has 1,159 DSL customers, which are primarily Colorado Lottery sites.

The MNT network manages 5.1 Gbps of subscribed bandwidth and operated at 99.9766% core network availability for July 2005 through June 2006 (not including scheduled outages). The MNT's two independent connections to the Internet total over 180 Mbps.



## FUTURE PLANS

As the MNT conquered yesterday’s Digital Divide, a new Digital Divide is forming because of the ever maturing pace of technology. The Asynchronous Transfer Mode (ATM) protocol of the current MNT has become outmoded and needs to be replaced with newer protocols, such as MPLS. Further, the present MNT pricing structure, based around units of one million bits per second, does not scale to tomorrow’s needs for one billion bits per second (Gbps). With ATM and its current high cost structure, the present MNT cannot adequately serve as a statewide backbone for Gbps networking. Finally, the “last-mile” (or the “first-mile”, depending on your point of view), remains an issue. Regardless of specific transmission technology (copper, fiber, wireless, cable, or whatever technology becomes feasible), last-mile Gbps access needs to be established throughout rural Colorado.

## STRATEGIC GOAL

The MNT will continue its role of serving as telecommunications “anchor tenant” in Colorado by applying the purchasing power of the State to stimulate needed technology upgrades and affordable pricing. Statewide improvement in broadband infrastructure will promote economic development and quality of life throughout the state, in particular, in rural areas where market demand alone may be insufficient to stimulate investment.

The MNT Program is guided by three principles:

- **Prosperity Principle.** The purpose of networks is to build communities across the state.

- **Anchor Tenant Principle.** The public sector should not simply meet its own needs without a strategy to address the needs of the entire community.
- **Partnership Principle.** New infrastructure needs to be owned and operated by the private sector so it can be made available to all through the free market.

## MNT POST 2010—RENEWING THE MNT PUBLIC-PRIVATE PARTNERSHIP

The MNT Program is beginning the process of re-bidding the contract for the MNT. By the end of the 10-year initial MNT contract with Qwest, June 30, 2010, the State will have issued a Request for Proposal (RFP) and awarded a contract to continue the MNT services and its role as the state’s telecommunications anchor tenant. State government (possibly in concert with K-12 organizations and other political subdivisions who wish to participate) will pledge all of its telecommunications business (about \$10M/year for the State), plus any necessary direct payments, to the winning telecommunications carrier. Note, in the original MNT award, direct payments of \$9.8 million were made to guarantee the public sector access to the new network. This served as an additional incentive to invest in the build-out of a fiber network.

The RFP will seek a highly discounted tariff for the public-sector consortium significantly below retail rates. This will remedy the key difficulty with the current MNT Program—that the State has been obliged to buy its circuits at the tariffed retail rate. This gives no advantage

to potential public sector customers once the overhead costs of managing the MNT as a secure, reliable, enterprise network are added to the price.

Public revenue sources for the MNT renewal will come from the pledge of existing government telecommunications business. It is assumed that governmental entities would pay for their new faster services without dramatic increase in cost and would do so from existing operating budgets. Any additional capital investment required by carriers to achieve this pricing could be accomplished through direct annual payments as fees. Revenue for these fees could come from departmental operating funds (as is the current practice, where the fee has been bundled into circuit costs as an unallocated expense), from the General Fund, the Universal Service Fund, or the Capital Construction Fund.

The State has an opportunity to address last-mile issues in concert with the MNT renewal through a one-layer or two-layer approach. In the one-layer approach, the MNT renewal itself would include last-mile connectivity to participating schools and other entities. In a two-layer approach, the MNT renewal would serve as a statewide Gbps backbone, and last-mile connectivity would be addressed through a series of local government Beanpole Project grants. The Beanpole grants would have several new requirements: that funds be used only for private carrier Gbps-like deployment, that funds not pay operating costs of participants, and the resulting network would be interconnected to the MNT backbone.

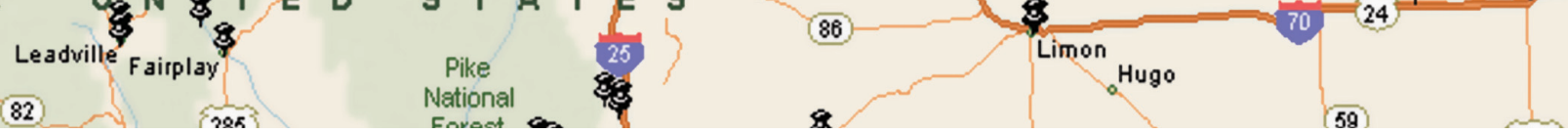
### **SPECIFIC PLANS**

The re-competition of the MNT contract is designed to provide greater bandwidth at similar or reduced costs to our customers—state and non-state agencies.

In parallel with the re-procurement of MNT’s wide area network circuits, DoIT will:

- Expand transport services, enhance performance of Denver metropolitan area network (MAN), and upgrade and expand disaster recovery for network systems.





- Partner with non-state agencies to better understand how the MNT can meet and serve their needs. One outcome would be to possibly aggregate NSAs’ demand with the State’s, to arrive at a larger total anchor tenant bandwidth package and deeper price discounts. Other coordination with NSAs will assure maximized use of federal Universal Service funds for customers connecting to the MNT (specifically, funds for schools and healthcare facilities).
- Implement aggregation opportunities. As reported, below, 80 sites connect to the MNT with four or more circuits. This presents an opportunity to aggregate these individual connections into one large, more cost-effective, connection. DoIT will work closely with the two state departments with the highest number of circuits connecting to rural sites: the Department of Human Services and the Department of Public Safety.
- Converge voice and data on the MNT. DoIT has successfully published an RFP for the upgrade of the Capitol Complex Telephony System (PBX) and posted intent to award. DoIT is currently in the contract negotiations stage for equipment and maintenance. This upgrade will include all of the current DoIT-administered voice applications today, deployment of VoIP in place of traditional telephony, and position the state to integrate all state-owned telephony systems into an Integrated Communications Network (ICN) in the future operating over the MNT.
- Support the ever-increasing use of the MNT by a larger and larger customer

base. DoIT is enhancing its order entry and billing services with a new system. DoIT is also implementing Web interfaces to its services to support order entry, billing, changes, and scheduling.

- Provide redundant access to the Internet. MNT traffic has two basic destinations: internal and external (to the Internet). The MNT has two separate and independent feeds to the Internet, one through a commercial provider and one through a higher education consortium called the Front Range GigaPoP (FRGP). DoIT continuously revisits its Internet Service Provider arrangements to maximize technical capability and minimize cost.

## SCHEDULE

FY06–07	Prepare project plan Pilot Gbps to end customer
FY07–08	Draft MNT-2 RFP Cost study of likely tariffs
FY08–09	Release MNT-2 RFP
FY09–10	Award MNT-2 contract

## PROCESS

The statutory responsibility for statewide networking lies with the Department of Personnel and Administration (C.R.S. 24-30-903 (1), (3), and (7)). The Department will work closely with the Governor, General Assembly, Chief Information Officer and Information Management Commission to move forward in accordance with the above plans and schedule, specifically to re-bid and award on-going MNT support by July 1, 2010.



# FY 2005–2006 RESULTS

## Goal 1—Aggregate State Data Communications

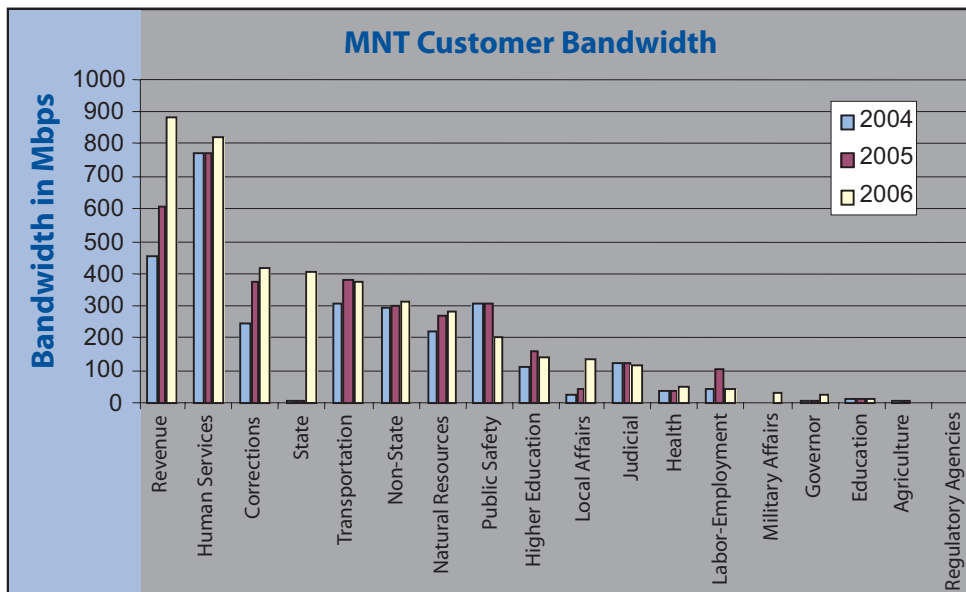
METRIC: Volume of network traffic, participation by department

### RESULTS

MNT currently supports 2,738 connections (1,679 ATM and 1,059 Frame Relay). This is 123 more connections than in 2005, with all of the growth in ATM. 866 sites (different physical locations) are connected to the MNT (see map). Total connection bandwidth is 5.1 Gpbs, vs. 4.9 Gpbs in 2005 and 4.8 Gpbs in 2004. Please note, data are reported as “connections” because the concept of the MNT is not a set of point-to-point circuits, but connections to a network cloud. The 2,738 connections would be the equivalent of 1,369 circuits).

...a steady  
20%  
per year  
growth.

The average connection size as of 2006 has remained stable, at around 1.86 Mbps. MNT customer use (use not including network core and internal use at DPA) grew to a 2006 level of 4.2 Gpbs from 3.4 Gpbs in 2005 and 2.9 in 2004—a steady 20% per year growth. Twenty-eight percent of all MNT connections are “slow speed” (less than 1Mbps) in 2006, down from 38% in 2005. Note, bandwidth data shown includes the capacity needed to enter the MNT data cloud (one end of a circuit), and to leave it (the other end of a circuit).



Statistics on the number of connections per site suggest an opportunity for circuit aggregation: 80 sites have 4 or more connections (82 in 2005, 52 in 2004).

The Judicial Branch, the Colorado Department of Transportation, and the institutions of higher education operate separate specialized networks, interconnected with the MNT. However, all three have substantial traffic on the MNT as shown in the figure above.



# Goal 2—Serve as Anchor Tenant

METRIC: Local public entity participation

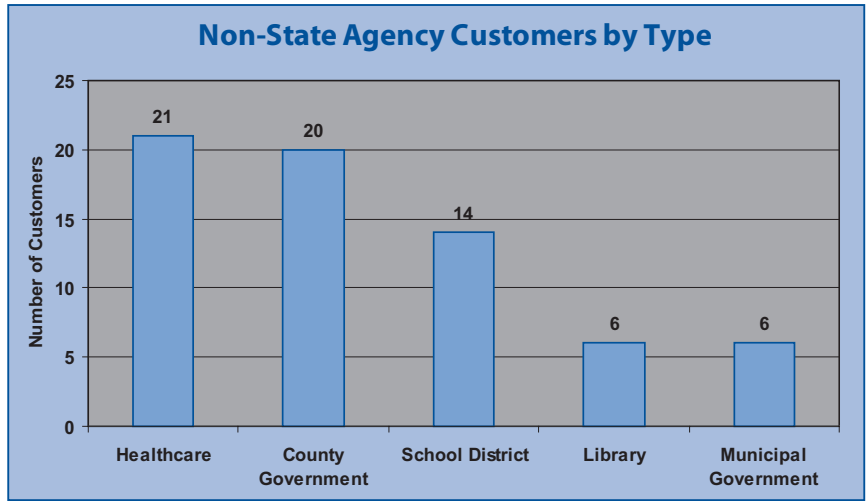
## RATIONALE

Colorado Revised Statutes state (C.R.S. 24-30-903(7)): *The Department of Personnel and Administration shall maximize "access to digital networks of the state by all public offices of all levels, branches and political subdivisions of the state within every community of the state."*

## RESULTS

Sixty-seven non-state agency (NSA) customers were served by the MNT as of June 30, 2006, including healthcare, county government, school district, library, and municipal government (see figure below). NSAs are the sixth largest customer group of the MNT in terms of bandwidth used, NSAs consume 17% of the total MNT bandwidth.

NSAs are the sixth largest customer group of the MNT.



## DISCUSSION

There is significant opportunity to expand the NSA participation in MNT. For example, MNT serves six of the 271 Colorado's municipalities, 14 of 181 school districts, and only four of 219 public or non-profit hospitals.

Increased participation by NSAs will require the MNT to be price-competitive. The present MNT cost structure

(presented above in the Network Overview section), determined by the tariffs agreed to in the original MNT contract, is the same tariff rate available to the public. After adding the true cost recovery charges for network operations, connection to the Internet and administration (currently 33% of circuit costs), the MNT, in most cases, is priced out of the market. To address this issue, as described above in the Future Plans section, when the State renews its MNT contract, it will seek deep discounts below retail prices commensurate with our status as a major customer. A significant reduction in the MNT's cost basis may then enable pricing that encourages greater NSA participation.

DoIT views the present MNT deployment a success because Internet access is available through the MNT to virtually any NSA. As such, the MNT has achieved its principal goal of overcoming the Digital Divide. The MNT serves as a network access point in many places in Colorado where no other alternative exists.

# Goal 3—Enhance Access for Private Sector

METRIC: Percent county seats with broadband access

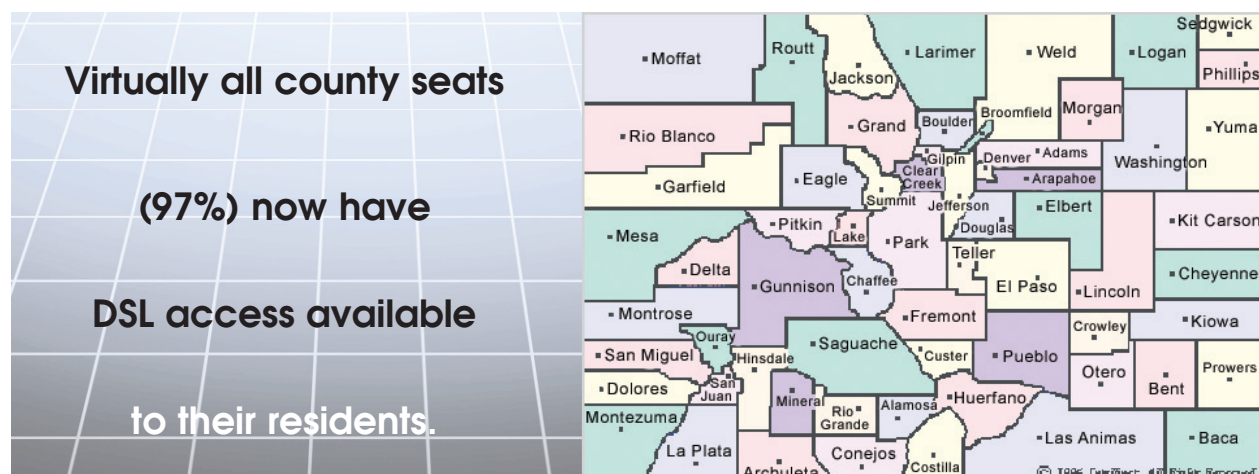
## RATIONALE

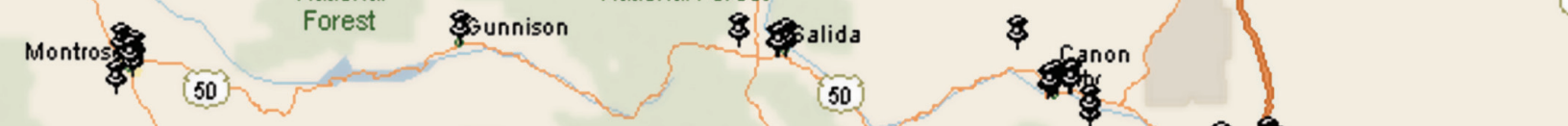
The private side of the MNT—the CHSDN, operated by Qwest and its partners—has deployed a statewide fiber-optic telecommunications backbone that reaches every county seat (except Silverton which is serviced by high-speed, reliable microwave). To be useful, however, that backbone must be available to homes and businesses. There must be an affordable link across the “last mile.” This is the role of private carriers to offer DSL and other broadband technologies. These last-mile broadband options provide substantially less expensive (often in the range of from \$30 to \$50 per month) connections than dedicated backbone data circuits. The MNT served as a trailblazer for last-mile broadband deployments by Qwest, its partners, and other Internet entrepreneurs now offering broadband services.

## RESULTS

Virtually all county seats (97%) now have DSL access available to their residents. The MNT has fully reached its goal of enhancing broadband access to homes and businesses.

	Qwest	CenturyTel	Eastern Slope	Phillips	Total
Total ANAPS	43	19	2	1	65
2004 Deployment	29	N/A	N/A	N/A	29
percentage	67%	—	—	—	45%
2005 Deployment	37	17	N/A	1	55
percentage	86%	89%	N/A	100%	85%
2006 Deployment	41	19	2	1	63
percentage	95%	100%	100%	100%	97%





## Goal 4—Promote Rural Economic Development

**METRIC:** Gap in percent in high tech workforce, metro vs. rural

### RATIONALE

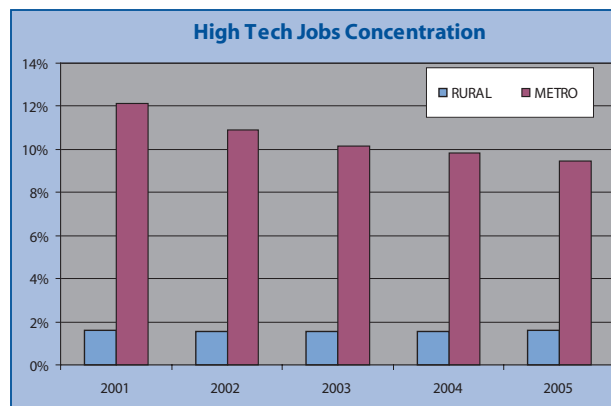
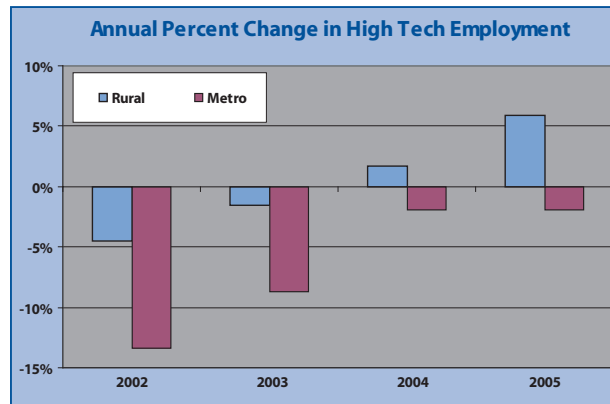
The Internet has led to a worldwide boost in productivity. A New Economy has emerged that strengthens existing industry (e.g., tourism, agriculture) while enabling entirely new forms of economic activity (e.g., data and information services). Because it is hard to measure New Economy job growth, per se, high technology jobs are used in this report as a surrogate indicator of New Economy potential. The deployment of high-speed communications by the MNT was expected to lead to growth in this type of employment in rural Colorado.

High tech growth  
(percent change) is  
now higher in rural  
Colorado than in metro  
parts of the state  
  
(6% vs. -2%).

### RESULTS

High tech employment in rural Colorado has risen each year since 2002, and totaled 3,761 jobs for December 2006. The post-9/11 slowdown hit rural high tech much less than metro, and rural high tech bounced back quicker (figure at right). High tech growth (percent change) is now higher in rural Colorado than in metro parts of the state (6% vs. -2%).

There remains a substantial gap between metro and rural high tech job concentration (figure below at right). Rural Colorado hosts about two high tech jobs per 100, where as metro Colorado hosts about ten per 100. It is hoped that the advent of broadband connectivity throughout rural Colorado will stimulate high tech growth and help further narrow this gap. High tech jobs are well-paying, in metro and rural areas alike. For rural areas, the average high tech wage of \$50,076 holds the promise of providing a standard of living that is commensurate with what is available in the metro corridor, and is substantially higher than the average rural wage of \$29,626.





<b>Top 10 High Tech Industries and Top 10 Rural Counties</b>	Grand Total	La Plata	Garfield	Eagle	Logan	Montrose	Routt	Pitkin	Summit	Morgan	Alamosa
<b>Grand Total</b>	3761	583	521	458	310	257	242	211	190	126	85
Engineering services	1240	258	300	200	2	111	143	6	57	3	24
Wired telecommunications carriers	471	28	27	50	10	44	15	12	20	17	27
Other computer-related services	323	4	1	7	271		8	4	2		
Custom computer programming services	286	37	65	97	1	3	14	8	19		
Computer systems design services	249	24	33	52	2	7	10	49	20		
Software publishers	236	160	36			2		15	14		
Cable and other program distribution	197	4	21		8	8	16	16	27	9	11
Internet service providers	123	5	29			16	6	7	3		17
Cellular and other wireless carriers	116	5		1			9		2	94	
Computer facilities management services	96			1			6	87	0		

## DISCUSSION

Software design-related jobs (computer services, programming, systems design and software publishing) now comprise 29% of the total rural high tech jobs (see figure above). These are among the fastest growing job categories according to the U.S. Department of Labor. It is reasonable to expect—and to promote—continued growth in these jobs for rural Colorado.

However,


there remains a

substantial gap

between metro

and rural high tech

job concentration.



## Goal 5—Improve Educational Opportunity

**METRIC:** The percentage of schools participating in the federal E-rate program for Internet access

The federal government provides telecommunications subsidies to schools, libraries and health care facilities under the Universal Service Administrative Corporation. The school portion of this program is termed the E-rate program. It provides funding for telecommunications costs (circuits), internal wiring, and for Internet access. Goal 5 tracks the schools' E-rate support for Internet access.

### RESULTS

Cumulatively since 1998, Colorado school districts have requested \$19 million in federal E-rate funds for Internet access. They have received and spent almost \$7 million. The general trend is upward year to year, with just over \$1 million spent in 2005 (see figure below). Note, 2005 and 2006 data are as yet incomplete.

E-rate Internet access is provided by qualified vendors that are registered with the E-rate program. Colorado schools participating in the E-rate program obtain Internet access from 76 different ISPs. Of these 76, Qwest serves the greatest number of sites in Colorado, 78, followed by the MNT, with 24. Two other providers serve 10 or more sites: Amigo.net, 12, and CenturyTel, 11. Seventeen ISPs serve only two sites each, and 35 ISPs serve a single E-rate site. Sixty-six percent of Colorado schools participate in the E-rate program. Of school districts receiving Internet access support, Qwest serves 26%, the MNT serves 8%, Amigo.net serves 4% and CenturyTel, 3.5%.

Schools have received \$7 million in E-rate funds since 1998 for Internet access.

Year	Total Requests	Requested Amount	Committed Amount	Pending Amount	Utilized Amount	Rejected Amount	Utilization %
2006	298	\$2,854,600.00	\$1,415,533.00	\$997,801.00	\$36,066.00	\$441,266.00	3.00%
2005	275	\$2,500,339.00	\$1,918,262.00	\$0.00	\$1,032,087.00	\$582,077.00	54.00%
2004	284	\$2,678,038.00	\$2,340,196.00	\$5,220.00	\$1,180,001.00	\$332,622.00	50.00%
2003	287	\$2,291,661.00	\$1,615,281.00	\$17,847.00	\$1,105,271.00	\$658,533.00	68.00%
2002	254	\$1,793,496.00	\$1,195,189.00	\$0.00	\$779,516.00	\$598,306.00	65.00%
2001	264	\$4,526,168.00	\$3,792,792.00	\$0.00	\$1,523,319.00	\$733,376.00	40.00%
2000	256	\$1,095,289.00	\$989,779.00	\$0.00	\$525,785.00	\$105,510.00	53.00%
1999	212	\$751,329.00	\$684,264.00	\$0.00	\$426,094.00	\$67,066.00	62.00%
1998	123	\$531,945.00	\$607,531.00	\$0.00	\$409,068.00	(\$75,586.00)	67.00%
<b>Total</b>	<b>2253</b>	<b>\$19,022,865.00</b>	<b>\$14,558,827.00</b>	<b>\$1,020,868.00</b>	<b>\$7,017,207.00</b>	<b>\$3,443,170.00</b>	

### DISCUSSION

One-hundred percent participation in the E-rate program would increase federal support for Internet access for Colorado's schools. Separately, 100% participation through the MNT as E-rate provider would reduce the number of disparate ISPs serving Colorado schools from 78 to one. Having all schools served by a single ISP would enable useful services only feasible through participation in an enterprise network, for example: school-to-school traffic (online learning, record keeping) without having to go onto the commodity Internet, high-quality two-way interactive video (sharing teachers and K-12 higher education links), and statewide participation in Internet2 (the advanced research network that 27 states now subscribe to for their schools).

## APPENDIX 1: NETWORK SECURITY

The recent challenges to information security are being widely reported in the press daily. These security challenges have and will continue to be addressed and mitigated by DPA/DoIT. Two years ago, DoIT created an Information Security Operations Center (ISOC) to provide enhanced MNT security monitoring and early warning to our customers on malicious code active on our network.

The ISOC also started blocking email that was not addressed to customer email servers, which resulted in blocking over 750,000 spam messages per month to MNT customers. As part of this effort, the ISOC also requested information security contacts for our non-state customers so we can dialogue with them during potential security events and when considering network-wide security policy changes.

The ISOC recognizes the importance of an open network to flexibly serve all our customers, so every security policy also includes a variance process for those customers who wish to opt out of the enhanced security or who need a specific exception for their business processes. The following policies and recommendations have been instituted by the ISOC:

The ISOC has implemented a “deny all permit by exception” policy at the State firewall at the gateways to the Internet.

### DPA/DoIT-ISOC recommends:

- that all hosts on the MNT have an anti-virus application with automatic updates enabled

- that all host servers be Windows 2003 or newer
- that all host PCs be Windows 2000 or newer
- that all hosts be protected, either by a network firewall or personal firewall
- that all hosts connected to the MNT be state-owned PCs or non-state entity-owned PCs and not personal PCs
- that all networks on the MNT utilize some method of anti-spam protection

E-mail servers on the MNT are permitted for non-state agencies with an approved E-mail Security Variance Request.

For permission to allow specific protocols and access to and from specific websites, all MNT users are required to complete and submit to the ISOC a Security Variance Request.

Remote access to the State of Colorado MNT is currently limited to Colorado state agencies or vendors sponsored by a State of Colorado agency. The associated department and their policies normally handle remote access to any agency network. The ISOC has the proper forms necessary to request remote access.

Non-state agencies are required to complete and transmit to DPA/DoIT Network services a Security Policy Form (FRM#05) before an entity can be accepted to participate on the MNT.

DPA/DoIT-ISOC can be contacted at (303) 866-3465, FAX (303) 866-3424, or at [ISOC@state.co.us](mailto:ISOC@state.co.us).



## APPENDIX 2: DATA COLLECTION METHODOLOGY

To observe multi-year trends of the quantitative metrics provided in this report, the metrics must be computed consistently each year. The following information is provided to specify exactly how the numerical values of each metric were obtained.

### **METRIC 1—Volume of network traffic, participation by department**

A spreadsheet was compiled by the Communications Service branch of the Division of Information Technologies. The spreadsheet listed all connections billed to the MNT Program. For each connection, the following data elements were provided: Dept, Agency–Org Key, State Circuit, Qwest Circuit, DLCI VPIVCI, Service Type, Circuit Quality, MNTPaths\_Bandwidth of Path\_K, MNTPaths\_Nbr Increments, Nbr Paths, Bandwidth Cost, Max Burst Cost, Backhaul Cost, DoIT Link/Port Cost, Monthly Path Cost, USF Charge, CDEF Charge, Final Total Path Cost, Port/Link Bandwidth, Site ID, City Name, Post Code, County Name, PathMegs. Cross-tabs were prepared for Dept by Service and Service by PathMegs.

### **METRIC 2—Local public entity participation**

The Communications Service branch of the Division of Information Technologies maintains a database documenting all “non-state agency”(NSA) connections to the MNT. This includes not only NSA direct customers, but also the first tier of entities behind customers serving as “aggregators” for others (e.g., Beanpole aggregators, county points of presence, municipal LANs, etc.).

### **METRIC 3—Percent county seats with broadband access**

Qwest Communications provided a list of DSL deployments by its partners and itself.

### **METRIC 4—Gap in percent in high tech workforce, metro vs. rural**

ES-202 data were obtained from the Colorado Department of Labor and Employment (DOLE) Labor Market Information Division in a file titled, NAICS Macro Thru 4Q2005. This file was filtered to include only the NAICS codes included in the American Electronics Association’s definition of high tech. Pivot tables and charts included with the DOLE table were used to produce employment totals for metropolitan and non-metropolitan regions of the state. These totals were divided by total employment figures for each region. The data were plotted monthly for the four-year span covered by the DOLE file (January 2001 to December 2005).

### **METRIC 5—Percent of schools participating in the E-rate Program**

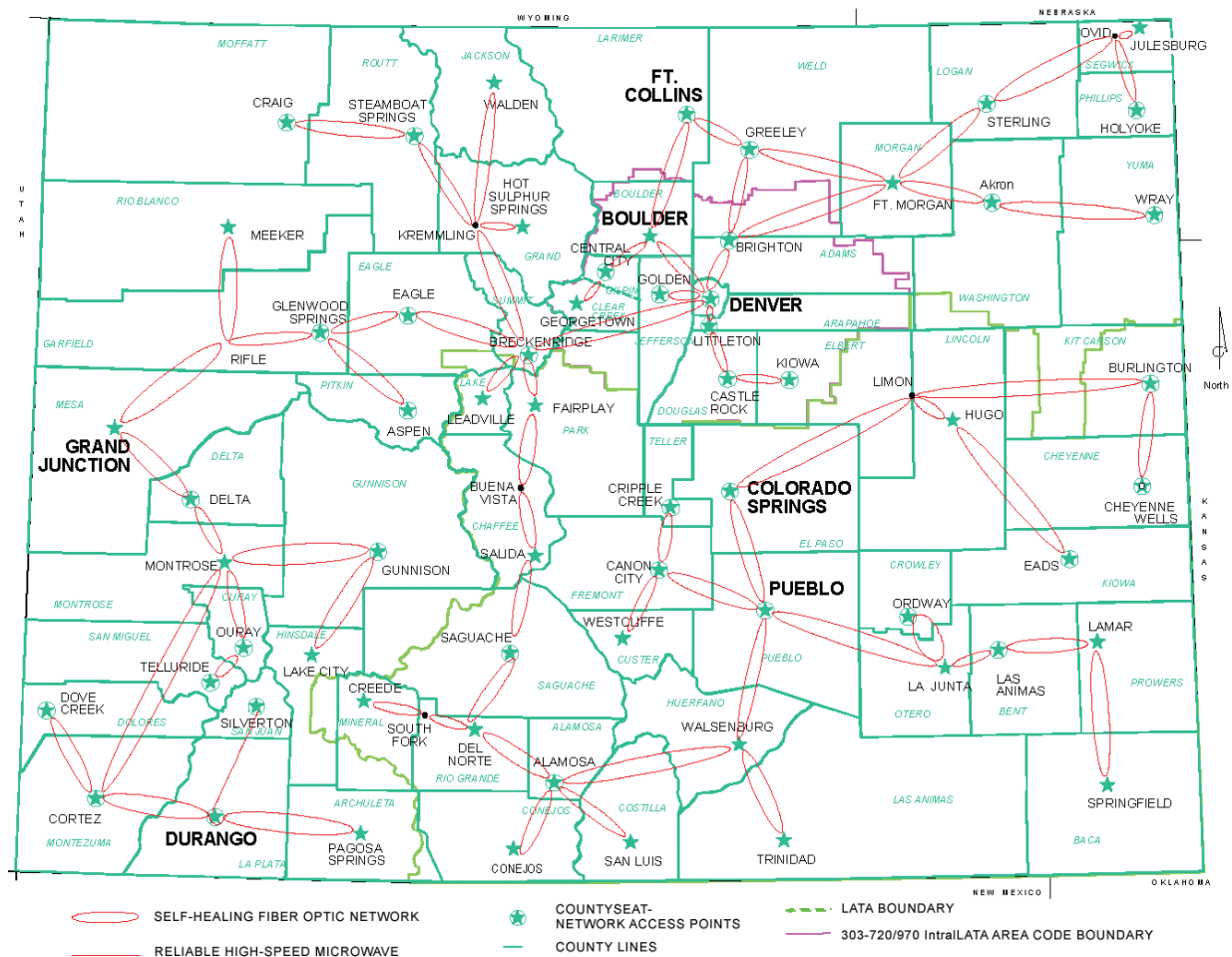
E-rate data was compiled from the following primary data sources: Funding Request Data Retrieval Tool (<http://www.sl.universalservice.org/funding/OpenDataSearch/Search1.asp>) and Colorado Department of Education list of school districts, and MNT User Base Data Report, extract of all school districts on the MNT.



# APPENDIX 3: MNT NETWORK DIAGRAM

The figure below illustrates the conceptual layout of the Colorado High Speed Digital Network, owned and operated by Qwest and its partners, that provides the network infrastructure of the MNT. While the CHSDN is available to all customers, the MNT has reserved 20 Mbps of traffic capacity at each of the county seat nodes. Each link is shown as a loop illustrating that, typically, each point-to-point link is comprised of two runs of fiber separated by at least 50 feet, compliant with the Self-Healing Alternative Route Protection (SHARP) standard. The point-to-point loops in many cases form larger loops that can reroute traffic due to outages or congestion.

## COLORADO HIGH SPEED DIGITAL NETWORK





Department of Personnel & Administration  
Division of Information Technologies