Colorado Department of Personnel & Administration

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Multiuse Network (MNT)

Annual Report – 2005

Submitted to: Colorado Information Management Commission

Submitted by: Division of Information Technologies
Department of Personnel & Administration
State of Colorado

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Contents

Executive Summary

The Multi-Use Network (MNT) concept was formulated in the February 1998 "Strategic Plan for a Statewide Telecommunications Infrastructure" and 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. It had five principal goals, listed in Results. The project was completed and a final report submitted by the MNT Task Force to the Governor and the Information Management Commission in October 2003. This report is the second annual report covering the progress of the MNT in achieving the five main program goals and reviewing issues relevant to the operation of the MNT, including security and plans for the future. Table 1 lists the five major program goals of the MNT and, for each, defines and quantifies a performance metric for that goal as of September 2004.

RESULTS

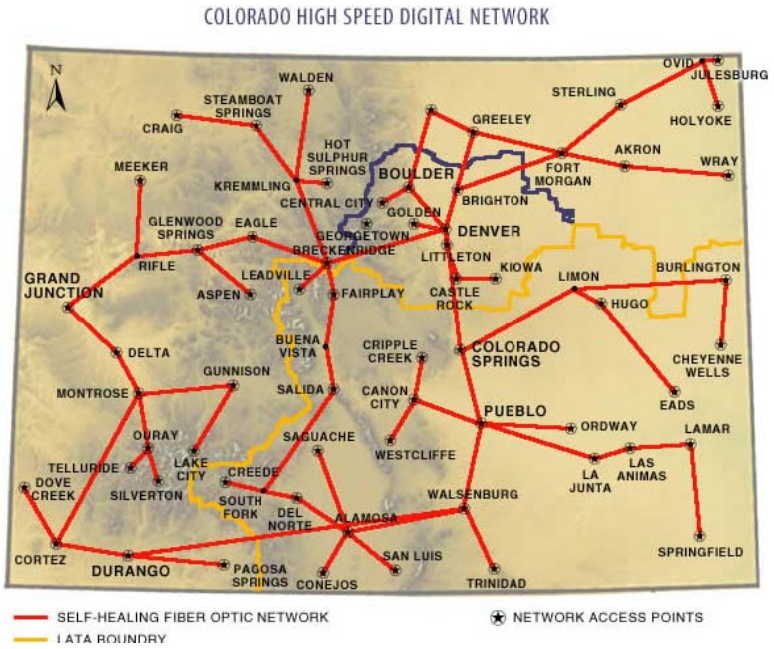
	Goal	*Metric*	*Outcome*
1	Aggregate all state data communications	Participation of state agencies in MNT	**State agency usage increased by 17% from 2004 to 2005, from 2.9 Gbps to 3.4 Gbps.**
2	Serve as anchor tenant	Additional participation in the MNT from political subdivisions	**There has been a significant fall-off in participation by non-state agencies. This reduction is due to MNT pricing and security.**
3	Enhance access for the private sector	Availability of broadband DSL/cable/wireless	**DSL access is now available at 86% of the locations where the MNT was deployed.**
4	Promote rural economic development	Metro/rural gap in percentage workforce employed by high technology firms	**The concentration of high tech jobs in rural Colorado increased by 11% between 2003 and 2004, while that in metro Colorado fell by 3.2%.**
5	**Improve educational opportunity**	**Participation of schools in federal E-rate program**	**61% of Colorado school districts participate in the E-rate program. In 2005, 2,756 E-rate requests were submitted, totaling $34.3 million, down from $47.5 million in 2004.**

FUTURE PLANS

1. Continue to make MNT access available to non-state agencies.
2. Convene state-wide planning group to plan for the transition of the MNT. Migration from today's megabit per second networks to gigabit per second networks will be key.
3. Work with the Department of Local Affairs to be sure that all local governments have access at adequate bandwidth to meet minimum state standards.
4. Aggressively support direct-connection to MNT from public sector fiber optic MANs.
5. Reduce network operating costs involved with core network circuits and switches.
6. Engineer the core of the MNT to support the constant bit rate requirements of video and voice.
7. Expand use of MNT for voice applications.

Network Overview

- Under the MNT program, Qwest and its partners built a statewide fiber optic network spanning all of Colorado's county seats: This network, owned and operated by Qwest and its partners, is called the Colorado High Speed Digital Network (CHSDN) and is available for use by the public, e.g., individuals, businesses, etc.
- The State serves as the anchor tenant on the CHSDN. Using the ATM cloud, five large telecommunications switches and wholesale access to the Internet, the Division of Information Technologies has created a sub-network of the CHSDN called the Multiuse Network (MNT).



Colorado High Speed Digital Network (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.
- MNT services include both circuit and Internet access in one bundled price. Both ATM and Frame Rely access are supported. The MNT also supports DSL access for state agencies.
- Subscription rates vary by the MNT teleco partner involved. Exact service quotes are available at http://www.mnt.state.co.us. Sample rates offered at the Qwest ANAPs include:

1 Mbps burstable bit rate	$535.93	1 Mbps constant bit rate	$603.24
6 Mbps burstable bit rate	$2,347.95	6 Mbps constant bit rate	$2,751.84

- The network operated 99.9764% average availability for July 2004 through June 2005 (not including scheduled outages).

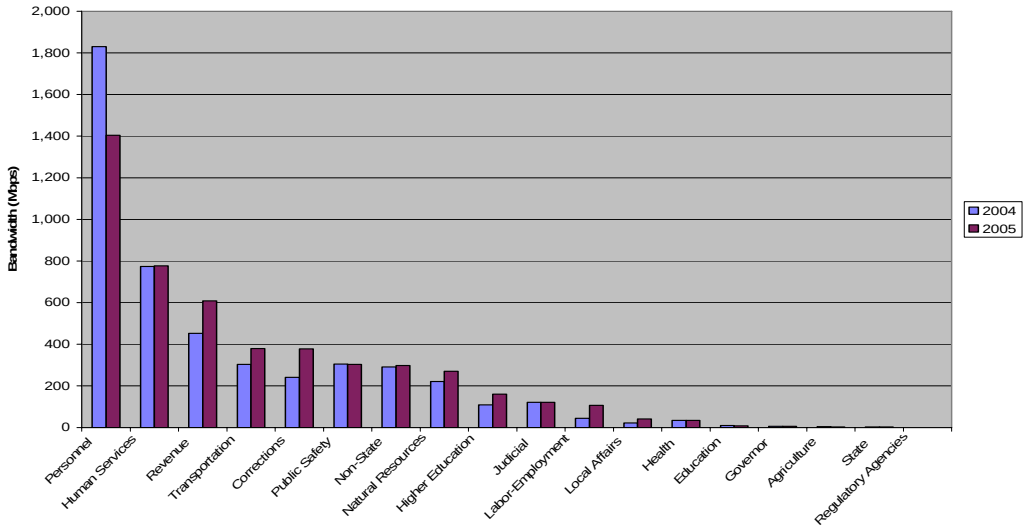
Goal 1 – Aggregate State Data Communications

METRIC: Volume of network traffic, participation by department.

RESULTS

- MNT currently supports 2,625 connections, including 1,567 ATM connections and 1,057 Frame Relay connections. This is 12 fewer connections than in 2004, but the average connection size has grown somewhat, from 1.813 Mbps to 1.867 Mbps. 2005 total bandwidth billed for on a monthly basis was 4.9 Gigabits per second up from 4.8 Gbps for 2004.

- Executive department use grew from 2.9 Gbps in 2004 to 3.4 Gbps in 2005, not counting the Department of Personal and Administration which reduced the core bandwidth reserved to run the MNT.



MNT Bandwidth Utilization by Department (as of August 2004 and August 2005)

- 38% of all MNT connections are "slow speed" (56 or 64 kbps) as shown in the table below. However, between 2004 and 2005 the number "fast" connections (1 Mbps or larger) grew while the number of slow connections fell.

ATM and Frame Relay Connections by Size of Circuit

	0.056	0.064	1	1.54	1.787
2004 ATM		568	928		6
2005 ATM		540	1021		6
2004 FRAME RELAY	217	321		592	
2005 FRAME RELAY	199	247		611	

- Statistics on the number of connections per site suggest an opportunity for circuit aggregation: 82 sites have 4 or more connections, up from 52 in 2004 (out of 813 sites total).

- Networks operated separately by the Judicial Branch, the Colorado Department of Transportation, and the institutions of higher education are interconnected with the MNT.

Goal 2 – Serve as Anchor Tenant

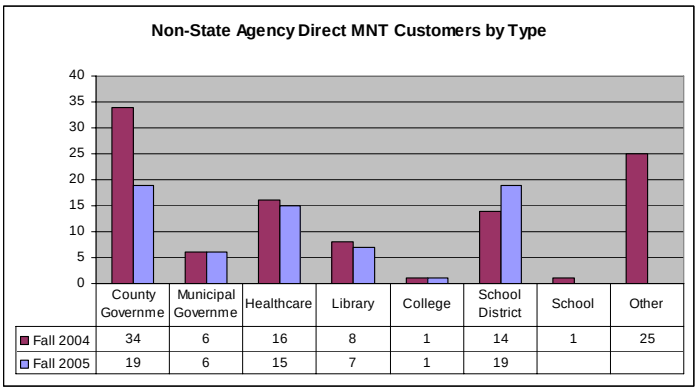
METRIC: Local public entity participation, by type of political subdivision.

RATIONALE

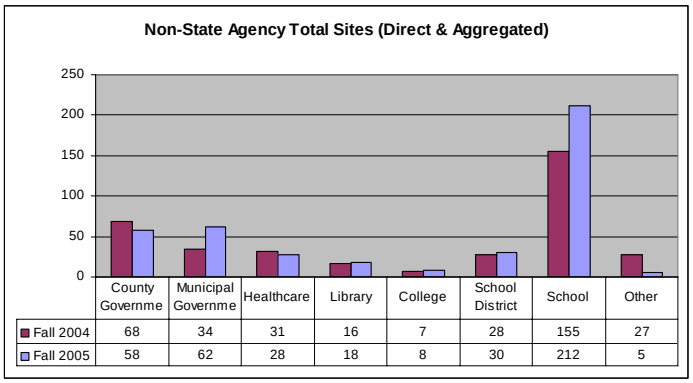
Colorado Revised Statutes state (C.R.S. 24-30-903(7)): *The Department of Personnel and Administration shall maximize "access to digital networks of the state by all public offices of all levels, branches and political subdivisions of the state within very community of the state."*

RESULTS

- Total non-state agency direct customers was 67 in 2005 vs. 105 for 2004. MNT direct customer base fell by 57% over the period. Reasons for the decline include service pricing and the MNT network security requirements.
- Total non-state agency sites, including all sites aggregated by direct customers, was estimated as 421 in 2005 vs. 366 in 2004. These values are estimates as not all aggregators filed updated lists of sites behind them.



	County Governme	Municipal Governme	Healthcare	Library	College	School District	School	Other
Fall 2004	34	6	16	8	1	14	1	25
Fall 2005	19	6	15	7	1	19		



	County Governme	Municipal Governme	Healthcare	Library	College	School District	School	Other
Fall 2004	68	34	31	16	7	28	155	27
Fall 2005	58	62	28	18	8	30	212	5

DISCUSSION

- A review of the importance for this goal should be undertaken and appropriate adjustments made. Should the MNT serve as a network of "last resort" for entities that have no other choice, or should an effort be made to establish the MNT as an enterprise network for the public sector?

Goal 3 – Enhance Access for Private Sector

METRIC: Percentage of county seats with DSL, cable, or wireless broadband access.

RATIONALE

The CHSDN (e.g., the "private side" of the MNT) serves as a statewide telecommunications "backbone" that reaches every county seat. In order for businesses in county seats to reach this backbone, there needs to be an affordable "last-mile" broadband connection available, such as DSL, cable or wireless. These last-mile broadband options provide substantially less expensive (often in the range of from $30 to $50 per month) connections than Frame Relay and ATM T1 access. The MNT has served as a trailblazer for last-mile broadband deployments by Qwest and its partners, and by entrepreneurs who have stepped forward to exploit this new resource and offer broadband Internet services to the community.

RESULTS

Eighty-five percent of all county seats have DSL associated with their ANAPs. This is a substantial gain from 2004. For example, Qwest provisioned an additional 8 ANAPs with DSL between 2004 and 2005, and now provides DSL service in 86% of its ANAPs. CenturyTel has deployed DSL to 17 of its 19 ANAPs, representing 89% of its total ANAPs.

	Qwest	*CenturyTel*	*Eastern Slope*	*Phillips*	*Total*
Total ANAPS	**43**	**19**	**2**	**1**	**65**
2004 Deployment	29	N/A	N/A	N/A	29
% 2004 Deployment	*67%*	--	--	--	*45%*
2005 Deployment	37	17	N/A	1	55
% 2005 Deployment	*86%*	*89%*	*N/A*	*100%*	*85%*

Ten county seats, however, do not yet have DSL deployments paralleling the MNT's deployment of ATM services locally. These include:

For Qwest: Clear Creek, Elbert, Gilpin, Grand, Lake, Park, San Juan, Segwick, and Teller counties.
For CenturyTel: Baca and Bent counties

Goal 4 – Promote Rural Economic Development

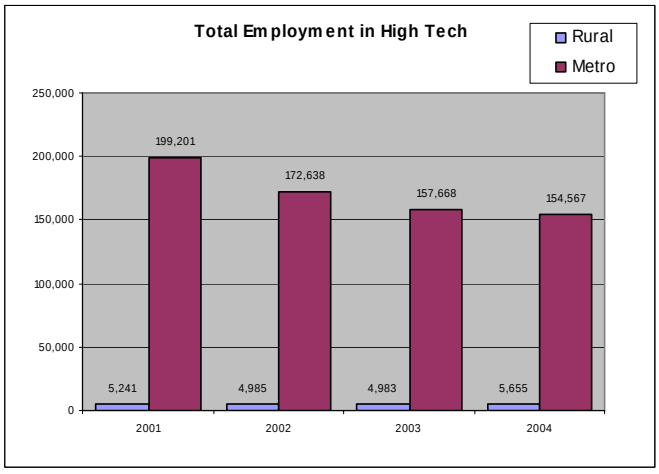
METRIC: Size of gap in percent workforce in high technology, metro vs. rural counties.

RATIONALE

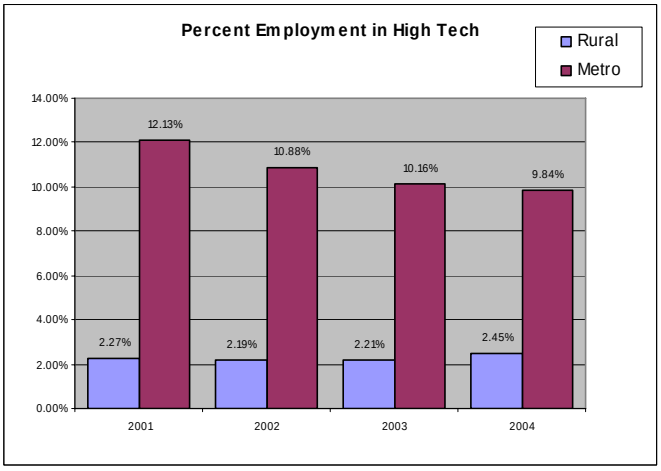
The United States has benefited from the worldwide, dramatic improvements in productivity over the past decade due to the advent of information and communications systems. This New Economy strengthens existing industry (e.g., tourism, agriculture) and enables entirely new forms of economic activity (e.g., data and information services). Because it is hard to measure New Economy job growth, high technology jobs are used in this report as an indicator of New Economy potential. Access to high speed communications is a prerequisite to New Economy jobs. The deployment of high-speed communications by the MNT throughout rural Colorado should enable growth in this type of employment in rural counties.

RESULTS

- For context, overall Colorado private sector employment, between January 2001 and December 2004, fell by 1.6%, from 1,865,195 to 1,835,544. Total rural employment grew from 491,964 to 510,602 or 3.8%.
- Focusing now on high tech: metro high tech employment has fallen each year from 2001 to 2004, with the rate of decline slowing — the annual change in 2003 vs. 2004 was -2.0%.
- Rural high tech job growth decreased in 2002 but grew thereafter, growing 13.3% from 2003 to 2004.
- In metro counties, the concentration of high tech jobs as a percent of all jobs has fallen each year, and fell by 3.2% between 2003 and 2004.
- In rural counties, high tech job concentration fell in 2002 but rose 11% between 2003 and 2004.
- The gap in concentration between metro and rural counties of Colorado has fallen from 5.4-to-1 in 2001 to 4.0 to 1 in 2004. The gap has closed due more to metro job concentration loss than rural job concentration gain.
- Average high tech wages have risen over 2001-2004 in both regions, by 10.3% in metro and 11.1% in rural counties.



Total high tech employment by region



Change in high tech job concentration

Goal 5 – Improve Educational Quality

METRIC: The percentage of schools participating in the federal E-rate program.

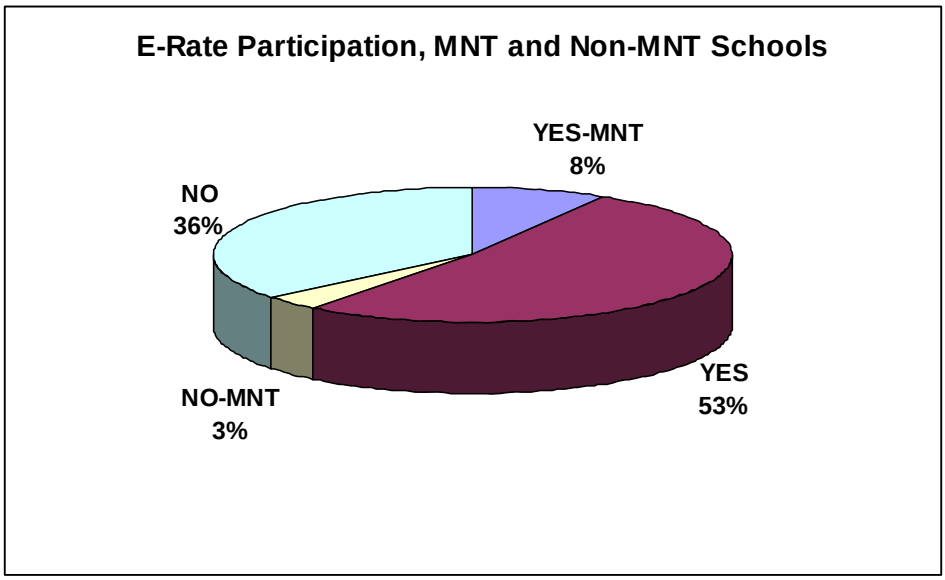
RESULTS

- Cumulatively since 1998, Colorado school districts have requested $344 million in federal E-rate funds received federal commitments of $130 million in these funds, utilized (spent) $80 million of the amount made available, and declined to spend $186 million. Reasons for a district to decline available funding include a decision by the district to change Internet provider and an inflexibility of the federal government to reallocate those funds to the new provider; or a dramatic drop in the cost of service (for example, through participation in the MNT, which provides low-cost Internet access).

History of E-rate Funding for Internet for Colorado Schools

Year	Total Requests	Requested Amount	Committed Amount	Pending Amount	Utilized Amount	Rejected Amount	Utilization %
2005	2,212	$34,333,975	$7,975,192	$22,081,700	$74,628	$4,277,083	1%
2004	2,767	$47,575,808	$23,928,563	$403,325	$6,249,142	$23,243,920	26%
2003	2,074	$29,074,746	$15,885,962	$5,442,452	$10,056,771	$7,746,333	63%
2002	2,265	$90,538,878	$23,814,812	$0	$20,082,683	$66,724,065	84%
2001	2,315	$70,143,951	$16,720,692	$0	$12,018,761	$53,423,259	72%
2000	2,550	$32,845,313	$14,464,401	$0	$9,448,650	$18,380,912	65%
1999	1,599	$16,261,069	$13,040,474	$0	$10,601,333	$3,220,594	81%
1998	1,969	$24,064,348	$14,316,280	$0	$11,506,150	$9,748,068	80%
Total	**17,751**	**$344,838,087**	**$130,146,376**	**$27,927,477**	**$80,038,118**	**$186,764,234**	

- 61% of Colorado schools participate in the federal E-rate program.
- A MNT customer school is more likely to participate in the E-rate program than a non-MNT school.



MNT Network Security

The recent challenges to information security are being widely reported in the press daily. These security challenges have and will continue to addressed and mitigated by DPA/DoIT. In the past year, 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 institute by the ISOC:

1. DPA/DoIT-ISOC has implemented a "deny all permit by exception" policy at the state firewall at the gateway to the Internet.

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

4. 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.

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

6. 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) 239-5844, FAX (303) 239-5864 or at ISOC@state.co.us.

Future Plans

The Division of Information Technologies is considering a number of plans for evolving the MNT over the next three years. Some of these include:

1. While non-state agency use has declined, MNT access will continue to be made available to non-state agencies.

2. We will convene a state-wide planning group to plan for the transition of the MNT once the existing contract with Qwest expires in 2010. Key to these discussions will be the migration from today's megabit per second network to gigabit per second networks now beginning to be deployed.

3. We will work with the Department of Local Affairs and others to be sure that all local governments are able to access adequate bandwidth to meet minimum state standards.

4. We will aggressively support a direct-connect strategy to tie in municipal, school district, and other fiber optic "municipal area networks."

5. We will continually work to reduce network operating costs. Strategies include: reducing the cost per bit of the main trunks connecting MNT's five switches; and, reducing the number of MNT switches.

6. In conjunction with these initiatives, the core of the MNT will be engineered to adequately support the constant bit rate requirements of video and voice traffic.

7. With the acceptance of newer voice technologies, specifically Voice over Internet Protocol (VoIP), the MNT will expand its usage for voice and video traffic.

Appendix: Data Collection Methodology

In order that multi-year trends of the quantitative metrics provided in this report may be observed, the metrics must be computed in a consistent manner each year. The following information is provided to specify exactly how the numerical values of each metric were obtained.

METRIC 1

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_Bandwith 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

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

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

METRIC 4

ES-202 data was obtained from the Colorado Department of Labor and Employment Labor Market Information Division in a file titled, NAICS Macro Thru 4Q2004. 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 MSA and non-MSA regions of the state. These totals were divided by total employment figures for each region. The data were plotted monthly for the three-year span covered by the DOLE file (January 2001, December 2004).

METRIC 5

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 (http://www.cde.state.co.us/edulibdir/directory_15.pdf), and MNT User Base Data Report, extract of all school districts on MNT. The process followed was: pull E-rate data file from USAC site, covert it to an Excel spreadsheet, delete all duplicate FRN/471 requests, use directory15 file for master school district list, cut and paste the .pdf file into a new excel file with select table feature in Adobe, sort the individual files by school district names, cut and paste the files into one sheet by matching the school district names to the applicant name as primary keys. Note, a match was not made for all school districts since some did not submit E-rate applications (also, some may not match their names and discrepancies were resolved). Continuing, in the new worksheet was added an "on E-rate" column, filtering on applicant name. Found blanks were marked as "no" in the "on-E-rate" column. After clearing the filter, MNT users from the MNT list were found and designated as Yes-MNT and No-MNT depending if they are on E-rate or not. All the rest of the blanks that are on E-rate were marked as "yes" using the filter to do entry. A pie chart function was then run on the E-rate data.