Draft

Custer County
Telecommunications Strategic Plan

Part 1: Telecommunications Needs Assessment

MARCH, 2001

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EXECUTIVE SUMMARY

In January, 2001, Custer County received a planning grant from the Beanpole Community Incentive Fund to complete a two-phase planning process for telecommunications needs in the County. This report represents the completion of the first phase - needs assessment. It includes an inventory, market survey, and review of industry trends. This assessment identifies issues and priorities that will assist the community in developing strategies to strengthen the local economy through telecommunications. The second phase of the planning process will result in a network implementation plan to connect public offices to the State of Colorado High Speed Digital Network.

The assessment indicated that CenturyTel has invested in a fiber backbone that has adequate capacity to meet current and future demands of the County. The primary issue in the backbone network is lack of redundancy. Currently, all traffic is routed to Canon City but a secondary connection to Salida is under consideration.

Other issues regarding the local switched network include providing service in the more remote rural areas of the County and the lack of high speed options. It is expensive to extend infrastructure to these areas and cellular phone coverage is spotty. Although Vanion has deployed DSL in Westcliffe it is costly and service is limited to 3 miles from the center of town. CenturyTel, however, has plans to deploy DSL in 2001 and projects that within five years the service will be available to 80% of residents in the County. For larger users, the State High Speed Digital Network will result in an ATM access point in Westcliffe by June, 2001. Additionally, improvements in satellite technology now offer a high-speed Internet option for even the most remote rural areas.

The market survey indicated that there are a high number of telecommuters and lone eagles in Custer County that are demanding high speed access. These users require bandwidth for applications such as transfer of large data files, access to databases, photo imaging and web design. Due to the technical sophistication of these users, they will also likely be early adapters of new technologies such as video and Internet telephony that will require higher bandwidth.

To help identify key priorities, the market analysis includes a tool to rank certain indicators of "Information Communities". According to this process and the community input regarding priorities, the following issues emerged.

- Redundancy in the backbone network.
- Affordable high-speed Internet options.
- Technology training in Internet, e-commerce, and networking skills.
- Networking County offices and on-line access to government databases

The action plan includes strategies to address these issues. Working with local technology providers and community education will be key strategies for addressing the needs of County residents. Phase 2 of this planning grant will help address the needs of public offices.

CUSTER COUNTY

TELECOMMUNICATIONS STRATEGIC PLAN

Part 1 - Inventory

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Section

1

LOCAL EXCHANGE CARRIERS

A. Public Switched Network

The local telephone network consists of the switching offices, the interoffice backbone and the local loop that connect customers to the switching facilities. The companies that own and operate the network are referred to as Local Exchange Carriers (LEC). LEC's sell "access" to their local networks to long distance companies for long distance phone calls.   Until the Telecommunications Act of 1996, LECs maintained a monopoly in their service areas. The new legislation now allows competitors to enter local telephone markets. Since the cost of building a second network is expensive, most competition involves a reseller that leases capacity from the existing local companies.

In the study area CenturyTel is the local exchange carrier that provides service to most of the County. CenturyTel covers the towns of Westcliffe and Silver Cliff as well as most of the rural portions of the County. Non-local voice and data traffic from CenturyTel is eventually routed to the Qwest network at the Canon City central office.

Rye Telephone Company based in Colorado City and Pine Drive Telephone Company based in Beulah cover a small area in the eastern portion of Custer County. There is no telephone service in much of the area that comprises the San Isabel National Forest.

The interoffice transport system is comprised primarily of fiber optic cable. In parts of Colorado, the network may also include copper wire and microwave. Many of these remaining links, however, are being upgraded to fiber cable. Many carriers that have recently upgraded to fiber optic cables, have overbuilt the network and have dark fiber that offers excess capacity.

A central office is the location where common carriers terminate customer lines and locate the switching equipment to interconnect those lines with other networks. The switches are essentially computers that route traffic to the rest of the network. New digital switches provide advanced calling features as well as services such as ISDN, ATM, and DSL.

The local loop is the line linking the customer premise with the local office. This is commonly referred to as "the last mile". The quality of the line can effect the ability to provide advanced services. There are distance limitations to providing services such as DSL and ISDN.   Although remote DSLAMs extend the service area for this technology, loading coils and other line maintenance problems need to be resolved to support advanced services.

These issues are generally dealt with on a case by case basis but there are often complaints on the timeliness of service to upgrade the lines. Generally, the local loop is in better condition in the towns with degradation in the lines in rural areas that are further away from central office. Some options such as wireless and satellite may help address some last mile issues.

B. Telecommunication Services

1. Calling Services

Calling services include a range of features that allow customers to manage calls more efficiently, use employee time more productively, and improve customer service. Features often represent costs savings to organizations. Calling features require digital switches and are available over analog phone lines. Following are the types of services typically available from local telephone companies.

• Custom Calling - Includes 3-way calling, call waiting, call forwarding, and speed calling.

• CLASS (Custom Local Area Signaling Service) - Caller ID, continuous redialing, remote access forwarding, scheduled and selective call forwarding, distinctive rings, and call rejection.

• Voice Messaging - Call answering and routing when your line is busy or unanswered. Call to get your voice mail, from your own phone or from a remote location.

• Centron/Centrex/Integrated Business Services **-** Allows multiple lines or extensions for businesses through the phone company's switch, so a business doesn't need its own switch. On-site computers and software allow users to manage calls, generate reports, and interconnect remote offices.

• 9-1-1 and Enhanced 9-1-1 - A service that routes all 9-1-1 calls to a designated Public Safety Answering Point (PSAP). Enhanced 9-1-1 offers additional features such as Selective Routing, Automatic Number Identification and Automatic Location Identification.

2. Advanced Telecommunications

For purposes of this study advanced telecommunications equal high speed (56K +), dedicated and/or switched, broadband telecommunication capability that allows users to transmit high quality voice, data graphics, and video signals using various forms of technology.

• Frame Relay - Frame Relay is a private, fast-packet-based data network service that supports data transmission with speeds ranging from 56 kbps up to 1.544Mbps. Requires a leased line to the switch to access the service. Does not carry voice signals.

• ISDN. "Integrated Services Digital Networks" - Allows simultaneous transmission of voice and data over the same line. ISDN requires a terminal adapter to digitize the total transmission into the CO. Can transmit voice, data, video, graphics at rates up to 128 Kbps.

• ATM (Asynchronous Transfer Mode) - ATM can transport multiple types of calls (voice, video, data, and image) from speeds of 56k up to 2.5 gigabits. It requires a leased line to the central office.

• Digital Subscriber Line (DSL) - A DSL circuit connects a DSL modem on each end of a twisted-pair telephone line, creating three information channels. The high speed channel ranges from 1.5 to 6.1 Mbps.   Service is only available within four kilometers of the central office.

• Leased Lines (56k, T-1, . . .) - A point to point circuit that is leased for the exclusive use of one organization. Speeds range from 56k to T-3. A T-1 line can have 24 channels with a speed of 64 KBPS for each channel while a T-3 can have a 672 channels.

C. Telecommunication Providers

1) CenturyTel

La Junta, CO
800-278-5696
www.centurytel.com

Central Offices & Exchange Prefixes: (In Study Area)	Location of ANAP – Westcliffe Westcliffe & Silver Cliff – 783
Rates:	Residential Line - $18.24 (Basic) Business Line - $40.29
Calling Services:	Custom calling, CLASS, Voice Messaging
Advanced Telecommunications:	ADSL is scheduled to be deployed in June. (256k upstream & 512k downstream.
Access lines:	The general trend has been an increasing number of residential and business lines as well as second lines for fax and modem. The number of leased circuits has remained stable.
Interoffice Network:	There is fiber backbone between the CenturyTel central office in Westcliffe and Qwest central office in Canon City. This includes 12 strands of fiber. Four strands are in use with OC-12 capacity. The dark fiber is available as back-up. Currently, all of CenturyTel traffic from Custer County is routed to Canon City. If this fiber were cut, there would be a service outage. A potential redundant route is to connect the Westcliffe central office to the CenturyTel central office in Salida. This would require upgrading the existing copper cable between Howard and Salida to fiber and installing fiber between Westcliffe and Howard. Acquisition of right-of-way to bury the fiber is the major obstacle in implementing this solution.
Improvements:	Qwest will be installing fiber terminal equipment in Canon City by June. This will allow the ATM ANAP and DSL to go on-line. DSL is scheduled to be deployed in Westcliffe by June. Initially, the customer must be within about 3 miles of the Central office to qualify for DSL. New technology allows that DSL can also be available within 3 miles of an AFC cabinet (remote switch) if there is digital loop carrier. CenturyTel plans to upgrade all analog loop carrier in Custer County to digital within the next 5 years. Once this is completed, it is estimated that 80% of residents in the County will eventually be able to receive DSL services.

2. Pine Drive Telephone Company & Rye Telephone Company

Pine Drive Telephone Company
Beulah, CO
(719)676-3131

Approximately 100 customers in the eastern portion of Custer County are in the Pine Drive Telephone Company exchange. Although the company offers DSL service in most of its territory, this service is not available in Custer County due to the condition of the copper cable. They are considering replacing the cable over the next two years. If there is customer demand, they will provide DSL at that time.

3. Rye Telephone Company

Rye County Telephone Company
Colorado City
(719)485-3400

Rye Telephone Company serves a small area in the southeast corner of Custer County. There are less than 50 telephone customers in this portion of the County and many of them are second homes. Rye Telephone offers basic telephone service and Internet service as well. There are no plans to offer advanced high-speed services in this area.

Figure 1: Local Exchange Companies Service Areas and Location of Central Offices
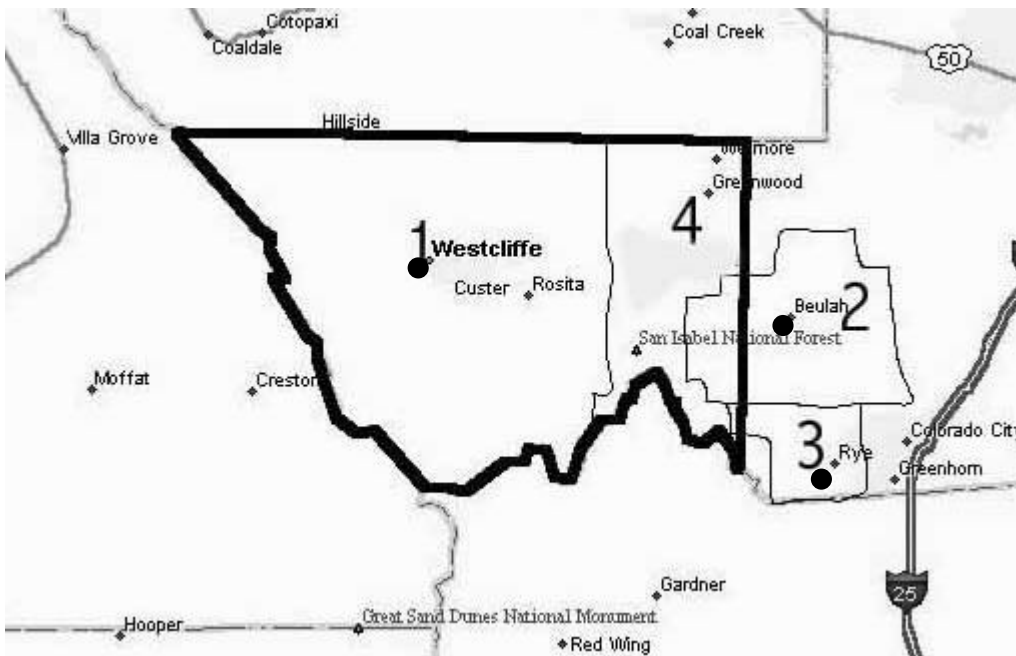
Legend:

1	CenturyTel	2	Pine Drive Telephone Company
3	Rye Telephone Company	4	No Telephone Service

● - Central Office Location

Notes:

1) Boundary lines of service areas are approximate locations and not to scale.
2) Information compiled from interviews and maps provided by service providers.
3) Prepared by Applied Communications. 2/01

Section

2

TELECOMMUNICATION NETWORKS

A. InterOffice Backbone - Local Exchange Companies

The backbone is the part of the local exchange network that connects the central offices. The interoffice backbone is comprised of a combination of fiber, microwave, and copper.

Fiber optic lines are light, compact, and can carry vast amounts of information. Fiber optic lines are not subject to electromagnetic interference and do not emit any radiation. Fiber optic cables used by telephone companies in the region vary from 4 strands up to 36 strands of fiber. Fiber optic trunk lines with 12 strands of fiber connect the central offices for CenturyTel in Westcliffe to the Qwest central office in Canon City. Four strands of fiber are in use. The Qwest contract with the State for Colorado High Speed Access Network requires a minimum backbone capacity of OC-3 (156 Mbps). The backbone between Westcliffe and Canon City has a capacity of OC-12 (622 Mbps).

B. Regional Carriers

Telephone companies, long distance networks, and Internet providers use fiber for trunk lines between cities. These trunk lines contain multiple strands of expensive single-mode fiber and carry long haul traffic.   These nationwide networks are costly due to the miles of cable that is required for the large distances between cities, right-of-way negotiations, and the expense of splicing and connecting the fiber to the necessary electrical components.   Additional access points add to the cost of the network and are generally limited to large cities that provide a point of presence for multiple large volume users.

Most of these long distance networks follow highway and railroad right-of-ways. In Colorado many carriers follow routes that generally parallel the Interstate Highway system such as I-70, I-76, and I-25 or follow railroad right-of-ways. The major regional providers do not have fiber routes through Custer County.

C. Colorado High Speed Digital Network

The State of Colorado has partnered with Qwest to build a multi-use network that will include an ATM access point in each county referred to as an Aggregated Network Access Point (ANAP). The ANAPS are connected by a self-healing fiber optic network (see Figure 2). Custer County is included in the first phase of this project and the ANAP will be located in Westcliffe by the June 2001. The following is excerpted from the State of Colorado "Statewide Multi-Use Network (MNT) – Fact Sheet".

<div align="center">Statewide Multi-Use Network (MNT)</div>

Project Description: The Multi-Use Network project (MNT) is a public/private partnership to build a high-speed fiber-optic network for the State of Colorado. Qwest is the awarded partner selected to build the MNT with the State serving as anchor tenant. The State will aggregate Colorado State government agency telecommunication requirements from its current multiple networks into a single network to reduce administrative and maintenance costs to the State. As anchor tenant, the State's investment will help leverage the development of telecommunications infrastructure and expand delivery of advanced services to all geographic regions of the state. The MNT will be implemented in three phases beginning in June 2000 and completing in 2002.

Project Partners: Qwest and subcontractors (CenturyTel, Phillips County Telephone Company, Eastern Slope Telephone Company, Citizens Communications, and Cisco Systems) are the awarded private partners for the project and will build the high-speed network. The MNT infrastructure will be owned, managed, and monitored by Qwest. The State of Colorado is the anchor tenant partner and as such, uses the significant aggregated telecommunications requirements of state government agencies as the leverage investment for extension of telecommunication capabilities and advanced services into all geographic areas of the state. The State of Colorado MNT Project Team will provide oversight of the prime contractor during the network build-out phases.

Implementation Phases: The project will be conducted in three one-year phases in which 70 ANAPS or Aggregated Network Access Points will be implemented across the state. An ANAP is defined as a minimum of 20 megabits of access capability for State government network users in an area. This service will be delivered over the new fiber optic network utilizing ATM (Asynchronous Transfer Mode) technology. Forty-two ANAPS will be implemented in Phase I, year 2000; an additional fourteen ANAPS will be implemented in Phase II, year 2001; and the final fourteen ANAPS will be implemented in Phase III, year 2002. The counties below are listed alphabetically within each phase. The implementation schedule is currently in development and will be released as soon as possible.

Phase I ANAPS Year 2000 – Adams, Arapahoe, Baca, Bent, Boulder, Clear Creek, Crowley, Custer, Delta, Denver (3 sites), Douglas, Eagle, El Paso, Elbert, Fremont, Garfield (2 sites), Gilpin, Gunnison, Jefferson (2 sites), La Plata, Larimer, Logan, Mesa, Montezuma, Montrose, Morgan, Otero, Ouray, Phillips, Pitkin, Prowers, Pueblo, San Miguel, Sedgwick, Summit, Washington, Weld, and Yuma.

Phase II ANAPS Year 2001– Archuleta, Cheyenne, Conejos, Costilla, Dolores, Grand, Huerfano, Kit Carson, Las Animas, Lincoln, Moffat, Rio Blanco, Rio Grande, and Routt.

Phase III ANAPS Year 2002 – Alamosa, Broomfield, Chaffee (2 sites), Hinsdale, Jackson, Kiowa, Lake, Lincoln, Mineral, Park, Saguache, San Juan, and Teller.

Figure 2: Colorado High Speed Digital Network
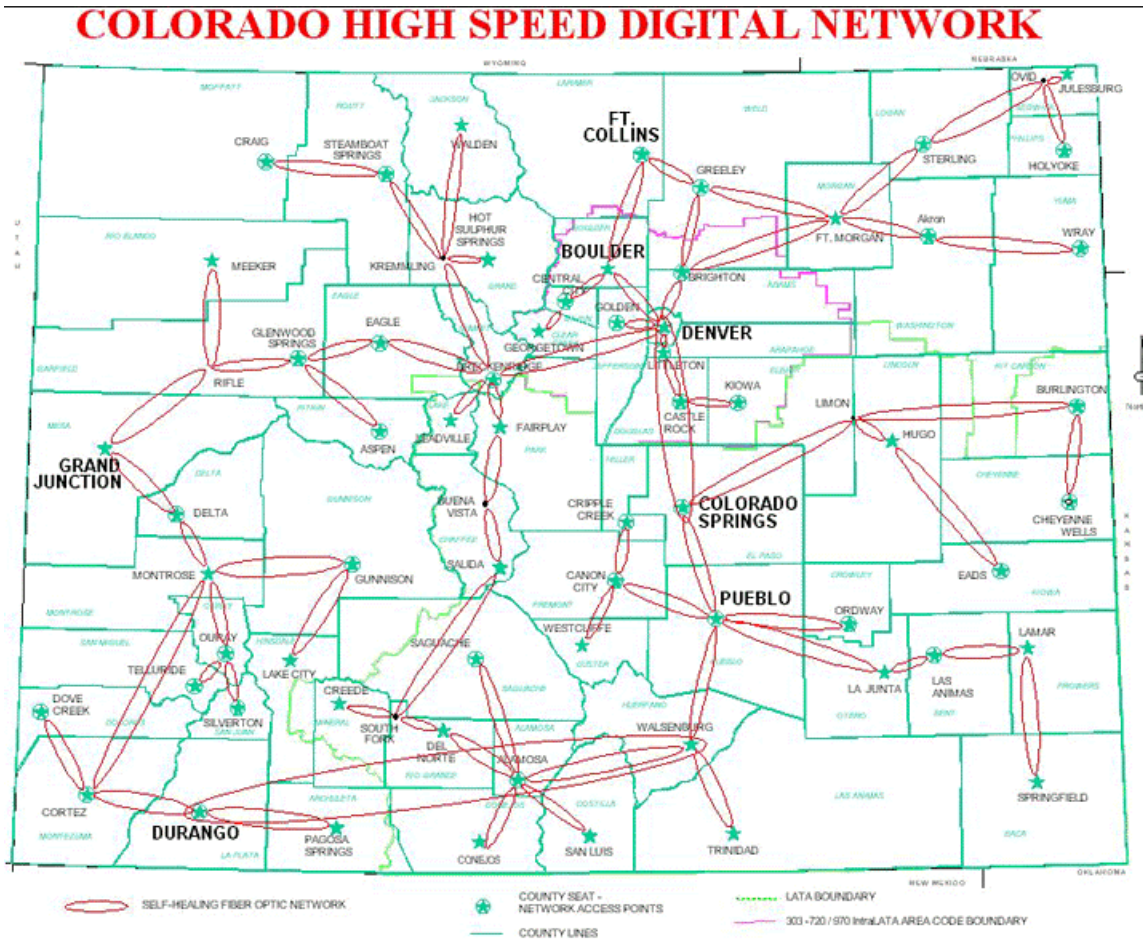
D. Dedicated Leased Networks

Carriers will set aside circuits in their network for dedicated use by their customers. These circuits are often referred to as leased lines. They are used for high speed data transfers, as well as applications, such as video, that generate a relatively constant flow of data and require a high degree of reliability. Since users are charged a flat fee for a dedicated circuit this can result in significant cost savings as opposed to long distance charges.   Leased lines offer point to point communication and are not part of the switched network.

Dedicated lease lines operate at varying speeds. The most frequently used is the T-1 line with a speed of 1.544 Mbps. Since a T-1 line can be expensive, an alternative is a fractional T-1 which runs at a fraction of a T-1's capacity (128 kbps, 256 kbps, 384 kbps, and 768 kbps). For companies with very heavy transmission needs, the latest technology is T-3 lines with operating speeds of 44.7 Mbps.

The State of Colorado is a large user of leased lines statewide and in the study area. The State will be connecting these circuits to the Aggregated Network Access Point (ANAP) in Westcliffe as part of the Multi-Use Network plan.   In Custer County these State circuits include the following:

Table 1: State of Colorado, Leased Circuits

1. Westcliffe	Human Services	9.6 KHz 64 NetCon90	ANALOG DATA
2. Westcliffe	Human Services	9.6 KHz 64 NetCon90	ANALOG DATA
3. Westcliffe	Department of Revenue, Motor Vehicle	64 64 DNet	Frame Relay DATA Revenue
4. Westcliffe	Department of Revenue, Motor Vehicle	64 64 DNet	Frame Relay DATA Revenue

Source: State Of Colorado, Telecommunication Services, Colorado Information Technology Services,

Typically, the demand for T-1 or fractional T-1 circuits is among agencies or businesses that are part of a wide area network or have a need to transfer large data files. Such agencies include:

* Public Agencies - The library and school district use leased lines to obtain Internet connectivity.

* Finance Institutions – Banks often have dedicated lines to connect Corporate wide area networks.

* Branch/Remote Offices Connecting to Company Headquarters – This type of industry is generally not present in Custer County.

* Lone Eagles – While Custer County has a substantial population of lone eagles and telecommuters, the cost to lease a line for Internet service has discouraged many from this option.

* Information Intensive Industries – Software, engineering, mapping, graphics and video applications.

Overall, there has not been a large demand for leased circuits from the business community.

Section

3

LONG DISTANCE

Since 1984, long distance companies such as ATT, MCI, and Sprint have been competing for long distance services. The Federal Telecommunications Act of 1996 allows long distance companies to also compete for local telephone customers. Following are some of the long distance issues.

A. Point of Presence (POP)

The long distance company's location where the local telephone company delivers originating interstate calls and receives terminating interstate calls is referred to as the point of presence. AT&T, Sprint, MCI and most other interexchange carriers pass the features of advanced signaling (CLASS features) from state to state across their networks. The switches must be digital with the appropriate features enabled to receive the signals.   Wide Area Networks (WAN's) and Internet access generally travel through the point of presence to connect to the remainder of the network. Access to points of presence are either through leased dedicated lines where cost is charged on the distance from the POP or long distance charges.   In predominantly rural environments, many local digital exchange switches do not receive these signals.   There is no point of present within the study area.   Colorado Springs is the closest point of presence for the study area.

B. Equal Access interLATA and intraLATA

For long-distance telecommunications purposes, Colorado is divided into two Local Access and Transport Areas (LATA's). The local telephone companies generally supply IntraLATA long distance. InterLATA's are historically served by long distance telephone carriers. Custer County is located within the southern LATA . (See Map).   The Telecommunications Act of 1996 requires equal access by long distance carriers in all LATA's by 1999. This change allows consumers to select the long distance carrier for any in-state calls. It also allows the local exchange carrier to compete in the long distance market.

C. Extended Area Service (EAS)

The Extended Area Service (EAS) is the calling area between the affected exchanges or communities that is considered a local call. Within the study area there is local calling throughout Custer County and to the Canon City and Florence exchanges. Pueblo is a long distance call. Customers can access services such as local dial-up Internet access and voice messaging with a toll free call within their local calling areas.

Where there is a community of interest between exchanges there may be local calling outside of the exchanges.   The Colorado Public Utility Commission (CPUC) establishes EAS. The CPUC reviews calling areas every two years and makes recommendations for new areas based on volume. In between the two years, communities may petition the CPUC for consideration of a new calling area.

Section

4

WIRELESS

A. Cellular

Cellular telephone received its name from the "cells" making up its transmission network. The coverage area for a cellular service is divided into a gridwork of cells containing low -powered transmitters and receivers. Cellular technology uses FM radio waves to transmit conversations.

As a caller moves about with a cellular phone, the call is transferred via a computerized switch between operating areas known as cells. Each cell has its own transmission tower linked to a Mobile Telephone Switching Office (MTSO), which connects the call to the public switched telephone network. MTSOs are owned and operated by one of the wireless carriers in your area. Cellular phones can provide custom calling services.

Verizon is the main provider in the study area (Verizon - http://www.verizon.com/). Signals are strongest immediately around Westcliffe and Silver Cliff and marginal throughout the rest of the County. Since wireless communications require line of site, the mountainous terrain in Custer County creates obstacles for full coverage.

B. Personal Communications Services (PCS)

Personal Communications Services (PCS) are digital wireless systems. Digital technology provides a platform for advanced calling services while increasing capacity and reducing operating costs. Digital service offers enhanced privacy and phones with longer talk time as compared to analog service. Digital encryption technology also reduces the potential for fraud by making it difficult to illegally obtain customers' phone numbers. Advanced features include caller id, nonvoice data, paging messages, e-mail, and faxes.

Since PCS systems also operate at a higher frequency, their cells are smaller and closer together. Power consumption is reduced resulting in longer battery life and lighter handsets. This technology requires an antenna at least every 10 city blocks. A new system of antennas must be constructed in addition to the existing cellular network. Many communities have adopted ordinances to control appearance of these facilities.

Currently, no cellular providers indicate plans to provide PCS services in the County in the near term.

C. Local Multi-Point Distribution Service (LMDS)

In 1998 and 1999, the FCC auctioned off spectrum licenses in the 24 to 38 GHz frequency band for Local Multi-Point Distribution Service. LMDS is a wireless system designed to deliver data through the air at rates up to 155 Mbps. Like cellular technology, LMDS uses wireless cells that cover geographic areas of two to five kilometers in radius. Unlike cellular phones, the customer has a fixed location with an antenna mounted to the premise to receive signals. The cell size is limited by rain fade and an unobstructed line of sight is needed from the base transceiver to the customer's transceiver.

Since LMDS operates at such high frequencies, the transmit and receive antennas must be in close line of sight of each other. Consequently, LMDS links are typically no longer than three to four miles and limits its use to tight clusters of users and is less likely to serve rural areas. There are no plans to deploy this service in the study area.

D. Multipoint Multichannel Distribution System (MMDS)

Multipoint Multichannel Distribution System (MMDS), is a wireless system for delivery of data via point-to-multipoint microwave radio signals. It operates below three gigahertz (GHz) at distances up to 35 miles. FCC approved use of MMDS for two-way data service in September, 1998. MMDS can have speeds of 10Mbps downstream and 128 kbps upstream.

Of the licensed spectrums, MMDS has the most promise for serving rural customers. MMDS has a range of 35 miles. Due to the fixed cost of a new tower plus base station and data access equipment, costs range from $200,000 to $400,000 to deploy the service. To cover these fixed costs, the system is more likely to be deployed in larger towns or in an area that can serve a cluster of rural towns from one site. It is not available in the study area.

E.   Non-Licensed Wireless

Wireless options are a promising technology to provide services to the rural portions of the County, to provide inter-city connections and to establish a metropolitan area network. Major vendors of wireless operate using radio transmission within the unlicensed 2.4GHz frequency band.   This system can provide 11MB of bandwidth between the sites.   There are distance limitations with this technology and as with all wireless systems it does require line of sight. Due to the mountainous terrain, this technology has limited application in the County. AmigoNet is an ISP that offers wireless service and has a repeater on Deer Peak that can serve Westcliffe and Silver Cliff.

F. Satellite

Satellites act as powerful signal repeaters, receiving and resending radio transmissions from ground-based antennas. Geostationary satellites orbit 22,000 miles above the equator at the same speed as the earth's rotation and thus appear stationary.   Geostationary satellites offer the most promise for offering affordable high-speed Internet access to the average consumer. Users must have a clear line of sight to the southern sky. The advantage of satellite is that it can be available to consumers in remote areas and areas where terrain might preclude other options for high speed access.   There are two primary satellite providers for end-user services.

DirecPC is currently the most widespread provider of Internet through satellites. The system was originally designed to deliver television programming and currently offers downstream rates of up to 400kbps. Upstream transmission is achieved via standard telephone lines. DirecPC is a division of Hughes Satellite Network. Hughes has announced the introduction of two-way satellite service and will be partnering with America On-Line and other Internet gateway services to market this product.

Figure 3: DirecPC Satellite Dish

StarBand is a two-way satellite Internet service that represents a partnership with Gilat Satellite Networks, Microsoft Corporation and Echostar Communications. The StarBand system consists of a satellite dish and coaxial cables to connect the satellite dish antenna to a PC or a "satellite modem." The antenna both sends requests to the Internet and receives Internet content via the satellite. No telephone connection, dial-up account or other Internet service providers are needed. Download speeds can reach up to 500 kbps with upload speeds up to 150 kbps.

Radio Shack offers a package that includes the StarBand dish antenna and a specially configured desktop PC that includes a pre-installed transmitter and receiver card. EchoStar, distributors of DISH Network satellite television, offers a package that includes the StarBand dish antenna and a "satellite modem" that will be connected to a USB port on your existing PC. A&A Satellite in Florence, CO is the dealer nearest to Westcliffe.

While satellite offer a high-speed option for users in rural areas, there are limitations regarding voice and video applications. Additionally, there is a high entry-level cost of up to a $1,000 that some residential users may not be able to afford. Monthly cost for Internet service is ranges from $70 - $80. Other difficulties with service may occur when there is heavy snow that can interfere with the signal.

There are also satellite services that provide Internet backbone connectivity for service providers and enterprise networks. Tachyon is one such provider and offers high speed, two-way, satellite-based Internet Protocol (IP) connections between organizations and terrestrial Internet backbones. This system is an alternative to providing redundancy to landline networks.

Section

5

INTERNET

A. Overview

The Internet is a worldwide interconnection of different computers and networks. Access to the Internet is available through a computer server that is connected to the network. Users can access the computer server directly if they are part of the local area or wide area network. This arrangement is common for larger employers and educational institutions. For individual users, Internet Service Providers (ISP) offer dial-up access (through a modem) to their server.

Once users obtain access to the server that houses their Internet account, communication proceeds through the network to the server where a particular application or bit of content resides. Web pages, e-mail accounts, and files are stored on the servers.

For purposes of routing traffic the Internet is divided into different levels or tiers that dictate the technical requirements for exchanging data over the Internet. Tier 1 Internet providers operate on a national scale and co-locate their equipment at exchange points or Network Access Points (NAP) in major cities. Regional and local providers purchase access to the Internet backbone through these Tier 1 providers. The nearest NAP to Custer County is located in Denver.

B. Dial-Up Access

The most common access for residential users and small business with stand-alone computers is dial-up access. With dial-up access the user connects the PC to a telephone line through a modem and the computer dials the ISP's server.

Generally, an individual dial-up account cost in the range of $15 - $20 per month. Since rate structures vary according to the type of service plan and changes periodically, it is recommended that users contact the ISP directly for this information. Specific information is generally available through the company's web page. Most ISP's will host customer pages on their server. Local dial-up access is available from several providers throughout the study area.

C. Direct Access

Direct access to the Internet provides a direct connection from the PC or network to the ISP. The connection is always active and there is no need to first dial-up the ISP through the phone line. Typically, leasing a dedicated line through the telephone company has provided direct access. This dedicated connection ranged in speeds from 56k to 1.4mb. Cost for leasing the line varies according to speed and generally ranges from $200 a month for a slower connection up to $1,000 + for the full T-1 speed of 1.4mb. The ISP charges a separate rate in addition to the line charges for their service and that also varies according to speed.

Within the last year, wireless connections have become an increasingly popular option for a direct connection to the Internet. For unlicensed wireless, the end-user pays a one-time charge for the antenna and equipment that will connect them to the ISP and a monthly charge for Internet service. The one-time charge for equipment ranges from $1,500 to $2,500. Amigo.Net is providing this service to the school district.

With LMDS and MMDS services the wireless equipment is generally leased as part of the Internet package and there is an installation charge . This service is not available in Custer County.

D. DSL Modems

Internet providers are now offering access through DSL modems. The modems are installed at the customer premise and run on a point to point circuit (dry-pair) to the ISP. The customer generally buys the modem and pays additional for Internet service.   Royal Internet Service offers DSL service. There are different types of DSL service.

- ADSL – Asymmetrical Digital Subscriber Line has different rates for downstream and upstream data.

- SDSL – Symmetrical Digital Subscriber Line has an equal amount of bandwidth available in both directions.

- DSL-Lite – A slower version of ADSL that does not require splitting of the line at the user end.

E. Internet Issues & Trends

A number of trends have emerged in the last five years as Internet technologies have evolved and user's demands have increased.   There is consolidation in the Industry with regional and national providers buying out many smaller ISPs. Frequently, the local providers that remain are forming affiliations and partnerships that allow them to offer a broader range of services and remain competitive.

Users are seeking more services such as networking support for wide area networks or virtual private networks.   Security issues requiring firewalls or encryption technologies are more common while increased bandwidth is the top priority for all service providers. As users become more reliant on the Internet, they become less tolerant of service outages and redundancy in the system is critical.

New applications are also creating more demands on ISPs. Real time applications for voice and video are making "Quality of Service" issues such as guaranteed bandwidth, handling delays, and prioritization of uses an essential component of Internet services. The growth in e-commerce has spawned a new industry of "Application Service Providers" (ASP) that provide the technology and programming that are common functions for many types of e-commerce sites. Such functions may include billing, ordering, customer service, and data collection.

The ISP's are responding to these changes by providing a variety of value-added services.   Additionally, there are consultants that provide e-commerce, networking and other technical support. Custer County has several consultants who provide web design, web hosting, and computer services.   Some institutions also rely on consultants in nearby Colorado Springs for technical support.

F. Internet Service Providers

Royal Internet Service is the only ISP with a POP in Custer County. Since Canon City is a local call, Custer County residents and businesses may also have the option of dial-up service with other Colorado Internet providers that have a POP in Canon City. There are no nation-wide ISPs, such as AOL, with a POP in Canon City. The nearest location for these providers is a long-distance call to Pueblo. BeWell has a POP in Canon City but has few dial-up accounts in Custer County.

Table 2: Internet Service Providers offering services to Custer County

Internet Service Provider	Services
Royal Internet Service/Vanion 302 S. 9th Street Canon City, CO 81212 (719)275-8817 www.vanion.com Parent Company Vanion is located in Colorado Springs	Areas Served: Statewide POP: Westcliffe (Courthouse) & Canon City Dial-Up Access: 33.6 to 56k, SDSL Rates: $19.95 for Dial-Up, SDSL = $115 per month plus Set-Up ($350) & Modem ($599) Primary Feed: T-1 from Westcliffe to Canon City. DS3 from Canon City to the corporate backbone in Colorado Springs. Services: Registered as CLEC and may provide Dial-Tone service in future.
Internet Commerce & Communication (formerly Rocky Mountain Internet) Headquarters – Denver (800)864-4344 www.rmi.com	Areas Served: Colorado, Seattle, Salt Lake, Phoenix, and Kansas City POP: Canon City (2 Dial-up Numbers) Dial-up Access: 33.6 to 56k, $19.95 per month Dedicated Service: Fractional T-1 or T-1 Primary Feed: T-1 from Canon City of Denver Services: E-Business Applications
Amigo.Net Alamosa, CO 719-589-6100	Areas Served: Alamosa, Hayden, Leadville, Pueblo, Salida POP: Pueblo Dial-up Access: No Dial-up in Custer County Dedicated Service: Wireless Primary Feed: Repeater on Deer Peak

Source: Compiled from Interviews & Web Page sites by Applied Communications. 02/01

Section

6

CABLE TELEVISION

Cable operators receive programs from satellite and broadcast signals, and re-transmit those signals through coaxial cable and/or optical fiber to customers' homes. Generally, a large "trunk" cable carries the signals down through the center of town and the feeder cables connects to the trunk cable and branches off into local neighborhoods. The cable operator runs a smaller "drop" cable from the feeder cable directly into the customer's home and attaches it to the television set.

Digital cable is a new service that allows for as many as 85 additional channels of music, movies, enhanced pay-per-view movies, special events and special interest channels (exact channel lineup and number varies for each community.) Digital compression technology allows up to twelve digital services in the space normally occupied by one analog channel. It is not necessary to completely rebuild a cable system to enable delivery of the digital technology. Digital cable is not available within the study area.

Cable modems provide high-speed connections over the same coaxial cable and fiber optic cabling used in cable TV networks. There are reverse channels for upstream and downstream data streams. The upstream channel which gets less use is a lower speed. Downstream channels may have speeds up to 10 mbps. In the cable system, however, the data channel is shared among all the homes linked by the coax cable so the actual data rate depends on the number of users sharing the channel. Still, speeds are typically much higher than other alternatives. Typical cable fees for unlimited Internet access is $40 - $50 per month. Within the study area there are no plans to deploy cable modems.

The Telecommunications Act of 1996 allows cable operators to provide telecommunications services. Although cities may not regulate telecommunication services through the cable franchise agreement, where permitted by state or local law, cities may regulate cable operators the same as they can other telecommunications providers.

1. Galaxy American Cable

Contact	Headquarters are in Missouri. (573)472-8291
Service Area	Franchise agreement with the towns of Westcliffe and Silver Cliff
Franchise	Separate agreement with each town. Both franchises are due to expire in 2004
Service	26 Basic Channels. $29.60 monthly
Infrastructure	Coax Cable (No fiber)
Planned upgrades	Digital Cable within year. They are testing cable modems in other markets but have no plans to introduce this service in Custer County.
Customers	270 customers in Custer County. The number of accounts has declined due to competition from satellite television.

Section

7

ELECTRIC UTILITIES

A. West Plains Energy

Pueblo, CO
(719)546-6565

West Plains Energy is a private investor owned utility. The parent company, UtiliCorp United, is based in Kansas City, MO. Utilicorp has facilities in seven states. West Plains Energy provides service in Custer, Fremont, Teller, El Paso, Otero, Pueblo and Brent Counties. In Custer County, it provides service primarily in the towns of Westcliffe and Silver Cliff with some residences along Oak Creek Grade. The utility does have joint use pole attachment agreements with telecommunication providers. They maintain some communication towers for their own use and do not lease space on these towers.

B. San Isabel Electric

P.O. Box 892
Pueblo, CO 81002
(719)547-2160

San Isabel Electric is a rural electric cooperative and provides service in the eastern portion of Custer County including the town of Wetmore. The company is based in Pueblo and also provides service in Pueblo, Huerfano, Las Animas, Otero, Fremont, and Costilla counties.   At this time, the company does not provide telecommunication services.   The company has joint use agreements with Qwest and the cable companies in their service area for use of the utility poles. It also has a radio system that covers 96 square miles with four separate sites for towers. These sites include Deer Peak in Custer County, Rocky Point in Colorado City, and Boen Hill in Trinidad. SkyTel paging company currently leases space on the towers for their equipment and leases with other wireless companies for co-location of equipment is a possibility.

C. Sangre De Cristo Electric

P.O. Box 2013
Buena Vista, CO 81211
(719)395-2412

Sangre De Cristo Electric is a rural electric cooperative that serves the rural areas in Custer County outside the towns of Westcliffe and Silver Cliff.   The company is based in Buena Vista and also provides service in Lake, Chafee, Fremont, and Saguache counties. Currently the company does not provide telecommunication services. The utility does have joint use pole agreements with Qwest, CenturyTel and cable companies in their service area. They participated in developing a business plan for REANET a company that was formed to build a fiber network in southwest Colorado. They are no longer directly involved in this effort.

Section

8

GOVERNMENT NETWORKS

A. Custer County School District

All of the schools computers are on the same network. The network is comprised of a 100 Base T hub with a Windows NT operating system and Category 5 enhanced cable with a Net Max Router. Until January, 2001 the network leased a 56k circuit to the University of Colorado campus at Colorado Springs for Internet access. In January, the District switched to a wireless connection to Amigo.Net for Internet access. The District has invested $8,000 to purchase two antennas to create the connection. One antenna is mounted on the school building with line of site to the Ace Hardware store. The School District owned antenna on the Ace Hardware building provides line of site to the Amigo.Net repeater on Deer Peak. The monthly costs for T-1 Internet service, prior to E-Rate discounts is approximately $200.

The school currently has about 100 computers and this will increase to 150 when the additional classrooms are completed for the 2001/2002 school year. The District does not use video-conferencing but is part of the Colorado On-Line School Consortium that offers credit courses over the Internet.

B. West Custer County Library District

The Library has eight workstations that are on a network and one stand-alone PC. All units have Windows 98 or 2000 operating systems with Pentium Class processors, 32k RAM and at least a 2 gig hard drive. The Library will be adding one more public access computer in the next year. The Windows NT network is comprised of an Ethernet 10Base – T Hub with Category 5 cable, and a shared printer. Internet access is provided via a leased 56k line to the University of Colorado in Denver.

C. West Custer County Hospital District

Telemedicine was available briefly through Centura in Denver but was discontinued due to low volume of use. The system was operated over a leased 128k line. The District uses teleradiology over a regular telephone line.

CUSTER COUNTY

TELECOMMUNICATIONS STRATEGIC PLAN

Part 2 – Public Input

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Section

1

FOCUS GROUPS

The purpose of the focus group meetings was to supplement the survey data. Focus group meetings allow participants to provide more in-depth responses to the questions on the survey. This forum permits a dialogue between participants and encourages the exchange of ideas, information and exploration of potential telecommunication strategies.

On January 24th and 25th, the consultant facilitated two focus group meetings at the Custer County Courthouse. The first meeting was targeted to public officials while the second meeting was targeted to the business community and general public. Approximately 40 people attended the focus group meetings over the two days.

Following are the primary issues from the meetings:

- The lack of affordable options for high-speed Internet access, especially for residential users in the unincorporated areas of the County.

- Participants noted that although Custer County has DSL service it has distance limitations and it does not have comparable rates to DSL service in nearby metro areas.

- CenturyTel explained that they would be deploying DSL and new technologies would allow them to serve approximately 80% of the County.

- There was also discussion regarding satellite and wireless technologies and options for these areas.

- Due to the number of rural residents, there was also discussion regarding cellular telephone service and issues with coverage in the rural areas.

- It was noted that Custer County is attractive to telecommuters, lone eagles, and second-home owners. These groups are becoming more reliant on technology and need high speed access to communicate with work and clients across the country and globe. The Telecommunications Plan needs to address these needs.

- The scope of the Beanpole grant program and how it might address these concerns was also discussed at both meetings.

Section

2

SURVEY METHODOLOGY

1.   Survey Objectives

The objectives of the survey was to provide information regarding the following:

1)   Current telecommunication usage and potential for growth.

2)   Satisfaction with existing services.

3)   Support for various telecommunication planning strategies.

2. Survey Design & Methodology

The survey was primarily a multiple-choice format. A copy of the questionnaire is in the appendix. County staff distributed surveys at the public meetings in January 2001 and the survey was posted on the Custer Guide web site. A total of 25 surveys were returned representing government, business, home business, and non-profit sectors.

This type of survey is not a statistically significant survey and it should not be used to extrapolate general trends of the population. Instead this survey targets a specific population and is intended to assess their specific needs. This survey population generally represents small businesses that are typical of the businesses that are located in the county.

Section

3

RESPONDENT PROFILE

1.   Survey Respondents

Representatives from business and government comprised the largest group of respondents of the survey.

Table 1: Survey Respondents

Type	# of Surveys
Business	9
Government	5
Home Business	3
Technology	1
Education & Library	2
Health/Medical/Non-Profit	3
Other	2
Total	**25**

Source: Custer County Telecommunications Survey – 03/01

The average number of employees for respondents was 4.5 with only 3 respondents with more than 10 employees. About 40% of respondents had an out-of-state client basis necessitating telecommunications services for non-local transactions.

2. Data Intensive Applications

Of the data intensive applications that require high-speed access to the Internet, respondents expressed the most interest in data transfer of large files, telecommuting, and access to government and professional databases.   These uses are typical among the lone eagles and teleworkers that are prevalent in the County.

There was also significant interest in photo-imaging/web-design/graphics and business-to-business applications. There was little interest, however, in e-government or computer mapping applications.

Table 2: Computer Applications

Type	Rating
High Speed Data Transfer	4.3
Tele-Commuting	3.8
On-line Access to Govt. & Prof. Databases	3.7
Photo Imaging/Web Design/Graphics	3.5
Business to Business	3.4
Interactive Video Conferencing	3.2
E-Commerce	3.0
Geographic Information Systems	2.9
E-Government	2.1

1 = No Interest

5 = Very Interested

Source: Custer County Telecommunications Survey – 03/01

3. Technology Spending & Integration

The survey asked for budget information on various expenditure items related to technology. Only half of the respondents completed all or part of this section with many respondents lacking of access to budget figures. From the data that is available, it indicates that due to the small number of employees, Custer County businesses have modest technology budgets.   The annual spending on computer upgrades was less than $3,000, equivalent to the purchase of a workstation with some software. The biggest variation was in the amount spent on long distance and cellular calls. This likely reflects the location of the client base that the business must call.   Only a few respondents had more expensive direct connections to the Internet. Although the average dial-up connection is $20 per month, a number of offices had multiple dial-up accounts and consequently had higher average monthly bills for Internet access.

Table 3: Selected Cost Information

Data Item	Range	Average
Telephone Costs Local	$15 - $200	$97
Long Distance	$10 - $1,300	$89
Internet	$10 - $275	$72
Cellular Service	$20 - $500	$72
Annual Computer Upgrades (Software & Hardware)	$1,000 - $7,500	$2,796.23

Source: Custer County Telecommunications Survey – 03/01

Section

4

TELECOMMUNICATION USE AND DEMAND

The survey results indicate the extent of usage among different types of telecommunication services and provide a measure of the demand for new products.

1.   Calling Services

Cellular service was the most popular of the different calling services with 68% of the respondents reporting use of this service. Voice messaging is used in slightly over 1/2 of the businesses while 36% of the respondents used a toll-free line.

Table 4: Calling Services

Response	Uses Service
Toll Free Line	9
Voice Messaging	14
Cellular	17
PBX/On-site Telephone Switch	0

Source: Custer County Telecommunication Survey 03/01

2. High Speed Access

Almost 33% respondents indicated that their organization uses local area networks and only 1 respondent indicated that their network was part of a wide area network. This is significantly lower than the 50% to 75% rate of networking that is found in businesses nationwide. Although the low rate of networking may be due to the low number of computers in the workplace (an average of 3.5), even small networks are becoming more common.   A growing market is for residential networks with a variety of home networking kits now available on the market. Establishing these networks will allow users to maximize the advantages of a high speed Internet connection among all the PCs in the workplace.

Only three respondents are using dedicated lines for high-speed access and another three are using DSL. The costs of dedicated lines and the lack of large networks are the likely reason for the lack of demand for dedicated circuits.   The focus group meetings indicated substantial demand for more affordable DSL technology that can serve residential areas.

Traditionally, small business has been slow to adapt Internet technologies but Custer County shows high rates of penetration. All but one business responded that they have Internet access. One respondent did not answer the question.

Table 5: High Speed/Advanced Services

Technology	Uses Now
DSL	3
Internet	23
Wireless Network	2
Dedicated leased lines	3
Video Conferencing	1
Local Area Network	8
Wide Area Network	1
Web Server	5

Source: Custer County Telecommunication Survey, 03/01

3. Future Use

Most businesses had multiple telephone lines to accommodate needs for fax and Internet. Businesses had an average of four telephone and fax/modem lines. About half of businesses reported plans to add more lines over the next two years. The average number of computers in a business corresponded with the low number of employees. Businesses had an average of 4.5 employees and an average of 3.5 workstations. Slightly less than half of businesses indicated that they planned to add additional workstations over the next two years.

Table 6: Projected Use of Technology

Technology	Average Use	% of Users Projecting an Increase
Phone Lines	2.84	52%
Fax/Modem Lines	1.08	32%
Computers	3.5	44%

Source: Custer County Telecommunication Survey, 03/01

Section

5

CUSTOMER SATISFACTION & PRIORITIES

Part 3 of the survey measured the degree that respondents agreed or disagreed with a series of statements on customer satisfaction and public policy alternatives. The responses were on a scale of one to five, with five indicating strong agreement and one representing strong disagreement with the statement.   A number value above three represents agreement with the statement.

1. Satisfaction with Services

There were four statements to measure overall satisfaction with telephone, cable, cellular, and Internet services. Of these services the strongest dissatisfaction was expressed with cellular service with an average response of 2.0. Almost all comments regarding cellular service dealt with poor cellular coverage in the area.

Dissatisfaction with cable services was almost as strong as the response for cellular services. Respondents mentioned the quality of reception, program selection, rates and customer service as concerns.

The response to satisfaction on telephone service was also low with a below average response of 2.6. The most frequent complaint regarded customer service and timely installation of new service. Other comments regarded issues with lack of DSL and slow access to the Internet. Respondents were generally satisfied with Internet service. Comments on Internet services generally related to slow connections due to the lack of options to connect at a higher speed and line quality in the rural parts of the County.

Table 6: Satisfaction with Services

Statement	Average Response
1. My local phone company provides adequate service.	2.6
2. My cable television company provides adequate service.	2.1
3. My cellular telephone company provides adequate service.	2.0
4. My Internet Service Provider provides adequate service.	3.12

Source: Custer County Telecommunications Survey, 03/01

2. Support for Public Policy Options

The statement that received the strongest level of agreement regarded the interest in training programs. Respondents indicated that work-force technology skills were generally adequate to meet their needs. Respondents also indicated general support for consideration of a buyer's cooperative.

Table 7: Support for Public Policy Options

Statement	Average Response
5. The workforce has adequate technology skills to perform most entry-level jobs in my organization.	3.5
6. I would be interested in training programs on such topics as the Internet, e-commerce, and networking.	3.7
7. I would consider joining a telecommunications buyer's cooperative.	3.4

Source: Custer County Telecommunications Survey, 03/01

CUSTER COUNTY

TELECOMMUNICATIONS STRATEGIC PLAN

Part 3 - Market Analysis

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1

STUDY AREA PROFILE

A. Geography

Custer County is located 80 miles southwest of Colorado Springs. Westcliffe is the county seat with a 1999 population of 476. The only other incorporated town, Silver Cliff is directly adjacent to Westcliffe and has a population of 494. The remaining 2,626 residents live in unincorporated areas of the county. Unincorporated areas include Rosita, is located 13 miles south of Westcliffe, and the settlements of Wetmore and San Isabel are located in the eastern portion of the County.

Westcliffe and Silver Cliff are located in the Wet Mountain Valley and are bordered by the Sangre de Cristo Mountain Range on the west and the Wet Mountain Range on the east. Elevations begin around 7,800 feet on the valley floor with several peaks in the Sangre De Cristo range exceeding 14,000 feet. Forty percent of the County is public lands and includes the 200,000-acre San Isabel National Forest, Sangre de Cristo Wilderness Area and the Greenhorn Mountain Wilderness area.

The County encompasses 739 square miles with an average density of 4.9 people per square mile. Custer County does not have interstate highway, air or rail service. Major transportation routes include Highway 96 providing east-west access and Highway 69 providing north-south access.

Figure 1: Location Map – Custer County
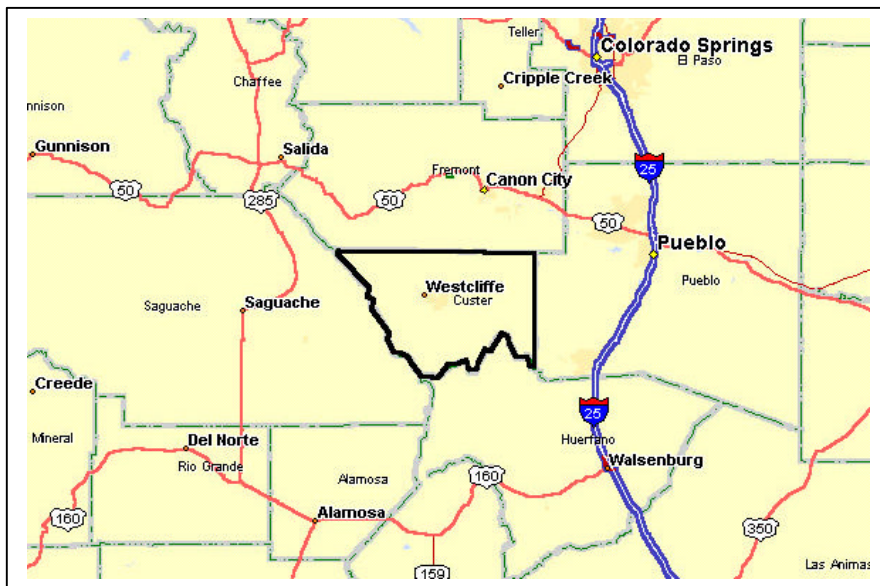
B. Socio-Economic Trends

The total population of Custer County increased from 1,926 people in 1990 to 3,596 people in 1999. This is an increase of 86% compared to a State of Colorado increase of 23% during this same time. In addition to this population increase, Custer County has seen an increase in second homes. Out of 2,841 housing units in 1998, half of them were classified as "vacant", a category that includes seasonal homes.

Traditionally, agriculture and government jobs were the primary components of the economy. With an increase in the new homes and tourism in the area, construction jobs, retail, and service jobs have demonstrated a substantial increase in the last decade. Most government jobs are in the local government sector with few state or federal jobs.   Employment in this sector also grew significantly in response to demands for services from the growing population.

Table 1: - Employment by Sector

Industry	1990	1999	% Change
Agricultural, Forestry, . .	234	224	-(.04%)
Construction	66	229	247%
Manufacturing	33	45	36%
Transportation & Utilities	18	48	167%
Wholesale/Retail	96	313	226%
Finance/Insurance/Real Estate	48	103	115%
Service	58	191	229%
Government	134	231	72%

Source: Colorado Department of Local Affairs, www.dola.state.co.us/demog/

At 2.4%, the 1999 unemployment rate in Custer County is slightly lower than the State average of 2.9%. Many of the jobs, however, are in the lower paying retail and tourism industry. Consequently, per capita income in 1998 in Custer County was $18,336, significantly lower compared to $29,994 for the State.

C. Technology Planning in Custer County

1.   Beanpole Coalition

The Custer County Planning and Zoning Office is leading the planning process for telecommunications in Custer County. Custer County has been working on updating its Master Plan for several years and has identified telecommunications capability as a priority. A core group of partners have been meeting and performing preliminary tasks to plan for telecommunications. The group is an informal coalition that meets on an as needed basis.   Each of the participating partners is relying on the development of the plan to define the structure of the coalition and to guide their implementation processes. The core partners in the planning process include:

- Custer County (Planning-Zoning, Sheriff, Road & Bridge, Dept. of Social Services, County Extension)
- Town of Westcliffe
- Town of Silver Cliff.

It is the goal of the planning process to expand the partners to include:

- Wet Mountain Fire Protection District
- Wet Mountain Valley Community Clinic
- Merchant & Chamber Association
- West Custer Library District
- Electric Utilities (West Plains Energy, Sangre de Cristo Electric, San Isabel Electric)
- Internet Service Providers (Royal Internet – Vanion, Rocky Mountain Internet – ICC)
- Upper Arkansas Area Council of Governments
- Custer County School District C-1
- Sangre de Cristo Christian Academy
- Office of State Electrical and Plumbing Inspectors
- United States Department of Agriculture
- Custer County Soils Conservation District
- San Isabel Foundation
- Wet Mountain Valley Project
- Custer 2020
- Custer County Regional Planning Commission
- Custer Search and Rescue
- Custer County Ambulance Corp
- Individual Telecommunication Users.

2. Project Sangreal

In the mid-1990s, a citizen group developed a plan to internetwork the Village of Westcliffe. The plan promoted the use of Internet technology to accomplish the following goals:

- Increase the number of visiting guests in the winter season.
- Offer opportunities to learn by developing a robust community based educational system.
- Attract an engineering, scientific and theological research community.
- Increase the revenue stream for Westcliffe, Colorado.
- Introduce the benefits of teamwork.
- Construct and publish a strategic plan/engineering roadmap for the community using input from a community wide cross-functional team.
- Construct hypermedia knowledge base for the Sangre de Cristo Wilderness and the Village of Westcliffe area using World Wide Web technology.

The group developed a network plan including recommending equipment for participating entities. Although there was no funding for the plan and no formal adoption of the recommendations by the public agencies, many have independently installed networks and are developing Internet applications. The network implementation plan will provide an updated assessment of equipment and networking needs.

Section

2

INDUSTRY ANALYSIS

Traditionally, rural areas faced daunting obstacles to attracting broadband services to their areas. Long distances between population centers and terrain translated to high costs to provide services in these areas. Low populations generated little revenue to offset this high cost and slow adoption of technology in rural areas exacerbated the low demand in these markets. New developments, however, are dramatically changing the technology landscape in rural areas. Among important trends to note:

A. Broadband – Supply

1)   Emerging Technologies

Service providers have recently introduced new technologies to address the "last mile issue". These include satellite, wireless, and DSL solutions. While the distance limitations with DSL are being addressed by installing remote switches in rural areas and new technologies offer possible solutions, each technology has technical, cost, and deployment issues that may still restrict their availability.

2)   Saturation in Urban Markets

Since the 1996 Act when competition was allowed in local markets, CLECs have concentrated their efforts in markets with populations of 500,000 or more. The high density of these markets allowed them to capture significant market shares. Over time, however, these markets have become saturated with competitors. Additionally, technology has evolved and it is now technologically and financially feasible to enter smaller markets. Consequently, competition is spreading to markets of 50,000 and extending to secondary markets from these network access points.

3) Consolidation

The trend following the introduction of new products or services is an initial entry of multiple vendors attempting to capture the market. Gradually, there is consolidation in the industry as poorly managed or under-capitalized firms exit the market. Consequently, there are fewer but larger firms that have developed the expertise and funding to be competitive. ISP's are currently undergoing this transformation as smaller local interests are being purchased or merged with regional providers. The main ISP in Custer County, for example, was recently acquired by Vanion. This trend results in larger firms with more capital to invest in technology. The downside, however, is that the larger firms may not have the local interest in customer service.

4) Wireless Internet/Mobile Commerce

With the increasing popularity of personal communication devices that can now access the Internet, mobile wireless will become a more routine function.   "Personal communication" or "portable computing" devices include cellular telephones, paging devices, palmtop computers (PDA's), laptop and vehicle based devices. Even as these technologies are being introduced, there is a convergence of features with cellular phones performing PDA functions. With this new technology, workers are more mobile and on-call at all times, anywhere.   The extent of wireless coverage in rural areas will become increasingly important.

B. Broadband - Demand

1) Applications Require More Bandwidth

Already, web applications have become more interactive and the download of large data files and audio files is increasing demand for high-speed connections.   New Internet applications such as video, virtual reality, and telephony require more bandwidth than the traditional text and graphic files that now dominate the Internet.   These applications represent the next generation of Internet uses and will require more bandwidth.

2)   Residential Market Grows

In the last decade, most users were accessing the Internet through work. Recently, Internet use at home has grown dramatically and now has a penetration rate of almost 50%. Part of this growth is due to the increase in telecommuting and self-employed workers. Lone-eagles working out of their homes rely heavily on information technologies to communicate with and deliver products to clients. These workers are looking for quality of life factors such as those found in Custer County. They will increasingly demand high-speed services to facilitate their work.

3) Networking Demands

Employers are spending more money on computer networking and subsequent expenditures on hardware and network management services. From 1995 to 2000, the proportion of personal computers that were networked grew from 56% to 78%. The increase in networking creates a need to design and manage networks as well as train staff to use the new systems. Network linkages to outside institutions and corporate offices generate more demand for bandwidth.

C. Other Technology Issues

<u>1)   Digital Divide</u>

The disparity between technology "haves" and "have nots" is called the "digital divide". According to 2000 data from the National Telecommunication and Information Administration (NTIA), this gap is closing but is still prevalent among the poor, rural areas and central city minorities. Rural areas as a whole lag behind urban counterparts in having high-speed access. Nationally, 11.8% of urban households had some form of high-speed access in while only 7.3% of rural households had comparable service.

Figure 2: This public access terminal at the Library is one way to address digital divide issues.

<u>2)   Technology Skills</u>

Global competition, the Internet, and widespread use of technology create a need for new work systems and a new set of skills for employees. According to the 1999 National Skill Summit, computer skills are becoming baseline requirements for many jobs with workers using a variety of advanced information, telecommunications, and manufacturing technologies. Forty-two percent of production and non-supervisory employees in manufacturing and service establishments now use computers.

From 1996 to 2006, employment in occupations requiring at least an associate's degree will increase faster than the average rate of job growth.   In the new economy, workers must be "multi-skilled" and must commit to a lifetime of learning and retraining in order to remain competitive in rapidly changing labor markets.

Section

3

FEDERAL & STATE INITIATIVES

A. Telecommunication Act of 1996

The Telecommunications Act of 1996 replaced the Communications Act of 1934, Cable Acts and other previous legislation covering the communications industry. The underlying premise of the act was to promote competition between segments of the telecommunications industry.

Traditionally, a monopoly telephone carrier referred to as a local exchange carrier (LEC) served local telephone service within the local access and transport area (LATA). With provisions for interconnection portability, and the bundling/resale of services, the Act allows other companies (competitive access providers) to compete against the local exchange carrier. The Federal Communications Commission (FCC) and the Colorado Public Utility Commission (PUC) administer these regulations.

Another provision of the Act was to enact a new Universal Service plan to maintain affordable charges in high-cost areas. The formula to subsidize this plan has been under debate the since the adoption of the act and the issue remains unresolved. The ultimate outcome can greatly influence rates for basic and advanced telecommunication services.

Section 706 of the Telecommunications Act directs the FCC and the state public utility commissions to encourage the deployment of advanced telecommunication services. In October, 1999 FCC staff released a report studying the deployment of broadband services. The study considered the recent ATT/TCI mergers and open access issues. Based on these studies, the Commission is refraining from mandating "open access", while monitoring for anticompetitive developments that may require intervention. The Commission advocates competition from multiple broadband providers as the best way to promote the development of broadband competition.

B. Colorado Telecommunications Infrastructure Fund, (The Beanpole Fund)

The Colorado State Legislature created the Beanpole Fund to bring advanced technologies to rural, remote, and underserved communities. Communities that demonstrate a very high likelihood of success in attracting private sector deployment of infrastructure and to communities that are close to where the initial phase of the Multi-use Network Backbone of Aggregated Network Access Points (ANAPs) is anticipated to occur are candidates to receiving Beanpole funding. The Beanpole Fund is a competitive grant process consisting of two funding phases:

1. Technical Assistance Planning Grant Funding:

This funding is intended for those rural areas that will be in Year One of the state's Multi-Use Network (MNT) start-up. There are more than 20 Aggregated Network Access Points anticipated to be in service by the close of FY '00. This current round of Technical Assistance funding will provide up to $45,000 for communities to use over a 4 to 6 month period to develop a comprehensive Community Infrastructure Network Implementation Plan (CINIP). The planning process will also incorporate elements of a Community Strategic Telecommunications Plan, but the focus will be on the development of the more technical and engineering- oriented CINIP.   This plan is being funded with the grant.

1.   Implementation Funding:

Implementation Funding may become available in FY '01 depending on action in the 'Legislative session. This funding is designed to complement the first phase construction of the Statewide Multi-Use Network, commonly known as the Statewide Backbone or ANAPs (Aggregated Network Access Point) Plan. Funds will be targeted to those communities that have completed a Community Infrastructure Network Implementation Plan. This funding is intended to assist those communities in underwriting the cost of leasing advanced services from private or not-for-profit sector telecommunications service providers for a period of up to three years (through June 30, 2004).

C. Rural Technology Enterprise Zones

The Colorado Public Utility Commission administers the Rural Technology Enterprise Zone (RTEZ). This program offers income tax credit for firms investing in telecommunication infrastructure in rural areas of the State. Qualifying infrastructure must provide Internet or Internet-type access and only physical plant costs qualify as infrastructure investment.

D. Internet Masters

The Colorado Internet Masters Program is an educational and civic volunteer program of the Colorado Rural Development Council, Colorado State University Cooperative Extension, Small Business Development Centers, Colorado Rural Technology Academy and partners.

The Colorado Internet Masters course is a unique opportunity to expand a community's knowledge of and skills for employing the world's newest frontier - the Internet. It provides civic-minded individuals with a "masters" course on how to use the Internet. Those who complete the course become "Certified Internet Masters" when they apply and share some of what they learn with others in their community through fulfillment of their 30-hour volunteer requirement.

Section

4

INFORMATION COMMUNITY INDICATORS

A. Information Community – Defined

To address the digital divide issue and to promote the adoption of new technologies, several organizations have advanced a model where communities embrace the changes resulting from rapid diffusion of information technology and use this technology to transform institutions and improve the quality of life for citizens. Terms to describe cities that embody these traits include, "Smart Cities", "TeleCities", and "Information Community". Among the features of an information community are:

- Integrating technology applications into the community
- Partnerships and coalitions
- Participation in the global economy
- Proactive response and planning
- Access for all citizens

B. Information Community Indicators as a Tool

Community indicators are a tool to evaluate the degree that a locality incorporates features of an information community. "Indicators" are descriptions of activities that exist when technology is successfully integrated into the local economy and public sectors. To use the tool, the community refers to the information in the telecommunications inventory and marketing survey to rate how well the locality is meeting each criteria. This exercise has several benefits including:

- Identifies the strengths and weaknesses in a community
- Helps sets priorities
- Provides a way to measure success over time
- Facilitates a dialogue among community leaders
- Summarizes information from assessment into user friendly format

The indicators in Table 2 have been compiled from several sources and then modified to reflect the needs of rural communities and current technology standards. Measures that are rated as a "2" or "3" represent issues that the community may want to address to create a more vital role for the community in the information economy. Measures that are rated "1" are assets that the community can promote and build on to achieve their goals.

Table 2: Information Community Indicators for Custer County

1. Networking

	Rating	Comment
a) Capacity of ILEC network	1	OC-12, ATM
b) Redundancy	3	One route to Canon City for interoffice transport
c) Alternative High Speed Networks	3	No cable modems. Limited Wireless. No CLECS operating in area.
d) Customer Service (Timeliness, Responsiveness . . .)	2	Some complaints about service

2. Access

	RATING	COMMENT
a) Affordability of High Speed – Gov. & Large Business	2	Comparable to Costs Statewide
b) Affordability of High Speed – Residential/ Sm. Business	3	DSL costs over $100 per month
c) Choice of ISP's	1	Multiple local dial-up options
d) Service Options (Cable, Wireless, DSL . . .)	3	No cable modems. Limited Wireless & DSL
e) Expanded Internet Services (VPN, QoS, Voice, ASPs)	2	Some E-Commerce support. Limited networking support
f) Video-Conference/Satellite Downlink Sites	3	Nearest site is in State of Colorado site in Pueblo.

3. Citizens

	Rating	Comment
a) Public Access Terminals	2	Library & Coop Extension have but limited hours.
b) Technology Outreach/Marketing	2	No organized effort. Press and on-line coverage
c) Technology Skills Training & Classes	3	Not offered by any local institution
d) Community Info and Non-profits on the web	2	Listed in On-Line Directory but few web sites

1 = Fully developed service/technology/application to meet present & near future needs.

2 = The service/technology/application is present but has limitations or is not fully developed.

3 = The service/technology/application is not present in the area or is present but not utilized by the
       community. Potential for future development.

4. Education

	Rating	Comment
a) K-12 – Internet Access	1	In every classroom. Recent upgrade to T-1 speed.
b) K-12 - Network & Equipment	1	All machines networked. Computers and network meet current standards
c) Tech Support/Teacher Technology Training	1	Has full time tech staff & assistants.
d) Use of Technology Grants, E-Rate & Other Funding	2	Uses E-Rate. Technology budget primarily locally funded.

5. Libraries

	Rating	Comment
a) Public Access Terminals	1	Five public access terminals for Internet
b) On-line Public Access Catalogue	1	Two dedicated terminals for this purpose
c) Internet Access & Technology	2	Direct connection at 56k. Computers are networked.
d) Use of Technology Grants, E-Rate & Other Funding	2	Uses E-Rate. Not on State Interlibrary Loan system.

6. Business/Economic Development

	Rating	Comment
a) Businesses On-Line	1	Survey indicates large % on-line
b) Community-wide On-Line Business Directory	1	http://www.custerguide.com/
c) Use of E-Commerce/B2B Applications	2	Most sites informational. Survey indicated low interest in e-commerce. B2B generated higher interest but less than other applications.
d) High Tech Office Space/Industrial Parks . . .	3	No such space available in County.
e) Recruitment or Incubation of Technology Businesses	3	No specific programs for this purpose.

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2 = The service/technology/application is present but has limitations or is not fully developed.

3 = The service/technology/application is not present in the area or is present but not utilized by the community. Potential for future development.

7. Government

	Rating	Comment
a) Web-Site - Informational, links, download forms	3	Few agencies are on-line.
b) E-Government Applications (On-line permitting, voting, searchable databases .. .)	3	No agencies have any type of e-government. Survey indicated little support for this application.
c) IT Staff/Tech Support	2	Some county departments contract out for tech support and software support.
d) Mapping/GIS	2	Planning and zoning are developing this application. Not yet complete.

8. Health Care

	Rating	Comment
a) Teleradiology	2	Use technology over regular phone line. No high-speed connection.
b) Telemedicine (ITV sites for consultation & training)	3	Service with Centura discontinued due to low volume of use.
c) Network links between doctors/hospitals for record sharing and other data needs	3	No linkages
d) Local Health Information On-line	3	No sites

9. Planning

	Rating	Comment
a) Telecommunications Organization	2	No formal or informal organization. Partnerships beginning to form as result of Beanpole grant.
b) Telecommunications Assessment or Plan	2	In progress
c) Accomplishments	3	When plan is completed will identify action step.
d) Relationship to Community or Econ. Dev. Plans	1	Comprehensive Plan addresses Telecommunication

1 = Fully developed service/technology/application to meet present & near future needs.

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community. Potential for future development.

Section

5

STRATEGIES

The strategies specifically address the needs that emerged from the "Community Indicator" exercise. Upon identifying needs based on the indicators, a public meeting helped developed strategies based on the following process.

- List of needs from the Community Indicator exercise.
- Establish priorities based on responses to community survey, feedback from public meetings and existing community plans.
- Identify resources available to address the important needs.
- Establish strategies to build on assets, take advantage of funding opportunities, and leverage outside resources.

Insert strategies after public meeting on 4/18 based on feedback from the assessment findings.

Section

6

Grants

There are a number of resources for funding telecommunication infrastructure or subsidizing the cost to purchase services. The most widely used fund is the School and Library Discounts, referred to as the E-Rate. This fund provides for discounts on certain telecommunication services to schools and public libraries if they meet the criteria for developing a technology plan and competitive bidding. Most of the eligible institutions in the study area were taking part in this program. The National Telecommunication and Information Administration provides funding for community infrastructure projects as well as a number of other federal agencies. The following grant programs are resources that may help Custer County pursue strategies.

A. Foundation Grants

1) Micron Foundation – Funds grants with an education focus that address science and technology training.

http://www.micron.com/contributions/index.htm

2) AOL Foundation

Past funding efforts include the Rural Technology Leadership awards and Digital Divide grants.

 http://www.aolfoundation.org/

3) Verizon

The foundation supports digital divide and education initiatives.

http://foundation.verizon.com/index.html

4) Benton Foundation

The web site includes Links to digital divide funding sources.

 http://www.digitaldividenetwork.org/fund.adp

B. Government Grants

1) National Telecommunication and Information Administration (NTIA)

Technology Opportunity Program (TOP) expects to release its *Notice of Availability of Funds* in January, 2001, with an expected deadline for proposals sometime in March, 2001. NTIA has funded five projects in Idaho since 1994.

http://www.ntia.doc.gov/otiahome/top/index.html

5) U.S. Department of Education

The Department administers a number of technology grant programs.

http://ocfo.ed.gov/

6) National Institute of Health (NIH)

The NIH has grants for telemedicine and other technology applications in the health field.

http://www.nih.gov/

CUSTER COUNTY

TELECOMMUNICATIONS STRATEGIC PLAN

Appendix

TABLE OF CONTENTS

Technology User Survey

Custer County is conducting this survey as part of a telecommunications plan that will help identify options for technology investment in the region. Your input is very important. The survey will take approximately 15 minutes to complete. All answers are confidential. For additional information contact Bob Thomason at 719 783-9012.   Mail surveys to: *Applied Communications, 2732 Evergreen, Great Falls, MT 59404.*

Thank you for your participation in this survey.

Part 1 – Respondent Profile (25 Respondents)

1. Name: _____

2. Agency: _____

3a. Mailing Address: _____

3b. Street Address: _____

3c. City: _____ Zip Code: _____

4. Phone: _____

5. E-Mail: _____

6. Does your organization maintain a web page? Yes (10) No (8) Under Construction (6)

6a. URL: _____

7. Please list the location of other offices/facilities within the county that are part of your organization.

a. _____

b. _____

c. Five respondents had offices in other locations.

Use back of form if there are more than three locations

8. Type of Organization: Circle the most appropriate answer.

a. Health/Medical (1)	b. Government (5)
c. Business (9)	d. Communications/Technology (1)
e. Industrial	f. Community Non-Profit (2)
g. Education (K-12) (1)	h. Education (Post Secondary)
i. Agriculture	j. Home Business (3)
k. Library (1)	l. Other (Specify: (1)_____

9. Number of Employees (FTE) _Avg. – 4.4   8. Number of Students (if applicable) _____

10. What is the primary geographic coverage for your clients or customers?

City/County (14) State (1) Multi-State (3) National (4) International (3)

Part 2 – Technology Usage & Needs

1. Please indicate the degree of interest your organization has in the following applications?

1 = No Interest   5 = Very Interested

						Average
a. High Speed Data Transfer	1	2	3	4	5	4.3
b. E-Commerce – Selling products/services via Internet	1	2	3	4	5	3.0
c. Tele-Commuting	1	2	3	4	5	3.8
d. Business to Business – Procurement, Customer Service	1	2	3	4	5	3.4
e. Interactive Video – Conferencing	1	2	3	4	5	3.2
f. E-Government (Permitting, Information Sharing, Voting . . .)	1	2	3	4	5	2.1
g. Geographic Information Systems, Computer Mapping	1	2	3	4	5	2.9
h. Photo Imaging/Web Design/Graphics	1	2	3	4	5	3.5
i. On-Line Access to Government & Professional Databases	1	2	3	4	5	3.7

2. Which of the following services do you use in your organization?

Service	Yes	No	Don't Know
a) Toll free line (800 or 888)	A – 9	B – 14	C
b) Voice Messaging through the phone company	A - 14	B – 9	C
c) ISDN	A – 4	B - 9	C – 5
d) DSL	A – 3	B – 11	C – 5
e) Internet	A – 23	B – 1	C
f) Cellular Phone	A – 17	B – 5	C
g) Wireless Network	A – 2	B – 16	C – 1
h) Dedicated leased lines (Fractional T-1, T-1, T-3)	A – 3	B – 10	C – 3
i) Video Conferencing	A – 1	B – 17	C
j) Local Area Network	A – 8	B – 12	C
k) Wide Area Network	A – 1	B – 15	C – 1
l) Web Server	A – 5	B 14	C – 1
m) Centrex/PBX Switch	A	B – 14	C - 4

3. Please indicate current and projected use of the following services in two years.

	Current #	Projected Use in 2 Years		
a. Number of Phone Lines	2.84	Same (11)	Increase (13)	Decrease
b. Number of Fax/Modem Lines	1.08	Same (15)	Increase (8)	Decrease
c. Number of Leased Circuits		Same	Increase (2)	Decrease
d. Number of Computers	3.5	Same (11)	Increase (11)	Decrease

Part 3 – Customer Satisfaction & Priorities

1. Please indicate the degree to which you agree or disagree with the following statements.

1= Strongly Disagree   2= Disagree   3= Neutral   4= Agree   5= Strongly Agree

a) My local telephone company provides adequate service.	1	2	3	4	5	*2.6*
b) My cable television company provides adequate service.	1	2	3	4	5	*2.1*
c) My cellular telephone company provides adequate service.	1	2	3	4	5	*2.0*
d) My Internet Service Provider provides adequate service.	1	2	3	4	5	*3.12*
e) The work force has adequate technology skills to perform most entry-level jobs in my organization.	1	2	3	4	5	*3.5*
f) I would be interested in training programs on such topics as the Internet, e-commerce, and networking.	1	2	3	4	5	*3.7*
g) I would consider joining a telecommunications buyer's cooperative.	1	2	3	4	5	*3.4*

2. Please describe any dissatisfaction you may have with the following services?

Telephone:

Cable:

Internet:

Cellular:

Part 4 – Costs Information

1. On average, approximately how much do you spend each month for the following services?

    a. Local Telephone $15 - $200, Average = $97

    b. Long Distance $10 - $1,300, Average = $600

    c. Cellular Telephone $20 - $500, Average = $89

    d. Internet $10 - $275, Average = $72

    e. Leased Lines

2. On average what is your annual budget for computer equipment and software?

Range $1,000 - $7,500, Average = $2,769.23

Please note any comments you may have about this survey on the back of the form.

Appendix 2: Glossary

Analog
Refers to the technique of conveying information by modulating (or varying) a wave by frequency, amplitude, or phase of carrier.

ATM
Asynchronous Transfer Mode Cell Relay Service (ATM CRS) is a high bandwidth service. The large bandwidth and cell relay structure allows for very fast movement of video, voice, and data traffic.

Backbone
The term used to describe the major, high volume routes connecting major points along the information highway. Also referred to as interoffice path or network that links smaller networks or the central offices.

Back-hauled Call
A phone call which is routed to a remote operations center and sent to its final destination using long distance facilities.

Bandwidth
The transmission capacity or frequency of a particular medium, wired or wireless. Digital transmission rates are usually measured in bits per second and when digital data is converted to frequencies it is measured in hertz. The highest bandwidths are necessary for transfer of pictures and video images.

Broadband
Technologies that transmit large amount of data, voice, and especially video. These are multi-channel and must be carried over coaxial, fiber optics, or wireless.

Cellular
A wireless communications service which allows mobile communications by passing the call in progress from one cell site to another.

Central Office
The telephone company building where the central office "switch" is installed. (Also switching office)

Centrex/Centron
A telephone company service allowing multiple lines or extensions for businesses through the phone company's switch.

CLASS
(Custom Local Area Signaling Service)
A package of state-of-the art custom features such as caller identification, continuous redialing, remote access forwarding, scheduled call forwarding, call rejection and more.

Coaxial
Coaxial cable has one or more central wire conductors surrounded by an insulator and encased in either wire mesh or extruded metal sheathing. It is a type of electrical cable which has high bandwidth, low cost, and low susceptibility to interference. It is used most often by cable television systems.

Compressed Video
A digitized, interactive, two-way transmission of video service that allows for multi-point conferencing. Signals are transmitted at a low bandwidth and consequently require fiber optics to carry the signal.

Custom Calling
Basic custom features generally include 3-way calling, call waiting, call forwarding, custom ring, and speed calling.

Data Protocol
A collection of rules that control the exchange of information between different nodes on a network.

Dark Fiber
Fiber optic cable which has been deployed but is not yet in use.

Dedicated Line
A communication line used exclusively by one customer. In a telephone leased-line, the line often does not pass through inter-exchange switching equipment

	and the line is leased on a flat monthly fee regardless of how much data are transmitted. They are also called a private line.
Dial-Up Access	The ability to dial a telephone number for the purpose of making a telecommunications connection.
Digital	Signals which consist of a series of discrete elements that have only one value at a time.
DSL	Digital Subscriber Line. Uses copper lines and DSL modems for high speed Internet access. Available in metropolitan areas.
Fiber Optic Cable	Projecting light as a medium for communications through thin glass fibers that allow light to bend without much interference.
Frame Relay	A private, fast-packet-based data network service that supports data transmission applications up to 1.544 Mbps. The service has no geographic limitations or maximum sites/networks. Used for data and graphics.
Gbps	1 billion bits per second, commonly called "giga bits per second"
Interexchange Carrier	An authorized common carrier which passes information between exchange areas. (Long distance companies.)
InterLATA	Calls within the Local Access and Transport Areas (LATA's) that are carried by long distance telephone carriers .
IntraLATA	Calls within the Local Access and Transport Areas (LATA's) where long-distance service is provided by the local telephone companies.
ISDN	Integrated Services Digital Network.
ISP	Internet Service Provider
Kbps	1 thousand bits per second, commonly called "kilo bits per second".
LAN	Local Area Network. A networking linking computers and other communications in an organization such as a school.
Leased Lines	Dedicated two-point and/or multi-point telecommunications lines leased from the telephone company or another telecommunications common carrier.
Loading Coil	A device used in local communication loops (usually those longer than 5,000 meters) that compensates for wire capacitance and raises voice grade frequencies. The coils are sometimes removed when high speed data are being transmitted because of distortion.
Local Exchange Carrier	A company which provides local exchange service.
Local Loop	The connection from the telephone company central office to the customer location. The local loop is also called the distribution network or the "last mile."
MAN	Metropolitan Area Network. A network spread out across multiple buildings with a city.
Mbps	1 million bits per second, commonly called "mega bits per second"

MHz	Megahertz. Indicates the frequency at which transitions occur in a communications circuit, or the frequency use in radio communications.
Microwave	A terrestrial wireless communications transfer medium which usually requires line of sight between towers to carry the signal over the airwaves.
OC	Designations for Sonet Circuits OC-3 = 155 Mpbs OC-12 = 622 Mbps OC-48 = Equivalent to four OC-12s
On-Line	Signifies a system in which end users are directly linked by circuits to a computer running an application.
Packet Switching	A method in data communications in which data are divided into packets and are routed to the final destination via the fastest route. The final destination node is responsible for reassembling the packets into the proper order.
PCS	Personal Communication Services (PCS) Wireless service using digital transmissions.
Public Switched Network	The public telephone network that provides communications services between all telephones and other equipment.
Quality of Service (QOS)	The acceptable level of communications service characteristics. A phrase used by the International Standards Organization for 6 parameters that are defined for the exchange of applications data.
Satellite downlink	A dish-like antenna that receives the communications signal from the satellite .
Server	A computer which provides clients with such services as databases, disk drives, or access to other network resources. They can be mainframes, minicomputers, large workstations, or LAN devices.
T-1	A digital communications facility for formatted digital signals that operates at a speed of 1.544 Mbps. (T-1C, T-2, T-3 & T-4 lines have higher transmission rates.
Telecommuting	The use of modern computer and communications technology to allow employees to work at home or some other site which is distant from the normal work site.
Telemedicine	The utilization of telecommunications facilities to connect and transmit various data between medical professionals.
Teleradiology	Telecommunications devices and connections used specifically in the medical field of radiology.
Two-Way Video Conferencing	Using two-way video to hold a meeting with participants at various locations so each group or individuals can see, hear, and interact with each other. Either fiber optic or compressed video technology can carry two-way broadcasts. Fiber optic technology is higher quality. Compressed video is less expensive.
Virtual Private Network (VPN)	A network which offers the functionality of a dedicated private network using the facilities of a public switched network.

Voice Messaging	The ability to store and retrieve voice messages from the public telephone system.
WAN	Wide Area Network. A network of computers spread over a wide area between cities and states.
Wireless	Communications without wires, such as local cellular phones, microwave transmissions, radio frequencies, and satellite networks.

Appendix 3: References

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