JOSEPHINE COUNTY DIGITAL VILLAGE PLANNING STUDY

Prepared for:

Southern Oregon Telecommunications and Technology Council
The Josephine-Jackson Regional Investment Board
The residents, organizations and institutions of Josephine County

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"It's a great invention but who would want to use it anyway?"

President Rutherford B. Hayes after
a demonstration of Bell's telephone

"Broadband is ***not*** about some grubby industry food fight over sharing, collocating or unbundling. Broadband ***is*** about finding the keys to unlocking a fresh flood of investment, innovation and competition. Broadband ***is*** about building a foundation for a dramatic leap forward in how we communicate, how we educate, and how we live our lives. Accordingly, our broadband actions must be as broad as our broadband vision."

Assistant Secretary Nancy J. Victory,
U.S. Department of Commerce, 2002

"The current generation of broadband technologies may prove woefully insufficient to carry many of the advanced applications driving future demand. Today's broadband will be tomorrow's traffic jam, and the need for speed will persist as new applications and services gobble up existing bandwidth."

"Understanding Broadband Demand: A Review of Critical Issues,"
U.S. Department of Commerce, 2002

"Remember that all reality was once a figment of someone's imagination."

Rachel Copelan

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EXECUTIVE SUMMARY

A Josephine County Digital Village

It is in Josephine County's economic, security and societal interest to have robust broadband connections to all residents who want them and, perhaps more important, for these same residents to know how to use them. It's only when these tools are used by a substantial number of the population will we see the benefits of a Digital Village.

A Digital Village refers to the use of information technology (IT) — the combination of computing and telecommunications technologies — in a community to improve productivity and competitiveness, to create economic and social opportunities, and to enhance quality of life. A Digital Village (DV) is a community-oriented process that incorporates technological, individual, and organizational components, and operates via a partnership between community leaders and technology resources. The components of a DV are those things that must exist in order to increase a community's overall productive capacity and quality of life: individuals, organizations, and technologies. Widely available and reasonably priced broadband is only one of the components.

In the 21st century, access to and intelligent use of information technologies will be necessary for rural communities to attract and retain businesses and, therefore, remain economically viable. Most experts predict broadband will enable applications and services that transform our economy, education, health-care, R&D, homeland security, military effectiveness, entertainment, government and the quality of life for citizens around the world.

Josephine County Broadband Deployment

Josephine County now sees in its areas of higher density population broadband services not available even a year ago. These services are substantially underutilized.

Many providers, cities and communities, Josephine County included, are working to accelerate the deployment and usage of broadband networks. To date, these efforts have predominantly focused on the supply side – promoting infrastructure build-out.

In Josephine County we now see broadband services not available even a year ago. For example:

- Grants Pass and nearby areas now have a choice of cable modem, DSL or wireless.
- The Illinois Valley area now has DSL and wireless.
- Satellite broadband access is available everywhere.

While these service offerings demonstrate good progress, areas such as Wolf Creek and Sunny Valley as well as other rural and sparsely populated areas of the county are as yet unserviced. Additional efforts building on accomplishments to date need to be encouraged. More work remains to include these areas, possibly as candidates for wireless implementations.

Considerable work on the demand side remains in Josephine County – factors impacting business and consumer uptake. As with most new technologies *broadband supply currently exceeds demand* as demonstrated by "take rates" for the existing services. Strategic demand, not conditions of supply, is the major determinant of both technological change and economic growth. In other words, you can build it and they still may not come, unless economic conditions are right. Robust demand is critical to successful deployment.

Broadband Alone Has Minimal Impact – Education Is Critical

Businesses simply switching to high-speed access will not suddenly save millions of dollars or begin producing more competitive goods or services. Likewise, consumers should not expect instantly better lives or more fulfilling relationships just because they signed up for broadband.

Educational institutions and other organizations have a significant role to play in expanding awareness of the value provided through appropriate use of these technologies. Efforts should focus on encouraging locally owned businesses to adopt information technologies as a means of maximizing local diffusion and increasing demand levels. Broadband is an incredible *enabling* technology. It allows businesses that are willing to embrace Internet business solutions to transform business processes and realize significant returns on investment.

For consumers broadband offers new opportunities to work or learn more productively (at their desks or from home), publish multimedia, switch from viewers of entertainment to participants, and — most importantly — dramatically expand their communication possibilities. But *these transformations are not always plug and-play solutions — they often take work and effort.*

It's Not Too Early To Plan For Future Broadband Needs

Today's broadband infrastructure will be tomorrow's traffic jam, and the need for speed will persist as new applications and services gobble up existing bandwidth. Failure to keep pace will result in economic and quality of life disparities for Josephine County residents.

It is important to note that while Grants Pass, and soon cities of the Illinois Valley, now have access to the current generation of broadband technologies (cable, DSL and wireless), these may soon prove insufficient to carry many of the advanced applications driving future demand. It's also noteworthy to point out that not all populated areas of the county will be included for expansion in the capital plans of the providers of cable, DSL or wireless access.

Creating infrastructure to meet future needs opens opportunities to those who would take calculated risks and invest in the future. It also would serve to build a foundation for future economic and quality of life development. For example, if Josephine County cities are to compete with other cities, regions or even nations, having competitive telecommunications infrastructures will be at least as important as having access to I-5.

A good start toward meeting future needs would be the creation of an all-fiber network to service the local telephone company as well as competitive telephone companies, cable television providers, Internet Service Providers, wireless broadband providers or other telecommunications firms that directly provide content or capacity to their customers. Government agencies may include federal, state, county, and city governments as well as utility districts, k-12 schools, the community college and university extension services. Note that elements of this approach may already be available and might benefit from cooperation and collaboration resulting in arrangements for sharing networks.

Estimates for capital investment under one approach (All Fiber Network) range from $783,000 to $2,200,000. "Best practices" advice is to start small and add on using the revenue stream for self-financing when possible. Other means of financing are more readily available with a proven approach underway. Suggested routes and other details can be found in the body of the study.

Consider Public-Private Partnerships

Public-private partnerships can expedite infrastructure builds, yield private sector capital and revenue targets, and achieve public policy goals.

The combined capital and intellectual resources of the public and private sectors can result in better, more efficient services. A wide variety of ownership and management options are available: private sector, municipal, cooperatives, utility districts, consortia, and public-private partnerships. The use of public-partnerships is increasing because it provides an effective tool in meeting public needs, improving the quality of services, and resulting in a more cost effective investment.

Public-Private Partnerships have been in use in the United States for over 200 years. Public-private partnerships can take a wide variety of forms. In addition to the sharing of resources, each party shares in the risks and rewards potential in the delivery of the service and/or facility. The public's interests are fully assured through provisions in the contracts that provide for on-going monitoring and oversight of the operation of a service or development of a facility. In this way, everyone wins - the government entity, the private company and the general public. This contractual arrangement between government entities and private companies for the delivery of services or facilities is used for water/wastewater, transportation, urban development, telecommunications, and delivery of social services, to name only a few areas of application.

The low population density of Josephine County makes it difficult, but not impossible, to support expensive technology investments such as is required for broadband. In addition, history shows rural adoption timelines significantly lag those in urban areas, which slows development of the demand economically necessary to support infrastructure construction. Public-private partnerships are growing in use and should be considered for telecommunications related efforts.

Sustainability and Economic Impact

A successful Digital Village will be self-sustaining and result from a broad-based community effort, and not solely focused on technology per say.

At the end of the day it's true that someone somewhere will have to pay for the infrastructure and its operation. True sustainability (and profitability) will come from payments for use of the infrastructure and services (demand). A thorough answering of the "so what?" question leads to sustainability and profitability as well as realization of the potential of this use of technology. This question must be answered. Effective, efficient and coordinated use of the DV components will result in dollars flowing into the community - the coffers of residents, businesses and local governmental entities will benefit.

Ensure Plans Match Community Needs

Update the Josephine County Telecommunications and Technology Strategic Plan. Form a Community Action Committee with a focus on using telecommunications and other technologies to serve desired community outcomes.

Telecommunications infrastructure is now a critical component of community infrastructure with important implications for economic development and community quality of life. As such it needs to be incorporated into strategic planning efforts for communities. The Plan was last reviewed in January 2001. Much has changed. This would be an excellent first step.

The Plan would serve to coordinate activities on both the demand and supply sides of the equation.

A first action for the CAC could be the preparation of an updated Telecommunications and Technology Strategic Plan to provide a roadmap to desired community outcomes. In addition to updating the Plan this group could serve as a sounding board for community input, work closely with existing providers as well as to recommend community policy and action items. Here is an opportunity for elected officials to tap into the knowledge and willingness of county residents to participate as volunteers in this process.

It is NOT the responsibility of telecommunications providers to do economic and community development planning for your community. However, telecommunications providers must be active participants in this process. This is among the responsibility of the residents and their community leaders. For too long now there has been a tendency to defer on this activity and then to get upset when the private sector's capital plans evolve differently from a desired direction for development by the community. Providers will benefit from having a solid understanding of community needs and direction.

A successful CAC process requires broad engagement of community stakeholders, including:

- Local government
- Basic and non-basic industries
- Schools and colleges
- Libraries
- Public safety
- Healthcare and public health
- Community and economic development
- Volunteer, non-profit, and non-governmental organizations
- Telecommunications providers

Regional Awareness

A Rogue Valley Area Regional Network could be a great asset for the area.

Josephine and Jackson County demonstrate daily that this is one economic region. For this reason it's not too hard to make the leap from a Grants Pass/Josephine County all fiber network infrastructure to a Rogue Valley network. By no means a simple task but well worth evaluating further with a view to the future prospects for economic development and quality of life factors for the region.

More To Do!

Community leaders need to recognize the critical nature of this approach and work together in a collaborative and cooperative manner to help make real what many just talk about.

This study is far from the last step toward additional understanding and for action. Significant additional detailed work and collaboration will be required to achieve the full benefits of a Digital Village (e.g., a detailed engineering plan, additional validation of market potential, community education – especially for small to mid-sized business owners and employees).

This is an achievable goal with the public and private sectors working together. A number of the infrastructure pieces are already falling into place. Yet much remains to be done to achieve their full potential to the community. It's not just up to the telecommunications providers. They do what they do quite well. Now what are we going to do with the tools they've provided?

There's a Win-Win here for all. It will be driven by the degree of cooperation and collaboration practiced across all participating public and private sector entities. The outcome will be measured in economic vitality and continued quality of life improvements throughout the county.

PREFACE

Research and best practices point to the importance of community participation in a Digital Village (AKA: Digital Community) approach, suggesting that this element is perhaps more important than the technology needed to support it. This report provides the context for a Digital Village (DV) as well as a broad presentation of components and alternatives for achieving the outcome.

Experience from working with rural communities, surveys of Josephine County residents and businesses, detailed research of academic papers as well as other sources of best practices indicated the benefits of positioning the business and technical details of a broadband infrastructure in the context of a response to the "so what?" question. As in "so what if you have a 21st century telecommunications infrastructure throughout the county – what are you going to do with it and how will you prepare the population to use it?"

Information in this document comes from many sources. Find them listed in Appendix 9 - References. Detailed footnotes will not be found, as this can be very distracting to the reader. Academic writers may fault this, but then it was not prepared for the academy. Rather the hope is that a wide variety of interests will be served - technologists, educators, businesses, residents, and economic and community developers.

The study was commissioned by the SOTTC (www.sottc.org) and funded through a grant from the Regional Investment Board of Josephine and Jackson counties. The opinions expressed herein are the sole responsibility of the author. These opinions may differ from those of the aforementioned organizations. It is the author's hope that this study will serve as a next step in the discussion toward ensuring that Josephine County is a fully empowered player in the 21st century.

To this project the author brings years of experience researching, developing and applying technologies. This project benefited from previous work with communities across southern Oregon developing strategic plans that integrate telecommunications and other technologies into economic and community development efforts. Service as Chair of the Southern Oregon Rural Initiatives Committee (Southern Oregon Telecommunications and Technology Council) as well as chairing a statewide legislative council, the Oregon Telecommunications Coordinating Council (OTCC – www.ortcc.org) provided the opportunity and personal networking to bring additional insight to the project.

How to read the report
The report is organized around the following topics:

Section	Title	Contents
1	The What and Why of A Digital Village	Definition of a DV, DV response to community needs, components of a DV, DV development tactics
2	The Broadband Market	Assessment from global to national to local. Surveys, analysis
3	Broadband Technologies Descriptions	Descriptions of the key broadband systems and components

By no means is this study the last step toward additional understanding and for action. Significant additional detailed work will be required to achieve the full benefits of a DV. Critical to the success of a DV is the need for the communities to come together to make this a reality.

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SECTION 1 - THE WHAT AND WHY OF A DIGITAL VILLAGE

Digital Village Defined

A Digital Village (DV) and its development refers to the use of information technology (IT) — the combination of computing and telecommunications technologies — in a community to improve productivity and competitiveness, to create economic and social opportunities, and to enhance quality of life. This community-oriented process incorporates technological, individual, and organizational components, and operates via a partnership between community leaders and technology resources.

A DV responds to the needs of the communities and residents of the communities. It is a "virtual" community of people, firms, government agencies, schools, libraries, healthcare providers and other who share telecommunication networks and related services and who use the technologies to link to each other and the broader global information economy. A DV based on the application of an advanced telecommunications infrastructure (i.e., broadband) is a sustainable, environmentally sound strategy to enable the county's economic development and quality of life. Advanced telecommunications infrastructure can help support quality job opportunities and quality of life experiences. It is very important to understand that a DV is much more than simply having a broadband infrastructure in place.

The need to work together has never been greater. This is particularly true when we examine telecommunications networks in communities. Telecommunication networks increasingly seem to be deployed along sectoral lines in education, business, health or law, without regard for the need to develop a shared infrastructure. This is no longer working for urban or larger rural communities with adequate resources, and it is even a less viable strategy in small, resource-poor communities. Coordinated planning among all the potential users of a telecommunications network to share the basic infrastructure spreads the investment cost. The result is the ability to create sustainable services where they are most needed in smaller, more isolated rural communities. Another reason is that grant monies now target community-wide approaches.

Responding To Community Needs

A DV responds to the needs of communities in a number of ways. A few examples follow.

<u>By reducing and eliminating barriers related to the geography of the region</u>

- Reduces the need for travel as business and educational activities can be conducted online without fear of disruption.
- Eliminates barriers to public safety by improving access to and linking of emergency services, public safety and infrastructure agencies, both public and private, into a systematic network for disaster preparedness without fear of disruption.
- Reduces or eliminates cost-prohibitive and logistically unworkable barriers to providing distance learning for workers with families who can learn and take courses at home.

<u>Through addressing the needs of businesses wanting reliable and advanced online capabilities</u>

- Improves opportunities for expanded business and revenue.
- Increases the knowledge and skills of employees in utilizing telecommunications technology.
- Decreases customer dissatisfaction and resulting revenue loss due to inefficiency caused by unreliable technology,
- Broadens the ability of businesses in rural areas to access business support activities via online companies.

- Supports a multitude of tasks - everything from credit card transactions to placing on-line employment ads - with a higher degree of confidence.

By Targeting Key Targeted Industries

- Aids in the recruitment of target industries that are dependent upon the availability of broadband.
- Supports the growth of and retention of target industries using or desiring to use online technology to support or expand operations.

By broadening employment opportunities

- Provides avenues for entrepreneurial activities that may lead to self-sustaining employment. The better the technology the more opportunity for online entrepreneurial success.
- Allows for accessing employment opportunities on a broader scale (regional, state or national).
- Supports training of employees to upgrade computer and telecommunication sills and thus improve their employability through cross training.

By improving health care access and providing health professions support

- Makes available video medical consultation and high-speed record and X-ray transmission
- Allows more reliable and advanced links between health and public safety services, especially important in emergencies.
- Allows for reliable and advanced distance teaming for health care professionals in isolated rural areas.
- Supports the development of and makes available to residents a database of health care resources and health education information.
- Supports funding from outside sources that support rural telemedicine programs/projects, which creates jobs and improves health care access.
- Improves the ability of health care providers to maintain business records, bookkeeping and other services that can be conducted or supported with online businesses.

Through Supporting Education

- Allows cost effective distance learning (students telecommute) in rural areas with up to date telecommunications capabilities.
- Allows sharing of teaching materials, techniques and presentations among educators online.
- If free of disruptions, promotes group collaborative learning through conferences online that can include students and educators from around the world.
- Provides alternative resources for professional development of teachers without spending funds on transportation.
- Extends the hours beyond the normal campus hours of access to information and communication by students, students' families, and faculty, and expands the type of curriculum available.
- Facilitates curriculum coordination between public schools and public libraries.
- Reduces isolation of teachers in rural areas by allowing linkages with other educators in rural and urban settings.
- Experts from other parts of the country can be an interactive part of any classroom when the telecommunications technology is advanced.

By meeting the demands of residents to have online services

- Supports the needs of rural residents to have access to the same information and resources provided to non-rural residents via online resources.
- Increases the ability of residents to engage in entrepreneurial and educational opportunities made available with telecommunications technology.

In supporting efforts to make online technology available to all residents, regardless of income

- Increases access to advanced online technology at home, school or work and within the community (for example, libraries) eliminating information access divisions.
- Lower income residents in low-employment areas will have access to efficient online resources for job seeking within and outside of the area.

By making online telecommunications more accessible to all age groups

- Supports the needs of individuals most likely (by age) to utilize telecommunications online services at home, school or work.
- Supports efforts to train young children and the elderly in the use of online technology.

Advancing How People Within the Communities Access and Exchange Information

- Increases access to local information resources through local libraries.
- Allows public libraries to share electronic databases.
- Connects Fire and Police Departments with other departments for safety and disaster communication.
- Allows online access to publications/newspapers outside of rural areas.
- Allows nonprofit organizations to access funding resources without investing in long distance travel or costly books/publications.
- Links rural communities with other rural communities for the purpose of exchanging strategies addressing a number of rural issues.
- Is an effective marketing tool for products and services for rural business reaching to broader markets.

Public Library Usage

- One way in which information access and exchange can be improved is through better online capabilities that can be provided at public libraries. For low-income families, the elderly, and children, the public library is an easy and cost-free (usually) way to learn about and use online services.
- Eighty-seven percent of school-age children in Oregon use public libraries. This shows the critical role played by public libraries in the lives of school-age children. The usage rate among the adults aged 18 to 64 years was 64%.

The Components of Digital Village Development

The components of DV development are those things that must be developed in order to increase a community's overall productive capacity and quality of life: individuals, organizations, and technologies. Widely available and reasonably priced broadband is only one of the components.

Productivity and quality of life are determined, first and foremost, by the actions and decisions of individuals. Individuals may increase their productivity and quality of life either by improving their personal abilities, or by coordinating with others, each taking on a particular, complementary task or responsibility, resulting in organizations. Technology is a formalized, tangible means of accomplishing a particular task. Technologies are developed and used by individuals, so their value is determined in part by the ability of those individuals. But the value of technologies is also based on the task they perform, and the extent to which that task is linked with others in an organizational context.

One way to look at these components is as a "three-legged stool," illustrated in Figure 1. A community's overall capacity to produce and deliver a high quality of life is a function of the individual capabilities, technological facilities, and organizational capacities that it encompasses. Each "leg" relies on and complements the others. If any one component is under- or over-developed it undermines the value of the others. For example, a community might build a high-speed fiber optic network that runs into every home and business. But if individuals are not capable of using it and organizations don't have the capacity to use it, the network will be under utilized. It will have little value to the community. Thus DV development is maximized when the

three components are balanced. Leadership, by definition, determines where resources go and what gets done, so it is central to digital development, to maintaining its balance by supporting and guiding DV development projects.

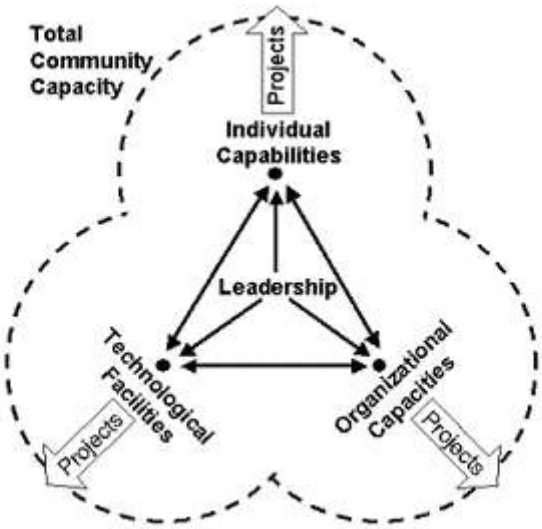


Figure 1. The "three-legged stool" of digital village development. The combination of individual capabilities, technological facilities, and organizational capacities determine a community's overall capacity. Each "leg" of the stool depends on the others for stability. The balance between components is determined by community leadership and achieved via projects.

There are two aspects to each component of DV development, based on the reality that having does not necessarily result in doing. Just because facilities, capabilities, or capacities exist doesn't mean they're used to improve productivity or quality of life. At the most general level, DV development may be discussed in terms of the components a community has, and what it does with them, as "having" and "doing." More specifically, the components of DV development have intrinsic and instrumental characteristics (or variables) that describe what they are and how they boost productivity and quality of life. Technologies may be available, but availability does not necessarily mean that they are used to access information. Individuals may be aware of what's available, but may lack the ability to use it. And, organizations might have an architecture of positions and systems, but that does not mean they produce anything of value.

Generally speaking, DV development occurs whenever someone uses information technology (IT), the combination of computing and telecommunications technology, to increase productive capacity and/or improve quality of life within a community. But such uses often occur in isolation, restricted to a particular individual or organization. Such small-scale DV development has limited impact because it doesn't tap the efficiencies and synergies that are inherent in community. DV development becomes more robust with scale and scope, when a broad set of individuals and organizations, representing the whole community, illustrated in Figure 2, are involved.

DV development is most efficient under such circumstances because numerous entities can often realize benefits from IT implementation for little or no marginal cost. Such an inclusive approach can also be more effective because it may simultaneously address several complementary issues. Finally, this approach is naturally more equitable because it involves all members of a community, or at least their representatives. For example, an organization may develop an electronic resume bank in order to get more or better employees and to, consequently, reduce the cost and improve the effectiveness of its human resources functions. But, that same resume bank may be developed to serve the needs of several organizations for little marginal cost. Also, by banding together, the organizations create a larger pool of opportunities for a broader range of job seekers, making the resume bank more noteworthy, visible, and useful.

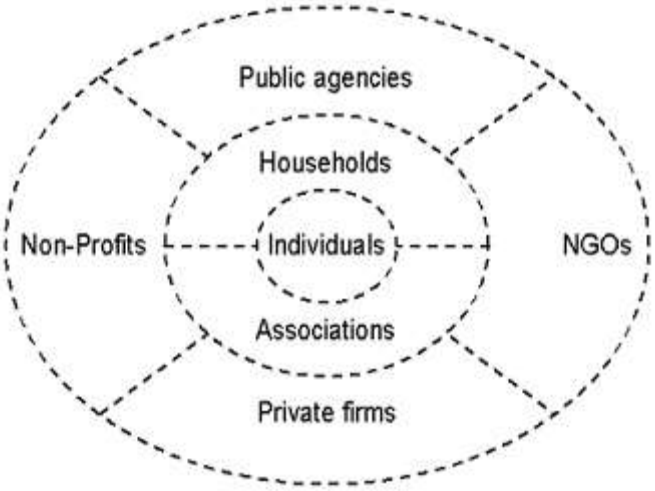


Figure 2. Community sectors may be characterized by level of formal organization, productive outputs, and the extent to which members of each sector respond to political and/or economic forces. In order to achieve balanced and robust digital village development the process should have participants from all sectors and from the various stakeholder groups.

In the discussion about the productive requirements of citizens and firms there often is even less consideration about how stakeholders might work together to meet challenge for such inclusive projects. There is rarely a mechanism for identifying synergies between various organizations. Even in small communities where everyone supposedly knows everyone else's business, there is often little thought to meeting those needs as efficiently and effectively as possible. And, there is even less thought about how IT might be applied to those objectives. Finally, when these things do occur they don't always result in projects that achieve all of the stated goals. But, even when development efforts fall short, if participants gain experience that can be applied to make future efforts more successful, then learning has occurred. Learning is a form of development, and can be considered a benefit in and of its self.

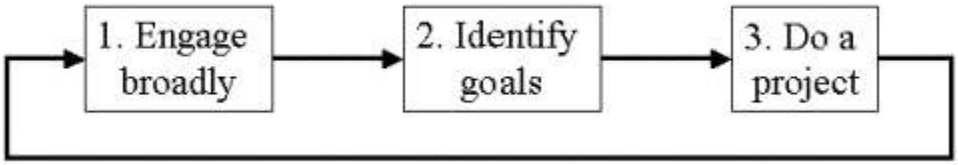


Figure 3. The general process of digital village development involves doing projects that target common or complementary goals of community stakeholders, which can be best identified by broad engagement.

The general process of DV development, as illustrated in Figure 3, begins with broad engagement of community stakeholders—groups and organizations that have a stake in the productive capacity of the community. Broad engagement makes DV development robust because it means the process doesn't rely on a large commitment from any one individual or organization. It also helps to assure that DV development is balanced, and optimizes the efficiency, effectiveness, and equity of the process. Ideally, the process includes representatives of various sectors in the community, illustrated in Figure 2, and/or from various community stakeholders, including:

- Local government
- Basic and non-basic industries
- Schools and colleges
- Libraries
- Public safety

- Healthcare and public health
- Community and economic development
- Volunteer, non-profit, and non-governmental organizations

The next step is to identify the goals of the various stakeholders, and then to choose a tactic. The best tactics are those that address common or complementary goals. For example, schools may have the goal of providing students with real-world applications of math, writing, and other topics, while a goal of Chambers of Commerce is to provide technical assistance to their members. If the students — as they often do — have substantial skills with technology, and the business needs help with technology, then an appropriate tactic may be to create a program in which students and business people cross-train each other. The students help the businesses use technology, and the businesses show students how to calculate and communicate in order to be successful. Note that the technology is not the end in this example, it is the means and the medium by which both the students and the businesses increase their capacity to succeed.

The last, and most crucial, step in the DV development process is doing a project. With this step talk is transformed into action. Without action, DV develop simply does not occur. For example, until we've created a school-business technology partnership, as opposed to just talking about it, we can't reasonably say that it benefited either students or businesspeople! This leap from discussion to action is really what DV development is all about. So how do projects happen; what's the difference between situations where everyone just talks about using IT for development, and situations where it actually happens? Or where someone does something and no one responds, such as setting up a community technology center and having no one use it? The difference is community technology leadership: persons who have a commitment to the community, experience—or at least interest—in technology, and ability to lead projects. As illustrated in the DV development value chain, illustrated in Figure 4, technology leadership largely determines the value of a project, as well as whether the project even occurs.

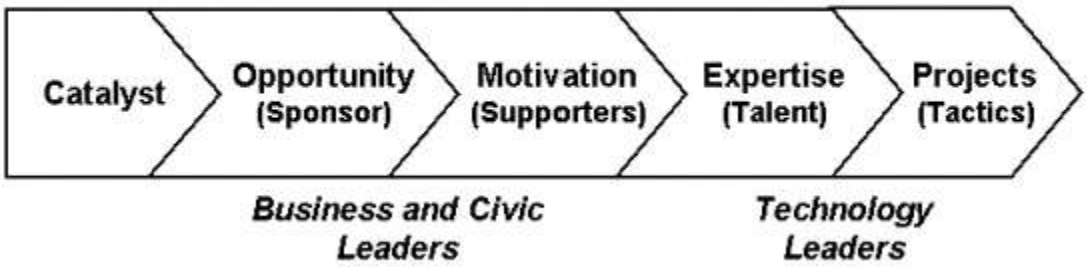


Figure 4. The digital village development value chain shows the roles involved in digital village development and how each role contributes to the value of digital village development projects.

The value chain illustrates how value accrues through leadership roles, for particular assets and activities. In other words, if we're going to invest time and money in using IT for development, how can we maximize the value of, and return on, that investment? The value chain answers this question. The last link in the chain, where the value of DV development is realized, is the project itself. In order to do technology-related projects there must be technical expertise, typically provided by local technology talent. Unfortunately, local technology talent is too often not engaged in community leadership. They may lack either the support or the vision necessary to choose and implement tactics. Also, technologists are often totally consumed with their day-to-day responsibilities and lack the motivation and opportunity to do DV development. The motivation must come from those who employ or otherwise support the technology talent. Specifically, business and civic leaders' role in DV development is to make sure technologists have the time — paid time off from work, ideally — and resources to work on projects. Of course, community leaders can hardly be expected to make this commitment unless they see clear benefit, at reasonable cost, resulting from the projects.

Note that the value chain is not necessarily a sequence, but a visualization of how roles and relationships might be structured in order to maximize digital development. The more value added at each link in the chain, the greater the overall value of the resulting project. DV development can occur without some components of the value chain, and the roles involved in each link may emerge in any order, but the most impact will come from having them all lined up. For example, talent often exists without projects, and there are many erstwhile sponsors pursuing projects with few supporters and little expertise. While technological expertise is needed to conduct projects, leadership is needed to guide them. The digital development value chain could be embodied in a single person, or multiple persons might fulfill various roles along the chain. Each link may add to, multiply, subtract, or divide the total value of digital development.

The value chain suggests roles that various persons may play in doing DV development projects. The combination of sponsors, supporters, and talent working together make up a community's DV development team. The scope and scale of DV development are determined by the extent to which community members take on one or more of these roles, and on how many and how well individuals participate on the DV development team.

Digital Village Development Tactics

DV development tactics are basically blueprints for projects. Tactics are selected based on existing goals, resources, and activities. Tactics may target a particular component, as listed in Table 1. But tactics should not be seen as ends in and of themselves. This is a recipe for failure.

Tactics should be tied to socioeconomic outcomes as explicitly as possible. There are several reasons for this. First, without such linkage there will be scant support for the tactic. The socioeconomic outcomes provide the rationale but also the WIIFM—"what's in it for me"—that motivates people to allocate assets and activities to the tactic.

Second, development is a learning process, which necessarily means the learner is assessing his/her/its knowledge, and socioeconomic outcomes provide a means of doing this.

Finally, tactics, along with socioeconomic circumstances, change over time. For example, there may be a significant population that desires, but cannot afford, a computer, so it may be reasonable to implement a computer purchase or redistribution program. But eventually that demand will be met. What then? Should the program continue indefinitely? Should it become something else?

These questions can only be answered by relating the effort back to the socioeconomic objectives. If the purpose was simply to give people computers, then the program can come to an end. But if the program was to build skills, or improve access to healthcare, or promote civic participation, then other tactics may be appropriate.

Technological Facilities *Availability & Access*	**Individuals Capabilities** *Awareness & Ability*	**Organizational Capacities** *Architecture & Applications*
• Computer purchase or refurbishing program • Free laptops for students • Community technology center • Public ISP (freenet) • Wireless Internet zones • Community owned/managed infrastructure • New product trials	• Basic computer literacy training • Business mentoring program • Web fair • Technology demo sites • IT professional mentoring • Technology presentations • In-home support • Software selection assistance • Internet promoter	• Public email • Web site for civic groups • Electronic collaboration (groupware, workflow, etc.) • Electronic newsletters • Community portal • Web-based calendars • Web-based conference area/ town commons • Community history base/ archival record • On-line volunteer database

Table 1. Digital village development tactics can be categorized by the components they enhance. Some tactics lend themselves to, or are complementary to, multiple components. Tactics can be combined or tailored to achieve particular goals. Some tactics may need to precede others due to predication.

It may go without saying, but DV development tactics can be difficult to replicate. This in spite of the fact that many of these tactics require very low real asset commitments, i.e., they don't cost a lot to do. But replication of tactics inevitably requires organization and knowledge. Every community is replicating learning that has occurred somewhere else when they implement these tactics. And, because every community is different, the rationale, the implementation process, the tactic itself, and the eventual outcomes will be different. Many communities typically don't have a complete or robust DV development value chain in place, and therefore don't have adequate capacity to do DV development, which is the source of the old "chicken or egg" paradox: you can't use IT if you don't have it, but if you don't use it you can't get it. One of the ways to address this is to provide an optimal amount of information about each tactic: enough so that a reasonably motivated and intelligent individual can instigate them, but not so much that the tactic becomes inflexible and difficult to adapt.

The tactics in Table 1 are "project" tactics, because they are amenable to being made tangible as projects - identifying a need, developing a plan, and implementing it. Tactics are categorized by the components that are primarily developed when they are implemented as projects. Tactics inevitably touch components of all three types, but typically focus on a particular level, on establishing a particular "having" component and developing a consequent "doing" component. Project tactics can be described in terms of the IT-related components involved and the hypothetical or desired result, the socioeconomic rationale for the project. In order to effectively replicate the tactic, those involved in implementing it also need to know the sequence of tasks, or action plan, for the tactic, and need to have some idea of time and resource commitments required to make it successful, given the scale on which they wish to implement it.

It may be unnecessary, or even detrimental, to provide too much information. The sponsors, supporters, and talent involved should effectively be required to get creative and be discouraged from trying to take a cookie-cutter approach. Again, every community is different, so the underlying socioeconomic rationale and the actual instance of the tactic will be different. Tactics can be distilled down to their benefits, activities, and costs without necessarily detailing exactly how they were implemented in other places. Those details may be irrelevant and even counterproductive. The tactic should provide just enough information to show the potential socioeconomic benefits, provide a general roadmap for implementation as a project, and spark the imagination. (See Appendix 8 – Community Development Resources Centers for a more comprehensive view).

SECTION 2 - THE BROADBAND MARKET

Broadband Overview

Broadband - high-speed, always-on Internet connectivity – represents the next phase in the evolution of the Internet. Most experts predict broadband will enable applications and services that transform our economy, education, health-care, R&D, homeland security, military effectiveness, entertainment, government and the quality of life for citizens around the world. The deployment and usage of broadband will significantly impact the global competitiveness of nations and businesses in the future. Not surprisingly, many nations, states, cities and communities are trying to accelerate the deployment and usage of broadband networks. To date, these efforts have predominantly focused on the supply side – promoting infrastructure build-out and determining appropriate competition and regulatory policies. Since the primary role of government economic policy is to set an environment that encourages capital formation, rewards risk and encourages competition, investment and innovation, supply side inquiries remain vitally important. Supply side decisions are also critical because we'll need significant upgrades of existing network infrastructure to supply the last mile bandwidth required for advanced applications – today's broadband will be tomorrow's traffic jam, and the need for speed will persist as new applications and services gobble up existing bandwidth.

It is also important and appropriate to consider the demand side – factors impacting business and consumer uptake. Demand for broadband is robust, although as with most new technologies, broadband supply currently exceeds demand (in all but the most rural markets). There are several factors that impact the robustness of demand. For consumers these include concerns over cost; disappointment with the quality and types of content available, especially lack of movies, music and local information; inadequate customer support and lack of plug-and-play consumer premises equipment; and lack of confidence in the Internet due to security and privacy concerns. For businesses, barriers to greater broadband demand stem from price concerns (exacerbated by economic uncertainty); lack of access to DSL or cable; failure to perceive the returns on investment in broadband; lack of understanding about how to implement broadband business solutions that make sense for company strategy; and concerns over security and other legal uncertainties.

The factor most likely to accelerate broadband demand is the creation and deployment of easily understood, value-adding business and consumer applications at prices that meet the needs of the market. New applications and services that consumers want and businesses need will provide the tipping point for broadband demand and usage. At the same time federal, state and local leaders can take steps to accelerate broadband demand. For broadband, the sky is the limit and it is not falling yet. Nevertheless, actions to accelerate demand are justified and valuable.

Demand side factors – ready availability of easily understood, value-adding business and consumer applications at reasonable prices – are critical determinants of the pace with which broadband is adopted and merit greater attention. Wildly popular services and applications drove adoption of earlier technologies, and they will be the key to accelerating broadband deployment as well.

Of course this is not to suggest that there are not significant supply-side questions that need to be considered carefully. Regulatory considerations have impacted investment, competition and innovation in the telecommunications industry for most of the 20th century and there are very important questions that need to be resolved across all platforms to promote ubiquitous broadband availability, needed infrastructure upgrades and a competitive broadband market.

Old knowledge tells us that strategic demand for any innovation must exist before it will be deployed successfully. This is not a newly discovered phenomenon. Strategic demand, not conditions of supply, is the major determinant of both technological change and economic growth.

In other words, you can build it and they still may not come, unless economic conditions are right. Demand is critical to successful deployment.

Our ability to remain competitive in a global technology-using economy will depend upon a variety of factors including:

- Our ability to attract, retain, and educate the best and brightest scientists and technologists;
- Our support for world-class R&D and innovation in the public and private sectors;
- Our success in fostering a business environment that rewards risk and encourages entrepreneurship; and
- Our ability to maintain a world-class information infrastructure.

With respect to this last point – maintaining a world-class information infrastructure – there may be no element more critical today than ubiquitous and affordable high-speed Internet – broadband. The deployment and usage of broadband networks will significantly impact the global competitiveness of nations and businesses in the 21st Century.

Data On High-Speed Services For Internet Access in the World

Global DSL subscriptions nearly doubled during 2002, from 18.8 million to 35.9 million, with further growth to 60 million lines by the end of 2003. The momentum is well underway, as research showed an increase of 10.3 million lines during the second half of 2002 — roughly 3.3 million more than the first six months of the year.

For the first time since 2001, the U.S. has exceeded South Korea in the number of DSL subscribers, but the U.S. falls to 18th place in terms of penetration, largely due to the 11 million cable modems that are deployed in the U.S. In addition to the U.S., Canada, Austria, the Netherlands, and the UK have more cable modems in have more cable modems than DSL

South Korea won't remain in 2nd place for long as South Korea's broadband market is likely to become saturated during 2003, and Japan will usurp its rank.

Some smaller countries also have high levels of DSL penetration, notably Iceland, with 6.9 DSL lines per 100 people. Estonia is by far the most DSL-advanced country in Eastern Europe with 2.24 lines per 100 people.

The UK, France, Finland and Switzerland all saw similar percentage growth in DSL during second half of the year, while Chile, Israel and Australia all increased their DSL lines by about 70 percent in the same period.

Top Ten Countries for Growth in DSL lines (second half of 2002)

Country	Growth
China	214%
UK	89.3%
France	86.9%
Finland	82.5%
Switzerland	77.9%
Israel	72.4%
Chile	71.4%
Japan	70.9%
Australia	70.5%
Netherlands	69.6%

Note: only countries with over 100,000 DSL lines are listed here.
Source: Point-Topic

Millions of DSL Lines

Asia-Pacific	14.5 million
Western Europe	9.4 million
North America	8.2 million
South & East Asia	2.7 million
Rest of the World	1.1 million

Source: Point-Topic

Based on data from the World Factbook 2002, Internet penetration in the United States and Canada is roughly 58 percent. This figures represents more than 182 million users between the two countries.

Of the 165.75 million U.S. users, 122.43 million are estimated to be "active," according to March 2003 data from Nielsen//NetRatings. Nielsen//NetRatings defines active users as the number of people that actually go online in a given month.

Canada and U.S. Internet Usage

	Population	**Internet Users**	**Penetration**	**ISPs**
Canada	31,902,268	16,840,000	53%	760
United States	280,562,489	165,750,000	59%	7,000
TOTAL	**312,464,757**	**182,590,000**	**58%**	**7,760**

Source: Nielsen//NetRatings

Data On High-Speed Services For Internet Access in the U.S.

- High-speed lines connecting homes and businesses to the Internet increased by 27% during the first half of 2002, from 12.8 million to 16.2 million lines, compared to a 33% increase, from 9.6 million to 12.8 million lines, during the second half of 2001.
- Of the 16.2 million high-speed lines in service at the end of June 2002, 14.0 million served residential and small business subscribers, a 27% increase from the 11.0 million residential and small business high-speed lines reported six months earlier.
- Of those 16.2 million high-speed lines, 10.4 million provided advanced services, i.e., services at speeds exceeding 200 kbps in both directions. Advanced services lines increased 41%, from 7.4 million to 10.4 million lines, during the first half of 2002. About 8.7 million of the 10.4 million advanced services lines served residential and small business subscribers.
- At the end of June 2002, the presence of high-speed service subscribers was reported in all 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands, and in 84% of the nation's zip codes, compared to 79% six months earlier.
- High-speed asymmetric DSL (ADSL) lines in service increased by 29% during the first half of 2002, from 3.9 million to 5.1 million lines, compared to a 47% increase, from nearly 2.7 million to 3.9 million lines, during the preceding six months.
- High-speed service over coaxial cable systems (cable modem service) increased by 30% during the first six months of 2002, from 7.1 million to 9.2 million lines. By comparison, cable modem service increased by 36%, from nearly 5.2 million to 7.1 million lines, during the second half of 2001.
- High-speed service subscribers were reported present in 99% of the most densely populated decile of zip codes at the end of June 2002, compared to 98% a year earlier, and in 50% of the least densely populated decile, compared to 37% a year earlier.
- For zip codes ranked by median household income, high-speed subscribers were reported present in 98% of the top one-tenth of zip codes and in 69% of the

bottom one-tenth of zip codes at the end of June 2002. The comparable figures a year earlier were 96% and 59%.

While the United States has the largest total number of Internet users, broadband users, businesses online, and e-commerce transactions (both B2B and B2C, both by volume and value), other nations are gaining ground fast.

In the U.S., deployment of the current generation of broadband appears by most estimates to be proceeding rapidly, especially in urban areas. Broadband uptake among U.S. households has also been growing very rapidly, fueled by robust demand. Broadband uptake among U.S. businesses also appears to be robust.

It is important to note here that the current generation of broadband technologies (cable and DSL) may prove woefully insufficient to carry many of the advanced applications driving future demand. Today's broadband will be tomorrow's traffic jam, and the need for speed will persist as new applications and services gobble up existing bandwidth. While long-haul data transport capacity exploded in the 1990s, last-mile capacity upgrades have proceeded much more slowly. Estimates for new investments needed to build out a significantly more robust and capable national broadband Internet range from $100 billion conservatively estimated by the National Research Council to $200 billion according to Bear Stearns, to more. Regulatory certainty, reasonable returns on investment and long-term competitive markets are all going to be necessary if the private sector is going to make these investments and deploy the next generation networks.

Broadband Demand Among Consumers

Cost

The most obvious factor limiting broadband demand today is cost. An August 2002 survey by Yankee Group asking dial-up consumers why they were not upgrading to broadband networks found 72% of respondents complaining broadband was "too expensive." Many consumers fail to see the value proposition for investing in broadband, considering it a luxury they cannot afford or not yet worth the $45-$55 per month investment. Some consumers believe that broadband is a workplace technology with little value outside the office (and little interest in bringing work home).

These sentiments appear to be exacerbated by concerns over price instability – 91% of all broadband providers (that did not go bankrupt in 2001) *increased* price since the beginning of 2001, by an average of 11.4% for DSL and 16% for cable. Remember too that roughly 40% of Americans have not yet seen the value proposition for subscribing to any Internet service, while almost 75% of dial- up Internet users in the U.S. reported being content with the quality of the service they use in a 2001 Parks Associates Survey.

Content

A majority of consumers will sign up for broadband when value-adding applications and services are readily available, easily understood, and offered at reasonable prices. Wildly popular services and applications ("killer apps") drove adoption of earlier technologies – e.g., fax machine (legal fax signatures), the PC (spreadsheets), and the dial-up Internet (email, web browser) – and they will be the key to accelerating broadband deployment as well. The good news is that, for consumers, we already know some of these killer apps. Right now the most significant driver for consumer broadband adoption has been telework – the ability for consumers to work from home more readily[15]. According to In-Stat/MDR, more than 60% of the US workforce is in remote locations, an enormous potential source for future broadband teleworkers.

In a 2002 poll, the Winston Group found:

- 54% of Americans believe teleworking will improve the quality of their lives,
- 66% believe telecommuting would help them strike a better work/life balance, and

- A third of Americans would even forego a pay rise in order to work from home.

Convenience
Stories of dissatisfaction with service providers are legion, with some complaining that companies make you wait at home all day or require multiple trips to install the technology effectively. These inconveniences appear to influence narrowband consumers' decisions to not adopt broadband, and broadband consumers' spending decisions. In a 2002 study commissioned by Motive Communications:

- 51% of respondents using broadband claimed that they had encountered problems with service and support, such as having to contact a provider multiple times to get a problem solved or unacceptable delays in support.
- 90% of US broadband users said they didn't have enough confidence to purchase additional services from their current provider.

Confidence
Consumers are concerned about privacy, security, SPAM and unsavory online locations – the dark side of the Net.

- (According to the Progress and Freedom Foundation), a June 2002 study from Jupiter Media Metrix indicated that almost 70% of US consumers worry that their privacy is at risk online. *(Jupiter Research, Jun. 3, 2002).*
- Consumer fears over security – including identity theft, hackers, fraud-artists and viruses – are even more pronounced. A July 2002 Gartner Research study found that 30% of those currently using the Web to shop on a regular basis said they would stop using the Internet for purchases if they lost $25 [to fraud], while 58% of non-regular Internet shoppers said that a loss of less than $25 would keep them from purchasing anything else on the Web. *(eCommerce Times reporting Gartner, Aug. 2002).*
- Consumers are likewise deterred from greater Internet use by difficulties escaping the unsavory side of the Internet, including pornographic materials. Unsolicited email from adult-oriented Web sites increased 450% from June 2001 to June 2002 according to Cyber Atlas, and the omnipresence of porn sites keeps some folks off the Internet entirely. *(Cyber Atlas, July 3, 2002).*
- The Radicati Group estimates SPAM now represents more than a third of all email sent. *(eCommerce Times, Sept. 11, 2002).*

Broadband Demand Among Businesses

As with consumers, businesses in the U.S. are steadily signing up for high-speed access and implementing broadband business solutions. Many businesses are using broadband to improve business processes or achieve efficiencies. Others are migrating to Internet-based systems to remain part of the supply chain of larger organizations that have moved their procurement systems online (such as automotive companies and retailer Wal-Mart). Telecommuting is driving significant business upgrades to broadband as businesses look for secure solutions to link remote offices and increasingly mobile workers. Yet as with consumers, several factors limit the pace with which companies are upgrading to broadband.

Many businesses – especially small businesses – don't understand or appreciate what high-speed Internet access is or what broadband applications can do for them. In survey released in September 2002, TPG / eCom Ohio asked a cross section of U.S. businesses using dial- up Internet why they did not use broadband. The results:

- 29% reported no high speed service was available
- 23% said service was too expensive
- 21% suggested they were happy with their current access
- 13% reported they were not interested enough

- 8% said they never thought of it
- 3% said they had not gotten around to it
- 1% offered miscellaneous answers

This same survey asked businesses about how they perceived the impact of Internet use on revenues and productivity:

- 64% of businesses predicted "no increase" in revenues
- 43% expected no increase in productivity

Companies often:

- Fail to see the return on investment (value proposition) for broadband upgrades, especially in a challenging business environment.
- Fear they lack skilled experts at the firm to manage the networks and run the applications.
- Need more strategic advice from their suppliers.
- Lack management commitment to the Internet as a key part of the business strategy.
- Don't perceive demand among their consumer base.
- Are concerned about security, privacy and other legal considerations.

More Market Realities – CLEC's

Cable Multiple Systems Operators (MSOs) and telecommunications companies continue to consolidate and severely cutback capital spending. Competitive Local Exchange Carriers (CLECs) remain heavily reliant on incumbent LEC loops and transport, particularly high capacity facilities. While nationally CLECs have made substantial investments in network infrastructure ($56 billion through 2001), this has not translated into a large number of local loop facilities. Most CLEC fiber facilities are long haul, intercity facilities instead of loops to customer premises. The availability and ubiquity of loop facilities, including high capacity facilities, has not increased significantly since 1999.

CLEC fiber only connects to about 3% to 5% of the nation's commercial office buildings (about 30,000 buildings). Most of these buildings are carrier hotels, ISP POPs, and very large office buildings where there is demand for several DS-3s or OC-n circuits. Thus, service to these buildings is not an indication of the general availability of CLEC facilities, including high capacity facilities.

There are a number of factors that impair the ability of CLECs to self-provision loops: high cost of deployment, and closing of capital markets. Many of the CLECs that fueled the late-1990's fiber construction are now in financial distress, or have declared bankruptcy. Those CLECs that have survived are finding it harder to get financing to continue deployment of their networks.

CLEC's have other hurdles such as right-of-way and building access issues. Often CLECs are forced to use incumbent LEC special access services, which are priced well above UNE rates; they also endure protracted provisioning delays for such facilities because they have no alternative. Incumbent LECs have no incentive to aid retail competitors who are viewed as competitors, and taking market share. Incumbent LECs have the incentive to leverage their legacy network facilities and legacy, high-margin services. Thus, without competitive pressure, they have reduced incentives to deploy lower cost, higher capacity services, particularly where those services would risk eroding the high revenues obtained from existing broadband customers.

Federal Legal Developments

The FCC's legal rules affecting broadband continue to be marked by uncertainty. The law treats different communications technologies (wireline, cable, satellite, wireless) differently. Some are

essentially unregulated, the FCC regulates some, and municipalities regulate others. Because broadband services (1) can deliver data, voice, video, and Internet access quickly and efficiently; (2) can be provided over a variety of facilities and technologies (copper or fiber optic lines, cable, wireless, free-space optical, or satellite); and (3) use some different equipment than traditional telephony (e.g., packet v. circuit switches), they are difficult for regulators to categorize.

Broadband deployment issues also are caught up in other telecommunications regulatory proceedings, for example:

- UNBUNDLING – Should the FCC require the unbundling of broadband facilities?
- UNIVERSAL SERVICE – Will the use of broadband undermine the traditional services that fund universal service? If so, how should universal service be funded in the future? Should broadband be required to contribute? Should broadband services be supported by universal service? If so, which providers should get the support, entities that provide only broadband services or only entities that provide broadband in conjunction with basic telephone services?
- REGULATORY JURISDICTION – Should broadband be deregulated? Even if there is an absence of effective competition? If it should be regulated, by whom (the FCC or state PUCs)? If cable provides broadband services, should they be regulated by municipalities as the cable TV services are? Should all broadband services be regulated in the same way and subject to the same rules, regardless of the provider or the technology used?

There remains to be considerable uncertainty about whether the final outcome will result in regulatory parity among the different technologies. It is also uncertain whether the outcome will allow for *intramodal* (within a technology platform) or only *intermodal* (between different technology platforms) competition.

The FCC determined that cable modem service (high speed Internet access through a cable system) should be classified as an interstate *information* service, as opposed to a *telecommunications* service or a *cable* service, for regulatory purposes (Order issued on March 15, 2002). Under the Telecom Act, an "information service" includes "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications." 47 U.S.C. §153(20).

Because cable modem service is an information service, the FCC concluded that Title II of the Act and the FCC's *Computer II* and *Computer III* rules do not impose any open access requirement on cable companies (i.e., the obligation to provide ISPs with access to the cable company's subscribers through its cable modem service). To the extent a cable company voluntarily provides a stand-alone telecommunications offering to an independent ISP as part of providing cable modem service, that relationship is one of *private carriage*, not common carriage, under the Act, and not a telecommunications service.

The FCC initiated a further rulemaking proceeding to consider whether it should exercise its ancillary authority under Title I of the Act to impose open access or other regulatory requirements on cable modem service, and what role, if any, is left to the States in this regulatory regime. The Order is on appeal to the 9th Circuit Court of Appeals (which previously ruled in *AT&T v. City of Portland*, 216 F.3d 871, 878 (9th Cir. 2000), that cable modem service was a telecommunications service. As a result of FCC proposals, do local governments have any role left in the regulation broadband services?

The FCC tentatively concluded that wireline broadband service (i.e., service delivered over telephone company wireline facilities) should be considered an information service, not a telecommunications service. This ruling raises a number of questions, for example:

- Do the open access rules of Computer II and Computer III govern the obligations of incumbent LECs who themselves offer broadband Internet access? i.e., must these

incumbents continue to offer telecommunications inputs needed by unaffiliated ISPs to reach the LEC subscribers? Or, should such relationships be left to private ordering or some other regulatory approach?

- Should incumbent LECs that self-provision the transmission component of an internet access service, and do not offer the transmission component separately to other ISPs, be relieved of all Title II obligations, including the unbundling and interconnection requirements of Section 252 of the Act, with respect to the facilities used in providing that service?
- Should an incumbent LEC's relationships with unaffiliated ISPs be considered private carriage, and not common carriage, and thus not subject to Title II?
- Should wireline broadband service providers be required to contribute to universal service support programs?

Actual Impact On Regional Economic Growth

Because broadband technologies are so new (and continue to evolve), there are no definitive studies of their actual impact on regional economic growth and tech- led economic development. Of course that never prevents economists and technologists from speculating or estimating. Specific regional economic development benefits anticipated as a result of greater broadband deployment and usage include:

- Job creation and retention. Broadband availability allows local businesses to remain competitive, operate more efficiently, and access more consumers more quickly and thus grow faster. Smaller manufacturers need access to high-speed networks to remain part of the supply chain of larger players.
- Reduced traffic congestion and automotive pollution through increased telecommuting.
- More successful industrial growth, recruitment and retention. Information businesses can start and locate anywhere they want, and they tend to look for areas with educated workforces, advanced infrastructures and high quality of life. Knowledge workers expect and require advanced telecommunications infrastructure.
- Improved K-12 education systems. We have just begun to scratch the surface of technology-based improvements to education and have miles to go. Today's children are oft en immersed in digital technologies their entire lives *except* when they're at school, where technology is inadequately used. Integrated into learning by trained teachers, broadband connections can improve education for students.
- Increased start-up and entrepreneurial activities. The Internet enables entrepreneurship, facilitates networking critical to funding start- ups and encourages rapid tech-led economic growth, with broadband empowering smaller players to compete against larger and more established companies.
- Urban core revitalization. In cities around the nation, broadband-enabled cyber districts are transforming large blocks of formerly empty warehousing and manufacturing space into highly sought-after post- industrial hubs. For example, Pittsburgh has turned former steel plants into Digital Greenhouses and research centers incubating new companies and technologies.
- Improved government efficiencies and service delivery through e-government.

Actions By State and Local Governments

States and localities around the U.S. can take steps to promote broadband demand. Some of these initiatives include:

- Considering Bandwidth when addressing issues such as rights of way, taxes and application fees, tower siting, zoning, building and construction codes, building access, franchise agreements, historic preservation and environmental protections.

- Aggregating Demand to incent carrier deployment, as is being done by entities such as Berkshire Connect in New England.
- Educating Citizens and Businesses.
- Deploying eGovernment.
- Removing Non-Telecom Barriers to Killer Apps.
- Offering Regional Broadband Planning Assistance.
- Encouraging Experiments (e.g. Fiber-To-The-Home New Builds).

Actions By Business Leaders

Industry trade associations and business leaders can take steps to promote broadband demand. Such efforts include, among other things:

- Promoting business and consumer understanding.
- Forging partnerships between broadband creators and business users.
- Improving security and protecting privacy.
- Expanding partnerships among educators and researchers.
- Encouraging and supporting telework.

A Long Road Ahead.

There are myriad ways in which broadband can, or is predicted to, transform the economy, education, health-care, R&D, homeland security, the military, and the quality of life for seniors and those with disabilities, among others. These possibilities make clear that there is no shortage of "killer" applications in the pipeline, and their impacts are likely to be very significant. As these services and applications become available, they will drive broadband and justify the investment for citizens, businesses and governments.

It is worth observing that broadband alone has minimal impact. Businesses simply switching to high-speed access will not suddenly save millions of dollars or begin producing more competitive goods or services. Likewise, consumers should not expect instantly better lives or more fulfilling relationships just because they signed up for broadband.

Broadband is an incredible *enabling* technology. It allows businesses that are willing to embrace Internet business solutions to transform business processes and realize significant returns on investment. It offers consumers new opportunities to work or learn more productively (at their desks or from home), publish multimedia, switch from viewers of entertainment to participants, and – most importantly – dramatically expand their communication possibilities. But these transformations are not always plug and-play solutions – they often take work and effort. That said, the following broadband-enabled applications should ensure widespread deployment and justify efforts to stimulate growth.

Economists are already predicting significant macroeconomic benefits from the proliferation of broadband networks. It is believed that widespread broadband usage can extend the IT revolution and further improve national and regional productivity, helping to promote robust economic growth and increase our standard of living.

- Using a robust, nationwide network will expand U.S. employment by an estimated 1.2 million new and permanent jobs. These jobs include direct labor associated with deploying and maintaining broadband investment, direct labor associated with manufacturing the infrastructure components and consumer premises equipment, and indirect labor associated with creating services and applications that would ride on advanced networks.
- Experts identify broadband as *the* critical element enabling applications that transform business processes, such as supply chain management, customer relations management, telework, collaboration, virtual manufacturing, e-learning, and video conferencing.

- IT professionals report the top five broadband benefits as:
    - o Improved productivity (78%)
    - o Faster desktop access (76%)
    - o Ability to handle data- intensive applications (57%)
    - o Ability to handle more users (53%)
    - o Ability to handle multimedia (51%)

For broadband, the sky is the limit. New applications and services that consumers want and businesses need will provide the tipping point for broadband demand and usage, especially continued improvements in communications applications. However, success in sustaining the Internet revolution as it moves from dial- up to mid-band to truly high-speed broadband will benefit from concerted effort and partnerships among federal, state, and local government as well as business leaders. We must ensure an environment that encourages capital formation and rewards risk – we need to let the innovators innovate, and the entrepreneurs create jobs, companies and growth.

The telecommunications sector is particularly desperate to see accelerated broadband deployment and usage. Telecom is mired in a serious downturn that some analysts blame for over 500,000 jobs lost and $2 trillion in evaporated market capitalization, with broadband the only "bright spot" according to the *Wall Street Journal*. The sector suffers from extraordinary debt overhang – debts grew 165% while revenues grew just 50% from 1996-2000, according to the Precursor Group. Likewise, new wire less and data services are squeezing traditional carriers' profit margins, while cautious VC and financial markets are virtually closed to telecom companies due to fears following the bubble and the WorldCom, Global Crossing, Tyco, Adelphia, and other scandals. And telecom and telecom equipment makers also suffer from extraordinary excess capacity, particularly following the boom and bubble of the late 1990s. Large service providers are focusing on operations and provisioning systems. Streamlining their software platforms and reducing operational expense is crucial to the recovery of the industry. The implication is for slowed growth in infrastructure builds for the foreseeable future.

Josephine County Profile

The communities included in this profile cover 1,640 sq. miles, and have a population of 75,726. While half of the county residents reside along the I-5 corridor, the remaining residents are dispersed over miles of mountainous, remote areas, creating physical isolation of whole communities. In addition to the barrier of distance, other factors challenge the economy and delivery of services. Josephine County is listed as a distressed county in Oregon. Population growth is on par with Oregon as a whole at 20%. The actual unemployment rate ranges between 8 and 11 percent (maybe even higher) and the income per person is just $19,862, almost the lowest in Oregon. More than 28% of Josephine County's children live below the poverty level, 58% of children in the community are eligible for free or reduced school lunch, households with persons under 18 is over 29%, over 18% of residents are below the poverty level, and 20% of its residents are over the age of 65. Seventy-five percent of Josephine County has been designated as Enterprise and Champion Communities, reflecting both its poverty and seriously underserved population.

The Josephine County rurality - along with its lack of telecommunications infrastructure, sparse population and poor economy - provides scant economic incentive to attract either industry or commerce to this distressed area. The challenge faced by community leadership is to bring long-term "vision" into "reality". Progress will be made in the short-term by providing reasonably priced access to the global information network to all residents; and by using information age technology both to provide cost-effective and quality services and to build a more viable economic base that draws upon the natural beauty, the opportunity for tourism, the commercial development of existing industries, and the recruitment of new business to this expansive region.

People QuickFacts	Josephine County	Oregon
Population, 2000	75,726	3,421,399
Population, percent change, 1990 to 2000	20.9%	20.4%
Persons under 5 years old, percent, 2000	5.3%	6.5%
Persons under 18 years old, percent, 2000	23.1%	24.7%
Persons 65 years old and over, percent, 2000	20.1%	12.8%
White persons, percent, 2000 (a)	93.9%	86.6%
Black or African American persons, percent, 2000 (a)	0.3%	1.6%
American Indian and Alaska Native persons, percent, 2000 (a)	1.3%	1.3%
Asian persons, percent, 2000 (a)	0.6%	3.0%
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	0.1%	0.2%
Persons reporting some other race, percent, 2000 (a)	1.2%	4.2%
Persons reporting two or more races, percent, 2000	2.7%	3.1%
Female persons, percent, 2000	51.4%	50.4%
Persons of Hispanic or Latino origin, percent, 2000 (b)	4.3%	8.0%
White persons, not of Hispanic/Latino origin, percent, 2000	91.4%	83.5%
High school graduates, persons 25 years and over, 1990	32,680	1,511,760
College graduates, persons 25 years and over, 1990	5,224	382,171
Housing units, 2000	33,239	1,452,709
Homeownership rate, 2000	70.1%	64.3%
Households, 2000	31,000	1,333,723
Persons per household, 2000	2.41	2.51
Households with persons under 18, percent, 2000	29.8%	33.4%
Median household money income, 1997 model-based estimate	$26,988	$37,284
Persons below poverty, percent, 1997 model-based estimate	18.7%	11.6%
Children below poverty, percent, 1997 model-based estimate	28.5%	16.3%

Business QuickFacts	Josephine County	Oregon
Private nonfarm establishments, 1999	1,861	99,945
Private nonfarm employment, 1999	17,326	1,332,403
Private nonfarm employment, percent change 1990-1999	13.9%	31.0%
Nonemployer establishments, 1998	5,236	209,844
Manufacturers shipments, 1997 ($1000)	439,641	47,665,990
Retail sales, 1997 ($1000)	590,258	33,396,849

Retail sales per capita, 1997	$8,065	$10,297
Minority-owned firms, percent of total, 1997	6.0%	6.2%
Women-owned firms, percent of total, 1997	24.8%	27.6%
Housing units authorized by building permits, 2000	424	19,877[1]
Federal funds and grants, 2000 ($1000)	392,285	16,552,889
Local government employment - full-time equivalent, 1997	2,220	117,999

Geography QuickFacts	**Josephine County**	**Oregon**
Land area, 2000 (square miles)	1,640	95,997
Persons per square mile, 2000	46.2	35.6
Metropolitan Area	None	

1: Includes data not distributed by county.
(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.
FN: Footnote on this item for this area in place of data
NA: Not available
D: Suppressed to avoid disclosure of confidential information
X: Not applicable
S: Suppressed; does not meet publication standards
Z: Value greater than zero but less than half unit of measure shown
F: Fewer than 100 firms

Josephine County Economic Indicators	1994	1995	1996	1997	1998	1999
Population	68,100	71,100	72,000	73,000	73,000	73,400
Labor Force	28,600	28,190	28,900	28,720	28,680	29,116
Total Employment	25,990	25,830	26,030	26,010	26,190	26,681
Unemployment	2,610	2,360	2,870	2,710	2,490	2,435
Unemployment Rate (%)	9.1	8.4	9.9	9.4	8.7	8.4
Non-Farm Payroll Employment	19,680	20,010	20,360	20,870	21,190	N/A
Total Covered Employment	19,244	19,502	19,769	20,516	20,823	21,730
Total Covered Payroll ($ thousands)	366,222	385,112	409,119	440,497	463,425	N/A
Average Annual Payroll Per Employee ($)	19,030	19,747	20,695	21,471	22,255	23,156
Number of Business Units	1,765	1,808	1,812	1,898	1,941	1,973
Total Personal Income ($ thousands)	1,145	1,240	1,313	1,361	1,473	N/A
Annual Per Capita Personal Income ($)	16,523	17,407	18,183	18,574	19,862	N/A
Assessed Value of Property ($ millions)	3,094	3,332	3,385	3,555	3,386	3,881
Residential Construction Building Permits--- Value ($ thousands)---	629 46,463	401 35,065	330 32,495	335 33,948	N/A	N/A
Travel Expenditures ($ thousands)	65,190	69,360	70,960	70,580	N/A	N/A
Travel-Related Employment	1,068	1,103	1,083	1,051	N/A	N/A

N/A -- Data is not yet available.

Oregon State Economic Indicators	1996	1997	1998	1999	2000	2001
Population	3,181,000	3,217,000	3,267,550	3,306,000	3,421,399	3,471,700
Labor Force	1,720,000	1,732,000	1,762,000	1,761,000	1,802,938	1,793,773
Total Employment	1,618,000	1,631,000	1,664,000	1,660,080	1,715,453	1,679,914
Unemployment	102,000	101,000	98,000	100,360	87,485	113,859
Unemployment Rate (%)	5.9	5.8	5.6	5.7	4.9	6.3
Non-Farm Payroll Employment	1,475,000	1,525,000	1,557,000	1,575,100	1,606,800	1,596,100
Total Covered Employment	1,466,126	1,522,053	1,550,148	1,577,666	1,607,911	N/A
Total Covered Payroll ($ millions)	39,654	43,237	45,804	48,698	52,701	N/A
Average Annual Payroll Per Employee ($)	27,046	28,407	29,548	30,867	32,776	N/A
Number of Business Units	102,005	107,816	111,215	111,047	108,432	N/A
Total Personal Income ($ millions)	73,871	79,120	77,579	85,800	94,999	98,500
Annual Per Capita Personal Income ($)	23,111	24,393	23,920	26,000	27,649	28,400

Assessed Value of Property ($ millions)	190,154	166,447	176,089	186,642	198,911	N/A
Residential Construction Building Permits--- Value ($ millions)---	27,814 2,760	26,999 2,838	25,854 2,827	23,249 2,653	19,877 2,533	21,049 2,985
Travel Expenditures ($ millions)	4,748	5,018	5,169	5,520	6,069	6,111
Travel-Related Employment	86,600	87,100	90,800	91,200	95,300	94,100

Preliminary data, N/A -- Data is not yet available.

Broadband Services in the Josephine County Market

Over the past couple of years we've seen significant and measurable progress in availability of broadband services (DSL or cable modem) in Josephine County. That is, at least two companies (e.g., Qwest and Charter) do provide these services into a market footprint generally focused in the highest density areas of the county (i.e., Grants Pass). Providers of these services do speak to plans for further expansion (e.g., DSL by Frontier-Citizens in the Illinois Valley cities). Other mechanisms for providing high bandwidth come as some form of T-1's and carry significantly higher prices than found in higher density urban areas. To our knowledge Gigabit Ethernet services are just now available in a small area of the county (provided by Charter). Plans to reach into the less densely populated areas of the county by the major providers seem to not exist.

Often cited as barriers to growth are "take rates" and startup capital. The "take rate" or service purchases level issue reflects customer views as to perceived value, area demand and the market price point. "Take rates" remain low (maybe reaching to the 10% level – this data difficult to obtain due to competitive reasons cited by the providers) and probably reflects services acquisition by early adopters, perceived value of the services and price resistance. Issues remain as to whether or not current service offerings can be truly called affordable, especially at the higher end of the services spectrum. This is an area where education can play an important role, helping customers (or potential customers) to understand how to integrate the use of higher bandwidth into their businesses or their daily lives.

Availability of startup capital hinges on the ability to demonstrate a sustainable and profitable enterprise. Whether it be a private, public or public-private investment, the ability to sustain the operation is critical. Even community-owned facilities must demonstrate a reasonable payback of investment to justify such expenditures. In these days of limited financial resources this is an even more critical calculation. It is in this challenge we find opportunities for aggregating demand.

It's been said that high bandwidth access is available...to those who can afford it. It's our hypothesis that there is a profitable market for advanced telecommunications services provided at reasonably priced rates, one that requires creative approaches to identifying and aggregating the customers and to structuring the approach. This identification and aggregation effort must come from community leadership in conjunction with current telecommunications providers.

Studies of broadband deployment issues showed that while gains are being made on the supply side, the demand side of the equation would certainly benefit from more attention. Old knowledge tells us that strategic demand for any innovation must exist before it will be deployed successfully. This is not a newly discovered phenomenon. Strategic demand, not conditions of supply, is the major determinant of both technological change and economic growth. In other words, you can build it and they still may not come, unless economic conditions are right. Demand is critical to successful deployment.

We can help build demand. It is not enough just to provide and operate the infrastructure and services of advanced telecommunications. Education on a number of levels may very well be the

most significant critical success factor in deployment of telecommunications infrastructure and accompanying advanced services in Josephine County. Often we find that too few are knowledgeable or comfortable in using the technology. We see this evidenced in the low "demand pull" or "take rates" making it difficult to provide the business justification for providing necessary capital investment to build the infrastructure and services. There is a need to educate businesses, institutions and residents on how to avail themselves of these advances.

Broadband is available in the Josephine County market. The following charts summarize services, costs, and desired services and costs. [Please note: we do not endorse any particular product or service. We offer these examples as evidence of advanced services in Josephine County and may have inadvertently not included all providers.]

Service Provider	**Service(s)**		**Area Covered**	**Cost****
Charter Communications	Cable Residential Business available	 256 Kbps /128 Kbps 768 Kbps /384 Kbps 1.5 Mbps /1.2 Mbps up to Gigabit Ethernet	Everywhere in Grants Pass where Cable TV is offered	 $39.99 +20.00 +20.00 N/A
Qwest	T-1 T-3/DS-3 DSL (ISP costs are in addition) 256Kbps/256 Kbps 256k to 640 Kbps/256 Kbps 256k to 640 Kbps /256 Kbps 640 Kbps /640 Kbps 1 Mbps /1 Mbps 4 Mbps / Mbps 7 Mbps /1 Mbps	1.544 Mbps 43 - 45 Mbps	Generally available throughout the exchange (see exchange map) Grants Pass	$700 $12,500 $21.95 31.95 55.00 66.00 88.00 165.00 275.00
Frontier-Citizens	T-1 T-3/DS-3 DSL	1.544 Mbps per second 43 - 45 Mbps	IV cities: O'Brien, Cave Junction, Selma	$1,100 N/A $40+ (To be announced)

** All costs are shown as monthly and are without setup or other fees that may be necessary. Multi-year contracts or promotions may result in savings.

Budget Internet (http://www.budget.net/DSL/index.html) and Qwest have teamed up to provide DSL and Internet service. Qwest provides the DSL circuit and Budget Internet provides the Internet access. Qwest offers three types of MegaBit DSL service: Qwest DSL 256, Deluxe and Professional. The Qwest DSL 256 account is for residential customers who seek low cost high speed Internet. The Deluxe account is mainly for residential and very small offices. The Professional account is for larger businesses. Below are descriptions of the Qwest service levels.

Residential Qwest Based Service

One-time Setup Fees	Budget Internet $10.00	Qwest $99.00	Total $109.00
Speed	Budget Internet Monthly Charge	Qwest Monthly Charge	Total Monthly Charge
Qwest DSL 256 (Up to 640k/272k)	$ 20.00	$ 21.95	$ 41.95
Deluxe (Up to 640k/272k)	$20.00	$31.95	$51.95
Professional 640k (Up to 640k/544k)	$35.00	$58.00	$73.00

Small Business Qwest Based Service

One-time Setup Fees	Budget Internet $10.00	Qwest $99.00	Total $109.00
Speed	Budget Internet Monthly Charge	Qwest Monthly Charge	Total Monthly Charge
Deluxe (Up to 640k/272k)	$50.00	$31.95	$81.95
Professional 640k (Up to 640k/544k)	$80.00	$58.00*	$138.00*

Qwest price based on 12-month contract
Higher speeds available upon request

Large Business Qwest Based Service

One-time Setup Fees	Budget Internet $10.00	Qwest $99.00	Total $109.00
Speed	Budget Internet Monthly Charge	Qwest Monthly Charge	Total Monthly Charge
Deluxe (Up to 640k/272k)	$100.00	$31.95	$131.95
Professional 640k (Up to 640k/544k)	$180.00	$58.00*	$238.00*

* Qwest price based on 12-month contract
Higher speeds available apon request

InternetCDS offers DSL in the Grants Pass area (http://www.internetcds.com/dsl/).

Type of Service	One Time Setup Fee	Monthly Cost	Technical Information

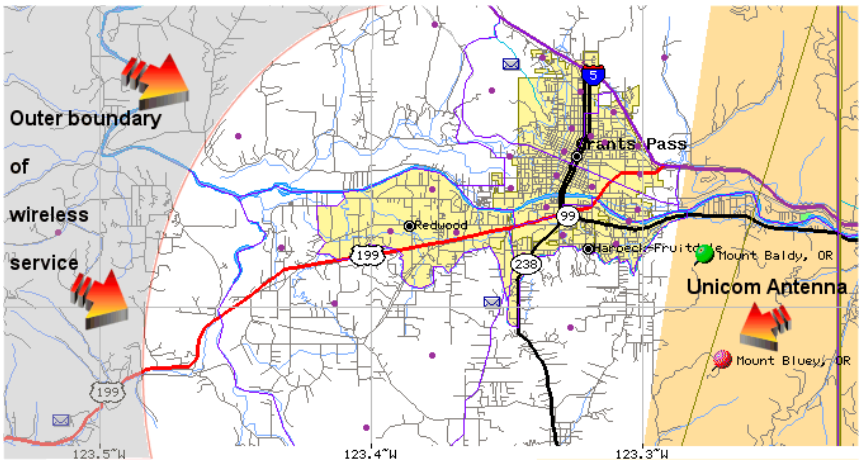
Residential DSL	$99.00	$32.00	• Monthly fee of $32 includes payment for data line • Includes lease of internal DSL modem • 1 dynamic IP • Blocked Ports(a)
Small Office/Home Office (3 PC's max)	$99.00	$89.00	• Monthly fee of $89 includes payment for data line • Includes lease of internal DSL modem • 1 dynamic IP • No Blocked Ports
Business DSL (d)	$250.00	$150.00	• Includes router and firewall • Static IPs as requested • No blocked ports

CaveNet provides a wireless broadband service (http://www.cavenet.com/Wireless/default.asp).

One time setup fee $300.00, Monthly $50.00. Requirements include:

1. A computer with a network card. (Ethernet card - Can be easily added if you do not have one.)
2. Clear line of site to a CaveNet Tower - CaveNet In town, 8 dollar mountain, Takilma Rd 2.5 miles from Holland Loop
3. To connect multiple computers you will need an Ethernet router.

Unicom provides a wireless broadband service (http://wireless.uci.net/grantspass/).



Single Computer

Wireless Pricing	Setup	No contract	1 yr. contract
Basic Wireless 256kbps	$125.00	$49.95	$45.95

Includes:

- 10 MB non-profit web space
- 3 E-mail addresses
- 256kbps 24/7 Internet Connection
- External wireless radio installation
- 25 Feet of RF cable

Basic Wireless 128kbps	$125.00	$42.95	$38.95

Includes:

- 10 MB non-profit web space
- 3 E-mail addresses
- 128kbps 24/7 Internet Connection
- External wireless radio installation
- 25 Feet of RF cable

Wireless is supported under most computers/operating systems that have an Ethernet port/network card, including Windows 95/98/2000/NT/ME, Mac, Linux, etc...

Multiple computers

If you wish to have multiple computers on the wireless service, you will need an external wireless radio and NAT router. You may purchase the NAT router from us or directly from a computer store. If the NAT router is purchased from us, we will configure it at no additional charge. Each computer needs to have a network card installed.

Wireless Pricing	Setup	No contract	1 yr. contract
Basic Network Wireless	$349.95	$49.95	$45.95

Includes:

- External Radio
- 10 MB non-profit web space
- 3 E-mail addresses
- 256kbps 24/7 Internet Connection
- 1 Network Card (NIC) Installed (If the computer is a Mac, customer must provide and install NIC.)
- 45 Feet of RF cable

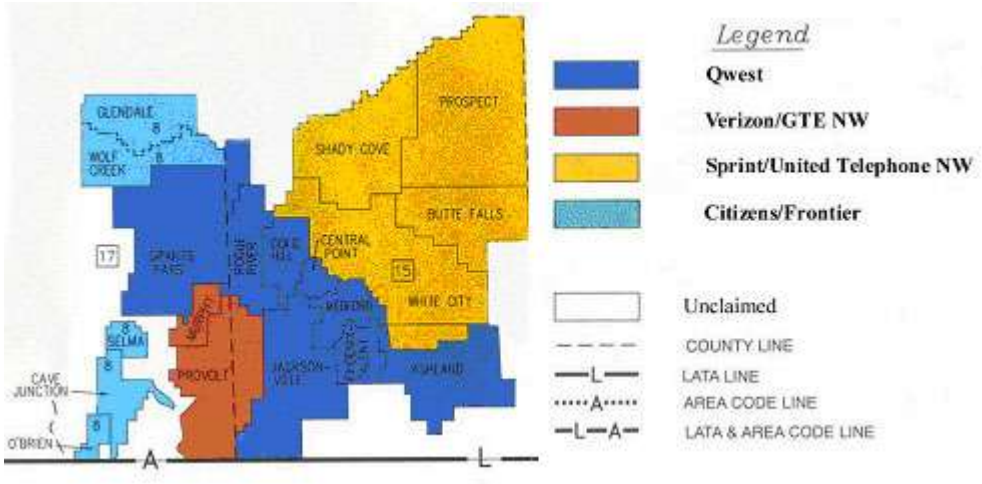
Extras

$5.95/month	Per additional computer
$1.00	Extra RF cable per ft. up to 100 ft.
$55/hour	Network Consulting (Any additional labor)
$22.50	10/100 Autosensing Network Card
$129.00	Linksys BEFSR11 NAT Router
$85.00	8 Port 10/100 Switch
$5.00	Network Cable (3-10 ft.)

What's not included: Static IP addresses are not included, however they are available under certain circumstances.

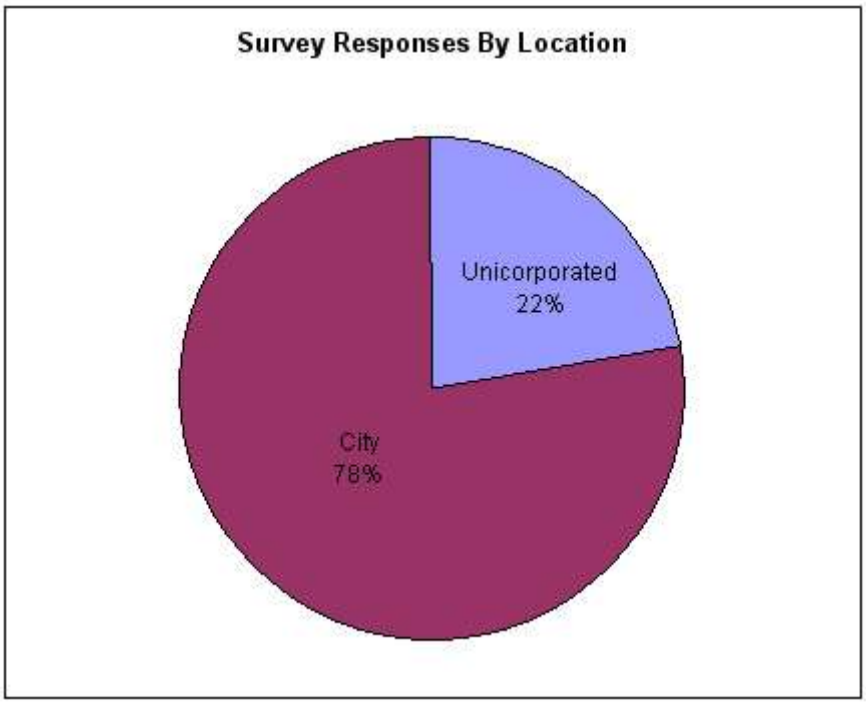
PRICES ARE SUBJECT TO CHANGE AT ANY TIME – Unicom may no longer be accepting new wireless clients at this time.

Telephone Company Exchanges in the Rogue Valley

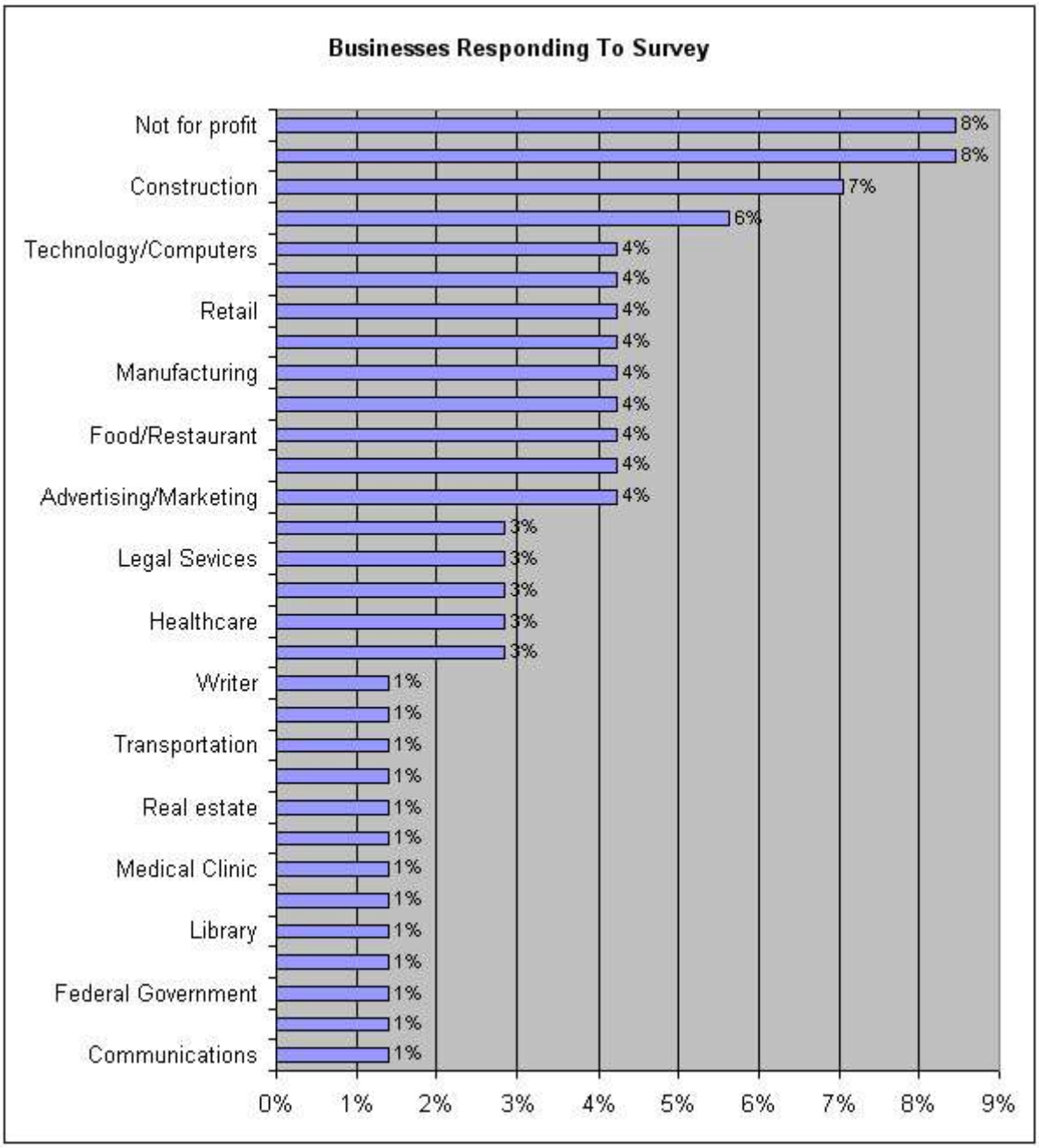


Survey - Josephine County

Business Survey Responses By Location



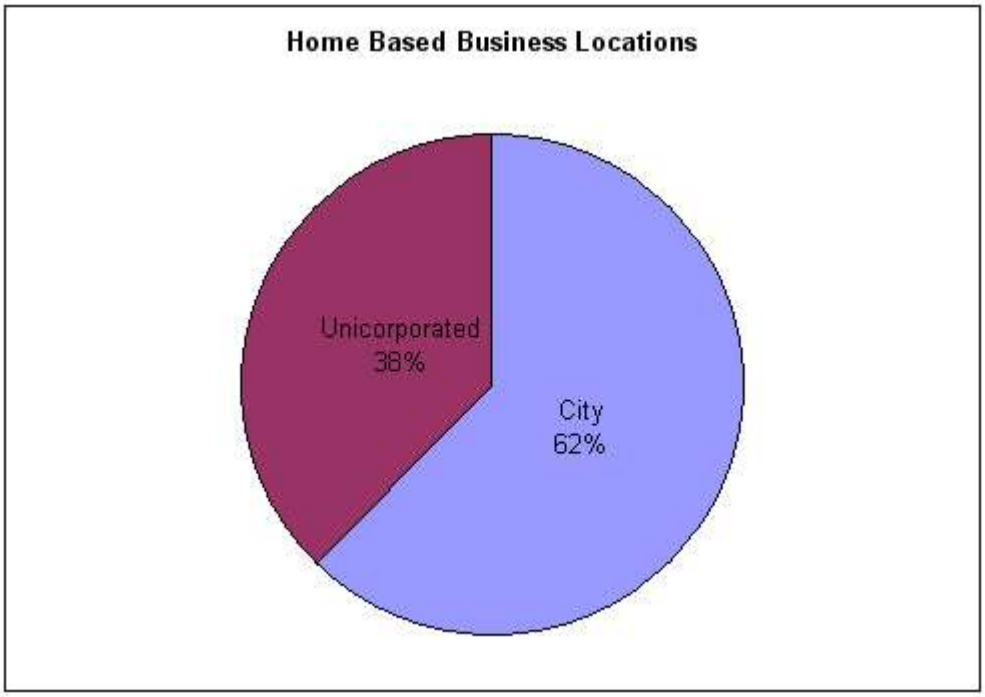
Businesses Responding To The Survey



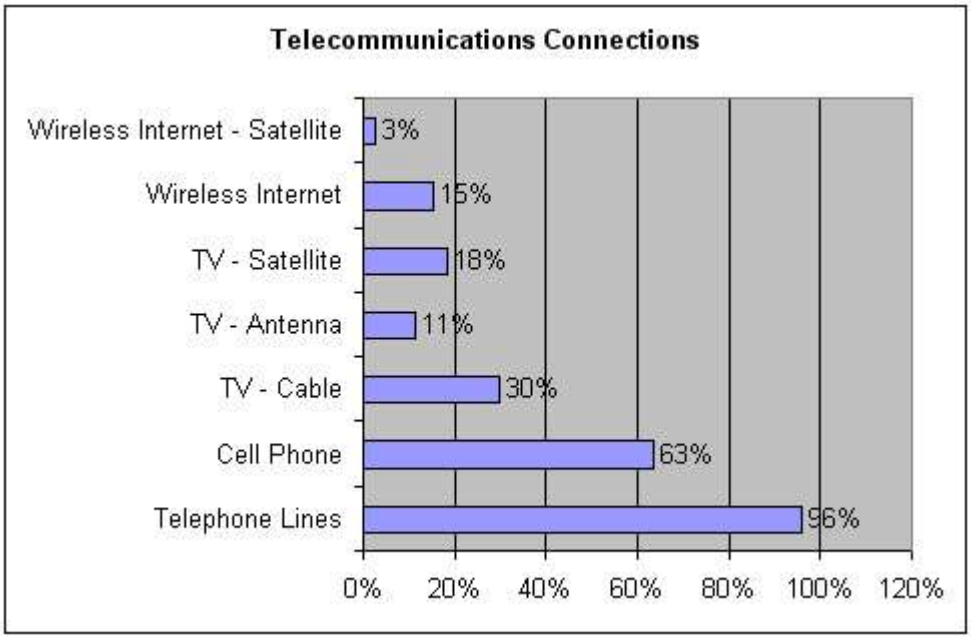
Businesses NOT Responding

Community College
Distribution/logistics
Elementary Schools
Fire Department
Government
High Schools
Law Enforcement
Middle Schools
Mining
Telecommunications
University

Home Based Businesses

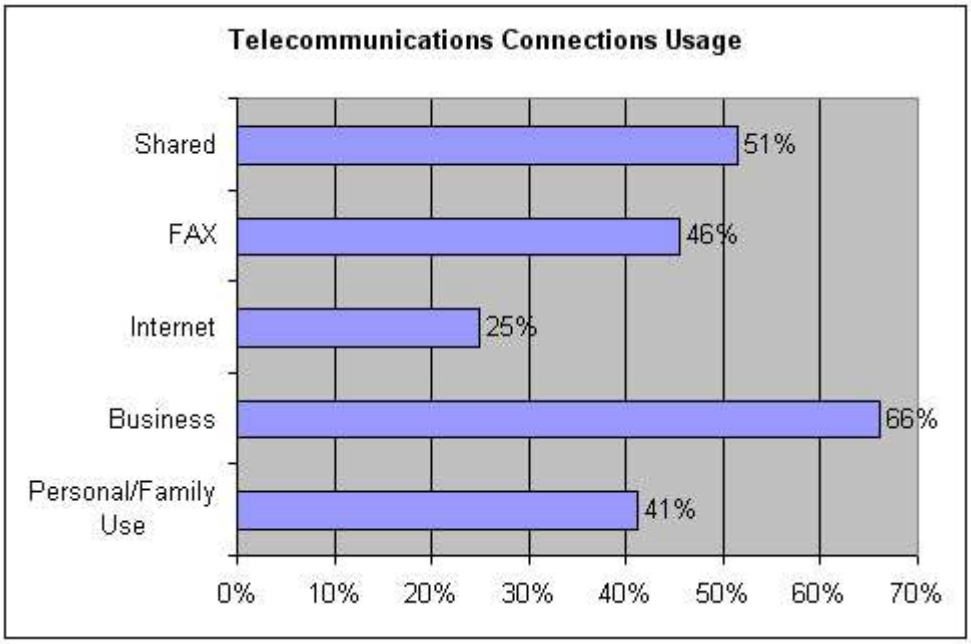


Business Telecommunications Connections

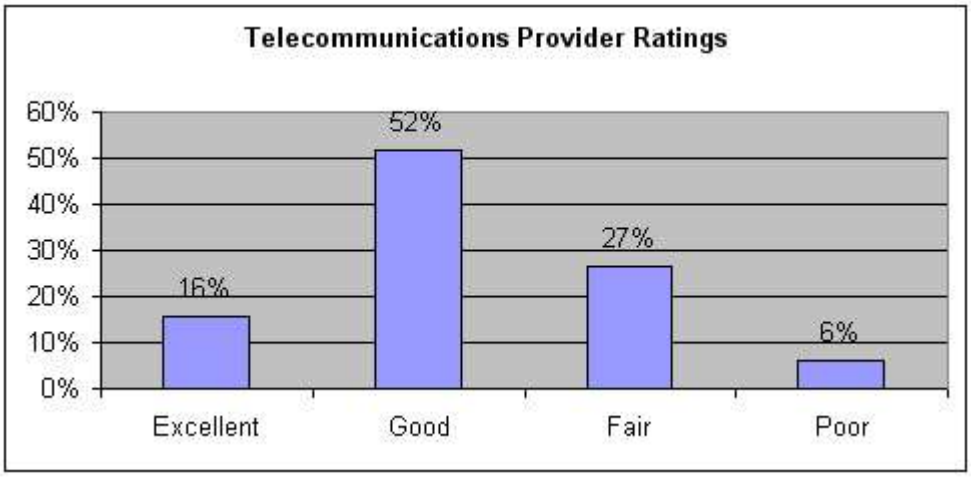


Lines Per Business 4.65

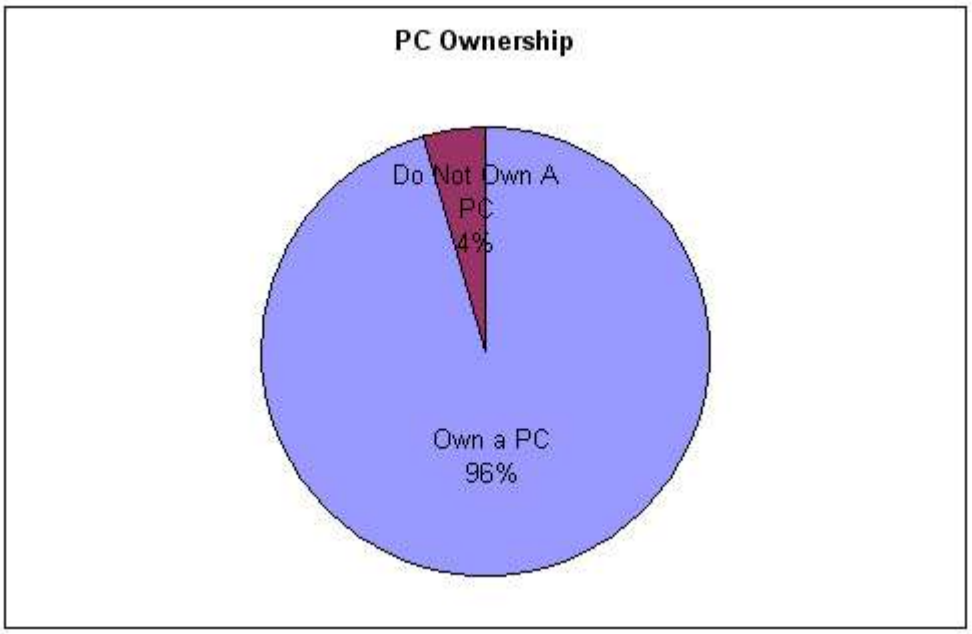
Telecommunications Usage in Businesses



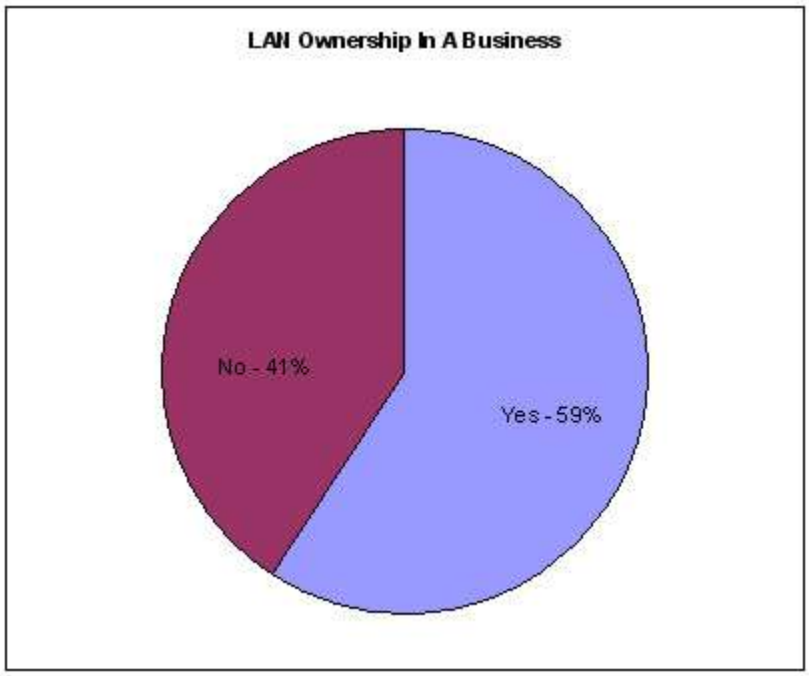
Telecommunications Provider Ratings By Businesses



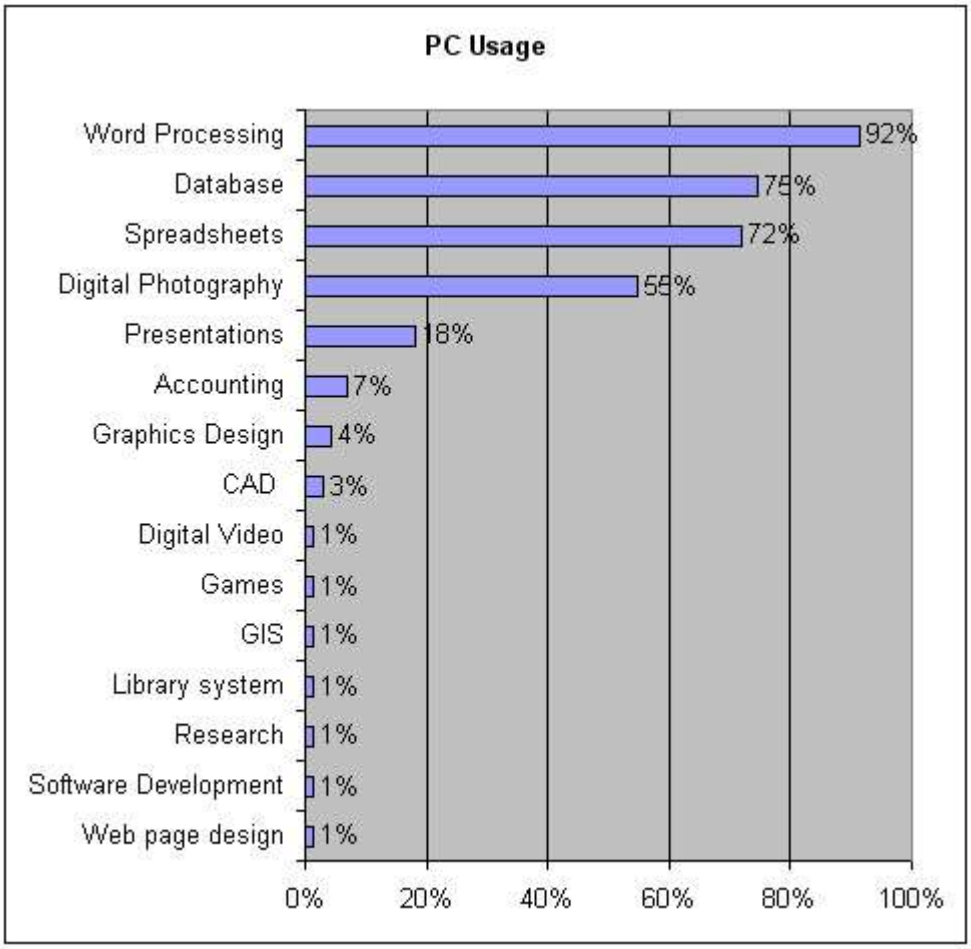
PC Ownership in Businesses



LAN Ownership

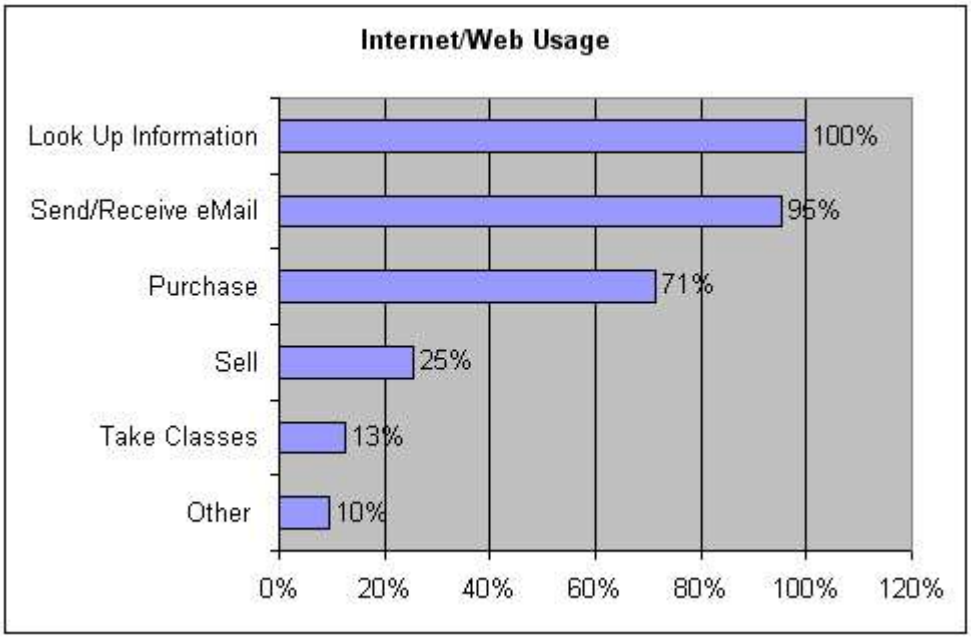


Business PC Usage

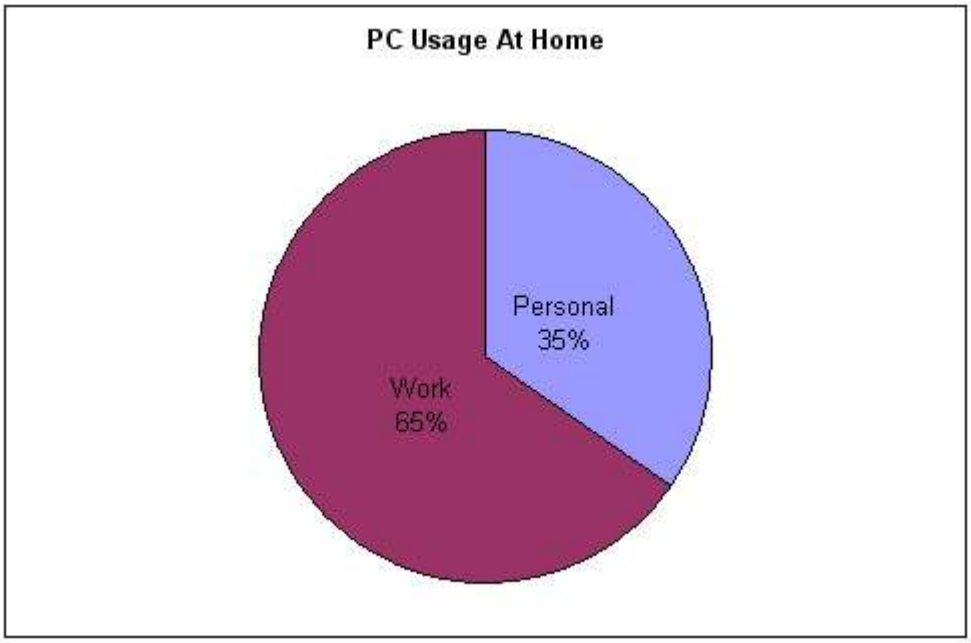


Percent Using Internet/Web	89%
Internet/Web Usage Per Business	10.17
PC's Per Business	7.91
Persons Using PCs Per Business	9.21
Ratio Of Persons To PCs	1.2
Percent Of Businesses With LANs	59%

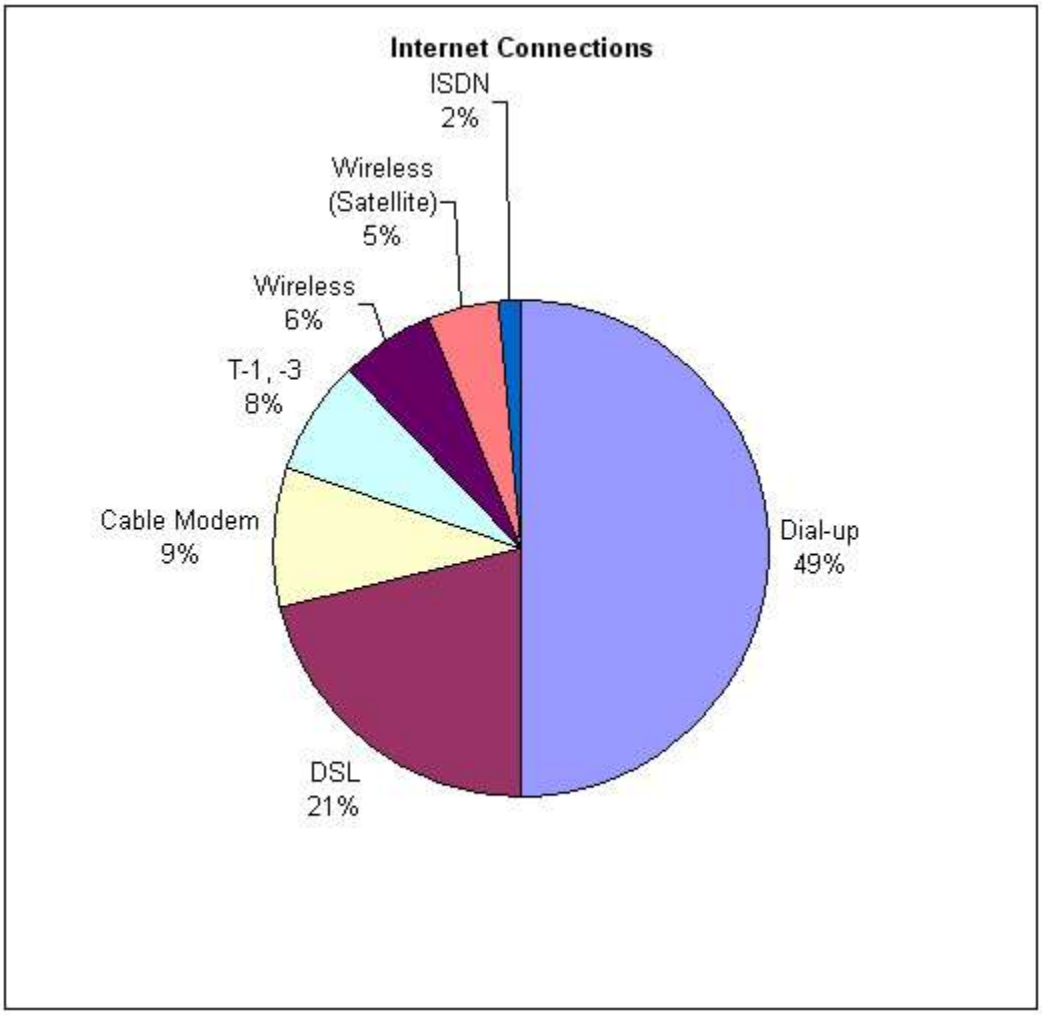
Business Internet/Web Usage



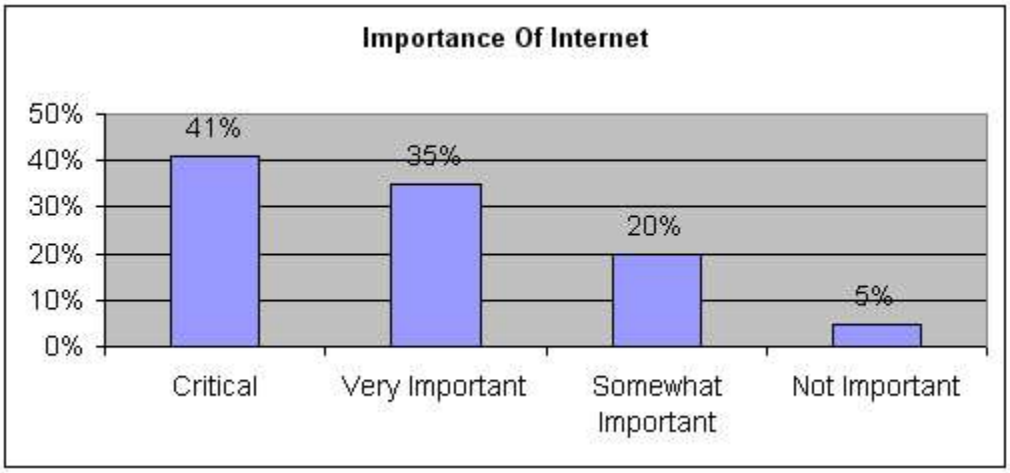
Businesses With PC Usage at Home



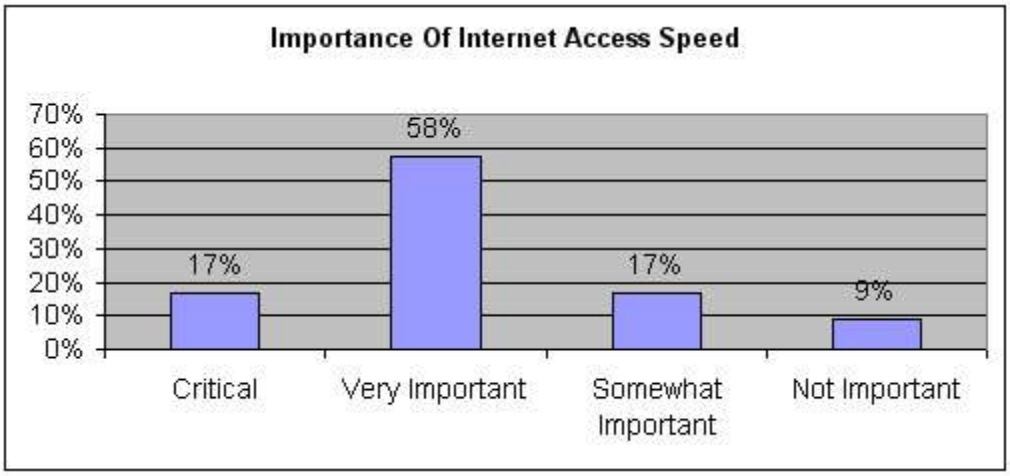
Business Internet Connections



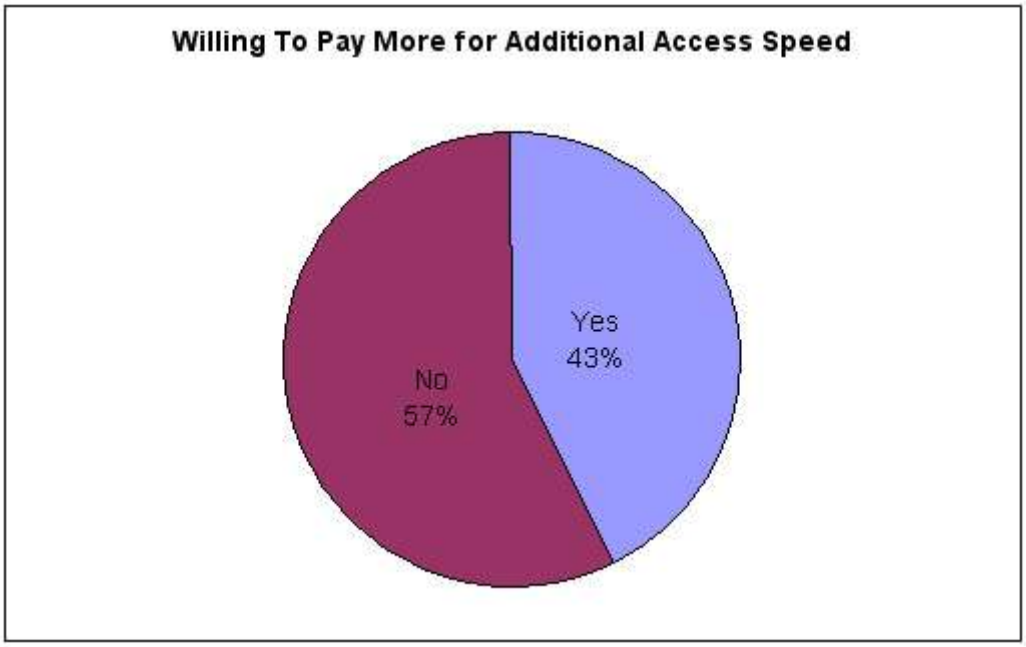
Importance of Internet Access To A Business



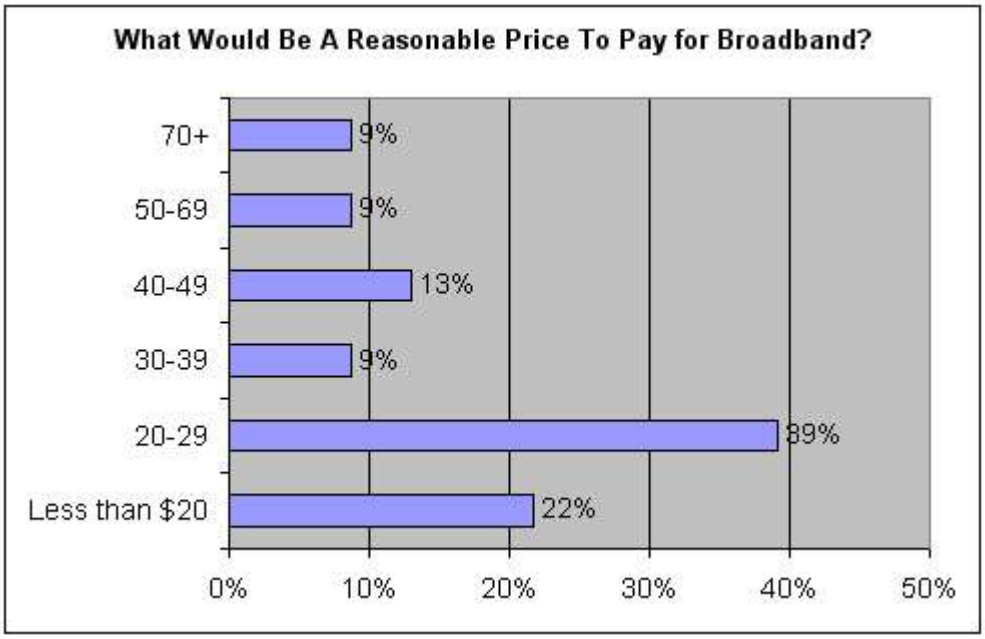
Importance of Internet Access Speed for a Business



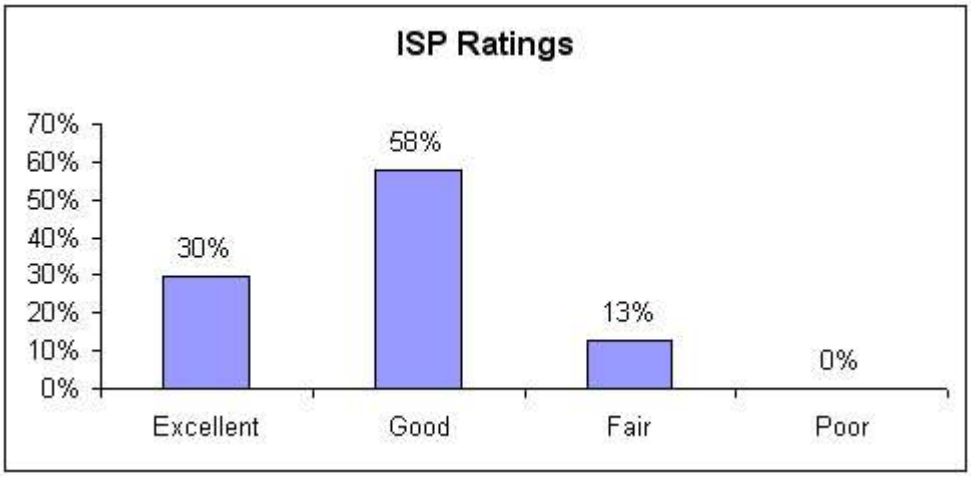
Businesses Willing To Pay More for Additional Access Speed



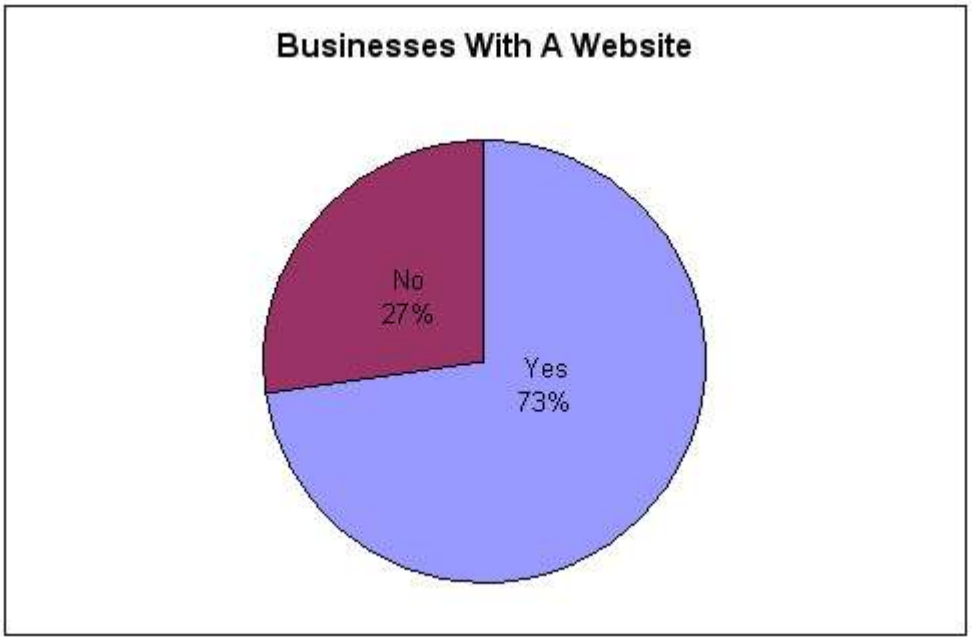
Reasonable Price To Pay for Broadband By A Business



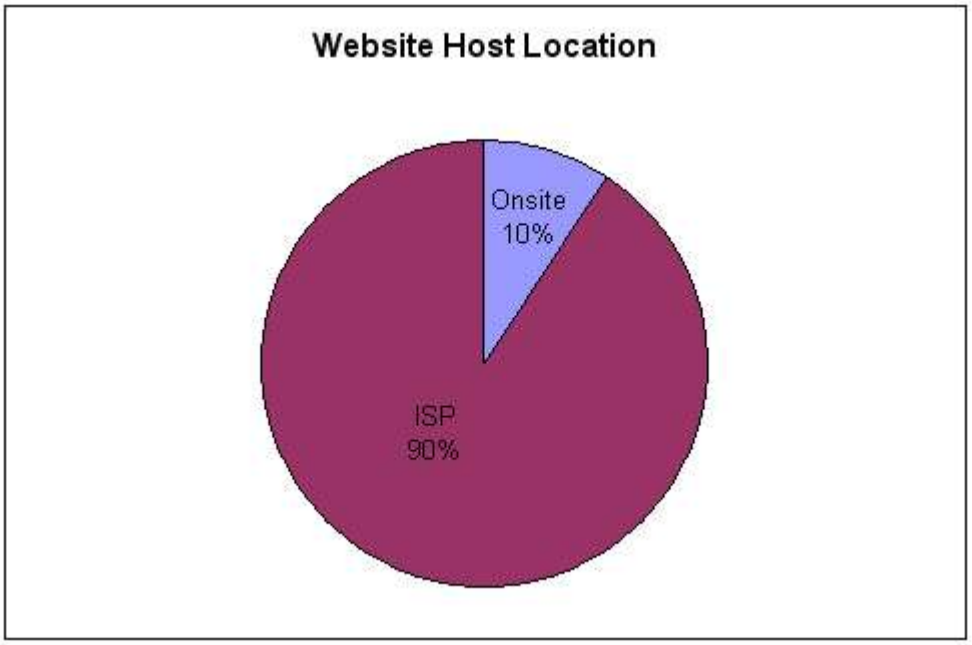
Business ISP Ratings



Businesses With A Website



Website Host Location for Businesses



Comments From the Business Surveys

<u>Voice</u>

- Currently considering switching to cell phone as primary family use - cost issues.
- Qwest's POTS is too expensive at $24/mo. Pacific Bell is able to offer their POTS for $14/mo. PacBell has equal or greater rural service area in CA compared to Qwest in OR. I know Qwest is in financial trouble. Certainly they won't lower their rates. I'm dreaming to think that they will voluntarily upgrade their network. While not of major importance to me, the 13 mi local calling radius/area is not very useful in rural areas like GP. Qwest puts too much time, effort and funds into

marketing/peddling/foisting "frills" services like call waiting, call forwarding, message center, caller ID, call return , &c. Qwest's new autumn ads are disingenuous. ...In my view nothing has changed.

- If one is unwilling to call or write, they aren't true friends. Family is willing. I need to hear the voices.
- I am disgusted with fake billings received by mail to supposedly purchase advertising.
- Too much telemarketing!! Security issues. Cellular - accessibility.
- Local phone service via Qwest has been historically terrible, long distance is a shopping nightmare and cell service cam be spotty throughout county.
- I switched from Qwest a few years back and have been much happier. I originally switched to ATG and am now with McLeod.
- Phone company charges too damn much for crappy service and lines.
- Cost
- I have a cell phone and enjoy it -- "a must!"
- Bad connections in this rural area -- I presently hear a foul-mouthed woman on my business line.
- Cellular - poor quality - disconnects - lose signal
- Cell - inability to keep good connections or to connect in the first place.
- Qwest phone service is horrible here.
- Cellular needs to be more minutes per $…billed in partial minutes instead of full
- My concern is while we have so many phones and features to choose from, so many wonderful package programs, we're missing a feature that is MOST important…"can you hear me now?" technology?!?!?
- I think all of it is getting too expensive/ Should be able to tie all of it together from a single provider.
- Random outages
- Qwest sucks!!
- Cell - not good throughout the county. Local - my privacy is invaded by telecommunications.

<u>Internet</u>

- I would like "faster service" however the speed & cost for faster service is a real question of how much you value your waiting time. I just multi-task while I'm waiting for downloads - I would pay $20-25 but that's about all. However I recognize that slow service will stifle growth of computer driven businesses.
- High speed access to rural residents is a pivotal capacity to being able to make an income locally.
- Citizens, college instructors. Etc. by and large fail to see or utilize the greater potential of the Internet. At RCC very few instructors/students carry PDAs or laptops. RCC does not have (WiFi) access. The RCC common areas are not wired for AC power ot Ethernet for laptops. Their idea of a web-based course is a radio-button Web-form exam. Course lecture s/b recorded, digitized, organized and freely available online for access by students. Specific lecture or lab session s/b videotaped and digitized and also freely available for viewing/download. Labor for this c/b mostly free as class projects for tech/media students. The city/county should consider making WiFi Internet available at city/county owned/operated facilities....
- We have connection issues -- guess at times cannot connect with their server -- and our building is megabit certified -- need a permanent answer/solution.
- Security
- We had a Website. It cost money with no returns/
- T1 costs. Particularly where multiple phone companies are included.
- I am put off by all the ads, SPAM, pop-ups.
- Security issues. Viruses. High price. SPAM.
- T-1 dedicated the only way to go.

- I switched from dial-up to DSL this past year. I'm very happy with the service but find the cost to be high. I think DSL providers have us over a barrel and can basically charge what they want.
- Too slow at home - don't use enough to justify high-speed hookup. Had DSL at one time but cancelled.
- Too much SPAM (289 email messages this morning after not checking messages for one week) and too many annoying pop-up ads. Takes too much time to sort through junk. Even with filters in place, to access business items.
- Unicom is the only ISP that is of any worth in this town. Everyone else sucks.
- Security
- Wireless laptop access would be nice
- Privacy. SPAM. Porn - should not be allowed unless you specifically subscribe to it.
- Qwest gives only 20K connects via a 56K modem due to noisy lines. I wish Starband was a lot cheaper.
- Real online security.
- Would love to get DSL service sometime sooner than my expected lifespan!!!
- Too many pop-ups - too much junk email - misuse by staff

Video

- I really don't understand how the digital revolution has taken so long to hit the home screens. HDTV for example. If current trends continue it looks like the news-entertainment-music-computer-phone & communications we will be getting bundled into a single unit which reflects all these capacities and others as well - security-health-companionship & etc. Is this a good thing? Ultimately what controls do we posses?
- Rural areas are not served by Cable TV or cable data. Satellite does not carry local programming. Satellite Internet is is slow, expensive and high latency. Low earth orbit satellite has not yet materialized.
- Advertised on Cable TV.
- Sick of type of advertising being used these days. Lack of morals shown on TV.
- Too expensive
- Cable charges too much for not enough service. For the same cable company people in Jackson County pay less for the same service. Cable charges $10 more for cable Internet service if you don't want their TV service which I think is outrageous and unethical. There is little or no cheap computer teaching for middle age people. RCC does not offer those type of classes, basic computer use.
- I wish you could purchase movie, weather and headline news without all the sitcom and religious channels.
- CD only way to go
- Satellite is just fine.
- High cost of cable - no compensation for downtime/outages
- Mostly garbage on.

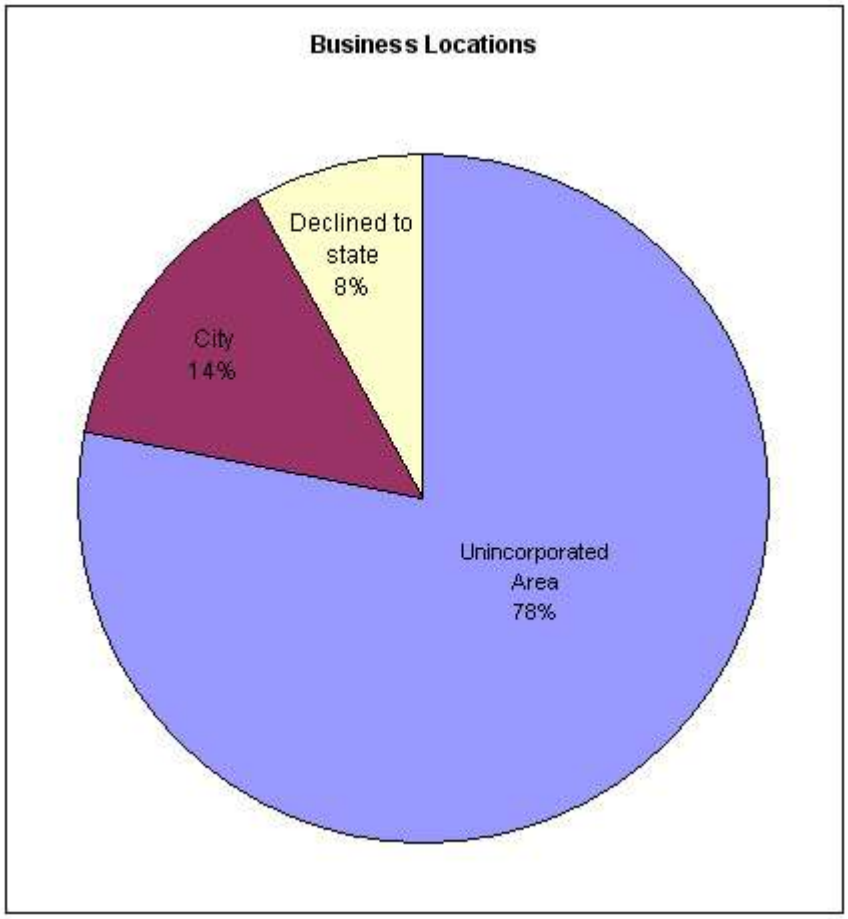
Other

- The technical aptitude of GP area ISP employees is rather low. Qwest and Charter are moving extremely slow or not at all to provide high speed Internet to rural areas. Local ISPs have been very slow to implement v.92 modem standard that offers Internet call waiting. This could help offset the high cost of having to have a second phone line by allowing families to maintain their data connection while taking an incoming voice call. Also v.92 shortens the modem's negotiation time, establishing a connection more quickly. The ONLY viable option for semi and rural homes that I can see: affordable ISDN.
- I did not find a training or meeting schedule on the SOTTC Website
- Being an average consumer I am often lost with new technology and newer equipment.
- Lack of time
- Things are becoming too impersonal.

- PowerPoint. PC's are great!!!

Survey - Cave Junction Area Businesses

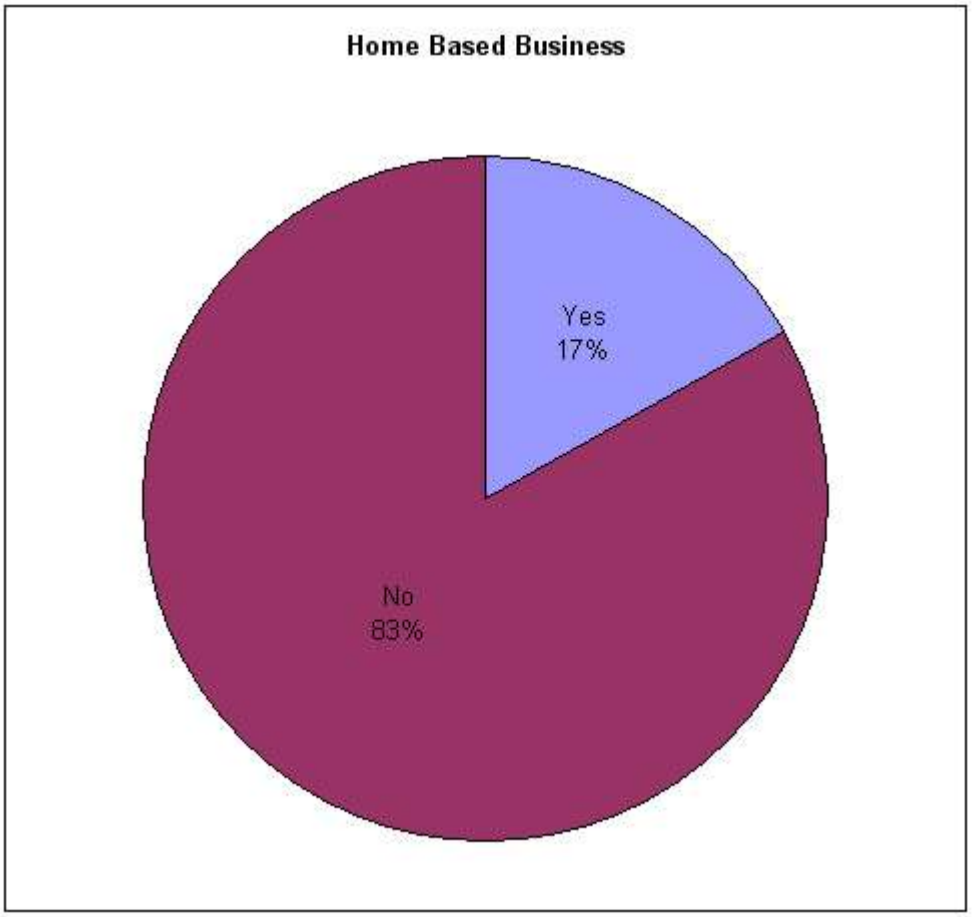
Cave Junction Area Business Locations



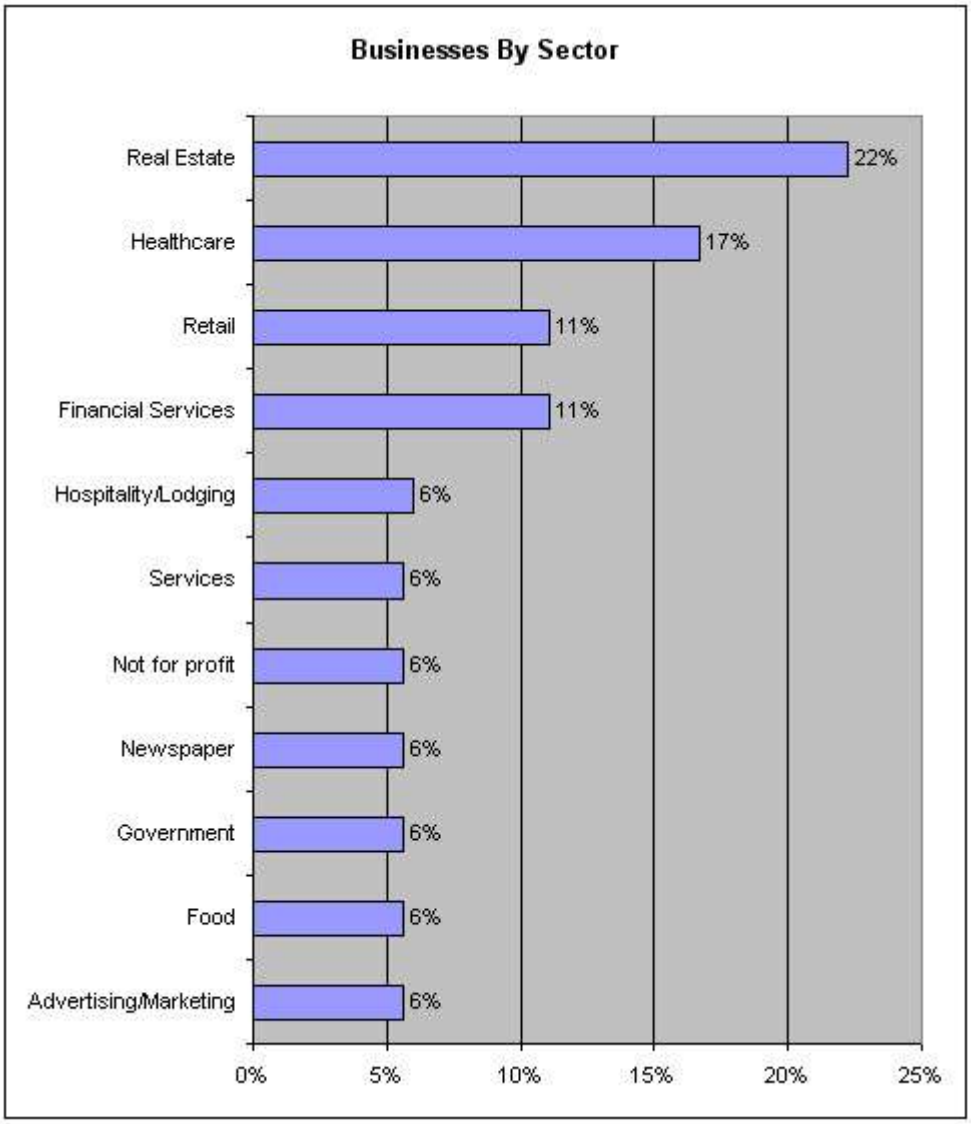
<u>Area/City Names</u>
Cave Junction

Employees per business 2.9

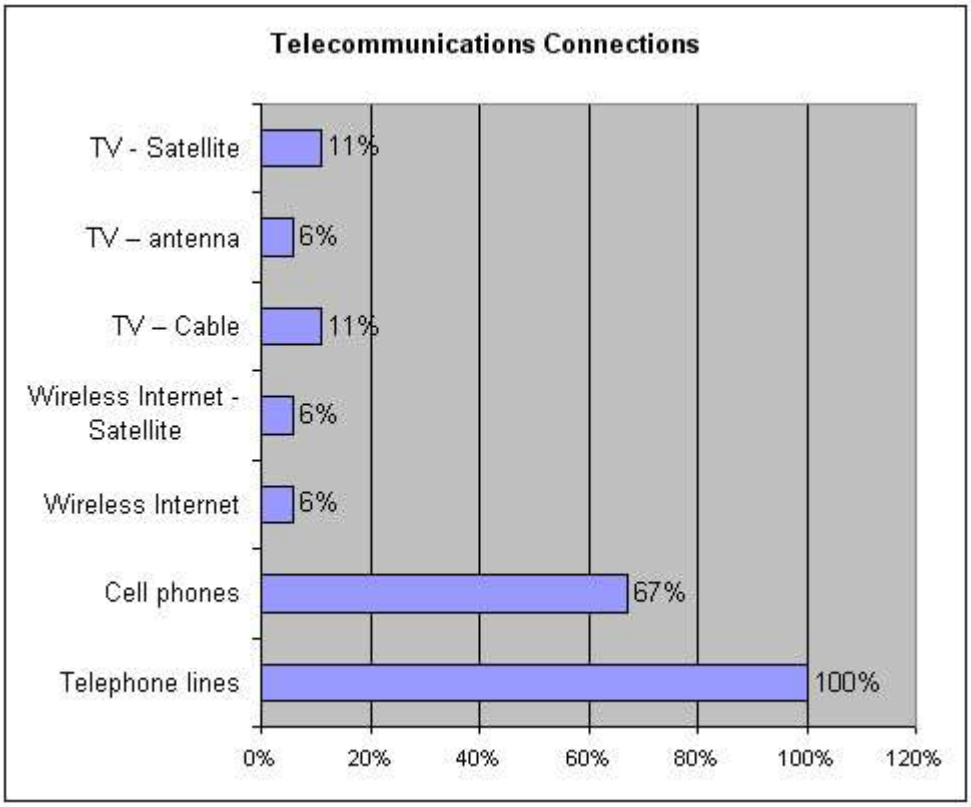
Home Based Business



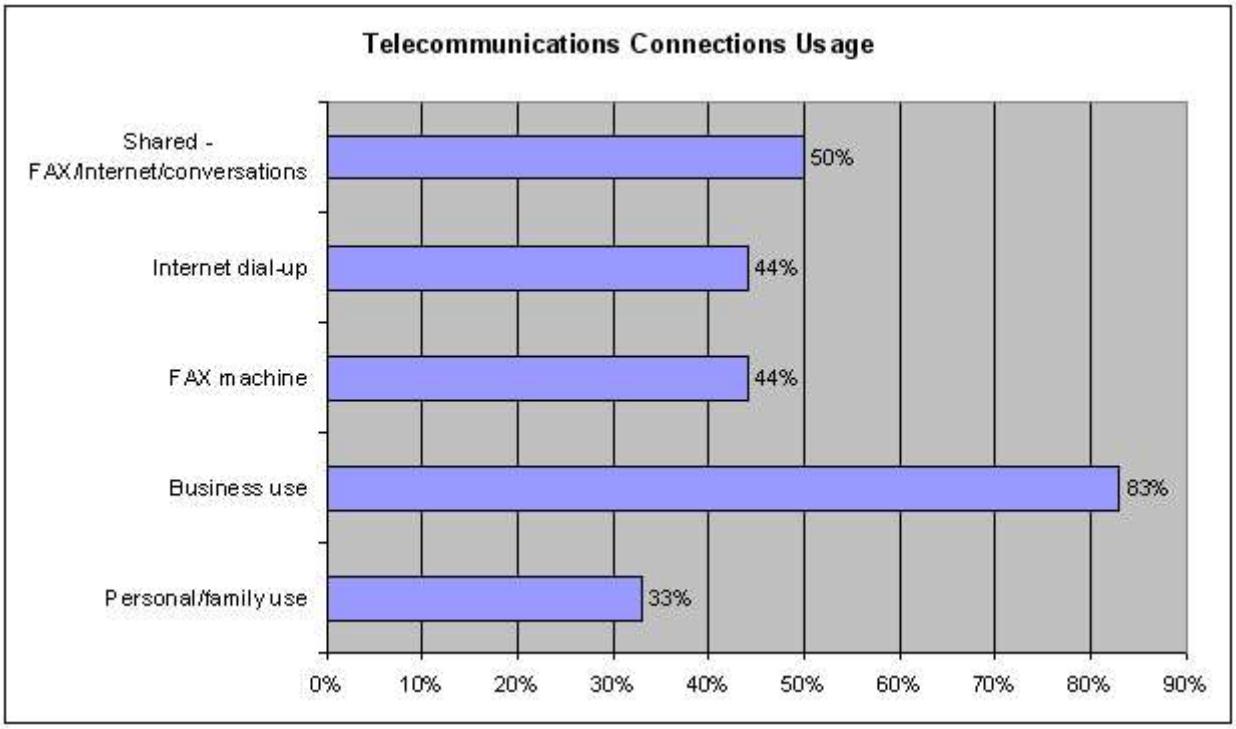
Businesses By sectors



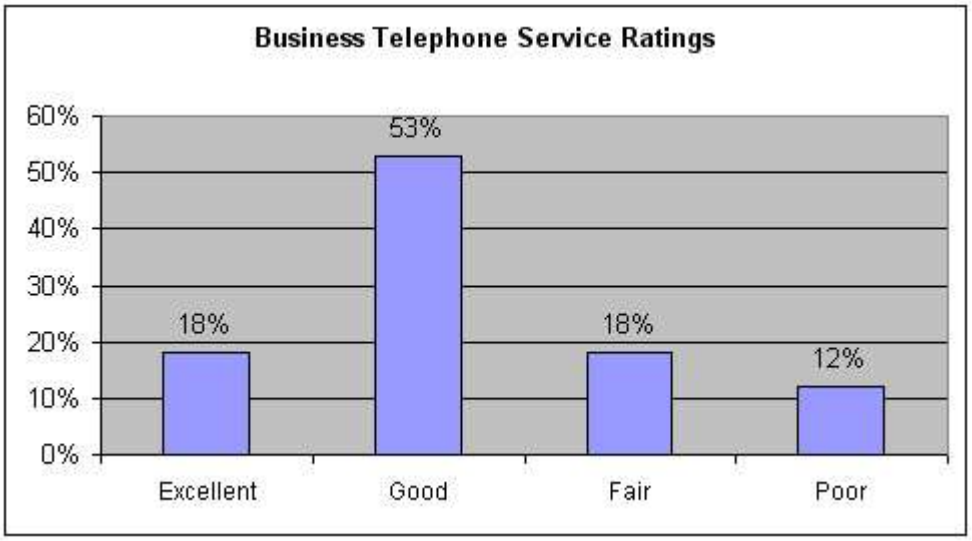
Telecommunication Connections in Businesses



Use of Telecommunications Connections in Businesses



Business Telephone Service Ratings



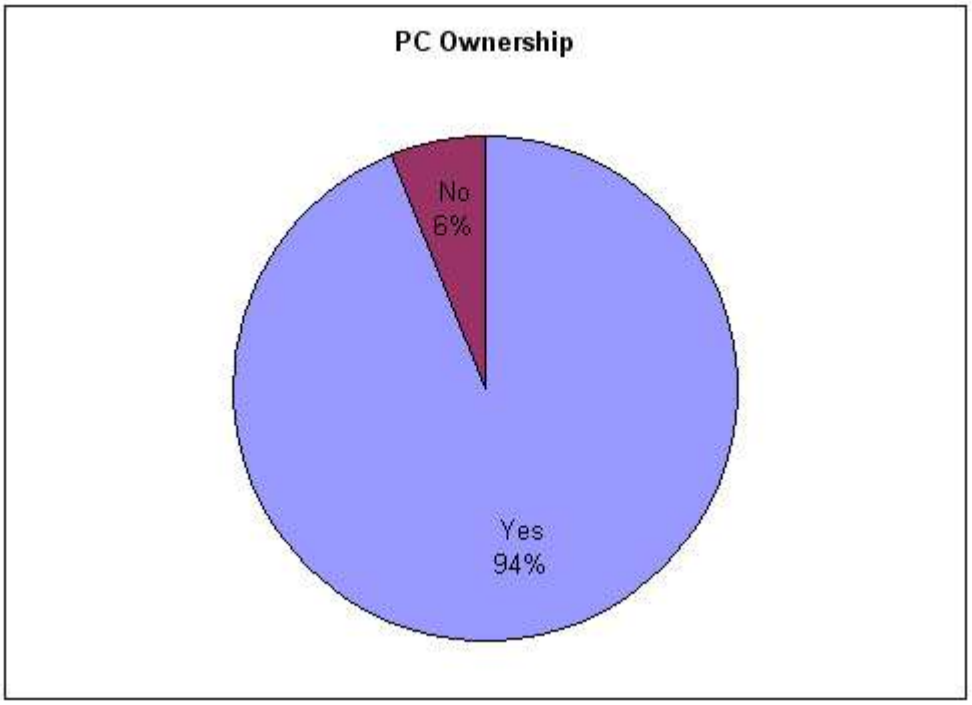
List your telephone service providers

Frontier, MCI WorldCom, Qwest, Sprint, US Cellular

2-Way Video Conferencing

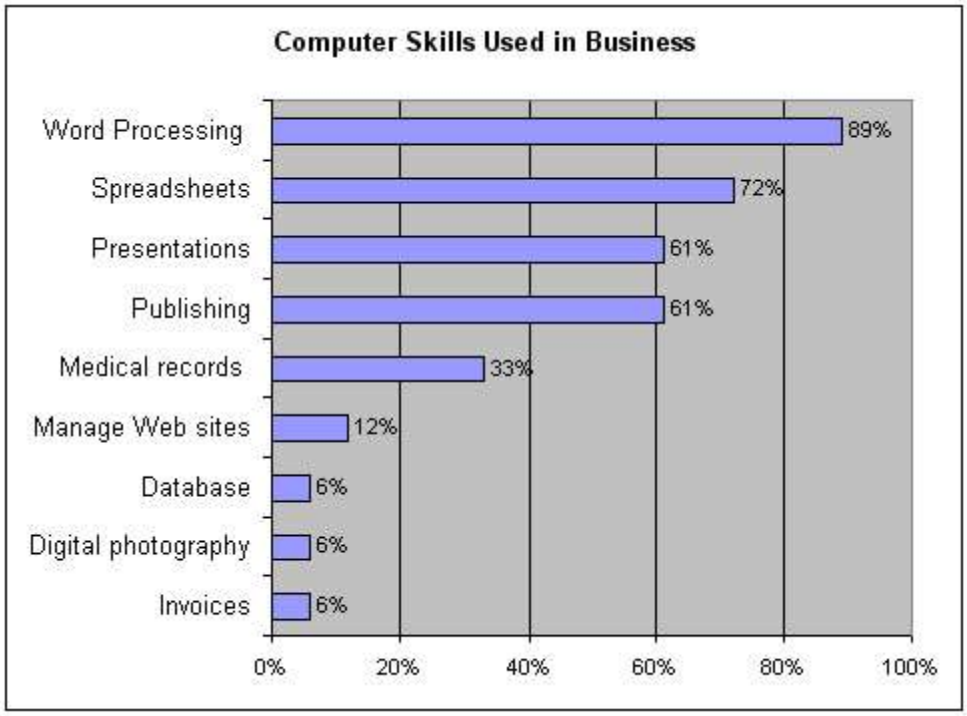
No business has this service on site. 11% of businesses indicated they need the service

Computer Ownership In Businesses

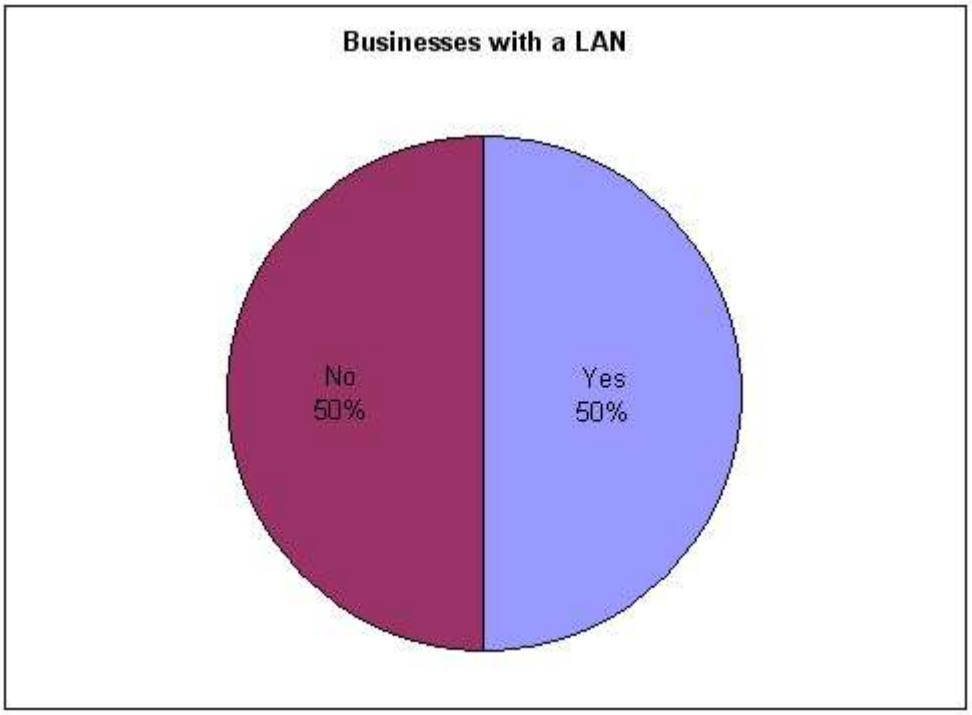


3.9 PC's per business
3.7 PC users per business w/PC's

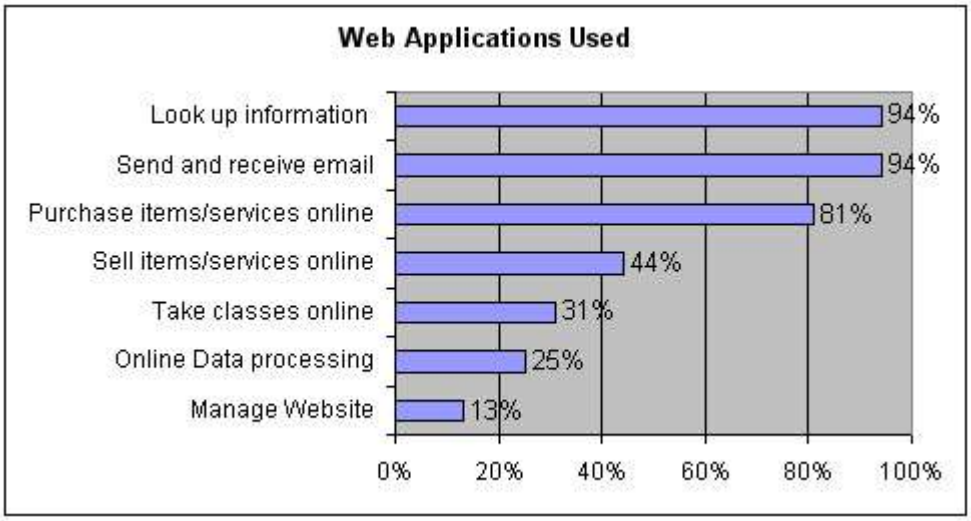
Computer skills used in businesses:



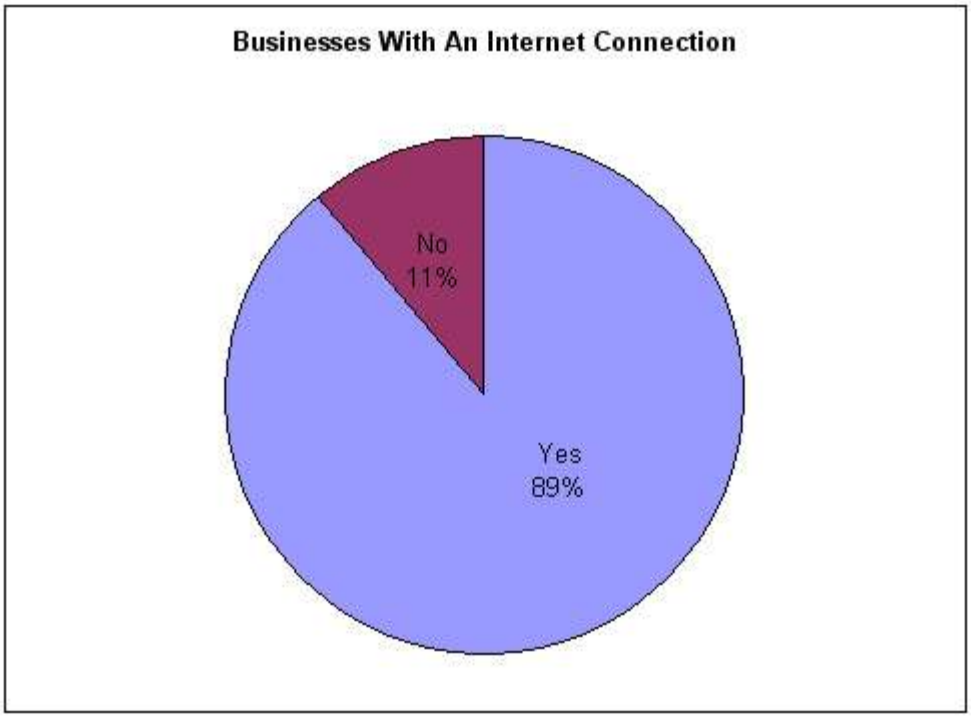
Businesses With A LAN



Internet/Web Services Used

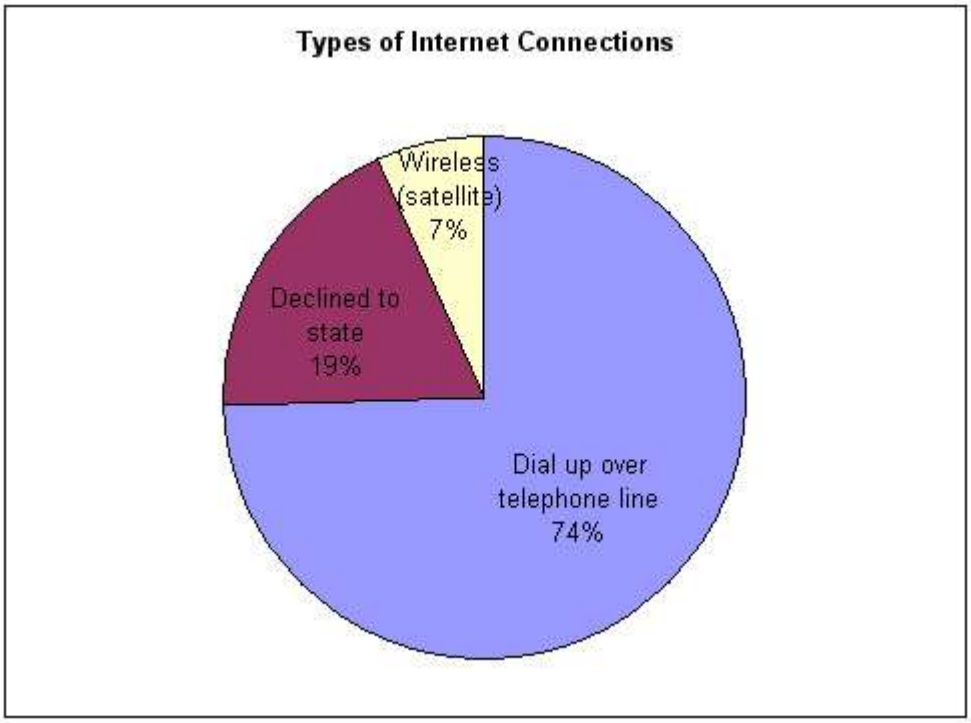


Businesses With An Internet Connection

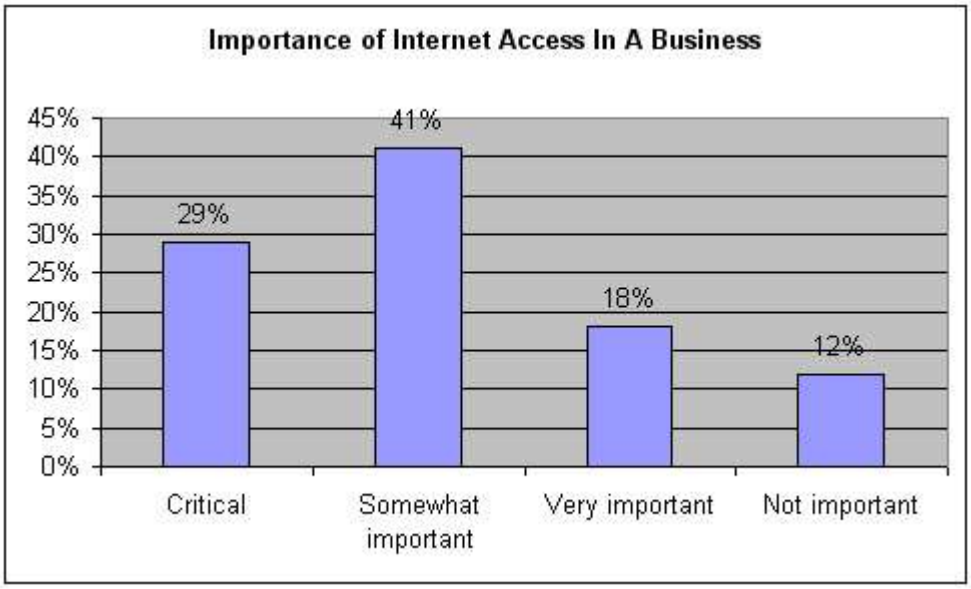


100% of businesses use the Internet/Web
6% used a public computer

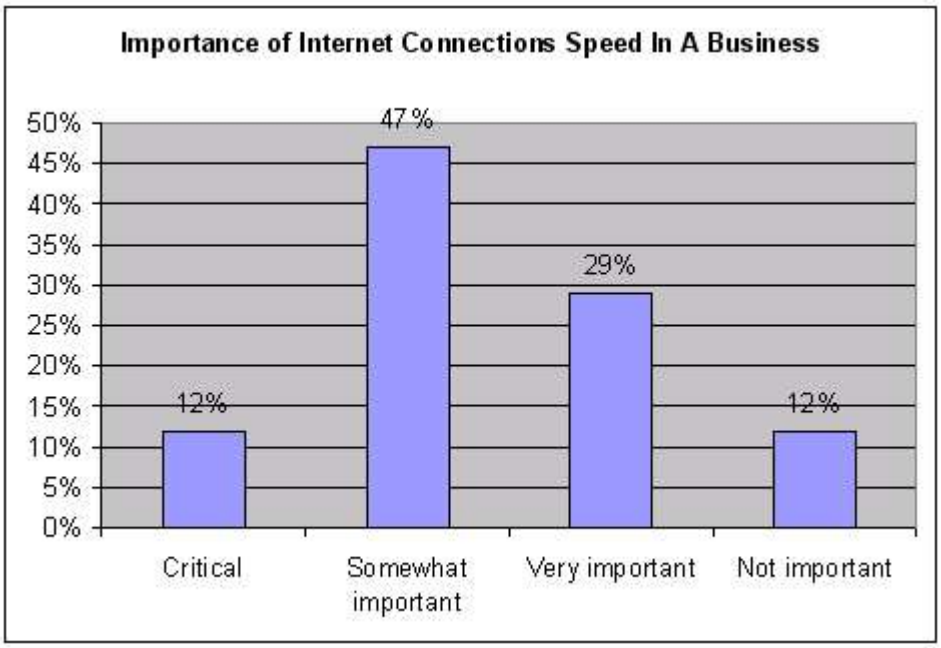
Types of Internet Connections



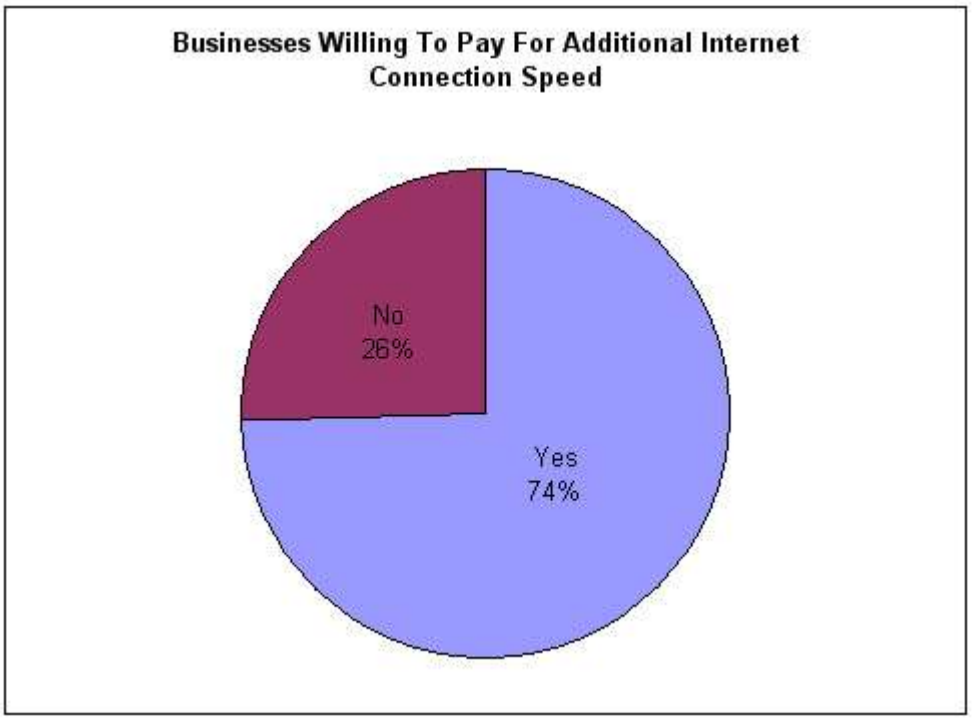
Importance of Internet Access In Businesses



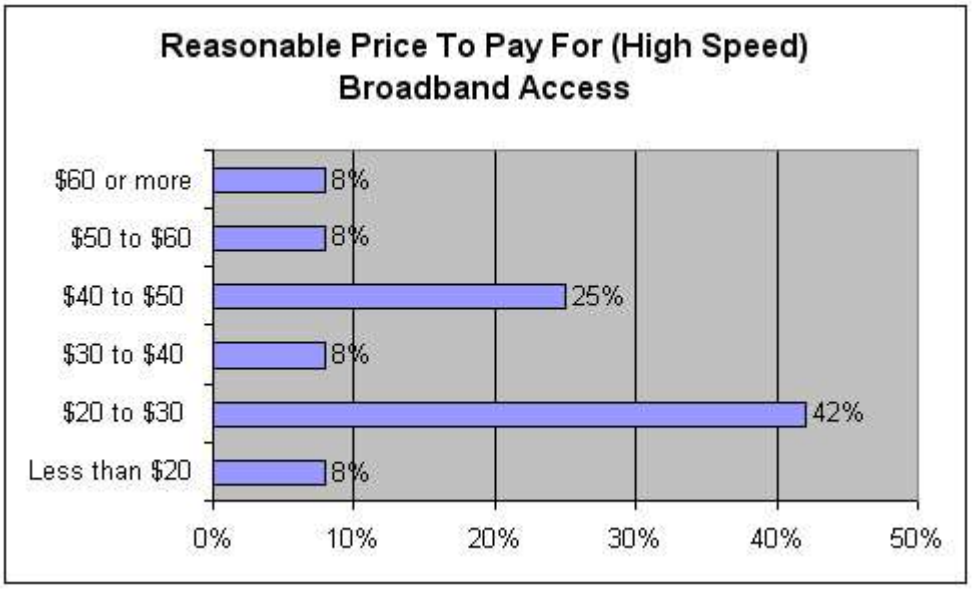
Importance of Internet Connection Speed in Businesses



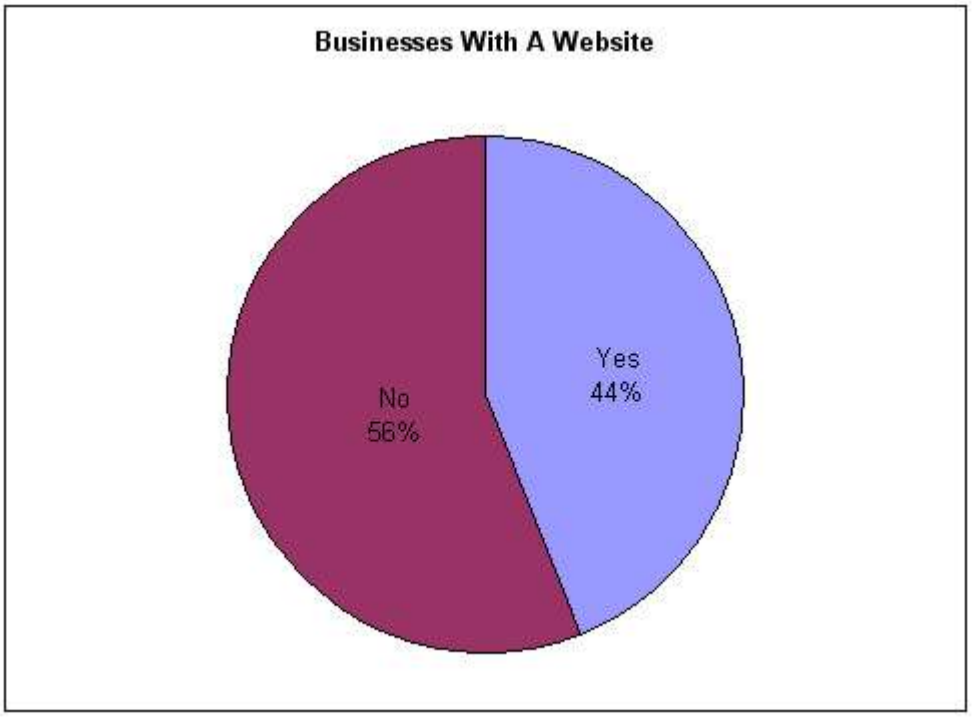
Willing To Pay for Additional Internet Connection Speed



Reasonable Price To Pay For High Speed (Broadband) Access

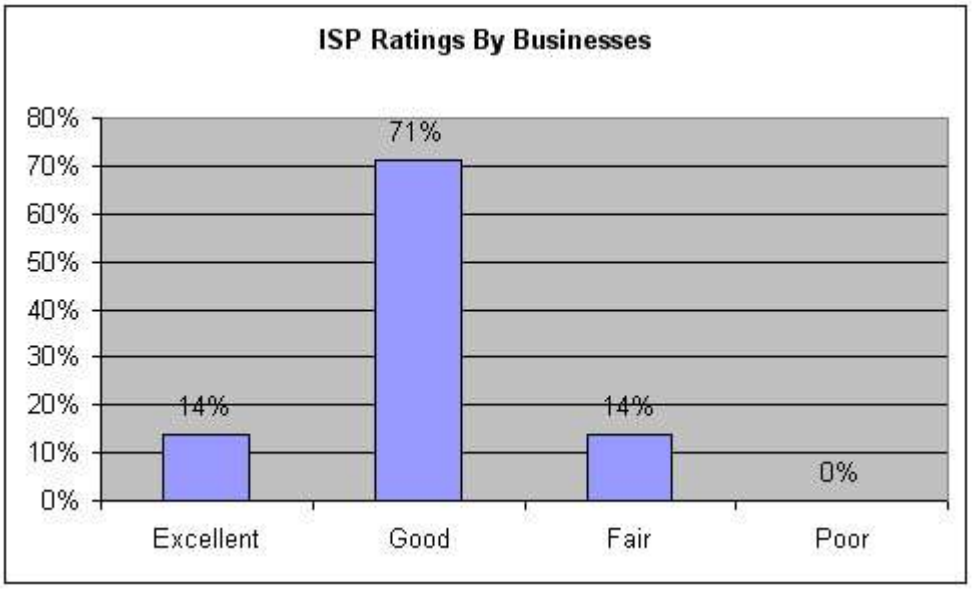


Businesses With A Website



If "Yes," where do you host your business Website:
At an ISP 100%

Business Internet Service Provider (ISP) ratings



List of ISP(s)
Cavenet
CDS
InternetCDS

Response to question seeking future need for these services

Wireless (satellite)
Wireless (land-based)
DSL
Cable
ISDN
T-1
T-3/DS-3
Fast Ethernet
Gigabit Ethernet
Video Conferencing
Virtual Private Network
Other

67% responded, "I don't recognize most of this stuff."

Concerns or comments about telecommunications

33% had no concerns or comments.

Voice

- Cellular -- just lousy out here! Lack of good carrier with low rates.
- Citizens/Frontier is the worst customer service that I've had to deal with in my 25 years of business. Need a better, more progressive telephone company to provide better service.
- I would like to see all of So. OR as one region -- so we could call Medford & Ashland as local calls.
- It would be nice to have a system within the IV that would work anywhere. Cell phone towers are limited.

- Need clearer lines with less static.
- Our local service c/b expanded to include GP. More lines are need. Circuits are busy often.
- Privacy, radiation.
- The large # of dead zones for cell and pagers. The # of lines available -- overwhelmed during Biscuit Fire.

Internet

- I would like a satellite or tower system available to IV. High speed Internet would attract small business.
- Increased speed -- most of my computer use is done at home office and service is slow (24k). Increased access to services will help valley prosper economically.
- Is there enough demand for high-speed Internet to justify other than 2-way satellite?
- It would be nice if all telephone/video/Internet/TV were under one access and one company and all over fiber optics w/one bill and at a reasonable competitive price.
- Much too slow and troublesome.
- Need more rapid access.
- Often problems getting online with Internetcds. Connection is SLOW.

Video

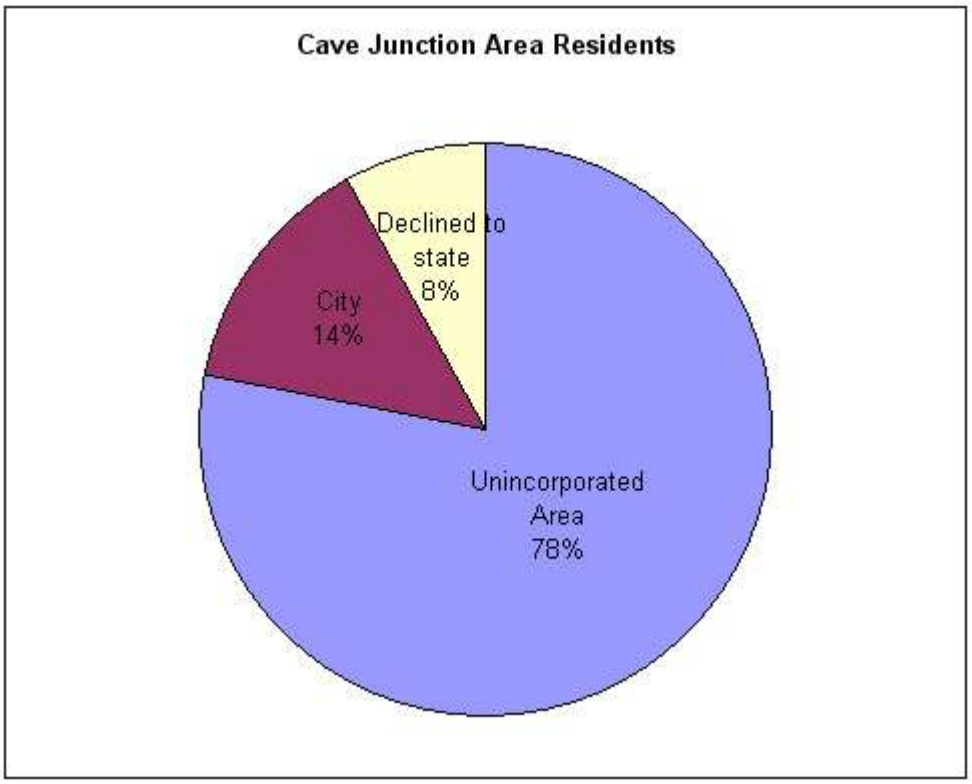
- Unable to receive local network channels ABC, CBS, NBC and satellite providers don't offer some or all, even when paying additional charges.
- Why bother?
- Why isn't Charter Cable TC available to people who live outside of Cave Junction! Satellite TV does not carry local TV news stations and with the immediate threat of the spreading Biscuit fire and the entire IV under a 30-minute evacuation notice, this created a lot of stress. The entire valley should have cable TV access! We lost customers because the news media hyped the fire and what promised to be a very busy tourist summer dropped off substantially. August is normally our busiest month but because of the Biscuit fire and the smoke, people quit coming! We, like other valley businesses, lost income which we can never recover.

Other

- If we don't offer DSL or some similar speed connection on the Internet soon we'll continue to lose opportunities to attract new business into this area.
- Need to look into fiber optics for everything.
- Thanks for your attention to this matter. This is a definite "weak link" in the chain here and your addressing it may increase the odds for better services. Thanks for all you folks do to make this a better place, it is wonderful and always better.

Survey – Cave Junction Area Residents

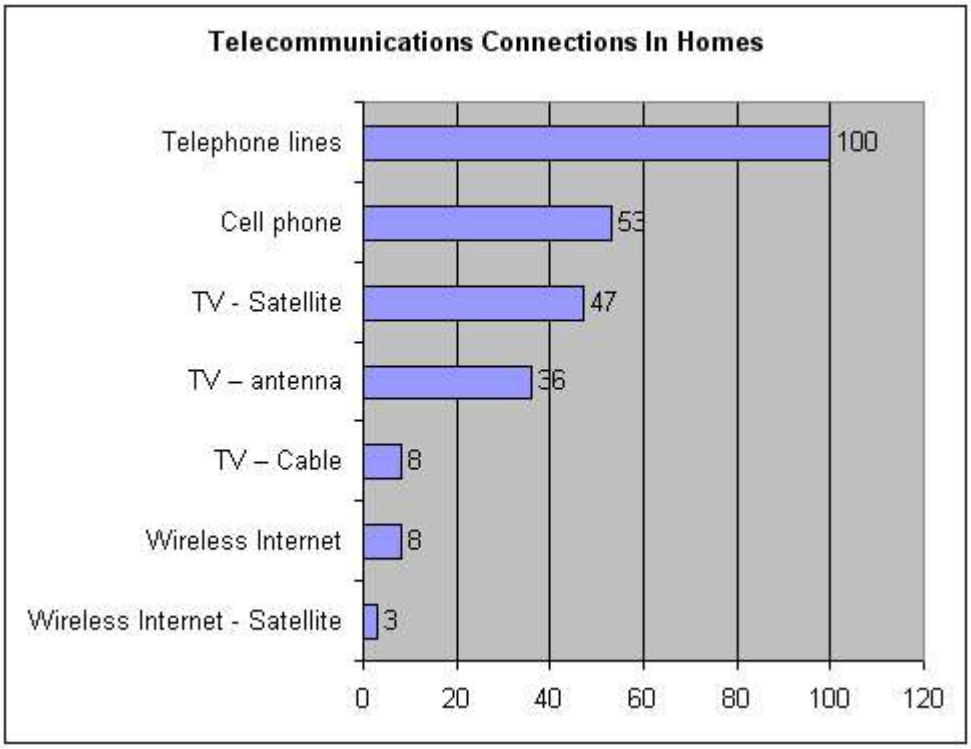
Location



Area/City Names

Cave Junction
Holland
Kerby
O'Brien
Selma
Takilma

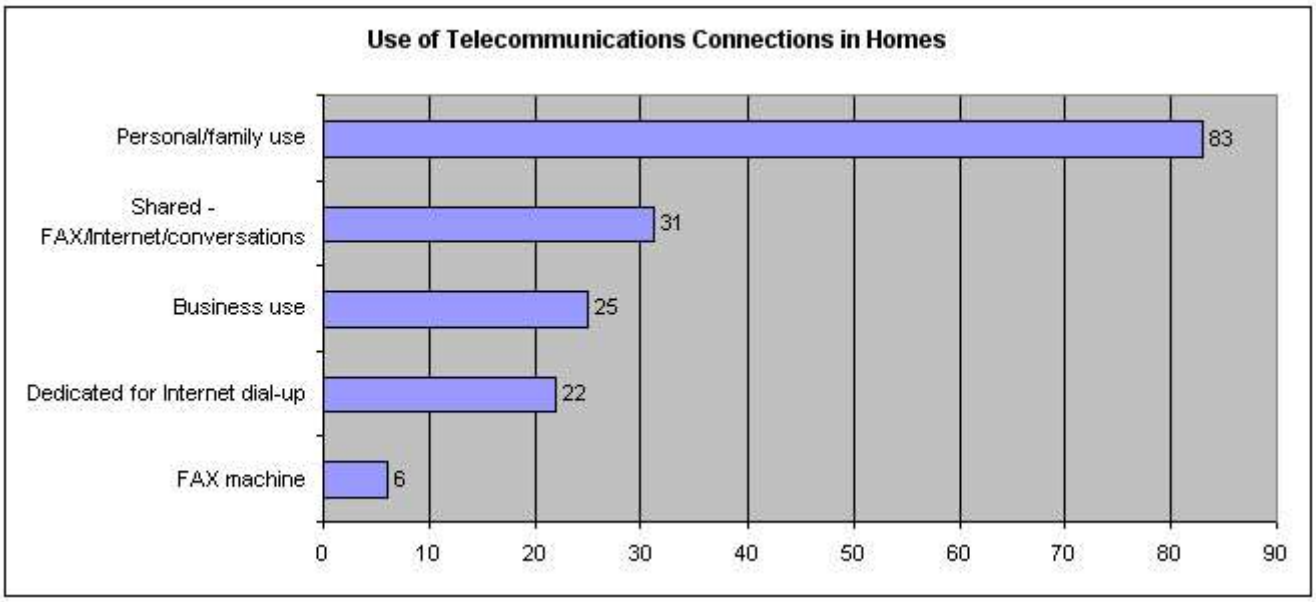
Telecommunication Connections In Homes



Note: Homes may have multiple connections

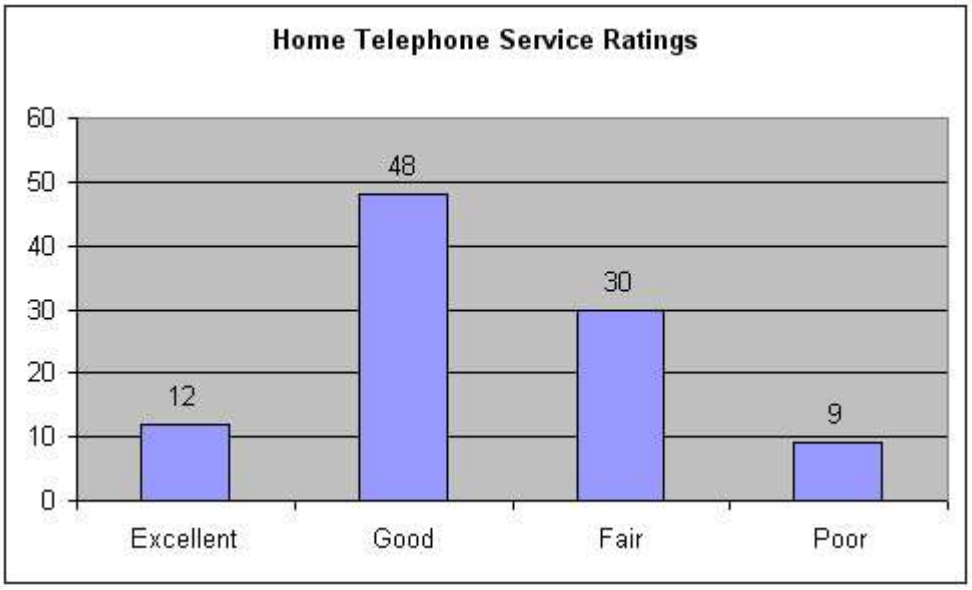
Average number of "#'s" per home = 1.82

Use Of Telecommunications Connections In Homes



Connections may have multiple uses.

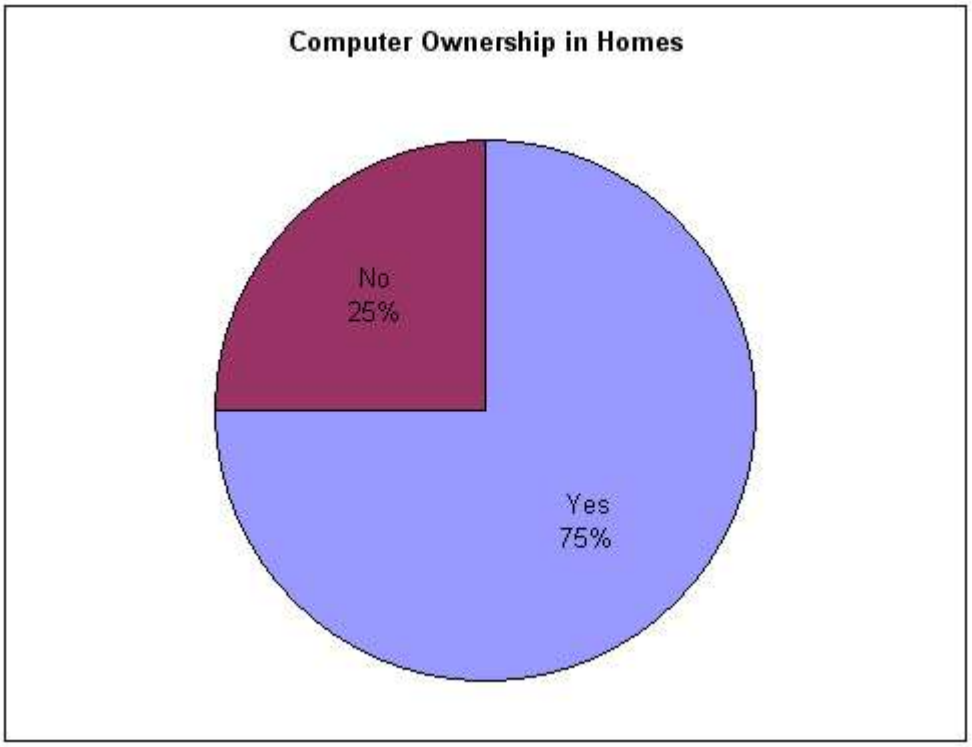
Home Telephone Service Ratings



<u>Telephone service providers</u>

ACN
ATT
Citizens/Frontier
Edge
Ramcell
US Cellular

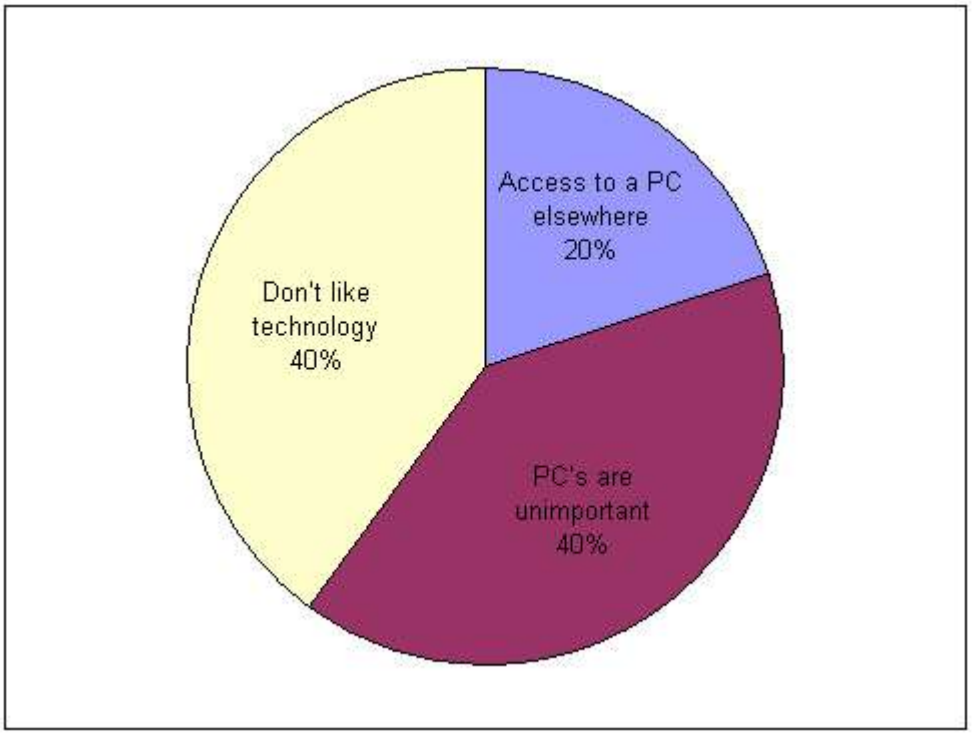
Computer Ownership In Homes



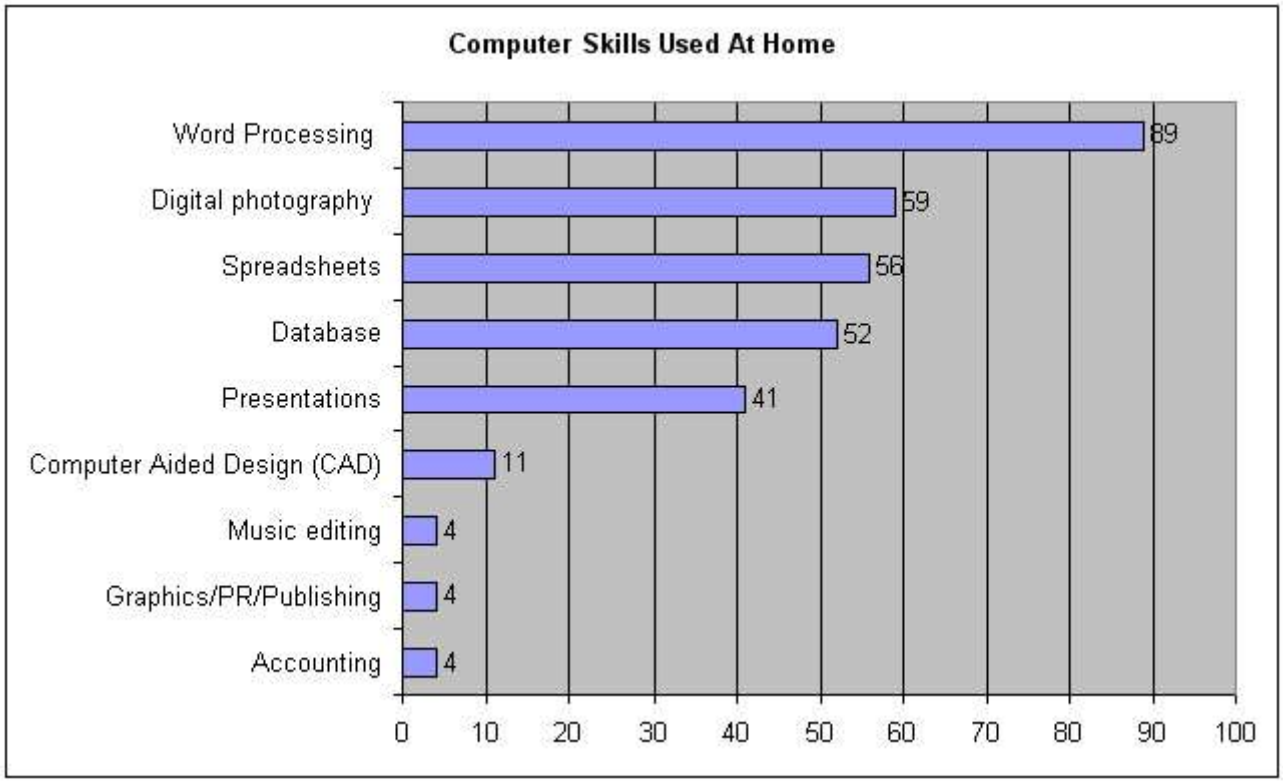
If "Yes"…:

	#
Average # PC's per home	1.48
Average PC users per home w/PC's	2.26

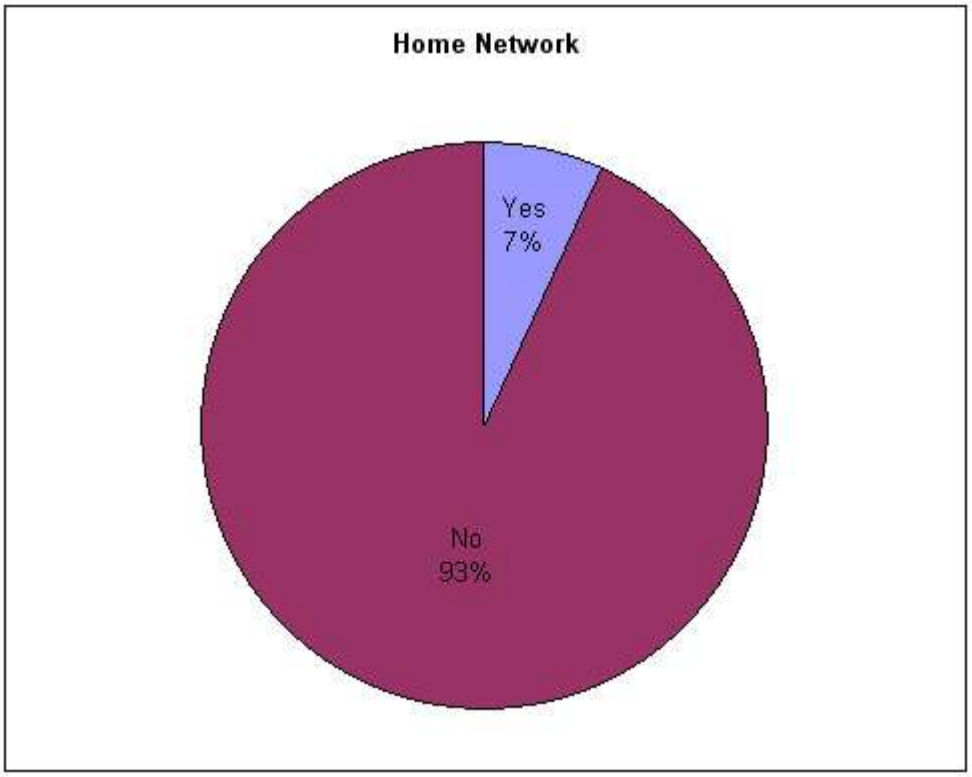
If "No" …:



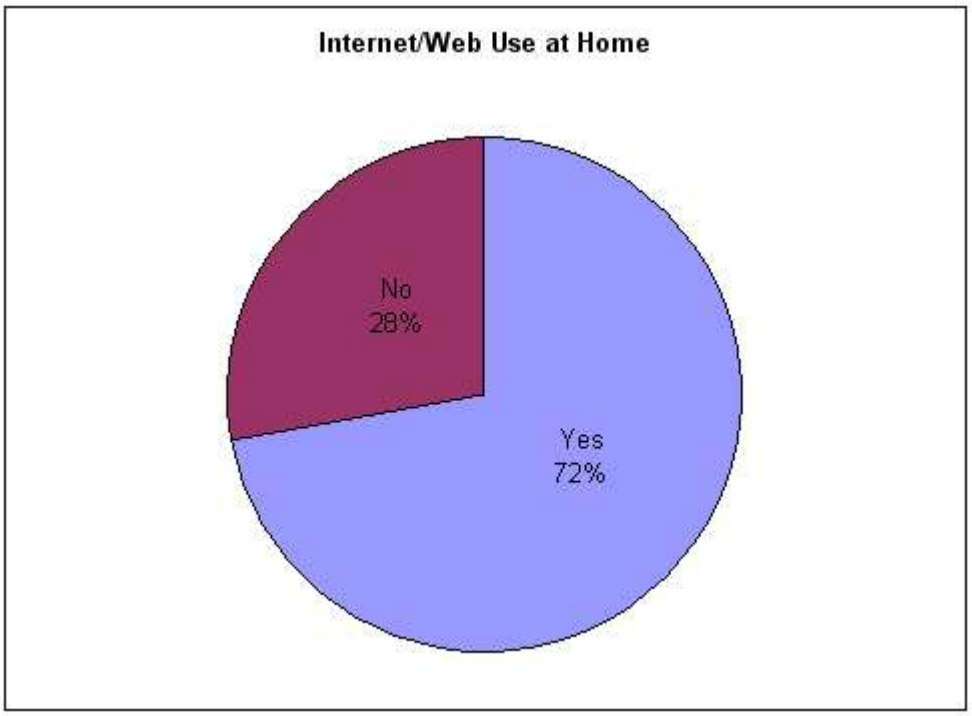
Computer Skills Used At Home



Home Network



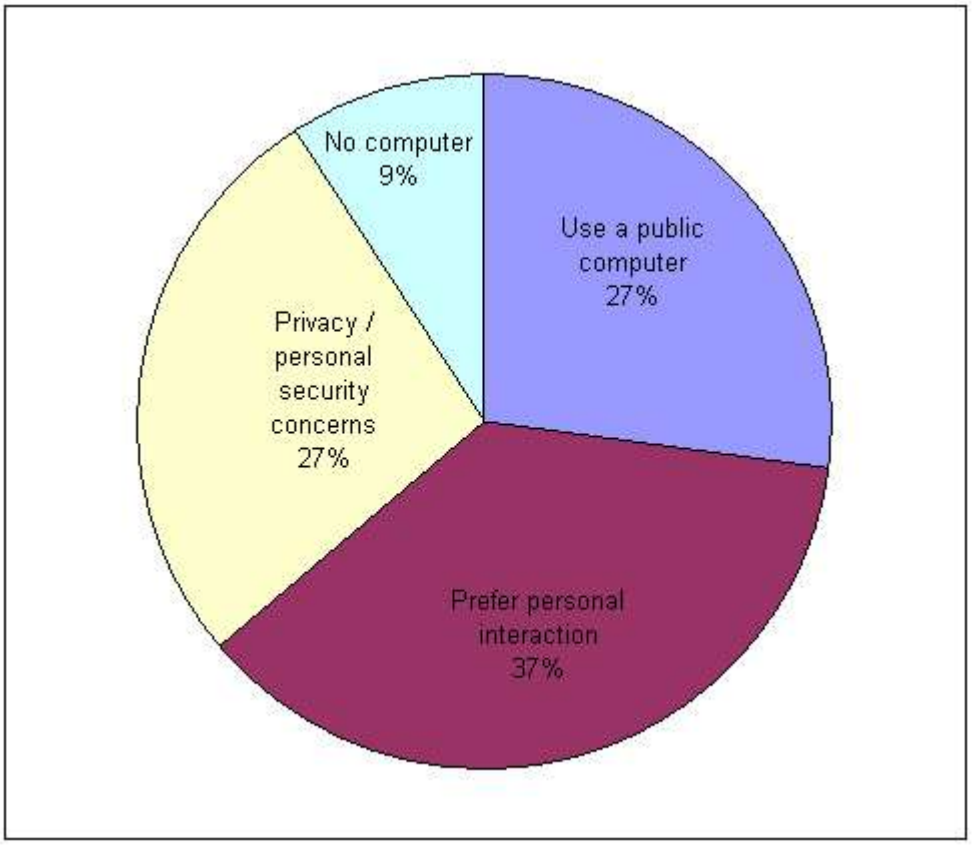
Internet/Web Use In Homes



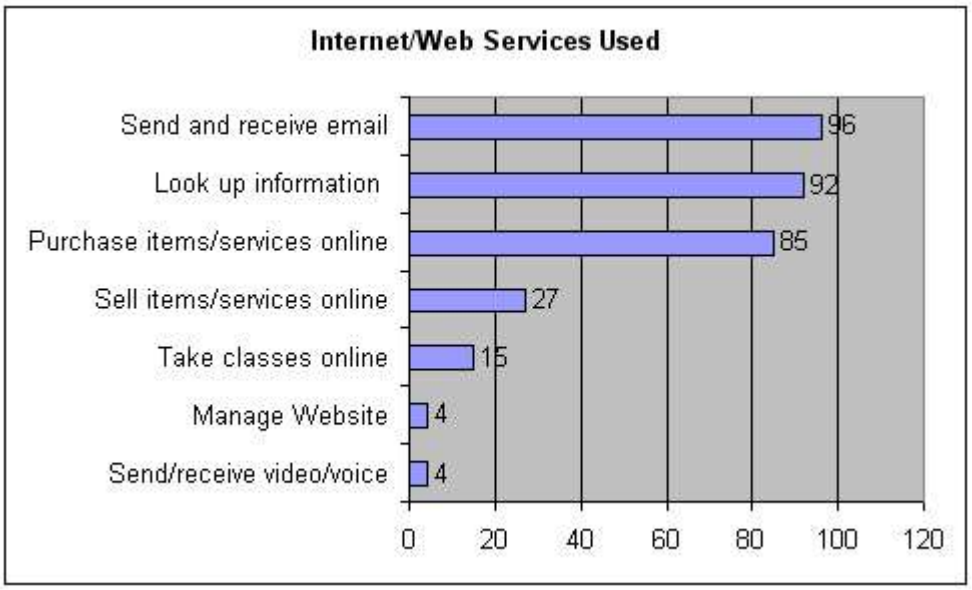
If "Yes"…:

	#
Average number using Internet/Web	2.73

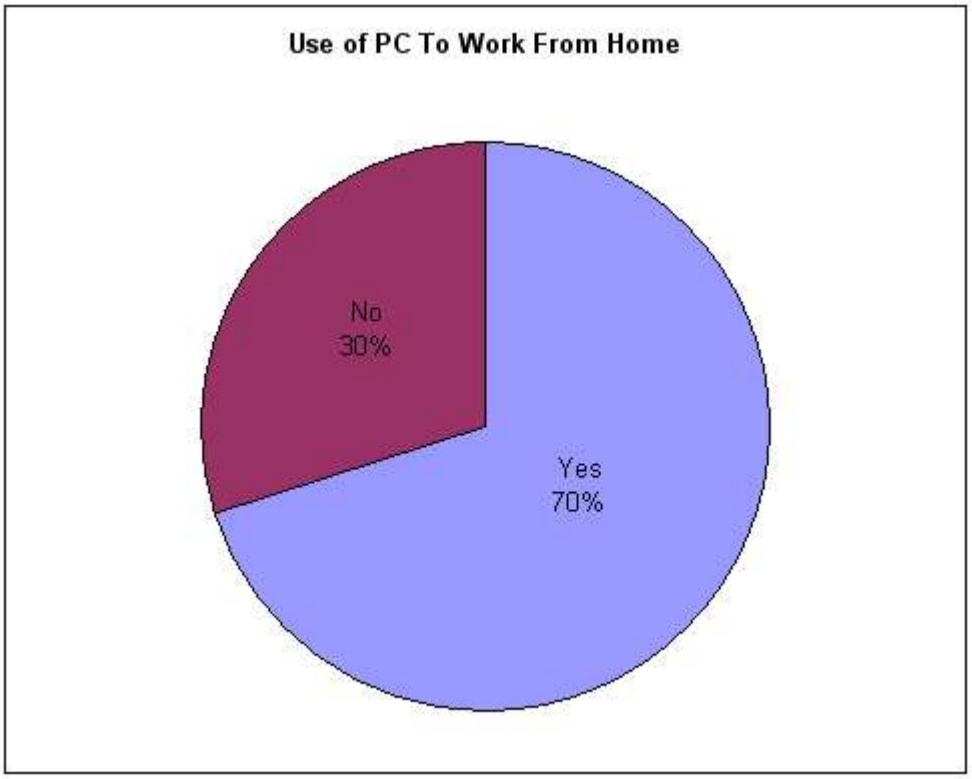
If "No"…:



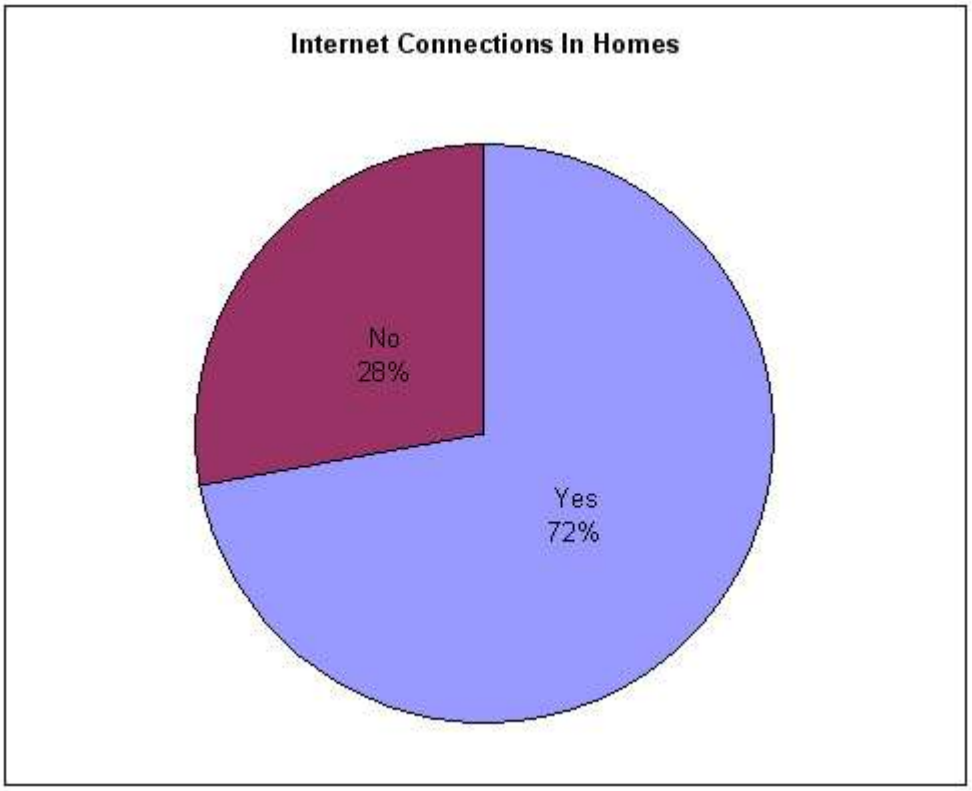
Services Used



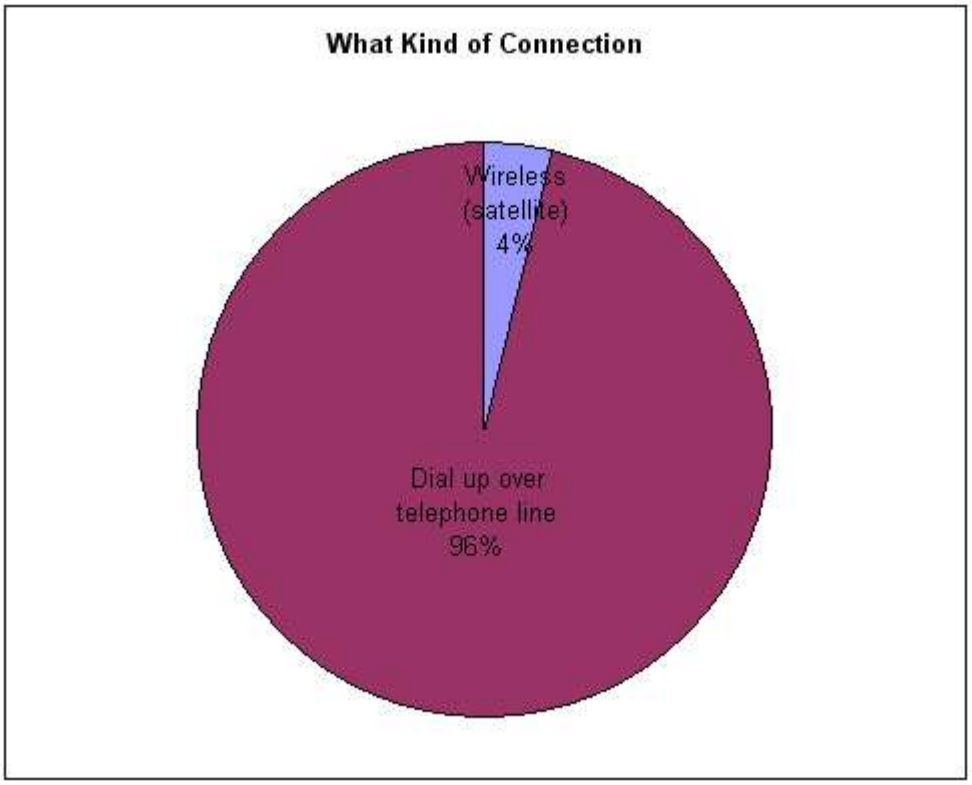
Use Of PC To Work From Home



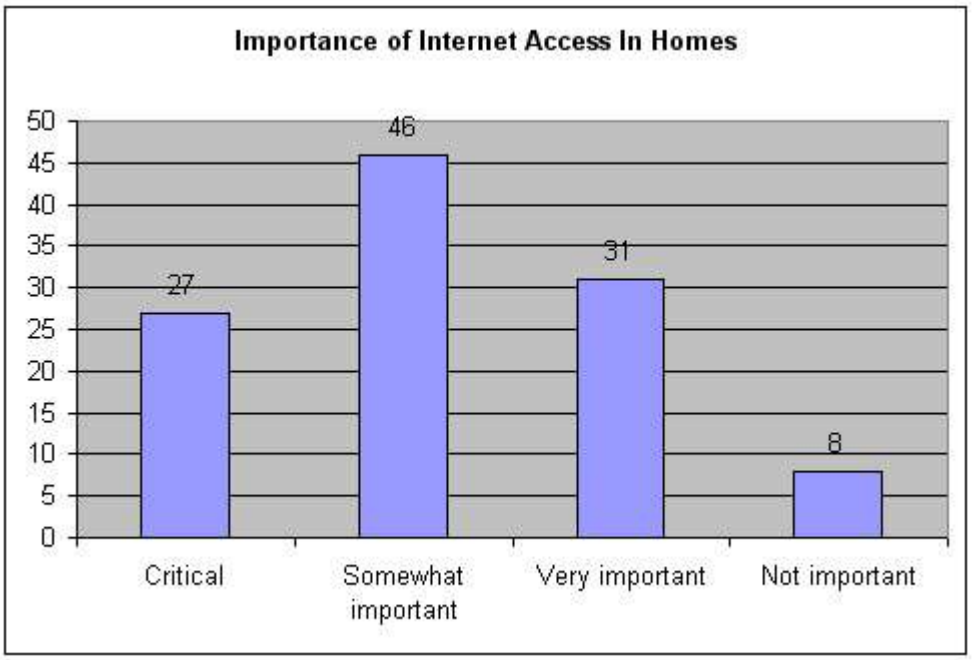
Internet Connections In Homes



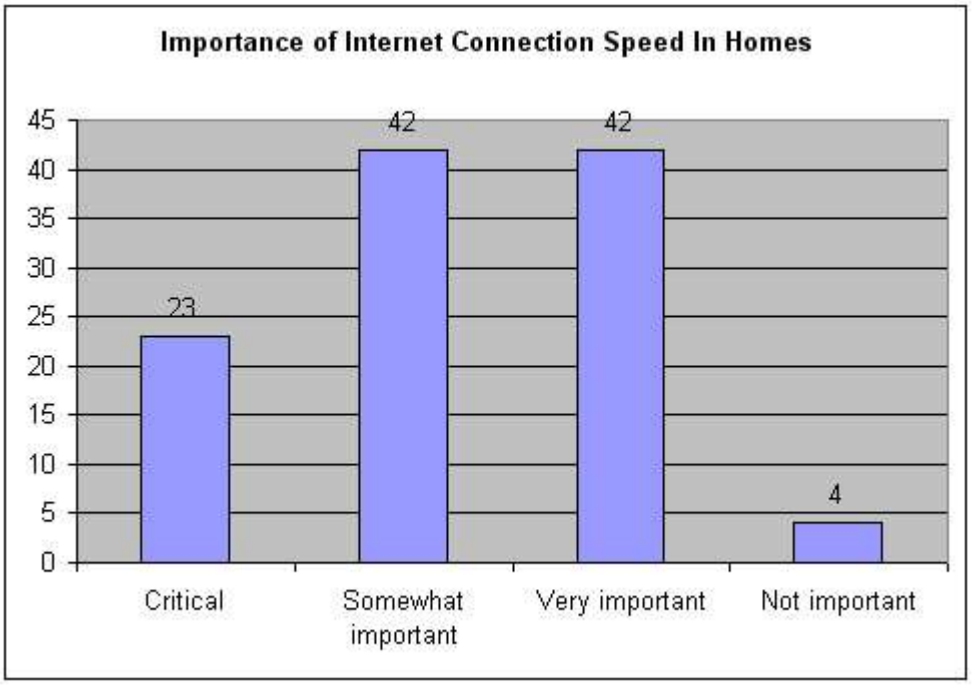
What Kind Of Connection



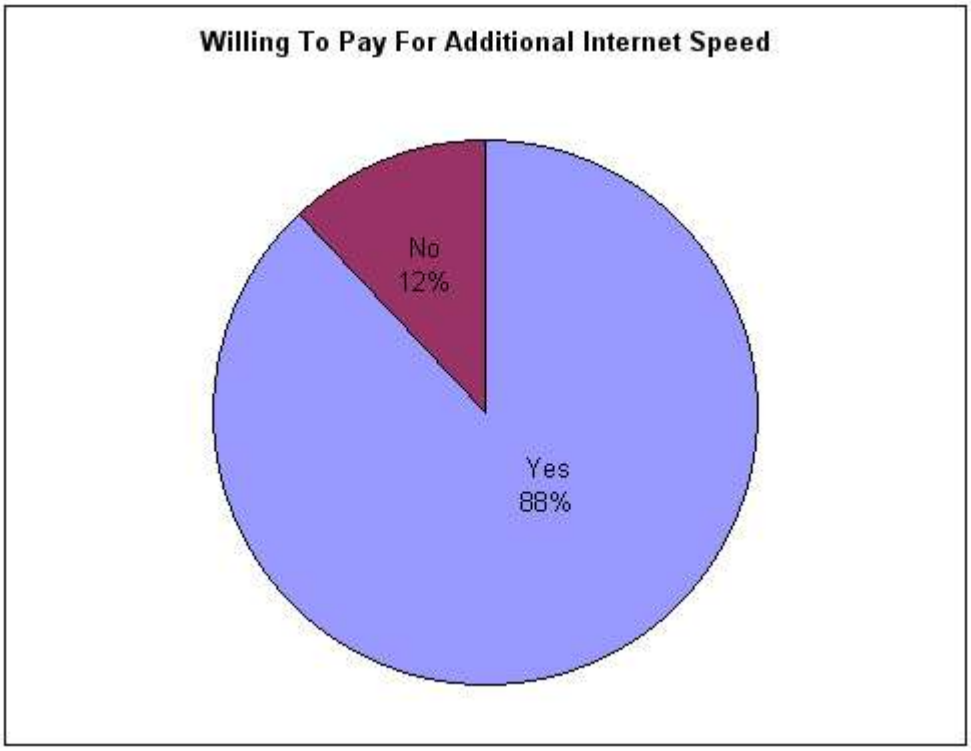
Importance Of Internet Access In Homes



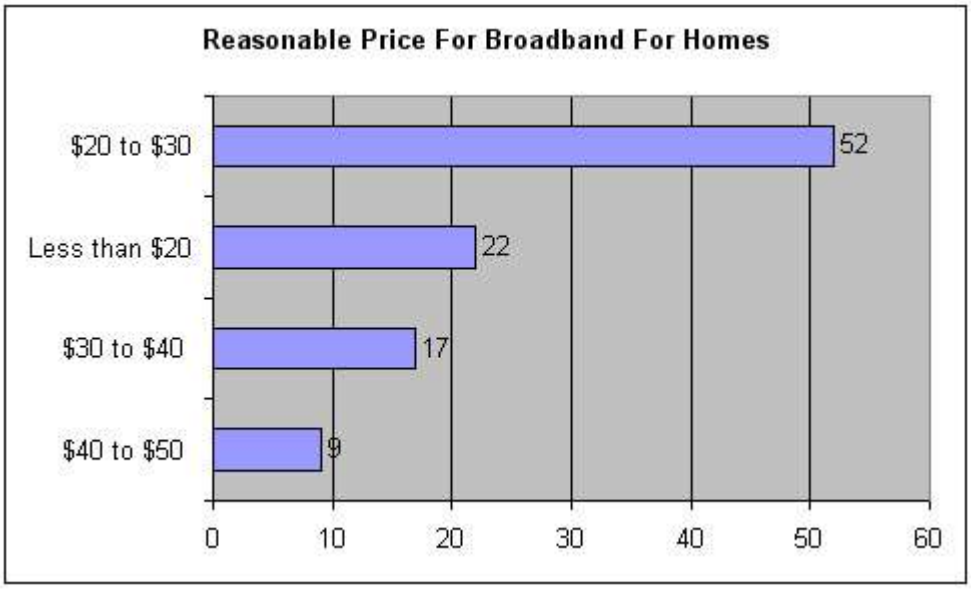
Importance Of Internet Connection Speed In Homes



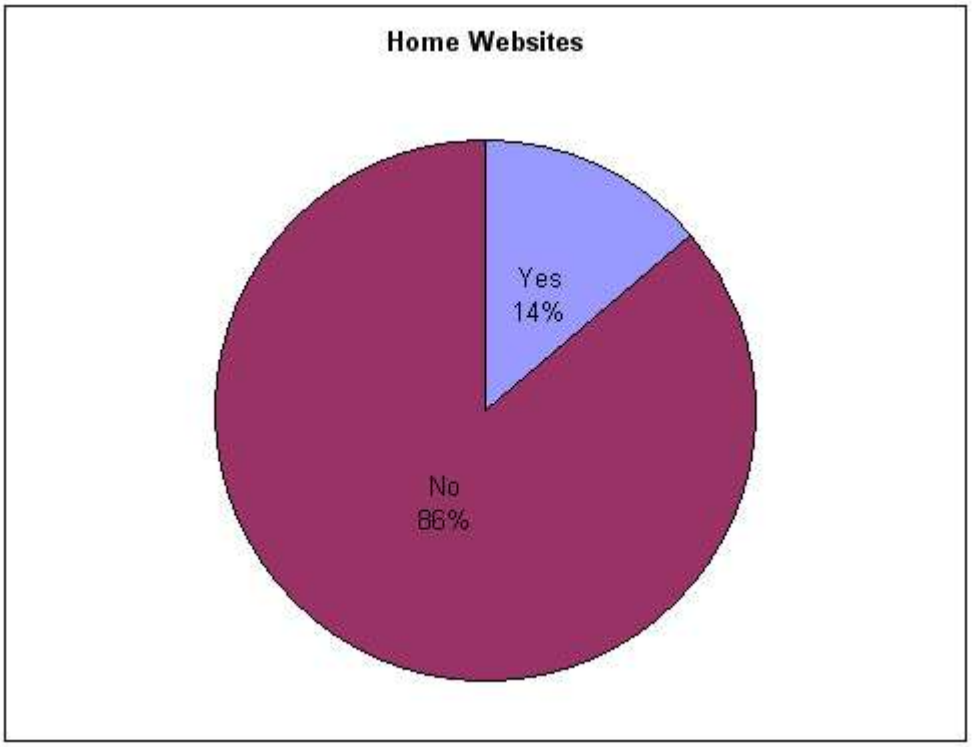
Willing To Pay For Additional Internet Connection Speed



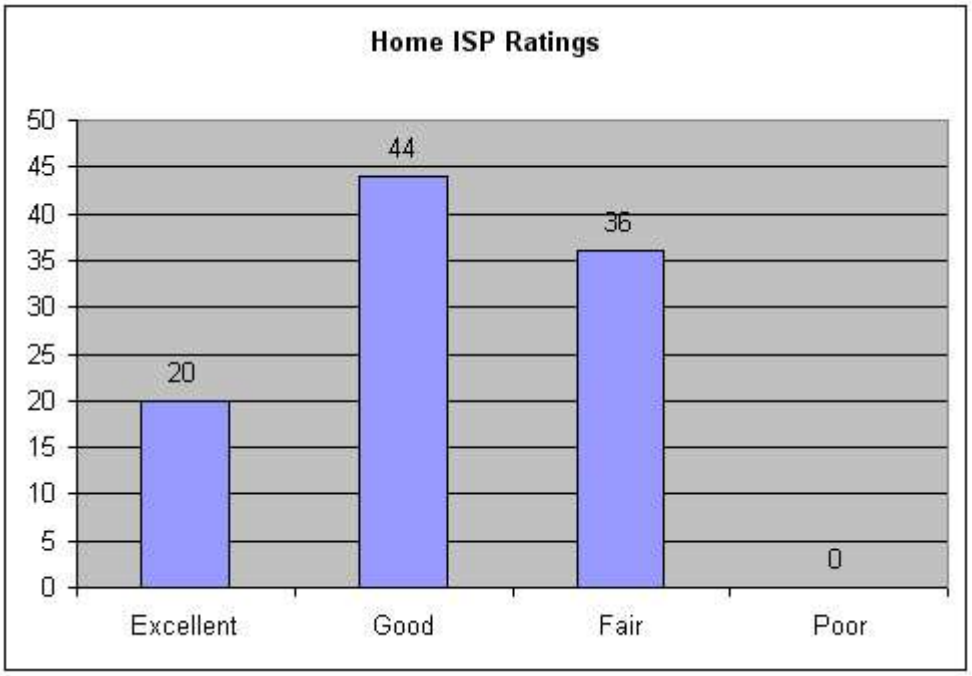
Reasonable Price For Broadband Access For Homes



Home Website



Home Internet Service Provider (ISP) Ratings



List of ISP(s)
Cavenet
CDSnet
Internet CDS

Concerns and Comments About Telecommunications

Voice – Local/ Long Distance/Cellular

- Affordable LD. Cellular not available throughout whole valley.
- As we are primarily analog out here, there are several phone services not available such as caller ID; plus the quality of service is not as good as one can get in say GP and beyond. (I just changed from US Cellular to Ramcell and it's a much better service and connection quality.)
- Cell - need better service. Some areas can't call or receive. C/B critical.
- Concerned that the proposed so. OR EAS doesn't raise the (all ready to high) cost of O'Brien-Cave Junction EAS.
- Frontier Comm. Have been very unreliable. I have had several problems. Very unsatisfied.
- Frontier not competitively priced.
- In state LD too high.
- LD to O'Brien. Pay extra to call GP
- Phantom calls. LD is good. Cell is poor.
- The local switch in O'Brien is ancient. Everyone was hoping it would be destroyed by the Biscuit fire so that Frontier would have to buy a new one from a yard sale….
- Very expensive.
- Very important. Many providers do not have a digital signal in CJ.

Internet/Data

- …recently installed fiber-optic cable running thru town that nobody can use!…
- Downloads too slow
- Higer speed w/b delightful.
- I just got a brand new whiz-bang computer system and was disappointed in getting the same old connection and download speeds. Don't know what I could have been thinking…
- Keep it simple
- Need DSL
- Need faster connections.
- Prices high. Slow connection and often kicked-off
- Slow, slow, slow. Dropped connects. Poor dial-up connects.
- Slow, glitches
- Slow.
- Slow…

Video/Television

- Dream on!
- Hope there is some possibility of broadband to the rural areas of IV. It would seem inappropriate to use community resources to extend broadband only to those areas with cable access or w/I DSL distance of phone switches. Community resources s/b used for wireless last mile broadband access...
- Local channels only through cable.
- No local stations.
- No local TV access through satellite.
- No off-air signals, no local stations. Want local PBS.
- Not important.
- Poor reception. Might get dish.
- Small dish/big dish -- very confusing and no one seems to be able to provide access to a wide range of choice unless you take tons of stuff you don't watch -- and don't want to pay for!
- We are not able to get cable out here. Spouse not keen on dish.
- Would like to get Internet service through satellite.

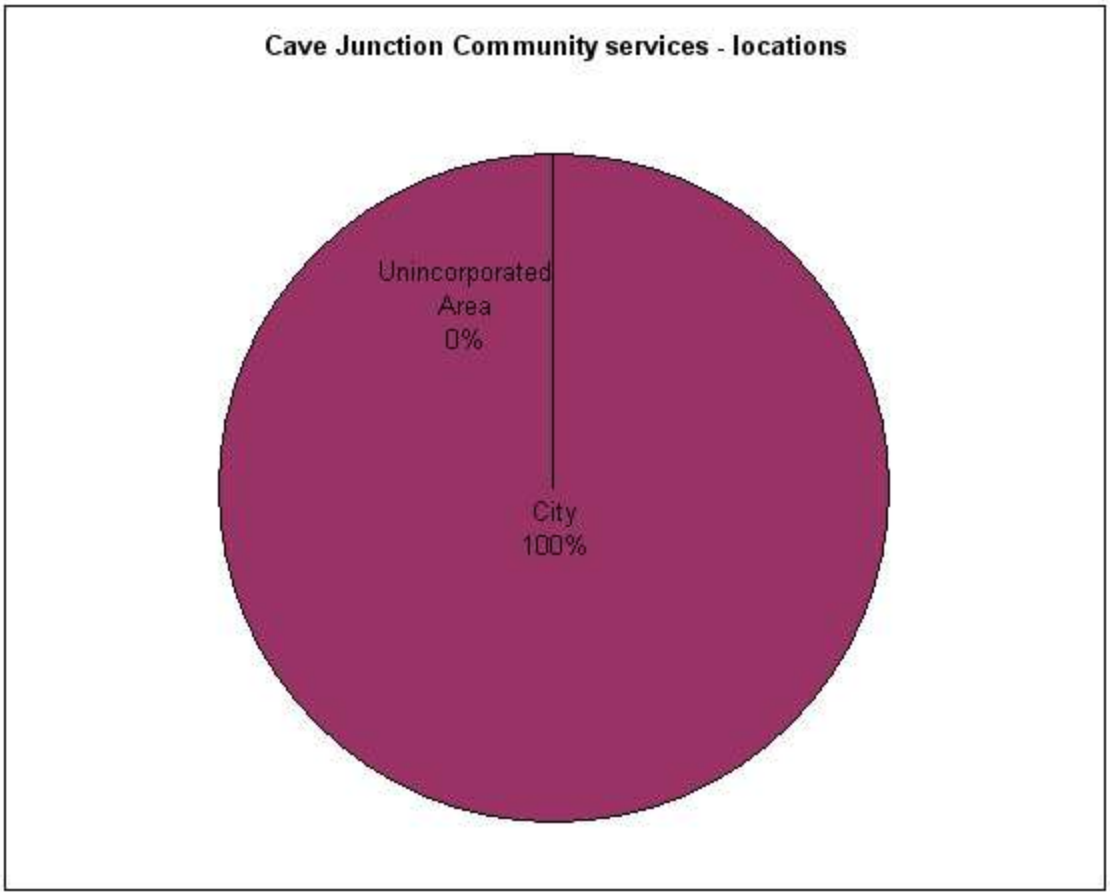
Other

- GP should not be LD.

- I have a product that s/b on the Web. I have a business ad on the Web now.
- Only other comment is the need for a true (not related to a business or org.) Illinois Valley web site, as evidenced by the fire, for community information, meetings, weather and emergency info. I recently wrote a very informal proposal and gave it to Ron about this. There are still some domain names available for such a site, but I believe ivonline.com is already taken by an Illinois (state) group or invividual... Thanx for getting this survey together.
- Price - rates - all those added unexplained expenses? Keep tacking them on.
- The local phone company, hard-wire broadband seems unlikely in the next many years. Satellite offers hope. I would prefer duplex access, but don't need any TV channels. What kind of hope do you have to offer?
- Wish it was all hooked together with one fee.

Survey - Cave Junction Area Community Services

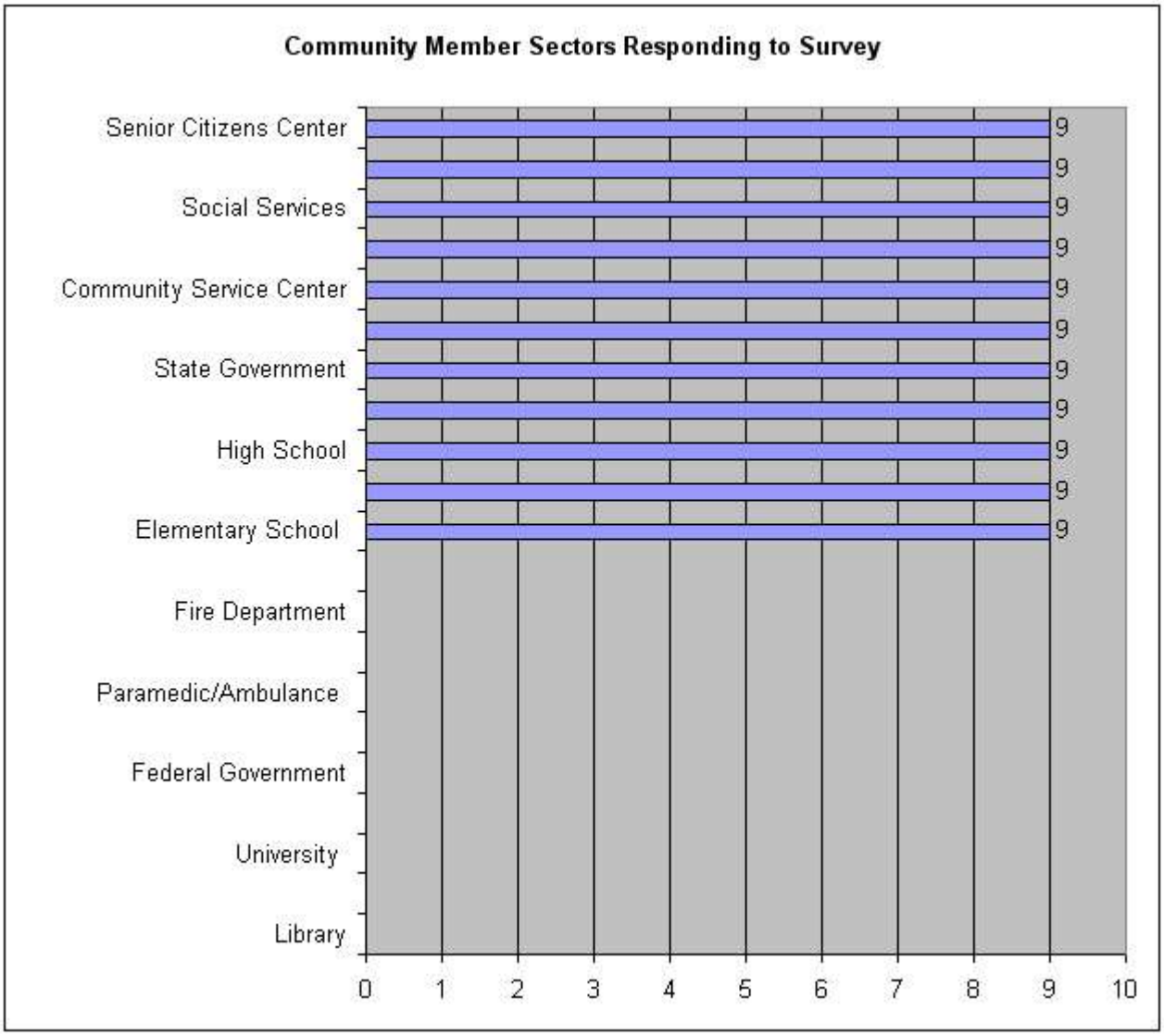
Cave Junction Area Community Service Locations



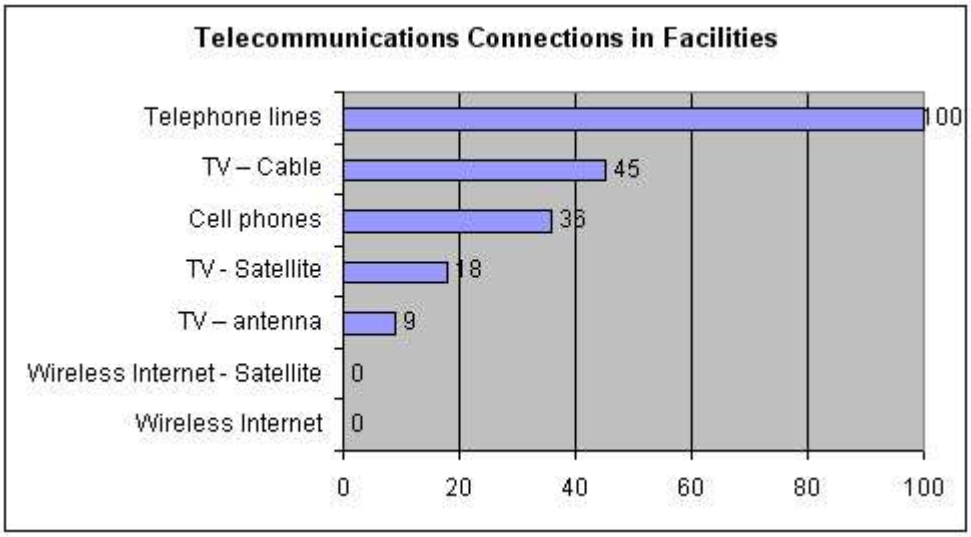
Community Member Employees

	#
Employees	237

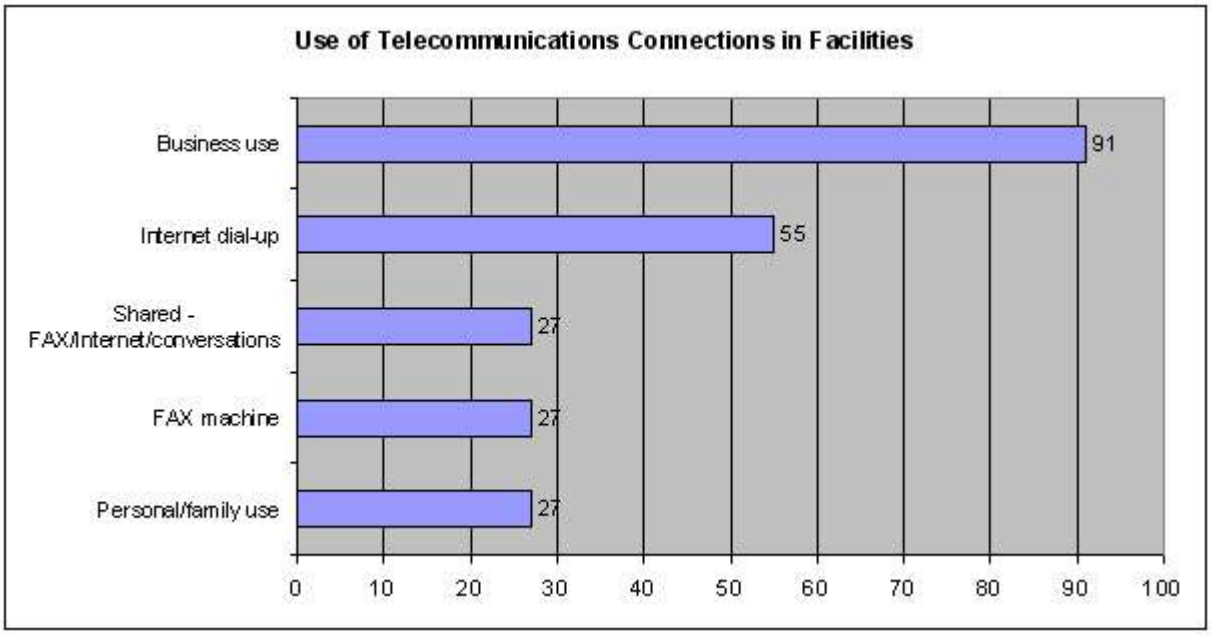
Community Member Sectors



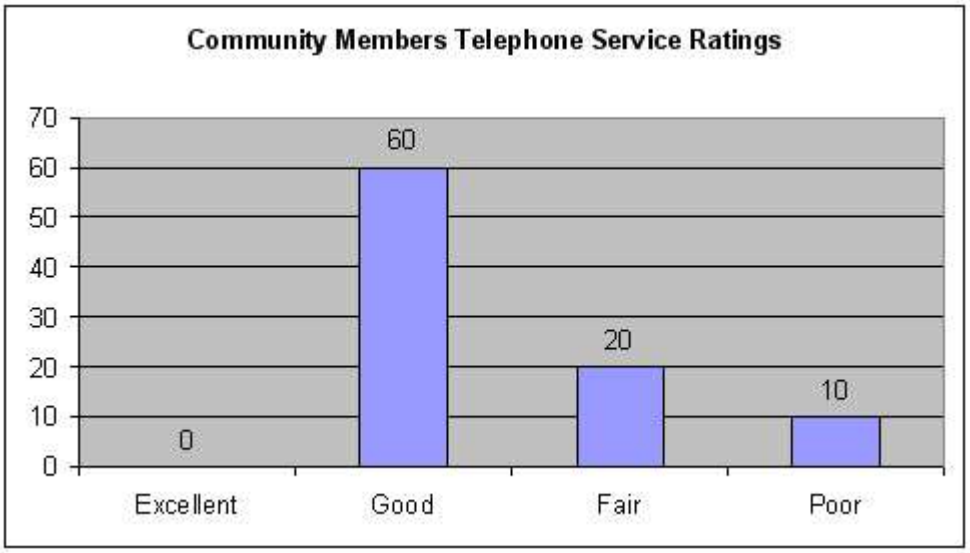
Telecommunication Connections in Facilities



Use of Telecommunications Connections in Facilities



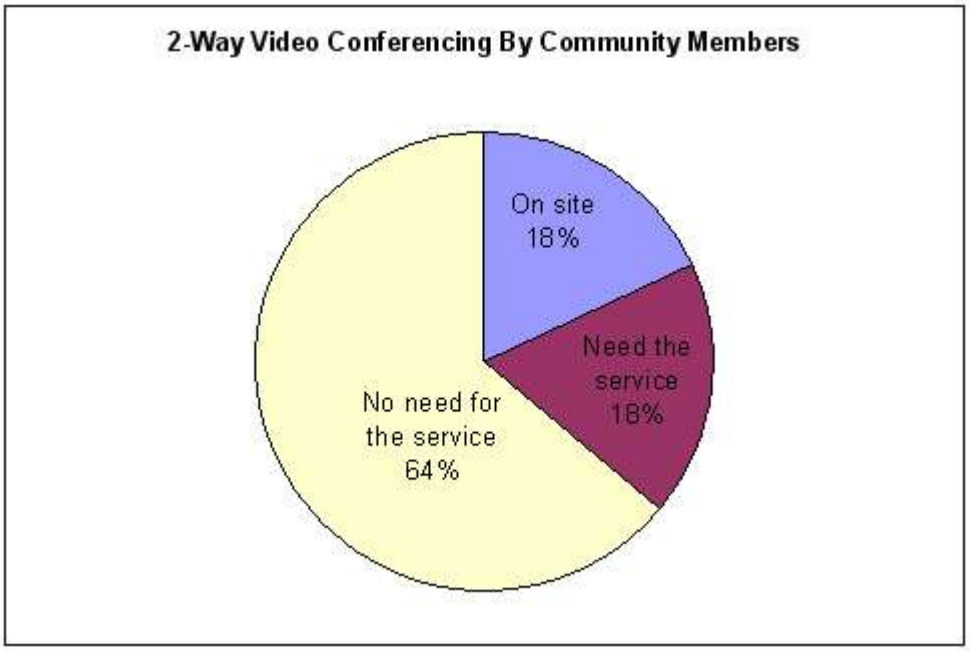
Community Members Telephone Service Ratings



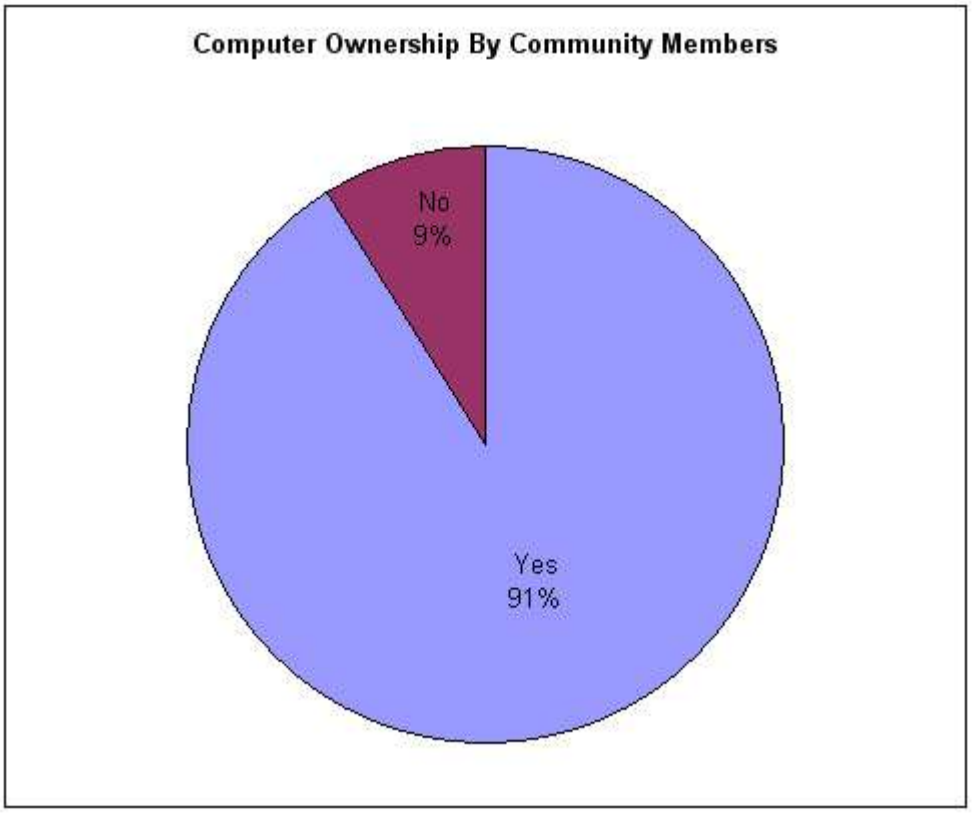
Telephone service providers

Frontier
Qwest
Working Assets
ATT

2-Way Video Conferencing



Computer Ownership By Community Member



If "Yes"…:

	#
Average # PC's per community member	37
Average PC users per community member w/PC's	1.6

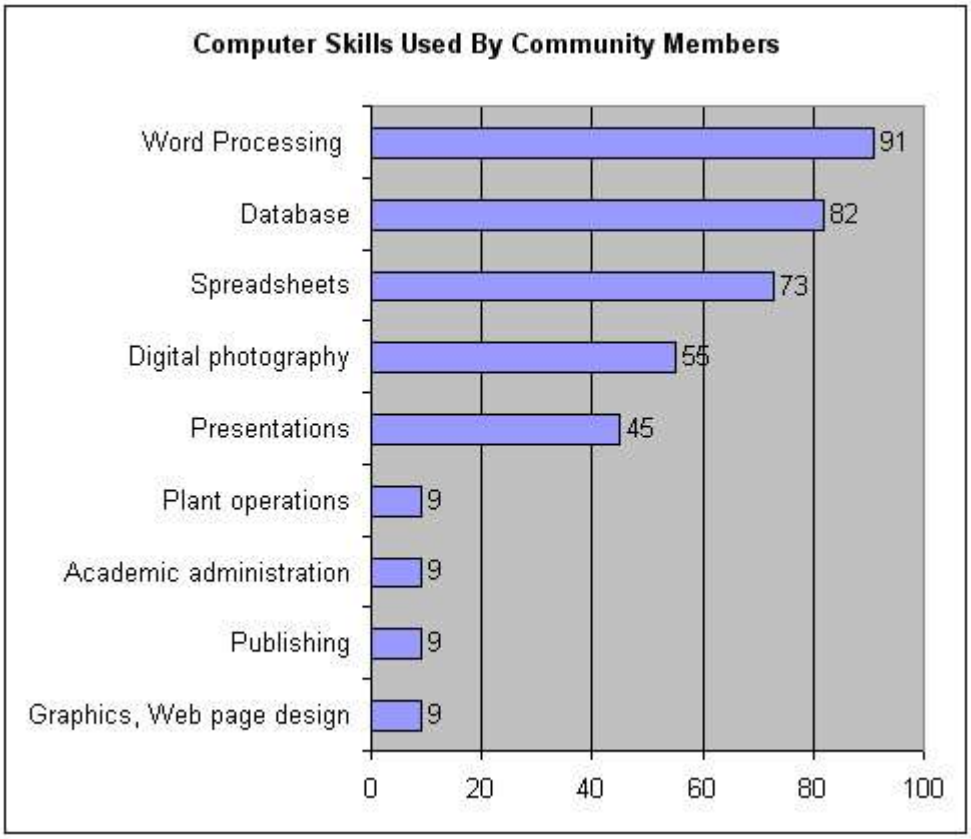
NOTE: 160 PC's at the high school

If "No" …:

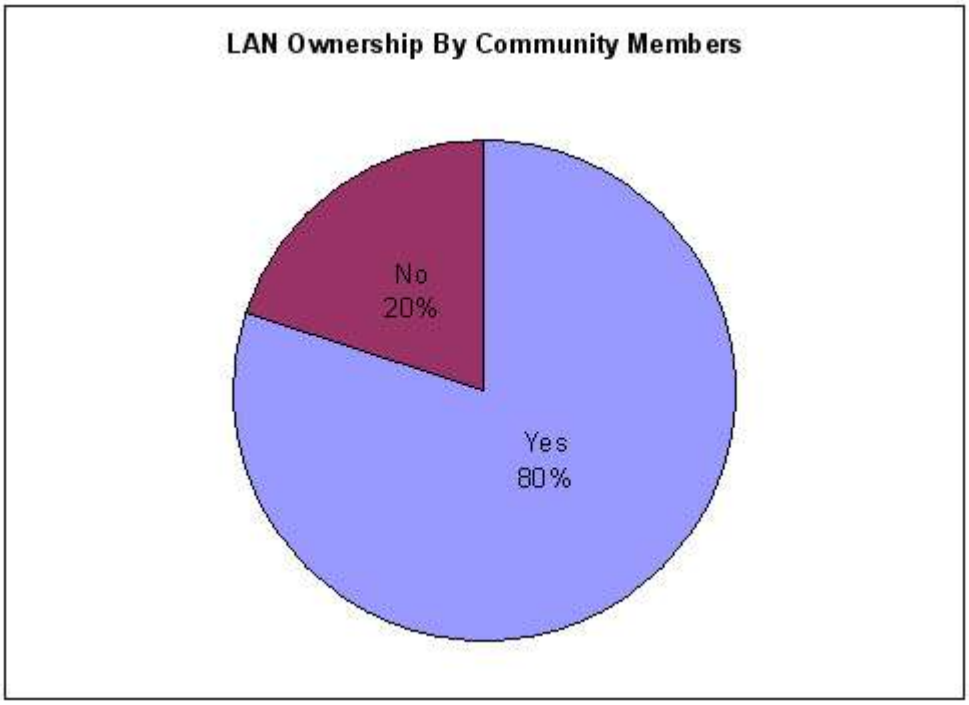
	%
PC's are too expensive	9
Need training before I'll get a PC	0
PC's are unimportant	9
Don't like technology	0
Access to a PC elsewhere	9
Other:	0

Note: These responses from the same location

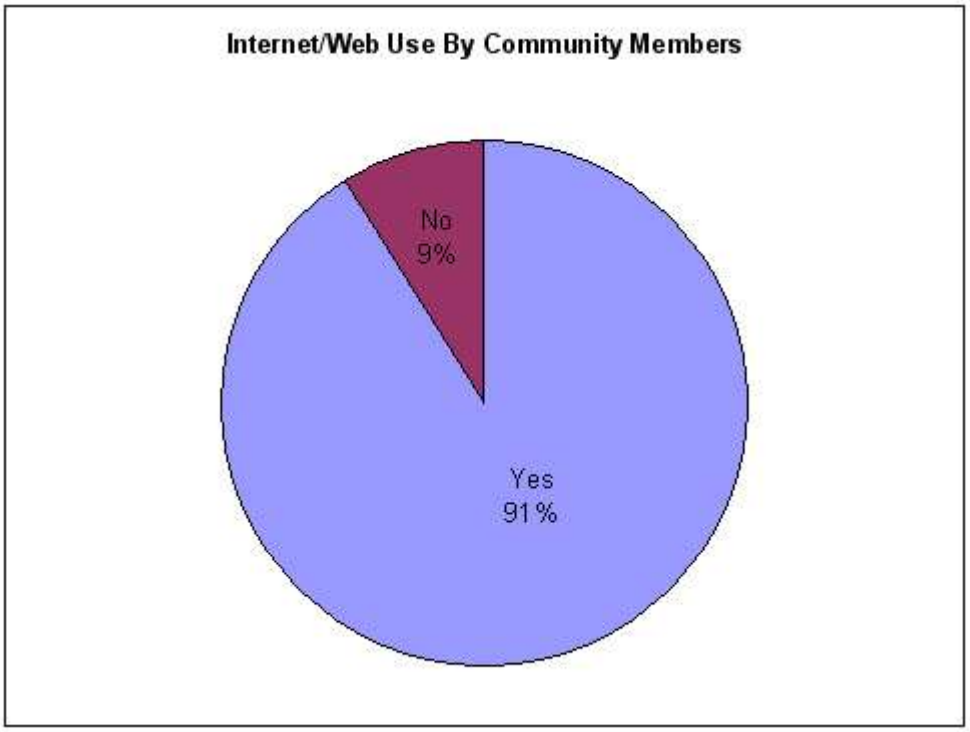
Computer Skills Used By Community Member



LAN Ownership



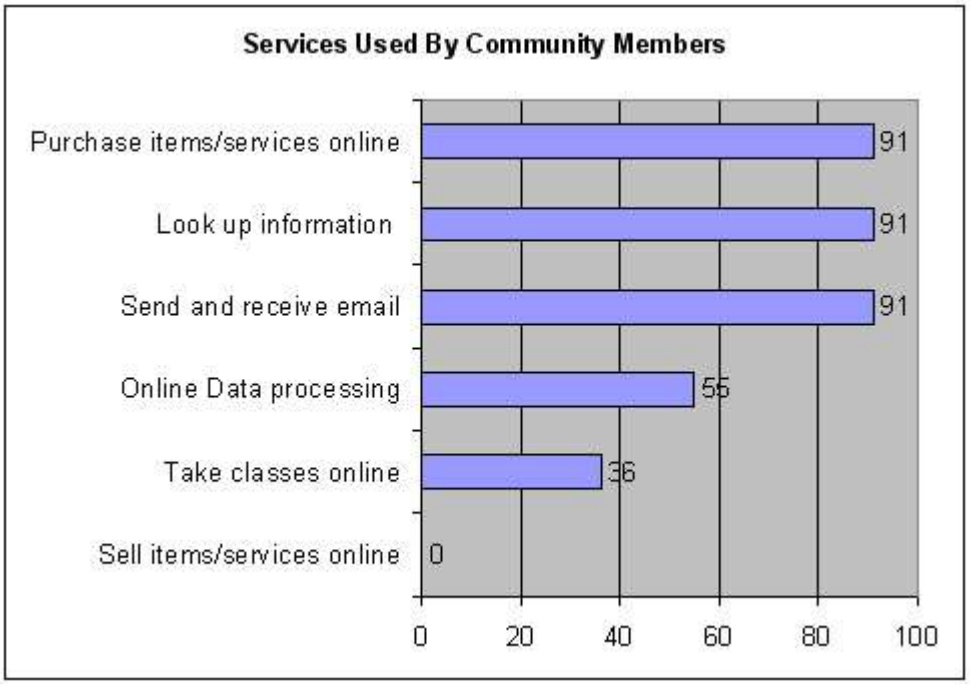
Internet/Web Use By Community Members



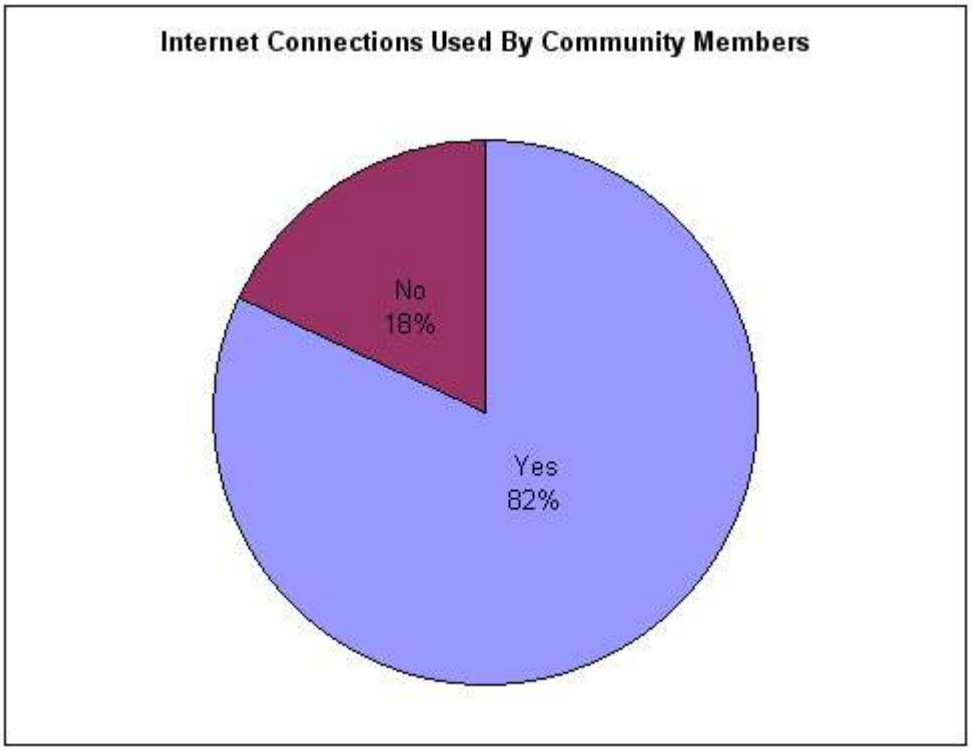
If "No"…:

	%
Use a public computer	9
Prefer personal interaction	0
Privacy/personal security concerns	9
No computer	0
Use home computer	0

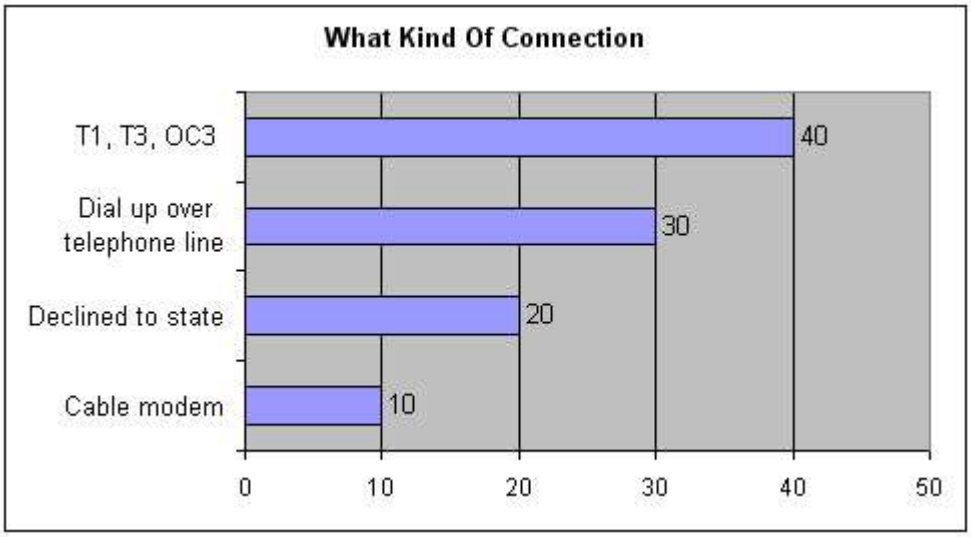
Services Used By Community Members



Internet Connections Used By Community Member

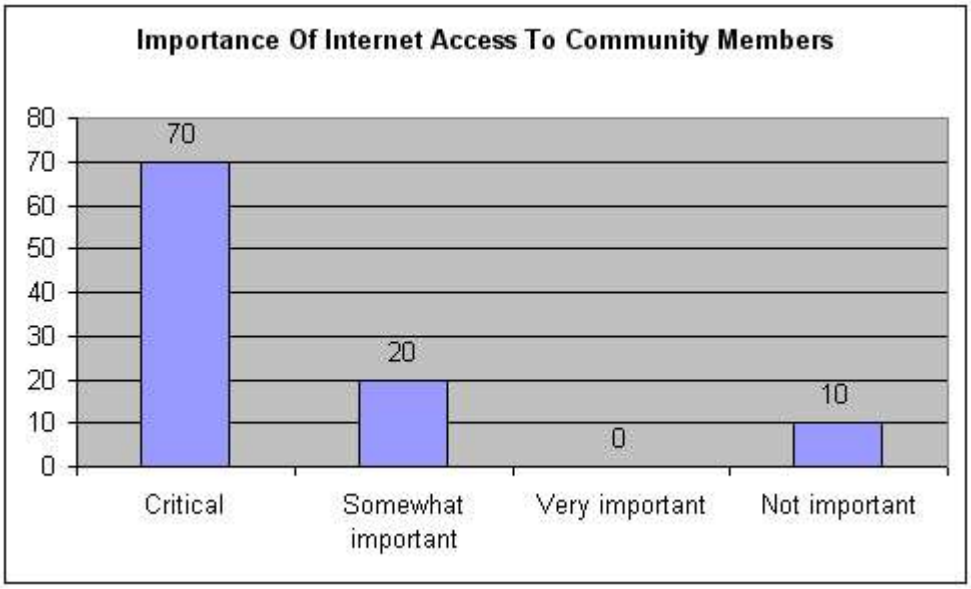


What Kind of Connection / What Does It Cost – Community Members

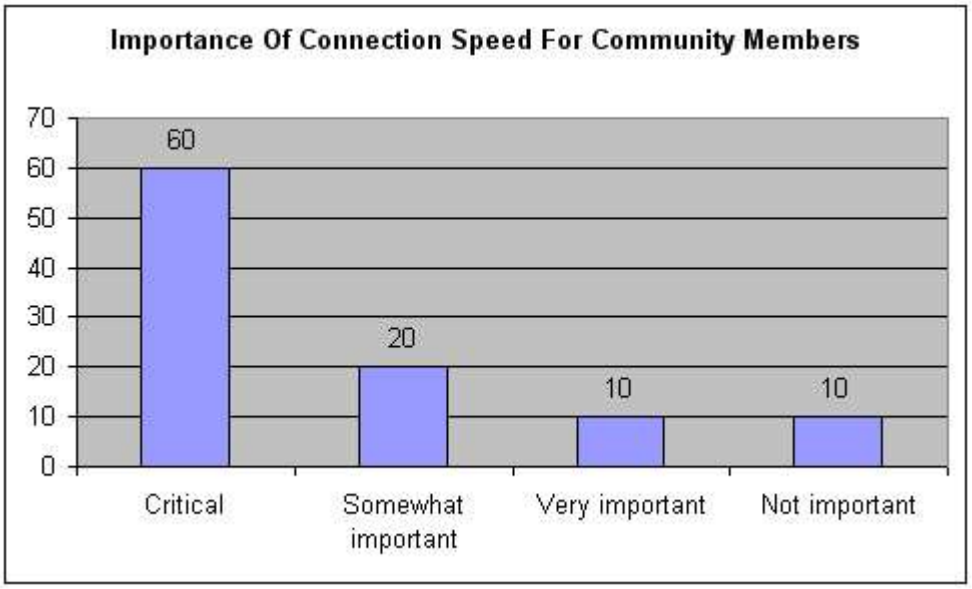


Note: Curiously, there is no cable modem access in Cave Junction.
T-1's are at schools

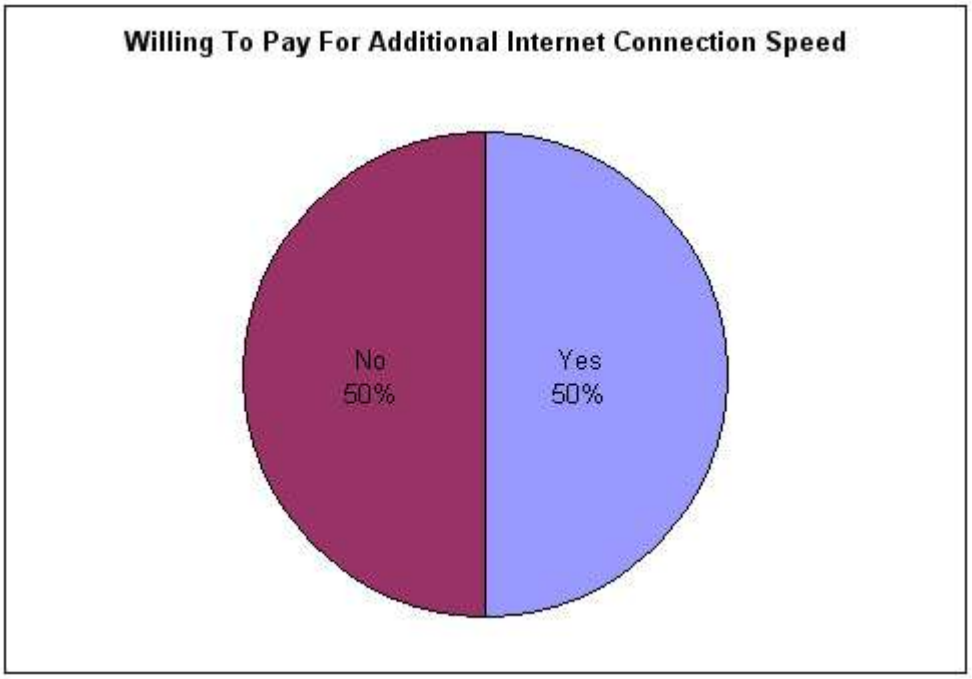
Importance of Internet Access for Community Members



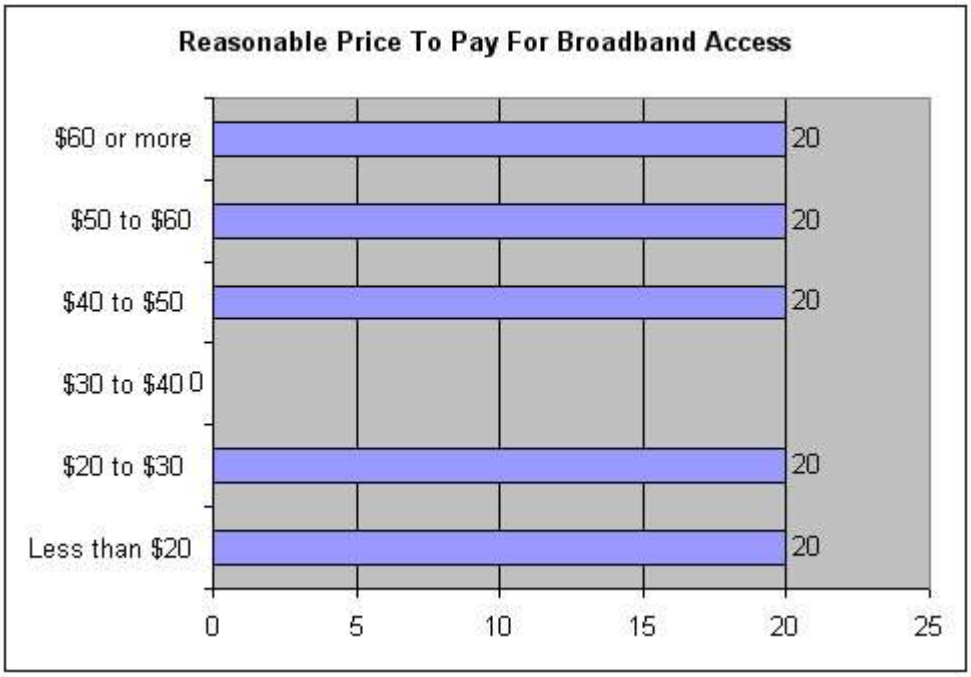
Importance of Internet Connection Speed for Community Members



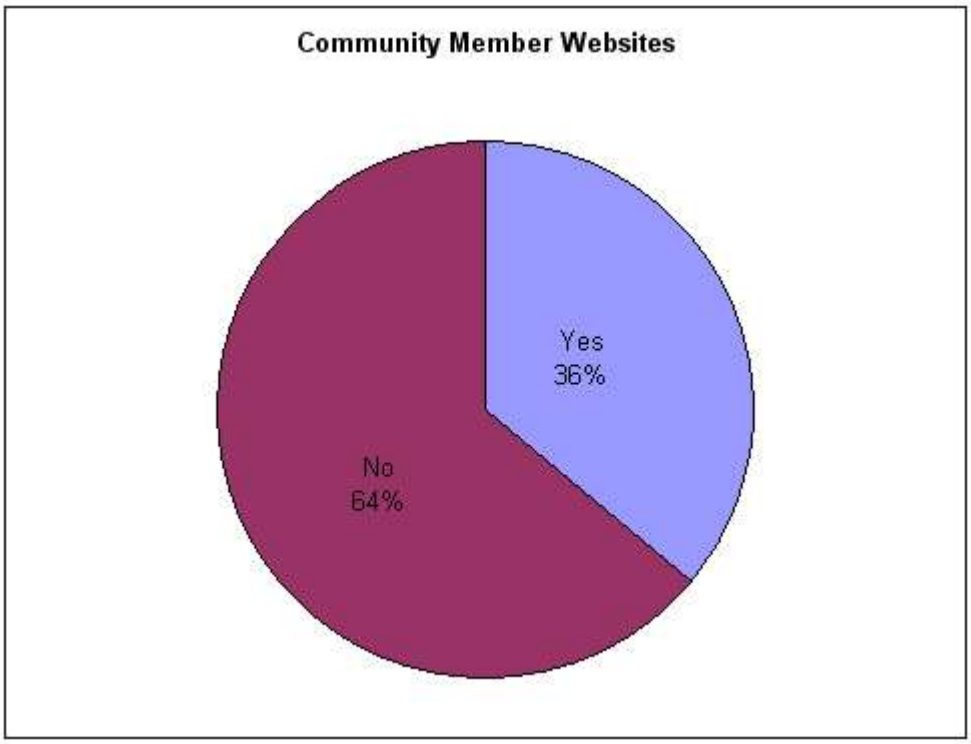
Community Members Willing to Pay for Additional Internet Connection Speed



Reasonable Price for Broadband Internet Access



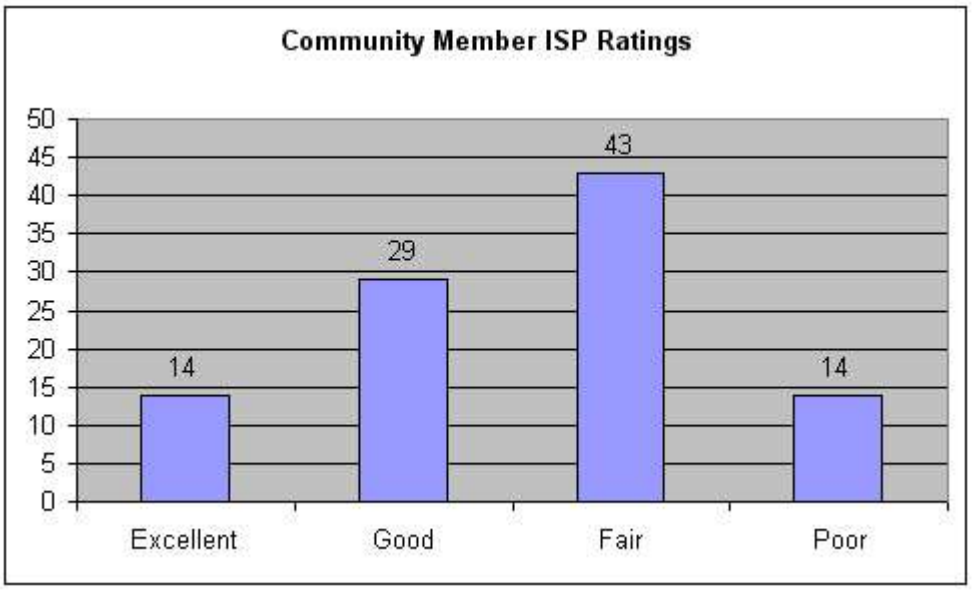
Community Member Websites



If "Yes," where do you host your business Website:

	%
Onsite	25
At an ISP	75

Community Member Internet Service Provider (ISP) Ratings



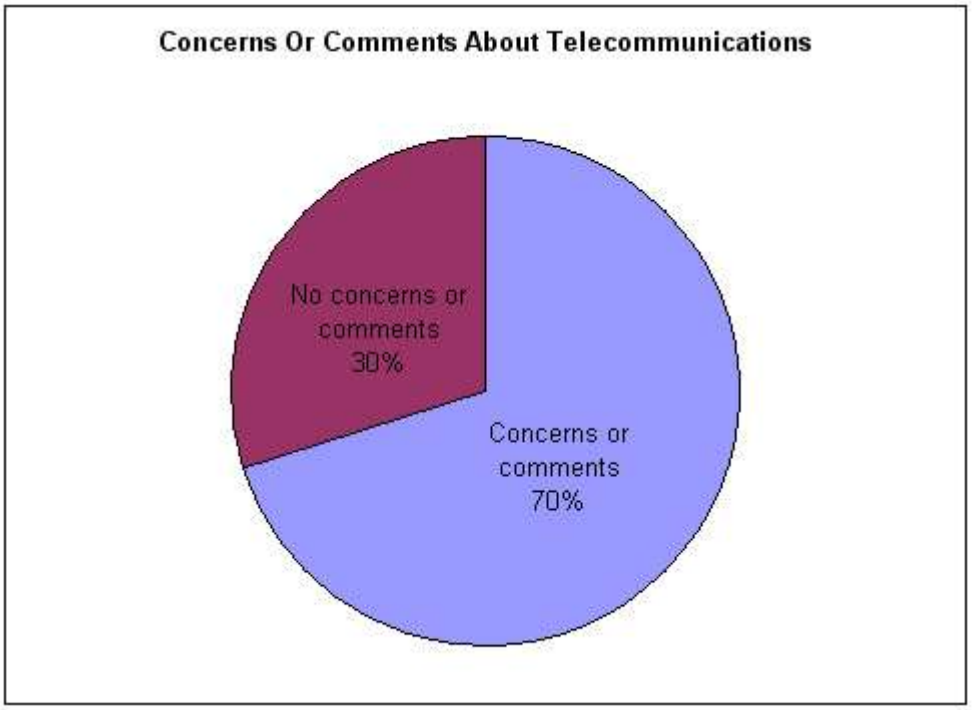
List of ISP(s)
Original Web Solutions
CDS
ESD
InternetCDS
Cavenet

Telecommunications Connections – Additional Information

	Now	Future
Wireless (satellite)	9	9
Wireless (land-based)	9	9
DSL	9	9
Cable	9	18
ISDN		
T-1	9	9
T-3/DS-3		9
Fast Etherne	9	9
Gigabit Etherne		9
Video Conferencing		9
Virtual Private Network		9

	%
"I don't recognize most of this stuff."	36

Concerns or comments about telecommunications



Voice
- Calls to Grants Pass from most of Valley are long distance.
- Need more lines, voice mailbox capability
- I would like to see digital cell phone use become possible in IV.

Internet
- Too Slow
- Our own dedicated T-1 line
- Dial-up speed is less then 28.8. Cable or satellite Internet s/b available.
- With 25 classrooms and other school areas accessing T1, transmission can be slow.
- Faster Speed, downloads extremely slow

Video
- No access to local stations outside cable infrastructure.
- Our video equipment: VCR's. DVD's, cameras are either so outdated they are not useful, or non-existent (school).

Other
- Wireless and video conferencing and of course #1 is net speed.
- Digital cameras and picture ready printers are needed in every classroom.

Survey Analysis

Four surveys were conducted. Surveys were mailed to 4 populations – Josephine County, Cave Junction residents, Cave Junction businesses and Cave Junction community services. The Josephine Countywide survey gives a picture across the entire county and is heavily skewed by the Grants Pass area responses from small to medium sized businesses. The Cave Junction Area surveys give us a picture of a much smaller town population, both for businesses and residents.

The Josephine County sample included the entire Grants Pass Chamber mailing list along with the addition of all schools, libraries, city offices and county offices were surveyed. 636 surveys were

mailed with a return of 71 (11.1%). 78% were located in Grants Pass with the others coming from through out the county.

Generally speaking the overall results from all surveys did not differ substantially from other surveys in rural southern Oregon (e.g., Douglas and Klamath Counties see www.callineb.com for those results).

Results from the surveys reflect communities where small to mid-sized businesses constitute the majority of businesses. Home based businesses are not unusual and many do take work home.

A quick review of the Josephine County survey reveals 96% of Grants Pass participants have telephone lines with 63% using cellular phones. 51% indicated they use a "shared" line for Internet access (dial up) and 25% used a dedicated line. 68% rate their telecommunications provider as Excellent or Very Good.

96% own a PC. 59% have a LAN in their business. Word processing is the most used application (92%) followed in order by database (75%), spreadsheets (72%), digital photography (55%), presentations (18%), accounting (7%), graphics design (4%), CAD (3%) and others at 1% each. This mirrors findings from other areas in that PCs are everywhere and the use of images is rapidly on the rise. 59% of the businesses have a LAN.

Use of the Internet is consistent with usage elsewhere. 100% use it to look up information. 95% send/receive email. 71% make purchases on the Web while 24% use it for sales. 13% use the Internet to take online courses.

Internet connections are still predominantly dial up (49%). DSL has made inroads at 21% while cable modem access lags at 9%. The largest entities rely on T-1 and DS-3 connections (8%). Wireless and satellite come in at 6% and 5% respectively. ISDN only accounts for 2% of Internet connections.

Internet access was rated by 76% as Critical or Very important while 75% rated Internet access speed as Critical or Very Important. 43% were willing to pay more for increased access speed. When asked what would be a reasonable price to spend, 39% responded with a $20-29 range, 9% were in the $30-39 range and 13% were in the $40-49 range. 40% indicated they would be willing to pay over $40.

73% indicated they have an online presence through a Website. 88% of those rated their ISP as Excellent to Very good.

The Cave Junction area surveys for residents and businesses used a random sampling technique with the Illinois Valley phone book as the source for the sample. A random number generator provided the page, line and column for the selection. Ron Philips, IV CRT ED, chose the community services group. 100 residents were mailed surveys and 36 returned completed surveys (36%). 61 businesses were surveyed with a return of 19 (31.1%). 11 community services received surveys with 11 being returned (100%).

A quick review of the Cave Junction Area Business survey reveals 100% have telephone lines (not surprising as they were drawn from the telephone book) with 67% using cellular phones. 50% indicated they use a "shared" line for Internet access (dial up) and 44% have a dedicated line. 71% rate their telecommunications provider as Excellent or Very Good.

94% own a PC. 50% of the businesses have a LAN. Word processing is the most used application at 89% followed in order by spreadsheets (72%), presentations (61%), publishing (61%), medical records (33%), manage Websites (12%), database (6%), digital photography (6%), invoices (6%). This mirrors findings from other areas in that PCs are everywhere and the use of images is rapidly on the rise.

Use of the Internet is consistent with usage in rural communities. 94% use it to look up information. 94% send/receive email. 81% make purchases on the Web while 44% use it for sales. 31% use the Internet to take online courses. Note that the percentages for purchases, sales and online learning are slightly higher.

Internet connections are still predominantly dial up (74%). DSL was not available at that time nor cable modem access. Wireless satellite came in at 7%.

Internet access was rated by 88% as Critical, Somewhat Important or Very Important while 88% rated Internet access speed as Critical or Very Important. 74% were willing to pay more for increased access speed. When asked what would be a reasonable price to spend 42% responded with a $20-29 range, 8% were in the $30-39 range and 25% were in the $40-49 range. 41% indicated they would be willing to pay over $40.

44% indicated they have an online presence through a Website. 85% of those rated their ISP as Excellent to Very good.

The written comments submitted on the Cave Junction Area business survey are worth reviewing.

A quick review of the Cave Junction Area Residents survey reveals 100% have telephone lines (once again this is no surprise as they were selected from the telephone book) with 53% using cellular phones (even with comments as to poor quality of reception). 31% indicated they use a "shared" line for Internet access (dial up) and 22% have a dedicated line. 60% rate their telecommunications provider as Excellent or Very Good.

75% own a PC. 7% have a LAN in their home. Word processing is the most used application at 89% followed in order by digital photography (59%), spreadsheets (56%), database (52%), presentations (41%), CAD (11%), music editing (4%), publishing (4%), and accounting (4%). Again this mirrors findings from other areas in that PCs are everywhere and the use of images is rapidly on the rise.

Use of the Internet is consistent with usage in rural communities. 92% use it to look up information. 96% send/receive email. 85% make purchases on the Web while 27% use it for sales. 15% use the Internet to take online courses. Again note that the percentages for purchases, sales and online learning are slightly higher in the more rural areas.

Internet connections are predominantly dial up (96%) in the 72% of homes with access. DSL was not available at the time of the survey nor cable modem access. Wireless satellite came in at 4%.

Internet access was rated by 92% as Critical, Somewhat Important or Very Important while 96% rated Internet access speed as Critical or Very Important. 88% were willing to pay more for increased access speed. When asked what would be a reasonable price to spend 52% responded with a $20-30 range, 17% were in the $30-40 range and 9% were in the $40-50 range.

44% indicated they have an online presence through a Website. 85% of those rated their ISP as Excellent to Very good.

On the down-side, when contacted (follow-up on non-responders) there was generally mild interest to little or no interest on the part of the larger entities to work in a collaborative or cooperative fashion. A great hesitancy was noted to become involved in exploring such an approach, even to the extent of expressing a request to "not reveal" the source of such comments. Similar entities that did respond to the survey often indicated a similar sentiment.

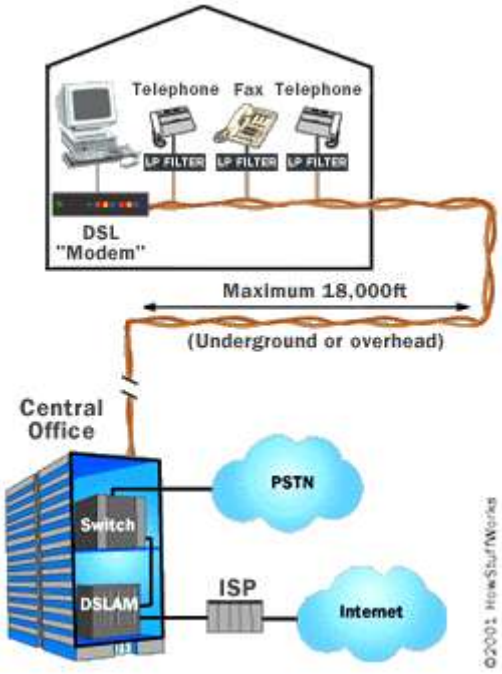
Yet, overall there appears to be a market readiness throughout Josephine County to provision high-speed broadband connectivity with a price point ideally somewhere in the $30-50 range. This market segment is primarily the small to mid-sized businesses.

Where high-speed services are available, the take rate remains low. This is not just due to price point alone. There is a need for education on the uses for broadband. Herein resides the biggest challenge and opportunity in Josephine County.

SECTION 3 - BROADBAND TECHNOLOGY DESCRIPTIONS

Digital Subscriber Line (DSL)

DSL is a very high-speed connection that uses the same wires as a regular telephone line. Most homes and small business users are connected to an asymmetric DSL (ADSL) line. ADSL divides up the available frequencies in a line on the assumption that most Internet users look at, or download, much more information than they send, or upload. Under this assumption, if the connection speed from the Internet to the user is three to four times faster than the connection from the user back to the Internet, then the user will see the most benefit (most of the time).



Precisely how much benefit you see will greatly depend on how far you are from the central office of the company providing the ADSL service. ADSL is a distance-sensitive technology: As the connection's length increases, the signal quality decreases and the connection speed goes down. The limit for ADSL service is 18,000 feet (5,460 meters), though for speed and quality of service reasons many ADSL providers place a lower limit on the distances for the service. At the extremes of the distance limits, ADSL customers may see speeds far below the promised maximums, while customers nearer the central office have faster connections and may see extremely high speeds in the future. ADSL technology can provide maximum downstream (Internet to customer) speeds of up to 8 megabits per second (Mbps) at a distance of about 6,000 feet (1,820 meters), and upstream speeds of up to 640 kilobits per second (Kbps). In practice, the best speeds widely offered today are 256 Kbps to 1.5 Mbps downstream, with upstream speeds varying between 64 and 640 Kbps.

ADSL uses two pieces of equipment, one on the customer end and one at the Internet service provider, telephone company or other provider of DSL services. At the customer's location there is a DSL transceiver, which may also provide other services. The DSL service provider has a DSL Access Multiplexer (DSLAM) to receive customer connections.

Most residential customers call their DSL transceiver a "DSL modem." The engineers at the telephone company or ISP call it an **ATU-R**. Regardless of what it's called, it's the point where data from the user's computer or network is connected to the DSL line. The transceiver can connect to a customer's equipment in several ways, though most residential installation uses USB or 10 base-T Ethernet connections. While most of the ADSL transceivers sold by ISPs and

telephone companies are simply transceivers, the devices used by businesses may combine network routers, network switches or other networking equipment in the same platform.

The DSLAM at the access provider is the equipment that really allows DSL to happen. A DSLAM takes connections from many customers and aggregates them onto a single, high-capacity connection to the Internet. DSLAMs are generally flexible and able to support multiple types of DSL in a single central office, and different varieties of protocol and modulation in the same type of DSL. In addition, the DSLAM may provide additional functions including routing or dynamic IP address assignment for the customers.

The DSLAM provides one of the main differences between user service through ADSL and through cable modems. Because cable-modem users generally share a network loop that runs through a neighborhood, adding users means lowering performance in many instances. ADSL provides a dedicated connection from each user back to the DSLAM, meaning that users won't see a performance decrease as new users are added -- until the total number of users begins to saturate the single, high-speed connection to the Internet. At that point, an upgrade by the service provider can provide additional performance for all the users connected to the DSLAM.

ADSL is competing with technologies such as cable-modem access and satellite Internet access for high-speed connections from consumers to the Internet. According to IDC, a market-analysis firm based in Framingham, MA, approximately 330,000 households in the United States were connected to the Internet via DSL in 1999, compared to 1,350,000 households with cable modems. By 2003, IDC estimates that the number of households with cable modems will have risen to 8,980,000, while DSL will have raced into the broadband lead with 9,300,000 households.

Currently, ADSL is limited (by U.S. Federal Communications Commission regulations) to a maximum of 1.5 megabits per second. Current technology can provide a theoretical maximum of up to 7 megabits per second, and research promises even greater performance in the future with protocols like G.Lite and VDSL.

Advantages of DSL:

- You can leave your Internet connection open and still use the phone line for voice calls.
- The speed is much higher than a regular modem (256 Kbps - 1.5 Mbps vs. 56 Kbps)
- DSL doesn't necessarily require new wiring; it can use the phone line you already have.
- The company that offers DSL will usually provide the modem as part of the installation.

Disadvantages:

- A DSL connection works better when you are closer to the provider's central office.
- The connection is faster for receiving data than it is for sending data over the Internet.
- The service is not available everywhere, especially in rural areas.

Integrated Service Digital Network

ISDN is an older network technology that supports transfer of simultaneous voice and data traffic. Similar to DSL in this respect, an ISDN Internet service works over ordinary telephone lines. ISDN Internet service generally supports data rates of 128 Kbps.

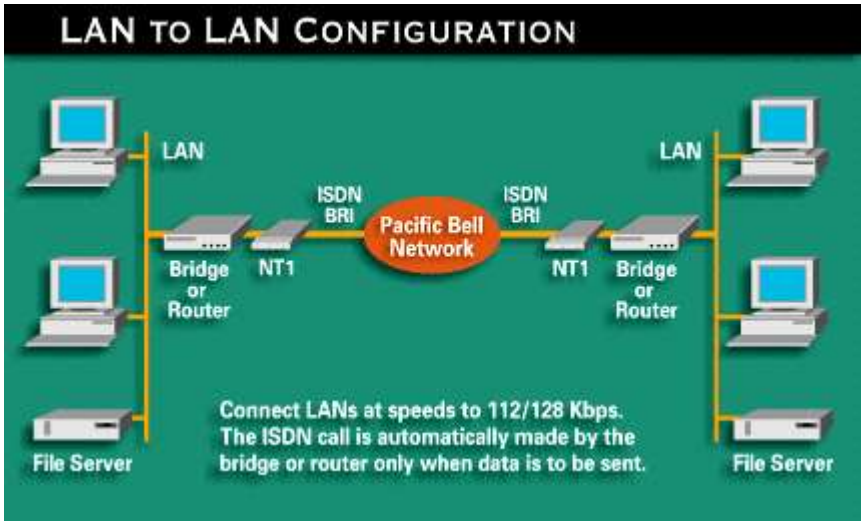
ISDN emerged as an alternative to traditional dial-up networking during the 1990s. The relatively high cost of service, though, limited its popularity with home users. The much higher speeds

supports by newer cable and DSL technologies diminish the importance of ISDN for home networking, but ISDN technology may still have application in other areas of business.

ISDN BRI (basic rate interface) service runs over the ordinary telephone twisted pair wiring that is installed in most every home today, which means that these homes are ISDN ready. The only downside is that the phone company must have ISDN service available in the area. Although ISDN is readily available in many if not most areas in North America, it has yet to be as ubiquitous as is plain old telephone service (POTS).

Regardless, one of the advantages ISDN BRI has over POTS is the fact that it provides a high-speed digital connection through the phone system. By utilizing the phone system's digital network, the user can take advantage of higher data networking speeds and relatively error-free transmissions.

A basic ISDN setup for home or office
The ISDN line does not provide its own power. Thus, an independent power supply is always required.



A typical LAN-to-LAN configuration
The connection is used, and changes incurred, only when data is sent.

T-Carriers

T-1's are a dedicated phone connection supporting data rates of 1.544 Mbits per second. A T-1 line actually consists of 24 individual channels, each of which supports 64Kbits per second. Each 64Kbit/second channel can be configured to carry voice or data traffic. When T-1 capacity is carried over fiber, it is referred to as a *DS1* line. Most telephone companies allow you to buy just some of these individual channels, known as *fractional T-1* access.

T-1 lines are a popular leased line option for businesses connecting to the Internet and for Internet Service Providers (ISPs) connecting to the Internet backbone. The Internet backbone itself consists of faster T-3 connections.

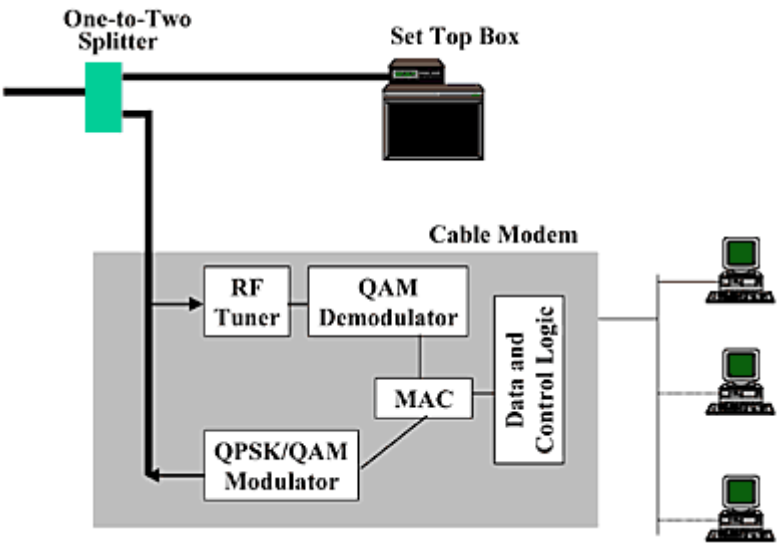
T-3 lines are a dedicated phone connection supporting data rates of about 43 - 45 Mbps. A T-3 line actually consists of 672 individual channels, each of which supports 64 Kbps. T-3 lines are used mainly by Internet Service Providers (ISPs) connecting to the Internet backbone and for the backbone itself. T-3 lines are now generally referred to as *DS3* lines.

Cable Modem

A modem designed to operate over cable TV lines. Because the coaxial cable used by cable TV provides much greater bandwidth than telephone lines, a cable modem can be used to achieve extremely fast access to the World Wide Web. This, combined with the fact that millions of homes are already wired for cable TV, has made the cable modem something of a holy grail for Internet and cable TV companies. There are a number of technical difficulties, however. One is that it is still unknown whether the cable TV networks can handle the traffic that would ensue if millions of users began using the system for Internet access. Despite these problems, cable modems that offer speeds up to 2 Mbps are already available in many areas.

Like voiceband modems, cable modems **mo**dulate and **dem**odulate data signals. However, cable modems incorporate more functionality suitable for today's high-speed Internet services. In a cable network, data from the network to the user is referred to as downstream, whereas data from the user to the network is referred to as upstream. From a user perspective, a cable modem is a 64/256 QAM RF receiver capable of delivering up to 30 to 40 Mbps of data in one 6-MHz cable channel. This is approximately 500 times faster than a 56–kbps modem. Data from a user to the network is sent in a flexible and programmable system under control of the headend. The data is modulated using a QPSK/16 QAM transmitter with data rates from 320 kbps up to 10 Mbps. The upstream and downstream data rates may be flexibly configured using cable modems to match subscriber needs. For instance, a business service can be programmed to receive as well as transmit higher bandwidth. A residential user, however, may be configured to receive higher bandwidth access to the Internet while limited to low bandwidth transmission to the network.

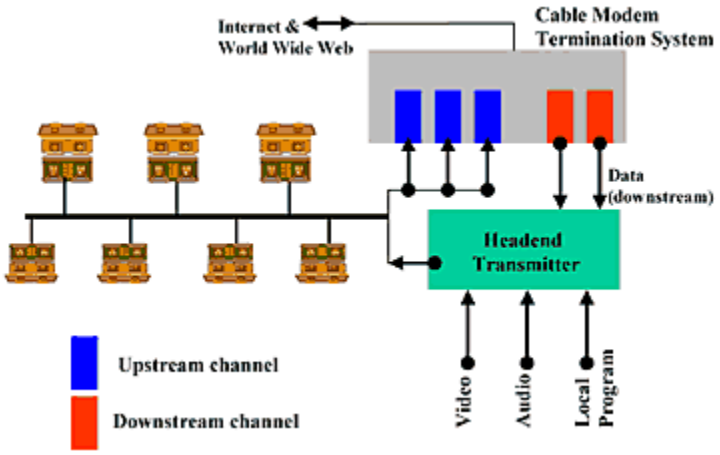
A subscriber can continue to receive cable television service while simultaneously receiving data on cable modems to be delivered to a personal computer (PC) with the help of a simple one-to-two splitter. The data service offered by a cable modem may be shared by up to sixteen users in a local-area network (LAN) configuration.



Cable Modem at the Subscriber Location

Because some cable networks are suited for broadcast television services, cable modems may use either a standard telephone line or a QPSK/16 QAM modem over a two-way cable system to transmit data upstream from a user location to the network. When a telephone line is used in conjunction with a one-way broadcast network, the cable data system is referred to as a telephony return interface (TRI) system. In this mode, a satellite or wireless cable television network can also function as a data network.

At the cable headend, data from individual users is filtered by upstream demodulators (or telephone-return systems, as appropriate) for further processing by a cable modem termination system (CMTS). A CMTS is a data switching system specifically designed to route data from many cable modem users over a multiplexed network interface. Likewise, a CMTS receives data from the Internet and provides data switching necessary to route data to the cable modem users. Data from the network to a user group is sent to a 64/256 QAM modulator. The result is user data modulated into one 6-MHz channel, which is the spectrum allocated for a cable television channel such as ABC, NBC, or TBS for broadcast to all users.



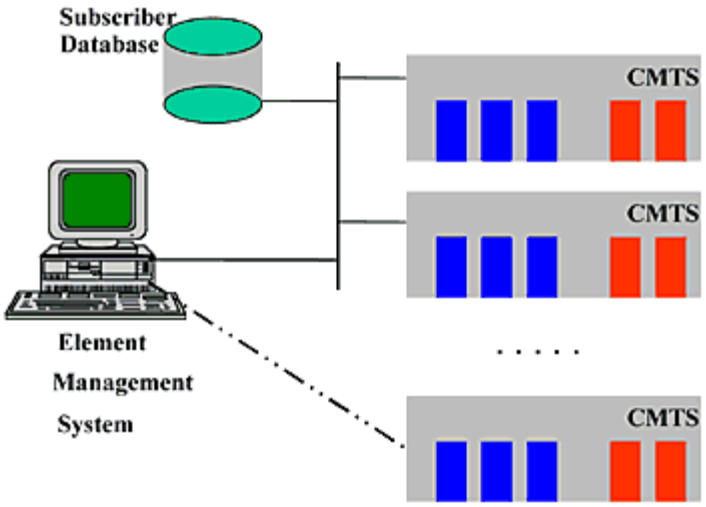
Cable Modem Termination System and Cable Headend Transmission

A cable headend combines the downstream data channels with the video, pay-per-view, audio, and local advertiser programs that are received by television subscribers. The combined signal is then transmitted throughout the cable distribution network. At the user location, the television

signal is received by a set-top box, while user data is separately received by a cable modem box and sent to a PC.

A CMTS is an important new element for support of data services that integrates upstream and downstream communication over a cable data network. The number of upstream and downstream channels in a given CMTS can be engineered based on serving area, number of users, data rates offered to each user, and available spectrum.

Another important element in the operations and day-to-day management of a cable data system is an element management system (EMS). An EMS is an operations system designed specifically to configure and manage a CMTS and associated cable modem subscribers. The operations tasks include provisioning, day-to-day administration, monitoring, alarms, and testing of various components of a CMTS. From a central network operations center (NOC), a single EMS can support many CMTS systems in the geographic region.



Operations and Management of Cable Data Systems

Cable System Pros and Cons

Pros	**Cons**
Proven Technology	High Fixed Cost
Present CATV	Heavy on OSP electronics
Industry Standard	Shared data bandwidth
Relatively inexpensive	Inadequate future bandwidth?
Adequate present-day bandwidth	Same "Mousetrap" as Incumbent/Some Stranded Costs if migration to FTTH is migration is required

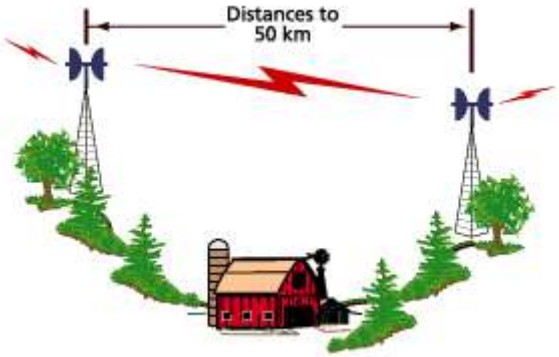
HFC System Overview

Network Design:	• Fiber from the cable headend to neighborhood fiber/(power) nodes that typically feed 50 to 500 homes using coax cable.
Standards/CPE:	• Use of cable set top boxes for MPEG2 digital video, DOCSIS 1.0 or 1.1 (standard) cable modems for data
Spectrum Use:	• Telephony -- 5 to 45 MHz • Analog Video -- 55 to 550 MHz • Digital Video-- 550 to 750 MHz • Data -- 750 to 860 MHz

Typical Service Offering:	• POTS where telephone capable (very small %) • Shared 10BT Ethernet across a fiber node (50 to 500 homes) • 75 Analog video channels, Digital tier with PPV, Premium packages (100 channels)
Strengths:	• Upgraded bi-directional systems can offer full suite of services (voice, analog and digital video, data, and telephony) • Coax distribution network to residential customers is already in place. • Can leverage cost curves of DOCSIS cable modem standard which will provide lower data CPE costs • Packet cable standards will make it possible to add IP telephony services.
Weaknesses:	• Very costly to upgrade the video distribution network to support bi-directional voice and data High cost of maintaining an active RF (amplifier) system. • Nodes must be split and fiber added as penetration increases and as bandwidth demand for advanced services are needed. • Data users experience degraded performance as more users are added to the network (shared 10BT LAN environment). • Low upstream data rate makes current HFC design primarily a residential offering. • Lifeline telephony requires battery backup systemsinstalled in the network.

Wireless Technologies

Fixed-wireless systems have a long history. Point-to-point microwave connections have long been used for voice and data communications, generally in backhaul networks operated by phone companies, cable TV companies, utilities, railways, paging companies and government agencies, and will continue to be an important part of the communications infrastructure. Frequencies used range from 1 GHz to 40 GHz. But technology has continued to advance, allowing higher frequencies, and thus smaller antennas, to be used, resulting in lower costs and easier-to-deploy systems for private use and for a whole new generation of carriers that are planning to use wireless access as their last mile of communication. The terms wireless broadband and broadband wireless are not used consistently, but generally both apply to carrier-based services in which multiple data streams are multiplexed onto a single radio-carrier signal. Some vendors also use the terms to refer to privately deployed networks.



Fixed-wireless systems can be used for almost anything that a cable is used for, whether the cable is a T1 circuit, a cable television cable, an Ethernet cable or a fiber optic cable. Fixed-

wireless systems are designed so that they emulate cable connections, and they use the same type of interfaces and protocols, such as T1, frame relay, Ethernet and ATM. Keep in mind that fixed-wireless systems are also used for voice communications as well as for carrying television programming. But most new development in fixed-wireless systems is data-centric, such as for Internet access, or is flexible in supporting both voice and data communications. Fixed-wireless systems match cable-based systems for all-important parameters, including delay, bit-error rate (1 in 100 million or better) and throughput (1 Mbps to 155 Mbps). Consequently any application that operates over a cable should be able to operate over a fixed-wireless system. The only exception is communication involving geosynchronous satellites where delays can exceed a quarter of a second.

In some cases, a fixed-wireless system is the only wireless option. So you must decide if a fixed-wireless connection is practical and if it is competitive with available wireline connections. In many cases, a wireless connection could be the only option for high-speed communications. This is especially true in more remote areas. In some areas, the only option for communications will be by satellite. When both wireless and wireline options exist, the potential reasons to consider wireless include lower costs, faster deployment, greater flexibility and better reliability. Costs and deployment have to be evaluated on a case-by-case basis and actual costs will depend on the particular circumstances.

Wireless communications offers tremendous flexibility and ever-improving performance, but it does have some limitations. First and foremost, wireless uses radio spectrum, a finite resource. This limits the number of wireless users and the amount of spectrum available to any user at any moment in time. The amount of spectrum available equates almost directly to data bandwidth, with 1 Hz of spectrum typically yielding between 1 bps and 4 bps of throughput depending on various factors, such as the type of modulation used and environmental factors. The amount of spectrum actually available varies from radio band to radio band, but suffice it to say that fiber optic cable offers far greater overall capacity. Despite this capacity limitation, wireless offers more than sufficient bandwidth for many applications. But it is important to know the capacity of a particular wireless system in order to understand how it can satisfy your requirements if they should expand in the future. Another limitation is that fixed-wireless systems operate at frequencies that almost always require line of sight and that are restricted to distances that vary from a few miles to tens of miles. It is no mystery why microwave dishes are located at tops of towers, hills and buildings. Unlike cellular and other mobile wireless systems, fixed-wireless systems use fixed antennas with narrowly focused beams. A 3-degree to 4-degree beam is not uncommon. And unlike cellular systems, in which base stations communicate with dozens of mobile stations, broadband systems usually operate in a point-to-point manner, though a number of point-to-multipoint systems are in development. Very few standards exist for fixed wireless systems, so you will need to purchase equipment from the same vendor for both sides of the connection to ensure interoperability.

In many instances both wireless and wireline alternatives will be available. Here are some guidelines for choosing which to use.

- **Remember line of sight.** You must be able to see the point with which you wish to connect, whether it is your own site or a wireless carrier. Depending on the technology used, effective range is from about three (5 km) to about 20 miles (30 km). Multiple hops also are an option but add complexity.
- **Consider wireless if there are no good wireline options available.** Perhaps you are in a suburban area and need high-bandwidth connectivity, but no fiber runs to your building. Even if wireline options exist, the length of time to obtain wireline service may be prohibitive.
- **Consider wireless if you need to bridge LANs in two buildings in close proximity.** An unlicensed spread-spectrum or licensed microwave connection could be cost-effective, particularly if you have to pay $500 or more for a monthly T1 connection. Wireless equipment providers claim a typical payback of two years.

- **Consider wireless if crossing wireline service boundaries.** Wireline service might be exceptionally expensive if crossing different LEC areas and a wireless connection could be cost-effective.
- **Consider wireless for temporary or backup connectivity.** If you need a temporary connection between two nearby sites, or if you need a backup connection, wireless might be your best option.
- **Compare offerings between wireless and wireline carriers.** If a wireless carrier is offering service to your building, investigate its pricing because it may be undercutting wireline providers to develop its business. Wireless carriers may also have greater flexibility in their offerings, such as the ability to easily increase bandwidth on demand.

802.11

802.11 refers to a family of specifications developed by the IEEE for wireless LAN technology. 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients. The IEEE accepted the specification in 1997.

There are several specifications in the 802.11 family:

- **802.11** -- applies to wireless LANs and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).
- **802.11a** -- an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. 802.11a uses an orthogonal frequency division multiplexing encoding scheme rather than FHSS or DSSS.
- **802.11b** (also referred to as *802.11 High Rate* or *Wi-Fi*) -- an extension to 802.11 that applies to wireless LANS and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.
- **802.11g** -- applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

802.11b (WiFi)

The IEEE 802.11b specification allows for the wireless transmission of approximately 11 Mbps of raw data at distances from several dozen to several hundred feet over the 2.4 GHz unlicensed band. The distance depends on impediments, materials, and line of sight. This specification started to appear in commercial form in mid-1999. 802.11b is an extension of Ethernet to wireless communication, and as such is ecumenical about the kinds of data that pass over it. It's primarily used for TCP/IP, but can also handle other forms of networking traffic, such as AppleTalk or PC filesharing standards.

Each radio may act, depending on software, as a hub or for computer-to-computer transmission, but it's much more common that a WLAN (wireless local area network) installation uses one or more access points, which are dedicated stand-alone hardware with typically more powerful antennae. Similar to access points are residential gateways, a new class of device, which offers similar features but without the advanced management required for corporate networks or high-traffic installations. The standard is backwards compatible to earlier specifications, known as 802.11, allowing speeds of 1, 2, 5.5 and 11 Mbps on the same transmitters. Several new, incompatible protocols are in the process of being released, including 802.11a (54 Mbps over the 5 GHz band), 802.11g (22 Mbps over 2.4 GHz), and Texas Instruments' PBCC 22 Mbps standard.

An industry group known as the Wireless Ethernet Compatibility Alliance (WECA) certifies its members equipment as conforming to the 802.11b standard, and allows compliant hardware to be stamped Wi-Fi compatible, short for Wireless Fidelity. The Wi-Fi seal of approval is an attempt at a guarantee of intercompatibility between hundreds of vendors and thousands of devices. (The

IEEE does not have such a mechanism, as it only promulgates standards.) 802.11b has become the only standard deployed for public short-range networks, such as those found at airports, hotels, conference centers, and coffee shops and restaurants. Several companies currently offer paid hourly, session-based, or unlimited monthly access via their deployed networks around the U.S. and internationally.

802.11g ("Wireless Ethernet")

Adopted last November (2001) after a long and often-heated debate, the IEEE 802.11g draft standard extends data rates for 2.4-GHz wireless-LAN (WLAN) systems to 54 Mbits/second and provides backward compatibility with existing 802.11b (Wi-Fi) equipment. Both mandatory and optional aspects are included. Basically, the draft standard mandates use of orthogonal frequency-division multiplexing (OFDM) for higher data rates (greater than 20 Mbits/s) and requires support for complementary code keying (CCK) to ensure backward compatibility with existing 802.11b radios. The draft also includes two optional elements, called CCK/OFDM and packet binary convolutional coding (PBCC.) Developers may elect to include either optional element or omit both options entirely.

IEEE 802.11a and 802.11g now share a common high-rate waveform (OFDM) and offer complementary advantages to consumers. IEEE 802.11a systems enjoy more spectrum at 5 GHz, thus allowing for more channels and, by extension, more users. On the other hand, 802.11g systems provide backward compatibility with existing Wi-Fi devices and offer a range advantage relative to systems operating at 5 GHz.

The emergence of IEEE 802.11g is extremely beneficial for the WLAN market. OFDM is the mandatory high-rate waveform in the 2.4 GHz band. Data rates of up to 54 Mbits/s are now available in the 2.4 GHz band. In addition, backward compatibility with Wi-Fi devices is assured. Longer term, the IEEE 802.11g draft standard represents an important step toward the realization of dual-band (2.4 GHz and 5 GHz) radios. Because OFDM is already required for operation in the 5 GHz band, implementing 802.11g in a dual-band device adds no extra hardware complexity to the resulting product. For dual-band devices, "G is free!"

Advanced Fiber Networks - Fiber To The Premise (FTTP)

The infrastructure that has dominated most of the recent CATV system installations has been Hybrid-Fiber-Coax (HFC). This system is usually configured with a fiber "feeder" cable, which terminates at a community node. At the community node, optical signals are converted to electrical signals for transport over the copper cabling, which circles the neighborhood and drops off at each home. This system was intended for an entirely different purpose than high-speed data access. It was designed to deliver high-density CATV service. Fiber optic cable replaced the coaxial cable trunks of the past in order to deliver the Radio Frequency (RF) modulated signals more efficiently to the neighborhood coax system. This system suffers from the innate limitation of copper: bandwidth ceilings, electromagnetic interference and asymmetrical communication speeds — resulting in a limited lifespan. While in the short term this represents a usable (at best) cable plant, the much shorter amortization timeline requires higher customer charges. While seen as the easiest sell to developers and homebuyers, the HFC model doesn’t provide much more than an all-copper solution because a bottleneck of shared infrastructure still exists.

Why HFC Won't Serve the Needs of Tomorrow

Service	***Required Bandwidth***
Collaborative remote studio video editing	45 Mbps symmetrical
Broadcast quality video per channel	6 Mbps asymmetrical
Full motion video conferencing	6 Mbps symmetrical
Lower quality video conferencing	128 to 512 Kbps symmetrical
Application hosting/delivery	128 Kbps desktop symmetrical
HDTV per channel	18 to 20 Mbps asymmetrical
VoIP / POTS (voice telephony)	64 to 256 Kbps per phone
Interactive remote learning - online university	128 to 512 Kbps symmetrical
Interactive Gaming	5 Mbps symmetrical
Business inventory and remote management	128 to 512 Kbps symmetrical
Electronic investment and banking	56 to 128 Kbps
Telemedicine	1 to 6 Mbps symmetrical

Only Fiber Can Scale

3 DTV MPEG Video Streams (VOD)	15.00 Mbps
Telecommuting/VPN	2.00 Mbps
Video Conferencing	1.00 Mbps
Web Surfing	1.50 Mbps
Interactive Gaming	1.00 Mbps
High Definition TV	19.20 Mbps
4 Phone Conversations	0.26 Mbps
Total	**39.96 Mbps**

Bandwidth: *Will only increase*
Revenue: *More bandwidth, more revenue*
Infrastructure: *Must be scalable*

Network	***Distance Limit for Bandwidth Ranges***
Fiber Optic	9-12 miles for 1 Gbps symmetrical
Hybrid Fiber Coax	1,400 ft for 1 Gbps asymmetrical
Asymmetric VDSL (Copper)	1,000 ft for up to 52 Mbps downstream

The installation of fiber throughout the network, from the provider to the subscriber premises, is the only future-proof, lay-it-and-leave-it, infrastructure design. The industry has embraced the term FTTP to denote an all fiber network. But, the fiber can reach a variety of customer premises, such as businesses, schools, hospitals and other institutions.

Since fiber technologies are being innovated to make installation, connectorizing and splicing easier, combined with a rapid decline in the cost of materials and labor, fiber is quickly becoming the most cost-efficient media. In addition, to quote the International Telecommunications Union's (ITU) G.983 recommendation, "Maintenance is easy… all fiber systems are regarded as more reliable than hybrid fiber-metallic ones." As of yet, we haven't even begun to tap the potential of fiber optic cable in transporting digital information. This virtually unlimited potential means that the fiber laid today can be used for decades. With such long lifecycles, subscriber costs decrease since a much shorter schedule of return on investment is possible.

The issue of ownership is also much more flexible in a FTTP infrastructure. The model can be anything from a single community service provider to an open access, "come one, come all" approach to service provisioning. Fiber can support a multitude of technologies and converged applications. Rather than limiting the technology that can be deployed, fiber creates an environment of innovation and unlimited possibilities. Simply put, by implementing fiber

everywhere in the network— end-to-end — network infrastructure is able to support whatever technologies emerge over the next 20 years and beyond.

Is your home fiber ready?

Service	Details	RBOCs	DSL Headends	Digital Cable Headends	Cable Headends	ISP	Satellite	Fiber.TV Fiber Optic Head End
Digital Packet Television	IP Digital Packets	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Network Cannot Support This Feature	Support in Future is Doubtful	Partially Supported Today or in Near Future	Supported Today
High Definition Television	1080i & 1080p	Network Cannot Support This Feature	Support in Future is Doubtful	Partially Supported Today or in Near Future	Network Cannot Support This Feature	Network Cannot Support This Feature	Partially Supported Today or in Near Future	Supported Today
Ready Interactive Television	Two-Way Video	Support in Future is Doubtful	Support in Future is Doubtful	Partially Supported Today or in Near Future	Network Cannot Support This Feature	Network Cannot Support This Feature	Support in Future is Doubtful	Supported Today
DVD Television	DVD Quality Video	Support in Future is Doubtful	Support in Future is Doubtful	Support in Future is Doubtful	Network Cannot Support This Feature	Network Cannot Support This Feature	Support in Future is Doubtful	Supported Today
Interactive Music Programming	Interactive Controls	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Support in Future is Doubtful	Supported Today
Music Programming	Pre Programmed	Supported Today	Supported Today	Supported Today	Supported Today	Supported Today	Supported Today	Supported Today
High Speed Internet on TV	1 to 10 mb/s	Support in Future is Doubtful	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Support in Future is Doubtful	Not Supported Today. Possible in Future Supported Poor Quality	Partially Supported Today or in Near Future	Supported Today
2 Way Ultra High Speed Internet	100 Mb/s to 1 Gbs+	Network Cannot Support This Feature	Network Cannot Support This Feature	Not Supported Today. Possible in Future Supported Poor Quality	Network Cannot Support This Feature	Network Cannot Support This Feature	Network Cannot Support This Feature	Supported Today
High Performance Online Games	High speed 5 mb/s games	Network Cannot Support This Feature	Not Supported Today. Possible in Future Supported Poor Quality	Not Supported Today. Possible in Future Supported Poor Quality	Network Cannot Support This Feature	Network Cannot Support This Feature	Network Cannot Support This Feature	Supported Today
IP Phone Service	Multiple IP phones	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Network Cannot Support This Feature	Not Supported Today. Possible in Future Supported Poor Quality	Network Cannot Support This Feature	Supported Today
Fiber-To-The-Home/Business	SM/MM Fiber Optic Cable	Partially Supported Today or in Near Future	Support in Future is Doubtful	Partially Supported Today or in Near Future	Partially Supported Today or in Near Future	Network Cannot Support This Feature	Network Cannot Support This Feature	Supported Today
	A Single Architecture & Protocol All Services	Support in Future is Doubtful	Not Supported Today. Possible in Future Supported Poor Quality	Not Supported Today. Possible in Future Supported Poor Quality	Network Cannot Support This Feature	Network Cannot Support This Feature	Network Cannot Support This Feature	Supported Today

Supported Today | Partially Supported Today or in Near Future | Not Supported Today. Possible in Future Supported Poor Quality | Support in Future is Doubtful | Network Cannot Support This Feature

Free Space Optics (Laser)

Free Space Optics (FSO) is an optical wireless, point-to-point, line-of-sight broadband solution. Originally developed 30 years ago by the military, Free Space Optics can be the best wireless solution where fiber optical cable is not available, high bandwidth (anywhere from 1 Mbps up to 1.25 Gbps) is required, and line-of-sight can be obtained to a target within a couple of miles or less. The growth and convergence of telecommunications and datacom have accelerated last-mile access needs for high speed links. With tens of thousands of successful deployments worldwide, Free Space Optics is now a viable choice for connecting the LAN, WAN, and MAN; and carrying voice, video and data at the speed of light (10 Mbps-1.25 Gbps Ethernet, ATM, Sonet, T-1, T-3, DS3, OC3, OC12, OC24).

Some advantages of FSO:

- **High Speed Broadband Access** Free space optics (FSO) utilizes advanced wireless optical technologies to bridge the last-mile in carrier networks and makes high-speed broadband access a reality. Based on optical technology, it provides levels of bandwidth comparable to fiber optic cable. With current availability of up to 1.25 Gbps, throughputs of hundreds of Gbps are possible in the future.
- **Low Cost Bypass of Copper Infrastructure** FSO solutions enable service providers to dramatically lower their cost of providing high-speed broadband access to end-users compared to other commercially available last-mile solutions. This is

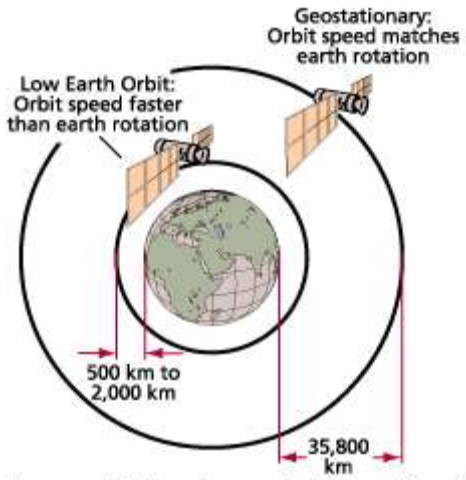
because it does not involve the expensive process of obtaining rights-of-way, licenses, or permits from governments, digging the ground to lay cable, or charges for spectrum rights. All that while maintaining costs that are lower than traditional infrastructure. FSO offers a return on investment of weeks or a couple of months, versus the years it takes for other solutions.

- **Rapid Deployment and Service Provisioning** FSO optical wireless products enable service providers to avoid time-consuming processes, such as obtaining rights-of-way, and other governmental licenses, or the labor-intensive process of digging and installing cables in the ground. As a result, FSO can be installed and made operational in a few hours. Using available Network Management Systems, service providers can efficiently and cost-effectively perform provisioning from a central location through a point-and-click graphical user interface, thus eliminating time-consuming onsite service calls or "truck-rolls".
- **Improved Availability and Reliability** FSO can be deployed to operate over an optical mesh architecture that allows transmission between any two points on the network and enables full traffic re-routing around a failed link. The short mesh configuration enables the wireless link to remain connected in all types of weather.
- **Improved Scalability and Flexibility** An FSO solution can be designed to scale efficiently as demand for bandwidth and new services grow, therefore initial deployment is also cost effective.
- **Creation of New Revenue Opportunities for Service Providers and Carriers** Service providers and carriers are able to rapidly introduce new upgrades thanks to available software and system based products. Features include new service level agreements, Quality Of Service enhancements, dedicated wavelengths to the end-user, and bandwidth on demand, without significant hardware changes or additions.

Satellite

A variety of satellite systems are available today for broadband communications to 155 Mbps. Today these all involve geosynchronous satellites, but soon LEO systems also will be available. Satellites today are not usually competitive when good landline communications options exist. Rather they make the most sense in the following types of situations:

- There are no good terrestrial options. This is especially true in developing nations or out at sea.
- You are deploying a mesh network of more than fix or six nodes that spans a large geographic area, e.g. multiple countries.
- You are broadcasting data to a large number of locations.



For any orbit, there is a speed where centrifugal force matches gravitational force.

Fiber Ring

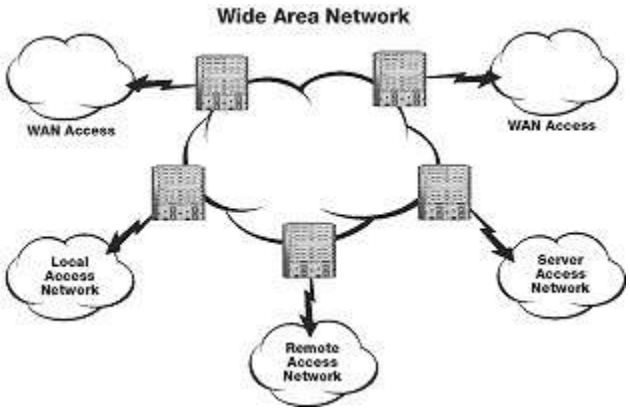
A fiber ring is a fiber route laid out in a loop so that the fiber enters the electronics via one direction and leaves it in another direction. In addition, each piece of electronics can send information from either of two directions to get to the next location. The terms “east” and “west” are commonly used to describe this, not necessarily having any relationship to geographic placement. SONET is a fiber optic protocol (i.e., language) that takes advantage of this ring topology by allowing traffic to switch to the “other” direction around the ring if equipment or the fiber itself fails. For example, if traffic is traveling “east to west” around the ring and a piece of equipment fails, the ring will automatically switch to a ”west to east” direction to go around the problem. In this way communications traffic traveling in a true SONET ring requires two failures at the same time to adversely affect the data and voice traffic on the system.

A collapsed ring has the same electronics as a true SONET ring, but the “east” and “west” sides of the ring reside in the same cable sheath. The fibers are separated into different areas within the cable, but severing the fiber cable will take out both directions along the ring. The system will still have the full protection on the electronics. The end result is somewhat higher than a straight (linear) cable run with out any looping, but less than that of a true ring. This approach eliminates the almost double cost of a physically separate true ring layout. At the same time future expansion to a true ring requires only installing additional fiber, without changing electronics or affecting traffic, when additional funding is available.

Metro Area Networks (MANs)

A MAN is data communication network covering the geographic area of a city (generally, larger than a LAN but smaller than a WAN).

Metropolitan networks are undergoing a radical transformation. Developments in "last-mile" and fiber optic technologies, combined with the demands of the new applications, have put pressure on service providers and infrastructure vendors to improve their services. The following figure illustrates the basic elements of a metro network solution and its relationship to access and long distance networks.



Three different levels exist in any enterprise network infrastructure:

1. **Access Networks**
   There are three classes of access networks: local access networks between a Point of Presence (POP) and the customer premises network; remote access networks for off-site communications using a public network; and server access networks. A local access network includes all the network elements between the provider's POP and the customer's end system. The two major access network components are customer-owned LANs (with building, riser, and campus levels), and the MAN access link (which is usually provider-owned).

Ethernet is the dominant technology for the LAN at both the floor and backbone levels, often using a mix of the older shared-media and newer switched-media networks. Networks have traditionally been 10 Mbps to the desktop (i.e., basic Ethernet), with 100 Mbps to the desktop now becoming the standard, and with 100 Mbps or 1 Gbps being used for high performance users and external access.

The MAN access link is the infamous "last mile" between the MAN or WAN provider and the customer premises. The demarcation point (the point of responsibility hand-off from the network provider to the customer) can be located at the customer premises interface or at the provider's POP. The access link is often based on copper wire technologies, such as time division multiplexing, and has been relatively low in speed (especially when compared to Gigabit Ethernet). Aggressive fiber deployment in major metro areas and advances in last-mile access technologies, such as wireless broadband and free space optics, remove this as a bottleneck and permit Ethernet to be used as the link protocol.

2. **Metro Core Networks**
   The metro core network must interface to both the local access network and the WAN access network. Historically, metropolitan area connectivity has been provided by SONET rings, which were designed and built to carry voice traffic. However, most of the traffic growth in these networks is now due to data applications. Data traffic volume has already surpassed voice traffic volume in many metropolitan areas. The SONET transport infrastructure is not optimized for data traffic and cannot scale to support the rapid growth of the Internet in a cost-effective manner.

   Metro service providers are looking for cost efficient, data-optimized solutions to supplement existing SONET infrastructures. Metropolitan networks and their providers need to evolve to meet the future application needs and to remain competitive. Provision of value-added services as an integral part of the provider's infrastructure is one of the steps that needs to be taken.

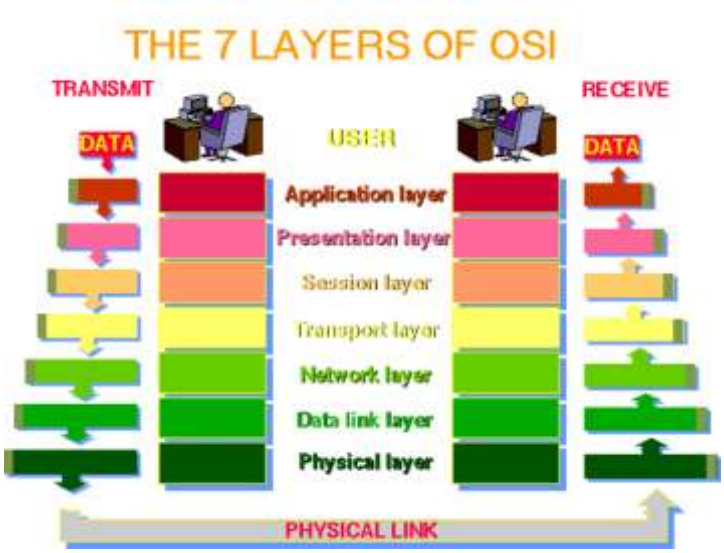
3. **Wide Area Networks**
   WANs have always been an essential ingredient in any large enterprise's network infrastructure. Various technologies have been used for low- and high-speed WAN transport, including time division multiplexing, circuit switching, and packet switching. Ethernet has become a possible solution at this level.

Metropolitan networks serve largely as a "middleman" for other networks, as suggested in the preceding figure. However, this involves considerably more than providing a simple high-speed connectivity service. It is the value-added services and features that serve to differentiate one metropolitan network provider from another.

Transport Protocols

SONET

SONET is short for ***S****ynchronous* ***O****ptical* ***Net****work,* a standard for connecting fiber-optic transmission systems. SONET was proposed by Bellcore in the middle 1980s and is now an ANSI standard. SONET defines interface standards at the physical layer of the OSI seven-layer model. The standard defines a hierarchy of interface rates that allow data streams at different rates to be multiplexed.



SONET establishes Optical Carrier (OC) levels from 51.8 Mbps (about the same as a T-3 line) to 2.48 Gbps. Prior rate standards used by different countries specified rates that were not compatible for multiplexing. With the implementation of SONET, communication carriers throughout the world can interconnect their existing digital carrier and fiber optic systems.

Some of the characteristics of SONET include:

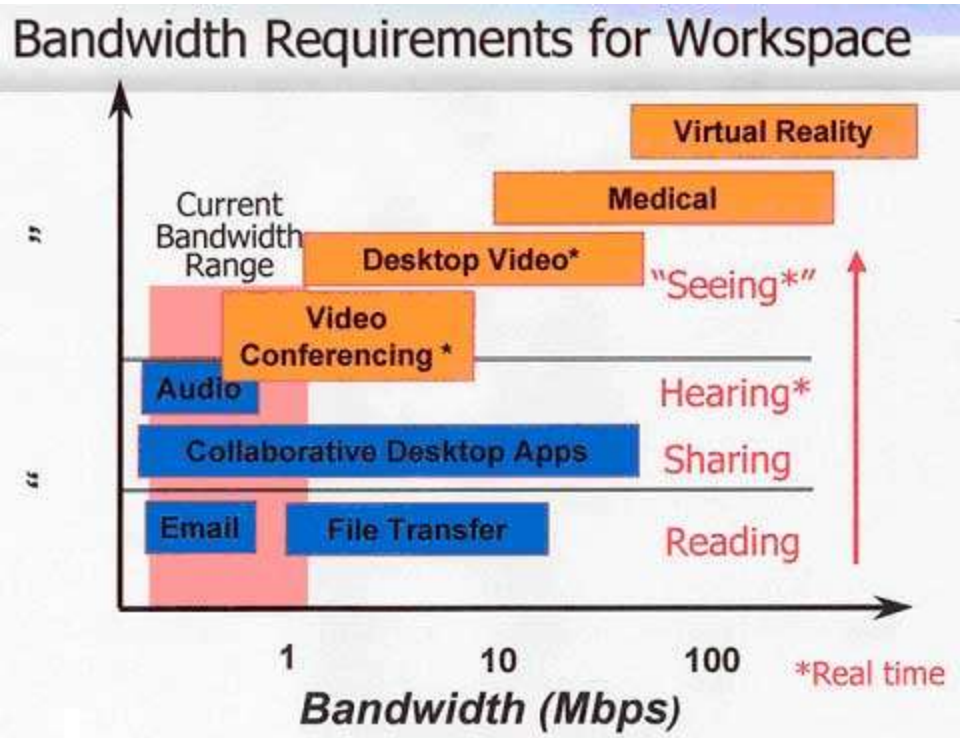
- Survivable/resilient — 50 msec restorations w/99.999% reliability.
- Optimized for voice traffic.
- Billions of dollars worth of deployed infrastructure.
- Expensive to deploy.
- Not as proficient as Ethernet in carrying data traffic.

The following table lists the hierarchy of the most common SONET/Optical Carrier (OC) data rates:

Optical Level	Line Rate (Mbps)	Payload Rate (Mbps)	Overhead Rate (Mbps)
OC-1	51.840	50.112	1.728
OC-3	155.520	150.336	5.184
OC-12	622.080	601.344	20.736
OC-48	2488.320	2405.376	82.944
OC-192	9953.280	9621.504	331.776
OC-768	39813.120	38486.016	1327.104

Other rates (OC-9, OC-18, OC-24, OC-36, OC-96) are referenced in some of the standards documents but were never widely implemented. It is possible other higher rates (e.g. OC-3072) may be defined in the future.

Use the following chart in conjunction with the above ratings to gauge the OC rate necessary to handle the proposed application.



Ethernet
Ethernet is a local-area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the CSMA/CD (Short for ***C****arrier* ***S****ense* ***M****ultiple* ***A****ccess / **C**ollision **D**etection,* a set of rules determining how network devices respond when two devices attempt to use a data channel simultaneously (called a *collision*) access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.

A newer version of Ethernet, called *100Base-T* (or *Fast Ethernet),* supports data transfer rates of 100 Mbps. And the newest version, *Gigabit Ethernet* supports data rates of 1 gigabit (1,000 megabits) per second.

Fast Ethernet is a networking standard that supports data transfer rates up to 100 Mbps (100 megabits per second). 100BASE-T is based on the older Ethernet standard. Because it is 10 times faster than Ethernet, it is often referred to as *Fast Ethernet.* Officially, the 100BASE-T standard is *IEEE 802.3u*. Like Ethernet, 100BASE-T is based on the CSMA/CD LAN access method. There are several different cabling schemes that can be used with 100BASE-T, including:

- **100BASE-TX:** two pairs of high-quality twisted-pair wires
- **100BASE-T4:** four pairs of normal-quality twisted-pair wires
- **100BASE-FX:** fiber optic cables

Gigabit Ethernet, abbreviated *GbE*, a version of Ethernet, which supports data transfer rates of 1 Gigabit (1,000 megabits) per second. The first Gigabit Ethernet standard (802.3z) was ratified by the IEEE 802.3 Committee in 1998.

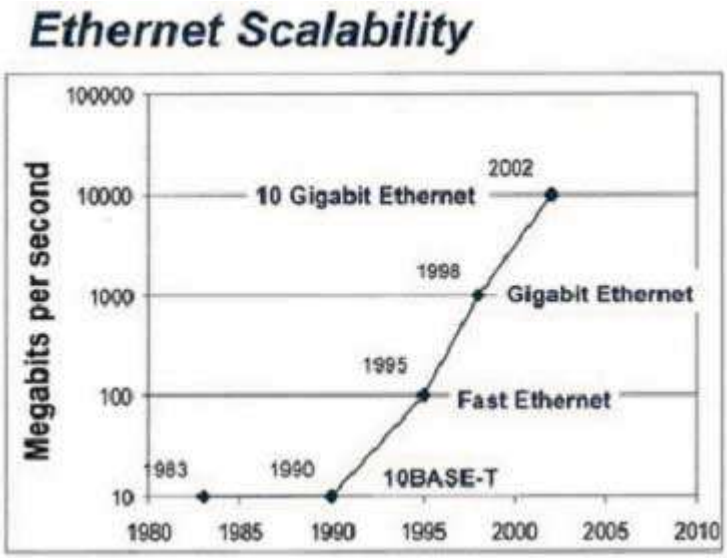
Some of the characteristics of Ethernet include:
- Versatility - accommodates today's and tomorrow's services - supports IP services.
- Lower equipment costs.
- Highly available
  - First fiber Gigabit Ethernet networks shipped over 5 years ago

- First 100Mb/s fiber Ethernet networks shipped over 8 years ago
- Service Flexibility - always ready to accommodate a new service or customer's needs = more revenue
- Simplicity
- High Revenue Potential – rich service support
  - VOIP
  - Video
    - Video Conferencing, Training, Distance Learning
    - Broadcast TV, Video on Demand
    - Surveillance, Remote Arraignment
  - Data
    - Internet Access, Private Line, TLS
    - Storage Area Networks, Point of Sale
- Many active Ethernet network operators: ILECs, CLECs, municipalities, power companies, MSOs
- Large Capacity = more revenue

Mode	**# Fibers**	**Capacity**	**Cost Comparison**
Point-to-Point Ethernet	32 or 64 fibers (active)	Up to 32 Gigabits per Second	130%
Local Convergence	1 to 8 fibers (active, switch)	Up to 4 Gigabits per Second Up to 32 Gigabits of local switching	100%
Distributed Splitting	1 fiber (passive, passive optical splitter)	Up to 1 Gigabit per Second <1 Gigabit local switching	100%

Network Capacity Comparison (example assumes 32 nodes)

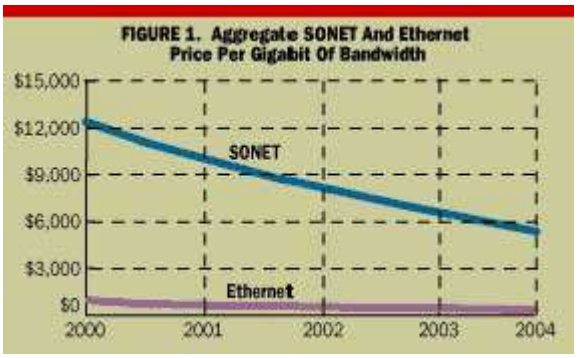
- Scalable - Scalable in increments from 1M bit/sec to 1G bit/sec and soon to 100G bit/sec.



- Interoperability
- QoS issues do exist. Ethernet is not optimized for voice traffic, although this is rapidly changing w/VoIP advances.
- Not quickly restored in the event of a failure, although this too is rapidly changing w/RPR advances.

SONET vs. Ethernet

One by one, Ethernet overwhelmed competing technologies in the LAN market. Ethernet, with its advantages in price, economies of scale, and simplicity, is likely to prevail over SONET in the MAN/WAN marketplace. While SONET prices are likely to fall to some degree, Ethernet will have the advantage in any price war, especially as 10-Gigabit Ethernet (10-GE) products mature and come to market.



The difference in Ethernet and SONET pricing reflects the origins of the two technologies. Ethernet was developed for LANs, which required a large number of relatively inexpensive pieces of equipment. SONET was designed as a network core technology, an application that required fewer, more powerful, more reliable and, consequently, more expensive pieces of equipment.

Another advantage Ethernet brings to the MAN/WAN market is its technological simplicity. Ethernet links tend to be easier and faster to provision than SONET links. In addition, moving Ethernet from the LAN into the MAN and on into the WAN means increased interoperability between the local area, metropolitan area and wide-area networks.

A unified transport protocol eliminates inefficient translation between the different segments of the network, and blurs the distinctions between LAN, MAN and WAN. These are all good things in the eyes of network managers and are areas where SONET will find it hard to compete.

The final breach in SONET's MAN/WAN position is made by the combination of Ethernet and dense wave division multiplexing (DWDM). Now DWDM equipment can carry Ethernet signals over virtually any distance, and the DWDM manufacturers are adding more administration and maintenance tools to their equipment. Together, Ethernet and DWDM will have all the range and network management capabilities necessary to go head-to-head with SONET.

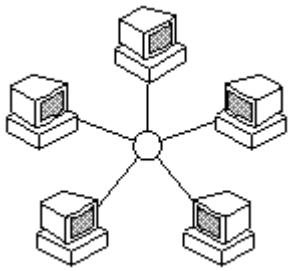
SONET has a huge installed base and a dedicated following among ILECs and other established service providers. This means that, as with other disruptive technologies, new companies must spearhead the transition. The larger companies are hesitant to cannibalize their existing product lines, and they retain a strong bias toward their legacy technology. But the new providers that will galvanize the transition are already on the scene. It is just a matter of time before the ILECs and other service providers respond to the competitive pressure and start integrating Ethernet into their service offerings.

Over time, Ethernet will overwhelm SONET in the MAN/WAN market. Ethernet is cheaper, has better economies of scale and allows for simpler, more unified networks. In the MAN, Fast (100 Mbps) and Gigabit Ethernet (1 Gbps) will form the foundation for Ethernet-based services that will replace T1, T3 and SONET connections. In the WAN, most IP traffic will be carried by 10-Gigabit Ethernet, while in the network core, where traffic loads are heavier and the distances are longer, a large proportion of the traffic will be carried by 10-Gigabit Ethernet over DWDM.

Network topologies

A network topology is the shape of the network, or the arrangement of the connections between the nodes. There are several distinct options, each with it's own advantages and disadvantages.

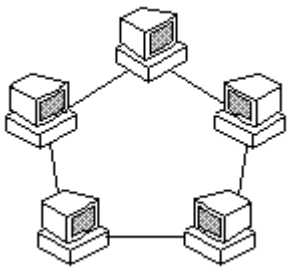
Star



The star topology is widely used for data communications networks. One of the main reasons for its continued use is based on historical precedence. The star network was most popular in the 1960s and early 1970s because it was easy to control.

All traffic emanates from the hub of the star. The central site is in control of all the nodes attached to it. The central hub is usually a fast, self-contained computer and is responsible for routing all traffic to other nodes. The main advantage of a star network is that one malfunctioning node does not affect the rest of the network. However this type of network can be prone to bottleneck and failure problems at the central site. Modern systems solve this problem by providing a redundant backup of the hub node.

Ring

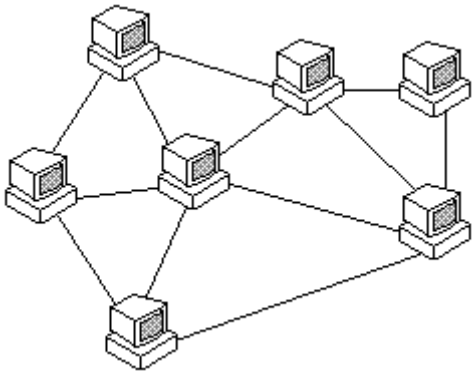


The ring topology is also a popular approach to configuring networks; the ring topology is so named because of the circular aspect of the data flow.

In most instances data flow is in one direction only, with one single node receiving the transmission and relaying it to the next node in the ring. The ring topology is attractive because it is rarely subjected to the bottlenecks associated with hierarchical and star configurations. Moreover, the logic to implement a ring network is relatively simple. Each node in the network is tasked with a straightforward job of accepting the data and sending it to the computer attached to it, or sending it back out onto the ring to the next intermediate node.

However, like all networks, the ring network has its drawbacks too. The primary problem is the use of a single channel to connect all the nodes in the network. If a channel between two nodes fails, then the entire network is lost. To alleviate this problem, some ring networks have backup channels and others have switches that will route data around a failed node. This increases reliability in the event of channel or node failure. More recently, ring networks are being implemented with two rings, so that the network will still be able to function in the event of channel failure.

Mesh Topology



The mesh topology has been used more frequently in recent years. The main attraction is its relative immunity to bottlenecks and channel/node failures. Due to the multiplicity of paths between nodes, traffic can easily be routed around failed or busy nodes. With the high number of interconnections, this approach is very expensive in comparison to other topologies, but many users prefer the mesh network, because of the high reliability (especially for networks that only have a few nodes that need to be connected together).

How long does it take to transmit

	MRI digital image file with 300 slices	Typical Lung X-ray	One 50-Mb Aerial Map
28.8 kbps - typical dial up	374 hours	74 hours	4 hours
512 kbps - typical DSL	20 hours	4 hours	13 minutes
1.54 mbps - T-1	7 hours	90 minutes	7 minutes
100 mbps - Fast Ethernet	1 minute	5 seconds	5 seconds
1,000 mbps - Gigabit Ethernet	5 seconds	0.2 seconds	0.2 seconds

Note: results may vary.

Coast-to-Coast DVD Movie Transfer*

for you to 'Get It'	Minutes	Hours	Days
Modem 56 kbps			13 days
Pony Express			11 days**
ISDN 128 kbps			5 ½ days
Cable Modem 1.5 Mbps		11 hrs 36 min	
T-1 1.54 Mbps		11 hrs 12 min	
FedEx. Express		10 hrs	
DSL 8.5 Mbps		2 hrs 12 min	
PON OC-12/OC 19.4 Mbps	53.6 min		
35 mph	30 min***		
Fast Ethernet 100 Mbps	10.4 min		
Gigabit Ethernet 1000 Mbps	1 min		

* 'The Matrix' DVD 7.18 GB from New York, NY 10005 – delivered to Beverly Hills, CA 90210

** extrapolated from record: 7 days 17 hrs - approx 2,000 miles from St. Joseph, Missouri to Sacramento, California Lincoln's Inaugural Address, March 4, 1861

*** if you live close – no traffic – it's in stock & there's no line

SECTION 4 - BROADBAND OWNERSHIP ALTERNATIVES

Private Entities

Incumbent Local Exchange Carriers

An ILEC (incumbent local exchange carrier) is a telephone company in the U.S. that was providing local service when the Telecommunications Act of 1996 was enacted. ILECs include the former Bell operating companies (BOCs) that were grouped into holding companies known collectively as the regional Bell operating companies (RBOCs) when the Bell System was broken up by a 1983 consent decree. ILECs are in contradistinction to CLEC (competitive local exchange carriers).

A "local exchange" is the local "central office" of an LEC. Lines from homes and businesses terminate at a local exchange. Local exchanges connect to other local exchanges within a local access and transport area (LATA) or to interexchange carriers (IXC) such as long-distance carriers AT&T, MCI, and Sprint.

ILEC's are shareholder owned corporations. Qwest is an example of an ILEC.

Competitive Local Exchange Carriers

In the United States, a CLEC (competitive local exchange carrier) is a company that competes with the already established local telephone business by providing its own network and switching. The term distinguishes new or potential competitors from established local exchange carriers (LEC) and arises from the Telecommunications Act of 1996, which was intended to promote competition between both long-distance and local phone service providers.

North American Telecom and Winstar Communications are examples of CLECs (which generally are listed as simply "local exchange carriers."). CLEC's generally are shareholder owned corporations but not necessarily.

Public Entities

Broadband systems being built by public entities are emerging in a wide variety of forms. State laws may dictate what form these systems can take, and local and regional circumstances also play a strong role. Some parts of the country have a history of providing utility services through public ownership; other areas have been forced to consider municipal broadband systems due to a lack of any services in the market. Others see a localized market failure for certain services, and seek to fill that gap.

What these systems have in common is the ability to use traditional forms of governmental finance to lower costs of capital. In addition, most public agencies and municipalities have a longer-term horizon in which to achieve a return on investment. They are not looking at 5- or 7-year return on invested capital. All these factors can help make municipal broadband systems more cost effective, and gain the benefits of a robust broadband infrastructure for all residents of the community. From traditional cable type systems to wholesale networks to dark fiber providers, public entities are approaching the lack of broadband connectivity in their communities from diverse perspectives.

Public networks for communities and areas that lack sufficient size and density to attract capital investment may represent the best chance to ensure open access, competition, innovation, reasonable service prices as well as timely and ubiquitous deployment of true broadband services.

Municipal Broadband Systems

Many communities are evaluating the need to build their own high-bandwidth broadband network. Cable Multiple System Operators (MSOs). Telecommunications companies continue to consolidate and severely cut back capital spending while competitive local exchange carriers (CLECs) are

facing hurdles in obtaining financing to continue deployment of their fiber optic networks. In addition, incumbent local exchange carriers (ILECs) are choosing not to deploy lower cost, higher capacity services, particularly when those services would risk eroding the high revenues obtained from existing broadband customers.

Municipal broadband systems can help communities retain current key industries and businesses by providing essential communication infrastructure. A high bandwidth broadband network can attract new businesses and jobs.

Benefits of Municipal Broadband

Municipal broadband systems can help communities retain current key industries and businesses by providing essential communication infrastructure. At the same time, a high bandwidth broadband network can attract businesses and jobs.

- ECONOMIC DEVELOPMENT - Through offering high bandwidth networks cities can enhance the economic climate in their respective communities by attracting new businesses.
- COMMUNITY PRESERVATION - Preserve industries and economic opportunities that may require access to high bandwidth networks to compete in the broader economy.
- ESSENTIAL COMMUNICATION SERVICES – Provide essential communication services to Public Safety, Educational Institutions and Hospitals. Increase access to essential medical services by facilitating links to regional medical and trauma centers.
- UNIFY COMMUNITY – Provide an advanced high bandwidth network throughout a community, offering opportunities for access to governmental and educational services.
- SPARK COMPETITION – Create real competition in the local area in cable telecommunication and Internet access and content business. Competition helps stabilize consumer prices, and offers greater choice and selection.
- OPEN ACCESS – Provide an Open Access platform for service providers, content providers and Internet access providers to use.
- TELECOMMUTING – With a high bandwidth network in place, real telecommuting becomes an option, helping relieve road congestion, and offering flexibility for both employers and employees.

Municipal Owned Electric Utilities - Examples

CityNet Chicago: The city of Chicago is using its telecommunication buying power to leverage into a city-operated network.

UTOPIA (Utah Telecommunications Open Infrastructure Agency): As many as 17 different Utah cities with a population of nearly 500,000 customers are banding together to build a wholesale fiber-to-the-home network. Retail businesses locate on the network and provide services to end customers. Bonds will be issued to finance construction when there are sufficient service provider contracts.

Portland, Ore., IRNE Network: A city-operated internal network, Portland's solution is comprised of I-Net facilities, contributed conduit, and existing infrastructure to provide all city telecommunication services, as well as other governmental entities. Portland purchases wholesale elements from Qwest.

Publicly Owned Electric Utilities

There is some debate about whether existing publicly owned electric utilities provide the "best" public entity to provide high bandwidth municipal broadband services. This debate will be waged for years to come, as the full variety of models begins to operate and expand.

Some of the reasons for this conclusion are:

- public power's history of providing utility service to areas either not served or underserved by private utilities;
- public power's willingness to step in where service is limited or of poor quality;
- public power has provided competition in many larger cities, including Los Angeles, Seattle and Tacoma;
- the traditional role in community economic development;
- a longer term return on investment is acceptable for public infrastructure;
- customers already receive electric service and have an existing billing relationship with the utility;
- the utility has existing back office, network operations and outside plant maintenance operations, and has a history of installing service at customer premises; and
- public power provides access to poles and other facilities in the rights-of-way.

Regardless of the conclusion, this list provides a window into some of the key issues each municipality will have to consider before adopting a particular entity in which to provide a high bandwidth broadband network.

Communities with their own electric utilities are now in an excellent position to provide for their own current and future communications needs. Because municipal electric utilities, government facilities and schools are significant users of advanced telecommunications services, these communities have built-in "anchor tenants" that can ensure a sizable revenue stream and lower project risks. They have decades of experience in providing high technology products; dealing with residential, industrial and commercial customers of all kinds; and furnishing technical support and customer service. They have access to essential rights of way, poles, ducts and conduits. They also have a century old ethic of universal service.

Public Utility Telecommunication Networks - Examples

Anaheim, Calif.: Using a municipal dark fiber network, the city leases capacity to private entities. Each customer located on the network pays for the necessary electronics to light the fiber.

Ashland, Ore.: Similar to Click!, the Ashland network competes with Charter Communications. Customer rates for Charter are lower in the city of Ashland than the surrounding region.

Chelan County Public Utility District: Operating as a wholesale fiber optic network, the PUD provides core internal communications with a trial for commercial and residential customers. The county is limited to operating a wholesale network due to Washington law.

Click! Network: Serving as Tacoma Power's cable and data network, Click! provides cable television and data to residential customers as well as a commercial data network in parts of the city. The network supplies a residential retail network throughout the city. It is an open access platform with up to four distinct ISPs offering Internet connections. The service competes directly with AT&T and is considering expanding to the entire service region of Tacoma Power.

Grant County Public Utility District: The county has an advanced fiber-to-the-home open access network capable of 1 gigabit speed. Leveraging off of the NoaNet middle mile network, Grant County PUD is bringing fiber to residences and businesses throughout its service territory. The territory averages 12 homes per square mile and services approximately 35,000 - 40,000 total homes in a total area of over 5,000 square miles. Upon completion, Grant County PUD estimates 47,000 miles of fiber at an estimated cost of $120 million.

NoaNET (Northwest Open Access Networks): NoaNet Oregon and NoaNet Washington are completing a "middle-mile" network that leverages the existing Bonneville Power Agency network throughout Washington and Oregon. Fiber and electronics are extended throughout areas of the Northwest to help connect communities, both rural and more urban areas. Last mile connections

remain the obligation of each community. The Washington network is owned by a consortium of public utility districts and provides fiber links to its constituent communities.

The Oregon network is owned by a consortium of electric cooperatives, several cities and a Native American tribe. Each NoaNet entity is distinct, and the laws in Washington and Oregon differ on whether such an entity may only provide wholesale service, or may be allowed to provide retail service as well.

Legal Issues

Cable Services

- "Cable service" means "(A) the one-way transmission to subscribers of (i) video programming, or (ii) other programming service, and (B) subscriber interaction, if any, which is required for the selection or use of such video programming or other programming service." 47 U.S.C. §522(6).
- Section 613(e)(1) of the Communications Act provides that "a State or franchising authority may hold any ownership interest in any cable system." 47 U.S.C. §533(3). However, this section has been held to be "permissive rather than empowering"; in other words, it does not constitute a federal grant of authority to provide cable service. *Time Warner Comm. Inc. v. Borough of Schuylkill Haven*, 784 F. Supp. 203 (E.D. Pa. 1992).

Telecommunications Services

- Telecommunications service" means "the offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used." 47 U.S.C. §153(46). "Telecommunications" means "the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." 47 U.S.C. §153(43).
- Section 253 of the federal Telecommunications Act of 1996 states: No State or local statute or regulation or other State or local legal requirement may prohibit or have the effect of prohibiting the ability of *any entity* to provide any interstate or intrastate telecommunications service.
- 47 USC §253(a).

"*Any entity*" and units of state government

- *City of Abilene v. FCC*, 164 F.3d 49 (D.C. Cir. 1999): No. The court affirmed an FCC order holding that section 253 did not preempt a Texas statute forbidding Texas municipalities from providing telecommunications services because the phrase "any entity" could not be interpreted broadly to include municipalities. Both the FCC and other courts have followed the *Abilene* decision without much discussion. *See Missouri Mun. League*, 2001 WL 28068 (FCC Jan. 12, 2001); *Mun. Elec. Auth. of Georgia v. Georgia Pub. Serv. Comm'n*, 241 Ga. App. 237, 525 S.E.2d 399, 403 (Ga Ct App 1999); *Iowa Tel. Ass'n v. City of Hawarden*, 589 N.W.2d 245, 252 (Iowa 1999).
- *City of Bristol v.Earley*, 145 F.Supp.2d (W.D. Va. 2001)(vacated as moot following enactment of corrective legislation): Yes. The court rejected the *Abilene* decision and held that the use of the broad language "any entity" made it "clear and manifest that Congress intended section 253(a) to have sweeping application, including areas in which states traditionally enjoyed exclusive regulatory power." Accordingly, the court held that a Virginia statute prohibiting municipalities from providing telecommunications services to the public was preempted by section 253(a). The court also stated that whether the Virginia law were couched in terms of *prohibiting* activities that otherwise were a valid exercise of municipal government or a *withholding of authorization* to the city, the state law would violate the federal rule.

- *Missouri Municipal League v. FCC*, 299 F.3d 1949 (8th Cir. 2002): Yes. The court held that Section 253(a) does not provide independent authority to local governments to provide telecommunications type services, but will preclude a state from interfering with pre-existing authority to provide services. State interference in existing ability could be deemed a "prohibition."

Municipalities Legal Authority

- The authority of municipalities to construct and operate broadband communications networks differs among the states. States that have dealt with the subject either grant express authority to provide communications services, grant the authority to provide some services but not others, expressly restrict the services that can be offered, expressly prohibit municipalities from providing all telecommunications services, or so condition the provision of specified services as to effectively prohibit them. For states that have not addressed the subject, municipal authority to provide communications services is governed by general rules of municipal authority.
- Dillon's Rule States. Dillon's rule, first proposed in 1868 by John Dillon, Chief Judge of the Iowa Supreme Court, is a judicially-enforced rule that has been incorporated into some state constitutions and codified into law in other states. It provides that the authority of a municipality is strictly construed to include only those powers expressly granted or necessarily implied or necessarily incident to the powers expressly granted. If there is doubt about a claimed grant of power to a municipality, it is generally denied.
- Home Rule States. Home rule or "charter" municipalities generally are able to exercise any powers that are not expressly denied by the state's constitution, statutes, or the municipality's own charter. In some states, only certain municipalities are able to exercise home rule authority, while others are not. Similarly, in some states, statutes granting municipal authority to some entities are to be liberally construed, but strictly construed for other entities.
- Ultimately, each state's law must be examined carefully, all procedural requirements are followed, and the public entity's own charter allows the contemplated activity.

Authority of Oregon Municipalities and Other Public Entities

Cities

- Under Oregon's "home rule" statute," a city may take all actions necessary or convenient for the government of its local affairs, "except as limited by express provision or necessary implication of general law." ORS 221.410. Thus, if a city's charter confers authority to provide either retail or wholesale telecommunications services, the city will be empowered to do so.
- Where the city charter contains a broad grant of authority (e.g., "over all matters of city concern to the fullest extent allowed") it is likely no special grant will be necessary. *Multnomah Kennel Club v. Dept. of Revenue*, 295 Or 279 (1983). *GTE v. Lincoln County*, 179 Or App 46 (2002). Challenge to Lincoln County's plan to provide telecommunication services both internally and beyond county borders: LECs argued that municipalities have no right to compete with private industry, and that the county had no authority to provide services outside its borders. Court found that it is irrelevant that municipal business competes with private industry. It also found that the county was within its statutory authority in providing service in two other counties.

Public Utility Districts

- The Oregon Constitution created PUDs "for the purpose of supplying water . . . for the development of water power and/or electricity . . . and for the distribution, disposal and sale of water, water power and electric energy". There is no other implied or express authority for PUDs to deliver telecom services CO-OPS

- Under Oregon law, a cooperative may be organized "for any lawful purpose.. . ." *ORS* 62.115. Cooperatives may "exercise all powers necessary or convenient to effect any or all of the purposes for which [they are] organized." *ORS* 62.125(14). In Oregon some cooperatives currently organized specifically to provide telecommunications services. An Oregon cooperative organized to provide electric or water services may wish to amend its organizational documents to specifically reference telecommunications services

Competitive Local Exchange Carrier (CLEC) Registration in Oregon

- Registration is required for those providing switched voice service.
- Registration is not required if only providing data services.
- Advantages of CLEC registration:
  - Right to access ILEC poles, ducts and conduit at cost-based rates.
  - Right to enter into interconnection agreements with ILECs – allows calls to locally terminate.
  - Right to enforce interconnection agreements by state regulatory commission.
  - Right to purchase services for resale from the ILEC at a discount.
  - Right to purchase unbundled network elements from the ILEC at cost based rates.
  - Right to collocate in ILEC end offices at cost-based rates.

Level playing field obligations

To the extent a municipal system seeks to provide cable services, a franchise will be required from the city the network operates. *See* 47 U.S.C. 541 (cable operators must obtain a franchise from local governments). Franchising authorities must provide a "level playing field" between the incumbent cable provider and any new entrants. *See* 47 U.S.C. § 541(a)(1) (forbidding state franchising authorities from granting exclusive franchises or unreasonably refusing to award additional, competitive franchises). A substantial body of "level playing field" cases has emerged in recent years. These cases generally provide for the following:

- Franchises must be compared, not on an item-by-item basis, but as entire packages.
- "Equal" benefits and "equal" burdens are not required; rather, the appropriate standard is "substantial" similarity.
- When comparing the terms and the build-out requirements of franchises, the appropriate comparison is not between the new entrant's franchise and an incumbent's renewal franchise, but between the new entrant's franchise and the original franchise that the incumbent (or its predecessor) obtained at the time that its situation more closely resembled that of the new entrant today.
- It is inappropriate to compare a new entrant's burden in constructing an entirely new system with an incumbent's burden in upgrading an existing system.
- A franchising authority may properly give weight to both the added risks that a new entrant faces in attempting to enter a market against entrenched competition and the benefits of incumbency that an existing provider enjoys.

See the following cases: *In re: Dakota Telecommunications Group*, 590 N.W.2d 644 (Minn. App. 1999); *New England Cable Television Ass'n, Inc. v. Department of Public Utility Control*, 27 Conn. 95, 717 A.2d 1276 (1998); *United Cable Television Services Corp. v. Dep't of Public Utility Control*, 235 Conn. 334, 663 A.2d 1011 (1995); *Knology, Inc. v. Insight Communication Co., L.P., et al.*, Civ. No. 3:00CV-723-R (W.D.KY)

Cooperatives – 501 (c)(12)

I.R.C. 501(c)(12) provides federal income tax exemption for benevolent life insurance associations of a purely local character, mutual ditch or irrigation companies, mutual or cooperative telephone companies, electric companies, or "like organizations". The Service has never distinguished the terms "mutual" or "cooperative" for purposes of I.R.C. 501(c)(12).

The purpose of an I.R.C. 501(c)(12) organization is to provide certain services to its members at the lowest possible cost. To qualify for and maintain exemption under I.R.C. 501(c)(12), a cooperative must receive 85 percent or more of its income each year from members. The income must be collected solely to meet the cooperative's losses and expenses.

An organization must satisfy three requirements to qualify under I.R.C. 501(c)(12). First, it must be organized and operated as a cooperative. Second, it must conduct activities described in I.R.C. 501(c)(12) and the regulations. Third, it must derive 85 percent or more of its income from members. These three requirements can be categorized as: (1) the cooperative organizational and operational test; (2) the activities test; and (3) the income source test.

Organizational and Operational Test

A common requirement under I.R.C. 501(c)(12), I.R.C. 521 and Subchapter T is cooperative organization and operation. What is a cooperative? The term is not defined in I.R.C. 501(c)(12), I.R.C. 521, Subchapter T, or the regulations. Rather, the definition comes from the common law.

The Tax Court, in Puget Sound Plywood v. Commissioner, 44 T.C. 305, 307-308 (1965), *acq*.1966-1 C.B. 3, described a cooperative as comprised of members who sought "(1) [f]or themselves to own and manage the [organization], as distinguished from having it owned and managed by outside equity investors; and then (2) to have their [organization] turn back to the members the excess of the receipts from the store sales over the cost of the goods sold and the expenses of operation." This description identifies three basic principles or requirements: (1) democratic control by the members; (2) vesting in and allocating among the members all excess operating revenues over the expenses incurred to generate the revenues (i.e. operating at cost); and (3) subordination of capital.

- Democratic Control
  This requirement assures that members participating in the cooperative endeavor remain in control of an I.R.C. 501(c)(12) cooperative. A cooperative satisfies this by periodically holding democratically conducted meetings, with members, each with one vote, electing officers to operate the organization.

- Operating at Cost
  This requires that a cooperative return the excess of net operating revenues over its cost of operations to the member-patrons. In other words, the cooperative must not operate either for profit or below cost. The excess is usually called "savings" (rather than profit) because it is the amount not spent to obtain services (telephone, electricity, etc.) for member-patrons or to operate the cooperative. A cooperative's savings belong to its member-patrons, not the organization, and it must allocate the savings to its member patrons in proportion to the amount of business it did with each.

- Subordination of Capital
  This requires that contributors of capital to the cooperative, in their status as equity owners, neither control the operations nor receive most of the pecuniary benefits of the cooperative's operations. That is, cooperatives are oriented to member-patrons. This distinguishes the cooperative from the for-profit corporation, which is shareholder oriented. The idea behind this requirement is that members of a cooperative band together to share interest, risk, and burden to obtain services or benefits, whether water, telephone, electricity, etc., rather than simply invest as equity owners. This requirement has two components. First, members control an I.R.C. 501(c)(12) cooperative and own the savings or pecuniary benefits from its business, which stay with them rather than go to shareholders or equity investors. Second, a cooperative must limit return on capital (e.g. dividends to shareholders) to insure savings or pecuniary benefits benefit member-patrons rather than shareholders.

- Additional Requirements
  Rev. Rul. 72-36, 1972-1 C.B. 151, sets out organizational and operational requirements an I.R.C. 501(c)(12) cooperative must satisfy to insure democratic control, operation at cost, and subordination of capital. They are:

  - The organization must keep adequate records of each member's rights and interest in the assets of the organization;
  - The organization must distribute any savings to members in proportion to the amount of business done with them (based on the operation at cost principle);
  - The cooperative must not retain more funds than it needs to meet current losses and expenses (also based on the operation at cost principle);
  - The cooperative can not forfeit a member's right and interest in the organization upon termination of membership; and
  - Upon dissolution, the cooperative must distribute any gains from the sale of any appreciated asset to all who were members while the cooperative owned the asset in proportion to the amount of business done with each, so far as practical.

Whether a cooperative satisfies the basic cooperative principles or the requirements of Rev. Rul. 72-36 is a question of fact. A specialist must review the documentation (bylaws, articles of organization, etc.) to determine if the cooperative has satisfied these principles and requirements.

<u>Operations of an I.R.C. 501(c)(12) Cooperative</u>
I.R.C. 501(c)(12) cooperatives are essentially member or consumer service organizations that provide members goods or services permitted by I.R.C. 501(c)(12). Who are members? I.R.C. 501(c)(12) and the regulations do not define "member," but the definitions for I.R.C. 521 and Subchapter T apply as they parallel I.R.C. 501(c)(12). Section 1.1388-1(c)(3)(ii)(c) of the Income Tax Regulations defines member as a "person" (an individual, corporation, or cooperative) entitled to participate in the cooperative's management. As a member usually gets services from the cooperative, he or she is also a patron. A "patron" is any person (an individual, corporation, etc,), whether member or non-member, with or for whom the cooperative does business on a cooperative basis. Sections 1.1388-1(e) and 1.522-1(b)(2) of the regulations.

The following example illustrates the (very) basic operations of an I.R.C. 501(c)(12) electric cooperative.
X, an electric cooperative, buys electricity from a power generating utility company. X collects money from its members to defray the costs and expenses of buying the electricity for its members. It must return the excess over the costs to the members or nonmembers by the amount of business done with each. The excess amount is known in cooperative terminology as "savings" or "patronage dividend," for it is an adjustment in the price X charges its members. The savings reduce members' electric costs.

X may keep a reasonable amount of the savings as reserves for capital improvement, unexpected expenses, expansion, etc. But X must inform each member of the amount of savings attributable to the business the member has done with it. X does this by "written notices," and credits each member's account in its books. This procedure is known in cooperative terminology as "allocation," and the account is usually called a "capital credit account" (the balance sheet account approximating retained earnings) reflecting the member ownership of the amount in the accounts. When there are excess reserves, the board of directors authorizes "redemption" of amounts in the accounts, and X makes payments from the accounts to the members. In effect, X is returning part of the fees it charged members for electricity.

Activities Test

I.R.C. 501(c)(12) describes four specific categories of organizations that can qualify for exemption: benevolent life insurance associations, ditch or irrigation companies, telephone companies, and electric companies. I.R.C. 501(c)(12) also provides for a fifth category, "like organizations," which is not defined in the Code or the regulations. So, the activities of an organization are crucial in determining qualification for exemption under I.R.C. 501(c)(12).

Telephone and Electric Activities

I.R.C. 501(c)(12)(A) provides for the exemption of cooperatives that provide telephone services. Telephone services include both local and long distance services. I.R.C. 501(c)(12)(C) provides for the exemption of cooperatives that provide electricity to members. Providing electric services does not include financing purchases of electrical, water, or plumbing appliances. *See* Consumers Credit Rural Electric Coop. Corp. v. Commissioner, 37 T.C. 136, 143 (1961), aff'd 319 F.2d 475 (6th Cir. 1963). Also, Rev. Rul. 65-201, 1965-2 C.B. 170, held that neither selling electrical materials to members nor furnishing, repairing, or testing equipment are providing electric services or like activities within the meaning of I.R.C. 501(c)(12).

Eighty-Five Percent Member Income Test

A cooperative exempt under I.R.C. 501(c)(12) must receive 85 percent or more of its income from members. Member income is member-sourced and derived from I.R.C. 501(c)(12) activities conducted according to cooperative principles. The 85 percent member income test is computed annually. An I.R.C. 501(c)(12) cooperative may be exempt in one year but lose exemption in another if it does not derive 85 percent or more of its income from members. Rev. Rul. 65-99, 1965-1 C.B. 242, provides that if a cooperative continues to meet the other requirements of I.R.C. 501(c)(12), it need not reapply for recognition of exemption to be considered exempt in years it meets the member income test.

The member income test considers only income received or accrued in the annual accounting period. Rev. Rul. 68-18, 1968-1 C.B. 271. For background information, *see* Topic I, CPE 1980, Current Technical Issues: Electric Cooperatives and Cooperative Telephone Companies Described in I.R.C. 501(c)(12).

In applying the member income test, each item of income is classified as member income, nonmember income, or excluded income. Before applying the member income test on an item of receipt, it must first be considered income.

Rev. Rul. 57-420, 1957-2 C.B. 308, concluded that the activities of an organization that provides and maintains a two-way radio system for its members are similar to those of a cooperative telephone company. By providing communication capability to members on a cooperative basis the organization served the same purpose as the organization described in Rev. Rul. 57-240 and traditional telephone cooperatives under I.R.C. 501(c)(12)(A).

Current Issues –Telecommunication Services

Many cooperatives provide local and long-distance telephone services. However, new technology has greatly changed the nature of electronic communication, and increased the uses that can be made of traditional telephone wires or wireless systems. Telephone cooperatives have expanded with the rest of the industry. Many telephone cooperatives offer new telecommunication services including wireless or cellular phone services, Internet access, paging services, home security monitoring, medical alert services, and environmental (energy consumption, temperatures, *etc*.) monitoring. These services allow member-patrons to communicate with others by voice, writing, or other forms of communication. For example, home security monitoring allows a member patron to be informed when there is a dangerous situation at his or her home or business. Medical alert and environmental monitoring services are similar.

Public-Private Partnerships

Public-private partnerships are a contractual arrangement whereby the resources, risks and rewards of both a public agency and private company are combined to provide greater efficiency, better access to capital, and improved compliance with a range of government regulations regarding the environment and workplace. Through this agreement, the skills and assets of each sector (public and private) are shared in delivering a service or facility for the use of the general public. Public-private partnerships can take a wide variety of forms. In addition to the sharing of resources, each party shares in the risks and rewards potential in the delivery of the service and/or facility. The public's interests are fully assured through provisions in the contracts that provide for on-going monitoring and oversight of the operation of a service or development of a facility. In this way, everyone wins - the government entity, the private company and the general public.

Public-Private Partnerships have been in use in the United States for over 200 years. Public-private partnerships have been in existence since long before the Revolutionary War. In 1652, the Water Works Company of Boston was the first private firm in America to provide drinking water to citizens. This contractual arrangement between government entities and private companies for the delivery of services or facilities is used for water/wastewater, transportation, urban development, and delivery of social services, to name only a few areas of application. Today, the average American city works with private partners to perform 23 out of 65 basic municipal services. Also, governments realize that the combined capital and intellectual resources of the public- and private-sectors can result in better, more efficient services. The use of partnerships is increasing because it provides an effective tool in meeting public needs, improving the quality of services, and more cost effective.

Evidence suggests that the use of public-private partnerships is on the rise. Even in the best of times, governments at all levels are challenged to keep pace with the demands of their constituencies. During periods of slow growth, government revenues are frequently not sufficient to meet spending demands, necessitating painful spending cuts or tax increases. Similarly capital available to private sector companies can be difficult to obtain. Partnerships can provide a continued or improved level of service, at reduced costs. And equally important, partnerships can also provide the capital needed for construction of major facilities. By developing partnerships governments and private-sector entities can maintain quality services despite budget limitations.

Public infrastructure and service needs far exceed the capability of government budgets to meet them. In education, for example, the American Society of Civil Engineers has said that 75 percent of America's school buildings are inadequate to meet student needs. To close this schoolhouse gap would require a capital investment of $3,800 for every student in the United States. Even in better times, school districts won't have the funding to meet this need. This is true in virtually every area of public life, from highways to waterworks. Public-private partnerships enhance the resources and the capability to address pressing public needs.

Public-private partnerships aren't just about budgetary issues. Governments are turning to partnerships because they see that merging the resources of the public- and private-sectors makes it possible to improve the quality of services provided to citizenries. The U.S. military, for example, has developed partnerships to build housing for enlisted personnel, resulting in higher-quality living quarters without a large impact on the defense budget. Homeland security relating to public safety looks to benefit from public-private partnerships for solutions

Governments themselves are the biggest supporters of public-private partnerships. While there can be substantial misperceptions about the value of partnerships, a look at who endorses them should clarify the picture. Federal agencies like the Environmental Protection Agency, the Department of Defense, and the Veterans Administration all use partnerships. And the number of state and local governments using this tool is even greater. For example, the U.S. Conference of Mayors is enthusiastically working with private-sector providers to discuss ways to make

partnerships more effective. Numerous surveys indicate why -- governments traditionally realize cost savings of 20 to 50 percent when the private-sector is involved in providing services.

Private contractors can achieve long-term success in partnering with governments by providing quality, value and dependability. As mentioned earlier, private companies have high levels of accountability with the public, media and regulators at various levels. In fact, regulatory bodies tend to enforce regulations more tightly with private contractors than they do with government agencies, realizing that ordering government entities to comply with regulatory requirements can mean increased budget challenges and higher taxes. As a result, both private companies and government officials are under full scrutiny, which minimizes the opportunities for corruption.

There is more than ample evidence to show that public-private partnerships result in a higher quality of services while holding the line on costs. Private-sector partners are able to practice cost efficiencies to hold down expenditures, while also taking advantage of additional revenue streams. In cases where there have been rate or tax increases, it came as a result of upgrading or expanding systems -- and under the terms of the contract signed between the public and private partners. Often, major projects can be undertaken at little or no cost to the public. For example, in the public-private partnership that rebuilt Washington, D.C.'s landmark Union Station, the multi-million dollar improvements were completed without using a dime of taxpayer money. In part, the private contractor is recouping costs from rents paid by retail shops in the facility.

A number of components must be addressed to create an optimal environment for p-p partnerships. Private sector entities must be ensured that financial commitments to a project will be kept. Private sector as well as public sector entities must have clearly defined roles to ensure and retain appropriate operational control over projects. The components include:

- **Political leadership**
  - commitment from the top and under a statutory foundation
- **Active public sector involvement**
  - on-going monitoring of performance
- **A carefully developed plan**
  - extensive, detailed contracts, clearly describing the responsibilities of all partners
  - a clearly defined method of dispute resolution
- **On-going open and candid communications with stakeholders**
  - public officials
  - private sector partners
  - affected employees
  - public members with an interest in the service to be provided
  - the press
  - labor unions
  - relevant interest groups
- **Partnership selection**
  - "lowest bid" is not always the best choice for selecting a partner
  - "best value" in a partner is critical in a long-term relationship
  - experience of the partner
- **It must be a real partnership**
  - shared burdens and shared rewards for both the public and private participants
- **Real incentives**
  - or the private sector will not participate
- **Keep it simple**
  - minimize bureaucratic procedures that can cripple a project

Why consider public-private partnerships for telecommunications?
This is the age of information technologies, but there can be a hefty cost of getting a system operating or for taking existing infrastructure into newer technologies. Appropriately crafted public-private partnerships can open up access to capital funding generally not available to the

private sector, the end result being achievement of public policies (like increased economic opportunity) while supporting private sector goals (e.g., increased profits). Through public-private partnerships, many governments are now able to fully participate in "E-government" with their constituents, or effectively coordinate government activities and budgets. Better service, improved tools and saving money are exactly what public-private partnerships are all about.

Where do we start (telecommunications)?
The first barriers to remove are those of mis-communication and mis-information. Industry, government and citizenry need to voice their concerns in a context of "we are friends, not competitors" and have an opportunity to help each other. Both problems and opportunities need to be put on the table. We should focus on barriers and stumbling blocks that can be removed and incentives that can be created by government as much as on what industry can do. It's more important for people first to talk about what they hope to improve in their communities and less about specific technical configurations for telecommunications infrastructure. Every community needs a telecommunications and technology strategic framework and work plan that addresses a vision for their community (i.e. their economy and quality of life – healthcare, education government access, recreation, etc.). Developing a list of needs and issues is an excellent starting point.

Possible Oregon telecommunications public-private partnerships
Homeland security programs may be good candidates for public-private partnerships. Local government entities may be able to get Federal funds for "homeland security" purposes that could be used to improve E911 access, including route redundancy and self-healing rings in territories not served by Qwest.

Underserved areas may benefit from a cooperative partnership between the public and private sectors. There likely are a number of cooperative "demand stimulation" and "demand aggregation" opportunities through which public and private entities share benefits. We need to openly and candidly talk further about stimulation or incentives for broadband applications in health care, e-government, education, e-commerce and entertainment.

User-owned ("condominium" approach)

A user-owned infrastructure permits end-users to access the converged provisioning of data, voice, and video through a single physical network connection. It also presents an opportunity for end-users to choose among open, competitive offerings of CAS (content, applications, and services) from multiple suppliers based on "competition on the merits" of those CAS offerings.

AFNs illustrate the new paradigm of user-owned infrastructure: infrastructure that is owned/controlled as assets of individual entities, or groups of end-users. Organizations with campus-like facilities, including private sector firms, schools, government agencies, and municipalities, are adopting this approach to ownership. They are taking control of their telecommunications infrastructures as assets that they own/control (thus the growing use of the term "asset-based" telecom). This trend is gaining momentum and spreading to a wider market as customer equipment becomes less costly, easier to install and use, and more fully- featured.

Two characteristics inherent in networks, including AFNs, are: (1) the inevitable susceptibility of a network to natural monopoly status, and (2) the fact that the network can be implemented in such a way that the marginal cost of its use can approach zero. These factors are of fundamental importance to an analysis of deployment approaches appropriate to an AFN.

In order to achieve the benefits potentially available from the AFN, the ownership incentive structure for the network must simultaneously:

- Neutralize the potential for a natural monopoly to become manifest in the network and to be exploited.

- Enable the "economic public good" character of the network by ensuring that the marginal cost of its use is driven to approximately zero, and the price of such use is set to marginal cost.

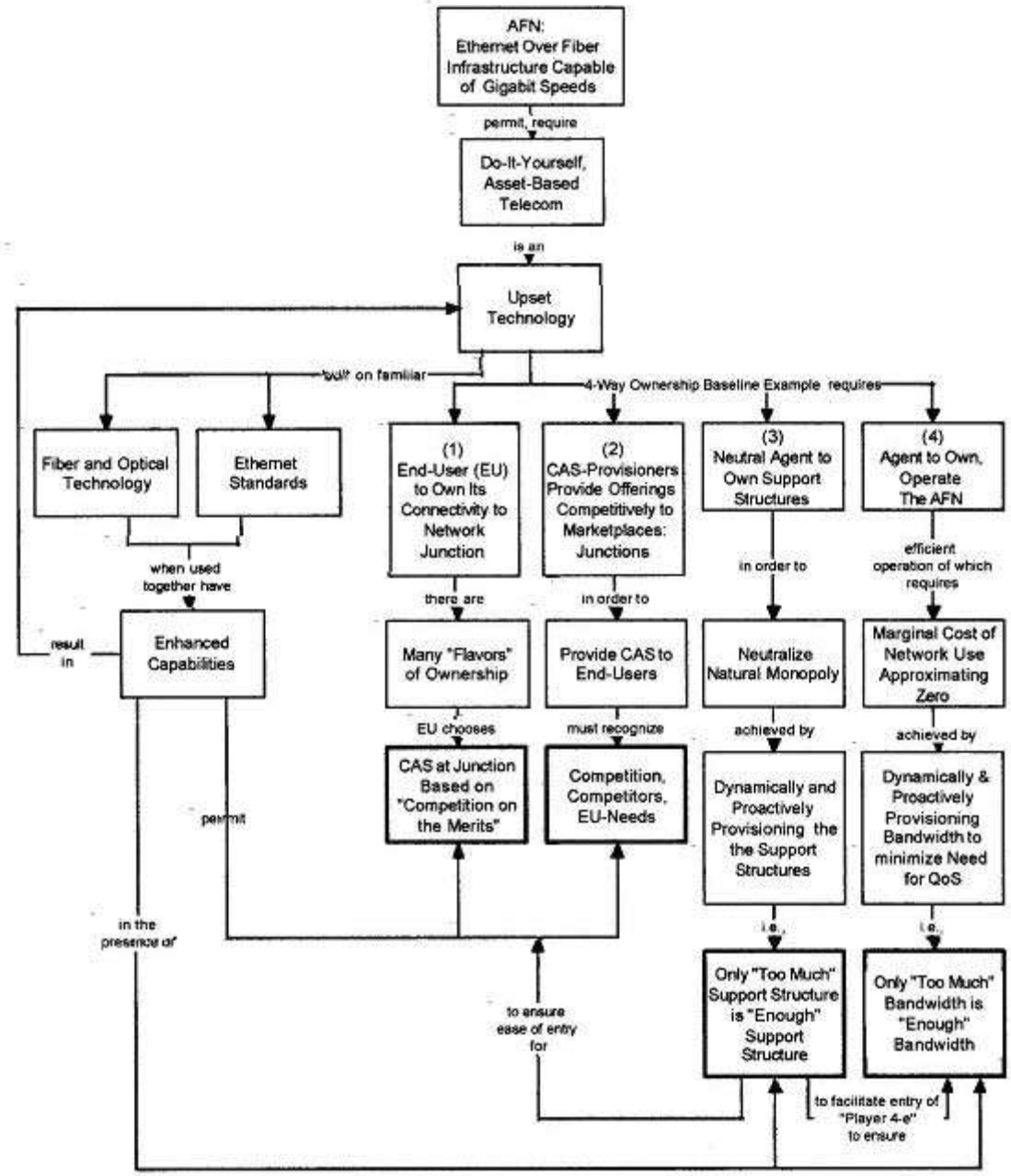
These two objectives can be achieved by invoking a simple approach for AFN deployment: "Only Too Much Is Enough." While this approach may at first appear enigmatic, it is both powerful and necessary.

An entity that deploys a network that it owns/controls for its own use, operates under a new paradigm that results in many benefits. The new paradigm includes:

- Opening the network infrastructure to a wide range of potential providers permitting end-users to select from the competing offerings based on the respective price and merits of each. Competition at this level can provide end-users with: increased choice, enhanced quality, as well as lower prices on offerings.
- Providing sufficient bandwidth to drive the incremental cost (marginal cost) of using the network to approximately zero, and passing on this benefit to internal network end-users at a price of zero for such incremental use. This price applies to uses that specifically include transport of supplied by vendors to end-users, and to transport of "peering" traffic from other networks.
- Paying for the infrastructure deployed to support the network out of combined savings to end-users from tariffs no longer paid to legacy telecom providers and from lower prices paid to providers. Often these savings can more than compensate for the costs of deploying the infrastructure in the first place.
- Permitting an organization that is not large enough, alone, to deploy such a network for its own use, nonetheless to share in its benefits. It can do this by joining with others in an integrated incentive structure to own/control a network for mutual benefit, coordinated by a neutral entity such as a municipality or other not-for-profit organization.
- Obviating potential negative impacts from the natural monopoly condition inherent in networks including a network deployed as suggested above -- because natural monopoly poses no problem in such a network owned/controlled by an entity for its own use (One does not exploit oneself.).

On the other hand, the owner of a network may offer the network for use by others. In doing so it may seek to exploit the network's natural monopoly potential and compound it into a vertical monopoly by providing to "captive" end-users, under non-competitive prices and conditions, CAS (content, applications and services) that it owns/controls. This can occur especially in regions that are likely to be chronically underserved. Such a possibility can be foreclosed, however, by regulations requiring that when supplying its network to others, each such network-supplier act only as a carrier of CAS, i.e., that it be prohibited from exercising vertical market power by providing to client-end-users CAS that it owns/controls.

The following figure poses a way to view how all of this might fit together. The "Neutral Agent" could be from the private sector. The Neutral Agent could also be the network operator.


AFN:
Ethernet Over Fiber Infrastructure Capable of Gigabit Speeds
permit, require
Do-It-Yourself, Asset-Based Telecom
is an
Upset Technology
built on familiar
4-Way Ownership Baseline Example requires
Fiber and Optical Technology
Ethernet Standards
(1) End-User (EU) to Own Its Connectivity to Network Junction
(2) CAS-Provisioners Provide Offerings Competitively to Marketplaces: Junctions
(3) Neutral Agent to Own Support Structures
(4) Agent to Own, Operate The AFN
when used together have
there are
in order to
in order to
efficient operation of which requires
result in
Enhanced Capabilities
Many "Flavors" of Ownership
Provide CAS to End-Users
Neutralize Natural Monopoly
Marginal Cost of Network Use Approximating Zero
EU chooses
must recognize
achieved by
achieved by
CAS at Junction Based on "Competition on the Merits"
Competition, Competitors, EU-Needs
Dynamically and Proactively Provisioning the the Support Structures
Dynamically & Proactively Provisioning Bandwidth to minimize Need for QoS
permit
in the presence of
i.e.,
i.e.,
Only "Too Much" Support Structure is "Enough" Support Structure
Only "Too Much" Bandwidth is "Enough" Bandwidth
to ensure ease of entry for
to facilitate entry of "Player 4-e" to ensure

SECTION 5 – BROADBAND INFRASTRUCTURE DEVELOPMENT POTENTIAL

Infrastructure To Meet Tomorrow's Community and Market Needs

If there were to be a locally owned, forward-looking broadband infrastructure, two would be good candidates for longer-term investment: Advanced Fiber Networks (AFNs) and wireless broadband. The suggestion of these two modalities stems from the previous discussions of technology horizons and market needs. Given the context of the Josephine County marketplace, taken along with several factors based in what we know of these technologies today, DSL and HFC will provide some unknown years of service ahead; yet the laws of physics as understood today seemingly are inherently limiting for these approaches. Relatively speaking, today AFNs and wireless broadband today seem unbounded in their service potential and product offerings.

AFNs and wireless broadband technologies represent inherently disruptive innovation. Their deployment is having and is likely to continue to have direct impact on the business models of current telecom providers. Rapid, wide deployment of these networks could well lead to a tumultuous transition period as the functioning of a competitive market drives the price of services offered over the networks of incumbents to their marginal costs. Interestingly, two of the RBOCs have now announced they will commence transitioning to this AFN approach in the future. RBOCs also have announced introduction of wireless broadband infrastructure in some areas.

Although networks over fiber infrastructures as well as wireless broadband are already being deployed by leading-edge end-users in the private and public sectors throughout North America and abroad, at this early stage in the U.S., such networks are vulnerable to being blocked through non-market, anti-competitive tactics of rivals. The tradeoffs between the costs to the economy of such an interference with market forces, as compared to those from the stresses of a possible, rapid transition to a disruptive technology in response to market forces, demand careful monitoring, penetrating analysis, and levelheaded, steady stewardship - in the context of creative leadership.

Suggesting AFNs and wireless broadband as modes to pursue also reflects an understanding of the traditional base upon which these platforms are founded - DSL is profoundly a Telco program based on using existing copper plant as HFC is a cable-industry approach. Both industry segments are seeking to maximize their investment in plant and provide decent bandwidth. However, without substantially rebuilding their networks (and some have started, e.g., Verizon) they will be the bottlenecks of the future. In Josephine County Telcos (e.g., Qwest and Frontier-Citizens) are the significant DSL providers (resellers of the services also exist); they own most, if not all, of the copper plant in the cities of Grants Pass and Cave Junction/Selma. Charter in Grants Pass is the sole provider of cable (HFC) access to broadband.

In no way should this recommendation be taken as anything more than a reflection of widely held opinions by a wide range of independent technical experts as to the current knowledge and forecast for the upside boundaries of the architectures. It is not a reflection on these mostly private sector companies as "good" or "bad." This is a technology issue and not some form of ethical or moral evaluation. Many members of the LECs and cable industry will argue in defense of their investments, but these public arguments generally stem from the marketing and financial segments of their respective businesses. Fundamentally, there is a strong business imperative to extract as much value from existing investments as possible. The tide is changing, however, as we start to see more and more investment in fiber between central offices and other connect points.

The underlying technologies of optical fiber and wireless broadband are well proven and understood. What's more, in combination these technologies promise great economic advantages and social benefits from widely deploying a truly broadband infrastructure capable of gigabits (fiber-based infrastructure), rather than the kilobits or megabits currently offered by incumbents. Additionally, with proper structuring of the ownership and management this infrastructure

provides the opportunity for competition, open access to end users, to suppliers, and each to the other, and provides an opportunity for freedom from arbitrary and, by some analysts, capricious limitation of such offerings.

AFNs and wireless broadband do this at a much lower cost required to access services from an infrastructure of similar capability if that capability was provided as a service through networks owned by legacy telecom firms (e.g., AFNs and wireless broadband employ technologies in ways that together represent a fundamental shift: increasing the capabilities, lowering the costs and facilitating the deployability of the telecommunications infrastructure). Although these new combinations are in their youth, even today they allow end-users to carry out for themselves, in addition to functions of the past, many functions not previously possible.

Today, the telecommunications paradigm involves incumbent local exchange carriers (ILECs) using voice-centric, circuit-switched, narrowband infrastructures, or the cable modem suppliers using TVcentric, broadcast-oriented infrastructures, to provide connectivity services to end-users along with selected content, applications, and services (CAS). The legacy infrastructures are copper (or copper with fiber), and as noted, are circuit-switched or broadcast-based. Each is in a late stage of its lifecycle. The ILECs and cable- modem network operators (i.e., cable television companies) each own the respective infrastructures through which they supply connectivity as well as their respective selections of CAS for use by end-users. These suppliers have yet to demonstrate their ability to provision data, voice, and video economically through a single connector, much less to represent a venue for open, competitive provisioning of CAS.

In the US the greatest capacities of today's most advanced copper-based residential DSL services are tens of megabits per second with asymmetric bandwidth (greater downstream than upstream). Cable network-based data services are also provisioned with asymmetric bandwidth. Yet both are plagued with practical performance problems. DSL speeds degrade considerably with increasing distance and cannot function at more than about 15 kilo-feet due to signal loss and external interference, especially from nearby T-1 circuits. Coaxial cable is shielded from most external interference, but still cannot be used over large distances; in addition, it inherently does not scale easily to large numbers of users because it is a shared communication medium and therefore is prone to congestion.

In stark contrast, fiber infrastructure is well suited for gigabit broadband and beyond. Relatively inexpensive laser equipment can already transmit 10 Gigabits per second on each available wavelength of a single fiber (i.e., two orders of magnitude higher on each wavelength than the current capacity of DSL or cable modem). The signal fidelity of fiber is unsurpassed, allowing transmission over tens, even a hundred miles without regeneration.

Such secure networks are already being deployed by owner-users that range in size from Fortune 100 firms to small businesses, to rural, municipality-led owner-groups acting for their mutual benefit. The networks provide dedicated symmetric connectivity at speeds that can reach gigabits per second (up to tens of billions of bits each direction) on wavelengths over a single fiber, as compared to the bare megabit (million-bit) asymmetric (faster downstream than upstream) connectivity currently offered by incumbent network owner-suppliers of digital subscriber line (DSL) or cable-modem services. Providing networks with such high bandwidth greatly facilitates convergence of data, voice and video through a single network connection to the end-user that, in turn, permits access to content, applications and services (CAS) from multiple suppliers. The infrastructure for such a network can be built using products that are "plug and play" (i.e., interoperable and interchangeable) from multiple manufacturers. As a result, such products are highly competitive, surprisingly cost effective, scalable, and increasingly available today.

Ownership

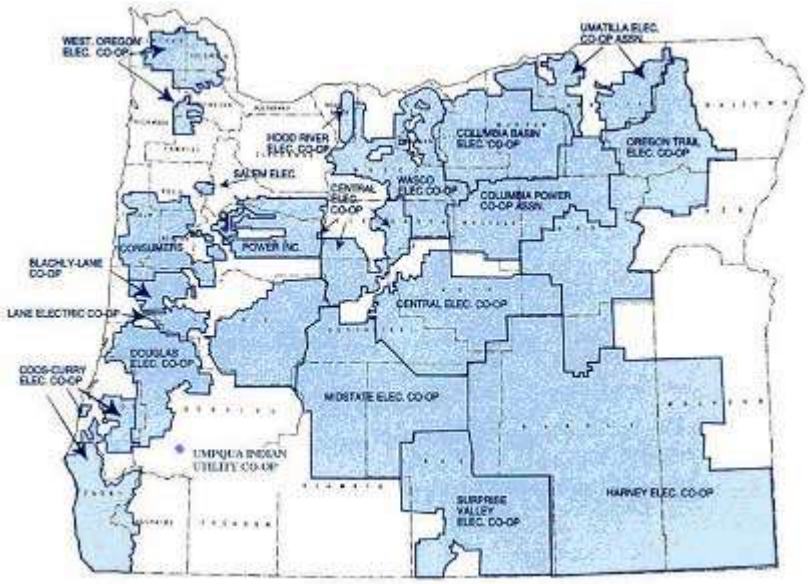
One option is to do nothing. Qwest and Charter will continue to enhance their service offerings of DSL and cable modem access in the Grants Pass area. Frontier-Citizens will add DSL in the Illinois Valley. Private sector investors will explore re-selling DSL or invest in wireless broadband. It’s not

a "bad" approach but ultimately may need to be married to the interests of a broader public policy. Still, this may not be that far off from a sound customer-driven approach. These entities are driven by the natural profit seeking motives of privately owned companies. Often this falls short of broader public policy goals of communities, especially in smaller or more rural areas.

Another option is to create a community-oriented and sanctioned entity to work with providers to help them understand the true aggregated needs of the communities, helping to foster and guide investment, development and provision of services. This group could also ensure that leveraging of advanced services facilities are incorporated into community and economic development planning. Here we start to see the benefit of public-private partnerships (discussed in more detail in Section 4). This approach can help to implement an enhanced customer-driven (community-driven) approach, beneficial to all parties.

Too often this element of dialogue has been missing when communities wake up to their telecommunications status and start to approach the issue of provisioning of advanced services. In many areas communities are just now starting to include telecommunications in their strategic planning efforts. We often hear of efforts well underway without there ever being a discussion with the local providers. This is a necessary step to avoid the polarization that has occurred between public and private sectors in this state. Perhaps of even greater importance for a collaborative and cooperative approach is the efficient and effective use of scare capital for infrastructure investment. It's really not the responsibility per say of the private sector to formulate public policy, such as economic and community development strategic plans. The role of the private sector is to participate in the planning process and then to provide services as appropriate.

Yet another option is to pursue a cooperatively owned model (e.g., 501(c)(12)). Here in Josephine County we face a significant challenge. Unlike many of the community-oriented infrastructure builds underway in Oregon, or for that matter in the U.S., Josephine County lacks a motivated organization to provide leadership necessary to move a publicly- or cooperatively-owned broadband ownership initiative forward. Typically what we see are municipalities, cooperatives or utility cooperatives leading these efforts. While in Josephine County there is widespread recognition of the importance of an advanced telecommunications infrastructure, there is no readily apparent interest or motivation on behalf of the county government or cities of the county to engage in such an effort. Additionally, there is no electric utility cooperative in the county that might take on this task nor is there currently any other such collective entity pursuing this idea.



Oregon Rural Electric Utility Cooperatives
Note: there are no Electric Utility Cooperatives in Josephine County
http://www.oreca.org/map.htm

Under current circumstances two ownership options seem more likely for Josephine County, especially in the Grants Pass area: user-owned (condominium) or a private sector entity with a strong community service orientation. One approach might be to seek a "blend" of these models.

No matter what the approach to ownership, the creation of a community-oriented telecommunications planning group would be beneficial to any and all modes of ownership. Without this there will be no focused, community-oriented approach to coordinating and collaborating building of additional infrastructure -- the status quo will prevail.

Suggested Fiber Network Topology

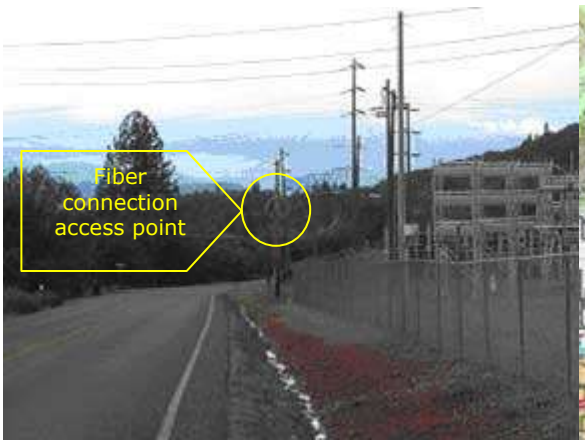
The initial suggested route uses a collapsed ring approach. This approach allows for a reduced cost of entry and provides for future expansion as the customer base grows. It needs to be built with ample "dark fiber." Dark fiber is optical fiber infrastructure (cabling and repeaters, if necessary) that is currently in place but is not being used. To the extent that these installations are unused, they are described as dark. "Dark fiber service" is service provided for the maintenance of optical fiber transmission capacity between customer locations in which the light for the fiber is provided by the customer rather than the owner of the dark fiber. The dark strands can be leased to individuals or other companies who want to establish optical connections among their own locations. The company or individual provides the necessary components to make it functional.

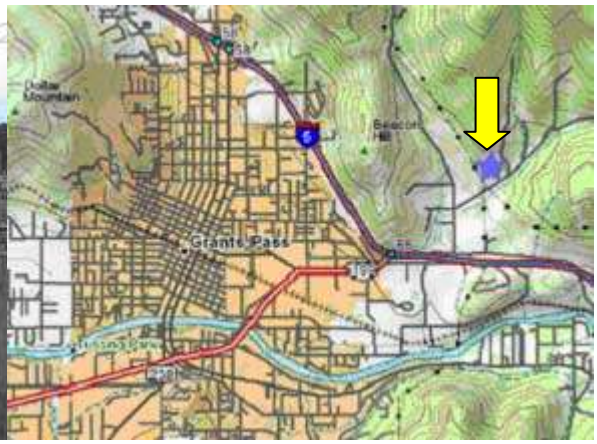
A 48-count fiber with at least an OC-48 rating is recommended. Two drivers of this rating (and above) include two-way video conferencing and telemedicine requirements (e.g., transmission of CT scans). This may seem like gross overkill given apparent current demands. But…if we're building for the future, then you can never have enough bandwidth available.

This model is presented for discussion purposes as well as to understand what opportunities may exist, and we grant that it may have any number of issues to address (i.e., flaws). A next step would be to retain a telecommunications engineering company (e.g., W & H Pacific or Hunter Communications) to fully flush out all technical design details and nuances.

Interconnection opportunity requires further exploration

NoaNet is required to provide at least one access point to the public purpose fibers in each of the rural counties that the Bonneville Power Administration (BPA) fibers pass through. NoaNet announced in March of 2003 it is passing through Josephine County on leased Pacific Power fiber. For Josephine County the most likely connection point would be at the Jones Creek substation.



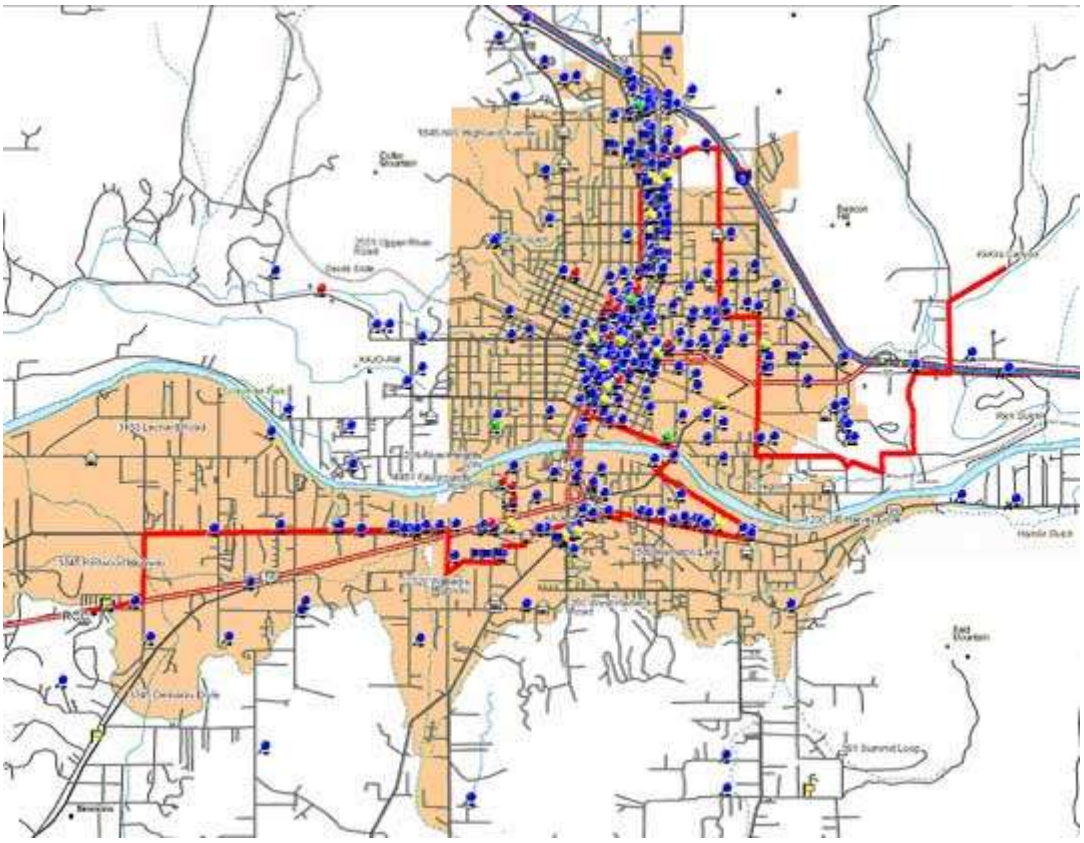


The location of the NoaNet POP could either be on land adjacent to the Pacific Power Jones Creek substation, or it could be located closer to the city to be served with the fiber. One possible site

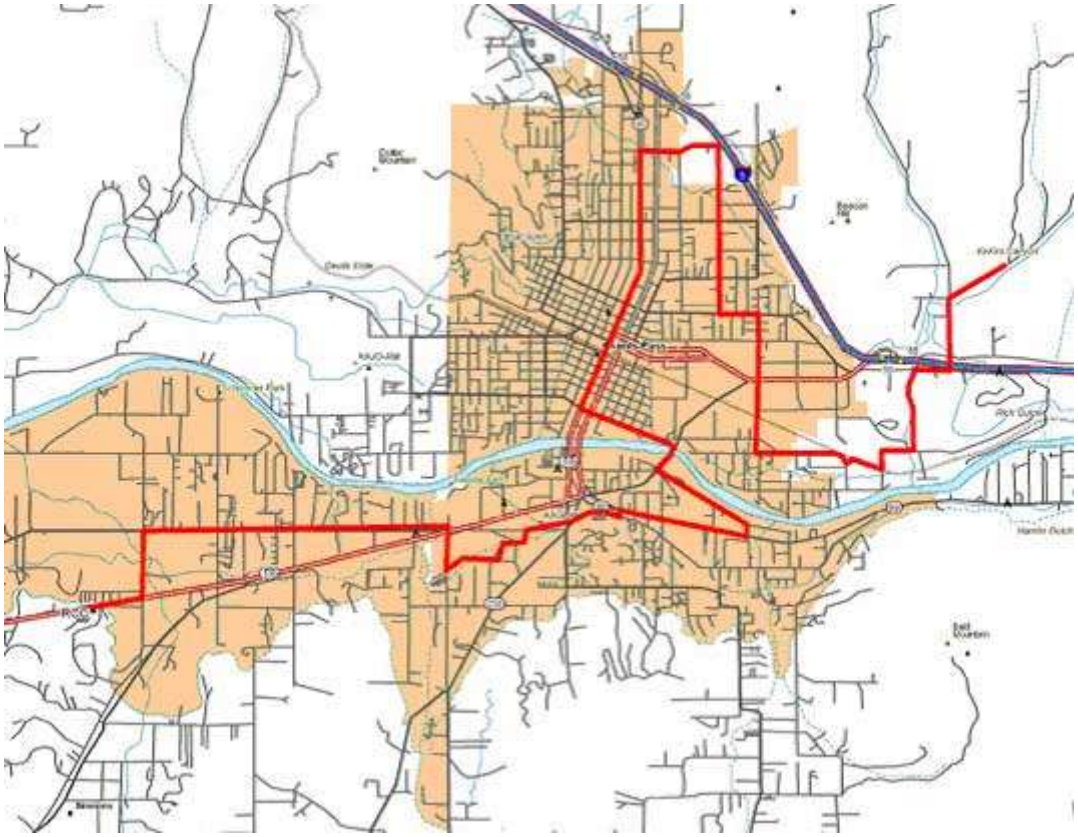
for the POP might be at the Grants Pass school bus maintenance location on SE Gladiola Avenue. No discussion with Pacific Power, Noanet or the school district of this possibility has as yet occurred.

Route selection (fiber)

The methodology for the middle mile route selection included plotting all addresses for the Grants Pass Chamber of Commerce membership, county facilities, city facilities, schools and associated facilities, health care facilities, financial institutions and larger businesses (see following map). This route addresses the majority of surveyed entities. [Note the CD accompanying this study contains large map files of the routes contained in this study.]



The suggested initial route is 14.3 miles (shown next in red below with the plotted data removed).

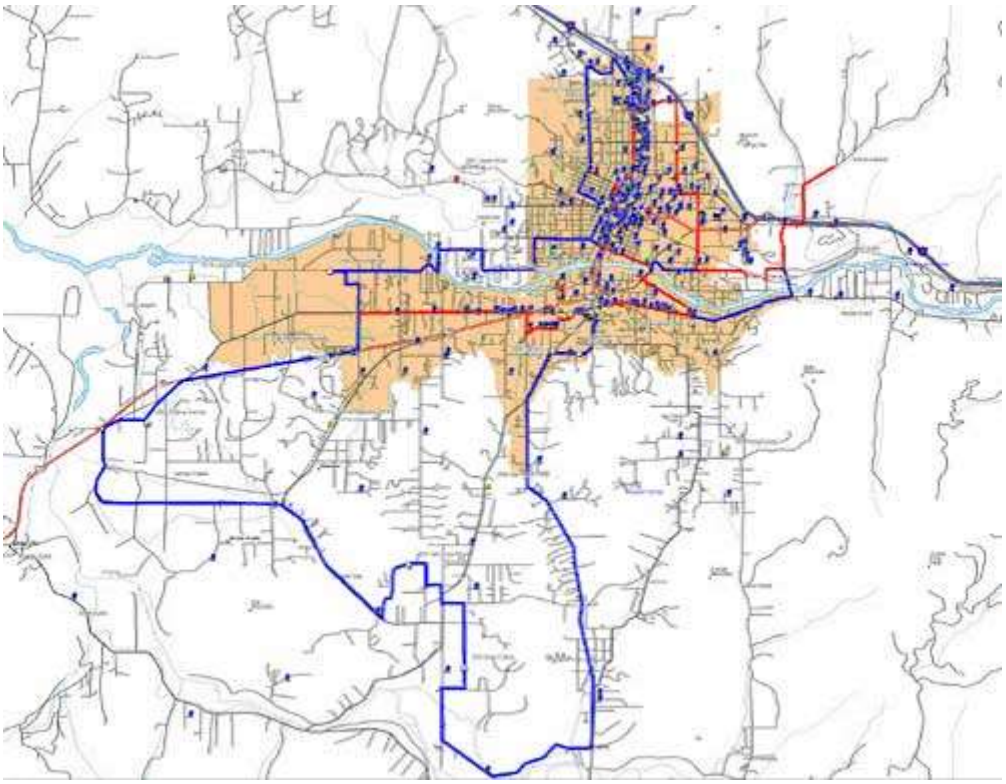


The suggested route is all aerial. It crosses the Rogue River adjacent to the Grants Pass Parkway crossing. The Rogue River constitutes a natural barrier that has been spanned by power, telephone and cable providers.

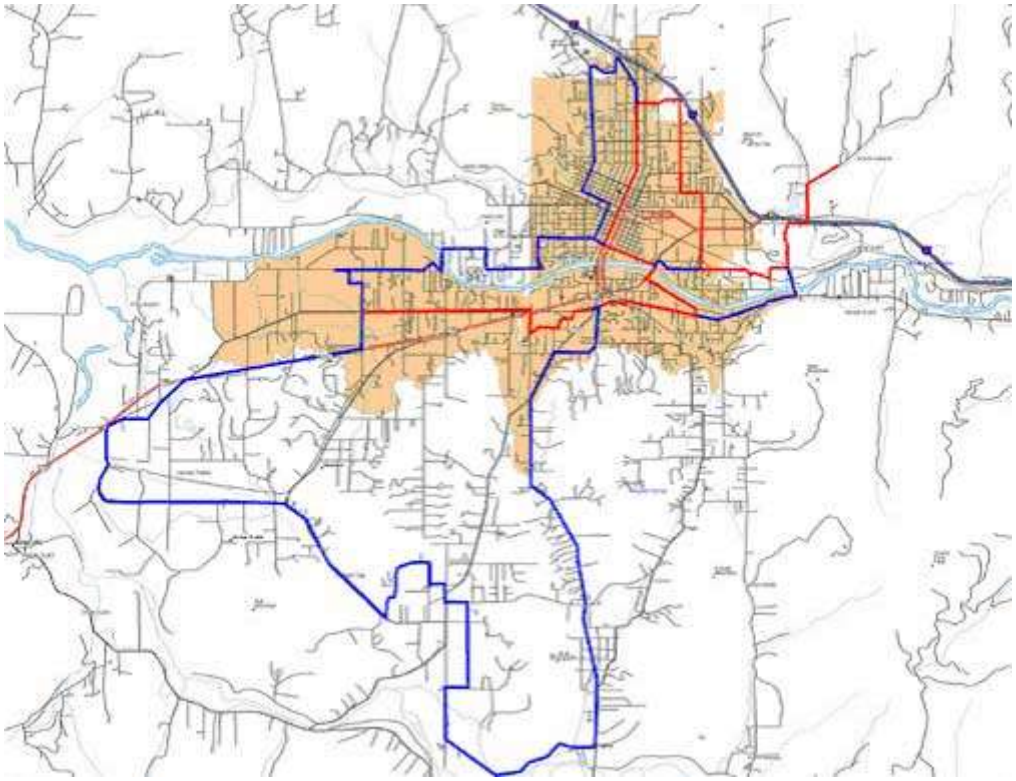
Utility lines crossing the Rogue River at Grants Pass Parkway

Route expansion – mesh ring (fiber)

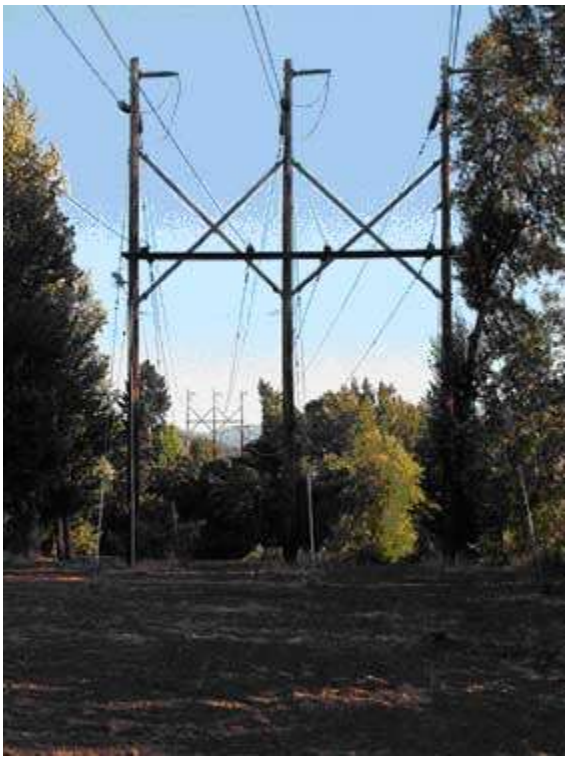
Shown in blue on the following maps is an expansion of 32.64 miles (shown in blue) to the initial route proposal (shown in red -- total would be 46.9 miles). This would provide for a mesh ring topology approach (see Section 3). Mesh rings provide for additional redundancy and fault tolerance in a ring topology.



This next map shows the ring topology (red and blue) with the location icons removed.



This expansion requires two additional river crossings, both of which are already available due to existing utility line crossings.



Glen Drive off of Lower River Road to Leonard and Mesman Drive.

Favil Lane utility line crossing

Cost of Construction

As suggested by the following chart, now is a good time to commence a fiber build. A variety of factors are seemingly at a low. Labor-intensive activities will likely have the greatest increase. Materials and electronics seem to have abated in cost for the time being.

The construction cost factors favor doing it right now.

Electronics (fiber)

A number of alternatives are available for customers choosing to lease fiber strands. Selecting a standard that all customers would utilize is critical for interoperability and for overall containment of maintenance and operation costs. Here we suggest the CISCO ONS 15454 as a reasonable choice for two reasons.

First, it is the same equipment used by NoaNet on their backbone fiber system. Compatibility problems should be nil. [Note: for purposes of discussion we make the assumption that NoaNet would be the backbone provider of choice, even though today to our knowledge there is no known definitive plan to place a NoaNet POP in Josephine County. Also, nothing dictates that the interconnect has to be through NoaNet. Qwest could serve.]

A second reason is the flexibility of the equipment. The ONS 15454 combines supercharged SONET/SDH transport, integrated optical networking including ITU Grid Wavelengths and DWDM, unprecedented multiservice interfaces on demand including Ethernet, ATM and TDM to deliver radical economic benefits to service providers. The ONS 15454 provides the functions of multiple network elements in a single platform. The basic chassis, control cards, and fan units are the same no matter what the equipment is used for. Tailoring the electronics to a customer's requirements is a simple matter of changing cards. For example, to equip an OC-3 ring using the ONS 15454, OC-3 optics cards are plugged into the chassis. To equip T1s, cards having 14 T1s on them are plugged into the chassis. For a customer requiring a 10 Mbps or 100 Mbps signal, Ethernet cards are plugged into vacant chassis slots to carry the signal. With many other manufacturers a different chassis for Ethernet connections than the chassis that would be used for voice traffic.

Other equipment should be viable in lieu of the Cisco equipment and can be investigated in a detailed engineering phase of the project.

Wireless Broadband

Wireless broadband Internet access uses many frequency bands. Wireless broadband modems offer similar performance to cable modems operating over wired cable television systems (CATV), but the business is easier to enter as the transmitters cover an entire city or region. The new IEEE 802.11g amendment extends the data rate of IEEE 802.11b WLANs to 54 Mbps from 11 Mbps.

This study does not address the wireless broadband business opportunity in depth. Grants Pass and now Cave Junction both currently have access to wireless broadband. (see Section 2, Broadband Services in the Josephine County Market). Appendix 6 includes additional information pertinent to a wireless broadband discussion.

Telecommunications Service Offerings

Telecommunications service offerings and demand seem to grow daily, limited only by what the mind is capable of imagining. Some of the mainstream offerings include:

Cable Television

- Digital
- Video on Demand
- HDTV

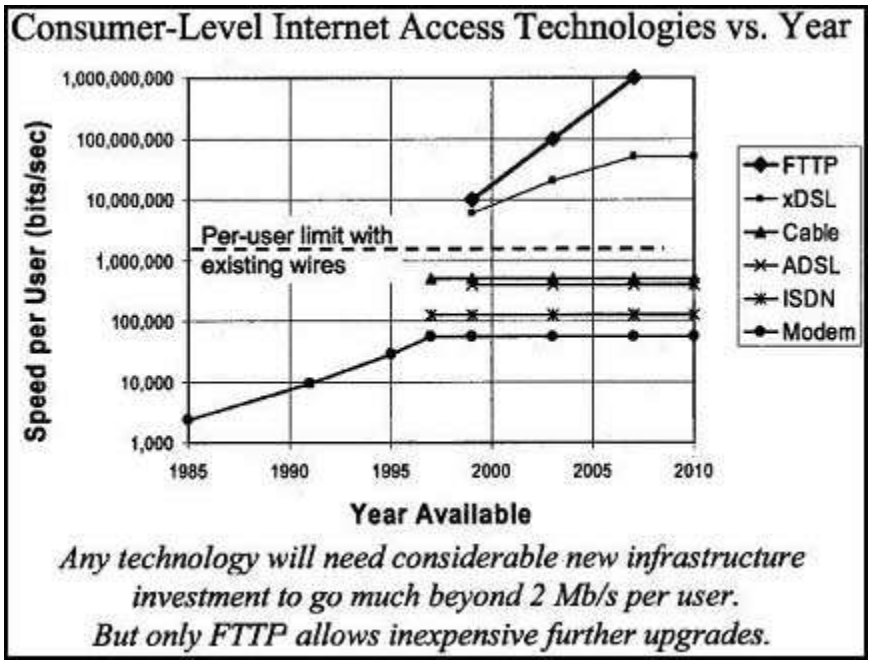
Voice
- Dial Tone
- Competitive Access
- VoIP

High Speed Internet
- Web services
- Entertainment/games
- Video applications (e.g., chat, meetings)

Utility Applications
- Remote Meter Reading
- SCADA (supervisory control and data acquisition)
- Load Management
- Traffic Light Control

Other Applications
- Home Security
- Telemedicine
- Video Arraignment
- Distance Learning
- Online government

New applications consistently require more and more bandwidth. To meet the needs of the immediate and distant future means that we have to address this reality or suffer the consequences of bottlenecks or the total inability to deliver some of the critical services required for both business and community needs. Failure to provide these capabilities will further decrease economic opportunities as well as quality of life considerations.



One thing is becoming abundantly clear…bandwidth is at a premium – "only too much is enough!"

The Market Opportunity

The market profile undertaken in this study was a first step to establishing whether or not a marketing opportunity exists and, if so, to gain a better understanding of the opportunity. Section 2 – The Broadband Market contains the results of several surveys.

There does appear to be a fiber route market opportunity, especially in the Grants Pass area. By no means is this a "slam dunk" as seemingly indicated by the low desire for such an entity by the

larger potential customers. This is not to say that the market is not developable but rather that this is a market with a lot of skepticism – it's a "show me" marketplace. Among the implications are the needs to start slow and to build a comfort level necessary to create sufficient trust relationships for changes to occur. A critical core of satisfied customers is what will propel this marketing opportunity.

This opportunity is best served using an open access network. It also looks promising for a wireless broadband infrastructure, one that would see residents and small to middle-sized businesses as customers. Wireless also has merit in this same segment and would appear to be a reasonable solution in the Illinois Valley area. Wireless could be an opportunity to serve areas not immediately in the vicinity of a fiber network. [Please note that there are already wireless broadband providers in several areas of Josephine County. The balance of this discussion will focus on the fiber opportunity and some adjustments to that approach that may act to improve its success.]

The primary Grants Pass opportunity is a fiber optic route that connects a primary backbone connection (e.g., NoaNet) to retail telecommunications service providers and/or government entities in the area. "Retail telecommunications service providers" may include the local telephone company, competitive telephone companies, cable television providers, Internet Service Providers (ISPs), wireless Internet Service Providers (WISPs) or other telecommunications firms that directly provide content or capacity to their customers. Government agencies may include federal, state, county, and city governments as well as Utility Districts, schools and universities. Note that it is assumed for purposes of this study that this network will provide wholesale telecommunications service to the retail providers mentioned above. [Note: a secondary backbone connection (e.g., Qwest) could make sense to ensure redundancy.]

The wireless opportunity looks most promising to meet needs of many small to mid-sized businesses, schools, and a number of aspects of government needs.

Marketing to this target market (fiber) depends on engineering a route that is both cost-efficient, technically sound and in proximity to potential major customers - a "fiber-to-main-street" approach that targets business customers and government agencies. The geographic area initially will be somewhat focused targeting fewer customers but those with greater revenue potential. Taking a step-by-step approach will allow the opportunity to prove operational processes and build confidence among prospective customers.

Sales Strategy and Projections

Josephine County historically has lagged in deployment of advanced telecommunications access (i.e., broadband). This has seen a dramatic turnaround over the past year or so. Charter has completed a significant investment throughout the area and now offers up to Gigabit Ethernet services for businesses. Residents are able to purchase three levels of broadband access anywhere that they can receive the digital services of Charter.

Qwest has deployed DSL throughout the city and surrounding area. The recent additions of an ATM switch in Grants Pass as well as the DSL installations, in large part due to the SB622 infrastructure improvements (one form of a public-private partnership), bode well for businesses, residents and communities. T-1's and DS-3's are available as well.

As a result of these improvements to the area's infrastructure profile, competition is keen. Neither Charter nor Qwest were forthcoming about the exact details of the take rates for their services (competitive reasons for non-disclosure cited). However, it's reasonable to assume that they are somewhere in the band of national averages - between 4-12%. Several studies show that once a customer chooses a broadband provider, it's very difficult to get them to change.

The marketing surveys indicate that there are a number of Grants Pass area businesses that are potential broadband customers (49% still on dial-up). Cable customers make up 9% of this

population while DSL is at 21%. Only 8% indicated they have T-1 lines, and so these are also potential customers. The Internet is considered Critical or Very Important to 76% of the group and Internet speed is Critical or Very Important to 75%. Some 43% indicate they are willing to pay more (than current dial-up rates). In this population 35% indicated they also work at home using the Internet, increasing the ability to expand customer possibilities. A target price of $35-40 per month would likely be a reasonable pricing band for the lower end of the pricing structure for smaller businesses. T-1 "equivalent" rates in the less than $400 range would be attractive. This is consistent with a number of studies from across the U.S. But, just as a reminder, this study recommends pursuing a wholesale market vs. a retail market. ISPs would have the last mile responsibility for the low-end of the pricing structure.

The rationale for an open access network is bolstered in the fact that 88% rate their current ISP as Excellent to Very Good. The opportunity to continue to do business within an established relationship is very attractive to customers and would encourage ISP's to purchase wholesale services from the fiber entity.

A successful sales strategy would likely be achieved through the following prioritization schema:

1. Government agencies - federal, state, county, and city governments, utility districts, schools and the community college.
2. ISPs and WISPs
3. Larger middle-mile business customers
4. Cable companies and telecommunications providers
5. Smaller to mid-sized businesses with high bandwidth requirements.

Please note again that this is first a wholesale model. Retail market needs would be service through ISPs and WISPs.

In this market there will be a need to demonstrate superior service. Competition on price will be keen, as the incumbent providers are known for predatory pricing in the face of competition from startups. Superior customer service will be critical to success.

Sales Force

Individuals with high technical expertise, including the ability to design, install and understand all details of operation of the network, must execute the sales function. The sales force must have a high level of competency in technical skills as well as a demonstrated competency in telecommunications theory and applications. These qualifications are necessary to build customer confidence from the first encounter. The qualified candidate(s) will also need to present a professional demeanor and ability to communicate.

Likely candidates for this role would be a computer or electrical engineer with strong customer-relations skills. Annual wages for this sales engineer role with benefits for this area would range from $50-60K.

Promotion and Advertising

In general the promotion of broadband already is extensive. Millions upon millions of dollars expended by major companies means that general education of the marketplace may not be required. The daily bombardment of the market place is well underway by PC manufacturers, ISPs, software companies, cable and the telecommunications providers. As the public increasingly accesses e-commerce, the "need for speed" increases as well.

In this marketplace (wholesale and larger customers) initially the best promotion will come from word of mouth, especially on the heels of superior service. Yet some promotion will be of valuable. A few suggestions follow:

1. A publicity campaign using press releases.
2. Networking at chamber of commerce events, economic development councils and functions, and community service clubs.
3. Use of a well-designed Web presence.
4. Calling on potential customers.
5. Encouraging "word of mouth" promotion through incentives for referral

Personnel, Equipment, and Facilities

The opportunity under discussion is essentially a startup. As such there will be a need to purchase, lease and otherwise acquire equipment and personnel to build, operate and maintain the fiber optic system. Other expenses will be rights of way fees and the establishment of a 24 x 7 customer service and dispatch center.

Valuable "hands-on" experience would be gained through having a core management and operations team in place during the engineering and initial startup phases of the project. This way they can participate and assist with the engineering and construction phases of the project as well as to build necessary relationships within the community. This team would consist of a director/manager ($70-80K with benefits), the previously discussed sales engineer, a network manager ($40-50K with benefits), and office manager ($35-45K with benefits).

At least one bucket truck would be required ($30K) as well as a light utility vehicle (pick up - $15K) for the sales engineer and other shared uses. "Previously owned" low mileage vehicles should be considered. Several lots in the Rogue Valley had vehicles that would meet the needs of the entity.

Test equipment and other construction related tools would be necessary. The detailed engineering phase will identify these needs in greater detail.

A location for the placement of the electronics to support the POP needs to be addressed. Space required for this equipment could be the size of a large closet. The co-location space in the POP will include primary AC power, HVAC, and security. Consideration of backup power needs further evaluation in light of the overall risk exposure for customer's needs. AC power generators (auto – start on failure/shut-off on recovery) or primary DC power (batteries and chargers) would be detailed in the engineering phase.

Space would be available in each wholesale customer's building to install electronics and other support equipment. Once again, the space requirements are minimal with power, HVAC, and security to be considered.

Tower and pole attachments, or other such related agreements, will need to be obtained to allow the builds throughout the incorporated and unincorporated areas of the county.

24 x 7 dispatch could be kept to a minimum through the use of monitoring equipment with alarm triggers (e.g., automatically call a pager on failure).

Construction

Prior to a detailed engineering design estimates for a fiber build are likely to be less than precise but serve to give an idea of investment required. The GP initial route of 13.4 miles is estimated on the range of $357,500 to $500, 000. The expanded route of 46.9 miles is estimated at $1.2 MM to $1.5 MM. A detailed engineering of the final routes will determine the exact costs. Estimates were calculated using $25,000 per mile, which may be on the high side.

Financial Information

Among the purposes for this study was to determine if there was sufficient market opportunity to pursue building network infrastructure in Josephine County and, if so, what might that financial model look like. This portion of the study contains some very broad financial modeling information. While considerable work remains to reach a final conclusion, evidence exists to support the idea that there is a "middle-mile" fiber plant opportunity. Keep in mind that additional detailed work (e.g., detailed engineering and market validation) would need to be accomplished prior to seeking financing. Due to the relatively low interest and response from larger potential customers, the projected revenues are in need of substantial additional validation to bring them closer to "real" market potential. As a consequence the information in the section should be used as a starting point for a further more detailed and refined analysis. This appears to be a "me too" market opportunity that will require building trust and confidence in a provider's ability to provide quality services at a competitive price point. Once a solid core of clients is achieved and a positive track record has been established, others will join in. This means a slow start and no miss-steps.

Also, keep in mind that at times it seems there are as many ways to build a network as there are engineers. What follows is a very simple, perhaps simplistic, view of the financials for the collapsed ring route discussed in the Section 5 topic "Route Selection (fiber)."

Startup Capital Requirements

Model 1 – NoaNet backbone connection

STARTUP INVESTMENT	
Motor vehicles, Tools, and test equipment	
Bucket truck	30,000
Pickup	15,000
Tools	22,000
Test equipment	15,000
Equipment subtotal:	**82,000**
Fixed equipment	
Fiber cable (13.4 miles)	333,500
SONET/IP equipment (2)	200,000
Batteries and chargers (2)	20,000
Fixed equipment subtotal:	**553,500**
Other costs	
Legal	20,000
Office equipment	10,000
Software	2,000
Engineering	60,000
Loan fees	7,000
Payment to NoaNet	246,400
Base Payment to Noanet	1,232,000
Total other costs:	**1,478,400**
TOTAL STARTUP INVESTMENT:	**2,113,900**

Model 2 – alternative backbone connection

STARTUP INVESTMENT	
Motor vehicles, Tools, and test equipment	
Bucket truck	30,000
Pickup	15,000
Tools	22,000
Test equipment	15,000
Equipment subtotal:	**82,000**
Fixed equipment	
Fiber cable (13.4 miles)	333,500
SONET/IP equipment (2)	200,000
Batteries and chargers (2)	20,000
Fixed equipment subtotal:	**553,500**
Other costs	
Legal	20,000
Office equipment	10,000
Software	2,000
Engineering	60,000
Loan fees	5,000
Initial connection to backbone (DS-3 x5)	50,000
Total other costs:	**147,000**
TOTAL STARTUP INVESTMENT:	**782,500**

Notes:

- Bucket truck and pickup costs were noted at two Medford car lots in the month of June 2003.
- Tools include a fusion splicer w/cleaving tool, portable generator, trailer, lights, and pop-up splicing tent.
- Test equipment is an optical power meter and optical time domain reflectometer.
- Office equipment PC's, server, desks, chairs, lights, cabinets, &c.
- Software consists of office productivity tools as well as for accounting.
- Engineering is an estimate of costs for preparing a detailed engineering technical design and all associated supporting documentation.

Profit and Loss

Model 1 – NoaNet backbone connection

	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
OPERATING REVENUES					
Interest earnings	0	61,000	41,067	20,533	0
NoaNet repayment	0	410,667	410,667	410,667	0
Billings	400,000	800,000	1,200,000	1,600,000	1,600,000
TOTAL REVENUES:	**400,000**	**1,271,667**	**1,651,734**	**2,031,200**	**1,600,000**
OPERATING EXPENSES					
Personnel					
Director/Manager	70,000	73,500	77,175	81,034	85,085
Sales Engineer	50,000	52,500	55,125	57,881	60,775
Network Manager	40,000	42,000	44,100	46,305	48,620
Office Manager	30,000	31,500	33,075	34,729	36,465
Personnel subtotal:	**190,000**	**199,500**	**209,475**	**219,949**	**230,946**
Facilities					
Office and network equipment space (rent/lease)	35,000	36,750	38,588	40,517	42,543
Pole fees - 536 (40/mile) x $13	6,968	6,968	6,968	6,968	6,968
Facilities subtotal:	**41,968**	**43,718**	**45,556**	**47,485**	**49,511**
Material, services and supplies					
Electricity	2,500	2,500	2,500	2,500	2,500
Vehicle expenses	5,000	5,000	5,000	5,000	5,000
Insurance, licenses	4,000	4,000	4,000	4,000	4,000
Legal	0	3,000	3,000	3,000	3,000
Training	10,000	2,000	2,000	2,000	2,000
Consumable supplies, utilities	5,000	5,000	5,000	5,000	5,000
Consultants	25,000	5,000	5,000	5,000	5,000
Material, Services and supplies subtotal:	**51,500**	**26,500**	**26,500**	**26,500**	**26,500**
Depreciation ($635,500 base)	**127,100**	**127,100**	**127,100**	**127,100**	**127,100**
Amortization ($2.4 MM)	**480,000**	**480,000**	**480,000**	**480,000**	**480,000**
TOTAL OPERATING EXPENSES:	**890,568**	**876,818**	**888,631**	**901,034**	**914,057**
NONOPERATING EXPENSES					
Interest expense (5% on remaining balance)	120,000	96,000	72,000	48,000	24,000
Amortization on loan fees	1,400	1,400	1,400	1,400	1,400
TOTAL NONOPERATING EXPENSES:	**121,400**	**97,400**	**73,400**	**49,400**	**25,400**
TOTAL EXPENSES:	**1,011,968**	**974,218**	**962,031**	**950,434**	**939,457**
NET INCOME (LOSS) BEFORE TAXES	**(611,968)**	**297,449**	**689,704**	**1,080,766**	**660,543**
Taxes (assumes a not for profit organization)	0	0	0	0	0
NET INCOME (LOSS):	**(611,968)**	**297,449**	**689,704**	**1,080,766**	**660,543**

Model 2 – alternative backbone connection

	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
OPERATING REVENUES					
Billings	400,000	800,000	1,200,000	1,600,000	1,600,000
TOTAL REVENUES:	**400,000**	**800,000**	**1,200,000**	**1,600,000**	**1,600,000**
OPERATING EXPENSES					
Personnel					
Director/Manager	70,000	73,500	77,175	81,034	85,085
Sales Engineer	50,000	52,500	55,125	57,881	60,775
Network Manager	40,000	42,000	44,100	46,305	48,620
Office Manager	30,000	31,500	33,075	34,729	36,465
Personnel subtotal:	**190,000**	**199,500**	**209,475**	**219,949**	**230,946**
Facilities					
Office and equipment space (rent/lease)	35,000	36,750	38,588	40,517	42,543
Pole fees - 536 (40/mile) x $13	6,968	6,968	6,968	6,968	6,968
Facilities subtotal:	**41,968**	**43,718**	**45,556**	**47,485**	**49,511**
Material, services and supplies					
Electricity	2,500	2,500	2,500	2,500	2,500
Backbone connection	50,000	100,000	150,000	200,000	200,000
Vehicle expenses	5,000	5,000	5,000	5,000	5,000
Insurance, licenses	4,000	4,000	4,000	4,000	4,000
Legal	0	3,000	3,000	3,000	3,000
Training	10,000	2,000	2,000	2,000	2,000
Consumable supplies, utilities	5,000	5,000	5,000	5,000	5,000
Consultants	25,000	5,000	5,000	5,000	5,000
Material, Services and supplies subtotal:	**101,500**	**126,500**	**176,500**	**226,500**	**226,500**
Depreciation ($635,500 base)	**127,100**	**127,100**	**127,100**	**127,100**	**127,100**
Amortization ($1 MM)	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**
TOTAL OPERATING EXPENSES:	**460,568**	**496,818**	**558,631**	**621,034**	**634,057**
NONOPERATING EXPENSES					
Annual Interest expense	50,000	40,000	30,000	20,000	1,000
Amortization on loan fees	1,000	1,000	1,000	1,000	1,000
TOTAL NONOPERATING EXPENSES:	**51,000**	**41,000**	**31,000**	**21,000**	**2,000**
TOTAL EXPENSES:	**511,568**	**537,818**	**589,631**	**642,034**	**636,057**
NET INCOME (LOSS) BEFORE TAXES	**(111,568)**	**262,182**	**610,370**	**957,966**	**963,943**
Taxes (assumes a not for profit organization)	0	0	0	0	0
NET INCOME (LOSS):	**(111,568)**	**262,182**	**610,370**	**957,966**	**963,943**

Notes:

- All amortization and depreciation schedules are straight-line.
- Calculations for billings used $400 per T-1 equivalent. DS-3 capacity calculations used for connections in Model 2.

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
T-1 units					
	100	200	300	400	400
DS-3 units					
	4.7619048	9.52381	14.28571	19.04762	19.04762

Risk Assessment

Technology Issues and Risk Factors

Infrastructure, products and services all involve rapidly changing technologies. Among the technology related issues and risks to be faced include:

- DV technology strategies not performing up to expectations.
- Integration of technologies being more difficult than expected.
- Lack of alternative back-up technologies to choose from.
- Competing technology offerings available at a lower price point.
- Higher-capability technologies becoming cost-competitive sooner than expected.

Response to these risks include:

- The proposed system uses digital technologies throughout, which is increasingly available and demanded by consumers and businesses alike.
- Maintain technological independence by using widely available standards and by not locking in any one vendor.
- Develop contingency plans and back-up strategies in case preferred technologies so not perform or integrate as expected.
- Form strategic alliances with companies offering proven advanced technologies and by avoiding becoming a hardware/software developer.
- Use conservative estimates for the technical, price performance, and lifetimes of systems.

Business Issues and Risks

General market

- Slower than expected pace of consumer and business adoption of new products and services.
- Buyer confusion due to the array of choices and conflicting messages.
- Growth in the community's general need for high-speed data services.
- Difficulties inherent in selling services.

Risks related to products and services

- Enough product and services to sell to cover infrastructure costs.
- Designing products and services that match customer's high-value needs.
- Being able to meet customer's price points.
- Availability of products and services on schedule.
- Delivering products at predicted prices and costs.

Risks related to sales

- Level of competition.
- Being a new, unknown, and unproven provider of products and services.
- Willingness of customers to pay for products and services offered.

Risks related to competition

- Competition from multiple directions, known and unknown.
- Price undercutting by a "deep-pocket" competitor.
- The need for marketing muscle and staying power.
- The need to move quickly and aggressively.

Suggested strategies to respond to the realities of this challenging marketplace

- Use realistic and conservative sales forecasts acknowledging the slow market penetration that can be anticipated.
- Target early adopters who are ready for change.
- Conduct continuous market research.
- Be honest about product and service availability schedules.

- Share the risk with other business partners.

SECTION 6 - RECOMMENDATIONS AND NEXT STEPS

Build Demand Through Focused Education Programs

It is in Josephine County's economic, security and societal interest to have robust broadband connections to all residents who want them. Equally important is to have a population that understands and appreciates the value of using these resources. Otherwise, "what good is it?" Building a business/Internet-savvy population is an achievable goal with the public and private sectors working together.

In the 21st century, access to and intelligent use of information technologies will be necessary for rural communities to attract and retain businesses and, therefore, remain economically viable. The low population density of Josephine County makes it difficult for rural areas to support expensive technology investments such as is required for broadband. History shows rural adoption timelines significantly lag those in urban areas, which slows development of the demand economically necessary to support infrastructure construction.

Today we see many of the advanced services (i.e., broadband) now available in the more densely populated areas of Josephine County, a level of services not fully anticipated even a year ago. However, in the face of this growing availability of services (supply side), take rates of those services remains low. Whether it be that customers do not see the value of the services at the current rates or that they are unsure of what to do with the services, the take rates remain low (demand side).

The findings suggest development efforts should focus on encouraging locally owned businesses to adopt information technologies as a means of maximizing local diffusion and increasing demand levels. Old knowledge tells us that strategic demand for any innovation must exist before it will be deployed successfully. Strategic demand, not conditions of supply, is the major determinant of both technological change and economic growth. In other words, you can build it and they still may not come, unless economic conditions are right. Demand is critical to successful deployment. Demand attracts investment capital!

Ideas for building demand include:

- Collaborate on the development of Community Development Resource Centers in Grants Pass, Cave Junction and other locations.
- Build on existing alliances and expertise of Rogue Community College, the Job Council, RASCALS, Community Resource Teams, the Southern Oregon Telecommunications and Technology Council (SOTTC) and other sources of community participation.

Establish a Telecommunications Community Action Committee

To date the issues surrounding advanced telecommunications services have not seen a sustained local ownership of the process. Successful Digital Villages ("digital communities" or by whatever name you choose to call them) depend on an on-going participation between all stakeholders. Form an acknowledged and representative Telecommunications Community Action Committee with a focus on using telecommunications and other technologies to serve desired community outcomes.

This group could then serve as a focal point for coordinating planning activities, serving as a conduit to elected officials and helping to identify sound public policy. Telecommunications providers MUST participate in this activity.

Update the Telecommunications and Technology Strategic Plan

A first action for the CAC could be the preparation of an updated Telecommunications and Technology Strategic Plan to provide a roadmap to desired community outcomes. In addition to updating the Plan this group could serve as a sounding board for community input, work closely with existing providers as well as to recommend community policy and action items. Here is an opportunity for elected officials to tap into the knowledge and willingness of county residents to participate as volunteers in this process.

Telecommunications infrastructure is now a critical component of community infrastructure with important implications for economic development and community quality of life. As such it needs to be incorporated into strategic planning efforts for communities. The Plan was last reviewed in January 2001. Much has changed. This would be an excellent first step.

The Plan would serve to coordinate activities on both the demand and supply sides of the equation.

Design, Build, and Share An Infrastructure for the Future

Findings of this study strongly suggest that there is an opportunity to build infrastructure for the future, provide competitive offerings and to increase the economic and quality of life factors residents seek.

This means becoming familiar with a new way of doing business some refer to as "co-optition" – cooperative competition. There will be resistance to this new way of doing things. Change seldom occurs in a vacuum. The good news is that where this approach has taken hold, communities and businesses have all benefited.

Rogue Valley Regional Telecommunications Infrastructure Opportunity

Josephine and Jackson County demonstrate daily that this is one economic region. Examples can be found in SOREDI (www.soredi.org), Rogue Community College (www.rogue.cc.or.us/) and Asante (www.asante,org). For this reason it's not too hard to make the leap from a Grants Pass/Josephine County all fiber network infrastructure to a Rogue Valley network. By no means a simple task but well worth evaluating further with a view to the future prospects for economic development and quality of life factors for the region. This report has not dealt with the topic, but it's one whose merits deserve further evaluation.

APPENDIX 1 - JOSEPHINE COUNTY TELECOMMUNICATIONS STRATEGIC PLAN

Vision Statement

Josephine County is a place thriving with business and industrial activity of a very diverse nature. Cottage industries, secondary wood products, entrepreneurial activities, business expansions and tourism drive this diverse economy. The business climate of Josephine County and the incorporated cities and the attitude of business leaders in our county are such that recruitment becomes an automatic process. Our children, after whatever level of education they achieve, can come home and find good paying jobs. Our unemployment levels equal those of the State and County wages are equivalent to the State average wage. Our prosperous citizenry supports needed governmental programs, civic activities and charitable works.

The communities of the Rogue Valley are working together to take advantage of the opportunities created by the new, information age infrastructure. Our businesses are competing in the new economy, our workforce is ready to use the new tools and build better ones, our public services are convenient and responsive, and everyone has access regardless of location or income. Our telecommunications services providers are upgrading their facilities and services. They all have high-speed connections that are always on, and able to support home businesses, telecommuting, distance learning, electronic commerce, telemedicine, and new forms of entertainment.

Strategic Plan Goals

Residents, institutions, organizations and businesses of Josephine County will benefit from a comprehensive and insightful Technology and Telecommunications Plan (T&TP). Implementation of an infrastructure that is consistent with and builds upon regional and statewide technology and telecommunication plans will provide maximum benefit. The telecommunications and technology infrastructure will:

- Be accessible, reliable and affordable for all residents of the county, regardless of location.
- Have standard communications capabilities, use scalable solutions to accommodate growth in demand; and be adaptable to new applications and opportunities.
- Provide access to quality services at a reasonable cost by creating partnerships and aggregating demand to reduce operating costs to the benefit of the Josephine County users.
- Provide high-speed access to technology and information so that employees can be as efficient as possible, businesses can be competitive in the world of electronic commerce, and residents can have easy access to information and services.
- Provide low cost training, distance learning and in-service options and common technical support to reduce costs to Josephine County users.

APPENDIX 2 – PROPOSED COMMUNITY ADVISORY COMMITTEE

Note: These are folks that have demonstrated interest in the outcome of broadband distribution and usage in Josephine County. It is by no means an exhaustive list. Suggested additions include telco and cable providers. The CAC needs participation for all critical sectors of the area. Use of resources from out of the area is encouraged. Include them as ex officio members.

Name	Organization	eMail
Josephine County		
Doug Beck	Chair, Regional Investment Board	dbeck@valleysoftisp.net
Tom Bradbeer	Dean, Rogue Community College	tbradbeer@roguecc.edu
Dan Gomez	Sunny Wolf Community Resource Team	gomez@grantspass.com
Al Koski	Josephine County Economic Development	akoski@co.josephine.or.us
Kin R. Lane	Original Web Solutions	kin@originalwebsolutions.com
Bob Loesor	ISP	bob@valleysoft.net
Charlie Mitchell	Grants Pass Economic Development	cmitchell@ci.grants-pass.or.us
Mary O'Kief	RCC	mokief@roguecc.edu
Ron Phillips	Illinois Valley CRT – Executive Director	ronphillips@ivcrt.org
Jim Riddle	Josephine County Commissioner	jwriddle@aws-inc.com
Dave Toler	Illinois Valley School District	tolerfloyd@cavenet.com
Tyler Wilhelm	Josephine County Information Systems	TWILHELM@co.josephine.or.us
Regional		
John Irwin	SOTTC – JoCo Digital Village project manager	jirwin@mind.net
Sandy Olson	Asante	solson@asante.org
Richard Ryan	Hunter Communications	rryan@coreds.net
Kevin Talbert	SOU	talbert@sou.edu
Jack Ware	USDA/RUS	jack.ware@or.usda.gov
Ex-officio **		
Guy Alvis	NoaNet	galvis@noanetoregon.net
Link Shadley	NoaNet	lshadley@noanetoregon.net
Chris Tamarin	OECDD	christopher.Tamarin@state.or.us

** Ex officio members (i.e., participate in discussion and info exchange only)

APPENDIX 3 - TYPES OF PUBLIC-PRIVATE PARTNERSHIPS

Build/Operate/Transfer or Build/Transfer/Operate

The private partner builds a facility to the specifications agreed to by the public agency, operates the facility for a specified time period under a contract or franchise agreement with the agency, and then transfers the facility to the agency at the end of the specified period of time. In most cases, the private partner will also provide some, or all, of the financing for the facility, so the length of the contract or franchise must be sufficient to enable the private partner to realize a reasonable return on its investment through user charges. At the end of the franchise period, the public partner can assume operating responsibility for the facility, contract the operations to the original franchise holder, or award a new contract or franchise to a new private partner. The BTO model is similar to the BOT model except that the transfer to the public owner takes place at the time that construction is completed, rather than at the end of the franchise period.

Build-Own-Operate (BOO)

The contractor constructs and operates a facility without transferring ownership to the public sector. Legal title to the facility remains in the private sector, and there is no obligation for the public sector to purchase the facility or take title. A BOO transaction may qualify for tax-exempt status as a service contract if all Internal Revenue Code requirements are satisfied.

Buy-Build-Operate (BBO)

A BBO is a form of asset sale that includes a rehabilitation or expansion of an existing facility. The government sells the asset to the private sector entity, which then makes the improvements necessary to operate the facility in a profitable manner.

Contract Services - Operations and Maintenance

A public partner (federal, state, or local government agency or authority) contracts with a private partner to provide and/or maintain a specific service. Under the private operation and maintenance option, the public partner retains ownership and overall management of the public facility or system.

Contract Services – Ops., Maint., & Management

A public partner (federal, state, or local government agency or authority) contracts with a private partner to operate, maintain, and manage a facility or system providing a service. Under this contract option, the public partner retains ownership of the public facility or system, but the private party may invest its own capital in the facility or system. Any private investment is carefully calculated in relation to its contributions to operational efficiencies and savings over the term of the contract. Generally, the longer the contract term, the greater the opportunity for increased private investment because there is more time available in which to recoup any investment and earn a reasonable return. Many local governments use this contractual partnership to provide wastewater treatment services.

Design-Build (DB)

A DB is when the private partner provides both design and construction of a project to the public agency. This type of partnership can reduce time, save money, provide stronger guarantees and allocate additional project risk to the private sector. It also reduces conflict by having a single entity responsible to the public owner for the design and construction. The public sector partner owns the assets and has the responsibility for the operation and maintenance.

Design-Build-Maintain (DBM)

A DBM is similar to a DB except the maintenance of the facility for some period of time becomes the responsibility of the private sector partner. The benefits are similar to the DB with maintenance risk being allocated to the private sector partner and the guarantee expanded to include maintenance. The public sector partner owns and operates the assets.

Design-Build-Operate (DBO)
A single contract is awarded for the design, construction, and operation of a capital improvement. Title to the facility remains with the public sector unless the project is a design / build / operate / transfer or design / build /own / operate project. The DBO method of contracting is contrary to the separated and sequential approach ordinarily used in the United States by both the public and private sectors. This method involves one contract for design with an architect or engineer, followed by a different contract with a builder for project construction, followed by the owner's taking over the project and operating it. A simple design-build approach creates a single point of responsibility for design and construction and can speed project completion by facilitating the overlap of the design and construction phases of the project. On a public project, the operations phase is normally handled by the public sector under a separate operations and maintenance agreement. Combining all three passes into a DBO approach maintains the continuity of private sector involvement and can facilitate private-sector financing of public projects supported by user fees generated during the operations phase.

Developer Finance
The private party finances the construction or expansion of a public facility in exchange for the right to build residential housing, commercial stores, and/or industrial facilities at the site. The private developer contributes capital and may operate the facility under the oversight of the government. The developer gains the right to use the facility and may receive future income from user fees. While developers may in rare cases build a facility, more typically they are charged a fee or required to purchase capacity in an existing facility. This payment is used to expand or upgrade the facility. Developer financing arrangements are often called capacity credits, impact fees, or extractions. Developer financing may be voluntary or involuntary depending on the specific local circumstances.

Enhanced Use Leasing (EUL)
An EUL is an asset management program in the Department of Veterans Affairs (VA) that can include a variety of different leasing arrangements (e.g. lease/develop/operate, build/develop/operate). EULs enable the VA to long-term lease VA-controlled property to the private sector or other public entities for non-VA uses in return for receiving fair consideration (monetary or in-kind) that enhances VA's mission or programs

Lease/Develop/Operate or Build/Develop/Operate
Under these partnerships arrangements, the private party leases or buys an existing facility from a public agency; invests its own capital to renovate, modernize, and/or expand the facility; and then operates it under a contract with the public agency. A number of different types of municipal transit facilities have been leased and developed under LDO and BDO arrangements.

Lease/Purchase
A lease/purchase is an installment-purchase contract. Under this model, the private sector finances and builds a new facility, which it then leases to a public agency. The public agency makes scheduled lease payments to the private party. The public agency accrues equity in the facility with each payment. At the end of the lease term, the public agency owns the facility or purchases it at the cost of any remaining unpaid balance in the lease. Under this arrangement, the facility may be operated by either the public agency or the private developer during the term of the lease. Lease/purchase arrangements have been used by the General Services Administration for building federal office buildings and by a number of states to build prisons and other correctional facilities.

Sale/Leaseback
This is a financial arrangement in which the owner of a facility sells it to another entity, and subsequently leases it back from the new owner. Both public and private entities may enter into a sale/leaseback arrangements for a variety of reasons. An innovative application of the sale/leaseback technique is the sale of a public facility to a public or private holding company for the purposes of limiting governmental liability under certain statues. Under this arrangement, the government that sold the facility leases it back and continues to operate it.

Tax-Exempt Lease

A public partner finances capital assets or facilities by borrowing funds from a private investor or financial institution. The private partner generally acquires title to the asset, but then transfers it to the public partner either at the beginning or end of the lease term. The portion of the lease payment used to pay interest on the capital investment is tax exempt under state and federal laws. Tax-exempt leases have been used to finance a wide variety of capital assets, ranging from computers to telecommunication systems and municipal vehicle fleets.

Turnkey

A public agency contracts with a private investor/vendor to design and build a complete facility in accordance with specified performance standards and criteria agreed to between the agency and the vendor. The private developer commits to build the facility for a fixed price and absorbs the construction risk of meeting that price commitment. Generally, in a turnkey transaction, the private partners use fast-track construction techniques (such as design-build) and are not bound by traditional public sector procurement regulations. This combination often enables the private partner to complete the facility in significantly less time and for less cost than could be accomplished under traditional construction techniques. In a turnkey transaction, financing and ownership of the facility can rest with either the public or private partner. For example, the public agency might provide the financing, with the attendant costs and risks. Alternatively, the private party might provide the financing capital, generally in exchange for a long-term contract to operate the facility.

APPENDIX 4 - TERMS RELATED TO PUBLIC-PRIVATE PARTNERSHIPS

Anchor Tenant
An anchor tenant is the major tenant that attracts or generates traffic within a commercial operation. Anchor tenants are strategically placed to maximize business for all tenants. The type of anchor tenant depends on the type of commercial activity.

Asset Sale
An asset sale is the transfer of ownership of government assets to the private sector. Usually legislation or an Executive Order defines the transfer price distribution and recoupment priorities. In general, the government has no role in the financial support, management, or oversight of the asset after it is sold. However, if the asset is sold to a company in an industry with monopolistic characteristics, the government may regulate certain aspects of the business, such as utility rates.

Capital Lease
A capital lease is a lease that must be reflected on a company's balance sheet as an asset and corresponding liability. Generally, this applies to leases where the lessee acquires essentially all of the economic benefits and risks of the leased property.

Cash Flow
Cash flow is cash receipts minus cash disbursements from a given operation or asset for a given period. A cash flow statement shows all sources and uses of cash reflected in the balance sheet cash account from one period to the next.

Concession Benefits
Concession benefits are rights to receive revenues or other benefits for a fixed period of time.

Cooperative Agreements
A cooperative agreement as set forth in 31 USC 6305 is the legal instrument an executive agency uses to reflect a relationship between the U.S. government and a state, a local government, or other recipient when (1) the principal purpose of the relationship is to transfer a thing of value to the state, local government, or other recipient to carry out a public purpose of support or stimulation authorized by U.S. law, and (2) substantial involvement is expected between the executive agency and the state, local government, or the recipient in carrying out the activity contemplated in the agreement.

Equity
Equity is the difference between fair market value of the property and the amount still owed on its mortgage.

Fee Simple
A fee simple is an absolute and unqualified estate providing the owner with all incidence of ownership, including the unconditional power of disposition.

Franchising
Under the franchising of external services, the government grants a concession or privilege to a private-sector entity to conduct business in a particular market or geographical area--for example, operating concession stands, hotels, and other services provided in certain national parks. The government may regulate the service level or price, but users of the service pay the provider directly.

Ground Lease
A ground lease is a lease for the use and occupancy of land only, usually for a long period of time. It is also called a land lease.

Lease
A lease is a written agreement between the property owner and a tenant that stipulates the conditions under which the tenant may possess the real estate for a specified period of time and amount of rent.

Leasehold Estate
A leasehold estate is an estate in real property held by a lessee/tenant under a lease.

Leveraged Leasing
In leveraged leasing arrangements, the owner of a capital facility obtains the tax benefits of ownership of an asset by arranging debt financing and leasing the facility to a party who pays rent from revenues generated by the facility.

Operating Lease
An operating lease is a type of lease, normally involving equipment, whereby the contract is written for considerably less than the life of the equipment and the lessor handles all maintenance and servicing. Also called service leases, operating leases are the opposite of capital leases, whereby the lessee acquires essentially all the economic benefits and risks of ownership.

Partnership
A partnership is a legal relationship existing between two entities contractually associated as joint principals in a business.

Public-Private Partnership
Under a public-private partnership, sometimes referred to as a public-private venture, a contractual arrangement is formed between public and private sector partners. These arrangements typically involve a government agency contracting with a private partner to renovate, construct, operate, maintain, and/or manage a facility or system, in whole or in part, that provides a public service. Under these arrangements, the agency may retain ownership of the public facility or system, but the private party generally invests its own capital to design and develop the properties. Typically, each partner shares in income resulting from the partnership. Such a venture, although a contractual arrangement, differs from typical service contracting in that the private-sector partner usually makes a substantial cash, at-risk, equity investment in the project, and the public sector gains access to new revenue or service delivery capacity without having to pay the private-sector partner.

Public Purpose Debt
Public purpose debt is debt used to finance a project intended to be of value to the general public. Such debt can include ordinary government securities, such as general obligation bonds or revenue bonds, as well as qualified private activity bonds.

Request for Proposals (RFP)
An RFP is an announcement, often by the government agency, of a willingness to consider proposals for the performance of a specified project or program component. A request for proposals is often issued when proposals for a specific research project are being sought.

Request for Qualifications (RFQ)
An RFQ is a procurement tool routinely used by state and local governments and the private sector to select partners in major systems acquisitions, mainly those involving real estate development transactions. This approach differs from the traditional request for proposals approach in that it places greater emphasis on the actual qualifications of the potential contractor--his or her track record--rather than how well the potential contractor responds to detailed project specifications and requirements.

Revenue Bonds
Revenue bonds are bonds (instruments and indebtedness) issued by the public sector to finance a facility or equipment purchase, which, unlike general obligation bonds, are not backed by the full

faith and credit of the government. Instead, their revenues are generated from the facility or equipment that they finance. Because they are state or local government bonds, their interest earnings are tax-exempt under the Internal Revenue Code.

Revolving Funds

Revolving funds are accounts authorized to be credited with collections that are earmarked to finance a continuing cycle of business-type operations without fiscal year limitation. For intragovernmental revolving funds, collections primarily come from other government agencies and accounts. A revolving fund can be used to finance an initial revenue-producing infrastructure project, and as revenues are generated by the completed facility and returned to replenish the fund, they can be used to finance subsequent rounds of project development. Revolving funds can help agencies accumulate the resources needed to make capital acquisitions over time, but should only be established when agencies have a record of sound financial management and when fund purchases are small and routine enough to warrant reduced scrutiny by Congress and OMB.

Risk Unbundling

Risk unbundling is a means of facilitating the development of public-private partnerships for the development of capital improvement projects. It calls for the segregation of private and public risks, with the private sector preferring to assume those risks that are of a commercial nature and can be appraised and controlled, leaving the residual risks to governmental entities.

Sublease

A sublease is an arrangement whereby a lessee leases the property to a different end user while the lessor maintains ownership. Under such an agreement, the lessee retains all of its obligations under the lease.

APPENDIX 5 - EXAMPLES OF PUBLIC-PRIVATE PARTNERSHIPS

Public-private partnerships can take a variety of forms as illustrated by these few following examples.

Example 1 – Minnesota DOT and a private developer

For many parts of rural Minnesota, having the kind of fiber-optic communication capabilities that would deliver state-of-the-art service to businesses, schools and public agencies would be nothing more than a dream under most circumstances, because most entities would not invest the resources to build a communications infrastructure to serve so few homes and facilities.

A public-private partnership, however, made Minnesota a full participating partner in 21st century telecommunications. In a landmark agreement between the state's Department of Transportation and a private developer, the developer was given one-time access to Minnesota's interstate highway system in order to build and maintain a $125 million fiber-optic backbone along 2,000 miles of Minnesota roadway. In exchange, state agencies are given free use of the network.

In this way the state was able to leverage its highly desirable transportation routes in exchange for the development of fiber optic networks on less desirable, rural routes. As a result of this partnership, 80 percent of Minnesota citizens have better telecommunications services at lower costs.

Example 2 - Colorado and Qwest

The Multiuse Network (MNT) is a network built by a public-private partnership between the State of Colorado and Qwest Communications. In this partnership, the State plays the role of anchor tenant for the network and Qwest has the role of building and operating a new, statewide, fiber optic network.

The MNT is really a network inside a network. Qwest calls the overall new network it has built throughout the state the Colorado High Speed Digital Network (CHSDN). A subset of the network is dedicated for use by the State. That portion is called the Multi-Use Network (MNT).

Example 3 - New Mexico and Qwest

Connect New Mexico (CNM) is an association of representatives from the telecommunications, broadcast, computer and Internet industries working together with a shared goal of leveraging New Mexico resources for information and network technology development.

Under the contract, Qwest will deliver a centralized state-of-the-art backbone infrastructure allowing the transfer of voice, video and data services to MAGnet, which will reach state-government agencies and the citizens they serve in 24 rural and urban communities throughout New Mexico. MAGnet was designed to allow the State of New Mexico to consolidate all public-sector communications requirements from multiple networks into a single network. MAGnet will provide broadband capacity to the state, and will enable applications such as distance-learning and telemedicine applications, while reducing administrative and maintenance costs to taxpayers.

"This far-reaching network, while initially designed to benefit the public sector, will ultimately open the doors for economic development throughout the state," said Bob Stafford, chief information officer for the State of New Mexico. "MAGnet initially will enable state agencies, K-12, higher education institutions, judicial branches of government, and local and county government agencies to offer their services and applications to the general public in a more cost-effective and expedient manner. Because the State of New Mexico and its agencies have established the 'anchor tenant' that provides the business case for the deployment of this high-speed infrastructure, new businesses thinking about moving to New Mexico in the future, will be assured of getting the leading-edge, high-speed network connections required in today's business environment – not only in metro areas but in communities across the state."

"Qwest's partnership with the State of New Mexico is an example of how the public and private sectors can work together to establish a unique platform to benefit state and local agencies while also stimulating economic growth throughout New Mexico," said Cliff Holtz, executive vice president for Qwest's business markets group. "Public sector entities across New Mexico will begin seeing wider availability of services not traditionally available – or at least very expensive – to acquire in the past."

Example 4 – Oregon and Qwest

Most urban areas have more than one fiber line connecting local phone systems to long-distance networks, but less-populated regions typically depend on one fiber route.

Laying fiber costs money, and many telecom carriers are reeling from fiber-overbuilding in urban areas. The largest investments in redundant loops came from the state's largest local phone company, Qwest Communications International. It spent $70 million on network upgrades, including five redundant fiber-optic loops throughout the state. In exchange for that improvement and investments in school technology, the state deregulated Qwest's profits.

"Absent that kind of win-win situation for the company and the state, it makes it very difficult to have a business case (that will) pencil out that says, 'This is a good use of capital dollars," said Judy Peppler, Qwest's president for Oregon. "You're going to have some idle capacity at all times. But on the other hand, you don't have these outages."

Qwest has completed construction of three of the fiber rings, and it will finish the other two by October. The backup networks have averted at least two outages in rural areas. "It is obviously very valuable, especially when you have businesses that rely on your network," Peppler said.

Irv Emmons, senior telecommunications engineer for the Oregon Public Utility Commission, said before Qwest built a backup network in Eastern Oregon, a farmer in Madras cut the area's main fiber cable a few times a year. "That used to isolate all of Eastern Oregon," Emmons said.

Example 5 - Medford City Schools and a private developer

By placing fiber to schools in the Medford area, Hunter now has created a 'self-healing' ring that we will use to deliver services to enterprise customers throughout the Medford area. Hunter plans on replicating this model throughout the region.

Working with the Medford School Districts desire to reduce costs and stabilize the cost for connectivity of their school facilities, Hunter Communications evaluated the annual budget for the District's existing T-1 lines. "We discovered that cost would continue to increase at an annual rate of 7 to 14 % and the available bandwidth would not meet the future requirements for on-line testing," stated Hunter Communications owner Richard Ryan (541.734-2800, rryan@coreds.net).

After engineering a connectivity solution between all sites, Hunter determined that an opportunity to work with the District within its current budget was not only possible, but also that reducing these costs was realistic. Hunter offered to lease two pair of 'dark' fiber in a continuous ring to all but three school in the District and an additional 'dark' pair to the regional ESD (educational service district) for the same price of the current connectivity costs, replacing all T-1's. The project qualified for eRate funding and will further reduce the districts expenses by 52 % this year. The contract runs for 87 months and District has the option to extend the contract out to a total of 20 years. Hunter actually reduced the annual cost to the contact fee's that will reduce the cost to about 50 % of it current connectivity budget. Hunter has just completed similar service contracts with two adjacent School Districts bringing the total school sites served by the network to 31

Example 6 – Oregon S190 and private developers

Regional Fiber Consortium and FiberSouth Consortium are "twin" intergovernmental organizations that were hastily created to respond to a unique public/private telecommunications opportunity to secure dark fiber for community and economic development purposes in what has become a five

county region. The communities served by these two consortia benefit from the original communities that did the impossible and streamlined the permitting process and waived right-of-way fees to move at the speed of the private sector to create a valuable shared asset among nearly 30 cities in five counties (Lane, Klamath, Douglas, Coos, and Lincoln).

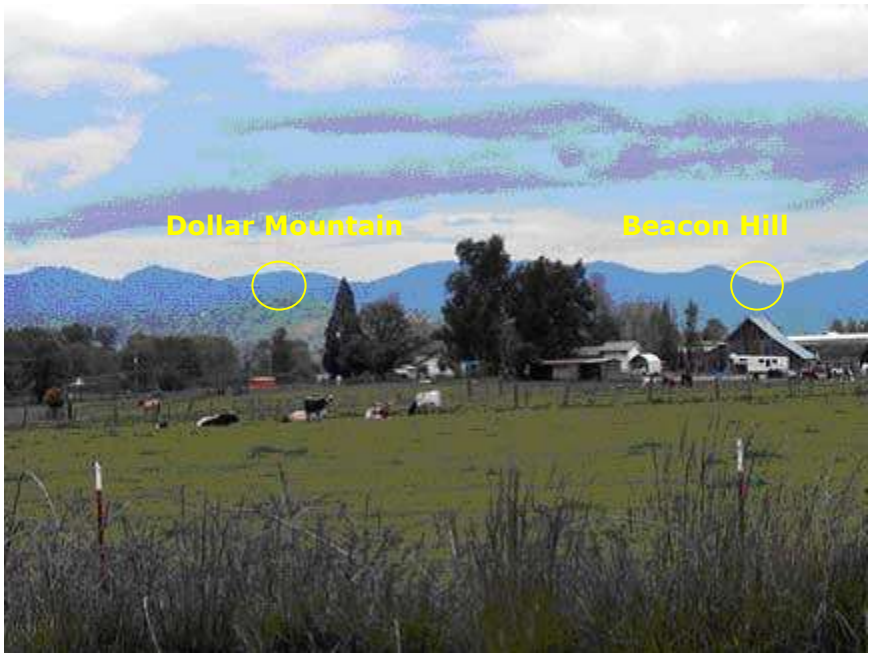
The inception of the project dates back to November 1998 and employs a "fiber brokering" rural strategy. This emerging opportunity to tested a theory with a proposed long haul fiber optic project that was being routed through several cities in Lane County, getting long haul companies to trade dark fiber for a streamlined permitting process. The companies were in a time sensitive growth mode so a streamlined process was of value to them. Their business plan did not include serving the small cities along their route and so our intent to serve even the smallest rural cities appealed to them. Springfield serves as the fiscal agent for the Regional Fiber Consortium and LCOG serves as the fiscal agent for the FiberSouth Consortium.

The existence of this open access fiber optic network, which now includes a third route from Eugene/Springfield through Salem to Portland, will link four major public universities and a half dozen community colleges and school districts for distance learning opportunities. This fiber network will also assure rural medical clinics have access to regional hospitals and OHSU in Portland to improve healthcare services in underserved high cost rural areas. Quality education and healthcare, coupled with public infrastructure that includes affordable advanced telecom services are the basic building blocks needed today by Oregon's rural communities to become competitive in the emerging knowledge-based global economy of tomorrow. The fiber consortia is well on its way to making this dream a reality and once it becomes fully operational it will strategically position the region to recover from the current recession with greater opportunities for creating a more diverse economy in the future.

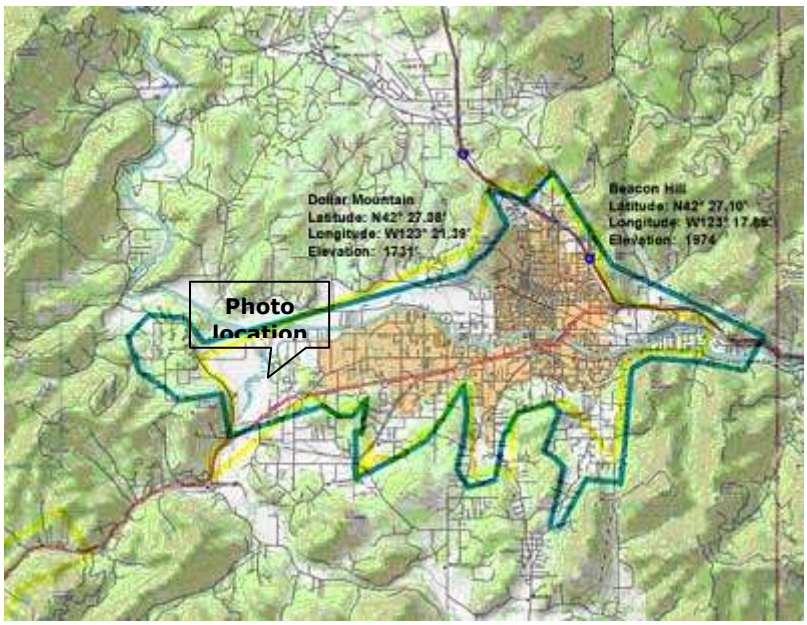
APPENDIX 6 – NOTES ON WIRELESS BROADBAND

Route Selection (wireless broadband)

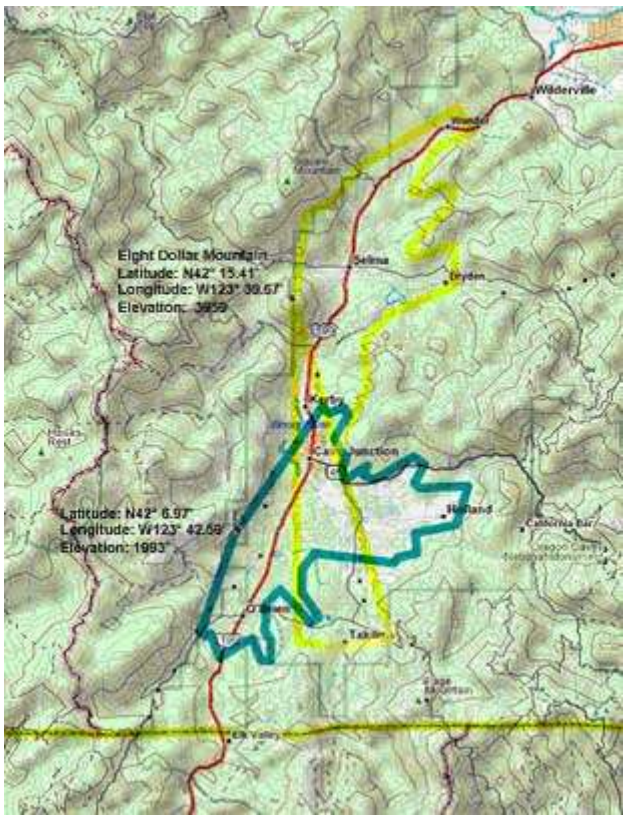
Wireless could readily service a significant portion of the populated area in and around Grants Pass, especially using technologies just now coming to market. This photo (see next page) was taken at the intersection of Leonard and Applegate. You can clearly see both Dollar Mountain (4.65 miles) and Beacon Hill (7.31 miles) from that location. These locations already have antenna structures in place.



This next map shows possible coverage of Grants Pass from two antennas (Dollar Mountain in yellow, Beacon Hill in blue-gray). These are very rough approximations and would require an engineering survey before proceeding. But it does point to the potential for broadband wireless coverage in the Grants Pass area.



The Illinois Valley could also be covered but with a bit more selectivity required in the placement of antennas (Eight Dollar Mountain in yellow and the unnamed ridge in blue-gray).



[Note: wireless broad exists for both Grants Pass and Cave Junction.]

Electronics (wireless broadband)

A number of wireless broadband products are available these days. Some examples include:

- DragonWave (http://www.dragonwaveinc.com/)
- Navini Networks (http://www.navini.com/index.htm)
- WaveRider (http://www.waverider.com/).

The Motorola™ Canopy product line provides a robust and affordable platform. As described in the following chart from their Website (http://motorola.canopywireless.com/) the product supports good throughput (several times faster than residential cable or DSL), good range (10-35 miles depending on configuration), and scalable users (200 and beyond). The Canopy Website provides additional detailed specifications.

Bandwidth	• The system bit rate is 10 Mbps. • Canopy™ system throughput is optimized for heavy loading (see below: Latency Control), so the throughput does not degrade as more subscribers are added. The measurable throughput is 7.5 Mbps point-to-point, 6.2 Mbps point-to-multipoint regardless of number of subscribers or average load.
Latency Control	• The Canopy™ solution delivers consistent packet latency of 20 ms, regardless of loading.

- To support QoS VoIP an access system must have a mechanism to prioritize VoIP packets as well as provide a consistent latency under any load. The combination of the Canopy™ system's high priority channel for QoS sensitive IP packets and its unique ability to insure consistent round trip latency of 20 ms, makes the Canopy™ solution an ideal network for delivery of QoS-based services such as voice and video.

Carrier to Interference

- All Canopy™ radios are tested at the factory to meet 3 dB carrier to interference. The nominal C/I of Canopy radios, based on parametric testing is ~2 dB. This is the lowest in the industry and a key reason that the Canopy platform is the most robust solution in the face of external interference.

Range

- The point-to-multipoint range is 10 miles and the point-to-point range is 35 miles. The "robustness" of the radio solution is best measured using C/I (Carrier to Interference Ratio). Motorola tests all Canopy radios at the factory to meet a minimum of 3 db C/I.

Users / AP

- The Canopy™ solution supports up to 200 Subscriber Modules per AP and 1200 per 6 sector AP cluster.

Non-Overlapping Channels

- The Canopy™ solution currently offers 7 non-overlapping channels of operation (3 at 5.2 GHz and 4 at 5.7 GHz) and uses three non-overlapping channels twice in every AP cluster to support 6 APs.
- A Canopy system can support two (2) six-sector AP clusters and a 5.7 GHz backhaul at a single physical site.

Dynamic Bandwidth Control

- The Canopy™ solution offers Dynamic Bandwidth Control on a per AP or a per user basis through the use of the Canopy Bandwidth Authentication Manager.

System Synchronization

- GPS Synchronization is used in the Canopy™ system to eliminate system self-interference. This unique capability gives a system operator the ability to locate a Canopy AP anywhere it is needed to increase system coverage and/or capacity.

Product Distribution and Support

- The Canopy™ platform is distributed through Authorized Canopy Resellers and a number of distributors to ensure that end customers can get product and support when and where they need it.

User Interface for Radio

- All Canopy™ radios are equipped with a Web Server built-in to the radio. This supports an intuitive local interface for installation as well as providing the same interface for remote management. The Canopy platform also supports Telnet, FTP, and SNMP for machine interfaces to central servers.

The basic building blocks are:

Access Point (AP)	• To distribute service to the surrounding community. • A cell site includes six AP Units (each covering a 60° sector). AC power supply, and up to two Backhaul Units, in addition to a GPS receiver, antenna, and built-in Ethernet switch for easy connection to your network.
Backhaul Unit (BH)	• Provides Internet "feed" from a remote location.
Subscriber Module (SM)	• The Internet access receiver, installed in or on your customer's site. A site with Canopy AP Units can serve up to 1,200 subscriber modules in all directions.

Pricing varies by supplier and promotions are ongoing. Here's a price list from an authorized reseller in March.

<u>5.2 GHz Starter Kit (Everything you need to become a wireless ISP)</u>
(30 SM's, 6 AP's, 1 Cluster Management module, 31 surge suppressors, 30 mounting brackets, 30 power supplies, 1 Cat 5 Cable Tester)
Lease Price: $436.44 per month
True Cost per subscriber (Including AP's, SM's, PS's, Cables, etc.): $14.55

<u>5.7 GHz Starter Kit (Everything you need to become a wireless ISP)</u>
(30 SM's, 6 AP's, 1 Cluster Management module, 31 surge suppressors, 15 Reflector dishes, 15 mounting brackets, 30 power supplies, 1 Cat 5 Cable Tester)
Lease Price: $495.95 per month
Cost per subscriber (Including AP's, SM's, PS's, Cables, etc.): $16.53

100 pack SM's (5.7 GHz, 10 mile subscriber units)
(100 5.7 SM's, 50 RD's, 100 Power supplies)
Lease Price: $1089.16
Cost per subscriber (Including SM, RD, PS): $10.89

100 pack SM's (5.2 GHz, 3 mile subscriber units)
(100 5.2 SM's, 100 Power Supplies)
Lease Price: $883.10
Cost per subscriber (Including SM and PS): $8.83

If you buy a bundle 100 pack of SM's you get the following free:
2 Access Points (5.2 or 5.7) OR a backhaul link (5.2, 5.7, 10 meg or 20 meg)

If you buy a bundle 500 pack of SM's you get the following free:
10 Access Points (5.2 or 5.7) OR 5 backhaul links (5.2, 5.7, 10 meg or 20 meg)

Buy any 3 backhauls sides (5.2, 5.7, 10 meg or 20 meg) and get the 4th side free

Bundle Packs of the following:

50 pack reflector hardware kits - $6141.00
200 pack reflector hardware kits - $23,229.00
50 pack Surge Suppressors - $1424.00
200 pack Surge Suppressors - $4984.00
50 pack universal mounting brackets - $1001.25
200 pack universal mounting brackets - $3560.00

Example of a grassroots effort

See http://www.oofwan.org/ for a grassroots, low-budget approach.

APPENDIX 7 – PROJECT DESCRIPTION AND ACCOUNTABILITY

Project Title: Josephine County Digital Village Planning Study

Description of the problem to be addressed: Advanced telecommunication and technology systems are proliferating across urban America, expanding economic opportunities and improving conerstone services such as health and education. Ironically, this is not true in rural communities where advanced technologies could meet our greatest needs and assist our most underserved populations. Current growth projections estimate that by 2002, high-speed access to the Internet will be 20 times more available to urban residents than to rural residents. This imbalance will persist unless rural communities collaborate aggressively, and thereby achieve viable economic models and innovative, sustainable technology plans. Rural Josephine Co., with its sparse population and mountainous terrain, cannot build a traditional business model to bring affordable broadband technologies to the County. As one of Oregon's poorest counties (40.9% is below 80% of the per capital media income), Josephine County's needs are further exacerbated by its high unemployment rate (9.2%). Other rural counties across the country have built community-wide collaborations (digital villages) to aggregate demand, leverage current and anticipated use, and frame viable and sustainable plans for building a community-wide broadband infrastucture. Sixty-five private and public businesses and organizations have come together to express the need for Josephine County to implement such a community-wide telecommunications and technology plan. This project is an essential step toward bringing affordable broadband to Josephine Co., and to facilitate the technology enhanced economic & community development that will allow Josephine County to better meet the needs of its 76,000 residents.

Project Description: The long-term economic and community development goals of Josephine County will be served by conducting a telecommunications broadband infrastucture planning study that is both a community-wide collaboration and is process rather than product based. SOTTC is proposing to facilitate a Josephine County "digital village" technology planning study as a creative means to an end---the means involves developing a public/private community collaboration---sharing a community-wide common vision, collaborative decision-making process and infrastructure---toward the end of building a strategic technology plan geared to bring affordable broadband to the residents of Josephine County. Outside expertise, experienced in facilitating rural infrastructure projects, will be retained. Drawing on the collaboration of 65 committed Josephine Co. groups and individuals, a viable and sustainable plan will be derived from cohesive planning, common goals and aggregated demands. Additionally, a structure will be designed for management, decision-making and costs to be broadly dispersed and proportional to use.

The Josephine County Telecommunication and Technology Plan already developed and approved by the Josephine County Board of Commissioners serves as framework for a technolgy business plan and includes the following goals and statements: Residents, institutions, organizations and businesses of Josephine County will benefit from a comprehensive and insightful Technology and Telecommunications Plan (T&TP) that is consistent with and builds upon other regional and statewide planning efforts, resulting in maximum benefit to residents. The telecommunications/technology infrastructure will:

- Be accessible, reliable and affordable for all residents of the county, regardless of location.
- Have standard communications capabilities, use scalable solutions to accommodate growth in demand; and be adaptable to new applications and opportunities.
- Provide access to quality services at a reasonable cost by creating partnerships and aggregating demand to reduce operating costs benefiting Josephine County users.
- Provide high-speed access to technology and information so that employees can be as efficient as possible, businesses can be competitive in the world of electronic commerce, and residents can have easy access to information and services.
- Provide low cost training, distance learning, in-service options and common technical support to reduce costs to Josephine County users.

This proposed technology planning study takes the Josephine County planning efforts one step farther: to the development of a specific technology business plan that creatively uses a community wide collaboration; assesses the population, economic and geographic barriers to building a broadband infrastucture; develops reccomendations regarding appropriate technologies and efficacious management systems, resulting in a detailed business plan. A detailed business plan in support of a viable and suatainable broadband infrastructure is essential as a precursor to securing capitalization or outside funding necessary for implementation of the plan .

The conceptual factors and key strategies of this proposed "digital village" planning study build on other model community-wide efforts across the country that have successfully developed sustainable broadband infrastructures in rural areas. The key elements of the plan include: aggregation of existing demand with system costs and management porportional to use to foster sustainability; a strategy for basic and affordable broadband services across the community of users with verticalization/intensification of capacities as needed in four domains (business, education, health, and public sector); collaborations and joint negotiations geared to increase vendor options and affordable solutions.

Expected Outcome: A year and a half of planning has gone on in Josephine County, with more than 60 interested and committed individuals, businesses and organizational entities. Broad agreement on goals and principles for exanding the telecommunication infrastucture has been achieved and approved by the Josephine County Board of Commisioners. Subsequently, these same goals and guiding principles served as base for the Southern Oregon's plan for funding under SB 622 and are in the process of being adopted in an additional 2-4 neighboring counties. The loosely knit planning that has been successful to date in Josephine County can not be taken further without a formal, facilitated planning study. The outcome of such a planning study will be a detailed plan, providing critical data on the current status, type and cost of broadband capacities in Josephine County; reccomendations on specific technologies that will best serve the Josephine County Communities: a structure, management and cost dispersal system appropriate for a community-wide broadband infrastructure; and a viable economical model that will be successful and sustainable in Josephine County. Structuring the community collaboration and procuring the initial capitalization essential for plan implementaion can be achieved only after this proposed planning study and with such a detailed, viable plan in hand.

The enthusiasm, involvement and community committment to date ensures that Josephine County's leadership will take the steps required to fully implement a detailed, viable technolgy plan, geared to bring an affordable broadband infrastructure to the co.

Ultimately, the 76,000 residents of Josephine County will have access to affordable broadband solutions, greater economic and community development strategies, and increased acess to high tech employment opportunities and higher wage positions as a result of this proposed planning study.

Service area impact and/or population served: 76,000 Josephine County residents, with major impact in Grants Pass and the Enterprise Communities of Illinois Valley and Sunny Valley/Wolf Creek

Request for funding first occurred in June of 2001 with funding levels as follows:

Grant Amount Requested:	$36,220
Matching Contribution (in kind):	$10,080
Total Project Cost:	$46,300

The project received approval in early 2002 with work commencing in April 0f 2002. For comparison purposes, reports and studies somewhat similar to this but with a narrower scope generally are costing anywhere from $38,000 to $60,000. This more inclusive approach resulted in a total cost to the grant funds of $25,550.00.

Month	Actual	In Kind
April - 2002	48	0
May	60	19
June	50	10
July	51	25
August	57	44
September	50	21
October	51	20
November	37	0
December	47	0
January -- 2003	50	5
February	0	21
March	10	23
April	0	65
May	0	30
June	0	40
July	0	50
Total hours:	**511**	**373**
Total Dollars:	**$25,550**	**$18,650**

Other In Kind contributions came from Douglas Electric Utility Cooperative in the form of a copy of their business and technology study (estimated value of $20,000) and many hours of interaction with telecommunications planners throughout the state (not tallied).

COMMUNITY DEVELOPMENT RESOURCE CENTERS

Introduction
Many of our rural communities find themselves struggling to provide economic and quality of life factors for their residents. Resources many times are not being used in an integrated fashion resulting in inadequate programs, program failures or lack of interest from a community. Working together in a cooperative and collaborative manner many communities find that they have hitherto untapped community wealth, both talent and capital. In this short paper you will find an introduction to a holistic approach to community development that focuses coordination and integration of efforts through a community led and directed Community Development Resource Center. Best described as a synthesis of best practices taken from many resources (listed at the end of the document), the intent of this paper is to get folks to collaborating and cooperating across their communities and the region they live in. Read it and share it. What do you think?

Community Digital Wells
Just as water is the source and sustenance of life, so too are information, knowledge, and how to access and use it in the new economy. Residents will benefit from a "community digital well," a shared place to dip into the "waters" of the new economy. Community Development Resource Centers (CDRC's) can serve as that access point.
To date, most initiatives aimed at closing the digital divide have focused on providing underserved and low-income communities with greater access to computers, Internet connections, and other technologies. Yet technology is not an end in itself – technology without a purpose is worthless!
The real opportunity before our society is to lift our sights beyond the goal of expanding access to technology and instead focus on *integrating* technology into our daily lives to achieve the outcomes we seek: tangible and meaningful improvements in the standard of living of families who are now struggling to rise from the bottom rungs of our economy.
Key Questions
Our communities now have a remarkable opportunity to marshal the resources and energies that have been summoned to the cause of closing the digital divide to create powerful real improvements in the daily lives of millions of people. The key is for our communities to unite around a new set of aspirations for technology investments in and by underserved and low-income communities. In every case, we must ask the following questions:

- Are we investing in technology for technology's sake, or are we investing with real outcomes in mind? Are the intended outcomes only what outsiders think the community might want, or are they in fact what people living there see as top priorities? Are we investing with an overzealous faith in the promise of technology, or do we have a realistic appreciation for the challenges underserved and low-income communities face?
- Will our investments simply satisfy our desire to be philanthropic, or will they produce real improvements in people's lives?

Cooperation & Collaboration Required The disparate interests working to bridge the digital divide can come together and can provide a powerful push to help our communities respond to the opportunities that technology offers underserved and low-income communities.
We can help communities apply technology to speed delivery of vital human services, attract new resources, improve job skills, facilitate neighborhood planning and community organizing, and build learning networks through which people with similar interests can share their diverse experiences.
Technology can spark community change so powerful that it will shatter the status quo. Such change will require much more than access to new tools; it will require a rigorous new focus on outcomes along with smart, large-scale investments to help communities achieve those outcomes.
The measure of our communities' progress in narrowing its fundamental disparities will have little to do with how many computers and Internet connections we install. It will have everything to do

with how well we can enable those who are less fortunate to elevate their own lives and the lives of their children.

Ten Premises for Moving Forward The following 10 premises are provided to stimulate interest in thoughts on how we can meet the challenge head on.

Premise One: **Focus on Narrowing Social — Not Digital — Divides** It is time to stop focusing so intensively on the technology divide. The real differences we should seek to narrow are America's core *social* divides: the grave disparities in economic opportunity, education, health, safety, housing, employment.

Premise Two: **Concentrate on Achieving Concrete Outcomes** Efforts to help low-income communities gain the benefits of technology must be directed toward achieving specific outcomes — in other words, tangible improvements in people's standards of living.

Premise Three: **Work Through Trusted Leaders in the Community** No matter how impressive the technology or how well-intended the motives, technology initiatives imposed on a community by outsiders are often ineffective.

Premise Four: **Support Efforts by Communities to Strengthen Their Capacity** The hard truth is that until at least a basic level of community capacity is in place, large-scale technology initiatives have little hope of success.

Premise Five: **Apply Technology to Help Build Capacity** Once a community has achieved at least a basic level of capacity, technology can be a powerful tool for the next stage of capacity-building efforts.

Premise Six: **Recognize that Technology Requires Its Own Capacity** Investments in technology must go far beyond funding for hardware, software, and wires.

Premise Seven: **Make the Case for Applied Technology** The truth is that most people, especially those in low-income communities, see little reason to embrace technology.

Premise Eight: **Make Major Changes in Public Policy** Although public officials have been quick to grasp the importance of helping low-income communities participate in the digital revolution, public policies have lagged behind public pronouncements.

Premise Nine: **Dramatically Expand the Availability of Capital** To address a social challenge of this size, the sheer magnitude of available capital must increase exponentially, and that capital must be invested strategically.

Premise Ten: **Dramatically Broaden the Scope of Efforts** Anything less than a massive mobilization of resources, financing, talent, and innovation is destined to produce only incremental and isolated victories.

Economic Challenges For Rural Communities The nation likes returning to rural America. Every week millions of radio listeners go back to Lake Wobegon to hear the news. They like the reassuring images of Main Street, where the women are strong, the men are good looking, and all the children are above average. Whether the aural art of Garrison Keillor or the printed frame of Norman Rockwell, the nation returns to these rural icons to confirm that all is well in America.

All is not well, however, if the nation looks past the icons to the *real* rural America. Some parts of the countryside are doing well, to be sure. Rural communities nestled in the Rockies of the Intermountain West, for example, are booming as newcomers flock to a scenic lifestyle. But a majority of rural places have not been swept along in the nation's long-running economic expansion.

Put simply, many parts of rural America face a make or break period in the coming years. The challenges are immediate to thousands of rural communities scattered throughout the nation's countryside, but they are also important to the nation. Slightly more than a fifth of the nation's people live in rural America. Rural places make up 97 percent of our nation's space—places where we grow our food and where we go to play. Did you know that rural America is home to more than 5,000 commercial banks, more than half the nation's total?

Rural America has always faced unique challenges, but the challenges ahead are of a different stripe, in part because the rural economy has moved far beyond agriculture, timber, and natural resources extraction. Moreover, a deep divide in the performance of the rural economy now makes it unlikely that a new tide will lift all rural boats.

Against the backdrop of these rural changes, two challenges will be critical in shaping the rural economic outlook:

1. Tapping digital technology
2. Improving human capital.

The Role for Community Development Resource CentersCDRC's work to enhance learning opportunities for low-income and other Americans through the use of computers and other technological tools.

- CDRC's serve as a technology resource **and more** in the community; helping businesses, community organizations, and local institutions use technology to strengthen their endeavors and the community as a whole.
- CDRC's reach those who are currently unreached, enhance knowledge and opportunities, provide a needed asset, and strengthen the community.CDRC's also help to develop leaders from the community to speak out in local and state policy debates.CDRC's can also help to educate residents as to the opportunities afforded them through access to high-speed online services. This helps to build the demand necessary to drive infrastructure investment by communications providers on rural and underserved areas.

CDRC or CTC?It's the "**and more**" that distinguishes CDRC's (Community Resource Development Centers) from CTC's (Community Technology Centers), moving the emphasis to a larger service offering wherein technology has a significant role but is not the sole reason for providing these resources.

What is a Community Development Resource Center (CDRC)?A CDRC is a community service, social action, and/or educational facility where computers, related communications technologies, and education programs are available to people who otherwise might have little or no opportunity to use or learn to use these technologies.

- A CDRC may be an independent agency dedicated to this mission; it may be a program within a larger multi-service agency; or it may be a program designed to enhance the overall mission of a service agency with a specialized mission. Each CDRC has its own unique qualities, yet all share a commitment to technology and education access and a belief that a CDRC can be a means for participants to increase their self-sufficiency.
- A successful CDRC offers opportunities to improve education levels, gain job-related skills, develop business management knowledge, and build personal and community capacity.

- It can offer a place where participants gather together and link with the entire community. An important criterion for success will be the degree to which the CDRC becomes an integral part of its community. Participants can and should take part in the planning process and have a real role in directing and sustaining center operations.

Learn From Others to Achieve the Promise of Centers Best practices taken from the experiences of others tells us what works:

- Centers must tailor their activities and "look and feel" to the unique cultural and economic needs of each community.
- Centers must be deeply involved in their local communities, able to refer families to other organizations for real world needs, to offer joint programs or services with other nonprofits, and to build bridges to employment agencies and employers.
- Centers must build private sector partnerships with technology companies' help to leverage resources in valuable ways.
- There is no cookie cutter or franchise formula. It is essential that each center articulate what it wants to accomplish in its community and then harness the technology to achieve that mission.
- Developing curriculum that supports measurable objectives, figuring out the best way to link participants to jobs, and finding and retaining the right staff provide significant challenges.
- With adequate resources and technical assistance, Centers accomplish more than provide valuable direct services to participants. They serve as a technology resource to public and private entities in the community, meeting a pressing need that otherwise would not have been met.

CDRC Program GoalsCDRC's can help participants build any number of important academic, business, and life skills, including:**Access Goals:** Provide computers and Internet access to a community that lacks these resources, or expand hours of public access to computers.

- **English Language Literacy Goals:** Improve language skills to an immigrant community or a community with historically low English reading and writing skills.
- **Educational Goals:** Improve academic achievement among school-age children, provide GED courses to adults, or adult education.
- **Basic Computer Literacy Goals:** Provide essential skills of computer usage, such as how to turn off the computer or how to use simple desktop tools and the Internet.
- **Advanced Technical Skills/Career Readiness Goals/Business Development:** Teach programming or use of specialized software tools that will offer new career opportunities, provide a suite of programs to assist in job searches and business development, or seminars on business management and leveraging of technology.
- **Community Building/Empowerment Goals:** Strengthen a community through improved communication and/or promoting involvement in local issues.

Likely Program Areas for a CDRC

Here are just a few possibilities to consider…

- Public Access to computers with Open Lab Time
- Pre-school and Family Activities
- Afterschool Activities
- Adult Education
- Elder Services
- Internet Access (this can be a focus as well as part of other offerings)
- Career Development and Job Preparation
- Job Placement
- Business incubation and nurturing
- Electronic Publishing (including video or multi-media)
- Electronic Commerce

Who Will Participate? What Are Their Interests?Every community consists of many different groups of people with a variety of interests. In the past we have looked primarily to classroom teachers and schools. In the minds of many, responsibility for improving educational opportunity for the least advantaged sectors of our population extends beyond the classroom and the responsibility of only the educational institutions.

Families, faith-based groups, charities, educational institutions, government, and community organizations (e.g., chambers of commerce) each have an important role to play in addressing educational inequalities in our country and in reshaping educational institutions for the future.

It's up to communities to lead this effort on their behalf, as only they know what is in the best interest of their communities.

CDRC Service Offerings So that residents, small businesses, and not for profits will be better equipped to succeed, the CDRC will offer:

Space
- Use of a conference room
- Limited office space

Education Services
- Technology and business skills training
- Business education programs and consulting - Marketing, management, Finance/Accounting, Strategic Planning
- High speed Internet access – businesses and public
- Access to distance learning programs – businesses and public

Office Equipment
- Access to computers and software – word processing, spreadsheets, database, presentations, Internet browsers, email
- Fax and copier at reasonable rates

Other Services
- Networking opportunities
- Introductions to business resources
- Information and linkages to funding sources
- Light clerical assistance - Telephone Answering, Word Processing, Photocopying
- Audiovisual Equipment
- Mail box and mailing address
- Answering service

Centers and their relationship to business incubation Utilizing the resources offered through a Center seems a reasonable and appropriate use in our small and rural communities.

- Eighty percent of businesses started will not be around at the end of five years.
- Indications are that eighty percent of new businesses started using this Incubator model will be.It's not just for startups.
- About 55 percent of all new jobs arise from the expansions of existing businesses and start-up companies create 45 percent. Start-ups fail at a much higher rate than established businesses.
- Making available these resources, especially the educational and training components, can be a big boon to existing businesses and to growing local economies. Incubator members have free or low-cost access to a wide range of business seminars and programs and free advice on office systems, marketing, growing your business, where to go for financing and many other areas of expertise.

Keeping in mind that this is but one of the functions that Centers can provide (business incubation), consider the possibilities. We know that most businesses started today will fail. What can a small business owner do to increase the odds of success? Let's paint a picture of how a Center and its associated resources might contribute to success.

Reasonably priced space, services, office equipment, group discounts and other services are available so that small businesses will be better equipped to succeed. The objective of the Incubator is to reduce overhead costs and management pitfalls of young businesses during critical

early years of operation. This early assistance enhances an entrepreneur's chances for survival and success.
The Center space is provided in a way that best meets the needs of the associates, while allowing for additional space when needed. All of this at a price much lower than traditionally leased space. Access to a conference room is also provided at no charge. Without the concern of exorbitant rent, clerical services and equipment, entrepreneurs and business owners can concentrate on getting their business off the ground and running, making profits and developing new jobs.
The Incubator associates have access to a variety of office equipment: fax, copier and computers. Desks, chairs and other office furniture are also provided. A receptionist is available to greet clients, monitor visitors and assist with clerical needs. Interns from area training centers and the community colleges are also available to assist.
Centers and their relationship to not for profit organizations Not for profit organizations are increasingly under pressure to leverage resources, to raise funds, and to operate their organizations efficiently and effectively. Technology can provide tools to assist not for profits in their missions. Centers can provide training in the use of tools, access to those tools, and staff to assist not unlike the way in which Centers can help with business incubation and nurturing. Here are a few examples:

- General technology concepts: Internal uses of computer networks, External uses of computer networks, Local area and wide area networks, Types of software applications, Online service providers, Security
- Education: Refining technology goals and requirements, developing an agency technology plan, how to link technology to strategy and work processes.
- Use of Database technology: Systems that track people and information about them (volunteers, donors, participants, customers, clients, etc.).
- The Internet: Use the Internet successfully to manage organizations and to attract and keep donors, volunteers and other supporters; using the 'Net to find information and funding leads; how to market an organization online; and more. Managing the Web development process, whether or not they will be doing the actual web page design and work or outsourcing the work.

CDRC Sustainability Bottom line is…you have to have one to "stay alive." True sustainability comes from becoming self-sustaining through revenue generating activities. Use grants for "gap-financing."Revenue possibilities:

- Fees for services
- Space rent
- Sliding scalesGrantsDonationsCorporate partnersSchool district partners

Volunteers – fill many roles
Getting Started…You Gotta Have A Plan Strategic planning helps communities identify which strategies offer the most potential to address local needs.
Strategic planning for can help communities to:

- Identify gaps in existing services and educational needs by pinpointing problems that limit economic development, services, or quality of life;
- Help people decide which problems are most important to address first
- Create opportunities for partnerships by identifying common interestsBuild more broad-based support for Center activitiesProvide a mechanism to coordinate multiple strategies

A complete strategic-planning process for Centers is comprised of three parts:

1) A needs assessment,
2) Goal setting to address the most critical issues, and
3) Crafting an appropriate action plan.

Advice: Hire a professional facilitator

Impacts of Centers An important resource for women and girls, people of all ages, and members of racial or ethnic minorities.

- Offer a range of opportunities to use computers and other technologies in classes as well as in self-directed activities.
- A valuable resource for obtaining job skills and learning about employment opportunities.
- Have a positive effect on participants' educational goals and experiences. Foster a sense of community and personal effectiveness, and allowed real community building to occur.
- A well-used resource for obtaining civic and government information: more than half of center users rated finding out about local events, local government, or state/federal government as important reasons for coming to their center.
- Help to increase users' self-confidence and reduce computer fears and anxieties.
- Participants' overall feelings about their Centers are overwhelmingly supportive.
- Meet resource needs of businesses and not for profits.

Starting A CDRC The start-up process for a CDRC generally moves through the following steps:

- Form a CDRC Steering Committee to serve as the governing body for the CDRC or as an advisory committee to the agency's existing governance structure.
- Engage in a process of community mapping to identify interests and needs of prospective participants along with assets and strengths available through other community enterprises and community members themselves.
- Form partnerships and develop commitments for assistance from members of the community (e.g., space, volunteers, funding, equipment & furnishings, etc.).
- Research and structure program offerings in response to identified needs and interests (e.g., adult education, after school sessions, job preparation, elder services, family and pre-school programs).
- Initiate a pilot program through which to test the planned programming structure and to further refine conclusions relating to community interest and need.
- Consider and plan for the operational needs of the CDRC (e.g., space, hardware, software, personnel, and resulting financial requirements).
- Develop a business plan mapping the CDRC's operational and financial assumptions so interested parties and founders can buy into the effort.
- Engage in whatever additional fund-raising, space and equipment acquisition, staff and volunteer recruitment is necessary to make the plan operational. NB: Do not plan to start full operations until the Steering Committee is satisfied that the CDRC has sufficient backing to stay in operation for at least 12 months.

How Long Will it Take to Create a CDRC?The time required to create a CDRC depends upon many variables, such as:

Staff
Computers
Participants
Space
Available funds for operations.

A CDRC can be established within a shorter time if a supervisor, hardware, and space is readily available.

In general, however, it is likely to take at least a year to establish a CDRC. This timeframe assumes that Steering Committee members have constraints upon their time, such as full-time jobs and families, which means that the time given to the CDRC will be limited.

Next steps... Form a CDRC steering committee.Create a project plan.

- ✓ Build partnerships.Define outcomes.

APPENDIX 9 - REFERENCES

Please note that many have worked hard to assemble their thoughts and approaches on digital villages, broadband, economic and community development. This document does not intend to do anything more than share information and knowledge with the intent to incite discussion and change. If I have inadvertently left out a resource, please understand it was not intentional and you deserve full credit for your efforts. My hope is that I have added value by bringing these ideas together and mingling them with my own.

Section 1 - The What and Why of A Digital Village

"Building a Nationwide Broadband Network: Speeding Job Growth," http://www.newmillenniumresearch.org/event-02-25-2002/jobspaper.pdf, Pociask, February 25, 2002

"Knowledge-Value Cities in the Digital Age," http://www.milkeninstitute.org/pdf/kvdc.pdf, Joel Kotkin and Ross C. DeVol, Milken Institute,
February 13, 2001

"Building the Electronic Commons: A Project of the Democracy Collaborative," http://www.democracycollaborative.org/programs/public/BuildingElectronicCommons.pdf, Peter Levine on behalf of Harry Boyte, Lew Friedland, and Robert Wachbroit, April 5, 2002

"Cyberspace As Place, and the Tragedy of the Digital Anticommons," http://www.law.berkeley.edu/journals/clr/library/library/cotter01.html, Dan Hunter, California Law Review, April 07, 2002

"Education Technology Must Be Included in Comprehensive Education Legislation," http://www.ceoforum.org/downloads/forum3.pdf, white paper by the CEO Forum on Education and Technology, March 2001

"The Power of Digital Learning: Integrating Digital Content," http://www.ceoforum.org/downloads/report3.pdf, The CEO Forum on Education and Technology, June 2000

"Berkshire Connect: A Case Study in Demand Aggregation," http://itc.mit.edu/itel/docs/2001/Berkshire_Connect.pdf, Sharon Eisner Gillette, MIT Program on Internet and Telecom Convergence, November, 2001

"Understanding Broadband Demand: Broadband and Business Productivity," http://www.technology.gov/reports/TechPolicy/BB_Wkshop020325.pdf, Mar. 25, 2002

National Commission on Entrepreneurship Testimony before the House Small Business Committee, http://www.ncoe.org/policy/mellingertest.html, April 3, 2001

Section 2 - The Broadband Market

"On the Path to Making the Broadband Vision a National Reality", http://www.ntia.doc.gov/ntiahome/speeches/2003/naruc_04292003.htm, Assistant Secretary Nancy J. Victory, U.S. Department of Commerce, NARUC National Summit on Broadband Deployment II, Hyatt Regency Crystal City, April 29, 2003

"DSL Leads Global Connections," http://cyberatlas.internet.com/markets/broadband/article/0,,10099_2108891,00.html, Robyn Greenspan, March 12, 2003,

FEDERAL COMMUNICATIONS COMMISSION RELEASES DATA ON HIGH-SPEED SERVICES FOR INTERNET ACCESS, media release, http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/hspd1202.pdf, December 17, 2002

"Understanding Broadband Demand: A Review of Critical Issues," http://www.ta.doc.gov/reports/TechPolicy/Broadband_020921.pdf, Office of Technology Policy, U.S. Department of Technology, September 23, 2002

"Revamping High-Speed Access Strategies: Tiered Services Hold the Key to Broadband Adoption," http://www.yankeegroup.com/, Yankee Group, Aug. 2002

"More Than Half of U.S., Canada Online," http://cyberatlas.internet.com/big_picture/geographics/article/0,,5911_2200601,00.html, May 2, 2003

"A Nation Online: How Americans Are Expanding Their Use of the Internet," http://www.ntia.doc.gov/ntiahome/dn/Nation_Online.pdf, National Telecommunications and Information Administration, February 2002

"The Policymaker's Dilemma: The Impact of Government Intervention on Innovation in the Telecommunications Industry," http://itd.colorado.edu/look5836/Readings/The%20Policymaker's%20Dilemma.pdf, Scott D. Anthony, Erik A. Roth, and Clayton M. Christensen, Harvard Business School – Working Papers, 02-075, April, 2002

Nielsen Net Ratings, http://www.nielsen-netratings.com/, August 15, 2002

Cyber Atlas, http://cyberatlas.internet.com/0,1323,,00.html, July 3, 2002

"Cable is too much better to lose," Jon C. Garcia and Jon Wilkins, The McKinsey Quarterly, 2001

"No Competition: How Monopoly Control of the Broadband Internet Threatens Free Speech," http://archive.aclu.org/issues/cyber/NoCompetition.pdf, An ACLU White Paper (No date provided)

"The Benefits of Broadband," http://www.entrepreneur.com/Your_Business/YB_SegArticle/0,4621,298929-----,00.html, Macklin, eMarketer, May 2002

"When Will the Telecom Depression End?", http://www.businessweek.com/magazine/content/02_40/b3802082.htm, Business Week, October 7 2002

"Further Defining A Layered Model for Telecommunications Policy," http://intel.si.umich.edu/tprc/papers/2002/95/LayeredTelecomPolicy.pdf, Douglas C. Sicker, Department of Interdisciplinary Telecommunications, Department of Computer Science, School of Engineering and Applied Science, University of Colorado at Boulder, September 12, 2002

"The United States Broadband Problem: Analysis and Policy Recommendations," http://www.brook.edu/comm/policybriefs/pb117.pdf, Charles H. Ferguson, The Brookings Institution, May 31, 2002

"Strategic Technology Infrastructure for Regional Competitiveness in the Network Economy," http://www.ecorridors.vt.edu/papers/topic/stircne/index.shtml, Virginia Polytechnic Institute and State University, under the aegis of its eCorridors Program, has released the output of a series of studies on issues surrounding the investment and development of strategic telecommunications infrastructure for communities.

"Fiber Optic Network Capacity and Utilization," http://www.tiaonline.org/marketdev/whitepapers/wp_url.cfm?url=http://www.tiaonline.org/marketdev/whitepapers/TIA_Fiber_Optic_White_Paper-PartI.pdf,

http://www.tiaonline.org/marketdev/whitepapers/wp_url.cfm?url=http://www.tiaonline.org/marketdev/whitepapers/TIA_Fiber_Optic_White_Paper-PartII.pdf, TIA, September, 2002

"Report from the Workshop: This Decade's (R)evolutionary Telecommunications Paradigm," http://www.ieeeusa.org/committees/ccip/Broadband03report.pdf, Alan McAdams, Cornell University, June 17-18, 2002

"Accelerating Advanced Broadband Deployment in the U.S.," http://www.ieeeusa.org/forum/POSITIONS/broadband.html, IEEE-USA Committee on Communications and Information Policy, Approved by the IEEE-USA Board of Directors, February 2003

Distressed Areas and Associated Index Values as of March, 2002, http://www.econ.state.or.us/DistList.htm

U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, County Business Patterns, 1997 Economic Census, Minority- and Women-Owned Business, Building Permits, Consolidated Federal Funds Report, 1997 Census of Governments. Last Revised: Thursday, 07-Feb-2002 14:18:48 EST. http://quickfacts.census.gov/qfd/states/41/41033.html

Oregon Employment Department; Center for Population Research & Census, PSU; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department, http://www.econ.state.or.us/SWCEIJO.HTM, Updated February 1, 2001,

Oregon Employment Department; Center for Population Research & Census, PSU; U.S. Census Bureau; Bureau of Economic Analysis; Oregon Tourism Commission; Oregon Department of Revenue; Oregon Economic and Community Development Department, http://www.econ.state.or.us/orstat.htm, Updated 4/9/2002,

"Report of the Oregon Telecommunications Coordinating Council," http://www/ortcc/org, Presented to the Joint Legislative Committee on Information Management and Technology on November 6, 2002 for the Seventy-Second Legislative Assembly, Revised December 5, 2002, Legislative Drafts as of January 6, 2003, Last Update: January 28, 2003

Section 3 - Broadband Technologies Descriptions

"How DSL Works," Curt Franklin, http://www.howstuffworks.com/dsl.htm

Integrated Service Digital Network definition, http://compnetworking.about.com/library/glossary, http://www.pacbell.com%2FProducts_Services%2FResidential%2FISDNuserguide%2F0%2C1078%2C30%2C00.html

T-1 Carrier definition, http://webopedia.internet.com/TERM/T/T_1_carrier.html

Cable modem definition, http://webopedia.internet.com/TERM/c/cable_modem.html

"How Cable Modems Work," WebForum Online Education, http://www.iec.org/online/tutorials/cable_mod/topic01.html?Next.x=40&Next.y=15

"Wireless Broadband and Other Fixed-Wireless Systems," http://www.networkcomputing.com/netdesign/bb1.html

"What is IEEE 802.11b?" http://80211b.weblogger.com/about

"Fiber To The Subscriber," http://www.wwp.com/docs/whitepapers/WWP_FTTS.pdf

"Free Space Optics," http://www.freespaceoptic.com/

"802.11," http://80211-planet.webopedia.com/TERM/8/802_11.html

"802.11g spec: Covering the basics," http://www.commsdesign.com/design_corner/OEG20020201S0035, Jim Zyren, Director, Strategic Marketing for Wireless Networking, Intersil Corp.,Irvine, Calif., EE Times, February 1, 2002,

"Benefits of Active Ethernet Service Delivery Access Network," http://www.ftthcouncil.org/dbfiles/techexchange/T204%20Benefits%20of%20Active%20Ethernet%20Network.pdf, Tim Holloway, World Wide Packets, FTTH Conference, 2002

"Ethernet/SONET debate strong as ever: Upstart vendors weigh pros/cons of metro infrastructures as new resiliency standard takes shape," http://www.nwfusion.com/cgi-bin/mailto/x.cgi, Terri Gimpelson, The Edge, June 18, 2001

"Ethernet Hype Dampened by Market Realities, Technical Challenges," http://www.phoneplusmag.com/articles/241CARRIER1.html, Khali Henderson, April, 2002

"The Role of 10-Gigabit Ethernet in Metro Area Networks," http://www.riverstonenet.com/technology/10gig.shtml, Steve Garrison, Riverstone Networks, January 2002

Cisco ONS 15454, http://www.cisco.com/warp/public/cc/pd/olpl/metro/on15454/

"Data Networks Topologies - Data and Managed Technologies," AAPT, http://www.net.aapt.com.au/techref/datanet.htm

Section 4 - Broadband Ownership Alternatives

InfoWorld survey of 372 U.S. IT professionals, July 2002
"Municipal broadband: deciding whether to build your own network," http://www.thompson.com/libraries/cable/tube/special_reports/tube_expert/tubeexpert303.html, Arthur A. Butler and Joel R. Paisner, Thompson Publishing Group, March 2003,

"Municipal Broadband: Deciding Whether To Build A Municipal Network, Choosing the Business Plan and Entity (Market Realities, Federal Regulatory Issues, Legal Authority and Community Options)," http://www.mrsc.org/Subjects/telecomm/LSIProgramMaterials.pdf, Arthur A, Butler, esq,m Joel R. Paisner, esq., Ater Wynne, LLP, LSI Municipal Broadband Conference, December 2-3, 2002

"Moving Your Municipal Metronet Forward: A Case Study in Knowing Where to Go & How to Get There," http://www.ftthcouncil.org/dbfiles/techexchange/C204%20UTOPIA%20–%20Part%201.pdf, http://www.ftthcouncil.org/dbfiles/techexchange/C204%20UTOPIA%20–%20Part%202.pdf, Paul Morris, UTOPIA, Joel Sybrowsky, DynamicCity MetroNet Advisors, FTTH Conference, 2002

"Understanding the Challenged! Municipal Entry: What Is Really At Stake," James N. Horwood and Allison L. Driver, Spiegel & McDiarmid, Jacksonville, Florida, October 7, 2002

"Frequently Asked Questions about Customer Owned Dark Fiber, Condominium Fiber, Community and Municipal Fiber Networks," http://www.canet3.net/library/papers.html, Bill St Arnaud, March 31, 2002

"Using Public-Private Partnerships To Develop Intelligent Transportation Systems: Potential Legal Barriers," http://www.millervaneaton.com/briefs_memos/using_public_private.doc, Nicholas P.

Miller and Kenneth A. Brunetti, Intelligent Transportation Systems and the Law, October 23-24, 2000

"Public-Private Partnerships: Terms Related to Building and Facility Partnerships", http://ncppp.org/howpart/ppptypes.html, Government Accounting Office, April 1999

"For the Good of the People: Using Public-Private Partnerships To Meet America's Essential Needs," http://www.ncppp.org/presskit/ncpppwhitepaper.pdf, A White Paper on Partnerships Prepared by The National Council for Public-Private Partnerships, 2002

"General Survey of I.R.C. 501(c)(12) Cooperatives and Examination of Current Issues," http://www.irs.gov/pub/irs-tege/topice02.pdf, Michael Seto and Cheryl Chasin, Internal Revenue Service, Department of Treasury

Section 5 – Broadband Infrastructure Development

"FTTH Outside Plant (OSP) Construction Issues & Cost," http://www.ftthcouncil.org/dbfiles/techexchange/B203%20FTTH%20OSP%20Constr%20Issues%20and%20Cost.pdf, James Salter, Atlantic Engineering Group, FTTH Conference, 2002

"Avoiding the Technical & Costly Obstacles Associated with Deployment of Fiber to the Home," http://www.ftthcouncil.org/dbfiles/techexchange/B204%20v2%20Avoiding%20Obstacles%20of%20FTTH%20Deployment.pdf, Shawn Smith & Cheri Podzimek, Americable, Inc., FTTH Conference, 2002

"Chelan County, Washington Case Study," http://www.ftthcouncil.org/dbfiles/techexchange/C302%20Chelan%20County%20Case%20Study.pdf, Ron Yenney, Chelan County Public Utility District #1, Wenatchee, WA, FTTH Conference, 2002

"Delivering Enhanced Services to the Last Mile," http://www.ftthcouncil.org/dbfiles/techexchange/T301%20Delivering%20Enhanced%20Svcs%20to%20Last%20Mile.pdf, Amir Ghoddoussi, Alcatel, FTTH Conference, 2002

"Engineering the Last Mile in FTTH Networks," http://www.ftthcouncil.org/dbfiles/techexchange/T201%20Engr%20the%20Last%20Mile%20in%20FTTH%20Networks.pdf, Dana Bisaro, Zero dB, FTTH Conference, 2002

"Independents Make the Case for PON versus HFC in New Developments," http://www.ftthcouncil.org/dbfiles/techexchange/B101%20PON%20v%20HFC,%20Part%201.pdf, http://www.ftthcouncil.org/dbfiles/techexchange/B101%20PON%20v%20HFC,%20Part%202.pdf, Burnie Atterbury, Alloptic, Dana Bisaro, Zero dB, Tom Reiman, Broadband Group, FTTH Conference, 2002

"SURA Optical Networking Cookbook: A practical guide to planning and deploying optical networks for research and education," http://www.sura.org/info_tech/opcook/opcook.pdf, Developed by the SURA Crossroads Architecture Working Group (AWG) and collaborators, Version 1, October 30, 2002

"Building the Business Case for Human Collaboration:The Reasons for Fiber to the Home," http://www.ftthcouncil.org/dbfiles/techexchange/B102%20Business%20Case-Human%20Collaboration%20Part%201.pdf, http://www.ftthcouncil.org/dbfiles/techexchange/B102%20Business%20Case-Human%20Collaboration%20Part%202.pdf, http://www.ftthcouncil.org/dbfiles/techexchange/B102%20Business%20Case-Human%20Collaboration%20Part%203.pdf, Bill Mularie, Telework Consortium, FTTH Conference, 2002

"Electric utility and telecommunications cooperative team up to 'access'orize rural Oregon," NoaNet/Pacific Power news release, March 2003

Appendix 5 – Examples of Public-Private Partnerships

"The Multi-Use Network (MNT) project," http://www.state.co.us/mnt/
http://www.state.co.us/mnt/NMT_Manual_Ver_1-5.pdf
http://www.ruralcolorado.org/Beanpole%20Briefing%20ppt.ppt

"Connect New Mexico (CNM)," http://www.connectnm.org/

"Qwest Communications Awarded New Mexico Statewide Network Contract," http://www.qwest.com/about/media/pressroom/1,1720,1066_archive,00.html

Hunter Communications and Core Digital Services, www.coreds.com

Rural Fiber, http://www.ruralfiber.net/

Appendix 7 – Community Development Resource Centers

"From Access To Outcomes", "Venture Philanthropy: The Changing Landscape", http://morino.org, The Morino Institute

"The Organization Of Learning In Community Technology Centers: Learning With Technology In 6 Communities," http://www.sri.com/policy/ctl/assets/pdfs/vstaera2001.pdf, SRI International

Community Technology Centers' Network, http://www.ctcnet.org/

Lone Eagles Consulting, http://lone-eagles.com/

TechSoup, http://www.techsoup.org/articles.cfm?topicid=12&topic=CTC%27s

"Community Learning Centers: Best Practices and Innovations," http://flconline.org/clctraining/

"COMMUNITY TECHNOLOGY CENTERS : Keys to Successful Planning, Implementation & Sustainability," http://www.ctcnet.org/pub/telecommunity2000/planning.html

Community Technology Centers Program, http://www.ed.gov/offices/OVAE/CTC/

HUD's Neighborhood Networks, http://www.hud.gov/nnw/nnwindex.html

Information Technology Indicators Project. http://www.cityofseattle.net/tech/indicators/

"Impact of CTCNet Affiliates: Findings from a National Survey of Users of Community Technology Centers", http://www.ctcnet.org/impact98/imp98toc.htm

AmericaConnects, http://www.americaconnects.net/

"Applying the Principles of Youth Development to Youth Opportunity Grants, WIA Formula Funded Programs & Community-Based Youth Programs" - Larry Brown, WAVE, Inc., http://www.waveinc.org/documents/Youth%20Dev%20Principles%20for%20YO%20&%20WIA%20Programs.doc

"Ten Thoughts for Your New Community Technology Center", http://www.techsoup.org/articlepage.cfm?articleid=163&topicid=12&CFID=869308&CFTOKEN=53519029

Meeting A New Century of Challenges In Rural America, http://minneapolisfed.org/pubs/region/99-12/rural.html