Community Benefits of a Palo Alto Fiber to the Home Municipal Utility

Prepared by Mark Heyer
Edited by Bob Harrington
with input from the people of Palo Alto
November 20, 2002

Introduction

The success of any municipal fiber to the home (FTTH) system ultimately hinges on the unique benefits that it provides to the citizenry. This paper takes its direction from the expressed views of Palo Alto citizens regarding their interest in these benefits. It is a work in progress. Expanded and formalized methods are planned for drawing additional citizen participation in the visioning process.

Ownership of the fiber utility by the City of Palo Alto confers a series of strongly desired benefits upon the community:

- ∞ CPAU is a trusted and highly reliable provider – highly reliable service and quality local support are highly desired benefits.

- ∞ FTTH will keep more of our telecommunication dollars at home.

- ∞ A FTTH system provides high speed, is flexible as to its offerings, and its enabled services can be very attractively priced.

- ∞ Public ownership of the infrastructure confers community control and promises wider access and availability for civic ventures.

- ∞ To the extent that competitive responses include lower prices and/or improved services, Palo Altans will directly benefit as a result, whether or not they subscribe to FTTH services.

Many of the ideas voiced regarding potential services and benefits are by nature speculative. Yogi Berra said it best: *"Prediction is really difficult, especially when it involves the future."*

Nobody can be certain *exactly* which feature, application or product will produce the *most* benefits, but educated guesses can be made based on solid knowledge of information usage and past patterns of information technology development.

Table of Contents

1 Unique Benefits of Fiber To The Home

1.1 Return on investment from FTTH

Investment in a fiber utility will generate returns many times greater than just what CPAU receives in subscriber revenues or access fees, which the Business Case is and the Business Plan will be based upon. The really big returns on investment will be enjoyed by users of FTTH-enabled services, many of them uniquely available on FTTH, including many of the community benefits described throughout this paper. The aggregate value of benefits to the individuals in the community and the community as a whole will be many times the cost of the municipal system.

Compared to fragmented, commercially restricted services, FTTH provides Palo Alto citizens with many more product and service choices, multiplying opportunities for return on investment.

1.2 What is Broadband?

Today, when we talk about communications, there are three apparent entities to consider – cable TV, telephone and Internet.
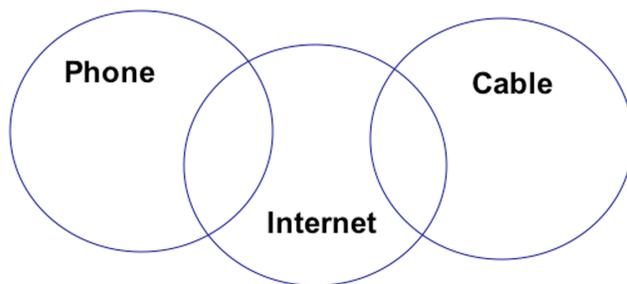
Figure One – Current communication applications

In the future, the communications landscape will be very different, populated with many independent service providers and applications. Only some of these will be the telephone, Internet and cable entities that we know today. This, then, is the actual definition of broadband:
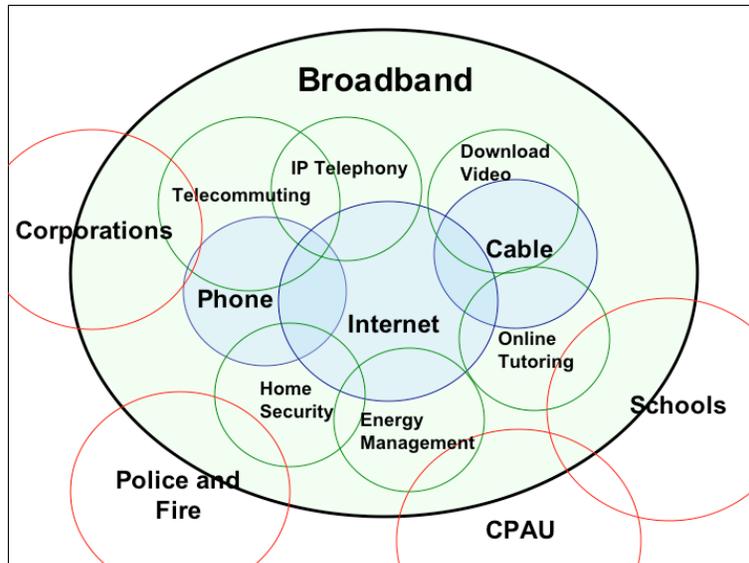
Figure Two – Broadband applications enabled by FTTH

It is apparent that no single "killer application" drives FTTH benefits; rather, it is a combination of active ingredients applied differently, daily, by each user. As we discuss various features and benefits of FTTH service, it is important to understand that characteristics of FTTH make it vastly different from competitors' offerings and uniquely important for each application and its benefits.

There are two key *unique* qualities of the municipally owned FTTH system as proposed for Palo Alto:

- ∞   Universal availability within Palo Alto
- ∞   Virtually unlimited bandwidth

These two factors are central to all of the discussions about specific stakeholders and benefits outlined in this paper. Noting the Citizen Wish List of applications in Section 2, few if any of the desired benefits can be achieved without a FTTH system.

1.3   Community benefits of universal availability

Early in this century, it was realized that maximum benefit for the telephone would be achieved with universal service. More recently, Robert Metcalf, considered the inventor of the Ethernet and later a founder of 3COM, postulated

Metcalf's Law, *"The value of an information network is equal to the square of the number of participants."*

Of all the desired benefits listed throughout this paper, few, if any, can be obtained using the current definition of the Internet, which is characterized by fragmentary penetration for broadband, blocking of competitive services by legacy monopolies, erratic service providers and the majority of users still on dialup connections.

The benefits of universal availability (as opposed to legislated universal service) are important:

- ∞ Equal availability of service to all citizens
- ∞ Critical mass for applications (video on demand)
- ∞ All required residences can be addressed (education/emergency warnings)
- ∞ Creating a high-speed community intranet through a single network

1.3.1 Community benefits as a result of ubiquity

While the Internet has proven to be a wonderful tool for reaching the world, it has so far been less effective for reaching one's own community. Yet, we all know that much of the information we use and exchange in our daily lives is local.

Indeed, many in the industry believe, and the PA-FTTH questionnaire respondents intuitively grasp, that the next major phase of development for Internet technology will be local in nature. Since local information is inherently more valuable to our daily lives than news of the world, we can expect many applications to emerge with high aggregate value.

As the movement toward information on demand moves forward, we will increasingly see more, smaller choices being made by information consumers. Rather than subscribing to a cable "package", we may choose to subscribe to individual products from a much larger inventory of possibilities than exists today. Many of the most valuable products may be local in nature.

A high-speed community intranet becomes more valuable when a substantial majority of households are connected to a common infrastructure. Emergency warnings, smart utilities and governmental communication depend on near-universal service for effectiveness.

School enhancement is a particularly dramatic example of the need for ubiquity. Online school enhancements should be available to ALL students equally. Today,

this shortcoming of our fragmented information infrastructure prevents implementation of programs that could have dramatic positive effects on educational effectiveness from pre-school to high school.

1.3.2 Colleges and universities as community models

In the United States at least, virtually every college and university is wired internally and some 95% provide broadband service to the campus. Stanford University is an especially cogent example for Palo Alto. At Stanford, fiber connections are provided to every "pillow" and Stanford has installed 40Gb backbones with 100Gb connections to other institutions within the advanced network group.

Stanford clearly recognizes that providing transparent access to every student, administrator, and faculty member is a great benefit to the organization.

1.3.3 Barriers to ubiquity with current technology and companies

- ∞ Limited technological reach (DSL)
- ∞ No commercial interest in expanding the service (AT&T cable modem – not offering new subscriptions)
- ∞ Perceived high cost to the customer (installation and service)
- ∞ No consumer interest in service offerings

These factors currently define the commercial information landscape of Palo Alto. While everyone has a telephone, only an estimated 35% have migrated to DSL/cable modems. Many more would if broadband were available, while others would not, due to perceived cost and limited interest in service offerings.

1.3.4 Creating a ubiquitous network

Internet penetration in Palo Alto is said to be approaching 90%. The majority of households are on dialup connections. However, due to the technological inadequacy of dialup, few if any of the future applications of Internet technology can be realized using dialup connections. Conversion of those dialup customers to FTTH would rapidly create a ubiquitous network. Based on the barriers to entry listed above, these are the critical steps:

- ∞ Make the technology available to the entire community
- ∞ Little or no installation cost and service offerings at competitive prices

∞ Many applications, any one of which might trigger adoption.

1.4   The benefits of bandwidth

The obvious feature of FTTH that attracts bandwidth-starved consumers is speed. For some, there are only two quantities of bandwidth: none and not enough. But what are the applications that will convert high bandwidth into solid community benefits?

Before we talk about specific applications, it is useful to see how bandwidth demand has grown consistently since the 1980's:
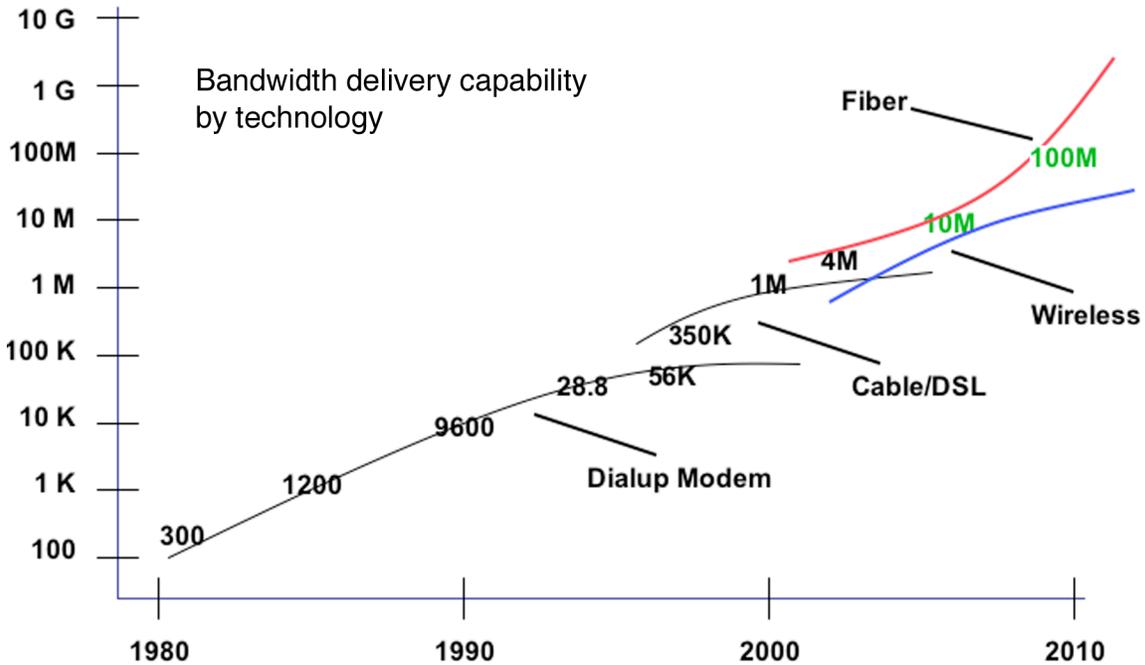
Figure Three– Bandwidth Delivery Capability by Technology

Except for fiber, all the rival technologies are limited by fundamental physical barriers and are currently working at the outer limits of their technological capability. The carrier frequency of fiber (the ultimate limit on capacity), about 300THz, is 300,000 times higher than terrestrial cable TV and 100,000 times higher than 3GHz wireless. Wave division multiplexing adds another 256 "channels" to the capacity of a single fiber and is in commercial use today. Since the electronics that feed fiber are improving at the rate of Moore's Law, doubling capacity every year, the fiber itself will accommodate many generations of improved electronics.

1.5   Video will drive bandwidth demand

Five years ago, who no one could imagine how they could possibly fill up a 1GB disk drive. Today, the smallest readily available drives are 20GB, paving the way toward 200GB products. Digital pictures and video provided the push for exponentially increased storage capacity. So it is with bandwidth.

But until you experience it, many can't imagine it. We all now know that television works, it has been around for 50 years. The same full screen digital video, but this time two-way or multicast, will be immediately possible on the FTTH Palo Alto intranet, because we will all have the necessary bandwidth. On-demand movie servers will likely be trial located within our intranet, because large file size downloads like movies will be in seconds rather than hours. Palo Alto will likely become the trail area for many vendors and proving ground for high-speed community services.

As consumers move from the old fixed-schedule broadcast television model to on-demand services, the bandwidth required can only be provided by FTTH technology. Therefore, providing FTTH to Palo Alto creates a foundation for future video services that provide citizens with increased flexibility, quality and choice.

It is commonly considered that commercial-quality real time video delivery consumes approximately 5Mpbs, or 15Mbps for HDTV. One thousand users watching on-demand HDTV at the same time consume an aggregate of 15Gbps, probably a conservative estimate for the Palo Alto of 5 years from now.

Downloading movies, as with MovieLink, is also expected to be popular, replacing a trip to the video store. For this modality, the desire is to download the movie in the shortest possible time, to reduce the latency before viewing. At one gigabit download speed, a 90 minute HDTV movie would arrive in 81 seconds. With a 100 megabit download, it would take 13.5 minutes and with a 10 megabit connection, 2.25 hours, with 1 megabit DSL-like service, over a half day. "On demand" is probably perceived as being less than 20 minutes or so.

In addition to commercial video content, we can anticipate considerable activity in education, peer-to-peer video file sharing, video monitoring and video conferencing over the FTTH community intranet. Taken together, these applications will provide increasing bandwidth demand into the foreseeable future.

1.6 Price and Competition

1.6.1 Price must be competitive

When queried about the most desirable benefits for an FTTH system in Palo Alto, survey respondents predictably put price at the top of the list (see Appendix). However, when asked to provide detail, as some did in their text responses in both Palo Alto and Alameda, the real question is not just about the lowest price, but about fair price for service delivered.

Some people, paying $80 or more for a quality DSL connection consider it, if not a bargain, at least tolerable. Others, paying $40 for a poor connection think that they are being ripped off.

Another component of satisfaction that affects price perception is customer service. A high-paid businessperson, who has to wait half a day for a cable repairman, who may not show up, values the time lost to be worth six months or more of the service charges.

The important lesson learned during the ongoing FTTH trial was that the extremely low incidence of systemic problems made, a) the customers very satisfied with the service and the charges, and b) the system very inexpensive to maintain and operate from CPAU's perspective.

The conclusion that can be drawn from these two observations is that people will willingly pay for a quality service and that the FTTH system, properly designed, could be much less expensive to operate than trouble-prone hybrid fiber coaxial (HFC) and DSL systems. These savings will translate into the ability to provide a basic level of service at a very attractive price that is accessible to all without incurring operating losses.

1.6.2 Ubiquity succeeds with attractive pricing

As we argued above, the benefits of FTTH multiply with increased penetration. Price is the classic objection to moving up to a faster Internet service. However, the majority of Internet users who are on dialup are not happy about it and would switch to a more capable service if the price was nearly the same.

In a recent experience with wireless broadband deployment in Oregon, AlwaysOn Network, market research showed that dialup customers would not pay more than $30 per month, regardless of the increased speed. On deployment, customers were given the choice of always-on, 75Kbps for $25 or 300Kbps for $40. 100% of dialup customers who were offered, converted to the service. After a week of experimenting with the speed options, 40% of those opted for the $40 package.

In the next section, we look at the opportunities for new types of service offerings and the community benefits that can accrue from a universally accessible municipal FTTH system.

2 The Community Benefit of FTTH Depends on Your Point of View

The definition of a FTTH "community benefit" largely depends on your point of view. Since more than a third of all Palo Alto households subscribe to Internet services with faster than dialup connections, the availability of high bandwidth is an obviously desirable benefit. For parents with children and their teachers, educational enhancement may be the most desirable benefit.

In the Palo Alto General Survey, the citizens voiced their opinions regarding the potential community benefits of FTTH – the Citizen Wish List:

"If you can envision an important or unique benefit that could result from extending fiber optic services to the home, please describe it here:"

Service Category	Mentions
Broadband service	39
Advanced services	35
Social benefits	35
School and education	27
Governmental benefits	27
Telecommuting/Home business	22
Health and safety benefits	16
Cable TV	12
Increased property values	8
Video on demand	8
HDTV	7
WiFi	5
Open access	6
Improved phone service	5

3 What Defines Community Benefit?

Since point of view shapes the perception of community benefit, let's look at the categories of stakeholders. It is easy to recognize the benefits to institutions…educational institutions such as the Palo Alto Unified School District, Stanford University and the private schools in town; city government; police, fire and utilities; churches; civic organizations and businesses, both corporate and retail. Then, there are social benefits that add to the quality of life for all Palo Altans. Next are benefits to individuals and families derived primarily from specific applications enabled by FTTH.

We will discuss these stakeholder benefits as follows:

Section 4 - Institutional benefits
- ∞ Telecommuting and commercial benefits
- ∞ Educational enhancement
- ∞ Enhanced police, fire and utility services

Section 5 - Social benefits
- ∞ Equal access to technology for all citizens
- ∞ Improved community communication
- ∞ Increased property values

Section 6 - Advanced service benefits
- ∞ Benefits of converged voice, video and data services
- ∞ Energy monitoring and security
- ∞ Telemedicine

Section 7 – Appendix -
- ∞ Web site established to collect further input
- ∞ Additional information

4 Institutional Benefits

4.1 Telecommuting

A major long-term trend in the evolution of business is the replacement of travel with communication technology - telecommuting in the corporate world and online shopping in the retail world - are two thriving examples of this trend.

For all of the businesses located in and around Palo Alto, virtually nothing is actually manufactured in the area any longer. Instead, workers are ferried to expensive office space in extraordinarily expensive private cars to talk on the phone and use the computer. While face-to-face contact is obviously necessary, much of today's and tomorrow's white collar information work can be done from home, particularly when supplemented with video conferencing, which is now becoming commonplace in larger corporate environments.

The essential requirement for effective telecommuting is reliable and available broadband service. Corporations such as Hewlett-Packard, Alza, IBM, Cisco and many others realize the benefit of lower facilities and support costs when workers do some portion of their work at home. The FTTH system will create a very beneficial infrastructure that will encourage companies to locate in Palo Alto by facilitating their corporate objectives for increased productivity.

Telecommuting also can have a substantial impact on commuter traffic into and out of Palo Alto. A worker who works from home just one day a week reduces his or her commuting load by 20%. A Hewlett-Packard study on telecommuting and employee travel released August, 2002, says in part:

> Employee commuting represents another significant part of HP's environmental impact. To reduce the impact on the environment, as well as on our employees and local communities, we have implemented progressive telecommuting programs, including allowing many employees to work from home. Telecommuting cuts energy and materials use and offers sizable financial benefits for HP and its employees, including:
>
> * Reduced driving impacts, such as gasoline and oil use, vehicle wear and tear, highway congestion, and exhaust emissions.
>
> * Reduced demand for facilities resources, including office space, energy use, and land needed for parking spaces.
>
> * Workplace benefits, including increased convenience and productivity, reduced absenteeism, and strengthened employee commitment.
>
> During 2001, HP's telecommuting program saved an estimated 1.3 million round-trip commutes, equivalent to 35.8 million miles not driven and more

than 16,800 tons of carbon monoxide not emitted into the atmosphere. The program also saved HP employees approximately 1.1 million hours of commute time and $10.7 million in automotive costs.

Commuting to work is only one type of employee travel that we are examining. As we have extended our analysis of HP's "carbon footprint," we have learned that air travel by HP employees contributes a surprisingly large portion of HP's CO_2 emissions. Though our air travel dropped significantly last year, we will continue to pursue strategies, including telephone and web conferencing, to reduce the impact of employee travel.

4.2   Educational enhancement

"...connecting the home and school...and broadening the educational opportunities for my children and incorporating this into the curriculum." – Palo Alto survey respondent

Palo Alto is justly famous for its school system and educational choices, both public and private. However, overloaded classrooms and rising operational costs impede the future of education in Palo Alto, as in other communities. A Palo Alto FTTH network begins to open possibilities for real educational improvements in choice, applications, audience and availability as the university communications model demonstrates.

Officials from the Dalton County, GA school district, visiting Palo Alto recently, described their motivation for undertaking FTTH deployment under aegis of their School Board. Using off-the-shelf educational software, they plan to increase classroom hours by 25% without adding facilities or staff. The key is that every student must have access to a capable and secure broadband connection. By their calculations, the educational improvement would pay for the cost of the FTTH installation and laptops for each student without further justification.

4.2.1   Palo Alto Unified School District (PAUSD)

The PAUSD is currently awaiting implementation of the I-Net system, which was created as a result of the franchise agreement between the cable Joint Power Authority (JPA for Palo Alto, East Palo Alto, Stanford University, Menlo Park, and Atherton) and AT&T Broadband. The I-Net links schools and government institutions within the JPA, but provides only dark fiber. The recipients of the fiber must provide all equipment, systems, support and maintenance.

Although the I-Net will connect institutions, as a group they must work out the protocols for exchanging information among themselves. In reality, communication between Palo Alto and, for example, Menlo Park schools, is less critical than communication between PAUSD and parents, students or entities

within Palo Alto. In particular, communication between PAUSD and student homes is particularly promising for educational enhancement.

4.2.2   Stanford University

4.2.2.1 Links between Stanford and Palo Alto

Stanford University began providing computing capabilities in a few residence halls in 1982. Today nearly every "pillow" has fiber service and the first wireless networks are currently on trial at Wilbur and Stern Halls. The University has long been recognized as proponent of Internet accessibility for its students. It was among the first to install fiber optic services throughout campus to every classroom, office and living unit. Many world-renowned business success stories involving the Internet have emanated from Stanford student creations, including Google and Yahoo!

In 1994, Jerry Yang and David Filo were on the same Stanford University electrical engineering doctorate track when boredom, burnout and the inevitable procrastination set in. Yahoo! was created.

In 1995, Stanford University computer science students Sergey Brin and Larry Page collaborated to create their precursor to Google - "BackRub". Their search engine development had begun.

Today at Stanford, in-room fiber network connections offer complete and unrestricted access to the Stanford University Network (SUNet) and the Internet. This provides access to services needed for research and course work: e-mail, the World Wide Web, course servers, online library catalogs and databases, electronic journals (many of which are restricted to SUNet users), and interactive network activities (e.g., chats and games).

To better understand the Stanford Residential Computing offering, see: http://rescomp.stanford.edu/

Colleges and universities in America have fully embraced the benefits of high speed Internet connectivity for their students in their residences. Of the 25 million American residences currently served by broadband connections, Nielsen NetRatings estimates 10 million to be college dorm rooms.

The research company In-Stat/MDR has recently found that the penetration of high-speed Internet and broadband networking into the K-12 and higher education markets is rapidly approaching national ubiquity, with over 90 percent of K-12 schools supporting some type of broadband access and 95 percent of higher education institutions having such access.

The I-Net initiative in Palo Alto, which will provide a fiber optic connection to each public school, is representative of the education market rapidly migrating to a fiber backbone. Compared to other industries, the education is the most advanced in terms of introducing a fiber backbone, with the finance/banking industry running a distant second. Currently, 16 percent of the K-12 and 30 percent of the higher education network backbones are comprised of Gigabit and 10 Gigabit Ethernet connectivity; Stanford University is just now moving to 100 Gigabit Ethernet connectivity for their backbone service.

There is a large market opportunity to serve off-campus locations with broadband access, In-Stat believes. Many universities, including Stanford, are attempting to broaden the reach of their network, either to remote labs/hospitals or university owned off-campus housing. Additionally, there is the opportunity to connect non-university owned housing for students and staff.

In a recent In-Stat/MDR survey of educational institutions, Ethernet LAN connectivity was by far the most prevalent form of access, with 70.2 percent of respondents indicating that they accessed the campus LAN through an Ethernet connection.

For many years, Stanford University has provided video courses for employees of companies, mostly within Silicon Valley. The lack of availability of video links from the point of distribution to the off-campus student limits the distribution of these popular courses. Only companies who are willing to foot the bill for this costly dedicated connection can offer these courses. Therefore, employees taking the courses have to do so at the company facility.

With an FTTH community network in Palo Alto, it is anticipated that Stanford will be interested in providing their video courses to individuals and employees who live or work in Palo Alto. Adult education in general can be expected to be one of the prime beneficiaries of an FTTH community network.

4.3   Trends in Educational Technology

CD-ROMs and DVDs currently represent technology that can replace the heavy textbooks that weigh down the backpacks of our children. With an FTTH system in place, all students could share a single copy of the published material. The publisher would have far better copyright control and could be located anywhere in the world. Furthermore, students could read and be tested on the material at the same time, with the scoring delivered to their student records automatically, relieving teachers of much drudgery and freeing their time for high quality interpersonal interaction with students.

Even more compelling, the use of interactive educational materials online can provide students with high quality educational experiences as it has at Stanford for over a decade, where course servers, online library catalogs and databases, electronic journals (many of which are restricted to SUNet users), and interactive network activities (e.g., chats and games) are now ubiquitous. The effectiveness of these experiences have been mentioned earlier and are further attested to by thirty years of the demonstrable success of private teaching centers for elementary school age children such as the Score Learning Centers, which was started in Palo Alto.

An additional trend that can benefit students is the rise of "peer-to-peer" communication – the popular instant messaging and gaming that children and teenagers are rapidly adopting today. As a variety of Palo Alto citizens have suggested, students could act as mentors or online tutors for seniors and others seeking their skills or vice versa.

Palo Alto stands at the threshold of leadership in offering all its residents, businesses and institutions fiber network-enabled services. Technology changes that are shaping the rest of society inevitably become part of the educational process, as well. Indeed, it is essential that schools to remain efficient, effective and relevant for communication-savvy youngsters.

Computer aided instruction has been under development since the 1960s. It made major advances with interactive videodiscs during the 80s, but the systems were cumbersome. CD-ROMs provided cheap distribution, but did not incorporate communication technology. The Internet has created a capable communication network, but most users still lack access to enabling bandwidth.

With FTTH, all these elements come together – low cost distribution, adequate bandwidth and communication capability. Products like those used today by private learning companies, such as the Score Learning Centers, or enhancement programs provided by public schools can be expected to become available in the home if ubiquitous FTTH is available.

4.4   Local merchant benefits

Local merchants and their customers can also realize benefits from FTTH. Online shopping and product research have proven to be very successful at supplementing bricks and mortar investments. They are currently limited by the small amount of information that can be communicated over a slow connection and the lack of personal contact and two-way communication. A high-speed local FTTH intranet would enable real-time face-to-face conversations with local store personnel, who

could demonstrate products and carry on conversations with the customer. Leveraging the benefit of travel and time reduction for consumers could provide local merchants with competitive advantages in serving their customers and avoiding being displaced by remote online merchants.

4.5 Public Safety Benefits

4.5.1 Citizen education

Currently, the City of Palo Alto engages in citizen outreach on a number of topics:

- ∞ Crime fighting
- ∞ Safety advice
- ∞ Energy saving

The availability of on-demand videos would greatly enhance the information conveyed presently via text pamphlets, especially when delivered interactively via the web, combining the best features of both print and video media. Wireless monitoring and control of appliances is likely in the foreseeable future.

4.5.2 Emergency warning system

Many people, both citizens and the city government, have discussed the desirability of an emergency warning system that would be highly specific it targeting its recipients and independent of the existing television or telephone systems. Such a system could be put in place provided that the FTTH is both reliable and universally available (and the electricity stays on).

4.5.3 Crime detection/prevention

Inexpensive Internet and video technology clearly presents opportunities for individual citizens to monitor their children and houses while away. However, it is also clear that this activity would be most effective is coordinated with the Palo Alto police department, either directly or through private security companies. In either case, working off of a single coherent information system would make the services possible where they are not practical today.

5   Social Benefits

"More community involvement and better communications between members of our community further enhance the desirability of living in Palo Alto."

"Community information infrastructure is very important in the coming age. In the long term the network could also be used for other social purposes including schooling (say a child has a flu and should stay home not to infect other students), medical services (old people that want to live at home, but need help)."

"Cheap experimental community media access would give any/all parts of our community a voice as well as experience with media production."
> *– Palo Alto survey respondents*

These comments reflect the local value of an FTTH system. It is a well known principle of information sociology that the most valuable information is that which is closest to you:
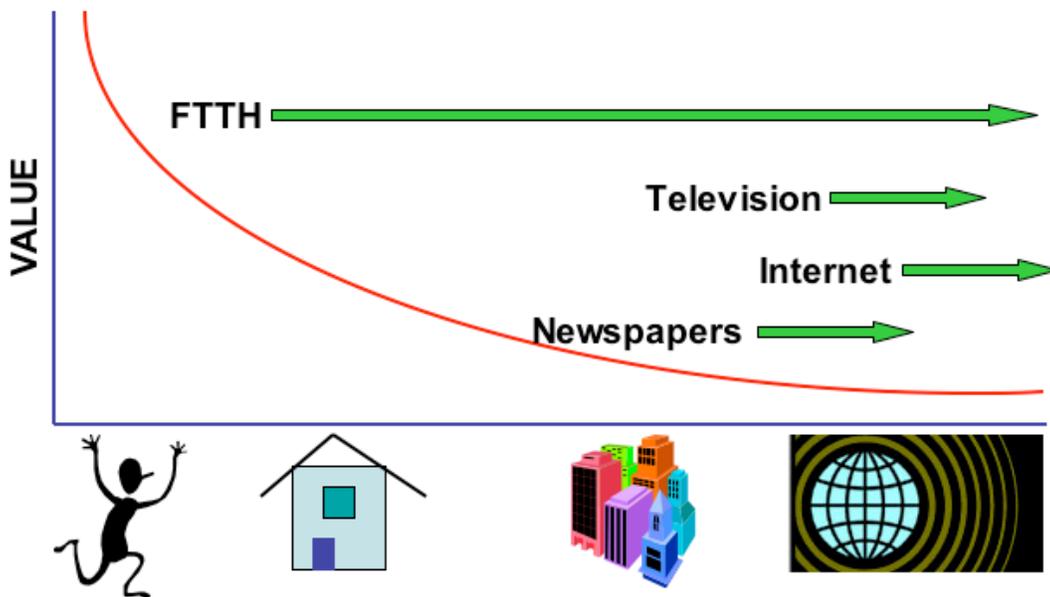

Figure Four – Value of information relative to distance

5.1   Interpersonal communication

The Internet has opened the door for many new types of communication, unforeseen only a few years ago. Interactive gaming, instant messaging and peer-to-peer file sharing have become staple items in the information diets of the younger generation. Many college networks host music jam sessions in which the

performers are located in different dorms or even campuses. Performances are often recorded and some are reaching commercial quality. A robust community intranet would create a breeding ground for the next generation of creative energy and could produce presently unimagined new forms of interpersonal communication.

5.2   Community communication

"Sliding scale access fees could have the wealthy supporting access for the poor, thus equalizing access within Palo Alto. Access to city documents, thick agenda packets and meeting minutes, and structured means of commenting online could increase citizen participation in local and regional decision making, as well as reduce paper use and paper filing hassles. Real time information on public transit (where the buses are and when they are expected at each stop) as well as transit trip planning tools (like that being implemented by MTC on the TransitInfo.org site) could increase people's use of transit." – Palo Alto survey respondent

The vision of using the Internet to enhance our own communities was largely ignored during the frenetic first wave of expansion. Local communication has more value to us in our daily lives than remote web sites. Many experts believe that the community use of Internet technology will ultimately prove to be the *most* important use of the Internet.

5.3   Health care

"Although not unique, perhaps, as a physician I can see the value to older, largely home-bound individuals with chronic diseases whose diseases could be more effectively managed by physicians and others from afar. Fiber optic services would more easily allow face-to-face video communication, as well as data collection. Such real-time, eye-to-eye, voice-to-voice contact would significantly elevate the quality of information and understanding by patient and physician. Palo Alto could also continue to lead in the care of all of its citizens, including those least able to fend for themselves. Such a network could be similarly used for online visits between more healthy patients and their physicians, as well as provide the backbone for physician to physician communication and image transmission." – Palo Alto survey respondent

5.4   Housing values

Some have claimed that installing broadband services will increase housing values. In some individual cases, this might be true. However, in our discussion with Palo Alto real estate experts, the perceived value of broadband was unclear. By far the largest driver of real estate values in Palo Alto is the perceived quality

and value of its public schools. As we have noted, schools of all kinds are among the biggest potential beneficiaries of an FTTH municipal information utility.

6   Advanced Services Benefits

6.1   The value of converged voice, video and data

The Mercury News of November 14, 2002 contains an article about a new Internet service called MovieLink, which allows customers to download major theatrical releases for a nominal fee. In 1976, after years of resistance, Fox Studios released the first group of 50 movies to videocassette distribution, opening the floodgates for the industry we know today, in which video sales equal or exceed box office revenue. MovieLink is just such a seminal event in the evolution of the Internet. However, video quality is poor because: " MovieLink sacrificed quality to achieve tolerable download speeds."

According to the Washington Post, "Internet music reached a milestone in its quest for legitimacy November 13th when two competing Web services owned by major record labels announced arrangements to sell songs from all five of the big labels.

"Pressplay (www.pressplay.com), the subscription service owned by Sony and Universal, announced that it had licensed songs from Warner Music Group, the only major label whose products previously were not available on the site.

Not only will companies like Pressplay, MusicNet and MovieLink succeed when backed by the large entertainment companies, consumers will demand (and pay for) higher and higher bandwidth for better quality and more immediate gratification.

A wide variety of advanced applications have been proposed for the municipal information utility, including:

- ∞ FM radio over fiber
- ∞ Energy management and home automation
- ∞ Security services
- ∞ Remote child and home monitoring
- ∞ Intra-community video phone service
- ∞ Community video monitoring
- ∞ Home health care

7 Appendix

7.1 Further Input on Community Benefits - Web Site

In order to collect further input from the citizens of Palo Alto on all aspects of community benefit, a web site has been established for the purpose. It is neutral in presentation, affording interested viewers access to background documents and resources. It also provides a mechanism for the expression of ideas in an organized and specific forum so that the information can be collected and meaningfully analyzed.

The current home for the site is: http://pub-ftth.zextranet.com/
The anticipated date for public announcement is December 1, 2002.

7.2 Stakeholders list for further research

- ∞ Libraries and library users
- ∞ Health services, doctors and staff
- ∞ Educators
- ∞ Site Council members
- ∞ K-12 students
- ∞ College students
- ∞ Clubs and Associations
- ∞ Church members
- ∞ Hobbyists
- ∞ Home businesses
- ∞ Professional services providers
- ∞ Small and medium businesses
- ∞ Corporate employers
- ∞ Corporate employees
- ∞ Telecommuters
- ∞ Gamers
- ∞ Shoppers
- ∞ Senior citizens
- ∞ Adult living facilities
- ∞ Property owners and managers
- ∞ Tenants
- ∞ Police and fire

7.3 Palo Altans' Top 10 most desired features/benefits from Fiber to the Home enhanced services.

1. **Competitive Price**

2. **Reliability**

3. **High Speed**

4. **Trusted Utility**

5. **City Ownership**

6. **Local Customer Support**

7. **Greater TV Channel Selection**

8. **Better Picture, High Definition TV**

9. **Single Bill for all Telecom Services**

10. **Choice**