

# LAST MILE BRINGING IT HOME

---

## FINDINGS REPORT

### SUBMITTED BY:

**PROFESSIONAL OPTIONS, KEATING CONSULTING SERVICE, INC.,  
RHOMBUS NETWORKS, ENTERSOURCE, INC., KITSAP PUBLIC UTILITY  
DISTRICT #1, VOICE PROCESSING SPECIALISTS , TELEBYTE NW,  
SPRINT, WEST SOUND TECHNOLOGY PROFESSIONALS ASSOCIATION,  
AND DIGIBODE, INC.,**

To

**SUBCOMMITTEE ON PRIVATE SECTOR LAST MILE SOLUTIONS**

KITSAP REGIONAL TELECOMMUNICATIONS COMMITTEE (KRTC.ORG)  
KITSAP REGIONAL ECONOMIC DEVELOPMENT COUNCIL (KITSAPEDC.ORG)

-KITSAP COUNTY, WASHINGTON-

17 JULY, 2002

## Table of Contents

<i>Executive Summary</i> .....	4
1. <i>Purpose</i> .....	4
2. <i>Findings</i> .....	4
3. <i>Recommendations</i> .....	5
4. <i>Thanks</i> .....	5
<i>Detailed Report</i> .....	6
1. <i>Purpose</i> .....	6
2. <i>Vision – That to which we aspire, but to which we may not realistically attain</i> .....	6
3. <i>Goal – That which it is reasonable to expect we should attain</i> .....	7
3.1. <i>Goal Defined</i> .....	7
3.2. <i>Reasons for the Goal</i> .....	7
4. <i>Background</i> .....	8
4.1. <i>Kitsap Regional Telecommunications Committee 2002 Work Plan Goals</i> .....	8
4.2. <i>Subcommittee on Private Sector Last Mile Solutions</i> .....	8
5. <i>Overview</i> .....	9
5.1. <i>Foundational Issues</i> .....	9
5.2. <i>Overview of Existing Conditions</i> .....	9
5.3. <i>Given Assumptions</i> .....	11
5.3.1. <i>Primary Bottleneck is Last Mile Connection</i> .....	11
5.3.2. <i>Secondary Networks Support Last Mile Connections</i> .....	11
5.3.3. <i>Match Solutions to User Applications and Market Considerations</i> .....	11
5.3.4. <i>User Adoption Will Depend on Availability, Cost and Marketing</i> .....	11
5.3.5. <i>Once a Circuit is Established, Other Services Are Possible</i> .....	11
5.4. <i>Future Considerations</i> .....	11
6. <i>Analysis Methods</i> .....	12
6.1. <i>Overview of Technical Characteristics of Broadband</i> .....	12
6.2. <i>Detailed Evaluation Criteria</i> .....	12
7. <i>Access Technology Options and Evaluations</i> .....	13
7.1. <i>Wireline</i> .....	13
7.1.1. <i>Digital Subscriber Line (DSL)</i> .....	13

7.1.2.	Hybrid Fiber/Coax (HFC) – Cable Networks .....	13
7.1.3.	Pure Fiber Optic Solutions (FTTx).....	14
7.1.4.	Traditional Dial-Up Access Plain Old Telephone System(POTS) .....	14
7.2.	Fixed Location Wireless .....	15
7.2.1.	Unlicensed Spectrum 802.11B.....	15
7.2.2.	Licensed Spectrum Local Multipoint Distribution System (LMDS) .....	15
7.2.3.	Free-Space Optics (FSO) .....	15
7.2.4.	Satellite.....	16
7.3.	Mobile Wireless.....	16
8.	<i>Existing Service Providers and Infrastructure</i> .....	16
8.1.	Incumbent Local Exchange Carriers (ILECs).....	17
8.1.1.	Qwest .....	20
8.1.2.	Sprint.....	20
8.1.3.	CenturyTel.....	20
8.2.	CLECs & ISPs (using ILEC infrastructure).....	21
8.3.	Local Wireless Providers.....	21
8.4.	Cable Firms with HFC Networks .....	21
8.3.1.	Charter Communications .....	21
8.3.2.	AT&T Broadband .....	23
9.	<i>Potential Plans for New HSD services</i> .....	24
9.1.	General Questions and Issues .....	24
9.2.	Market, Supply and Demand Considerations .....	24
9.3.	Economic and Competition Considerations .....	25
9.4.	Legal Considerations .....	25
10.	<i>Community Based Solutions (Local Utility Districts) and Kitsap PUD</i> .....	25
10.1.	KPUD’s Business Role.....	26
10.2.	Current Last Mile Connections .....	26
10.3.	Paying for the Last Mile Infrastructure .....	26
10.4.	Steps to Establish an LUD .....	28
10.5.	Ongoing Operations and Support.....	28
11.	<i>Potential Public Sector Actions</i> .....	30
12.	<i>Report Recommendations</i> .....	30
12.1.	Continued Public Education & Promotion.....	30

12.2. Explore LUDs and last-Mile Delivery Systems.....31

12.3. Promote Expanded Deployments of all HSD Services and better Service Plans .....31

13. Resources .....32

13.1. Infrastructure to Leverage .....32

13.2. Local Internet Service Providers.....32

13.3. Reference Models of Deployments.....32

13.4. Public Education and The WSTPA.....32

13.5. Potential Funding Sources .....32

14. Supporting Data.....33

14.1. Demographics & market information .....33

14.2. CLICK!NETWORK BY TACOMA POWER .....34

14.3. Appendix.....35

15. Report Contributors .....36

15.1. Bios of authors of this report.....36

## List of Figures

Figure 1. Kitsap County Fiber Optic Backbones ..... 10

Figure 2. Kitsap County ILEC Territories & Fiber Routes ..... 18

Figure 3. Kitsap County DSL Service Areas (Existing and Proposed) ..... 19

Figure 4. Charter Communications Service Territory ..... 22

Figure 5. Public/Private Development Models ..... 24

Figure 6. Estimated Cost to Connect Fiber Per Home/Business..... 27

Figure 7. LUD Service Provider and Customer Relationships Diagram ..... 29

## LAST MILE – BRINGING IT HOME

### Findings Report

#### **Executive Summary**

##### **1. Purpose**

The purpose of this document is to describe the telecommunications infrastructure in Kitsap County, and to propose potential improvements in services and deployments for the greatest economic benefit to small businesses and residents. The highlight is on High Speed Data (HSD) telecommunications services, given industry trends in technology and network convergence, and the positive economic and environmental effects of telecommunications. Kitsap County demographics are dominated by small businesses and residential users, hence the focus on bringing benefits to smaller users.

##### **2. Findings**

- Kitsap County has an extensive and growing HSD telecommunications network. There have been, and are continuing to be, significant investments in telecommunications infrastructure by existing providers. The performance level of this current generation HSD network is on the same order as other major commercial areas of the country, with typical 256Kb/sec to 1.5Mb/sec service offered.
- The Kitsap Public Utility District #1 (KPUD) backbone represents a significant new communications resource for the county. Third party retail providers will be needed to provide the connecting infrastructure, bridging the last mile to end-users.
- The formation of Local Utility Districts (LUDs) is proposed as a vehicle for creating this infrastructure. While LUDs could overlap areas with existing HSD service, there are many areas without HSD service. This would certainly apply to new developments. Areas not served by existing providers (for economic reasons) could benefit from the financial advantages of LUDs, with lower rates of returns and long term funding to spread costs.
- Proposed LUD infrastructures based on fiber to the end user would offer much higher levels of performance, potentially more applications, and competition in services with consumer choice. For example, 100Mb Ethernet service would provide sufficient bandwidth to support interactive video applications which are not possible over current Digital Subscriber Line (DSL) and Cable network offerings. However, LUDs are not without significant risks; financial, legal and market issues warrant further study.
- With some areas offering only one HSD service, there is still a need for competition.
- The AT&T Broadband cable networks on Bainbridge Island and northern Kitsap County, recently acquired from Northland Cable, do not support HSD services and will require significant upgrades. Until this occurs, users in these areas will have fewer choices for HSD services.
- Sprint will begin deploying DSL in the Poulsbo area as of Third Quarter, 2002. This will increase competition and expand services to small businesses.
- While Charter Communications is now marketing HSD cable to small businesses, AT&T Broadband is still targeting residential users.

### 3. Recommendations

- Promote the use of telecommunications to end users, both to prove/increase demand and create more economic substitutions. This will reduce traditional transportation costs (roads, bridges, buses, trains, etc.) and their environmental impacts. Despite other actions taken, this facilitates greater user buy-in to telecommunications, and supports all other initiatives to improve communications.
- Explore LUDs for fiber-to-the-home (FTTH) and potential wireless solutions. This provides more bandwidth to end-users at lower costs and/or expands services to unserved areas. Plans which do not replicate, or significantly overlap offerings of the existing vested interests, will generate the least amount of direct economic competition (and market risk). However, some overlap is to be expected and can create competition. The best plans should factor in balance between market risks and positive outcomes.
- Support AT&T Broadband efforts to upgrade cable networks for Bainbridge Island and northern Kitsap County. Furthermore, encourage AT&T to market its HSD cable products to small businesses.
- Support Charter Communication's efforts to bring its HSD cable modem products to small businesses, and extend into commercial areas.
- Encourage Sprint, Qwest and CenturyTel to continue expanding DSL deployment footprints within current financial constraints. Focusing on user benefit, areas without any current HSD products will benefit most from added DSL deployments.

### 4. Thanks

We thank those involved in the creation of this report. Without their participation, or sacrifice of personal and professional time, this report could not have occurred. Our special thanks go to:

Doña L. Keating	Professional Options
Charles Keating	Keating Consulting Service, Inc.
Dave B. Pabst	EnterSource, Inc.
Jeff Mattox	Rhombus Networks
David Jones	Kitsap PUD #1
Rand Hein	Voice Processing Specialists
Skip Malette	DiGiBode, Inc.
Jim Kendall	Telebyte NW
Brad Camp	Sprint Communications
Jane Nishita and Stella Ley	Qwest
Jerry Rotondo	Charter Communications
Dan Roso and Manson Hanks	CenturyTel
Nancy L. Stump	West Sound Technology Professionals Association (WSTPA)
Wini Jones	Bainbridge Island Economic Council

# LAST MILE – BRINGING IT HOME

## Findings Report

### Detailed Report

#### 1. Purpose

The purpose of this report is to facilitate availability of broadband internet access to homes and businesses across Kitsap County, Washington – taking it the last mile from the internet backbone to its terminus. By establishing this high-speed, large capacity Internet connectivity to residents of Kitsap County - public, private and commercial - we enhance the quality of life and business in our region. Through establishing this core regional capability, we attract attention to Kitsap as a place businesses desire to relocate. We potentially improve our environment and reduce the need for major capital highway and other infrastructure improvements. We reduce the need for workers to commute outside Kitsap, and enable residents to take fuller advantage of services offered to them through broadband Internet connectivity.

Our purpose in publishing this report is to address options for increasing the scope of broadband Internet connectivity, and plan for future actions to implement this growth. The within document provides background on broadband internet connectivity, identifies the current state of technology within the county, and addresses our evolution towards a super highway of information flow - from content providers, to home, office, and/or home office users.

Specifically, our goals are:

- Outline the importance of communications
- Provide foundational assumptions and detailed assessment criteria
- Document resources and existing available services
- Evaluate existing and potential solutions
- Provide a framework for future efforts

#### 2. Vision – That to which we aspire, but to which we may not realistically attain

Ninety percent (90%) of all Kitsap County business and residents have reliable Internet access at their home or office, with data transfer speeds of at least 500 kilobits per second, at the cost of less than \$50.00 per month. Over fifty percent (50%) of all Kitsap County residents, and ninety-five percent (95%) of all Kitsap County businesses, are connected to this information super highway.

By establishing demand, content providers continue to expand offerings which include:

- Voice Over Internet Protocol (VOIP) - reducing the need for copper telephone connectivity, and allowing for reduced telephone costs
- Entertainment on Demand - allowing home viewers to watch first-run movies, when they want to watch it

- Improved gaming capabilities
- Online shopping
- In-home monitoring of elderly and mobility-disadvantaged people
- Home security monitoring from remote locations
- Business offerings
  - Real-time remote medical diagnostics
  - Medical data archiving and cross-sharing
  - Video collaboration
  - Telecommuting, Remote offices

By establishing a ready demand pool, content providers will increase their quantity and variety of content. This in turn increased customer demand for service providers and content...a cycle of continual growth in the supply and demand for these services.



Thus, increase usage of communications creates a “virtuous” circle of upwardly spiraling reward. The tremendous value in making this a special type of utility is obvious, impacting all other elements which support our communities.

### **3. Goal – That which it is reasonable to expect we should attain**

#### **3.1. Goal Defined**

Small businesses and residents of Kitsap County seek increased access to low-cost, high-speed Internet connections (i.e.: Last-mile). Our role is to:

- Increase availability of high-speed, low-cost data services
- Increase the geographical areas served by these services
- Promote maximum cooperation between private and public sector ventures

Specific targets would facilitate measurement of our progress in these areas.

#### **3.2. Reasons for the Goal**



- Access to services is considered an essential element for a high technology business climate wherein economic growth, cleaner environmental practices, and family wage, community-based jobs can be realized.
- Direct applications of technology are extensive: Web browsing, E-mail, Messaging, Interactive games, Audio, Multi-media, Video streaming and on demand, etc.
- Utilizing communications technology supports many other goals:



tele-health, smart growth, education, etc. Telecommuting, satellite offices, and relocating businesses require advanced communications, as do existing businesses.

- Transporting bits instead of cars and people, communications reduces pressure on transportation systems and pollution, and promotes conservation. Distance learning reduces the need for physical facilities, and increase access to higher education as well as lifelong learning models.

## **4. Background**

For the past few years, the Kitsap Regional Telecommunications Committee (KRTC) functioned on an ad hoc basis to address telecommunications issues. This year, the Kitsap Regional Economic Development Council (KREDC) adopted KRTC as one of its formal program committees. The purpose of KRTC is to "develop and maintain a forum for telecommunications providers and users that focuses on the expansion, improvement and cooperation of all telecommunications needed to enhance the region's competitiveness in recruiting and retaining primary job businesses. The committee shall provide leadership, facilitation, and support by means of this forum to complement the needs of providers and users, with the overall goal of enabling 'state of the art' telecommunications in the region."

In order to achieve this purpose and move forward with work plan objectives, KRTC was formalized to include 21 voting members. It holds regular monthly meetings and maintains a forum for discussion of relevant issues.

KRTC held a retreat in January 2002 to flesh out Work Plan Goals. The Committee voted on items under each work plan goal they felt were most important for its focus. A copy of the retreat minutes can be found at [www.krtc.org](http://www.krtc.org).

### **4.1. Kitsap Regional Telecommunications Committee 2002 Work Plan Goals**

- Increase awareness of Kitsap businesses about telecommunications assets
- Explore uses of telecommunications infrastructure and demonstrate advantages to business and civic life
- Facilitate hook up of "last mile" solutions to end users throughout the county
- Educate public leaders and policy makers about the benefits and needs of telecommunications in the county

### **4.2. Subcommittee on Private Sector Last Mile Solutions**

Regarding last mile solutions, KRTC determined it was vital to explore public/private partnership solutions. As a result, a work group was formed to pursue the public sector issues while KRTC, on a parallel and coordinated track, formed a subcommittee to address private sector last mile solutions. Subcommittee chairman is Doña L. Keating (also Vice Chairman of KRTC) of Professional Options, The first meeting was held April 2, 2002. A copy of detailed minutes - including appointed members and action items - can be found at [www.krtc.org](http://www.krtc.org).

The subcommittee's goal is to explore technologies, economics, policies, and strategies associated with the last mile challenge, undertaking efforts to foster deployment and use. Eight

members were appointed to spearhead these efforts in five (5) areas: 1) providers and partnerships; 2) services and costs; 3) funding; 4) deployment; and 5) education and lobbying, with interim participation welcome from key interested parties.

## **5. Overview**

### **5.1. Foundational Issues**

- Kitsap PUD, through Northwest Open Access Network, or NOANet, is in the process of deploying a high-speed, high-capacity fiber optic backbone, adding tremendous potential access to a large number of Kitsap residents. This backbone is scheduled to go into service July 30, 2002.
- Kitsap is not a major market, leading to potentially lower infrastructure investments. This is, in part, due to lower Return On Investment (ROI). Efforts to increase or aggregate demand also increase utilization & ROI, making Kitsap more attractive to private investment.
- Kitsap does not fit the official criteria of a rural/distressed area, presenting a challenge in securing those grants and funding opportunities.
- Government entities can support private ventures by implementing uniform laws and a smoother permit process. Government can also support private ventures by providing infrastructure, and lobbying for state laws which legalize municipal networks (thereby reducing potentially costly lawsuits). However, governments must also be mindful of competing with existing services and its potential effect to increase or reduce services within the marketplace.
- Effective cooperation creates a meshed network of services for maximum availability of low-cost, high-speed connections.

### **5.2. Overview of Existing Conditions**

Kitsap County has an extensive and growing HSD telecommunications network. There continues to be significant investments in infrastructure by Incumbent Local Exchange Carriers (ILECs) and Cable providers. Between cable modems and DSL, many, but not all areas of the county have at least one type of available HSD service.

There is a significant need to expand offerings, provide open access, and increase competition over more territory. In Northern Kitsap and Bainbridge Island (areas without updated cable networks), DSL is the only option. Due to distance limitations of DSL, service areas are sparse. In Poulsbo, Sprint begins deployment of DSL beginning Third Quarter, 2002. This will add competition and expand services to small businesses.

Cable networks typically target residential users. Recently, Charter Communications began marketing HSD cable to small businesses. Until AT&T Broadband expands its service to small business users, competition between cable and DSL products in areas where they overlap will continue to be limited.

The Kitsap PUD backbone represents a significant new communications resource for the county. Third party retail providers are needed to bridge the last mile to end-users. The formation of an LUD offers the potential to build ultra-high capacity, customer-owned infrastructure.

Customer-owned infrastructure offers the possibility to take advantage of the latest improvements in fiber distribution. The Last Mile Subcommittee is researching costs and actual deployment of fiber to the home and business. Additional surveys are required to gauge the level of consumer interest, and graph a price/demand curve.

Areas of Kitsap with extremely low density may not receive cable data networks or DSL services for some time. In these areas, wireless services may be the best option.

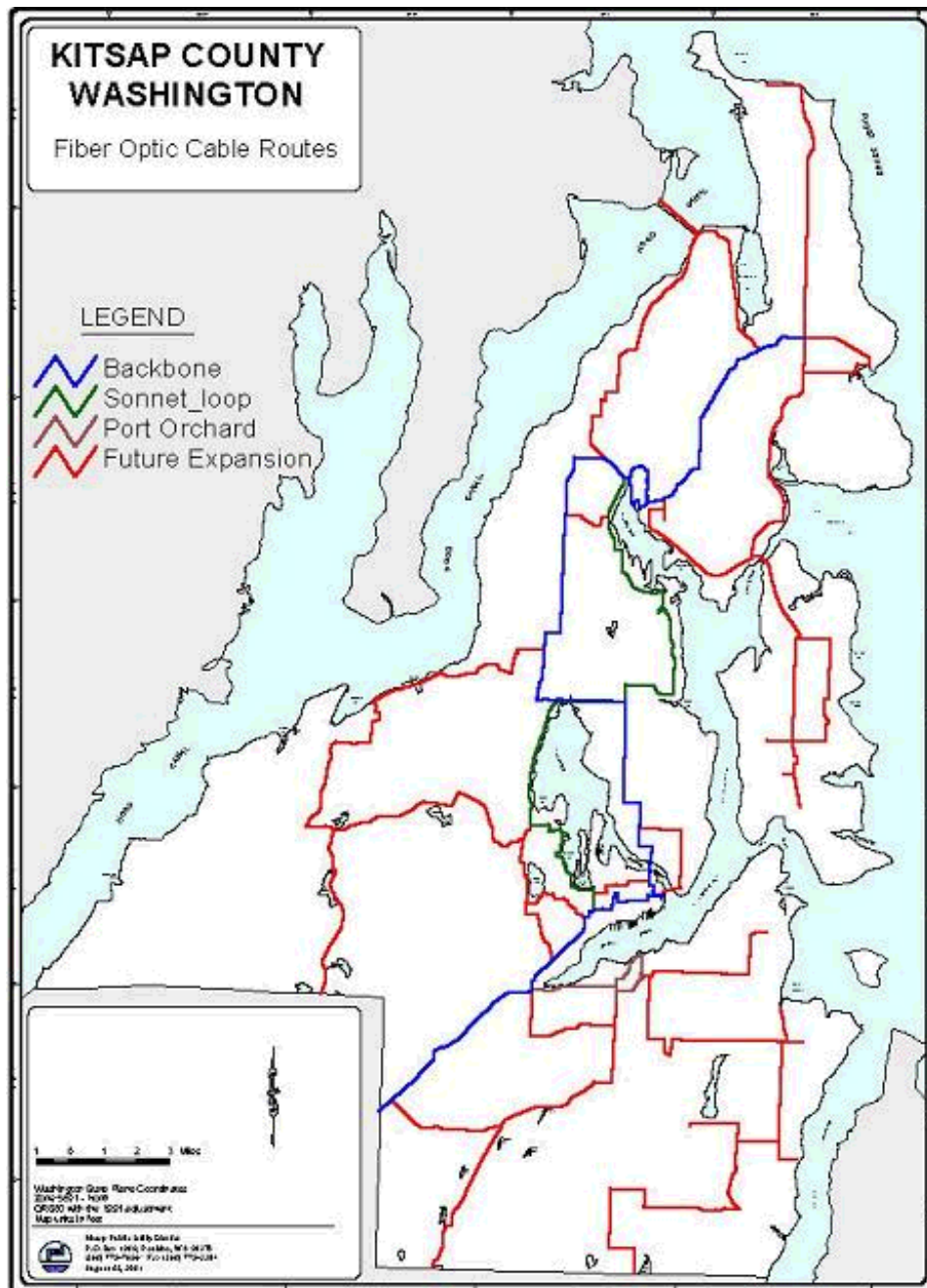


Figure 1. Kitsap County Fiber Optic Backbones

### **5.3. Given Assumptions**

#### **5.3.1. Primary Bottleneck is Last Mile Connection.**

The issue in its broadest sense is essentially that of last-mile infrastructure. It is the means by which we establish circuit (or connection) which transfer digitized data of any type (text, voice, video, etc.) to end users. This is the most costly to develop and is the bottleneck in bringing advanced communications services to end-users.

#### **5.3.2. Secondary Networks Support Last Mile Connections**

Another important consideration is the development of upstream networks on the local, metropolitan and national levels. Existing private interests maintain these "backbone" connections.

The Kitsap PUD NOANet project will provide additional local backbone capacity and redundant routes. Refer to Figure 1 for a map of this deployment.

#### **5.3.3. Match Solutions to User Applications and Market Considerations**

The ideal circuit capabilities vary based upon user and application. Thus, no singular solution is expected to fit all customers. Services with improved cost-performance are favored over those with lower cost-performance. Some customers are satisfied with dial up services.

#### **5.3.4. User Adoption Will Depend on Availability, Cost and Marketing**

Adoption of services will depend on cost and availability of services. There is an element of chicken & egg, in that demand cannot grow until the market is educated regarding new applications and the need to make economic substitutions.

Public policy can foster expedient adoption through awareness of services and efficient internal processes via Internet (such as permitting, public notices, zoning, utilities, public meetings, etc.).

#### **5.3.5. Once a Circuit is Established, Other Services Are Possible**

Once the circuit is established, many current and future applications are supportable given sufficient circuit capabilities (bandwidth, jitter, latency time, terms and quality of service). *Limitations in terms of service are important if they restrict applications or increase costs to end-users.*

### **5.4. Future Considerations**

- Convergence of Public Switched Telephone Network (PSTN) and the Internet is a given.

- Capacity in the global and national networks can scale rapidly. Removing speed limitations in the local link will move the “bottleneck” upstream but should not be a long-term limiting factor.
- Ideally, new solutions should be positioned to adopt evolving network protocols and standards for harmonization with new networks. IP transport and Ethernet protocols are given examples.
- Future applications incorporating video will require significantly more capacity.

## **6. Analysis Methods**

Whether the infrastructure is copper wire, glass fiber or a wireless connection is not material, except that different mechanisms have vastly divergent theoretical performance, cost of implementation, maintenance and services.

### **6.1. Overview of Technical Characteristics of Broadband**

Technology providing a “broadband” level of service can be measured and compared using the following aspects:

- Speed (bandwidth) in terms of bits per second - Measured in kilobits (KB) or megabits (MB) per second. Broadband is technically defined as exceeding 200 KB per second. Applications with TV video quality would require at least 3 MB per second.
- Symmetry between upstream and downstream capacity - Most consumer services are asymmetrical, offering more downstream capacity than upstream, typical with current web usage patterns. As consumers adopt applications generating more data, i.e., VoIP or interactive video, the need for greater upstream capacity will grow.
- Latency and Jitter - Communications quality can also be measured in terms of latency (time between request/response) and jitter (bursty transmissions). Lower latency times and less jitter are critical for applications such as VoIP.
- Guarantees of Bandwidth, Service Level Agreements (SLAs) - Consumer level services do not typically guarantee performance, which can vary depending on local traffic. Business level services guarantee local performances up to connections to the outer network, and restrict downtimes.
- Always-on is a significant quality improvement. Service is generally always available, critical for essential services such as 911 access.
- Controls on Applications and Content and usage of service (Terms of Service) - This can address whether a connection can be used for sharing in a home network, allowed levels usage, static IP addresses necessary for servers, etc.
- Implications of Network Design/Architecture - Issues which address whether or not a network is robust, secure, and has sufficient capacity to avoid severe drops in performance under load.

### **6.2. Detailed Evaluation Criteria**

- Coverage/Geography - Where is service available and what are the deployment issues
- Performance: Bandwidth, symmetry, latency, and jitter
- Cost: installation and ongoing monthly service fees
- Service plans and terms: guarantees of performance, restrictions on applications
- Network Robustness/Reliability/Security

- Legal issues
- Funding issues
- Economic and Market Risk issues
- Future expansion potential

## **7. Access Technology Options and Evaluations**

A communications circuit between the source of service and end user is needed to provide access. This is the crux of the Last Mile issue. Generally, the nationwide network has significant capacity. The greatest limitations exist in the “last-mile” connection to the end user. The following discusses currently available Last Mile access solutions.

### **7.1. Wireline**

Wire-line is anything requiring a physical line between the end user and service providers’ access point. This can be copper pairs (telephone lines), coaxial cable or fiber.

- Labor and access to a right-of-way are significant components of the total cost
- Installation costs substantially more for buried cables than aerial installation on poles
- Cost for electronics at each end of the line is more than the wire itself

#### **7.1.1. Digital Subscriber Line (DSL)**

Digital signals over existing twisted pair copper wire infrastructure. Offered by ILECs and Competitive Local Exchange Carriers (CLECs), and typically the only low-cost, high speed service offered by most local Internet Service Providers (ISPs) with the exception of some wireless solutions.

- Coverage: Available only in areas near DSL provisioning points. Maximum distance from end user to the DSL service location is approximately 15,000 feet. Line issues (in line pair-gain devices, digital loops, bridges and taps, etc.) limit DSL in other areas.
- Performance: Speeds from 256KB to 7MB/Sec. Drop off is significant as distance from access point increases. Symmetrical and asymmetrical services offered. Latency and jitter times are generally low.
- Cost: from \$40 per month to low hundreds. Within the budget of small businesses, but high enough to prevent wide spread consumer adoption.
- Terms: Business and consumer terms available
- Robustness, reliability and security are good
- Legal issues: Generally resolved
- Funding issues: Current financial limitations of the providers will limit deployment to slated areas.
- Economic and market risk
- Future expansion: While improvements in performance have occurred, and data circuits will likely supplant existing analog lines, it seems unlikely that DSL has enough capacity to carry HDTV level signals.

#### **7.1.2. Hybrid Fiber/Coax (HFC) – Cable Networks**

- Coverage: Available in southern and central Kitsap, generally to residential areas. The lack of penetration into commercial areas is an important limitation on usability for small businesses.
- Performance: Speeds from 512 KB to 1 MB/Sec and up. Asymmetrical, with lower upstream performance (typically 128KB). Latency and jitter times are generally low, but can vary due to congestion.
- Cost: from \$40 per month to \$100. Better performance per dollar than DSL but still high enough to prevent wide spread consumer adoption (average 15% take rate within areas served by HSD). Sole vendor does not provide competition to insulate against rate hikes.
- Terms: Mostly consumer oriented, but business plans coming forward now. Business plans will offer performance guarantees.
- Robustness and reliability are good. Shared network access with a node could present a minor security issue, which is offset by encryption. VPN highly recommended in general for any secure communications over the Internet.
- Legal issues: Generally resolved
- Funding issues: incumbent funding
- Economic and market risk. Economic risk with any monopoly provider. Possible laws to demand open networks if cable firms dominate over competitive alternatives.
- Future expansion. DOCSIS 1.1 (ready upgrade) offers direct path for performance improvements, adding quality of service and bandwidth controls. DOCSIS 2 offers increased upstream performance, than when combined with node splits. Could offer significant expansion capability and is a considering factor in home fiber network build-outs.

### **7.1.3. Pure Fiber Optic Solutions (FTTx)**

- Coverage: nonexistent as of now. Plans for trial areas underway.
- Performance: Ultra high – 100Mb per second to 1 GB per second and beyond. Ultra high local capacity. Costs and connection to the outer network would still limit Internet performance.
- Cost: Monthly operational costs expected to be higher than DSL or cable. Similar costs to install, possibly less than separate new services, but still a significant additional cost where infrastructure already exists.
- Terms: Consumer and business plans.
- Robustness, Security and reliability are good.
- Legal issues: Not resolved
- Funding issues: Consumer funding not proven, but testworthy.
- Economic and market risk. Possible consumer choice is a huge positive. Future expansion. Unlimited
- Future: expansion already there. Some architecture issues addressed

### **7.1.4. Traditional Dial-Up Access Plain Old Telephone System (POTS)**

- Coverage: Every where you can get a phone line
- Performance: up to 56kbps on a single line, with enhanced hardware, multiple connections may be bonded for increased bandwidth.
- Cost: \$20 per month
- Terms: Month To Month (MTM)

- Robustness: Fairly stable, easy to re-establish connection if connection lost.
- Legal issues: None
- Funding issues: None
- Economic and market risk. Deployment complete.
- Future: This exemplifies an existing technology beyond the zenith of its capacity. Now requires hardware innovation to remain viable.

## **7.2. Fixed Location Wireless**

### **7.2.1. Unlicensed Spectrum 802.11B**

- Coverage: Typically limited to geographical area of individual customer.
- Performance: With proper deployment, systems achieve 2 to 54 Mbps
- Cost: Hardware costs vary based on application but, in a typical building-to-building bridging situation, solutions can be provided for a one-time cost of under \$10,000.
- Terms: N/A
- Robustness: Reliable if installed properly.
- Legal issues: Resolved
- Funding issues: N/A
- Economic and market risk. N/A, typically a privately implemented solution ROI realized internally.
- Future: Technology continues to advance, which will allow for increased useable bandwidth within this area.

### **7.2.2. Licensed Spectrum Local Multipoint Distribution System (LMDS)**

- Coverage: Typically deployed in a metropolitan area.
- Performance: Comparable to Integrated Services Digital Network (ISDN)
- Cost: Varies by metropolitan area. Individual agreements forged based type distribution points. These points can be varied. Typical examples include buildings, power poles and bridges. MTM attachment rates are negotiated on a case-by-case basis.
- Terms: Varies
- Robustness: Reliable if installed properly.
- Legal issues: Generally resolved, but again must be scrutinized on a case-by-case basis.
- Funding issues: Unpredictability of deployment costs makes cost modeling difficult at best. Build-out costs parallel cellular communications, with a significantly lower take rate by consumers.
- Economic and market risk: High if not deployed in specifically researched areas.
- Future: Depends heavily on sweeping adoption at the consumer level to commoditize bandwidth, thus balancing deployment costs in the long term.

### **7.2.3. Free-Space Optics (FSO)**

- Coverage: N/A, Point to Point only.
- Performance: up to 2.5G bit/sec
- Cost: \$25,000 per pair that supports a 155M
- Terms: N/A



- **Robustness:** Need unobstructed line of sight. Beams are affected by fog, rain and snow, which can disperse the signals; flights of birds can momentarily block the beams.
- **Legal issues:** None known
- **Funding issues:** Balanced based upon application. While not practical for most Enterprise level applications, widely utilized by CLECS, like Terabeam and Cable & Wireless.
- **Economic and market risk.** Varies per model
- **Future:** Higher quality optical signal sources may lower implementation costs

#### **7.2.4. Satellite**

- **Coverage:** Anywhere with unclouded view of southern skies
- **Performance:** 500 Kbps download speeds
- **Cost:** Install \$350-\$500 and \$69.00/mo.
- **Terms:** MTM
- **Robustness:** As reliable as satellite TV.
- **Legal issues:** None known
- **Funding issues:** None, uses existing architecture
- **Economic and market risk.** N/A
- **Future:** Systems upgrades depend on cooperative ventures for hardware upgrades to transceivers, based on extremely high “rocket launch” versus “truck roll” charges.

#### **7.3. Mobile Wireless**

- **Coverage:** Not an issue. Multiple providers have overlapping coverage comparable to cellular
- **Performance:** akin to early modems, speeds vary based on proximity to transmission devices
- **Cost:** varies by provider
- **Terms:** usually bundled with a cellular service contract. – 1yr
- **Robustness:** Limited by the same factors as cellular service, topography and proximity to transmission sites.
- **Legal issues:** None known
- **Funding issues:** Phase 1 of deployment completed in parallel with cellular service
- **Economic and market risk.** Low, this deployment leverages existing cellular infrastructure costs in much the same way dial-up uses existing copper.
- **Future:** Technological advances may narrow the delta between cost and bandwidth.

### **8. Existing Service Providers and Infrastructure**

Investor owned utilities (Sprint, Charter, AT&T Broadband, CenturyTel, Qwest, etc.) have heavily invested in our local communities. Tens of millions of dollars in recent years have been used to collectively upgrade networks and provide HSD services to both residential and business customers throughout the region.

The build-out on today's infrastructure is managed to meet today's demand, and can be upgraded as consumption grows. Both cable and DSL services are robust platforms for e-

commerce, video conferencing and educational opportunities. Fast online experiences drive development of more broadband driven content sites for both businesses and residential users.

The new services are evolving. Sprint has its initial North Kitsap DSL launch in September 2002 and is planning additional footprint expansion in early 2003. CenturyTel quietly launched DSL in Kingston, and plans an expansion to rural Hansville in 2003. Qwest was first to launch DSL in Kitsap and its footprint has expanded quickly to cover many of Kitsap's population centers. Both Charter and AT&T Broadband have hybrid-fiber systems to deliver reliable and high-speed services to tens of thousands of potential customers.

While current performance limitations on DSL and Cable are mentioned as reasons for alternative deployments, improvements in these technologies are continuous and past limits have been removed. Wireless technologies such as spread spectrum are being applied to wireline technologies, enabling gigabit performance over existing copper infrastructure.

A key question for Kitsap: how do we drive the consumption of readily available services? Granted, there are pockets still waiting for a broadband option, but those pockets are shrinking with every new deployment and advancing technologies.

### **8.1. Incumbent Local Exchange Carriers (ILECs)**

County Kitsap has three major ILEC (Incumbent Local Exchange Carriers) or traditional providers of telecommunications services: [Qwest](#), [Sprint](#) and [Century Telephone](#). A map of their respective territories is shown on the next page, followed by general areas with current and projected service by Digital Subscriber Lines (DSL).

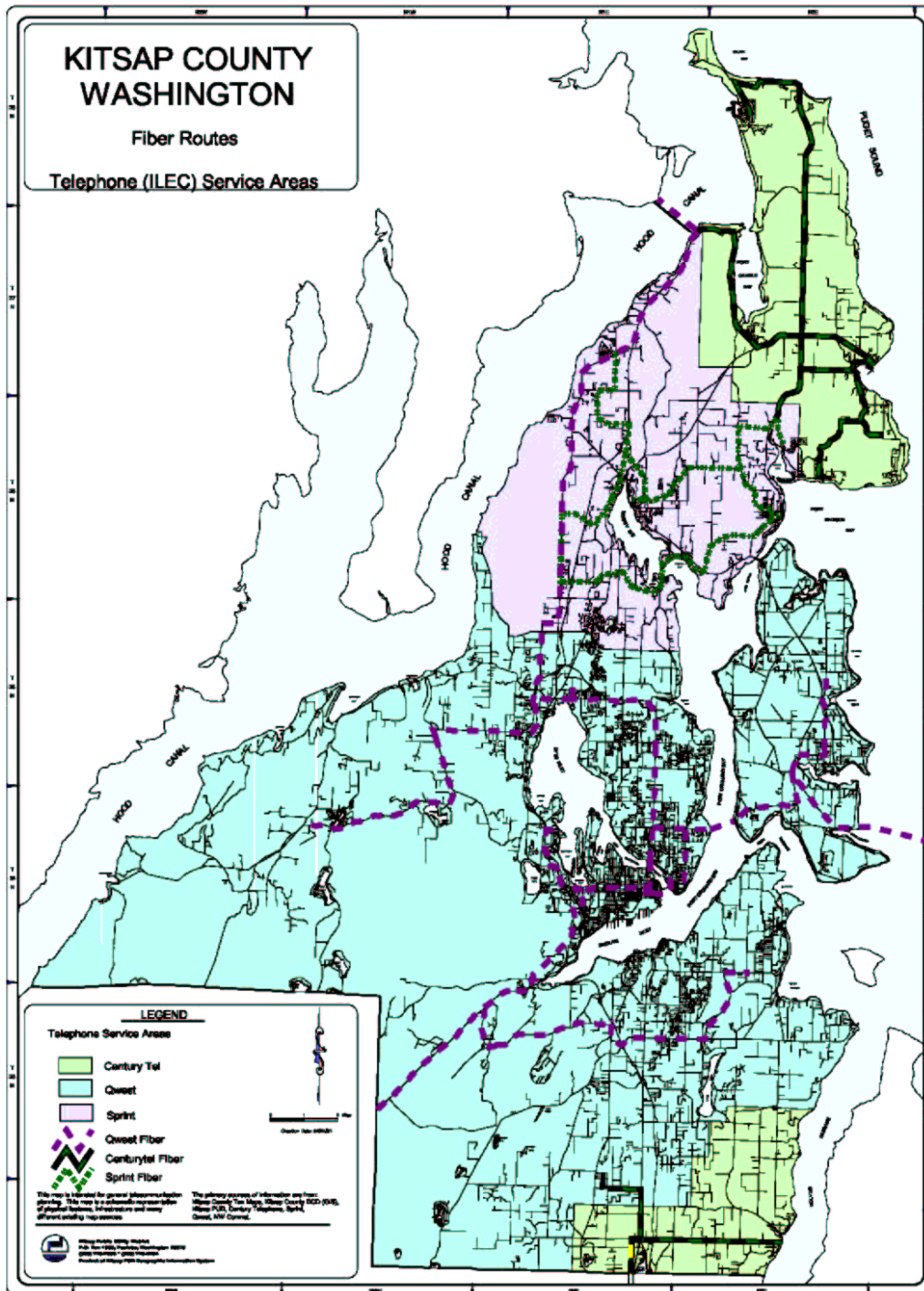


Figure 2. Kitsap County ILEC Territories & Fiber Routes

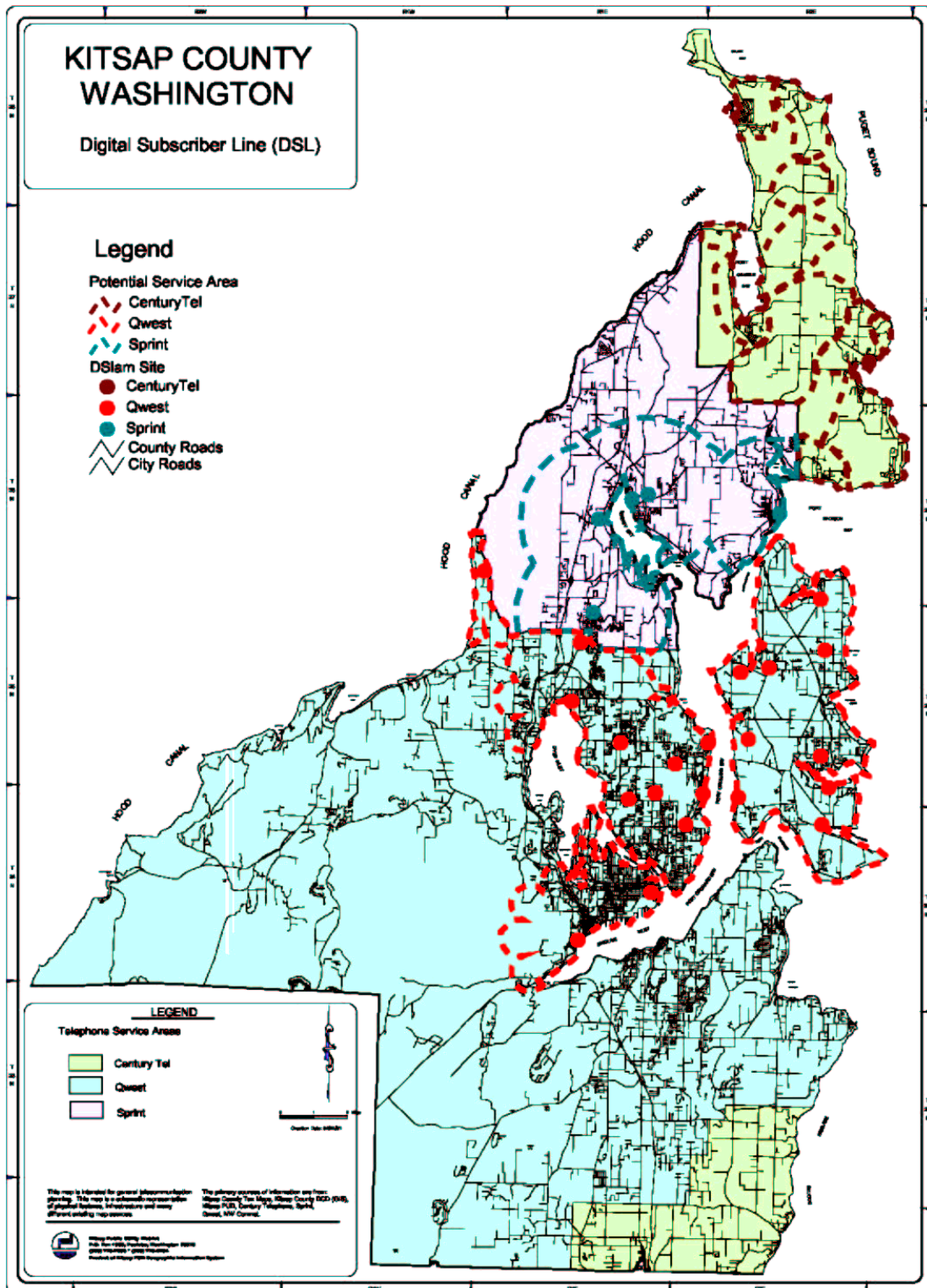


Figure 3. Kitsap County DSL Service Areas (Existing and Proposed)

### **8.1.1. Qwest**

Qwest provides a full range of connectivity options to central Kitsap, ranging from voice lines, ISDN, DSL to megabit services. A self-healing SONET ring, serving Bremerton connected to a regional ring, provides a robust communications platform with routes into and out of Kitsap.

Qwest was the first ILEC to bring DSL service to Kitsap. Initial deployments began in 1998 and included the Bremerton and Bainbridge Island central offices (CO). In 2000, deployment was expanded to Silverdale. In 2001, deployment of 17 remote terminals expanded the footprints beyond the areas nearby the central offices.

Qwest has also continued to upgrade fiber optic connections between central offices. One example is the new fiber optic ring between Silverdale and the Crosby CO (Camp Union. area). This addition doubled the existing calling path capacity, reducing the number of fast busies.

### **8.1.2. Sprint**

This year, Sprint's Local Telecommunications Division will invest about \$22 million in its 60 Oregon and Washington communities where the company provides voice and data services.

With construction projects already underway, the company expects to spend more than \$3.1 million in Poulsbo, and an additional \$16.2 million in the four other geographic regions it serves in two Pacific Northwest states (according to Tom Yates, public relations manager). Some of those funds will result in the deployment of Sprint's FastConnectsm DSL Internet service in 16 communities. Other major network improvement projects include fiber optic expansions.

Taxes on Sprint's telecommunications investments across the two states help cities and counties provide important services, such as schools, and police and fire protection. Based on the company's most recent complete records, it provides nearly \$2 million in property taxes and over \$800,000 in franchise (or utility) fees to counties and municipalities in Oregon and Washington. An additional \$132,000 is collected from customers who live in certain communities, and forwarded to their city governments as part of franchise agreements. Over \$65,000 is paid to the City of Poulsbo in franchise fees, and another \$320,000 to Kitsap County for property taxes.

Sprint's Local Telecommunications Division serves approximately 175,000 customer lines in portions of Oregon and Washington. The company employs about 800 people to provide customer service and support functions. They are based in a dozen different communities. This year, Sprint will distribute nearly \$150,000 in sponsorships and charitable contributions throughout the two states along with the several hundred hours its employees will give through an organized volunteer program.

It is Sprint's goal to be a friend to the community, and provide support for the programs that make our Pacific Northwest communities a better place in which to live.

### **8.1.3. CenturyTel**

CenturyTel provides a full range of voice and data services to the Northern sections of Kitsap, and the extreme southern edge of Kitsap.

CenturyTel, Inc. provides communications services including local exchange, wireless, long distance, Internet access and data services to more than three million customers in 21 states. The company, headquartered in Monroe, Louisiana, is the 8th largest local exchange telephone company (based on access lines), and the 8th largest cellular company (based on population equivalents owned), in the United States.

CenturyTel currently provides DSL service in the Kingston area. This year, CenturyTel is investing in excess of 330,00 dollars in infrastructure improvements. This includes the fiber build to Hansville that is nearing completion. By year-end, DSL remote terminals in Jefferson Beach, Gamblewood, Seatter, Hansville and Twin Spits remotes will be offering service. More sites are planned for the 2003 budget year

## **8.2. CLECs & ISPs (using ILEC infrastructure)**

CLECs also provide voice and/or data services within the county and services across the Local Access and Transport Area (LATA) boundaries defined for the ILECs. CLECs include Allegiance, ATG, [Covad](#), Electric Lightwave, [Focal Communications](#), Integra, Telligent and Worldcom, to name a few. Other organizations, such as contracted resellers of ILEC and CLEC services and/or partners/subsidiaries, provide additional resources.

## **8.3. Local Wireless Providers**

Telebyte NW is a local provider of wireless solutions. Please contact Jim Kendall at [www.telebytenw.com](http://www.telebytenw.com) for further details.

## **8.4. Cable Firms with HFC Networks**

### **8.4.1. Charter Communications**

The Kitsap County network provided by Charter Communications is designed to provide multiple fiber optic cables to local neighborhoods throughout the County. Charter Communications has invested over \$28 Million in upgrading its network. There are approximately 50,000 homes within the territory that are video and data capable, with the exception of areas served by Millennium Cable. Approximately 50% of area customers use video service and some 15% use HSD data products.

The Charter network is fully scalable to meet growth demands for today's needs, as well as the future. The network is capable of providing video-on-demand as well as high definition TV, and other products currently being developed. Charter recently added programs for small businesses, and hired Chris Acuña as the Commercial Account Manager for their new Small Business Internet Service. Their new small business internet service plans are designed to provide fast, affordable, scalable and always-on business-class services to small businesses.

The High-Speed Data product is expandable to meet both business and residential needs, and future requests for speed. The data network is continuously monitored to ensure optimal performance. There are currently two DS-3 circuits serving the backbone, and an additional DS-3 will be added before year-end to maintain optimal service.

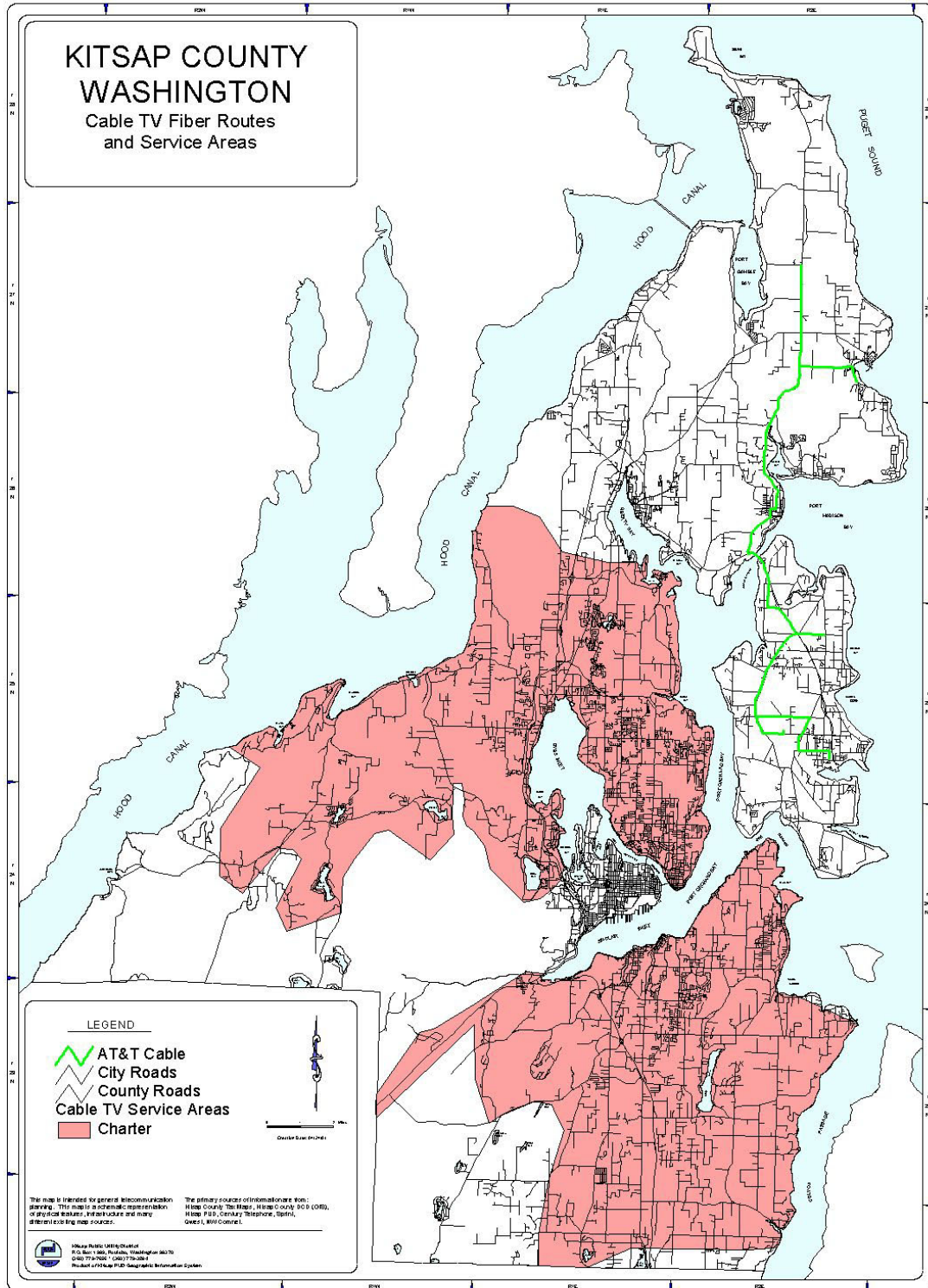


Figure 4. Charter Communications Service Territory

<b>Pipeline Packages</b>	<b>Customer Profiles for Each Package</b>	<b>Benefits</b>	<b>Monthly Rate</b>
Res-Bronze Up to 256k/128k	-Has one computer behind the modem -Primarily uses the internet for email...surfing -Visits sites with graphics/animation -Occasionally downloads software -5 e-mail address -10MB of web space	-Perfect bandwidth for one computer for customer who does not surf that much -Fast email/surfing -Quick access to sites -Quick download ability -Much better than 56k and faster than ISDN and entry level DSL service	\$29.95
Res-Silver Up to 768k/128k	-Has one computer behind the modem -Primarily uses the internet for email...surfing -Visits sites with graphics/animation -Occasionally downloads software -7 e-mail address -10MB of web space	-Perfect bandwidth for one computer -Fast email/surfing -Quick access to sites -Quick download ability	\$35.95
Res-Gold Up to 1.5M/384k	-Has multiple devices behind the modem -Sends/Receives large files-big surfer -Visits sites rich with graphics/animation -Often downloads software -7 e-mail address -10MB of web space	-Multiple devices-high speed access -Large files-no delay -Graphics/Animation quick and clear -Fast downloads -Great for gamers	\$54.95
SO/HO 1 768k/256k	- Shares many computers on one modem -Sends large text/graphics files -Uses FTP for posting to web sites -Consistently downloads software/large files -7 e-mail address -10MB of web space	-Many devices-high speed access -Large files/graphics w/ no delay -Navigation with click of the mouse -Instant download -Great for gamers	\$69.95
SO/HO 2 1.5M/384k	-Shares many computers on one modem -Sends large text/graphics files -Uses FTP for posting to web sites -Consistently downloads software/large files -7 e-mail address -10MB of web space	-Many devices-high speed access -Large files/graphics w/ no delay -Navigation with click of the mouse -Instant download -Fastest package we have -Great for gamers	\$99.95

#### **8.4.2. AT&T Broadband**

AT&T Comcast (Formerly AT&T Broadband, before the merger with Comcast) was the first firm to bring a cable based HSD service to Kitsap. HSD Service areas include Bremerton and portions of Poulsbo.

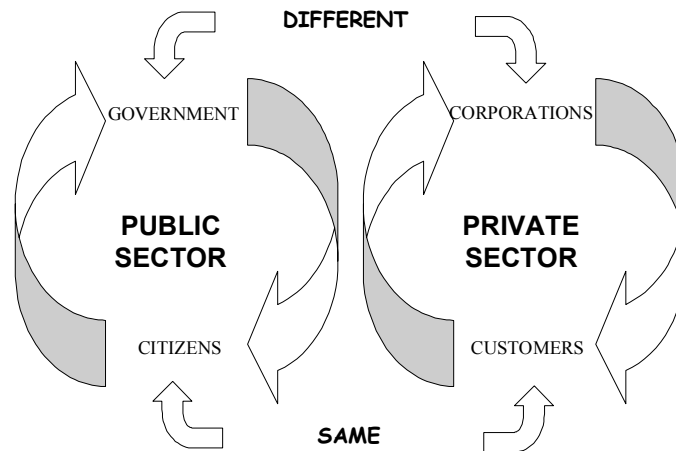
AT&T Comcast recently acquired the Northland cable networks which served Bainbridge Island and northern parts of Kitsap. These systems did not support HSD services and will require extensive upgrades.

Currently, AT&T markets its services to residential users, although some small business users utilize service. Encouraging AT&T to market small business class services within the areas already supporting HSD service server to leverage this infrastructure with the least possible investment.



## 9. Potential Plans for New HSD services

### THE MOST IMPORTANT PART OF THE PUBLIC-PRIVATE PICTURE?



© 2002 DIGIBODE

Figure 5. Public/Private Development Models

### 9.1. General Questions and Issues

- What is feasible, technically and economically?
- How can we fill in the gaps without overbuilding?
- How can we promote the interconnection of infrastructure and expanding service offerings?
- What level of broadband service performance and geographical deployment is necessary to encourage the development of new applications and increase user demand?
- What legal issues exist if creating a new service?

### 9.2. Market, Supply and Demand Considerations

- Demographics of Kitsap County – mostly small businesses and residential users
- Supply and demand economics apply
- Results of Bainbridge Island survey and incumbent provider take rates show consumer price sensitivity
- Although new technologies and services at lower costs can increase demand, in the near term demand is limited. Capital investments in redundant services are financially risky.
- Cooperation and agreements to interconnect and maximize utilization of existing infrastructure reduces risk and increases ROI for the participants.
- Incremental upgrades to provide/enhance services and add backup routes

### **9.3. Economic and Competition Considerations**

- Private firms require ROI to support the development of infrastructure. Government ventures don't require this, generally lack efficiency created by competition.
- The “connection” to the user can break down into distinct arenas: 1) building and maintaining physical infrastructure, 2) cost of transporting bits to/from the outer network, 3) providing end user applications (voice conversations, web hosting/browsing, email, video, etc). 4) providing customer service and billing.
- Both open and closed network business models exist. In closed networks, the provider of physical infrastructure also delivers connectivity, applications, billing and service. Open networks allow multiple providers of service, but depends on accurate allocations for cost of infrastructure, transport, applications and service.
- While some competition exists between different technologies (DSL, HFC, Fiber, Wireless), differences in cost, availability and performance limit the overlap and segment the market
- Once a sufficiently capable data connection is provided (barring any onerous terms of service restrictions), the connection can facilitate “virtual” services from other vendors. This adds competition, even in closed networks.
- The lower burden of regulations, combined with improving technology, favor the common network.
- Overbuilding the network, while increasing competition, may make it difficult for all market participants to economically support their business models.

### **9.4. Legal Considerations**

Plans for new infrastructures using unregulated services (that directly compete with existing regulated services) should factor in the cost and disruption of legal challenges from incumbents. While DSL has more competition, cable modem services face legal challenges in terms of open access networks. DSL offerings are more open to competition, but could become closed if the build outs falter over the next few years. (Note: The complex legal and regulatory issues are subjects of a separate addendum to this document.)

## **10. Community Based Solutions (Local Utility Districts) and Kitsap PUD.**

The Kitsap Public Utility District (KPUD) is a member of NOANet (Northwest Open Access Network). NOANet was formed by 38 public utility districts, primarily in Washington State, to cooperatively use extra capacity on the fiber optic telecommunications network built by the Bonneville Power Administration. KPUD has invested about \$5 million in building a fiber optic cable connecting to NOANet near the Bremerton Airport, near the Mason County line up the Kitsap peninsula to Kingston. Work is nearly complete on this fiber backbone and a “lighting ceremony” is scheduled for July 30<sup>th</sup> 2002. KPUD is also building legs and loops from this backbone to various communities, including Bainbridge Island. Most of those connections will be built in 2002 and 2003.

At various POPs (Points of Presence), KPUD can provide services, including point-to-point connectivity to wholesale customers. An example might be a school district connecting computers in all of its locations in a single, private dedicated network. KPUD only provides

Internet connectivity from the NOANet and data transport, not “content” or additional value added services.

### **10.1. KPUD’s Business Role**

Washington State law restricts KPUD from providing retail telecommunications services. However, to ensure the network is well managed and maintained, KPUD needs to control, maintain and operate the service at the network level, typically terminating at a demarc at the retail customer’s location. The demarc (short for demarcation) is the point where equipment makes the connection between responsibility points of the network service provider (KPUD), and the customer (e.g. in-house wiring).

Various entities can fill the gap between network services and content services, and between wholesale and retail. They are referred to as Telecommunications Service Providers (TSPs), but may be an ISP, homeowner’s cooperative, or other retailing organization. TSPs purchase wholesale services from KPUD and content providers (e.g. Internet, video streaming, telephone, security, medical management, etc.) and resell them to retail customers in homes and businesses.

KPUD as a public trust and is chartered to provide utility services on a cost recovery basis, not generate a profit. KPUD’s network is designed to be Open Access, allowing use and competition to multiple retail TSPs and content providers. It is anticipated that retail customers will have multiple TSPs to choose from. Each TSP may or may not have other services bundled such as Internet (ISP), video streaming and other entertainment services, and voice/video communications such as enhanced telephone. Also, the retail customer may be able to choose these specific content providers if they offer it directly.

### **10.2. Current Last Mile Connections**

As with any competitive service needing connectivity to the retail customer, one of the most important questions is “Who is going to build the *Last Mile*?” Qwest already owns the last mile of copper telephone wire, Charter Communications and AT&T Broadband of coaxial cable. For both technological and business reasons, neither of these last mile connections will be sufficient for the services described above.

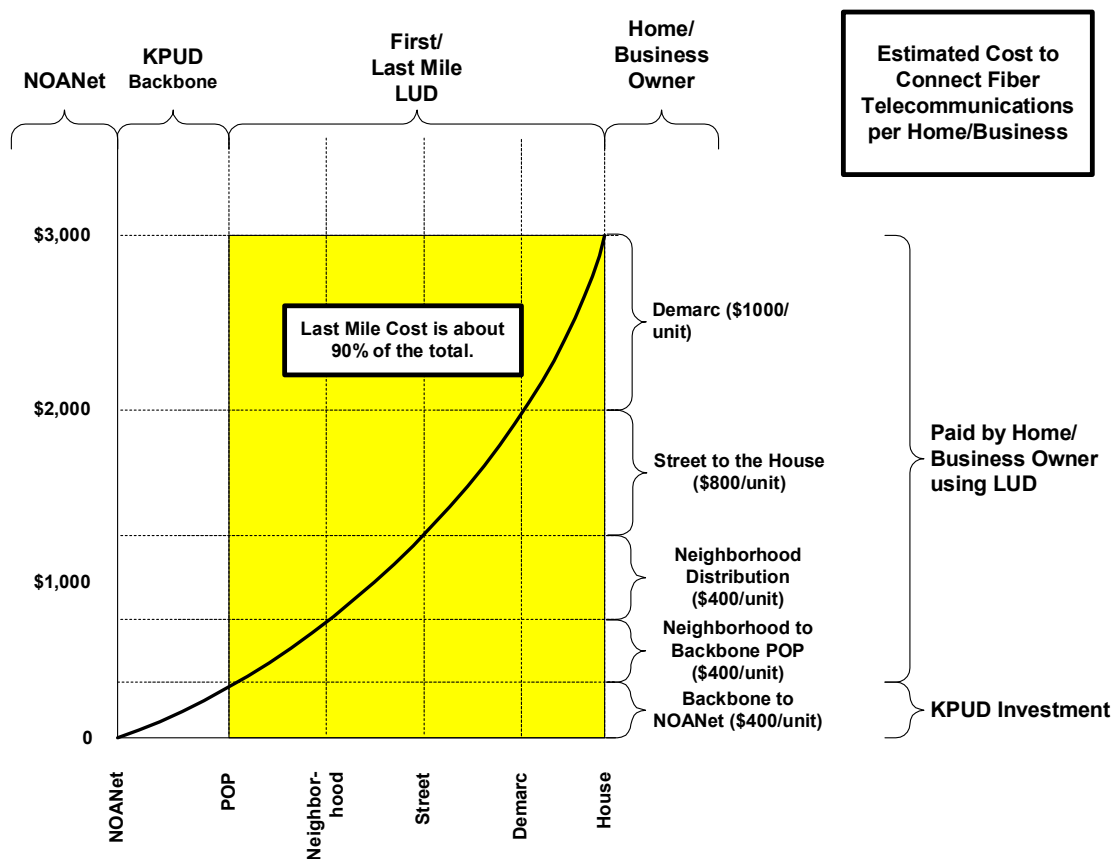
A much bigger issue than the speed limitations of the existing providers’ DSL or cable modems is that of choice and competition. Both Qwest and AT&T have implemented their Internet products, and maintained a high level of control as to what products were available, who provided them, and when and where they were available. In owning the last mile, they can dictate the ISP, whose entertainment services are provided (AT&T), which areas can get service, and when. Without choice, there is no competition. Without competition, availability, quality, content and cost - all suffer. For these reasons, very attractive options are: 1) a new high speed last mile connection, and 2) one that is not owned by a company which will control competition, pricing and services offered.

### **10.3. Paying for the Last Mile Infrastructure**

The cost to connect a home or business entails a number of components. For the purposes of this discussion the categories are:

- Cost of KPUD’s backbone and connection to NOANet
- Cost of distribution from a backbone POP to a neighborhood
- Cost of neighborhood distribution box and cables running by properties
- Cost of connecting from street to home of business
- Cost of demarc at home or business

Of course, each of these costs can be split between the homes and businesses served to determine a unit cost. The backbone is shared by the entire county; a POP may be shared by multiple neighborhoods. The distribution is shared by that neighborhood, and only the cost to run from the street and the demarc are not shared. Below is a chart showing very approximate costs for each of the components on a per unit basis.



**Figure 6. Estimated Cost to Connect Fiber Per Home/Business**

These figures are very approximate. Costs will vary based on volume, whether the cables are aerial or underground, whether conduit is in place or not, and the overall density of the neighborhood. However, the above diagram clearly shows that the “Last Mile” represents about 90% of the overall per unit cost.

This begs the question of “Who is going to pay this cost?” The obvious answer is the homeowner/businessowner/taxpayer/ratepayer. However, the current options are 1) a utility company, 2) a private company wanting to provide this service, 3) government such as a municipality, or 4) the homeowner directly. In the case of a utility or private company, they will seek to recover cost by installation and monthly charges into perpetuity, similar to our current phone and cable systems. They will also maximize revenues and profits, and may wish to sell only their services over the network. If it is government, profits it may be recovered in monthly costs, or borne by all taxpayers. If it is the home/business owner, it is paid for once, not repeatedly. It also becomes an asset to the property, a critical advantage.

The next question is “When will it be installed?” Absent an up front capital base of approximately two hundred million dollars to wire Kitsap County, deployment decisions will be prioritized. Some end users may never receive access, since favor will be afforded to areas where installation is lowest, and acceptance rate, the highest. This scenario is exemplified in the Winslow section of Bainbridge Island, the only area on the island where consumers can access DSL. One of the most equitable ways to determine deployment is by allowing each neighborhood and homeowner to choose when they want it.

The Local Utility District (LUD) is an ideal vehicle to both pay for last mile, and prioritize deployment. Under the guidance of KPUD, home and business owners can form a LUD and develop a telecommunications infrastructure from the demarc of each property to the KPUD POP. This is deemed an improvement and one time expenditure vs. the indefinite model of monthly fees. Owners who subscribe to the LUD up front can choose to have the cost paid over a long period (i.e. 15 years) at a low interest rate. Owners who abstain from subscription pay nothing (“zero assessed”) but must later pay the full unit cost should they choose to subscribe down the road.

With an LUD, “ownership”, the Last Mile barrier is removed, and providers can compete for our business without end users bearing the burden of endless monthly bills.

#### **10.4. Steps to Establish an LUD**

The process to establish an LUD is similar to that commonly used for years. Property owners (homeowners and business owners) collectively request establishment of an LUD by preparing and filing a petition with the utility district. If over 50% of the owners in the defined area make this request, the utility district must proceed with an engineering study to determine feasibility and costs. If less than 50% make the request, the utility district may choose to make the study. Once the engineering study is complete, the utility district develops a cost per unit on a rational and fair basis. Owners can then choose to participate or not. If sufficient owners participate (at the discretion of the utility district), the project is built, and costs apportioned to each participating property through a lien. Construction costs are paid with low cost tax-free bonds. After construction is complete, the utility district assumes responsibility for infrastructure, its maintenance and operation.

#### **10.5. Ongoing Operations and Support**

Separately from the LUD, the utility district will charge a monthly rate to users of the service for maintenance. This maintenance cost will include an amount set aside for normal upgrades necessary to keep the system performing well. It is expected that the electronics at each end of

the fiber will be replaced every 5 years, either due to growth or technical need. The fiber itself will last indefinitely and has no practical capacity limitation.

To pay for the LUD infrastructure, property owners are charged an amount on each property tax bill to repay the lien, and interest.

KPUD is prohibited from selling services to retail customers. As described above (and shown below), a Telecommunications Services Provider or Reseller (TSP) must resell services to retail customers. Additionally, various content providers may provide services to the TSP or directly to the retail customer.

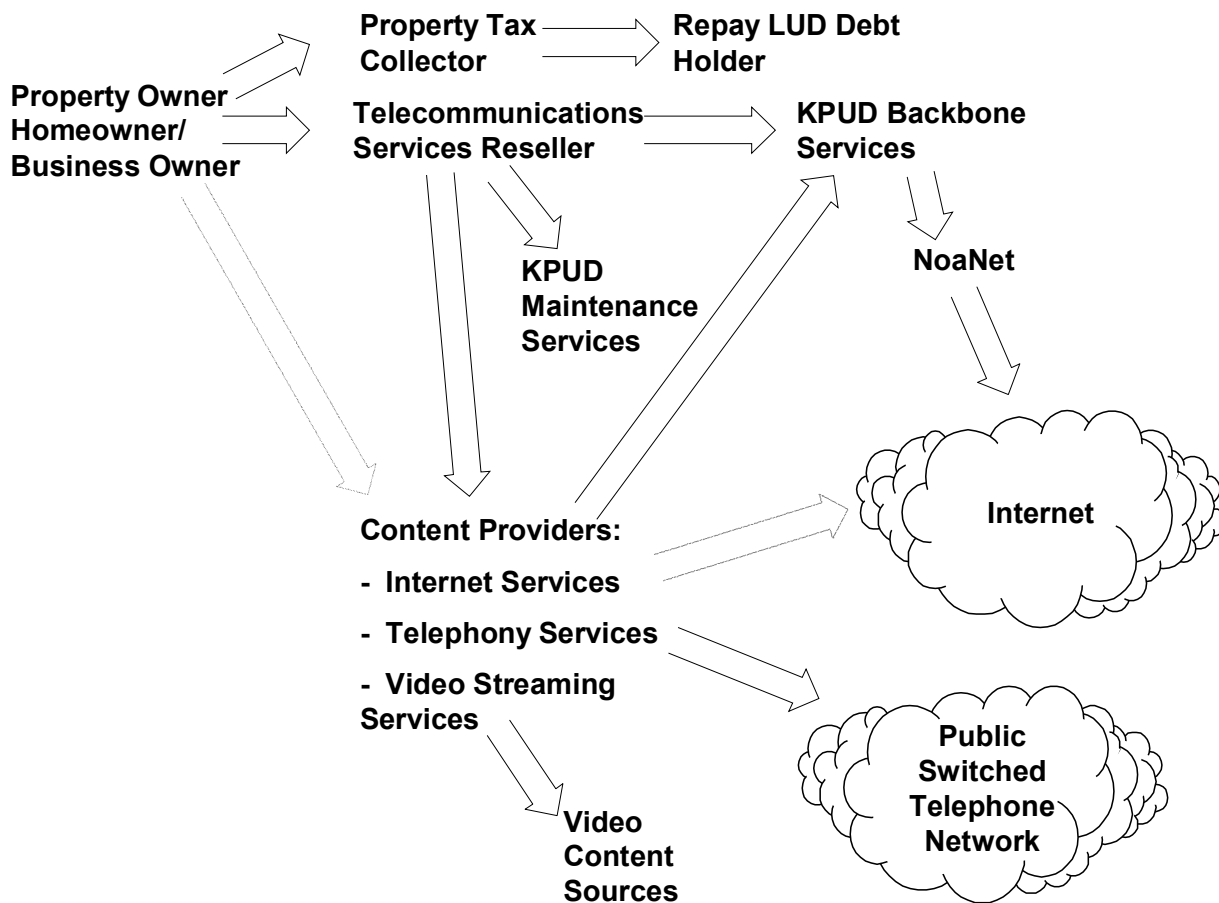


Figure 7. LUD Service Provider and Customer Relationships Diagram

## **11. Potential Public Sector Actions**

The public sector will have a different set of constraints. Governments have access to bond issues and other financial vehicles that best match one-time capital investments with payback over a number of years, and they also have access to a tax base that reduces the risk of default. If a major, one-time investment is to be made, the implication is that this technology must be as future-proof as possible, because it must remain viable for the period of the payoff. The most defensible technology choice in this case is fiber-to-the-home, with a separate fiber to each residence. Fiber has an intrinsic capacity that is huge, but the actual service is determined by the equipment that is installed at the residence and at the head end. With dark fiber running to each customer, the end equipment need not be upgraded for all the users at once but can be upgraded for each consumer at the time of his or her choosing. Thus, this technology base permits different consumers to use the fibers in different ways, for different services, and with different resulting costs for end-point equipment. The consumer can make these subsequent investments, reusing the fiber over the life of the investment. Upgrades are not, however, fully independent as they depend on the backhaul infrastructure. An upgrade will require not only new central office or remote terminal line cards, but also a compatible infrastructure beyond that; the remote terminal or central office rack itself may not be able to switch or route a higher-speed input due to hardware or software constraints.

A municipality serves only its own citizens, so any risk of bad planning must be carried within that community. Further, the voter reaction to miscalculation may amplify the perception of the error, which can have very bad personal implications for individual politicians. Long-term investment in services that do not bring visible short-term value to the citizens may be hard for some politicians to contemplate, because the payoff from this investment may not occur in a time frame that is helpful to them. So a planner in the public sector must balance the fact that most sources of capital imply a long-term investment with the fact that citizens may not appreciate the present value of long-term investment, and may assess the impact of investment decisions based on short-term consequences. This may lead to decision-making that is either more or less risk-averse (given the level of knowledge among the citizens and apparent level of popular demand) than the decision making of the private sector.

## **12. Report Recommendations**

### **12.1. Continued Public Education & Promotion**

In our continued efforts to enhance the telecommunications infrastructure of Kitsap, there is a need to educate the public regarding the uses of telecommunications. There exists a precept that telecom encompasses only the telephonic form of communications. The emphasis needs to be on what is possible with high-speed access by focusing on the current and potential uses, and how they can impact our local quality of life.

Before citizens/end users are expected to support a new fourth utility, they must understand the scope and breadth of telecommunications. By demonstrating practical uses, we can help users realize the effect it can have on their lives, thus increasing value.

Many are unfamiliar with the existing and future applications becoming available. The current perception of telecommunications as just a different phone service, or a quicker means to the

use the Internet, needs to be expanded by the demonstration video on demand, home monitoring, telework, tele-health, education, VoIP, remote diagnostics and more.

Informing the public will require an ongoing effort of education through media and traveling presentation, so that the implications of not having high-speed access in the coming years are clearer.

## **12.2. Explore LUDs and last-Mile Delivery Systems**

Explore LUDs for fiber to the home and potential wireless solutions, to bring more bandwidth to end-users at lower costs and/or expand services to areas not served. Plans which do not needlessly replicate or overlap offerings of existing vested interests will generate the least amount of direct economic competition (and market risk). Although some overlap is to be expected and can create competition, the best plans should factor in balance between market risks and positive outcomes. Several forms of deliver systems warrant detailed study.

- The development of wireless solutions offers the options to providing bandwidth to more remote areas with less density. As there are a number of less dense areas in Kitsap, the research into possible wireless solutions is important.
- The development of Fiber-To-The-Home projects offers the promise of superior levels of service, along with competition in services and consumer choice. Market surveys to prove demand are essential, as is promotion of the use of advanced telecommunications technologies which require very high levels of service and capability.

## **12.3. Promote Expanded Deployments of all HSD Services and better Service Plans**

Supporting existing provider efforts to expand deployment areas and offer new services directly builds upon existing infrastructure. Supporting better service plans is a low cost method to increase availability of services, matching the economic demographics of Kitsap by providing low-cost, high-performance and flexible plans designed for small business users. Specifically:

- Support AT&T Broadband efforts to upgrade cable networks for Bainbridge Island and northern Kitsap County. Encourage AT&T to market its HSD cable products to small businesses.
- Support Charter Communication's efforts to bring its HSD cable modem products to small businesses and extend into the pockets of commercial areas.
- Encourage Sprint, Qwest and CenturyTel to continue expanding DSL deployment footprints within their current financial constraints. Focusing on user benefit and areas without any current HSD products will benefit the most from added DSL deployments.



## **13. Resources**

### **13.1. Infrastructure to Leverage**

- Existing Infrastructure of private sector providers (Qwest, Sprint, CenturyTel, Charter, AT&T, wireless)
- Kitsap PUD backbone
- Dark Fiber

### **13.2. Local Internet Service Providers**

A number of local ISPs ([Donobi](#), [Northwest Network Services](#), [Telebyte NW](#), [TSCNet](#), [Webolution](#)) provide dial-up, frame relay, ISDN as well as DSL service in Kitsap. TelebyteNW is also offering high speed fixed wireless internet service in limited areas. Many different service packages for business and residential users are offered.

### **13.3. Reference Models of Deployments**

- City of Ellensburg
- Click Networks, Tacoma
- Clallam County
- Jefferson County

### **13.4. Public Education and The WSTPA**

The West Sound Technology Professionals Association (WSTPA) can play an important role in supporting the increased use of telecommunications. The highly skilled membership of the organization is well positioned to provide public education, user training on next generation communication applications, newspaper articles on technology and market surveys on technology usage. These efforts support an improved technology-friendly business climate with wider public support for telecommunications.

With its status as an educational non-profit organization, WSTPA also provides the opportunity to apply for grants to support ongoing educational efforts. For details on the organization, visit [www.wstpa.org](http://www.wstpa.org).

### **13.5. Potential Funding Sources**

- National Science Foundation
- Hewlett-Packard
- Intel Corporation
- ILECs and CLECs (Qwest\*, Sprint, CenturyTel, AT&T\*)
- Microsoft \*
- Washington State Department of Transportation Planning - grants for localities to explore options; cost-sharing for field trials

- Local Municipalities and/or Government
- Private sector investors (Business, ISPs, etc)
- Charter Communications
- Tribal Communities
- Verizon Foundation\*
- AT&T Foundation\*
- AOL Time Warner Foundation\*
- Real Networks Foundation\*

<http://www.ntia.doc.gov/otiahome/otiahome.html> - U.S. Department of Commerce National Telecommunications and Information Administration; Office of Telecommunications and Information Applications -- NTIA's Office of Telecommunications and Information Applications (OTIA) assists state and local governments, educational and health care entities, libraries, public service agencies, and other groups in effectively using telecommunications and information technologies to better provide public services and advance other national goals. This is accomplished through the administration of the Technology Opportunities Program (TOP) and the Public Telecommunications Facilities Program (PTFP).

<http://www.dot.state.mn.us/connect> - Trans & Fiber project combined financing

<http://www.dot.state.mn.us/connect/faq.html> - State right of way along highways traded for fiber

\* items denoted have grant/program details in funding sources document

## 14. Supporting Data

### 14.1. Demographics & market information

Excerpts from the Bainbridge Island Survey:

- **Penetration:** 88% own a personal computer, 67% use it for business and personal, 12% for business only of those using computer for business purposes.
- **Home offices** 42% of business users were in home offices. 52% of those with home offices, the income from conducting business in the home is primary income
- **Internet:** 98% of those with computers have some form of internet service
- **DSL** (the only common end user HSD service on BI): 57% want DSL, only 15% want a standard phone line. 51% uncertain if DSL available
- **Usage:** 50% work after hours on line from home. (telework). 69% use the Internet to purchase goods or services, 38% do their banking on line. 29% use the Internet to help with homework. On line investing is done by 25% of the respondents.
- **Performance:** 63% rated speed of on line connection at fair, poor or very poor
- **Price sensitivity:** Average bill 25\$/month. 48% willing to pay for more bandwidth - ranging from \$10 or less to \$20. Only 20% said they would pay an additional \$20 or more per month.

Commentary: there is a high penetration of home offices. Users want faster connections and most are willing to pay \$25 - \$45/month (up to \$20 over the average bill). Only 20% would be willing to pay over \$ 45/month.

## 14.2. Click!Network by Tacoma Power

Tacoma Power's Click! Network ([www.click-network.com](http://www.click-network.com)) is a HFC network. While the original goal of the project was to provide real-time monitoring of the power system, the utility realized early on that other "non-electric" telecommunications services could be offered over the system – with little incremental cost. These services could provide revenue diversity and additional telecommunications services in areas that were previously under-served. In 1997, after four years of detailed research and consideration of numerous alternatives, Tacoma Power began building its own telecommunications infrastructure.

Since network construction began in 1998, Click! has completed 775 miles of a robust hybrid fiber coaxial, two-way telecommunications network. At the core of the network is a fault tolerant Sonet-based redundant fiber architecture. Nearly every city resident and business has access to competitive cable TV services and several choices of high-speed Internet service providers. Details of services:

- **Cable TV:** launched in August 1988 - 20,800 cable TV customers, 35-40% penetration in some neighborhood nodes, 32% penetration overall.
- **WorldGate:** In November 1998, Click! was the first cable system on the west coast to offer a new Internet over television service - WorldGate. Using WorldGate customers can surf the Internet and use email without a computer. 20% of Click!'s cable TV customers currently subscribe to WorldGate.
- **High-Speed Commercial Grade Internet Services.** Since launch in March 1999, over 100 new businesses have located in the city, in part, due to the new telecommunication services. Several competitive local exchange carriers and access service providers have partnered with Click! and use the network's transport facilities to offer their own brand of value added services -- like competitive local telephone exchange service, connections to the Internet, and web hosting. Example customers are: Mellon Russell Company, DaVita, Insynq Data Utilities, Optic Fusion, Piper Jaffrey, Labor Ready, Sunshine Management Services, Advanced Telecom Group, Electric Lightwave, Inc., and many indirect sub-customers.
- **Open Access, Cable Modem Network.** Following a 10-month technical trial, Click! proved that a broadband network could support multiple Internet service providers and offer customers a choice for high-speed Internet services via cable modem. 4,800 Internet over cable modem customers riding Click! Connections through three ISPs: HarborNet, Net Ventures, Inc., and Advanced Stream. This model of modified open access (multiple ISPs riding the same, shared broadband network, rather than a proprietary solution) was the first of its kind in the nation.
- **Utility Monitoring:** Load management, power network diagnostics, real time automated meter reading
- **Institutional Network:** Schools, public safety, and other municipal buildings being connected to the network under the direction of the City at incremental cost, to allow video, voice, and data connectivity.
- **Increased Competition:** Since the network's construction, other wire line providers (AT&T and Qwest) have invested millions in upgrading their infrastructure, to meet the competition.

**Future Directions.** With policy maker approvals, Click! Network plans to construct in other Tacoma Power jurisdictions (University Place, Lakewood, Fircrest, Fife, Unincorporated Pierce County). Click! is also considering several initiatives that will expand the retail and wholesale offerings on the network and continues to drive the economic engine in Tacoma - providing choice, and partnering with other competitive access providers for business and residential services.

For Further Information, contact Diane R. Lachel, Government and Community Relations Manager, Click! Network / Tacoma Power [dlachel@click-network.com](mailto:dlachel@click-network.com)

### 14.3. Appendices

- Appendix A: Broadband Technologies - <http://books.nap.edu/html/broadband/appA.html>
- Appendix E: List of Acronyms - <http://books.nap.edu/html/broadband/appE.html>
- From Pew Internet and American Life Project. *The Broadband Difference: How online Americans' behavior changes with high-speed Internet connections at home* <http://www.pewinternet.org/reports/toc.asp?Report=63> This is a study that reveals the increased usage by users, in time spent and number of activities, when using higher speed connections. It suggests that even higher usage can be expected with even higher bandwidth.
- From Dan Bricklin(creator of VisiCalc) *Small Players Matter* <http://www.bricklin.com/smallplayers.htm> This clarifies the idea that the web, despite the presence of large media entities, is actually valued for the many small presences. The web is not necessarily a mass media. It may reach a massive number of people but it connects individuals and small groups. Personal note: interconnections within the county will facilitate this kind of small activity.

## 15. Report Contributors

### 15.1. Bios of authors of this report

Doña L. Keating, Subcommittee Chair

[www.professionalloptions.org](http://www.professionalloptions.org)

Doña L. Keating is founder and President/CEO of Professional Options, a business, information technology and policy consulting firm that uses strategy development and change management to help clients establish or refine their methodologies. Clients span the globe from government, to private, to corporate - and include utilities, governments, corporations, and national and multilateral organizations throughout the world.

Keating has participated in advisory forums with Congressman Jay Inslee regarding internet privacy issues and laws, as well as an ongoing advisory counsel to the National Republican Senatorial Committee and National Republican Presidential Roundtable. Keating also focuses on providing business, marketing, technology, telecommunications and policy consulting to major companies and organizations such as National Research Council, Organization for Economic Co-operation and Development, United Nations Environmental Programme, National Science Foundation, Qwest, AT&T, MCI, West Sound Technology Professionals Association, Kitsap Regional Economic Development Council, and many others. Professional Options also publishes The Guardian Newsletter, an international environmental publication as well as offering web hosting and design, marketing and advertising, and conferences and events planning services.

CAREER HIGHLIGHTS - Before forming Professional Options, Keating enjoyed an eleven-year profession in corporate, environmental, mergers & acquisitions, and financial law. Throughout her career, Keating has been influential in the drafting and formation of international policy. During the 1980's she was involved in drafting amendments to the Secondary Mortgage Loan Act; the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), commonly known as "Superfund"; Superfund Amendments and Reauthorization Act (SARA); and Resource Conservation and Recovery Act (RCRA) regulations governing the management of solid, hazardous, and medical waste.

In the early 90s, President Clinton named Keating along with other industry and labor leaders, consumer advocates, human rights organizations and legal teams for participation in a 28 country tour of primary and subcontractor locations for Nike, Liz Claiborne, Phillips Van Heusen, L.L. Bean, Tweeds, Patagonia, Nicole Miller, Kathie Lee and others. The committee was formed to advise the White House on issues affecting the international labor and environmental practices, and resulted in the creation of international laws and standards.

The U.S. Senate named Keating as a 20th Century Republican Leader, and awarded her the Republican Senatorial Medal of Freedom, the highest honor Republican members of the U.S. Senate can bestow. She has also been honored by numerous governmental, humanitarian, and educational organizations for her leadership. Keating is also a co-founder of the Ronald Reagan Center in Washington, D.C.

PROFESSIONAL ASSOCIATIONS - Outside Washington State, Ms. Keating has served in several organizations, including Chicago Council on Foreign Relations, Smithsonian Associates, Harvard Club of Chicago, USA Today Small Business Panel, and National Association of Female Executives.

In Washington State, Ms. Keating currently serves on the board of West Sound Technology Professional Association (WSTPA) and Olympic College Business Management Advisory Committee. She is Vice Chairman of the Kitsap Regional Telecommunications Committee, and Chairman of the Subcommittee on Last Mile Private Sector Solutions. Keating was the driving force behind the Earth Day event EarthAware2000, and as a major sponsor of Kid's Day America, a nationwide environmental event for children. She is a member of the Silverdale and Bainbridge Island Chambers of Commerce, and the Washington State Science & Technology Roundtable.

Charles Keating, President  
Keating Consulting Service, Inc.  
cak@kcsco.com  
TEL. 360.613.5860

Keating Consulting Service (KCS) is a comprehensive information technology-consulting firm. Its mission is to integrate people, business and technology. To this end, it provides a complete range of project management, telecommunications, computer hardware support and software development services.

Incorporated in 1987, KCS has worked with a national base of clients in many different industries, including distribution, retail, construction, manufacturing, aviation, insurance, health care, law, investment, software development, economic development, government and more. On a local level, KCS has been very involved in promoting community telecommunications and economic development

- Working with the KREDC telecommunications committee. KCS helped organize the October 2001 "Get Connected" telecommunications conference in Silverdale, WA and gave a presentation on assessing telecommunications technologies. KCS worked on the educational grant writing committee and provided consultations on telecommunications infrastructure, and is currently working with both the private and public sector sub-committee initiatives.
- Provided consulting services to the Kitsap PUD regarding the development and deployment of the Internet backbone.
- Helped create the new KREDC web site, along with Professional Options and other firms, an important site for economic development and the dissemination of business relocation information.
- Founding member of the West Sound Technology Professionals Association. This organization is actively recruiting local technology professionals in order to create a wider base of technical resources within Kitsap County.
- Technology consultant to Rep. Jay Inslee on privacy and other tech-policy Initiatives.
- Actively promoting increased deployment and utilization of telecommunications services via presentations along with Professional Options
- Co-hosted the April 2000, Earthaware Environmental Conference
- Member of the Washington Technology Alliance

Dave Pabst, President  
EnterSource, Inc.  
davep@entersource.com  
TEL. 360.769.8783

Dave Pabst has over 20 years experience in planning, managing and supporting world-wide projects, with both hands-on project management and consulting experience. He is president of EnterSource, Inc., a team of Enterprise Resource specialists providing global management consulting services, focusing on program and project management needs across integrated companies. His expertise in international cultural awareness and operating in cross-cultural project teams is a significant asset with his clients, as he helps them improve time to market and competitiveness. In particular, Mr. Pabst has established EnterSource to provide fundamental project and resource management and controls in global telecommunications and high technology companies. He is an active member of the Puget Sound chapter of PMI, and is the author of "Inside the Looking Glass - Cultural Diversity in Project Teams," and numerous other papers and presentations to Project Management symposia around the world. He resides in Kitsap County, Washington.

Jeffery D. Mattox  
Rhombus Networks  
Jeffm@web-o.net

A native of Washington State's Kitsap Peninsula, Jeffrey Mattox has over 16 years in the electronics and communications industry. Since his departure from Rockwell Avionics in 1991, Jeff has added many disciplines to his telecomm resume.

His background as an avionics technician and a microelectronics technician placed him on solid footing as he went to work on his first broadband local area network for the Puget Sound Naval Shipyard in 1991. Since then Jeff has had the opportunity to work with clients in both the public and private sector. Ranging geographically from The Fred Hutchinson Cancer Research Center and Computer Associates, to Airbiquity and The Naval Hospital Bremerton, where his network engineering skills facilitated the hospital's designation by Wired Magazine as one of the 100 most wired medical facilities in the United States. Copper, fiber optics, wireless, point to point laser and satellite communications are all areas in which Jeff has expertise.

Having recently left Focal Communications, a CLEC and as the architect of Rhombus Networks Telecommunications Division, he has focused on developing agencies with LECs, CLECs and IntereXchange Carriers (IXCs) to continue to bring value to his customers by leveraging his knowledge to improve the customers bottom line.

Brad Camp, Public Affairs Manager  
Sprint Corporation  
brad.camp@mail.sprint.com

Sprint is the local communications provider in 60 Oregon/Washington communities, including parts of Kitsap County. Brad has been with the company since 1997 and brings a decade of media relations and public affairs experience to the table.

Sprint has been a part of the telecom group since its inception in Poulsbo. Cooperative efforts of the group have helped with market planning and deployment of a Tier-1 Internet POP in Poulsbo, completion of SONET Fiber Optic rings and a Fall 2002 district wide broadband DSL launch in Sprint's North Kitsap territory.

Nancy Stump, President  
West Sound Technology Professionals Association (WSTPA)  
nstamp@wstpa.org

Nancy Stump has an extensive background in technical software support, spending 12 years at Fujitsu North America Headquarters providing dedicated account support and senior liaison for U.S. developers and financial (ATM) subsidiaries around the world. Her specialty is customer service and account management.

In support of Kitsap, she has written several articles on telecommunication activities and assisted in presenting the Get Connected event held October 2001.

In addition to WSTPA activities, she is a member of the Kitsap Regional Telecommunications Committee and Last Mile Private Sector Subcommittee, Chair of the Education/Deployment Subcommittee and advisor for the Olympic College Computer Information Systems Advisory Board.

David M. Jones, Business Manager  
Public Utility District #1 of Kitsap County  
djones@kpud.org

As Business Manager with KPUD#1, David Jones is currently responsible for all telecommunication contracts, franchises, request for qualifications and request for proposals. Coordinating a 4 million dollar build of fiber optics through Kitsap County. Prior to this position, David was Office Manager, primarily responsible for managing and steering all accounting, computer hardware and software activities for the District. He has brought the District into the information age by promoting, educating and guiding current technology within the organization. By establishing a stable network, compatible user-friendly programs KPUD was able to automate many processes. A Geographical Information System was established in 1991 and proved to be a very valuable resource in solving water resource issues. The use of in-house electronic mail, calendar and Internet access has kept the District in the age of information and communications.

Jones is a former Technology Education/Industrial Arts Instructor with School District #15, Cut Bank, Montana for sixth through twelfth grade students. Subjects included Computer Aided Drafting, Woodworking, materials processing and Computer Basics. Additional responsibilities included managing the Adult Education program, establishing job opportunities for disadvantaged students within the school district. He also coached 3 different sports in both the High School and Middle School while employed by the District.

#### ORGANIZATIONS

Kitsap County GIS Users Group – Chairman 1991-1997  
Washington State Coaches Association - Member  
Washington State Wrestling Officials Association - Member  
Washington State Springbrook Software Users Group Chair 1996-1999  
North Kitsap Little League Board Member  
Kitsap Regional Telecommunications Committee Member  
Olympic College Drafting/GIS Steering Committee Chair – 1996-98

Skip Malette, President  
DigiBode Inc.  
Skip@whoever.com

Skip Malette has been involved in small business implementations of PCs and networks for the last 22 years. Prior to this he was a photographer, filmmaker and publisher. His computer roots go back to high school with a National Science Summer Scholarship to Texas A&M University in Math and Computer Science. He received his BA from the University of Kentucky with a strong emphasis on communications.

Malette has found the exciting changes in telecommunications in Kitsap County to be a fortuitous match for his interests and background.

For the last seven years, Malette has taken a strong interest in telecommunications costs and infrastructure. He formed DigiBode Inc. to address the long term needs of homes in a wired age. DigiBode Inc. provides design, consultative, and implementation services for home networking, a field that will expand around the installation of Fiber-To-The-Home.



James H. Kendall, President  
Telebyte NW Internet Services  
jim@kendaco.telebyte.com  
Tel. 360-613-5220

Jim Kendall opened the first Kitsap County based Internet Service in July 1994. Current service area includes NW Washington State/Puget Sound from Olympia to Bellingham, Shelton to Bellevue/Redmond and surrounding areas.

He recently formed NW Commnet, a joint venture with Convergence Technologies which provides wired, fiber, and wireless Internet and telecommunications in Kitsap and Mason Counties, as well as commercial/carrier grade co-location services in Bremerton, WA.

Jim received his BSEE from University of New Mexico in 1975, and completed postgraduate courses in Systems Management at University of Southern California. He also completed numerous trade and professional courses.

His professional associations and affiliations include being Founding Board Member and current President of Washington Association of Internet Service Providers (WAISP), one of the first State ISP trade associations in the nation; Member, Institute of Electrical and Electronic Engineers; and Arbitrator, Better Business Bureau since October 1993.

He is a retired Lieutenant Commander with the US Navy, having served 21 years. Jim has been a resident of Silverdale Washington since 1980. He is married with two adult daughters and two grandchildren.

Wini Jones, Consultant  
Fearless Leader, Inc.  
wini@fearlessleaderinc.com  
Tel. 206 842 7603

Wini Jones has been a resident of Bainbridge Island since 1978. As a business consultant she prepared business Offering Memorandums, a Feasibility Study for the Strawberry Pier Cultural Center (1998), Bainbridge Island Telecommunications Survey of Need and Use (2001), and was on the three person team that negotiated the transfer of the cable franchise from Northland to AT& T (December 2001). She was a former Vice President of Merchandising, Design and Advertising for Roffe Inc. for nearly 30 years, where her responsibilities included product design (Roffe brand product 67 - 88, Barrier outerwear brand - 88 - 92, Roffe and Demetre brand products 92 - 96) and new market planning (US and foreign licensees). While there, she developed new fabrics, insulations, and more with suppliers. Wini also produced sales collateral materials, which involved the planning and execution of national marketing, advertising and public relations campaigns.

Lary Coppola, Editor & Publisher  
The Kitsap Business Journal  
biznews@wetapple.com  
Tel. 360.876.7900

Lary Coppola is originally from Ft. Lauderdale, Florida and relocated to Kitsap County in 1975. An electrician by trade, he earned a Master Electrician certificate of competency and was later hired as IBEW Local 728, press secretary.

In 1979, Lary opened a photography business where his clients were realtors and builders. The business evolved into a studio, with the real estate work resulting in the MLS book and a pictorial real estate magazine of homes for sale in the area. He later sold the studio to focus exclusively on the publishing business. By the mid 1980s Coppola either owned or was partner in 7 real estate magazines in various areas. He later sold his interests, keeping only the one for Kitsap County. He then purchased Homes & Land franchises for Kitsap, Mason, Jefferson and Clallam counties and grew them into 3 magazines. Five years later, Lary's company was the largest desktop publisher in the county. In 1988, he started The Kitsap Business Journal and shortly thereafter, became the largest independent publisher in Kitsap County, and third largest overall behind The Sun and Kitsap Newspaper Group. It has since grown from 20 pages to 56 pages and climbing.

#### Community Service Activities:

- Vice President, Finemaster, Port Orchard Rotary (22-year Rotarian, helped establish the DARE program in South Kitsap while serving as youth committee chair, as well as serving on numerous other committees over the years, including the board of directors)
- Member, Kitsap County Planning Commission
- Member, Kitsap Regional Telecom Committee
- Member, Kitsap Regional Telecom Committee "Last Mile" subcommittee
- Board Member (7th term), Homebuilders Association of Kitsap County (HBA). Past secretary of the organization.
- Member (2nd term), USA Today Small Business Panel
- President (2nd term), Northwest Automotive Press Association (NWAPA)
- NWAPA Mudfest Chairman. Mudfest is the largest professional Sport Utility Vehicle competition in the nation. As NWAPA president and chair of Mudfest, I was able to move this event which last year brought 27 vehicles by 19 manufacturers (and their factory personnel) to Kitsap County for the second year in a row, utilizing Bremerton Raceway for the track testing portion.
- State Director (4th term), Building Industry Association of Washington (BIAW)
- HBA representative to the Kitsap County Association of Realtors Board of Directors
- Member, Bainbridge Island Chamber of Commerce
- Past member, United Way of Kitsap County, marketing committee
- Graduate, Anthony Robbins' Mastery University.
- Graduate, BIAW Professional Spokesman training course
- Graduate, BIAW Political Candidate training course
- Crew Member, State Inducer, Anthony Robbins' Unleash the Power Within events.
- Member, Anthony Robbins' Leadership Training