

Door County

TELECOMMUNICATIONS

Inventory

May 2002

Prepared for:

Door County Economic Development Corporation

Prepared by:

Applied Communications

www.appcom.net

EXECUTIVE SUMMARY

In April 2002, the Door County Economic Development Corporation contracted with Applied Communications to conduct a preliminary telecommunications assessment for the County. The assessment was intended to build on the work of the Door County Technology Council that has been meeting since July 2001. The mission statement of the Council is:

"The Door County Technology Council is made up of private and public sector organizations working to provide for the telecommunications infrastructure needs of Door County to improve the competitiveness of its businesses and quality of life of its residents."

The assessment includes an inventory of local exchange services, fiber networks, Internet, wireless and cable television facilities and services in the County. The purpose of this inventory is to identify issues, indicate near-term improvements in the telecommunication infrastructure and provide preliminary information for decision-makers to direct additional planning efforts. These efforts may include market surveys and feasibility analysis for various technology solutions.

The following is a summary of findings from the inventory.

- ◆ There are three Local Exchange Companies (LEC)- Ameritech, Verizon, & Century Tel
- ◆ None of the LECs have redundancy in their network.
- ◆ There is limited fiber in the local loop but it does not serve the industrial park.
- ◆ Advanced high-speed services are not available in County. Backhaul charges are costly.
- ◆ Local ISPs are investigating fixed wireless Internet.
- ◆ There are multiple ISPs serving all parts of the County.
- ◆ DSL is not available. Verizon has scheduled deployment for north Door County in the 4th quarter of 2002.
- ◆ Charter Communications has deployed cable modems in 3 towns and has a fiber network in the County.
- ◆ E-Commerce support is available from ISPs and technology consultants in area.
- ◆ BadgerNet has distance-learning facilities at all high schools and Northeast Wisconsin Tech College.
- ◆ Door County Memorial Hospital is part of interactive video network
- ◆ Issues are more political & financial than technological

Conclusion

This inventory represents the first phase of the telecommunications plan. Additional phases will fill in information gaps and include an application analysis for educational and government agencies. Additionally, a survey of business users will help identify the most feasible solution to meet their needs as well as provide data to make revenue projections for telecommunication services. The information from all of these stages will provide the foundation for completing preliminary feasibility analysis for several technology solutions. Ultimately, this analysis will suggest the parameters for engineering specific telecommunications designed to meet the unique needs of Door County.

Section

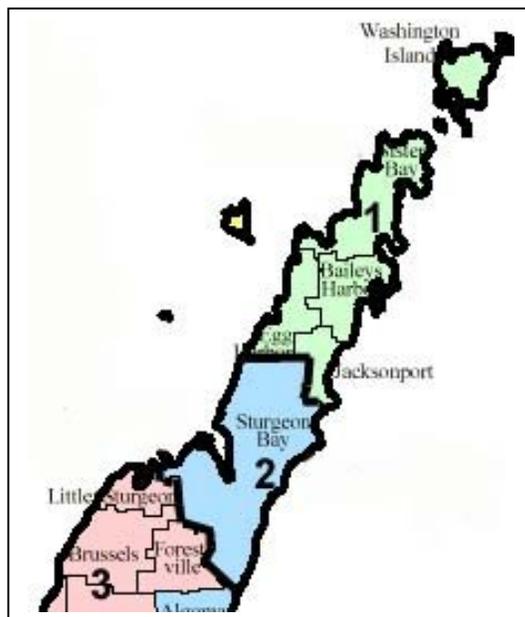
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LOCAL EXCHANGE CARRIERS

A. Public Switched Network

The local telephone network consists of the switching offices, the interoffice backbone and the local loop that connect customers to the switching facilities. The companies that own and operate the network are referred to as Local Exchange Carriers (LEC). There are three different service providers in Door County with Ameritech being the largest provider in terms of customers. Until the Telecommunications Act of 1996, LECs maintained a monopoly in their service areas. The new legislation now allows competitors to enter local telephone markets.

Figure 1: Local Exchange Boundaries in Door County



Legend:

1 - Verizon

2 - Ameritech

3 - Century Tel

1. Interoffice Backbone & Redundancy

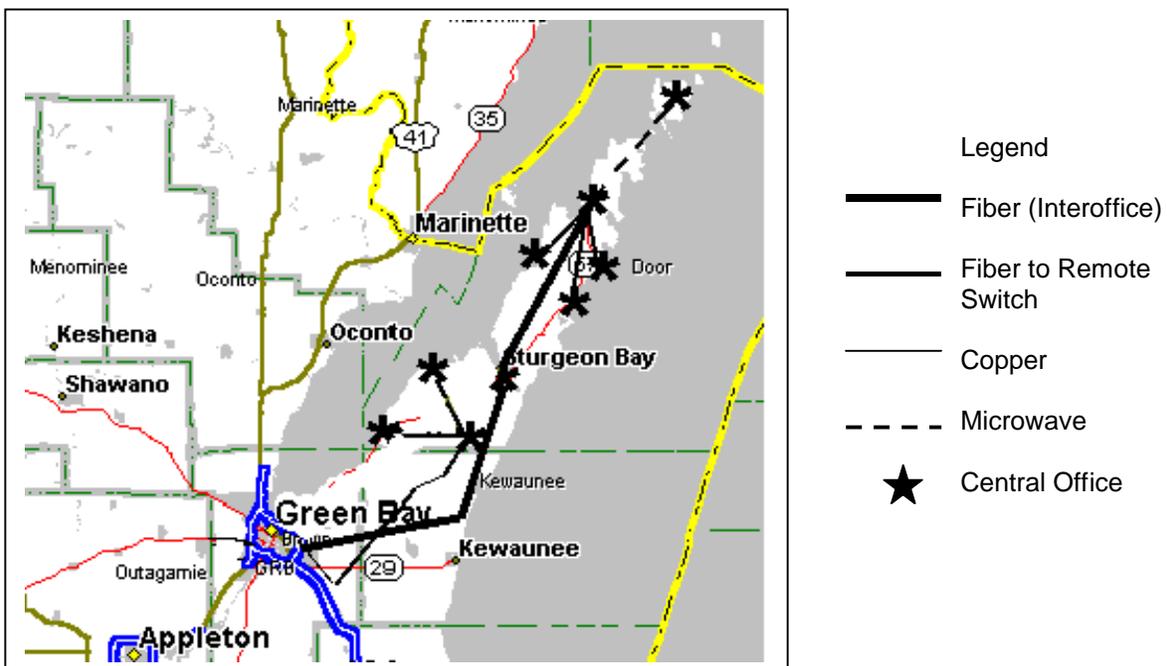
The interoffice backbone refers to the technology that connects the central office to the rest of the public switched network. Ameritech has only one central office in Sturgeon Bay, the largest city in the County. This central office is connected through a fiber backbone to the Ameritech central office in Green Bay. The backbone uses Sonet ring technology, so that if there is a service failure on one strand of the fiber traffic can be routed to another strand of fiber on the same cable. If this cable is cut, however, there is no alternative, or redundant, path for service.

Verizon has a host switch in Sister Bay and remote switches in Washington Island, Baileys Harbor, Egg Harbor, and Jacksonport. Washington Island is connected to the host switch via a microwave link. There is fiber optic backbone between the host central office and the three remaining remote switches. The Sister Bay switch interconnects with the Ameritech central office in Sturgeon Bay and uses the same fiber optic route to Green Bay to transport traffic to its nationwide network.

CenturyTel has fiber between the remote switches in Brussels and Little Sturgeon Bay and the host switch in Forestville. The Forestville switch is connected to the CenturyTel tandem switch in Green Bay through a combination of fiber and copper backbone. CenturyTel is planning to upgrade the copper segments between Casco and Luxemburg and between Denmark and Green Bay to fiber optic cable.

Redundancy refers to having multiple paths in the network, so if one path fails, traffic is routed to an alternate path. The local exchange networks that operate in Door County have central offices at the end of the path and if there is a failure in this path, customers experience a service outage. Another way to achieve redundancy is by having two vendors that have different paths out of town. Charter Communications is a cable company that can provide data services over their network.

Figure 2: Interoffice Backbone & Central Offices in Door County



Note: Map is not to scale. Distance and locations are approximations.

2. Central Office

A central office (CO) is the location where common carriers terminate customer lines and locate the switching equipment to interconnect those lines with other networks. Except for Jacksonport, all of the central offices in the County have wiring capacity to accommodate at 20% to 100% increase in access lines. Growth in access lines is attributable to either population/business growth or request for additional lines for the fax and Internet.

The switches are essentially computers that route traffic to the rest of the network. All the switches in the County are digital switches that offer custom calling and caller ID. New digital switches can also provide advanced telecommunications services such as ISDN, Frame Relay, ATM, and DSL. In the County, ATM and frame relay services are not available from any of the central offices. Only very large data users requiring DS-3 (45mbps) bandwidth or more generally require ATM. Frame relay service offers an efficient way to establish a wide area network between multiple cities. Businesses in the County that rely on this technology must pay backhaul charges to lease a dedicated circuit to the nearest central office that has frame relay capability in Green Bay.

Additionally, to establish a dedicated circuit to the nearest CO with frame relay service, users in northern Door County must sometimes cross the service area of multiple providers and pay circuit charges to each provider. This is a costly solution that can double the costs of the circuit charge for comparable services in areas that are located within a frame relay cloud. This also creates difficulty in tracing the source of the trouble to the specific provider during a service outage.

There are several remote switches serving areas in Door County. The remote switch is connected to the more powerful host switch and essentially offers the same services that are available from the host.

3. Local Loop

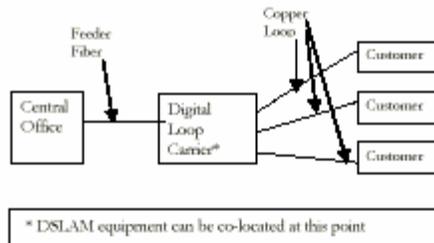
The local loop, the line linking the customer premise with the local office, is commonly referred to as "the last mile". The quality of the line and the distance from the central office can effect the ability to provide advanced services as can distance limitations to providing services such as DSL. Generally, the local loop is in better condition in the towns with degradation in the lines in rural areas that are further away from the central office. Some options such as wireless and satellite may help address some of these last mile issues.

Central office equipment can normally extend a circuit up to 18,000 feet without the addition of electronic equipment. Subscribers within that range are served directly from the central office equipment. In older plant designs, customers beyond the 18,000 feet have electronic equipment installed on the individuals' copper wires to extend the central office signal. This equipment including multiplexing and loading coils can limit the availability of high-speed services.

Digital loop carrier (DLC) is where companies install high bandwidth fiber optic facilities from the central office to the remote DLC terminal in a neighborhood node. In newer plant designs, the customers beyond the 18,000 feet limit are served with a DLC terminal. The carrier equipment is installed at an intermittent point (within 18,000 feet of the central office) where there is a natural grouping of customers. Copper loops are used to route the customers back to the DLC and from that point high-speed lines

carry the traffic from the carrier equipment back to the central office; in many cases, these high-speed lines are fiber. The following sketch that follows provides a simple layout of a DLC design.

Figure 3: Digital Loop Carrier Configuration



Source: Public Service Commission of Wisconsin, " Status of Investments in Advanced Telecommunications Infrastructure in Wisconsin", February 2002

The local loop that is comprised of copper cable has capacity for most residential and small business needs in the communities. Industrial areas, educational campuses, or business areas may generate heavy data traffic that would require bandwidth exceeding DS-3 (45 mbps). These areas are better served by fiber optic cable. The industrial park in Sturgeon Bay is not served by fiber optic cable. Educational facilities that are part of Badger.Net, including Northeast Wisconsin Technical College and the public high schools are served by fiber optic cable.

B. Telecommunication Providers

1) Verizon

100 Communications Dr.
 P.O. Box 49
 Sun Prairie, WI 53590-1842
 608-524-8636
 www.verizon.com

<p>Central Offices</p>	<p>Sister Bay</p> <p>Baileys Harbor</p> <p>Egg Harbor</p> <p>Jacksonport</p> <p>Washington Island</p>	<p>GTE Host Switch - Digital Installed 1986</p> <p>GTE Remote Switch - Digital Installed 1986</p> <p>GTE Remote Switch - Digital Installed 1986</p> <p>GTE Remote Switch - Digital Installed 1996</p> <p>GTE Remote Switch - Digital Installed 1995</p>
<p>Access lines: (Source: PSC Annual Report - 2000)</p>	<p>Sister Bay</p>	<p>Business - 1065 Residential - 3449 Total In Use - 4561 Wired for - 6336</p>
	<p>Baileys Harbor</p>	<p>Business - 270 Residential - 1243 Total In Use - 1534 Wired for - 1824</p>
	<p>Egg Harbor</p>	<p>Business - 818 Residential - 1977 Total In Use - 2725 Wired for - 4800</p>
	<p>Jacksonport</p>	<p>Business - 40 Residential - 561 Total In Use - 621 Wired for - 672</p>
	<p>Washington Island</p>	<p>Business - 154 Residential - 743 Total in Use - 896 Wired for - 1536</p>

Verizon (Continued)

Rates:	<p>Flat Rate Residential - \$17.58 per line. Measured service \$11.52 plus per minute charges.</p> <p>Base Rate for Business Line - \$25.38 per line.</p>
Calling Services:	<p>Caller ID, Custom Calling, Voice Mail</p>
Advanced Telecommunications:	<p>Must backhaul to Verizon POP in Green Bay for Frame Relay, ISDN BRI, or other services. ISDN PRI is available. No DSL.</p>
Interoffice Network:	<p>Fiber backbone to remote switches in Bailey's Harbor, Egg Harbor, & Jacksonport. Fiber backbone to Ameritech Central Office in Sturgeon Bay.</p> <p>Microwave Connection to Host switch in Sister Bay.</p>
Improvements:	<p>No planned upgrades to existing physical plant. New developments may include fiber optic cable extensions from the central office to a neighborhood node with copper from the node to individual residences. This will allow for future digital services.</p> <p>Central office switches can be upgraded to accommodate new growth.</p> <p>Current plans call for DSL deployment in the fourth quarter of 2002.</p>
Local Loop:	<p>No fiber in existing local loop. Loading coils in rural areas may contribute to slow Internet speeds. Data speeds may experience degradation further away from central office.</p>

Note: The information in these fields applies to all Verizon central offices in Door County.

2) Ameritech (Wisconsin Bell)

722 N. Broadway, FL B
 Milwaukee, WI 53202-4303
 (920)433-4043
 www.ameritech.com

Central Offices	Sturgeon Bay Remote, Digital Switch (Host Switch in Green Bay) Installed 1996
Rates:	Residential Line - \$11.57 + local calls. \$20 per month unlimited local calls Business Line - \$15.35 to \$42.00 per month
Calling Services:	Custom Calling, CLASS (Caller ID), Voice Messaging is a business service
Advanced Telecommunications:	Must Backhaul to Green Bay for Frame Relay, ISDN. DSL is not available.
Access lines:	Business - 8382 Residential - 5006 Total In Use - 13,388 Wired for - 17,440
Interoffice Network:	Fiber backbone from Sturgeon Bay central office to Green Bay Host switch
Improvements:	Upgrades in the local loop between 2000 - 20001
Local Loop	Fiber to Badger.Net sites. No fiber to industrial park.

3. CenturyTel - Forestville

129 Grand Ave.
 Forestville, WI 54213
 (608)796-7895
 www.centurytel.com

Central Offices	Brussels	Remote, Digital Switch Installed 1995
	Forestville	Host Digital Switch Installed 1995
	Little Sturgeon Bay	Remote, Digital Switch Installed 1995
Access lines: (Source: PSC Annual Report - 2001)	Brussels	Business - 119 Residential - 926 Total In Use - 1045 Wired for - 2060
	Forestville	Business - 75 Residential - 609 Total In Use - 783 Wired for - 1,504
	Little Sturgeon Bay	Business - 45 Residential - 557 Total In Use - 602 Wired for - 1,860
Rates:	Residential Line - \$18.45 Business Line - \$24.96	
Calling Services:	Custom Calling, CLASS (Caller ID), Voice Messaging?	
Advanced Telecommunications:	Backhaul to Green Bay for Frame, ISDN... DSL is not available	
Interoffice Network:	Fiber backbone between host switch in Forestville and remote switches in Brussels and Little Sturgeon. Fiber/copper backbone between central office in Forestville switch to interconnection point with tandem switch in Green Bay.	
Improvements:	Upgrade copper segments in backbone to fiber for segments from Casco to Luxemburg and from Denmark to Green Bay	
Local Loop:	Fiber to High Schools that are part of Badger Net. Some fiber to remote DLC switches.	

B. Competitive Local Exchange Companies (CLECs)

The 1993 Wisconsin Act 496 and the Federal Telecommunications Act of 1996 both had as an objective increasing competition for local exchange service. The number of certified competitive exchange providers has increased from 25 companies in 1997 to 126 certified CLECs as of December, 2001. According to the latest PSC report, the number of CLECs offering services was under one quarter of those certified.

One reason the number of certified CLECs outnumber those actively providing services is that national providers will file for CLEC status in all 50 states even though they are not offering services. This gives them a nationwide presence and once they have prepared the tariffs for their filing in one area, there are little additional costs to register in other States.

Another factor is the recent industry shake-up that has occurred over the past 18 months and is expected to continue through 2002. With increasing financial troubles, CLECs have scaled back on staff and infrastructure investments. Bankruptcy, reorganizations, and mergers have created a large degree of uncertainty in the industry. In the past 18 months, CLEC investment in infrastructure has trended downward.

Those companies that are offering services must compete on a selective basis. Consequently, they may only serve a portion of an identified exchange where the returns on the investment are highest. The majority of operating CLECs provide specialized services, often to business customers only. There is one active CLEC in Door County (McLeod). In addition to private companies, Wisconsin has a number of municipal and quasi-public utilities that are registered as CLECs. According to the PSC database, 15% of active CLECs fall in this classification. No municipalities in Door County are registered as a CLEC. Norlight is a CLEC but is only offering services in Green Bay and Appleton.

To become a CLEC, an entity must complete the PSC application with a \$250 application fee. They must also supply a copy of certification showing that the reseller was registered with the State of Wisconsin for tax purposes and a statement that the reseller does not own or control more than \$400,000 worth of telecommunications transmission equipment (excluding switches) in Wisconsin. While it is inexpensive to register as a CLEC other costs, including equipment, land or easement acquisition, labor and legal costs, make market entry difficult.

Of the operating CLECs, most are part fiber-based and serve major urban areas in the state. High-speed wireless service is a recent technology that CLECs are also using. Because these competitive carriers install infrastructure as they expand their service areas, the infrastructure is generally state-of-the-art and represents a significant investment by these competitive companies.

LONG HAUL NETWORKS

A. National Carriers

Interstate fiber optic backbone provides long-distance, high-capacity, high-speed transmission path for transporting massive quantities of data. Most of the backbone is comprised of fiber optic line but can also be provided using satellite systems and radio spectrum. These trunk lines contain multiple strands of expensive single-mode fiber and carry long haul traffic.

These nationwide networks are costly due to the miles of cable that is required for the large distances between cities, right-of-way negotiations, and the expense of splicing and connecting the fiber to the necessary electrical components. Additional access points add to the cost of the network and are generally limited to large cities that provide a point of presence for multiple large volume users. Even in these cities, the network is limited to users that require a minimum of OC-3 bandwidth with carrier users requiring as much as OC-102 speeds.

Most of these long distance networks follow existing rights-of-way along highway, railroad, and utility easements. AT&T, Worldcom, and Sprint are the major nationwide providers but in the last five years a number of other companies have built nationwide networks as well. There are no long haul networks in Door County although several have Points-of-Presence in Green Bay.

B. Middle Mile Facilities

The Federal Communications Commission (FCC) report, "Deployment of Advanced Telecommunications Capability: Second Report", define middle mile facilities as:

"... transport or routing from last mile aggregation points in order to interconnect and exchange traffic with national backbone providers or directly with other middle mile networks. "

This includes the transport facilities between central offices that Section 1 of this report described. Other types of middle mile facilities includes state government fiber optic networks and commercial enterprises such as exchange companies that lease excess capacity on their networks to Internet service providers and other users.

1. Nsight

Nsight
Green Bay, WI
www.Nsighttel.com

Nsight has a 75 mile fiber network in northeast Wisconsin that extends from Green Bay south to Appleton, north to Iron Mountain, and west to Merrill. A planned segment from Iron Mountain to Wausau will complete the fiber ring. Capacity on the fiber network is generally leased to other carriers. Nsight is studying the costs of constructing a fiber route from Green Bay to Sturgeon Bay to provide an alternate path to the Ameritech network. Qwest, which operates a long haul network that has a point of presence in Green Bay, has expressed interest in being a potential partner to lease capacity on the fiber if it were constructed.

In addition to the fiber network, Nsight has a wireless division that offers cellular service in Door County. Currently, Nsight has an agreement with Ameritech to lease extra capacity on the microwave link to Appleton for 911 traffic. This will provide redundancy for emergency services. There is limited capacity on the microwave spectrum and only a few additional T-1 circuits would be available to lease to an interested carrier.

2. Norlight

Norlight
1-888-747-8332
www.norlight.com

Norlight has a 5000 mile fiber network in the upper midwest. There is a Point of Presence in Green Bay. Norlight provides business services and leases capacity on the fiber network to carriers. Business services include wide area network connections, network support, and dedicated Internet access. Currently there are four to five business customers in Sturgeon Bay that must lease a T-1 circuit from Ameritech to access the Norlight network in Green Bay. Norlight has no plans at this time to extend fiber to Door County.

Section
3

LONG DISTANCE

A. Point of Presence (POP)

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

B. Equal Access interLATA and intraLATA

For long-distance telecommunications purposes, Wisconsin is divided into four Local Access and Transport Areas (LATA's). Within the LATA boundary, the local telephone companies generally supply IntraLATA long distance. These calls are also referred to as local toll.

InterLATA service refers to calls which cross LATA boundaries. For these calls, customers are able to choose their preferred long distance company. InterLATA's are historically served by long distance telephone carriers

Door County is located in the Northeast LATA. Some long distance companies charge different rates for state-to-state calls, interLATA calls within the state, and local toll calls. The Telecommunications Act of 1996 requires equal access by long distance carriers in all LATA's by 1999. This change allows consumers to select the long distance carrier for any in-state calls. It also allows the local exchange carrier to compete in the long distance market. The former Regional Bell Operating Companies, such as Verizon, must first meet certain requirements for interconnecting with other carriers to begin providing long distance service outside LATA boundaries.

Figure 4: Wisconsin Local Access and Transportation Areas (LATAs)



C. Extended Area Service (EAS) & Extended Community Calling (ECC)

Local service refers to calls placed to other customers in the caller's exchange. Extended Area Service (EAS) is a form of local service for calls between neighboring or nearby exchanges. Your local telephone company provides EAS and the cost is usually included in the charge for local service.

Customers may petition the Public Service Commission for service to additional EAS exchanges. The petition should be signed by at least 10 percent of the customers of one of the affected exchanges. If EAS is expanded, the rate for basic service will likely go up.

In 1993, the Public Service Commission authorized Extended Community Calling (ECC). ECC is generally provided between exchanges that are either adjacent to or near each other, that are not already covered by EAS. ECC only is applicable within LATAs. Calls across LATA lines are not affected by ECC; neither are previously existing EAS arrangements.

Although the local telephone company provides ECC calls, the rate for ECC is a per-minute charge. The ECC charge is lower than most long distance charges.

WIRELESS

All wireless technologies transmit data or signals using frequencies on the electromagnetic spectrum. These technologies include radio and television broadcasts, cellular transmissions, microwave, paging, and satellite. The Communications Act of 1934 authorized the FCC to grant licenses for broadcasts and other wireless services. During the 1990's, the FCC auctioned spectrum for cellular, PCS, paging, and wireless Internet services. There is also spectrum reserved for unlicensed wireless transmissions that in recent years has been developed for data transmissions.

As a result of these auctions, and the introduction of new technologies, the wireless industry has experienced dramatic growth in the past 10 years and this trend is expected to continue. The number of FCC licenses for towers is an indicator of the widespread use of wireless technologies. In Door County alone, there are 1222 active licenses for all types of towers. The following voice and data applications have growing importance for businesses.

A. Mobile Services

1. Mobile Telephone Service

Over the last several years, cellular and PCS technology have converged until they are almost indistinguishable. Both use technology that divides the service area into cells containing low-powered transmitters. As the caller moves about, a computerized switch transfers calls between cells. Roaming agreements between providers allows callers to use different networks.

In the past, cellular networks used an analog technology, while PCS networks used a digital format. Digital technology permits companies to offer inexpensive calling plans and services such as voicemail, caller ID, wireless data and mobile Internet offerings. Today, more than 62 percent of all mobile telephony subscribers use digital service. The largest companies own both cellular and PCS companies and even strictly cellular companies are converting analog networks to digital. New handsets allow users to receive either digital or analog signals.

To auction licenses for cellular spectrum, the Federal Communication Commission (FCC) divided the United States up into 734 different markets and licensed two entities for each market. Door County is located in the Rural Service Area that also includes counties in northeast Wisconsin. The cellular providers were required to build-out their networks in licensed areas.

Initially, the FCC auctioned off five blocks of broadband PCS spectrum for each of 493 Basic Trading Areas (BTA). Door County is in the Green Bay BTA. Many PCS providers have focused efforts on

metropolitan markets and have not built out their networks in rural areas even when they own the licenses in those areas.

In the United States, there are six mobile telephone companies that operate nationwide. These companies have built these nationwide networks through combinations, acquisitions, and license swaps. In general, the larger operators can achieve economies of scale and increased efficiencies. Additionally, consumers have broader coverage and fewer roaming charges with national providers. Following are the providers with licenses to operate in Door County.

Table 2: Mobile Telephone Providers in Door County

Provider	Type	Service Area	Coverage
Sprint	PCS	Nationwide	South Door County & Sturgeon Bay
CellCom	Cellular	Statewide	All of Door County
Verizon	PCS	Nationwide	Roaming Only
US Cellular	PCS	Nationwide	All of Door County
CenturyTel	PCS	Nationwide	Most of Door County - Selling Wireless Service to AITel
Airadigm	PCS	Regional	No Service

Source: Federal Communications Commission, Wireless Telecommunications Bureau

Although a provider may have a license to serve the entire County, there still may be gaps in coverage. This is due to terrain and areas that are located in a valley that does not have adequate line of sight to cellular towers. This is an issue for northern Door County. Additional towers would likely be required to address this service gap.

2. Mobile Data Services

The mobile data industry has grown substantially in the last few years. Mobile data service includes paging, web access on a mobile phone and e-mail delivery. Traditional one-way paging and advanced messaging services use paging and narrowband PCS spectrum. Mobile data services, such as wireless web and e-mail provided by mobile telephone operators use cellular, broadband PCS, and SMR spectrum. Data services can also be offered over handheld PDA devices with a mobile Internet connection, either through a built-in wireless modem or with the attachment of a wireless modem card, an advanced messaging device, or a mobile phone.

The newest service is mobile data services provided by dedicated data network operators. Currently, three major companies operate dedicated data networks: Motient Corporation, Cingular Interactive, Inc. and Metricom. These companies use unlicensed and Wireless Communications Service (“WCS”) spectrum to provide these services.

B. Fixed Wireless Internet

1. Local Multi-Point Distribution Service (LMDS)

In 1998 and 1999, the FCC auctioned off spectrum licenses in the 24 to 38 GHz frequency band for Local Multi-Point Distribution Service. LMDS can deliver at rates up to 155 Mbps. Like cellular technology, LMDS uses wireless cells that cover geographic areas of two to five kilometers in radius. Unlike cellular phones, the customer has a fixed location with an antenna mounted to the premise to receive signals. Due to the small size of the cells, LMDS links are typically limited to tight clusters of users and are less likely to serve rural areas. Actel Corporation and Northeast Communications of Wisconsin are the two license holders for the Green Bay BTA. As of December 2000, LMDS was not available anywhere in the State of Wisconsin.

2. Multipoint Multichannel Distribution System (MMDS)

Multipoint Multichannel Distribution System (MMDS) operates below three gigahertz (GHz) at distances up to 35 miles. FCC approved use of MMDS for two-way data service in September, 1998. MMDS can have speeds of 10Mbps downstream and 128 kbps upstream. Of the licensed spectrums, MMDS has the most promise for serving rural customers. To cover fixed costs, the system is more likely to be deployed in larger towns or in an area that can serve a cluster of rural towns from one site. AmerTel is the license holder for the Green Bay BTA. As of December 2000, MMDS was not available anywhere in the State of Wisconsin.

3. Wireless Communication Services (WCS)

WCS spectrum is located in the 2.3 GHz band. Blocks of WCS spectrum were auctioned for 52 Major Economic Areas (MEAs) and 12 Regional Economic Area Groupings (REAGs). Only AT&T and WorldCom are currently using WCS spectrum to offer fixed wireless services in a few markets. AT&T has the WCS wireless license in Door County but is not offering services.

4. Non-Licensed Wireless

Unlicensed wireless can provide services to the rural homes and are used to establish metropolitan area networks. Major vendors of wireless operate using radio transmission within the unlicensed 2.4GHz frequency band. This system can provide 11MB of bandwidth between the sites. There are distance limitations with this technology and as with all wireless systems it does require line of sight. Several ISPs are exploring a wireless service in Door County.

C. Satellite

The advantage of satellite is that it can be available to consumers in remote areas and areas where terrain might preclude other options for high speed access. Recently two-way satellite Internet service has been introduced for home users with download speeds that can reach up to 500 kbps with upload speeds up to 150 kbps. There are also satellite services that provide Internet backbone connectivity for service providers and enterprise networks. Tachyon is one such provider and offers high speed, two-

way, satellite-based Internet Protocol (IP) connections between organizations and terrestrial Internet backbones. This system is an alternative to providing redundancy to landline networks.

Section
5

INTERNET

A. Overview

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

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

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

B. Dial-Up Access

The most common access for residential users and small business with stand-alone computers is dial-up access. With dial-up access the user connects the PC to a telephone line through a modem and the computer dials the ISP's server. Speeds range from 28.8k to 56k depending on the modem and line quality.

Generally, an individual dial-up account cost in the range of \$15 - \$20 per month. Since rate structures vary according to the type of service plan and changes periodically, users should contact the ISP or check the web page for this information. Most ISP's will host customer pages on their server. Local dial-up access is available from several providers throughout the county.

C. Direct Access

Direct access to the Internet provides a direct connection from the PC or network to the ISP. The connection is always active and there is no need to first dial-up the ISP through the phone line. Typically, leasing a dedicated line through the telephone company provides direct access. This

dedicated connection ranges in speeds from 56k to 1.4mbps. Cost for leasing the line varies according to speed and generally ranges from \$200 a month for a slower connection up to \$1,000+ for the full T-1 speed of 1.4mbps. The ISP charges a separate rate in addition to the line charges for their service and that also varies according to bandwidth.

Within the last year, wireless connections have become an increasingly popular option for a direct connection to the Internet. For unlicensed wireless, the end-user pays a one-time charge for the antenna and equipment that will connect them to the ISP and a monthly charge for Internet service. Typically, the customer pays for the on-site equipment and modem plus a monthly Internet charge.

D. DSL Modems

Internet providers now offer access through DSL modems. The modems are installed at the customer premise and run on copper telephone lines to the ISP. The customer generally buys the modem and pays additional for Internet service. Speeds for DSL services vary but start at 128k and go up to greater than T-1 speeds. Currently, DSL is not available anywhere in the County.

E. Internet Issues & Trends

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

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

New applications are also creating more demands on ISPs. Real time applications for voice and video are making "Quality of Service" issues such as guaranteed bandwidth, handling delays, and prioritization of uses an essential component of Internet services. The growth in e-commerce has spawned a new industry of "Application Service Providers" (ASP) that provide the technology and programming that are common functions for many types of e-commerce sites. Such functions may include billing, ordering, customer service, and data collection. The ISP's are responding to these changes by providing a variety of value-added services. Additionally, there are consultants that provide e-commerce, networking and other technical support.

F. Internet Service Providers

There are no nation-wide ISPs, such as AOL, with a POP in the local calling areas. The entire County has at least one Internet provider that can provide dial-up services. The following is an overview of companies providing Internet service in the area.

Table 3: Internet Service Providers offering services to Fremont County

Internet Service Provider	Services
<p>Infinity Technology Inc. 2920 Walker Dr. Green Bay, WI 54311 (920)430-1117 www.itol.com</p>	<p>Areas Served: Northeast Wisconsin</p> <p>POP: Sturgeon Bay, Fish Creek, Washington Island</p> <p>Dial-Up Access: 56k</p> <p>Customer to Modem Ratio: 8:1</p> <p>Dedicated Service: Yes</p> <p>Primary Feed: Multiple T-1s from POPs to Green Bay. DS3 connection from Green Bay to Chicago & Minneapolis.</p> <p>Services: Network Support, Telephony, Web Development</p> <p>Planned Upgrades: Investigating feasibility of wireless service. Potential to provide by end of year.</p>
<p>DoorPI.Net P.O. Box 127 Forestville, WI 54213 (920)743-4999 www.doorpi.com</p>	<p>Areas Served: Door County</p> <p>POP: Sturgeon Bay, Algoma</p> <p>Dial-Up Access: 56k</p> <p>Dedicated Service: No</p> <p>Customer to Modem Ratio: 6:1</p> <p>Primary Feed: T-1 to Green Bay AT&T POP</p> <p>Services: Web Design, Web Hosting, Long Distance through Qwest</p> <p>Planned Upgrades: Additional T-1 circuits from Sturgeon Bay & Algoma POPs</p>

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<p>GreenBayNet 888-314-GNET www.greenbaynet.com</p>	<p>Areas Served: Northeast Wisconsin</p> <p>POP: Sturgeon Bay</p> <p>Dial-Up Access: 56k</p> <p>Customer to Modem Ratio: 5:1</p> <p>Dedicated Service: Yes</p> <p>Primary Feed: T-1 to Green Bay. Multiple access routes to Chicago</p> <p>Services: Web Design, Web Host, Network design & security</p> <p>Planned Improvements: Offering DSL & wireless in other parts of networks. Investigating wireless in Door County.</p>
<p>NetNet Green Bay, WI 920-617-6700 www.netnet.net</p> <p>(Division of Nsight)</p>	<p>Areas Served: Northeast Wisconsin</p> <p>POP: Sturgeon Bay</p> <p>Dial-Up Access: 56k</p> <p>Dedicated Service: Yes</p> <p>Primary Feed: T-1 to Green Bay</p> <p>Services: Web design, Web Hosting, Limited E-commerce</p> <p>Planned Improvements: Investigating wireless</p>
<p>DCWIS.com 4336 Door County Fish Creek, WI 54212-9735 920-868-9100 www.doorcounty.net</p>	<p>Areas Served: Door County</p> <p>POP: Egg Harbor</p> <p>Dial-Up Access: 56k</p> <p>Dedicated Service: Yes</p> <p>Primary Feed: Not Available</p> <p>Services: Web Hosting</p> <p>Planned Improvements: Not Available</p>

Source: Compiled from Interviews & Web Page sites by Applied Communications. 04/02

Section

6

CABLE TELEVISION

Cable operators receive programs from satellite and broadcast signals, and re-transmit those signals through coaxial cable and/or optical fiber to customers' homes. Generally, a large "trunk" cable carries the signals down the center of town and the feeder cables that connect to the trunk cable branch off into local neighborhoods. The cable operator runs a smaller "drop" cable from the feeder cable directly into the customer's home and attaches it to the television set. Hybrid fiber coax cables have fiber trunks that extend from the head-end to a neighborhood Optical Transfer Node (OTN) with coax drop cables to the customer homes.

Charter Communications has installed this hybrid infrastructure in the three communities (Sturgeon Bay, Sister Bay, Ephraim) in Door County where it provides service. In Sturgeon Bay, the franchise agreement included a provision that Charter run additional fiber through the electric utility's conduit under the bay which is reserved for the City's use.

Digital cable is a service that allows for as many as 85 additional channels of music, movies, enhanced pay-per-view movies, special events and special interest channels. Digital compression technology allows up to twelve digital services in the space normally occupied by one analog channel. Digital cable is available in Door County where Charter Communications offers service.

Cable modems provide high-speed connections over the same coaxial cable and fiber optic cabling used in cable TV networks. There are reverse channels for upstream and downstream data traffic. The upstream channel that gets less use is a lower speed while downstream channels may have speeds up to 10 mbps. In the cable system, however, the data channel is shared among all the homes linked by the coax cable so the actual data rate depends on the number of users sharing the channel. Still, speeds are typically much higher than other alternatives. Typical cable fees for unlimited Internet access is \$40 - \$50 per month. Charter Communications has deployed cable modems in Sturgeon Bay, Sister Bay and Ephraim.

In addition to cable services, cable companies may also offer wide area network services to businesses. Charter Communications services include fiber to the business from the OTN that would connect with the nationwide Charter network. In Door County, Charter Communications has a fiber route to Green Bay that connects to a statewide fiber ring. There are currently no business customers in Door County. Fiber does run parallel to the Highway 42 and the industrial park. Fiber could be extended into the park for a cost of approximately \$20,000 to \$30,000 per mile.

Charter Communications

Contact:	Charter Communications Headquarters: St. Louis, MO Regional Office: Madison, WI 608-752-0581 www.chartercom.com www.charterbusinessnetwork.com
Service Area:	Nationwide Provider. Door County - Sturgeon Bay, Sister Bay, Ephraim
Services:	Basic Cable Digital Cable Cable Modems Business Networking
Infrastructure:	Hybrid Fiber/Coax
Planned Upgrades:	Can be negotiated

ELECTRIC UTILITIES

Electric utilities have become important players in the telecommunications environment. Traditionally, utilities and telephone companies have cooperated on pole agreements that allow telephone wire to be strung along electric poles. Many utilities also have towers and other facilities that can provide sites for the collocation of wireless equipment. More frequently, the right-of-way that the utilities own are often leased by telecommunication companies to install fiber optic cable. Some electric utilities have even installed their own fiber networks and have entered the telecommunications market as a broadband supplier. Nationally, the Williams Company and Touch America are firms that were in the energy business but leveraged their right-of-way investments to build national fiber optic networks.

At the local level some rural electric cooperatives and municipalities have built fiber optic networks in order to offer broadband services. Electric utilities have the right-of-way and also have a network that already provides services to every home with the customer billing systems in place. The electric utility can use fiber networks for metering and lease the excess capacity to other providers that offer telecommunication services. Some utilities, such as Reedsburg or Sun Prairie, have even begun offering telecommunications services themselves.

1. Sturgeon Bay Utilities

Sturgeon Bay Utilities is a municipal utility providing electric service to residents in Sturgeon Bay and some out of town customers. The utility does not offer any telecommunication services. As part of the an arrangement to allow Charter Communications to install fiber optic cable in the conduit under the Bay, the utility uses some of the Charter dark fiber to connect City facilities for a wide area network. Use of the fiber is part of a "non-compete" agreement that limits the fiber only to city use. The facilities on the network include:

- ◆ Sturgeon Bay Utilities
- ◆ Wastewater Facilities
- ◆ City Hall
- ◆ Courthouse
- ◆ Library
- ◆ Schools

Additionally, WPPI, the company that sells electricity to the City, has fiber between the substations. Sturgeon Bay Utilities has pole attachment agreements with Charter Communications and Ameritech. There are several communication and water towers that the City co-locates antennas with cellular and emergency equipment. There is room for additional co-location of equipment on these towers.

VIDEO NETWORKS

A. PennNet - Badger Net

PennNet is a distance learning network that includes eleven sites in Door County and adjacent counties. The network started operations in the early 1990's using microwave technology to bring distance learning to a limited number of high schools. Participating schools were generally in the southern portion of the peninsula because of line of sight problems with the microwave signals.

With the State of Wisconsin legislation that established the TEACH funding, additional schools were able to purchase equipment and fiber optic technology replaced the microwave network. Currently the network includes the following sites:

- ◆ Algoma High School
- ◆ CESA 7/Southwest High School (Green Bay)
- ◆ Gilbralter High School (Fish Creek)
- ◆ Kewaunee High School
- ◆ NWTC/Green Bay
- ◆ NWTC/Sturgeon Bay
- ◆ Pulaski High School
- ◆ Sevastopol High School (Sturgeon Bay)
- ◆ Southern Door High School - Brussels
- ◆ Sturgeon Bay High School
- ◆ Washington Island High School

BadgerNet is the umbrella organization that links the various distance learning networks in the state. Any school on the network can connect to each other and BadgerNet also provides a gateway to link with sites outside of the State.

All public high schools in the CESA 7 region are on the BadgerNet system. Private schools are eligible for the subsidized connection rate but must purchase their own equipment. Currently, there are no plans to expand the network. Each school currently has one distance learning classroom and an additional classroom would not be eligible for the subsidized rate. (Subsidized Rate - \$250 per month. Unsubsidized Rate - \$1850 per month). Scheduling of the existing sites is approaching capacity.

In 2005, the contract with the current telecommunication providers will expire and the State will issue an RFP for the BadgerNet services. The State is currently undertaking a needs assessment to identify technology needs and the possibility of including state and public agencies in the RFP.

B. Door County Memorial Hospital

Door County Hospital is a subsidiary of Ministry Health Care in Milwaukee. There are eleven hospitals that are part of the Ministry Health Care system. Each hospital is part of the Ministry Health Care wide area network. Door County Memorial Hospital is part of the WAN through a T-1 circuit to the main facility in Milwaukee. The circuit carries voice, video, and data traffic. The video-conferencing equipment is used primarily for administration and training. The Hospital does not use teleradiology technology at this time.