

Broadband Market

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The current broadband market can be viewed from several different aspects. The term broadband has always been ever changing on exactly what speed constitutes broadband. According to several different regulation agencies such as the International Telecommunication Union Standardization Sector, recognizes broadband as a transmission capacity that is faster than primary rate ISDN, at 1.5 to 2 Mbps. The FCC definition of broadband is 768 Kbits, while The Organization for Economic Co-operation and Development (OECD) has defined broadband as 256 Kbits in at least one direction and is the most common around the world. There is no specific bit rate defined by the industry, and because of that, lower-bit rate transmission methods including dialup internet in some cases can be considered broadband in a loose term. (Wikipedia) With an open view on what constitutes broadband, the current segmentation of the broadband market will be explained including the historical activity of each segment. There will also be a discussion on governmental regulation and policy in addition to current corporate regulations and policies in place today. The controversial subject of BPL (Broadband over Power Lines) because of its pros and cons in terms of speed and feasibility in rural areas will also be discussed. Lastly, the experiences and difficulties of compiling this undertaking of the broadband market will also be explained in further detail.

Considering your definition of broadband, the segmentation of the market is surprisingly different than you would expect. First off, what is left of the dialup internet users is still considered broadband according to several sources. Wikipedia for example, defines broadband simply as “a signaling method that includes or handles a relatively wide range of frequencies, which may be divided into channels where multiple pieces of data are sent simultaneously to increase the effective rate of transmission, regardless of speed.” (Wikipedia) From there, the market has grown from dialup internet to such forms as ISDN, DSL, Cable, Satellite, Wireless, Cellular, FIOS, etc. To simply this, the current broadband market can be segmented into the core markets of consumer, business, and whole sale with the mentioned forms above falling into one or more markets.

The first and key segment of the broadband market that will be mentioned is the consumer market. This market has always been driven by demand and availability of resources and also contains the largest amount of people in it. In the beginning, there was dialup internet which could only achieve speeds up to 56.6k. With the demand for faster speeds and technologies, ISDN was developed and offered speeds up to 256k and uninterrupted phone service, but this technology never caught on in popularity as many went from dialup to the later developed and much faster technologies of DSL and Cable internet which top out at speeds of 10 and 30 Mbps respectively. Most of the consumer market is on either cable or DSL but now with the continual rollout of fiber to the home, more and more people are starting to consider FIOS internet which can offer speeds up to 50 Mbps, much faster than DSL and Cable can offer. In addition, there are also a growing number of wireless internet providers that provide broadband access wireless to your computer through a fixed wireless network, or using cellular technologies. The afore mentioned wireless technologies are real useful in the rural areas that aren't able to get other broadband technologies as cable or DSL because of their distance from the necessary equipment required to deliver their technologies to those areas. Partnership Broadband is a company out in North Texas which is an example of a fixed wireless provider and that they focus on delivering broadband to the underserved residential customers who don't have access to broadband internet currently.

The second largest segment of the broadband market is the business market. Businesses, especially large ones demand more speed and bandwidth due to the number of computers that may be on its network at one given time in addition to the amount of data that may need to be sent or received at a given time. Businesses have such offerings as T-1, T-3, and even OC-3 internet connections which are dedicated lines to the business and offer a lot more bandwidth and speeds of 1.544, 45, and 155 Mbps respectively. These lines offer very reliable connections to the network and because of that, also cost a lot more than it would for the slower speeds used for the residential market. For example, a T-1

can cost around \$250-\$500 a month to a really high \$25,000 - \$40,000 a month for OC-3. Some of the companies that offer consumer broadband services do offer a “business class” package of internet, however, the speeds are not nearly as fast as the mentioned broadband technologies above. They also can’t offer the same level of reliability in their connections since they are not dedicated lines but the trade off is in cost savings and is generally used for small to medium sized businesses.

The final market that will be mentioned is the whole sale internet market. The providers of whole sale internet are the ones that help to run the backbone of the internet as a whole. They also provide the bandwidth and connections to the internet to the internet service providers for the consumer market and government entities. These networks are highly complex and are able to achieve great speeds and throughput. An example of a whole sale internet provider is Airstream Communications and the Wisconsin Independent Network. These companies have invested in and operate a 3,000 mile fiber optic network throughout Wisconsin using OC-192 and OC-48 SONET technologies which can deliver over 9.953 Gbits.

Now that the segmentation of the current broadband market has been identified and explained, a closer look can be taken at some of the notable historical activity of these segments. Most of the information given about the consumer market is given in a historical sense in that the technology has gone from dialup to DSL, to cable, and now even to FIOS technologies and each time, increasing in speed and reliability. Looking at the histories WINs/Airstream Communications and Partnership Broadband will help to give a feel of the overall trends and changes in the broadband market.

The Wisconsin Independent network has an ownership consisting of over 31 independent telephone company investors, many of which are over 100 years old. WINs has the current challenge of dealing with the immense landline erosion which is currently taken place in the present market with many consumers choosing to eliminate their landline service as cellular phone technologies are

becoming more convenient and affordable. The telephone investors of WINS also had to deal with a lot of changes in the past, most notably of the deregulation and breakup of the monopolistic long distance and local telephone services which was able to create more competition which can only benefit the consumers, allowing them to finally have more features and choices for more reasonable prices.

A way that the investors in WINS are trying to adapt to the decline of landline services, is to try and offer additional services such as VOIP services to counter cellular plans, IPTV over their current lines to compete with the cable companies offerings, and with that trying to offer bundled services and improving customer service. These changes are all being made in order to try and retain their current customers and to try and get some back who had left for other providers and in addition to get new customers to use their service.

In a “data-centric” world, WINS needs to keep up with the challenges and ever changing culture of the technological world. Not only being able to keep their network up to date and increasing speeds, WINS also needs to consider the awareness that needs to be considered in terms of information security since their network carries an enormous amount of traffic and any given time. Focus needs to be put on keeping that information secure and the trust of the customers will be gained because of the effort. In addition more and more government regulations are requiring better security and attention to data integrity and security. In addition “the market has shifted from a monopolistic structure with infrastructure, to the consumers who are the ones who are now driving the market” (Berg).

Looking at the history of fixed wireless broadband internet, Partnership Broadband focuses on underserved residential and business customers who don't have access to broadband internet currently. Partnership focuses on building and maintaining wireless networks for cities, municipalities, apartments, and other businesses. They currently have over 9,000 customers and a coverage area of over 12,000

square miles using over 150 towers. They now are the largest provider in North Texas and are one of top ten largest fixed wireless internet providers in the nation.

However, it didn't all start like this for Partnership, as in their beginning roots, their offices were situated in the backyard of the original owner and how only 500 customers. The rise of the company was in large part due to the demand that was created by a few neighbors in a rural community who wanted to use some of the internet that the owner had originally gotten a lease on for himself from a larger company. This need is what developed Partnership Broadband and took advantage of this fast growing market that is also very large with lots of opportunity. Over the years, Partnership has been able to steadily grow out its network and business and have acquired 12 smaller companies in what is still a "fragmented market consisting of small providers." (Grijalva) The market is continually growing and is growing at a 45% growth rate. Partnership still however, has to deal with constant competition from other services and competitors in addition with the recent FCC analog spectrum sale to Verizon, could possibly have an effect on their business if Verizon were to start using their awarded spectrum to deliver their own wireless internet service.

Broadband internet has been steadily increasing through the years and will only continue to in the future. Current trends indicate that 50% of people are on DSL, while 41 % are on cable, 8% are using wireless like Partnership, and 1% is using other means. As mentioned earlier, consumer demand is now driving the market and as the demand is pushing for faster speeds at better costs. Companies are realizing that this is vital to their success and that an effort needs to be made into making sure they will stay up to date in their technologies and progress as speeds are increased in addition to more features.

With market segmentation and historical activity brought to light, one issue that has come up a lot recently is governmental regulation and policy. As the broadband market has become larger over time, the increase in different devices and increase in people using broadband have not been unnoticed

by government officials. As a result of this increased awareness, many issues have come up regarding regulation and policy of broadband. In the following, issues such as network neutrality and the stimulus package will be covered.

To start off, the topic of Net Neutrality will be explained and how this is related to government regulation and policy. The topic Net Neutrality by many people means “an open and nondiscriminatory Internet where people get the content they want.” (Chong, 2008) The idea behind Net Neutrality is people want to be able to connect to the Internet with any device and be able to download whatever they want, whenever they want, and how much they want without being regulated by their ISP. What is ironic about this is that the government wants to regulate ISP’s in order to do this. There are two sides to this issue; the first side is to not regulate broadband companies. The second side to this issue is to regulate broadband companies from regulating its customers, to keep the Internet free and neutral, which is called Net Neutrality. In 2005 the FCC classified cable modem service as an “information service” and not a regulated telecommunications service. In 2005 the FCC outlined four policy principles for the Internet. These policies are:

- Consumers are entitled to access their choice of lawful Internet content
- Consumers are entitled to run applications and user services of their choice, subject to the needs of law enforcement
- Consumers can connect their choice of legal devices that do not harm the network.
- Consumers are entitled to competition from ISPs and content providers

With these policies in place the FCC steps in only when there have been market abuses by corporations.

If government legislation requiring Net Neutrality were to ever come into place, this would affect broadband in five ways. Broadband regulation would affect content neutrality, blocking and rerouting, denying IP-network interconnection, network management and premium service fees by ISPs.

First, content neutrality would be regulated so that customers would be able to look at any content and use any application on the Internet. Secondly, is the issue of blocking and rerouting, legislation would prevent companies from blocking and rerouting content in the favor of their own content. The government would not allow broadband networks from discriminating content from competitors. Another issue is denying IP-network interconnection; this would prevent broadband network providers from refusing to link its network with other backbone providers. The forth issue is network management; this would allow legislation to regulate ISP's from being able to regulate their own networks. Lastly, is the issue of premium service fees, legislation would prevent broadband network providers from being able to provide different tiers of service to its customers. (Chong, 2008)

As one can see, government legislation could affect broadband substantially if Net Neutrality were ever to come into place.

Another issue regarding government legislation as covered in class by Victor Grijalva of Partnership Broadband is Obama's stimulus package. In this package, Obama wants everyone to be able to have access to broadband internet. In order to do this, the stimulus package would offer 7.2 billion in the package for broadband grants to be administered by the National Telecommunications and Information Administration with assistance from the FCC. The FCC would help determine where funding would be needed the most, by determining what areas are underserved with broadband technology. Victor stated that the grants must be dispersed by September 30, 2010 and the grant recipients have 2 years to build out their network. This would affect broadband drastically because the stimulus bill would allow more people access to the Internet and create more profits for broadband providers. (Egerton, 2009)

Government legislation affects how broadband is regulated and implemented. Government regulation can speed up the development of broadband and at times stifle the development of broadband through its regulations. Now, here is a focus on how corporations regulate themselves.

Considering the topic of governmental regulation and policy, it is natural to wonder how corporations regulate themselves and how it affects the broadband market. In the following paragraphs, issues regarding current corporate regulation and policy will be covered. These issues will be covered by presenting the policies of Comcast and UW-Eau Claire.

Comcast is a very large corporation that provides broadband services to its customers. Considering the sheer magnitude of Comcast, it has much influence over the broadband market. There is controversy surrounding Comcast's usage policy. Comcast regulates its network traffic "to deliver the best possible broadband Internet experience to all of its customers." (Comcast Corporation) Comcast's policy is to manage its network so that they can provide the best service. This includes using tools and techniques that ensure compliance with its Policy and Subscriber Agreement. Comcast takes the necessary measures to prevent network congesting by temporarily lowering the priority of traffic for users who are the top contributors to the network congestion.

One controversial topic involving Comcast is how they handle BitTorrent traffic. Comcast has been using packet-forging to disrupt peer-to-peer file sharing. With this in place, BitTorrent and P2P traffic is throttled and sometimes not functional at all. Customers of Comcast will be unable to use or be throttled when using P2P on Comcast networks. This corporate policy changes how the network is used by its users and affects broadband access.

On the other hand, UW-Eau Claire takes a different approach towards network regulation. Specifically, UW-Eau Claire doesn't have a policy at all. As presented in class by Tom Paine on UWEC Broadband Policy, he states that their mission statement is "to provide services that foster learning for

student to promote excellence through collaboration with others.” Tom believes that the UWEC mission statement is not policy but is likely to motivate through policy. Tom also believes that instilling a policy for network usage is not the mission of UW-Eau Claire. UWEC is unlike Comcast’s stance on network management. UWEC doesn’t lower the traffic of users who contribute to network congestion. Since UWEC is an academic environment not out to make profits like a business, UWEC isn’t under the same pressure as companies might be to instill network regulation of its users.

Broadband services are different among many organizations with different goals. In short, Comcast wants to provide the best possible service to all of its customers by limiting usage of customers that use more bandwidth. UWEC on the other hand takes a different approach towards broadband service; UWEC doesn’t want to limit usage of any of its users unless it is illegal. Many organizations that provide broadband service are looking for other means of providing services to increase their customer base, one such method is BPL.

An alternate method of getting broadband access out to the rural areas of the country would be through BPL, also known as broadband over power lines. This can be an option for when other broadband technologies are unavailable and the infrastructure isn’t readily available such as Partnership Broadband which provides fixed wireless access. How this technology works will be explained and how it has been a highly controversial subject because of the several pros and cons that make up BPL. A closer look will be taken from each side and information will be given to whether or not there is a possible future for BPL, especially with the recent provision in the stimulus package which may “funnel up to \$2.5 billion through the Department of Agriculture to provide broadband service to people who live in rural areas” (Fermoso, 2009). There are also several companies currently that are trying to explore the possibilities of BPL and are working on creating viable solutions that can be easily implemented with existing power line infrastructure.

BPL allows you to easily obtain “high-speed internet with speeds between 500 kilobits and 3 megabits per second which is equivalent to DSL and cable through any electrical outlet” (Valdes). How this technology works is that current power grids are slightly modified with specialized equipment that are installed by the electric company and/or a BPL developer. How the data is actually transmitted through the electrical wires is that “the alternating current power is bundled with radio-frequency energy on the same line without the need for a separate line because both are sent at different frequencies” (Valdes). The data is sent from lower power voltage lines, because the higher voltage lines will cause too much interference for data to be sent properly. This means that BPL can only be used from a substation out to the customer’s homes. The substations are usually connected to fiber optic backbones such as WINs (Wisconsin Independent Network) or Airstream Communications which supply the backbone of the internet to the BPL infrastructure. Also along the medium voltage lines, there are several repeaters installed which will keep the integrity of the signal as it travels back and forth to its destination. Then, a bypass transformer is used to take the data from the medium voltage lines and converts it down to the normal household 240 volt lines that run into the households without any loss or degradation. Inside the home, the signal is received by a power line modem that plugs into that wall and connects to your computer or other internet capable devices. Another way for the signal to be sent into the home is through the use of wireless links on the poles outside and sent into the home via 802.11 frequencies. (Valdes)

Now that BPL has been explained in detail about how it works, there are several advantages of using this technology. The biggest advantage is that it uses the existing power grid. With the existing power grid in place, no new cable needs to be put in place, only small modifications are needed. BPL offers cost benefits over other broadband services for rural areas if applicable such as satellite broadband which generally has higher equipment costs and slower speeds, especially when uploading. An example of high satellite costs would be Hughes Net Home Plan which consists of 1 Mbps download

and the extremely slow upload speed of 128 kbps for \$59.99. In addition to the high cost per month, users must pay roughly \$399.98 for their hardware and installation. BPL on the other hand would require a less expensive device similar to a cable modem with comparable download and increased upload speeds for around \$30 a month.

However, there are also several disadvantages to BPL. One such disadvantage would be the speed, while faster than other options; BPL still doesn't reach the speeds of cable and DSL at similar prices. In addition, BPL can cause interference with emergency short-wave radio signals, due to the power lines not being shielded like cable or phone lines. Lastly, power companies might have to update certain parts of their infrastructure because it is currently unable to allow BPL to be implemented due to the heavily outdated equipment and deteriorating power lines. Critics have such as Jose Fermoso states that "wireless tech offer less expensive and faster solutions. Also, the tech is not viable commercially and that it alters the rights of radio licensees."

To wrap up the discussion on BPL after mentioning the pros and cons of the technology and exactly how it works, there are several companies that are working on developing and implementing in rural areas. One such company that is working hard on the BPL effort is I.B.M. who is partnering with CenterPoint Energy among others to build a BPL network in Houston, TX in addition to spending over \$10 million over the years in research and development. International Broadband Electric Communications has also been working with I.B.M. and have rolled out a network throughout rural parts of Alabama, Indiana, Michigan and Virginia with an ever increasing demand. (Hansell, 2009) While there are certainly many aspects for and against this controversial form of broadband, there have been actual efforts made to try and make this a viable and profitable service for those with no other options in rural areas all over the United States.

Now that the overall segmentation of the broadband market and history has been explained in addition to governmental and commercial regulation and policy and the controversial technology of Broadband over Power Lines, there were many experiences and difficulties in researching and writing on the broadband market. We each had our own experiences and difficulties in which we will explain about in detail first starting with Adam's and then to Justin's.

The experience I had with this project and paper was a way for me to better understand just how the current broadband market works today and history behind a lot of it. I had somewhat of an idea on how the market was segmented and developed, but after doing the research and listening to the discussions in class I've felt that I now have a much better idea of how it all came to be. I definitely wasn't very familiar with the concept of fixed wireless broadband internet like Partnership, so I thought that it was really interesting to find out how it all works and that it is a feasible option for the rural communities. In addition, through our own pursuit, we've been able to discover the pros and cons over BPL and why it is so controversial, whether it is about its feasibility, or even the speeds that BPL can potentially deliver. It was also interesting to see that there is now an active push to try and implement BPL into the rural areas since all I've ever heard about BPL is about using it as a home network solution and that for its use in rural and commercial applications has always been on the table and then off.

Hearing about WINS and how part of the backbone of the internet was also quite interesting. Finding out that there are still over 100 local telephone companies in the state of Wisconsin was a surprise to me, I always thought that with the growth of the larger phone companies, that there would be no need for the smaller local ones anymore. Overall, there were many experiences that I felt were very beneficial to my knowledge of the broadband market as a whole. Having speakers who are experts in their respective fields was a great way to be able to pick at their brains through the questions brought up in class in addition to their own personal experiences.

The only difficulties that I would think in regards to this paper are just the sheer amount of information that is out there regarding broadband internet. There are several different definitions to what broadband is considered in a speed sense, and to be able to find our own opinion based upon the multiple definitions out there took some time and thought. Also, there is just a large amount of ways that you could segment each market in broadband so determining how it is to be divided was also quite a challenge.

Following Adams difficulties, I would like to say that mine were similar. The broadband market is so vast and there are so many things to cover that it is hard to fit all of it into the scope of this paper. I had to cut a lot of ideas that I had. I thought the presentations were really good. Especially the Network Neutrality topic, I never really knew what it was. I mean who doesn't want a "free" Internet. But, honestly I think my opinion might have changed. What was meant by "free" was confusing. People should be able to connect what device they need and such. Yet at the same time, I think broadband providers should be able to regulate their own network. That's just an opinion. Some other difficulties that I had are organizing information that I have read and from class into something meaningful. I thought this assignment was great and I learned a lot about broadband and I would recommend an assignment similar like this to future classes. Altogether this was a great project!

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