Municipal Broadband Networks

A Revised Paradigm of Ownership[1]

Terrence P. McGarty, Ph.D.[2]
Ravi Bhagavan

Abstract

This paper discusses the viability of municipal owned and operated local broadband networks. The key issue is the viability of such networks as compared to the classic carriers implementing their own networks in a more open market fashion. This paper develops the alternatives that are available to towns and municipalities in developing their own local broadband facilities. It discusses the alternatives, of design, operations, and financing. The conclusion reached is that each town represents a different case study, however, there are a wide class of municipalities for which a municipal broadband network is not only viable but is essential if the deployment of broadband is ever to be achieved. In addition, it is clear from the research performed, that in these municipalities, the deployment of a broadband system by and for the municipality is not only beneficial to the users but has the potential to create increased value, tax base, and higher return on the bond investment made.

Contents

[2] This paper was prepared as a working paper for the MIT Internet and Telephony consortium group. It represents the opinions of the author and does not reflect the views or opinions of the MIT ITC. Dr McGarty is a principal in the Merton Group, and is an advisor to the MIT ITC. Dr McGarty has been on the faculty of MIT and has been actively advising and contributing to the MIT ITC since its inception. Mr. Bhagavan is also a principal in the Merton Group.

1 INTRODUCTION

Towns and municipalities have over the past one hundred and fifty years or more deployed multiple types of local utilities; water, sewer, gas, electric, and in some cases telephony. Recently, there has been a trend on the part of some municipalities to deploy broadband communications, namely local fiber networks.

This paper discusses the viability of municipalities providing a local broadband fiber based network which would allow service providers to interconnect at a common point and provide their services, via this network, to the community. The network is merely a fiber broadband connection, with no services. It is viewed as a project effort rather than a general obligation effort to the municipality. The municipal broadband network has a head end which is an open interface to a wide variety of service providers. The network is an open network allowing and enabling the maximum use to the most service providers available.

The driving forces for this concept are as follows:

1. Local broadband has not been met by many private sector providers in an adequate manner to many municipalities. This includes cable and telco providers.

2. The current economic environment, especially as regards to telecom, makes such deployment highly unlikely in the near future.

3. Regulatory and legal delays caused by the 1996 Telecom act and initiated by the RBOCs have resulted in institutional stalemates and excessive cost factors to make a competitive environment the most inefficient path to broadband deployment.

4. Municipalities have, via municipal bonds, the most efficient capital raising capabilities of any providers. They can use their low cost of capital to raise financing for provide broadband projects.

5. Precedent exists for the establishment of a separate municipal network. There are over 200 broadband networks today in towns and municipalities. Moreover, historically, in the old AT&T days in New York, Empire City Subway, a separate company, owned and operated all telephone networks in New York. New York Telephone provided for switches and offices. AT&T provided long distance via Long Lines, and Western Electric the equipment. Thus even in the old days of monopolies, the "natural" partition of the local network was an integral part of AT&T operations. In effect the new paradigm is a deployment of the old paradigm.

6. Competition and value exists amongst the private sector services providers.. The service providers need scale and efficiency in local distribution and they cannot each deploy such distribution. A municipal network is at the very most efficient and economically viable alternative to get service providers to homes and local businesses.

1.1 Definition of Broadband

There is a general consensus that broadband, whatever that is, is beneficial and that most people want access to it. For the purpose of this paper we define broadband in a variety of ways. In the National Academy of Sciences (NAS) report, "Bringing Home the Bits", they state:

"Defining broadband is more than an academic exercise. Numerous groups would stand to benefit from workable definitions of what constitutes broadband. They include:

- *Consumers, who would like to be able to evaluate service offerings to see if the offerings are likely to meet their needs;*

- *Service providers, who would like to develop, invest in, and deploy services that consumers will need and want;*
- *Application and content developers, who would like to understand and track the connectivity performance options available to consumers;*
- *Policy makers or regulators, who seek to monitor broadband service deployment and measure the impact of policy or regulatory decisions on deployment, define the characteristics of services eligible for tax credits or loans, or define the characteristics of services required in build-out commitments associated with regulatory relief; and*
- *Public interest groups, which seek to evaluate capabilities available to consumers and to understand the implications of alternative policy approaches that influence those capabilities.*

Framed in this way, defining the term "broadband" in some sense also involves (1) identifying the kinds of applications that consumers are likely to find useful and desirable and (2) determining the benefits that different segments of the public anticipate from access to broadband services. The definition of broadband used by each of these groups will reflect that group's expectations and, consequently, can have a significant effect on decision making. Too limited a definition, such as establishing too low a data transmission rate as the broadband threshold, could result in a mismatch between expectations and capabilities, while a definition that is unrealistic in terms of technological capabilities, costs, or consumer demand could prompt inappropriate or poorly aimed policy interventions. The absence of a consensus on definitions will confuse political debate on the subject and require ongoing debates about what definitions to use."

The FCC does not specifically define broadband, but uses the term "advanced telecommunications capabilities" to describe services and facilities with an upstream (customer-to-provider) and downstream (provider-to-customer) transmission speed exceeding 200 kilobits per second (kbps).[3] The FCC uses the term "high-speed" for those services with over 200 kbps capacity in at least one direction.

The NAS study group goes on to provide two definitions for broadband:

"Broadband Definition 1. Local access link performance should not be the limiting factor in a user's capability for running today's applications….

Broadband Definition 2. Broadband services should provide sufficient performance--and wide enough penetration of services reaching that performance level--to encourage the development of new applications."

The first is technical and the second is service oriented. Neither play a role in what we present in this paper. Herein we state that a minimum of a single strand of fiber to the home or business, or place of business end user, is the basis of broadband infrastructure. It is not services, it is not what technical things are performed on the fiber, it is the fiber itself.

Broadband is like water pipes, sewer pipes, electrical wires, and gas pipes. It gets a utility from one point to another. In this case, it is bits. It does not care what the bits does, it does not care that people are connecting different types of bits, it does not care if the end user is buying bits from different people. When one gets electricity today from a town owned facility, the town gets paid for local distribution, but the customer can buy electricity from any one of potentially several providers. When one buys water from the town, one gets to do whatever one wants with the water; flush it, drink it, or wash with it. The same goes for gas in heating, cooking, or cooling.

[3] More specifically, the FCC defines broadband as,

*"Broadband refers most commonly to a new generation of **high-speed transmission services**, which allows users to access the Internet and Internet-related services at significantly higher speeds than traditional modems. It has the potential technical capability to meet consumers' broad communication, entertainment, information, and commercial needs and desires."*

See http://www.fcc.gov/cgb/broadband.html#broadband

Thus the definition for broadband herein is just local bit transport on a strand of fiber. Nothing more, nothing less. This is not wireless, not 3G, it is not twisted telephone loop, nor is it cable. The broadband system herein defined is a local utility which can be interconnected to by a wide variety of service providers of Internet, video, and telephony.

When the Bell System broke up, the intent was to disassemble manufacturing from services. Thus, AT&T offered long distance and manufacturing, and the RBOCs (Regional Bell Operating Companies) offered local service. There was limited discussion relating to separating distribution from service, the loop from the switch. The problem was that the technology did not yet support the idea, or so said the Bell Labs executives at that time. However, people at ARPA (Advanced Research Project Agency), the pioneering organization that built the original Internet, disagreed with the views of the RBOC executives.

The problem with the conceptualization and realization of broadband is that it gets tied up with the political and business agendas of the espousers.

McGarty has discussed the issue of world view and the interpretation of Kuhn's analysis of paradigms, naming specific examples.[4] It can be argued that the issue of broadband is colored by the world view of those proposing it. The architecture of any network is an embodiment of that world view. Thus broadband must be looked at through clear lenses.

1.2 Current Examples

The following is a list of towns and municipalities who are already affecting networks of the type we discuss in this paper. The list is quite extensive, there are at this time over 200 such efforts out of almost 55,000 town and municipalities in the US. That is a 0.5% penetration.

State	*Towns*
Alabama	Lincoln, Opp, Foley, Scottsboro
Alaska	Angoon, Kake, Kiana, Kotlik
Arkansas	Conway, Lockesburg, Paragould
California	Anaheim, Alameda, Burbank, Los Angeles, Palo Alto, San Bruno, Santa Rosa
Colorado	Center, Copper Mountain, Longmont
Florida	Gainesville, Key West, Lakeland, Leesburg, Newberry, Ocala, Valparaiso
Georgia	LaGrange, Fairburn, Marietta, Newnan, Thomasville
Iowa	Akron, Algona, Alta, Bancroft, Cedar Falls, Coon Rapids, Danbury, Dayton, Denison, Grundy Center, Harlan, Hartley, Hawarden, Hull, Independence, Indianola, Lake View, Laurens, Lenox, Manilla, Manning, Mount Pleasant, Muscatine, New London, Orange City, Primghar, Rock Rapids, Sac City, Sanborn, Sibley, Spencer, Tipton, Wall Lake, Waterloo, Westwood
Kansas	Altamont, Baxter, Cawker, Columbus, Courtland
Kentucky	Bardstown, Barbourville, Bowling Green, Frankfort, Glasgow, Williamstown
Maryland	Easton

[4] McGarty, Harvard, 1990.

Massachusetts	**Braintree, Chicopee, Holyoke, Shrewsbury, Westfield**
Michigan	Clearwater, Coldwater, Crystal Falls, Hillsdale, Holland, Lowell, Negaunee, Norway, Wyandotte
Minnesota	Bagley, Coleraine, Elbow Lake, Fosston, Jackson, Marble, Westbrook, Windom
Missouri	Newburg, Springfield, Unionville
Nebraska	Lincoln
North Carolina	Morganton
New Hampshire	Keane
Ohio	Archbold, Butler County, Celina, Cuyahoga Falls, Hamilton, Lebanon, Niles, Wadsworth
Oregon	Cascade Locks, Eugene, Lexington, Lincoln County Public Utility District, Springfield
Pennsylvania	New Wilmington, Pitcairn
South Dakota	Beresford
Virginia	Blacksburg, Leesburg, Lynchburg
Washington	North Bonneville, Sumas, Tacoma
West Virginia	Phillipi
Wisconsin	Oconto Falls, Two Creeks
Wyoming	Lusk, Bailroil

The conclusion that can be drawn from this list is that there is a significant interest in this opportunity as well as a growing experience base in effecting such utility services.

1.3 Comparisons

Let us begin by first comparing and contrasting the more classic utilities with broadband utility systems. This table compares several of the key characteristics of service already provided by municipalities.

Characteristic	*Water, Sewer, Gas, Electric*	*Broadband*
Penetration	Generally 100% although people can have wells and septic systems	Will depend upon market. It is not assumed to be general utility
Alternatives	Separate homeowner systems such as well and septic	DSL and CATV represent alternatives Dial up may be just satisfactory
Competition	Generally none	CATV and ILEC
Monopoly Status	De facto	Must be lobbied.
Regulation	May be state PUC	May be state PUC
Costs	Project based	Project based
Financing	Municipal bonds, project or general obligation	Municipal bonds
Operations	Local, outsourced	Local, outsourced

Interconnection	Certain open interconnect, certain bid	Open interconnect

The table clearly shows that broadband access, as a utility service, it very comparable to public utility services already being provided by the local municipalities. Thus the extension into this new service area, albeit without the background provision of services itself, is very akin to what the town or municipality is already providing.

2 MARKET FACTORS

The FCC in its June 2002 Report on Broadband reached the following observations and conclusions:

1. Subscribership to high-speed services increased by 33% during the second half of 2001, to a total of 12.8 million lines (or wireless channels) in service. The rate of growth during the first half of 2001 was 36%.

2. High-speed lines in service over coaxial cable systems (cable modem service) increased 36% during the second half of 2001, to about 7.1 million lines. High-speed ADSL lines in service increased 47%, to about 3.9 million lines.

3. Reported high-speed connections to end-user customers by means of satellite or fixed wireless technologies increased by 9% during the second half of 2001, and reported fiber optic connections to end-user customer premises increased by 8%. These technologies, together, accounted for about 0.7 million high-speed connections at the end of 2001.

4. Subscribership to the subset of high-speed services that are described as advanced services (i.e., delivering to subscribers transmission speeds in excess of 200 kbps in each direction) increased by 25% during the second half of 2001, to a total of 7.4 million lines (or wireless channels) in service. Advanced services lines provided by means of ADSL technology increased by 37%, and advanced services lines provided over coaxial cable systems increased by 32%.

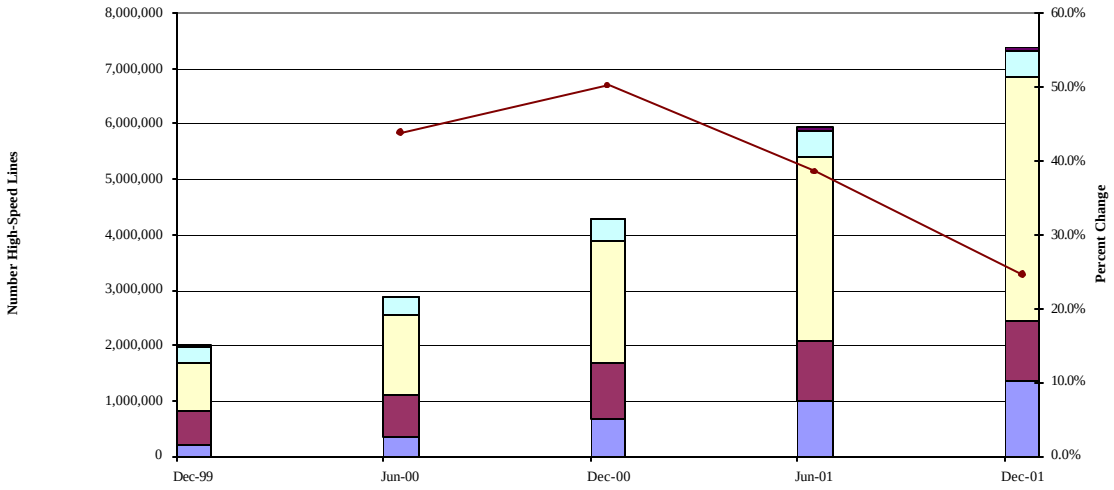
5. As of December 31, 2001, there were about 11 million residential and small business subscribers to high-speed services. By contrast, there were approximately 7.8 million such subscribers six months earlier, and about 5.2 million a year earlier.

6. Of the 11 million high-speed lines in service to residential and small business subscribers at the end of December 2001, FCC estimates that about 5.8 million lines provide advanced services.

7. Among entities that reported facilities-based ADSL high-speed lines in service as of December 31, 2001, about 97% of such lines were reported by incumbent local exchange carriers (ILECs). ILECs claimed a smaller share, about 83%, of high-speed lines delivered over other traditional wireline facilities. When all technologies are considered, ILECs provided about 38% of high-speed connections to end-user customers.

8. Providers of high-speed services over coaxial cable systems report serving subscribers in 49 states and the District of Columbia. Providers of high-speed ADSL services report serving subscribers in 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands, as do providers who use wireline technologies other than ADSL, or who use optical carrier (i.e., fiber), satellite, or fixed wireless technologies in the last few feet to the subscriber's premises.

The following chart shows the growth of access lines across various high-speed technologies, as well as average percentage growth of high-speed connectivity in the United States.



	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01
Satellite or Fixed Wireless	7,816	3,649	26,906	73,476	75,341
Fiber	307,315	301,143	376,197	455,549	486,483
Coaxial Cable	877,465	1,469,130	2,193,609	3,329,976	4,394,778
Other Wireline	609,909	758,594	1,021,291	1,088,066	1,078,597
ADSL	185,950	326,816	675,366	998,883	1,369,143
Percent Change		43.8%	50.2%	38.5%	24.5%

The Commission's data collection program gathers from providers' information about the number of high-speed lines in service in individual states, in total and by technology deployed in the last few feet to the subscriber's premises. Relatively large numbers of total high-speed lines in service are associated with the more populous states. The most populous state, California, has the largest reported number of high-speed lines. The second, third, and fourth largest numbers of high-speed lines are reported for New York, Florida, and Texas, which are the third, fourth, and second most populous states, respectively.

Reporting entities estimate the percentage of their high-speed lines in service that connect to residential and small business end-user customers (as opposed to connecting to medium and large business, institutional, or government end-user customers). These percentages allow FCC to derive approximate numbers of residential and small-business high-speed lines in service by state.

FCC analysis indicates that nearly 98% of the country's population lives in the 79% of zip codes where a provider reports having at least one high-speed service subscriber. Moreover, numerous competing providers report serving high-speed subscribers in the major population centers of the country. See the map that follows

States vary widely with respect to the percentage of zip codes in the state in which no high-speed lines are reported to be in service.

High population density has a positive association with reports that high-speed subscribers are present, and low population density has an inverse association. For example, as of December 31, 2001, high-speed subscribers are reported to be present in 98% of the most densely populated zip codes and in 43% of zip codes with the lowest population densities. However, the comparable figure for the least dense zip codes was 28% a year earlier.

High median family income also has a positive association with reports that high-speed subscribers are present. In the top one-tenth of zip codes ranked by median family income, high-speed subscribers are reported in 97% of zip codes. By contrast, high-speed subscribers are reported in 63% of zip codes with the lowest median family income, compared to 55% a year earlier.

The following is a summary by State:

State	*Residential & Small Business*	*Other*	*Total*
Alabama	121,074	17,905	138,979
Alaska	44,559	5,718	50,277
Arizona	233,214	18,495	251,709
Arkansas	62,900	3,637	66,537
California	1,685,476	355,800	2,041,276
Colorado	156,709	20,710	177,419
Connecticut	180,616	10,641	191,257
Delaware	24,197	2,404	26,601
Florida	776,704	134,557	911,261
Georgia	335,428	84,778	420,206
Idaho	13,288	5,157	18,445
Illinois	329,721	92,985	422,706
Indiana	99,837	23,867	123,704
Iowa	77,859	4,165	82,024
Kansas	120,375	5,588	125,963
Kentucky	47,060	20,810	67,870
Louisiana	148,039	16,721	164,760
Maine	46,955	2,568	49,523
Maryland	227,097	33,537	260,634
Massachusetts	447,030	58,789	505,819
Michigan	387,308	46,550	433,858
Minnesota	180,371	19,485	199,856
Mississippi	28,559	7,027	35,586
Missouri	164,774	17,020	181,794
Montana	11,676	1,361	13,037
Nebraska	69,171	2,280	71,451
Nevada	92,525	17,325	109,850
New Hampshire	62,967	8,233	71,200
New Jersey	522,979	67,213	590,192
New Mexico	28,119	3,821	31,940
New York	1,029,106	170,053	1,199,159
North Carolina	310,439	47,467	357,906
North Dakota	5,116	966	6,082
Ohio	371,141	65,625	436,766
Oklahoma	104,835	10,096	114,931
Oregon	131,279	26,769	158,048
Pennsylvania	318,833	57,606	376,439
Rhode Island	60,202	4,091	64,293
South Carolina	115,343	19,822	135,165
South Dakota	8,361	1,224	9,585
Tennessee	202,393	35,008	237,401
Texas	748,785	91,880	840,665
Utah	64,354	8,623	72,977
Vermont	20,354	1,441	21,795
Virginia	256,813	35,959	292,772
Washington	294,078	41,589	335,667
West Virginia	31,160	1,688	32,848
Wisconsin	159,328	23,067	182,395
Wyoming	6,845	1,011	7,856
Total	11,005,396	1,787,416	12,792,812

3 INDUSTRY FACTORS FOR FAILURE AND SUCCESS

In the past year, there has been a groundswell change in the telecommunications market. It has been in a downward spiral and appears to have disappeared from the view of most investors. The FCC is data presented above reflects two alarming facts: (i) less than only 107.0% of American households has high-speed services, and (ii) there has been a dramatic decline in the growth of high-speed services in the United States. The DSL model has failed to bring high capacity connectivity pervasively into homes and businesses. Cable companies have been resistant in these tumultuous markets in making the required upgrades and buildouts to their cable plants to support high speed Internet access and broadband services. Sparsely populated areas in the nation have seen the lowest penetration of broadband due to the high costs of infrastructure buildout and ongoing network/customer maintenance and support.

The current situation raises the question for any municipality which is , why should we as a town get into a business that clearly has had catastrophic consequences for those who were much more capable. The

question is not one of whether broadband is good; there seems to be a general consensus that it is. It is a question of successful execution in a market that has had colossal losses.

In our perspective, the causes of the current problems in the telecommunications market in the US are:

3.1 Overcapacity on backbone

There is a dramatic oversupply of backbone fiber. This results in only 2-3% of effective capacity in use, and less if one uses more advanced DWDM (Dense Wavelength Division Multiplexing) technology. This overcapacity has lead to price wars that has resulted in continuous losses. This overcapacity was a result of many factors, two being the most significant.

First, there was the unfounded optimism resulting from the anticipated growth in Internet services. What was clear from the start, however, was that if you gave every person in the United States a 56 Kbps modem, and had them on line simultaneously, then this would account for approximately 16.8×10^{12} bps or 16,800 Gigabits per second (Gbps) of capacity. This could be provided by only 16-160 strands of fiber!

McGarty, in a 1990 Harvard paper, stated:

"Fiber has revolutionized the data networks in the United States. A single strand of fiber can transmit 10^{12} bits per second of data. If we allocate each home, 100 million residences, with 100 Kbps of full time data, that is 10^{13} bits per second if everyone in the US is talking simultaneously in this high speed data fashion. That is the capacity of just a single strand of fiber. A typical bundle of fiber has 25 to 50 strands and these are connected to other such bundles. The current fiber network is structured like past voice networks, and generally does not take advantage of the bandwidth of the fiber. Albeit the technology is not yet totally operationally capable, the world view of the system designers is one that is to use fiber as copper. Use it for one voice circuit after another."

So in 1990, it was clearly known that a single bundle would suffice for usage, which was extraordinary. However, the dream for infinite capacity was based on having broadband access to the home. This concept would not want 56 Kbps or 100 Kbps, but Gpbs per home! However, this depended on the "last mile" infrastructure; the connectivity between the local hub or Central Office to the residential or commercial premises.

Second, as stated above, the last mile was the key factor. A twisted pair of copper could, even in 1990, provide ISDN speeds of up to 1.5 Mbps. In Europe, ISDN provides 2 Mbps capacity; Europe uses ISDN while the US does not. The last mile was destined to be a competition between the local telecom company and cable provider. There were many fiber-to-the-home (FTTH) trials, but with the 1996 Telecommunications Act, the RBOCs stopped them totally. They did not want to invest in a distribution capability that they would then have to sell at wholesale (i.e., unbundle) to competitors. Thus the RBOCs actually left millions of miles of stranded FTTH trials un-used.

3.2 Excess Debt

The carriers used high yield debt, in place of equity, to finance capital expenditures for infrastructure buildouts. The amount of such debt exceeded $1 trillion dollars. Most of it has been defaulted on.[5] This problem became symptomatic starting in 1998 when telecom companies started to wilt under the weight of their balance sheet obligations. Companies like Winstar had over $1 billion in high yield debt on their road to bankruptcy. The other new carriers were also amassing high yield debt at a rapid rate. This debt was effectually equity financing since these companies, in an exit scenario, were not generating sufficient cash flow to provide returns to stockholders over and above any returns to bondholders.

[5] Most interesting is that the SEC has no control over high yield debt. The rules that apply to equity do not apply to companies using the 144A type financing. For all purposes this type of financing is the equivalent to equity, and publicly at that.

Who created this excess debt fiasco and why? The answer is to look at the people involved in creating and raising such forms of financings. The high yield debt of the 1990's was the junk bonds of the 1980s; Drexel Burnham and all. There was no fundamental change in the debt, just increased risks and much higher numbers involved. In the 1980s, junk bonds were use to fund LBOs (Leveraged Buy Outs). In the 1990s, high yield debt was essentially used to replace equity, with no corresponding SEC (Securities Exchange Commission) oversight, leading to significant lack of transparency as well as accountability.

3.3 Excess Vendor Financing

After 1996, telecom companies raised almost $500 billion in vendor financing, which was subordinated in seniority to high yield debt. Lucent, Nortel, Siemens, Alcatel, Cisco, and others provided vendor financing at rates that were very high but concomitant with risk. This form of financing was typically secondary to other debt, generally the high yield borrowing. Clearly, the payback potential on vendor financing was diminished to begin with.

3.4 Regulatory Confusion

The 1996 Telecom Act created an artifact of a new paradigm for telecommunications regulation. However, the FCC has been without exception a failure in its regulatory management. The 1996 Act mandated competition. The key to competition was two simple elements: (i) access to the local unbundled loop and (ii) elimination of interconnection fees, also called access fees, resulting in a bill-and-keep environment. To date, neither of these key elements has been deployed. In fact, the FCC is generally opposed to these two elements for the same reasons as the ILECs (Incumbent Local Exchange Carriers) are, almost word for word. Thus, without any form of parity in interconnection and access, there will remain a non-competitive environment.

3.5 Inexperienced Management

This has been and in many ways continues to be a major problem. WorldCom was managed by good sales and marketing people but clearly missed on the regulatory and financial front. MCI, the carrier part of WorldCom, was initially a law firm with a telephone company attached.[6] That, at many levels, was its key to success. The battlefield is, was, and most likely will always be Washington D.C. to gain a sustainable competitive advantage. After the 1996 Telecom Act and during the infamous Internet bubble, startup telecom companies sprung up like wild weed everywhere; not many of them are around today, with more going out of existence on a regular basis. It is estimated that after 1996, over $4 trillion of private equity money went into telecom and Internet services companies; about $1 trillion of it has disappeared.

3.6 Pricing Suicide

Pricing has been a major problem with telecommunications survival. Companies have taken any and all steps to get revenue at the cost of losing billions of dollars. The most recent example is that of Internet transit pricing. Long haul carrier companies such as Genuity and UUNet, have reduced prices almost 90% over the first six months of 2002 and have seen revenue reduce, gross margins become more negative than the revenue, and losses eat up their remaining cash at a perilous rate.[7] The impact has been a 10:1 reduction in market capitalization in the same six-month period.

During the same period, however, the RBOCs have raised their prices 15% on average, for an annualized rate of 30%, and have seen increased reductions in their operating costs. In addition, the RBOCs have regained customers lost to the CLECs due to CLEC bankruptcy. The conclusion is simple; where there is total market competition, certain new entrants will price below costs to gain market share at any cost.

[6] See Coll for an excellent discussion of MCI as a survivor and growing company.

[7] At the time this paper was being prepared Genuity had defaulted on their debt but was yet to declare bankruptcy. They were going though more than $300 million a quarter in cash!

Similarly, in a competitive market, cash-rich players will reduce prices to squeeze cash-strapped players out of the market. Where a monopoly or oligopoly exists, pricing declines will likely be minimal.

3.7 Monopolistic Practices

The RBOCs have been brilliant in their ability to continue to affect a monopolistic market. The political lobbying power of the RBOCs is legendary and the cash thrown by them at litigation to protect their turf seems to come from a bottomless bucket.

There are two key monopolistic practices of the RBOCs which create barriers to entry to any competitor. They are:

> ***Access and Interconnection Fees:*** These are the fees charged by the RBOCs to interconnect to their network. McGarty has argued for over fourteen years that access fees must be eliminated for any type of communications competitiveness. The initial focus was on eliminating access in the wireless market. A wireless company, McGarty argued, was just another local phone company. A customer buys access from the local provider to a meet point. This service is for calls in and out. Thus the subscriber does not pay a different amount for the ability to receive than from the ability to call. Thus if one calls an RBOC customer, the RBOC should not be paid again for what the RBOC customer has already bought and vice versa. McGarty then goes on to demonstrate that the economics of access create predatory pricing in line with the violations under Sherman and Clayton antitrust laws.
>
> ***Unbundled Network Elements (UNEs):*** The simplest of the UNEs is the unbundled local loop. For telco based broadband competitors, having ready access to a loop is essential. As we are aware, COVAD, Northpoint, and others failed because the RBOCs delayed in loop provisioning. CLECs failed because of loop provisioning and price. For example, an RBOC charges $14.00 per month for a loop, plus co-location space and facilities for say $4.00, for a total of $18.00. They sell services for $19.00! Thus a new entrant could not compete on price. Yet the RBOCs say that the prices they are forced to sell are only 40% of what their costs are. If one follows that logic, then their costs are $45.00 on loop alone and that they must be loosing $26.00 due to loop costs. In fact, if one were to price all UNEs at the alleged RBOC cost , (assuming that they are at 60% discounts from their costs,), then their plant costs for a single phone line would exceed $1,000!

Clearly, based on the above discussion, the use of municipal broadband eliminates the UNE problem. It, however, does not eliminate the access fee problem. This is a legal issue. Access fees are barriers to entry, anti competitive devices used by RBOCs, theoretical constructs supported by academics on the RBOC dole, and ultimately the elements which create economic distortions via a penalty paid directly by the customer to the monopolist to support the monopoly.

3.8 Litigation Excess

The ILECs/RBOCs have been litigating in excess to prevent the CLECs and the DSL companies from becoming real competitors. Some of the initial cases are:

1. AT&T CORPORATION, *et al* ., PETITIONERS *v* . IOWA UTILITIES BOARD *et al* .;
2. AT&T CORPORATION, *et al* ., PETITIONERS *v* . CALIFORNIA *et al* .
3. MCI TELECOMMUNICATIONS CORPORATION, PETITIONER *v* . IOWA UTILITIES BOARD *et al.;*
4. MCI TELECOMMUNICATIONS CORPORATION, PETITIONER *v* . CALIFORNIA *et al* .
5. ASSOCIATION FOR LOCAL TELECOMMUNICATIONS SERVICES, *et al.* , PETITIONERS *v* . IOWA UTILITIES BOARD *et al.*
6. FEDERAL COMMUNICATIONS COMMISSION *and* UNITED STATES, PETITIONERS *v* . IOWA UTILITIES BOARD *et al.;*
7. FEDERAL COMMUNICATIONS COMMISSION *and* UNITED STATES, PETITIONERS *v* . CAIFORNIA *et al* .

8. AMERITECH CORPORATION, *et al* ., PETITIONERS *v* . FEDERAL COMMUNICATIONS COMMISSION *et al* .
9. GTE MIDWEST, INCORPORATED, PETITIONER *v* . FEDERAL COMMUNICATIONS COMMISSION *et al* .
10. U S WEST, INC., PETITIONER *v* . FEDERAL COMMUNICATIONS COMMISSION *et al* .
11. SOUTHERN NEW ENGLAND TELEPHONE COMPANY, *et al.* , PETITIONERS *v* .FEDERAL COMMUNICATIONS COMMISSION *et al* .

Recently, in June 2002, in the case of Trinko v Bell Atlantic, United States Court of Appeals For the Second Circuit, however, what we see is the first of several examples of how customers, not companies, are fighting back with the RBOCs using antitrust laws.

The following analysis considers several of the more recent cases wherein the RBOCs have used litigation to delay the deployment of services, broadband and more standard services. One should remember that the Act was passed in February 1996 and the FCC completed the rule making in September 1996. Thus by January 1997, the RBOCs had aggressively moved to have PUCs take pro RBOC positions. The first was Iowa as shown below. These five cases start to set the ground work for what the potential legal environment will hold.

3.8.1 Iowa Utilities Board v FCC et al, US 8th Circuit Court, July 17, 1997

This was one of the first major rulings. The 8th circuit was asked to vacate the entire FCC First Report and Order, which in essence established the details of the procedures to be followed in the implementation of Sections 251 and 252 of the 1996 Act. It was not that the FCC did a bad job, it was that the RBOCs wanted to generate confusion and delay.

In the ruling the 8th Circuit partially kept and partially rejected the issue of what authority the FCC has over states, generally ruling in the favor of the states. The Court stated that the States and not the FCC have the prime role of rate setting. In fact they severely restricted the FCC's ability.

There was the "pick and choose" rule, whereby the FCC stated that CLECs could pick and choose elements of interconnection agreements previously agreed to by other carriers to implement their own interconnection agreement. This would give CLECs an advantage. The 8th Circuit denied this.

However, it then addressed the issues regarding unbundling. This is the UNE issue. The UNE issue as we have stated was at the heart of broadband. It was the reason broadband failed. As to unbundling the 8th Circuit stated:

1. Unbundling of Operations Support Systems software and databases is approved. This allows for a seamless integration.

2. The FCC determination of allowing interconnection to the ILEC at any "technically feasible" point is acceptable.

3. Denied the FCC's interpretation that any element that must be unbundled and which is needed must be unbundled.

4. Upheld the FCCs interpretation of the "necessary" and "impairment" interpretations. "Necessary" means that it was necessary for the CLEC and impair meant that it would impair the CLECs service.

5. Denied the rule requiring unbundling and affiliated combining. The Court decided that the ILEC did not have to do the combining, that the CLEC would be both able and required to combine UNEs. This meant that the CLEC had to reassemble parts that were under the control of the ILEC. This lead to impossible situations.

6. Upheld the provision of allowing CLECs to purchased finished services. Generally this was and is not a competitive issue.

7. Upheld the unbundling rules in general. The RBOCs tried to stop this via referral to intellectual property rights and Constitutional Takings clauses in the Fifth amendment. The Court did not agree with these positions.

3.8.2 AT&T et al v Iowa Utilities Board, US Supreme Court, January 1999

The Supreme Court, Justice Scalia delivering, in addressing the above case f the 8th Circuits, found as follows:

1. Reversed the 8th Circuit in stating that Federal Law permits the FCC to have jurisdiction over the Act and its implementation.[8]

2. Reversed the 8th Circuits denial of "pick and choose" because it was clearly stated in the law. This is interesting since the 8th Circuit tried in many ways to remove this FCC interpretation.

3. Approved all unbundled access rules except Rule 319 (also 47 USC 51.319, FCC 96-325, First Report and Order), which is the necessary and impair clause. From the First R&O we find the FCC stating:

"275. The Department of Justice and Comptel reject the BOCs' argument that the general obligation imposed by section 251(c)(3) is limited by consideration of whether the failure to provide access to an element would impair a carrier's ability to offer a service. They argue that the term "impair" does not mean "prevent," and that we should interpret this standard to mean that a carrier's ability to provide a service is impaired if obtaining an element from a third party is more costly than obtaining that same element from the incumbent. They also dispute the incumbent LECs' argument that the "impair" language in this standard means that new entrants cannot exclusively use unbundled elements to provide the same or similar retail services that an incumbent offers. They argue that, if similarity is enough to prevent the use of unbundled elements, then section 251(c)(3) would be nullified. They further contend that, under the BOCs' theory, incumbents could prevent new entry through the use of unbundled elements by offering unbundled loops, switching, and other elements as retail services."

The Court vacated the rule 319, which had necessary and impair. The Courts reasoning was simply that necessary and impair were in eye of the beholder, and in this case the beholder was the CLEC not the FCC. It remanded the rule back to the FCC.

3.8.3 Verizon et al v FCC, US Supreme Court May 13, 2002

In this case, the Court ruled as follows

1. Affirmed that the FCC can set rates on a forward-looking basis. They also rejected the need for factoring in historical costs.[9]

2. Affirmed the TELRIC forward- looking cost basis for setting the rates.[10] [11]

[8] See Chevron v NRDC, 467 US 837. The case involved EPA regulations. The Court ruled that the EPA, and Federal Agencies in general, have great latitude in interpreting the law and in fact may have the right to change their interpretation.

[9] See Smyth v Ames, 169 US 466. The case involves railroads and rate setting across state lines. The Court ruled that it was reasonable for Nebraska to set railroad rates and that a state had that authority.

[10] TELRIC, is Total Element Long Range Incremental Costs. It is a method to determine costs that are: (i) forward looking, (ii) least cost, (iii) long run, (iv) incremental, and (v) include a return on invested capital. However, like all models the input determines the output. Thus, albeit a methodology, it is not based irrefutably and consistently based on facts. It is not reproducible.

3. Reversed 8th Circuit in requiring that ILECs combine UNEs into a single UNE at request of CLEC since ILECs have capability and control process, whereas the CLECs are helpless in the effort and may be hindered by the ILEC.

4. Takings argument was rejected.

This was in many ways a reversal for the RBOCs.

3.8.4 US Telecom Association (USTA) v FCC, Bell Atlantic as Intervenor, US Court Appeals, District of Columbia, May 24, 2002

This extremely poor and seemingly prejudiced opinion rejects the FCC re-do of the necessary and impair issues in 319 as described above. The DC Court totally rejected the FCC's efforts. It set unbundling back severely.

The DC Circuit Court focused on DSL services. The DSL companies, all bankrupt by the time of the ruling due to ILEC anticompetitive actions, has continued to block this effort. The DC Court, totally oblivious to this fact, actually states:

"The Line Sharing Order Petitioners primarily attack the Line Sharing Order on the ground that the Commission, in ordering unbundling of the high frequency spectrum of copper loop so as to enable CLECs to provide DSL services, completely failed to consider the relevance of competition in broadband services coming from cable (and to a lesser extent satellite). ***We agree."***

There is no competition. In fact the ILECs or RBOCs have slowly rolled out limited DSL knowing that in the long run they want separate monopolized fiber exempt from any Act provisions. This accomplished, with the help of the DC Court and their ilk, one can foresee slow broadband at extortionary rates. The DC Court goes on to say:

"In sum, nothing in the Act appears a license to the Commission to inflict on the economy the sort of costs noted by Justice Breyer under conditions where it had no reason to think doing so would bring on a significant enhancement of competition. The Commission's naked disregard of the competitive context risks exactly that result. Accordingly, the Line Sharing Order must be vacated and remanded. Obviously any order unbundling the high frequency portion of the loop should also not be tainted by the sort of error identified in our discussion of the Local Competition Order and identified by petitioners here as well."

In fact the FCC did regard the competition, the Court has not look at the stock market and see the impact.

3.8.5 Trinko v Bell Atlantic, US Court of Appeals, 2nd Circuit, June 2002

Trinko is a law firm in New York. It tried to get some telecommunications service from a CLEC, in this case AT&T. The CLEC failed to deliver based upon Verizon's refusal to deal. The result was that the law firm sued Verizon on two grounds; violation of the 1996 Act and antitrust violations. The 2nd Circuit dismissed the 1996 Act action based on not having standing. It agreed to the antitrust action.

The 2nd Court starts its discussion on the antitrust claim as follows:

"Generally, a plaintiff can establish that a defendant violates section 2 of the Sherman Act by proving two elements "(1) the possession of monopoly power in the relevant market; and (2) the willful acquisition or maintenance of that power, as distinguished from growth or development as a consequence

[11] See Duquesne v Barasch, 488 US 299. In this case the Court ruled that a state could set rates and in so doing did not violate the takings clause of the Constitution.

of a superior product, business acumen, or historic accident." Volvo N. Am. Corp., 857 F.2d at 73 (citations omitted); accord Top Mkts., Inc. v. Quality Mkts., Inc., 142 F.3d 90, 97 (2d Cir. 1998)."

The 2nd Court structures the claim as follows:

"Similarly, as a result of the alleged monopoly scheme, the plaintiff in this case had a similar set of choices: (1) stay with AT&T and receive inferior local service; or (2) switch to Bell Atlantic. While the second choice would hurt AT&T as a competitor, the first choice directly injures the plaintiff as a consumer. In this case, the plaintiff made the first choice and suffered the requisite antitrust injury."

The 2nd Court then stated:

"It is unlikely that allowing antitrust suits would substantially disrupt the regulatory proceedings mandated by the Telecommunications Act. In discussing the impact such suits would have on the regulatory process, it is useful to discuss separately suits seeking damages and suits for injunctive relief. Awarding damages for the willful maintenance of monopoly power would not substantially interfere with the regulatory scheme envisioned by the Telecommunications Act. In contrast, injunctive relief in this area may have ramifications that require particular judicial restraint."

However the 2nd Court ruled that the suit and claim survived based on antitrust grounds. This will open up a whole new avenue for litigation against the unbundling rules. It will also further delay broadband.

The litigation by the RBOCs against the FCC and all competitors is akin to slaveholders suing the Federal Government in 1866 for passage of the 13th Amendment eliminating slavery, under the "takings" clause of the Constitution. The RBOCs were and to a great degree are still the monopolists in all markets. They set prices, control who gets what segments, lobby the government to their advantage, and use the courts to protect their monopoly position. All of this is done in spite of the 1996 Act and the antitrust laws.

3.9 The RBOC Strategies to Broadband

Verizon has aggressively staked out its position vis-à-vis broadband with a paper written by John Thorne, Senior Vice President and Deputy General Counsel, Verizon.[12] The paper outlines what the RBOC, namely Verizon, intends to do to delay broadband until it is in its sole best interest.

Mr. Thorne begins the paper with:

"Computers make us rich. Computer networks make us richer. Very fast computer networks will make us richer still, if and when they finally get built – which will happen when the federal government steps aside and unleashes competition in the industry that now has the technology in hand to build them"

We can readily deconstruct this rather compelling statement from a corporate officer, a lawyer, and a representative of the Verizon position. Clearly, Verizon believes that having anyone else in the market is anti-competitive. The need is to take any and all restrictions and regulation off of them and then they will, single handedly, resolve the problem. As a result, they will get very, very rich. In turn, their sole intent is "to make us richer still".

He goes on to state:

"Unfettered competition delivers the most when markets are young, and when technology is evolving quickly. This is evidently true in broadband markets today. Most of the market is completely up for grabs, because 90-plus percent of the technology that will ultimately be used hasn't yet been built, 90-

[12] See :

http://newscenter.verizon.com/policy/broadband/primer_c.pdf?PROACTIVE_ID=cecfc9cbc9cdcdcec9c5cecfcfcfc5cecfc7cdc8c7c7cacfcec5cf

plus percent of the capital hasn't yet been committed, and 90-plus percent of the customers aren't yet being served. And because broadband digital services will ultimately absorb and displace the old, analog voice and video, it is equally true that no player in the market today has any assurance of winning any given share of the digital market ahead. Everything is up for grabs, because an extraordinary transformation in technology has overtaken all the old certainties.

In circumstances like these, regulators should have the wisdom and the courage to stand by and do nothing. For the most part, they have chosen to do just the opposite. Telecom regulation today reaches further, and more intrusively, than ever before. And the effects are now being felt across the economic landscape. The third wave of the IT boom – the broadband wave – has not materialized…"

This is a veiled threat. Verizon is clearly saying that they are not building broadband despite DSL efforts. DSL is the poor man's broadband. Verizon will not build broadband until it has been deregulated. Then and only then will it create more wealth for itself at the cost to the consumer.

The UNE issue is clearly an element of their strategy to delay and divert. As Thorne states:

"Rather than make unbundling the direct stepping stone to deregulation, as Congress intended, the FCC has instead transformed it into a mountain of new regulation. The Commission has invented far too many "unbundled network elements," and it has contrived to price them much too cheaply. It has done this ostensibly for the benefit of small competitors that lack both the resources and the technical expertise to build their own networks. But the upshot has been a tangle of regulation that has simultaneously discouraged new investment by both incumbent carriers and by competitors that have the finances and technical ability to build out new broadband networks and develop facilities-based competition. This is not simply the conclusion of chronically over-regulated incumbents. A unanimous U.S. Supreme Court reached that conclusion in a major January 1999 ruling. As did a unanimous Eighth Circuit Court of Appeals, in a key, follow-up decision in July 2000. That latter ruling is itself now headed back to the Supreme Court for further review."

As shown above, the Supreme Court has overthrown this issue. However the DC Appeals Court has brought it back into the fray.

"Collocation rules allow competitors to squat on the incumbent LECs' real estate, for the ostensible purpose of interconnecting their equipment with unbundled network elements in the incumbents' central office. The competitors supply network equipment, but are not required to have an office of their own. The "UNE Platform" rules push things a step beyond that – competitors do not have to supply any network equipment, either."

The answer to Thorne's concern is simply to create neutral meet points where Verizon and any competitor for any service can meet. Thus, the "squat" is not necessary. The meet point we propose is that of the head end of the municipal networks.

"The Commission has even managed to endorse a scheme under which incumbent carriers end up paying others – and paying them billions of dollars – to interconnect with and use the incumbents' own networks. This scheme travels under the innocuous alias of "reciprocal compensation." The 1996 Act required carriers to "establish reciprocal compensation arrangements for the transport and termination of telecommunications." The original idea was simple: local carrier A would have to pay local carrier B to "terminate" traffic originating on A's network and terminating on B's."

This is the access and interconnection issue. Having a "bill and keep" approach would eliminate mutual compensation and the significant transactions costs related thereto. Only when Verizon saw that to be the case did it start to move in that direction. He further states:

"For ordinary voice traffic, this would mostly be a wash. But for tens of millions of dial-up Internet users, the call always originates on their home phone line; the Internet itself never originates calls or phones you back. Moreover, Internet users often stay on line for hours at a time – much longer than typical voice callers."

Thus again we see a tendency to not do broadband.

Thorne then goes on to attack the cable companies. This is really a feint attack, since in reality he and Verizon ultimately want total deregulation.

"There is, as a result, sharply different regulation of high-speed data services provided over phone lines and over coaxial cable. Telephone companies have to unbundle the portion of the spectrum used for broadband and do so at below-cost pricing. Cable companies do not. Telephone companies have to permit their competitors to collocate equipment to make it easier to use the unbundled spectrum. Cable companies do not. Telephone companies have to offer for resale their retail broadband transmission services at a federally mandated wholesale discount. Cable companies do not. Telephone companies have been forced to provide their broadband services through separate affiliates as a condition to gaining regulatory approval of recent mergers. Cable companies have not. Telephone companies have to pay in to the universal service regime when they provide broadband access. Cable companies do not. And telephone companies are almost completely locked-out of the multi-billion dollar (and rapidly expanding) Internet backbone market. Cable companies are not."

This is a gross misstatement of facts. Towns or local cable boards regulate Cable companies. They do not have a monopoly. At any time, the franchise can be removed. Cable is a franchise business and towns get franchise fees. They provide universal services to towns, the franchising authority.

He then goes on to discuss the Internet:

"The Internet backbone is currently the least competitive part of the broadband market, owned and controlled by a few companies. The Bell Companies have sufficient incentive and capital to play an important role in developing the next generation Internet backbone, but have been kept out of the game. The economies of backbone networks depend on picking up and dropping off traffic at all major nodes nationwide – missing even one creates a serious competitive disadvantage. Section 271 approval, however, occurs on a state-by-state basis. A Bell Company, therefore, cannot become a meaningful competitor in the backbone market until it obtains its last approval to provide long-distance voice and data services in the last state where it serves as the incumbent local phone company."

The fact is that the Internet backbone is ruthlessly competitive. The biggest players are UUNet, Genuity, Sprint, AT&T, Cable and Wireless, and many more.[13]

His final statement is another sophistry of the highest form:

"Yet, if prior monopoly status were sufficient, unbundling and TELRIC regulation would equally apply to cable companies, which are, in fact, current monopolists in the market for multi-channel video. The incumbent phone companies, however, have no "prior monopoly" in the broadband market – there is no "prior" market here at all; the market is brand new. The disparate regulatory regimes the Commission has adopted will shape the development of that market, by inefficiently shifting investment in new products and services from the heavily regulated technologies to the unregulated technologies. By picking winners and losers in this nascent market, the Commission ultimately harms consumers.

[13] See McGarty, Transit, January 2002 for details.

Thus, the Commission has again placed competitors ahead of competition. By extending to broadband services the entire panoply of unbundling regulation, along with the attendant regulation of price, collocation, operations support systems, and competition in Internet backbone markets, the Commission has labored to boost a host of small firms that do little more than resell the facilities of phone companies. But resale adds little in the way of new value, and the unbundling rules themselves directly inhibit the provision of functional service. It takes a lot of delicate adjustment to overlay a torrent of data on top of a trickle of voice on a mile-long strand of copper. The high-tech business of pulling together high-speed networks has been taken over completely by fractious regulators."

This remark falsely states that cable is a monopoly whereas it is a franchise. It can be replaced or overbuilt at any time. His goal is to get Verizon's loop free from the FCC; then Verizon would unbundle any and all UNEs that any other competitor wants. If Verizon is allowed to do that, it will mean the end of any competition, any alternatives to access, and the beginning of the control of the network as it was before 1982 and the breakup of AT&T.

3.10 Key Strategies for Municipalities

Given the above machinations by the RBOCs, it appears that the only viable way to provide local open access is via municipal networks. For any municipality to participate in the telecommunications infrastructure market, they must be aware of how not to fall into the traps detailed above. We have suggested in the following table a brief summary of strategies that will be key to any successful implementation of broadband by local government.

Element	*Current Players Strategy*	*Municipal Broadband Strategy*
Overcapacity	• Assumed Internet demand • Assumed local broadband access	• Develop and implement improved metrics for measuring local broadband demand and growth thereof. Make broadband available ubiquitously to proactively spur local economic development • Compete with DSL and CATV • Market truly broadband services ahead of other players
Debt	• Use high yield debt as if it were equity • Assumed unbounded growth in stock market	• Use of municipal project bonds or alternate forms of municipal debt • Possible Federal Government underwriting, subsidization or grants • Low tax-exempt interest on debt
Vendor Financing	• Assumed continued vendor financing • Acquired financing at very high rates	• All capital plant bought via funds from bonds • RFP process to identify lowest-cost highest-quality vendors

Regulatory Confusion	• 1996 Telecom Act was poorly interpreted by FCC • Courts have continually reinterpreted Act FCC takes its lead from major RBOC incumbents and frequently ignores pressure from any new entrant FCC populated by former RBOC executives	• Power of state to act. • Independence of FCC and PUC.
Management	• Management was selected based on ability to raise money and promote stock. • Management commonly lacks operational and technical expertise	• Leverage existing skill sets (e.g. power utilities) • RFP process to attract and identify highest quality management companies
Pricing	• Due to proliferation of entrants, irrational pricing to capture market share at great operating loss	• As dominant player, can control pricing to ensure that assets generate sufficient revenues to pay bonds • No economies of scale locally for infrastructure plant
Monopolistic Practices	• RBOCs have practiced two blocking monopolistic and antitrust practices; access fees and unbundling of network elements.	• Create de facto monopoly for local broadband infrastructure • Requires significant political positioning
Litigation	• RBOCs have continued to litigate against entrants and FCC causing a poorly defined playing field. • Customers are now suing RBOCs using antitrust legislation. • Certain Courts, such as District Federal Court rule exclusively in favor of RBOCs and against FCC	• States typically provides local government Constitutional Authority to proliferate broadband practices • Need for strong lobbying

4 REGULATORY ISSUES

There are regulatory and economic issues that have seen significant discussion in the literature regarding the implementation of municipal networks and services of any kind. Carlson states the following:

"Municipally-owned utilities perform cost-efficiently relative to regulated private firms due to the efficiency-distorting effects of regulation. This phenomenon has been noted in the electric industry and is

also present in the cable television industry. Private electric utilities have, until very recently, been governed by rate-of-return regulation. Cable operators have been controlled by municipal franchise regulation and federal price regulation, and have also been granted deregulation. These four methods of dealing with the problem of monopoly all produce inefficiencies in private utility provision."

Carlson further goes on to state:

"Recent years have shown that deregulation is an undesirable solution to the monopoly problem. Congress deregulated the cable industry from 1986 to 1992. This six-year experiment revealed the monopolistic nature of the cable market. During this period, cable rates increased at triple the rate of inflation. The economic rents enjoyed by the cable industry during the period of deregulation indicate that the industry is a prime candidate for regulation. The popular discontent with cable deregulation was such that the 1992 Cable Act which re-regulated cable was the only bill enacted during the Bush Administration over the President's veto. The Telecommunications Act of 1996 mandates deregulation of the cable industry by March 31, 1999. This statutory repeal date is now being challenged by the FCC and by members of Congress due to the failure of technology to produce effective competition in the market for video programming distribution."

Carlson further goes on to recount the municipalization of networks"

"The Northeast and Midwest have long been centers of collective action against investor-owned electric utilities. Public power systems continue to be especially concentrated in Massachusetts, Vermont, Ohio, Indiana, Kansas, Nebraska, Iowa, and Minnesota. Many of these states were also centers of the Grange movement in the 1870's, when farmers collectivized to counter the abuses of the railroad industry."

There are multiple regulatory issues of concern here. They revolve primarily around the FCC and the state PUC.

4.1 FCC

The FCC has been authorized by Congress to oversee the Telecommunications Act of 1996. As has been shown herein, the FCC has had a difficult task due to litigation and the various Courts attempting to interpret the law for themselves.

However, Federal law broadly permits local governments to provide utilities on a competitive basis. Yet, there has been frequent litigation brought by private companies against public entities on the grounds of violations of due process, equal protection, antitrust laws and the First Amendment. Municipalities have been granted significant room to effect such infrastructure and services by the courts. and therefore, the litigation threat in a Federal Court from establishing an overbuilt broadband network may exist but is both a cost of doing business and is manageable.

The Telecommunications Act of 1996 ("the Act") was passed with the intent of creating a pro-competitive telecommunications policy that would allow all potential competitors, including public utilities, to enter local cable and telephone markets. Most importantly, the intent was to allow for the deployment of broadband types services. This was a major thrust of the Clinton Administration and had been a key effort of the then Vice President Gore.[14]

Congress passed the Act with huge majorities in both houses, signaling a compromise among all the major lobbying interests. The RBOCs and other incumbent local exchange carriers, however, resisted the proposal to open their markets to competition, and demanded concessions from Congress before they would consent to the legislation. Congress proposed a quid pro quo in order to facilitate passage of the statute. The *quid* that Congress granted in return for the *quo* of local competition was that the ILECs would receive the right to operate under substantially less regulation, the right to enter into vast new geographic and product

[14] See McGarty, 1990, Harvard, which discusses the NREN, a structure developed to become the Internet.

markets (including long distance, equipment manufacturing, and cable television), and the right to form strategic partnerships and other business relationships that had been previously foreclosed to them.

As Carlson states:

"On Capitol Hill, the ILECs submitted to laws that opened local communications markets to all potential competitors. The ILECs wanted to secure Congressional approval of their entry into other product markets, and so they needed to give Congress an unconditional promise to open their local markets to competition. The ILECs thus submitted to very broad pro-competitive language in the Telecommunications Act. Through the Act's passage, the ILECs obtained federal approval of their entry into other lucrative markets. Congress recognized that the ILECs could poison the compromise once the Act had passed. The legislators anticipated the legal barriers that the ILECs might erect at the state level in order to restrain competition. Congress therefore endowed the FCC with broad authority--and compelled its exercise--to preempt state and local laws that restrict competition."

We have previously demonstrated that the ILECs, especially referring to the Thorne Manifesto, vies deregulation as a right that the incumbent monopolists are due under this Act. Carlson states this conclusion fairly clearly in his paper. The statement that the FCC had broad authority to avoid poisoning at the state level was very prescient and true. All one has to do is look at the record of litigation we have already presented. Yet the fact is true each time the case reaches the Supreme Court the FCCs authority as ultimate arbiter is upheld.

Specifically, all one has to do is read Section 253(a) of the Act which provides:

No State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service.

Subsection (d) continues:

If, after notice and an opportunity for public comment, the Commission determines that a State or local government has permitted or imposed any statute, regulation, or legal requirement that violates subsection (a) or (b), the Commission shall preempt the enforcement of such statute, regulation, or legal requirement to the extent necessary to correct such violation or inconsistency.

Congress provided additional strength to the above provisions by mandating its enforcement and by protecting *any entity* seeking to provide telecommunications services. The provision applies to any laws that have the *effect* of prohibiting competition. Whether the phrase *any entity* covers municipally-owned utilities is presently a focus of debate.

Despite the fact that the FCC recently ruled that the phrase in the Act does not directly extend to municipally-owned utilities, the Act suggests that Congress did intend for municipally-owned electric utilities to be covered by the Act's preemption provision. This result was reached by a state court. The appeal of the FCC's ruling to determine the scope of the preemption language is pending before the D.C. Circuit.

4.2 States and the PUC

States have diverged in their willingness to permit municipalities to construct broadband networks. Three states have expressly authorized municipalities to own and operate telecommunications utilities. Six states have passed, or are considering, legislation to prohibit municipalities from providing telecommunications services. Other states are governed by general rules--Dillon's Rule--that hold municipalities to affirmative grants of power. These states in effect have prohibited municipalities from providing telecommunications services by withholding express permission to provide these services. This section of the article will suggest why some states have empowered municipalities to provide telecommunications services, while others have sought to restrict their authority. Furthermore, it will distinguish between the two restrictions

on municipal authority under state law--anti-competitive statutes and Dillon's Rule. A conclusion is reached that the first set of restrictions on municipal autonomy - the passage of anti-competitive legislation--is preempted by the Telecommunications Act of 1996. However, the second set of restrictions--the absence of express authority in Dillon's Rule states--constitutes a fundamental tenet of state sovereignty, and is beyond the preemptive scope of the Telecommunications Act of 1996.

The question of whether the preemption provision of the Telecommunications Act covers municipally-owned utilities will largely determine the ability of municipalities to create broadband networks.

There are some states that place very rigid controls over what a municipality can do, this has been characterized generally by what is called the Dillon Rule. Carlson defines Dillon's rule as follows:

"Dillon's Rule is a judicially-enforced rule that has been incorporated into some state constitutions, and that is codified into law in other states. First proposed in 1868 by John Dillon, Chief Judge of the Iowa Supreme Court, Dillon's Rule provides:

[A] municipal corporation possesses and can exercise the following powers and no others: First, those granted in express words; second, those necessarily implied or necessarily incident to the powers expressly granted; third, those absolutely essential to the declared objects and purposes of the corporation--not simply convenient, but indispensable . . ."

Carlson then summarizes the states that permit, deny and otherwise, municipal networks. This is summarized in the following Table.

State Permitted	*State Denied*	*Follows Dillon's Rule*
Iowa Georgia Minnesota	Missouri Nevada Tennessee Texas Virginia	Pennsylvania South Carolina

Carlson finally states:

"Recent history shows that private cable operators have not provided cost effective service. Neither municipal franchise regulation, deregulation, nor price cap regulation are satisfactory solutions to the problem of monopoly. Where public regulation and private monopoly fail, perhaps Milton Friedman's "third evil" of public monopoly is the option that yields the most effective solution. As noted above, public ownership has been a cost- effective solution in the electric power industry. Today, municipalization has re-emerged as the best form of ownership of the information highway."

Now, in the Commonwealth of Massachusetts Constitution, Article LXXXIX, Section 7 is a refinement of the Dillon rule. Specifically it states:

"Section 7. Limitations on Local Powers. - Nothing in this article shall be deemed to grant to any city or town the power to (1) regulate elections other than those prescribed by sections three and four; (2) to levy, assess and collect taxes; (3) to borrow money or pledge the credit of the city or town; (4) to dispose of park land; (5) to enact private or civil law governing civil relationships except as an incident to an exercise of an independent municipal power; or (6) to define and provide for the punishment of a felony or to impose imprisonment as a punishment for any violation of law; provided, however, that the foregoing enumerated powers may be granted by the general court in conformity with the constitution and with the powers reserved to the general court by section eight; nor shall the provisions of this article be deemed to diminish the powers of the judicial department of the commonwealth."

Thus, this typical example requires Legislature approval; in Massachusetts the Legislature is called the general court.

4.3 Antitrust Issues

The senior author has argued that effective competition in the local exchange market can only be achieved by the timely unbundling of the ILEC as well as the existing CMRS, the cellular carriers, as well as of the new CMRS.[15] In addition the unbundling should be done at fair and equitable prices. Furthermore we have argued that zero cost access was also an essential element in this overall process. We have developed these arguments based upon three elements; fundamental changes in the technological and operational environment, the application of the Telecommunications Act, and the direct application of the existing antitrust laws.

In many ways this is no longer an FCC or State PUC issue but has been raised to the civil and possibly criminal level of Clayton and Sherman respectively. The latter issue is one of blatant sustained anti-competitive behavior in the local exchange market. Recent evidence brought before the FCC and the State Commissions clearly indicate that there is more than just grounds for investigation.

This paper argues further, that the regulatory and administrative law process is rant with delays and inefficiencies. Further, we argue that although the antitrust laws are vehicles for appropriate remedies we should not expect the Federal Government to act on these issues. Thus, it is argued that the civil application of these laws may be the most used and most efficient vehicle for the true development of a truly competitive local, exchange market. Many authors have argued against the antitrust laws but these arguments have been based on much less market power and control that is evident in this case.[16]

The essence of antitrust law is to promote competition and not competitors. To do so in telecommunications one must recognize several significant principles. First is the loss of scale. As we have argued, technology is driving scale out of telecommunications. All costs are marginal costs and all average costs approach margin in a precipitous fashion. Second, disaggregation allow for marginal pricing in all elements of the business. Capital plant has been marginalized as a result of technology and operations costs are marginalized as a result of the restructuring of industry. Third, commoditization is the driving factor in telecommunications. A connection is just a connection and differentiation is driven to the periphery of the network. Fourth, prices is cost based, and this means that such artifacts of Rawlsian economics as the Baumol-Willig theorem have no place in a competitive environment, and the only maximization allowed is consumer welfare.

These four conclusions drive our analysis along antitrust grounds.

1. Telecommunications, especially at the local exchange level, has and still is a monopoly.

2. The 1996 Act took away any last vestige of antitrust protection from the ILECs, namely the RBOCs.

3. The main issue is interconnection and the secondary issue is unbundling.

4. Interconnection is dominated by tying arrangements which are directed at the elimination or thwarting of any competition as well as the competitors.

Thus, the conclusion is quite clear. Implementation of the 1996 Act will require aggressive prosecution of the antitrust laws. This prosecution will most likely be done by the new incumbents and not by the

[15] See McGarty TPRC papers.

[16] See the works by Bork and Posner. We generally agree with Posner that economic analysis is the key to determining how to best apply the law in these cases. In fact, we argue that the Posner approach is most likely to be the basis for many of the briefs developed in subsequent litigation.

Government since such acts on the Governments side have become a conflict between all three branches of the Government.

The following Table presents a summary of the antitrust cases and their application to the telecommunications market.

Case	***Cite***	***Decision***	***Relationship***
United States v. Loew's, Inc.	466 U.S. at 13-14 citing 371 U.S. 38 (1962)	Court held that Loew's violated § 1 Sherman because of block booking despite having only 8% or market share but Court ruled that "requisite economic power is presumed when tying product is patented or copyrighted".	Any patent protection by the RBOC is putatively proof. The extension to this is the RBOCs ability via the standards setting body or even via the regulatory bodies to establish de factor "patent" rights by their presences in the market as the participant controlling the definition of interfaces.
United States v. Jerrold Electronics Corp.	466 U.S. at 23, aff'd per curiam, 365 U.S. 567 (1961)	Issue of two separate products. Court focused on three elements: 1. Firms other than Jerrold sold the products separately. 2. Jerrold priced the product separately. 3. Jerrold's packages were customized suggesting separate products.	The issue is the separability of such products as ILEC interconnection and airtime. Also airtime as merely the provision of connections and not bundled with other separable products.
United States v. Fortner Enterprises (Fortner I)	394 U.S. 495 (1969)	Reiterated Northern Pacific. Namely; ...a total monopoly is not essential, rather the key is whether some buyers can be forced to "accept a tying arrangement that would prevent free competition for their patronage in the market for the tied product"	This is the case with ILEC and the airtime issue. The tying applies to the bundled CMRS opportunity as well as the bundling into the pricing algorithms used by the PUCs. The clear way to eliminate this ruling is to go to Bill and Keep.
United States Steel Corp. v. Fortner Enterprises (Fortner II)	429 U.S. 610 (1977)	US Steel credit company had insufficient market power. The Court concluded that a tying arrangement existence is insufficient unless the entire deal makes consumer worse off than they would be in a competitive market.	The issue is the consumer welfare and this is driven by clearing the market with the most efficient use of capital by the most efficient producer of the overall product. Clearly, in the case of interconnection, be it for local service or interconnect, the consumer is better off with a lower price, which has been shown via the IEC competition to be a direct result of competition.
United States Shoe Corp. v. United States	258 U.S. 451 (1922)	The Court ruled that "while the clauses enjoined do not contain specific agreements not to use the machinery of a competitor of the lessor the practical effect of these drastic provisions is to prevent such use."	Clearly the specific enjoining of usage is not required only the effect thereto. The application herein relates to the specific use of tandem offices that may be a back door into increasing access fees.
Unger v. Dunkin' Donuts of America, Inc.	531 F.2d 211) 3d Cir. 1971)	Court held that the seller's power could be inferred from: 1. coercion. 2. resolute enforcement of a policy to "influence" buyers to take both products. 3. widespread purchase of both products by buyers.	Clearly there is a form of coercion as argued supra and there is significant influence. There is no widespread purchase of both other than is the small segment of competitors. We have demonstrated these elements in this paper.

Case	*Cite*	*Decision*	*Relationship*
Times Picayune Publishing Co. v. United States	345 U.S. 594 (1953)	Clayton was only to commodities. Government evoked § 1 of Sherman. However although in § 3 of Clayton either "monopolistic position" or restraint of significant volume of trade was required, in Sherman both were required.	The issue is whether the products are products or services. If ruled services still have protection but a sharper issue to prove. Clearly the issue here is services.
Siegal v. Chicken Delight, Inc.	448 F.2d 43 (9th Cir. 1971), cert. denied, 405 U.S. 955 (1972)	Court found against Chicken by stating that if it had been secret recipe than it would have been acceptable but that defendant could have provided specifications for materials and the Plaintiff could have achieved the same results. Court ruled that three elements must be shown: 1. the scheme in question has two distinct items and provides that one may not be obtained without the other. 2. the tying product posses sufficient economic power to appreciably restrain competition in the tied product area. 3. a "not insubstantial" amount of commerce is affected.	Two distinct have been proven supra, economic power id evident via the monopoly control, and commerce is telecommunications which is per se "not insubstantial".
Northern Pacific Railway Co. v. United States	356 U.S. 1 (1958)	Court condemned the freedom of choice for consumers. Court held could show monopolistic control by simply showing "sufficient economic power to impose an appreciable restraint on free competition of the tied product". Court held the per se rule by stating: "tying arrangements serve hardly any purpose beyond the suppression of competition..."	Argue that "per se" rule can be applied directly. This is applicable to all elements of these arguments.
Kentucky Fried Chicken Corp. v. Diversified Packaging Corp.	549 F.2d 368 (5th Cir. 1977)	Court upheld Kentucky because there was no real coercion. Kentucky had approved other suppliers.	Not allowed to choose other suppliers thus a violation and Kentucky does not apply. This also applies since the monopolist controls the market.

Case	*Cite*	*Decision*	*Relationship*
Jefferson Parish Hospital District No. 2 v. Hyde	466 U.S. 2 (1984)	Set out five elements for successful tying: 1. must effect more than de minimis amount of interstate traffic. 2. tie is not express and coercion to buy the tyed product is evident. 3. two products must be separate. 4. defendant must have economic power. 5. no valid business reason for tying. Court in Jefferson ruled that Jefferson had only 30% of market power and thus did not force "customer" to buy product. Court stated, dicta, that: "to force a purchaser to do something that he would not do in a competitive market" was condemned.	Have proved all elements supra. Also this extends the per se rule to this violation. This case has been discussed extensively in the body of the paper.
International Sale Co. v. United States	332 U.S. 392 (1947)	Defendant may insist upon a tied sale when the quality of the tied product affects the operation of the tying product. Tying arrangement is not justified when the defendant can set quality standards for the tied product.	No issue of quality changes can be made in the issue of interconnection. Specifically, with the establishment of standards there is now a set of open and definable interfaces and performances and certifications that these interfaces must comply with. Thus any grounds from this case do not apply.
International Business Machines v. United States	298 U.S. 131 (1936)	When the tied sale is not accompanied by escape clause for the buyer who finds a better price then the tying arrangement can be used to price discriminate.	No escape clause allowed is one option to consider an antitrust case. We extend this to cover the inability to interconnect as a per se barrier to entry since it automatically precludes any competitor to enter the market in any efficient manner.
Henry v. A.B. Dick	224 U.S. 1 (1912)	Allowed defendant to force users of patented duplicating to use its paper.	This cases may have some benefit t o the ILEC but we believe that it is irrelevant since the defendant in this case had no monopoly position and it could be shown that there was some justification for the tying. Again, in the interconnection world there is a clear precedent for separation and the elimination of the tying arrangement.
Eastman Kodak Co. v. Image Technical Services, Inc.	112 S.Ct. 2072 (1992)	Court reaffirmed the view that products are separate when there is sufficient consumer demand to justify firms providing one without the other.	This extends the per se rule and reads onto the cases presented in this paper Moreover, the issue of bundling is at the heart of the current debate regarding interconnection. The ILEC is forcing companies to interconnect at the access t andem levels and will not allow them to select their own interconnect. They are bundling transport and switching and pricing it a factor of ten to twenty times their Long Run Average Costs. .

5 SERVICES AND NETWORK ARCHITECTURE

5.1 Services

The town, with suitably outsourced advisors, contractors and vendors, can facilitate establishment of open-access local broadband communications infrastructure and services available to homes and businesses in the Town through innovative financial, technological and business processes.

By developing an open-access broadband infrastructure, the Town can unbundled the network and provide wholesale network access to service providers including Internet Service Providers (ISPs), Internet Access Providers (IAPs), cable companies, content providers and data hosting businesses. This assures a level playing field and creates a competitive environment which in turn will likely manifest in low prices, high quality of service, and a diversity of broadband products and services to customers.

The system may provide, at a minimum, the following general services:

***Voice*:** The system may provide full switched toll grade quality voice service. The voice quality may be telephone toll grade or better and there may be no delays in speech that are perceptible to the user. The user may interface with the system by a standard method or means typically being an RJ-11 standard telephone jack employing their own standard telephone in the case of a residential user. The voice user is not expected to change any of their infrastructure interfaces. The "normal" telephone connection may be provided by means of the local interface unit, the LIU. The LIU may be compatible with any and all normal accepted telephone interfaces. The system must also provide all typical custom calling and CLAS features as expected in normal deliver of a competitive wire based telecommunications service.

***Low Speed Data*:** The system may be able to provide data at the rates of 56 to 1,500 Kbps on a transparent basis and have this data stream integrated into the overall network fabric. The system may handle all data protocols necessary in a transparent fashion. The network may allow local access to value added networks from the local access point. The low speed data may be provided for over a standard voice circuit from the users premises as if there were no special requirement. There may be toll grade or better quality. The system may also be capable of support all Group 3 fax services.

***Medium Speed Data*:** The network may be able to handle medium speed data ranging from 1.5 to 45 Mbps. The interfaces for such data may be value added network local nodes. Medium speed data may be provided for over a standard circuit from the users premises as if there were no special requirement. These may be toll grade or better quality.

High Speed Data: Data rates at and in excess of 45 Mbps may also be provided on an as needed basis and a dedicated basis. The data rates may be between 45 Mbps and a maximum of 2.5 Gbps. Also it may be required to provide access to such high-speed data services as Fast Ethernet and FDDI at 100 Mbps. This may require both physical layer interfaces and the data link and network layers as specified in the particular protocol. The system must also support multiple layer protocols including TCP/IP. Also the data must be point-to-point, point-to-multipoint, and multipoint-to-multipoint.

Video: The network may be able to provide the user with access to analog and digitized video services. This may also enable the provisioning of interactive video services. The video services may enable a system with a minimum of 150 video channels of remote programming, ten channels of local off-air programming, and 20 channels of locally generated programming. The interactive video may allow for ten channels of pay per view at a minimum, and interactive channels for local information selection. Video must also support such tiered services as basic, premium, pay per view, and interactive. The inputs to the system are from such sources as off-air, local generated, satellite, and other sources. Sources may be analog or digital, encrypted or not.

5.2 Technical Alternatives

There are multiple network designs that can be used to deploy local fiber broadband services via fiber to the home (FTTH). The factors that control what speeds are provided are the technology components that are installed at the end points of the fiber network; the residence/business and the service provider's Point of Presence (PoP), which may be the head end, local hub or Central Office (CO). The main forms of FTTH architecture are the following:

(i) "Home Run" systems: a separate fiber or fiber pair runs all the way from each home/business to the PoP. In this design, there is no sharing of fiber; therefore, this offers the ultimate performance with the most

flexibility. Independent providers can deploy technology of their choice with minimal compatibility and interoperability issues. In addition, the end-point equipment attached to each fiber can be independently upgraded. However, the costs of installation of this design are usually prohibitively high and is overkill in terms of performance capabilities.

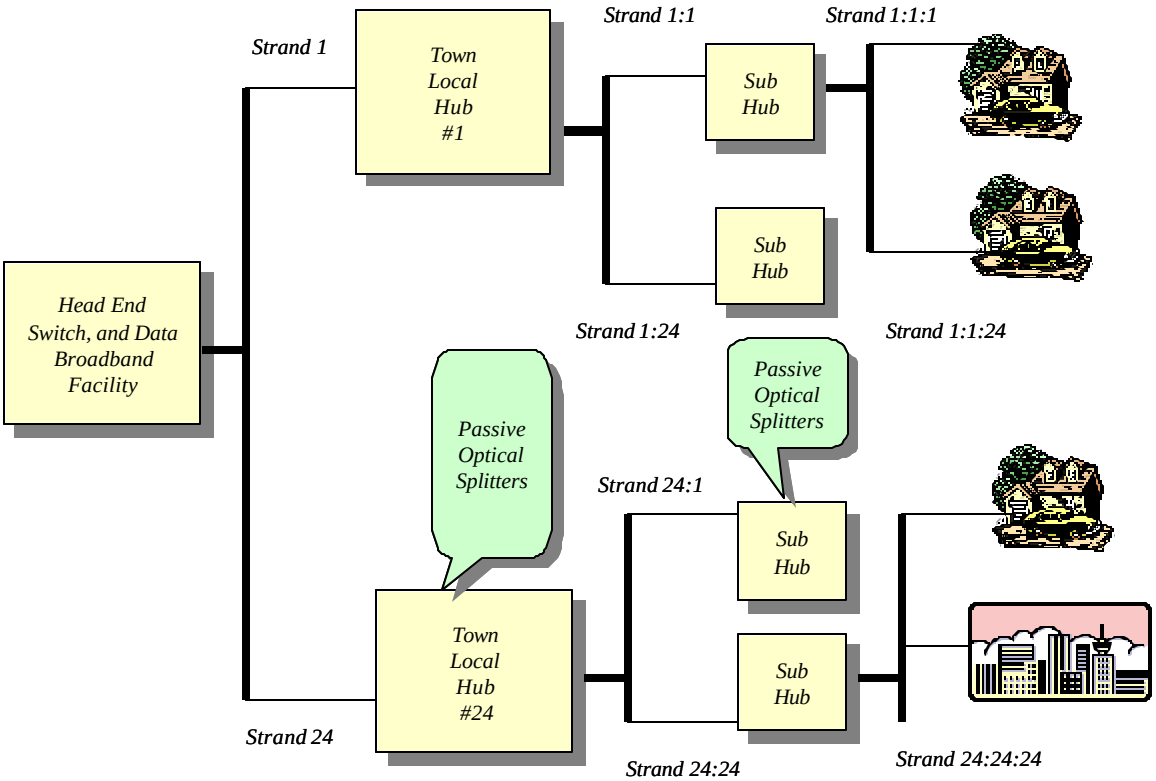
(ii) Passive Optical Network (PON) or "Passive Star": a single fiber or fiber pair runs from the head end to a passive optical splitter that is located at a local hub (also called a remote terminal or just "remote"). Single strands of fiber then run to a group of homes or individual homes or businesses. The optical splitters are quite compact and simple. The absence of active electronics in the field and the simplicity of design yield lower life cycle costs. In addition, the passive nature of the optical splitters avoids the need to have power systems at the remotes, thus increasing the reliability of the entire system. In addition, overall maintenance costs are reduced. The disadvantage of this design is that terminal and head end equipment may have to be simultaneously upgraded to ensure compatibility and interoperability.

(iii) FTTH with Fully Active Elements or "Active Star": in this architecture, fiber runs from the head end to one or more stages of remote terminals at which the signals are switched among fibers that then feed individual premises. Ethernet switches are typically used at the remotes. The primary disadvantage of this design is the need to have robust power systems and material real estate at the remote terminals; this generally yields a much more expensive system in the long run compared to the PON architecture.

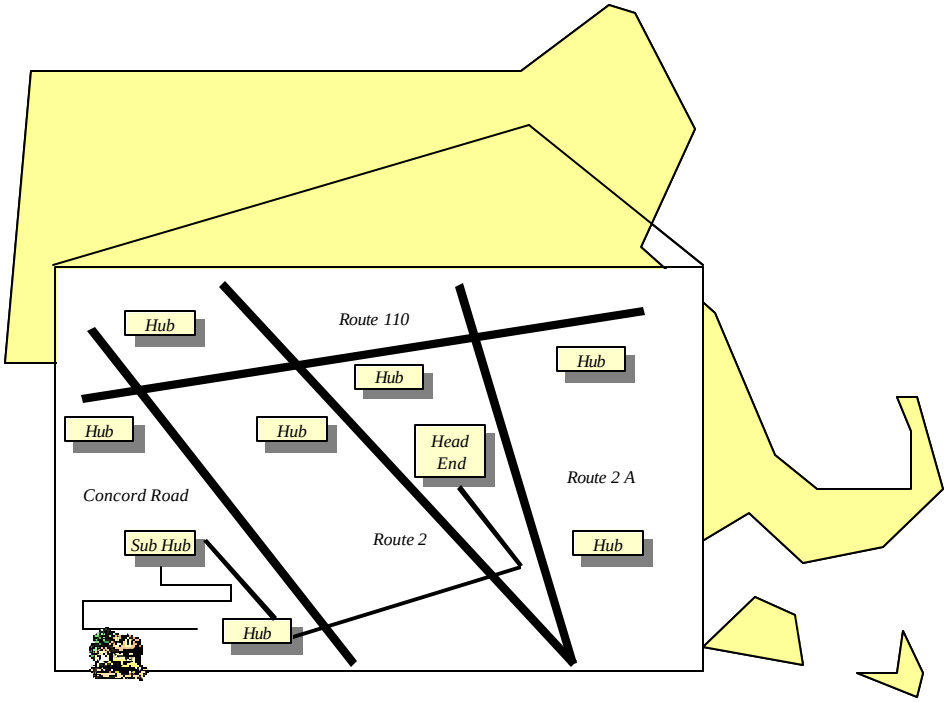
5.3 System Architecture

The proposed model for implementation herein is a passive optical network, PON. As mentioned before, the PON approach affords the lowest costs for installation as well as long-term operations and maintenance.

The typical PON architecture is shown below.



A typical town layout, using Acton, Massachusetts, is shown below:



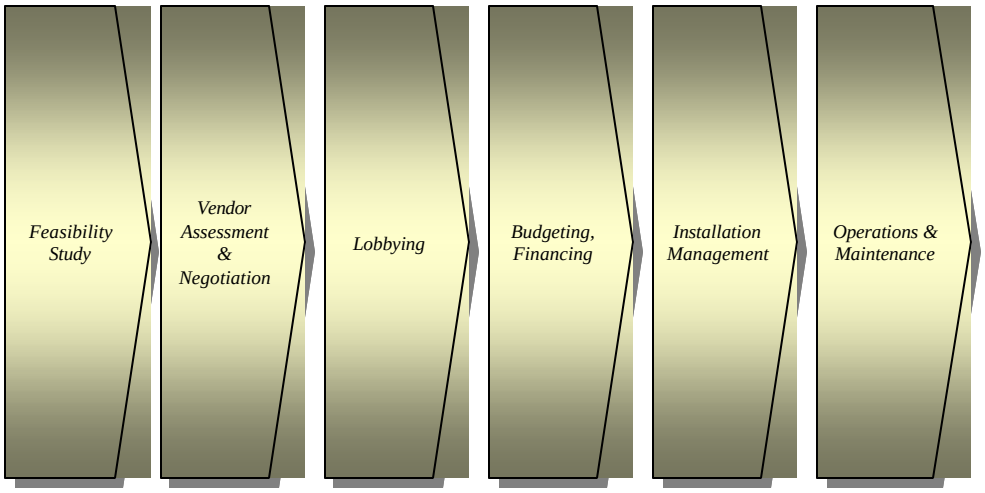
5.4 Network Costs

The modeling of the costs associated with the deployment of such services is generally well understood. It consists of the local plant, the customer interconnect, and a hub facility to support the services interconnection. This section presents some of the modeling assumptions and conclusions.
The following table presents the details of the approximate network capital costs.

Capital Costs	***Assumptions***	***Results***
• Fiber Installation, New Trenching: $40,000 per mile • Fiber Installation, Existing Conduits: $10,000 per mile	50%-50% split between new trenching and existing conduits	$25,000 per mile
Fiber Cost: $1,000 per mile per strand	2 strands per segment (1 pair)	$2,000 per mile
Optical equipment and buried installations: $4,500 per mile	PON architecture	$4,500 per mile
FTTH drop and installations: $750 per home	• Home has 150 foot frontage, or 40 homes per mile • 25% penetration of homes, or 10 homes per mile	$7,500 per mile
TOTAL		**$40,000 per mile**
TOTAL per Home	10 homes per mile penetrated	**$4,000 per home**

5.5 Implementation and Execution

The actual implementation of this system is portrayed in the following figure. There are six major steps:



1. Feasibility Study: This effort is a detailed feasibility study of the market, the costs to deploy, and the ability of the town on a project basis to pay back the bond.

2. Vendor Assessment and Negotiations: This is extensive negotiations, potentially in an RFP process, with the possible vendors to seek the best terms for the purchase of the equipment and the subsequent maintenance support. It must be remembered that most vendors make their money on the ongoing maintenance and spare agreements. These must be carefully negotiated because they may become a significant factor in latter years of operations.

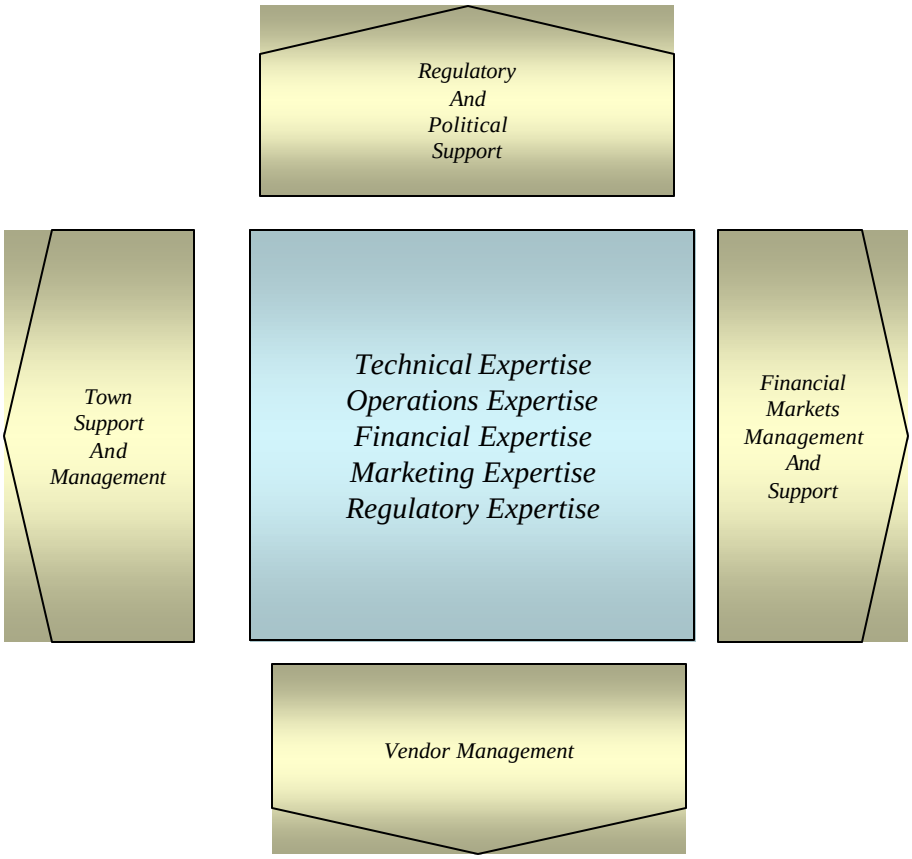
3. Lobbying Support: Lobbying support is critical. It is a process of dealing with the state and federal government, legislative and executive, FCC and PUC and others as required. It may not be that costly on a scale basis but is a significant factor.

4. Budgeting and Financing: This has two components: (i) development of a detailed budget for the project, and (ii) bond financing proposal: this effort is the first step in meeting and selecting underwriters of the bonds. This is a critical stage since what is presented and the selection of a quality underwriter will determine not only the terms of the bond but the very success of the offering. This is This is followed by the bond road show. It requires the underwiter the town and the support staff.

5. Installation Management: This is a general management function that requires significant experience in deploying fiber networks and infrastructure.

6. Operations and Maintenance: This is the ongoing operations and maintenance of the network and support of third party vendor interfaces.

The following depicts the internal expertise and the external interfaces required in the successful deployment of such a system. Clearly the external areas of regulatory and town management are highly interconnected and are a natural extension of what a town does. The areas of vendor management and bond management are extensions of town functions but possibly on a larger scale.



5.6 Competition

The competition and their strategies are depicted in the following table.

Company	*Comments*	*General Business Position*
RBOC (e.g. Verizon)	• *Slow migration in region* • *Has very weakened financial position* • *Limited IP infrastructure*	• *Monopolist*
CATV (e.g. AT&T Broadband)	• *Not building capital plant out* • *Has weak IP capabilities*	• *Serious financial problems* • *Lacks strategy for deployment*
DSL (e.g. COVAD)	• *Focuses on corporate customers and ISP's*	• *Initial entry still limited.* • *Limited network* • *Coming out of Bankruptcy* • *Business model does not allow cost-effective service to residential customers*
CLEC (e.g.)	• *Difficult business environment, even for basic services*	• *May not have access to capital for required buildout*

5.7 Benefits of a Municipal Broadband Network

Building an open-access local broadband infrastructure provides a Town with numerous benefits that easily compensates for the costs of the project. It is becoming increasing evident that Towns in suburban and rural areas are deriving much more than the most apparent benefits of publicly owned broadband infrastructure

such as the addition of jobs and tax revenue; in fact, there is an overall better quality of life to be gained as indicated in the following points.

1. Ubiquitous Coverage: As indicated before, the current business economic climate will not permit private enterprise to establish and operate broadband networks, especially in sparsely populated areas. A mission-driven project by a Town to bring broadband to its citizens appears to be the only solution to the quandary.

2. Efficiency: A Town may be able to leverage existing fiber strands installed by a municipally owned power utility, as well as corresponding telecommunications systems and facilities like backup power equipment, network monitoring systems, remote terminals and associated real estate. In addition, the Town may be able to utilize expensive Rights of Way owned by municipally owned utilities as well as tap into their existing telecom personnel for expertise.

3. Enhanced Services: Through unbundling of its broadband network to service providers, the Town could spur a diversity of value-added products including Voice over IP, flexible bandwidth, digital cable, video on demand, streaming media, etc.

4. Economic Development: A broadband network could act as a magnet to businesses. A common concern for both new-age as well as traditional businesses is the presence of a reliable high-speed communications system.

5. A Community Asset: A local pervasive broadband system operating profitably could improve the tax base and be a real asset to the Town. It could also favorably change the property taxes in the area as well as improve the credit standing of the Town so that cost of borrowing is reduced.

6. Competition: It is a common fact that a Town, by operating its own broadband network, can favorably influence the pricing as well as quality of communications service provided by private operators to its citizens.

7. Lower Life Cycle Costs: By installing an open-access fiber broadband system that is marginally over-engineered, the need for future upgrades and installations can be minimized. In addition, street-diggings can be avoided as well since fiber cables have a life span of 20 years.

8. Improved Government IT Integration and E-Government: Government data systems could be better integrated and business/technical processes standardized. E-government services such as tax collection, payroll, utility services and billing could be offered online in a broadband environment.

9. Security: The need for an integrated high-speed communications infrastructure at both a national and a local level has taken on new meaning after September 11th, 2001. No local government can ignore the importance of having a reliable broadband communications network connecting hospitals, schools, businesses and broadcast companies to provide notification and rapid response in the event of emergencies.

6 CONCLUSIONS

It is clear from this analysis that a municipal broadband network is very viable. In fact, it may be the only way certain areas will be able to get such broadband facilities. If a town views the existence to broadband as both a social imperative as well as an essential element to retain and attract businesses, then the ability of the town to implement this service will be critical.

This paper has made several observations on where the market is going, what the opportunities are, what the needs are, and several ways to best meet the needs. What is clear is that there is a clear and unambiguous need for some entity to provide broadband services to municipalities. The provider must be able to do so in a fully open network fashion.

It is also clear that the ILECs, as Verizon has shown in the Thorne Manifesto, that the ILECs have a strategic interest in broadband if and only if they can recreate their own monopoly and have full deregulation on pricing. This should be totally unacceptable to any rational person.

The cable companies are clearly struggling for market share and they have limited abilities in today's financial markets to remedy and expand their networks.

Thus the opportunity is here and now for a municipal network build-out. Clearly the opportunity is as follows:

1. Establish a consortium, region by regions, of municipalities who want to build networks.

2. Prepare Feasibility Studies to ensure that there is a viable market.

3. Use municipal tax-exempt bond financing, especially with today's rates, to secure very cost effective financing of the projects.

4. Use experienced third party management and contractors for the build and subsequent operations.

5. Provide a single point of presence, the meet point, for the provisioning of a broad set of services,

This strategy is readily reproducible in many municipalities and many markets.

7 REFERENCES

1. Areeda, P., L. Kaplow, Antitrust Analysis, Little Brown and Co (Boston), 1988.

2. Baumol and Sidak, Toward Competition in Local Telephony, MIT Press (Cambridge, MA), 1994.

3. Bork, R.H., The Antitrust Paradox, Free Press (New York), 1978.

4. Brown, S.J., D.S. Sibley, The Theory of Public Utility Pricing, Cambridge University Press, Cambridge, England, 1986.

5. Carlson, S.C., A historical Economic and Legal Analysis of Municipal Ownership of the Information Highway, Rutgers Computer and Technology Law Journal, 1999.

6. Coll, S. The Deal of the Century, Atheneum (New York), 1986.

7. Computer Science and Telecommunications Board, National Research Council, "Broadband: Bringing Home the Bits", 2002.

8. Darby, L.F., Investment Incentives and Local Competition at the FCC, Journal of Media and Law Policy, November 2000.

9. de Sola Pool, I., Technologies Without Barriers, Harvard University Press (Cambridge, MA), 1990.

10. de Sola Pool, I., The Social Impact of the Telephone, MIT Press (Cambridge, MA), 1977.

11. DeGraba, Patrick, Bill and Keep at the Central Office As the Efficient Interconnection Regime, FCC OPP Working Paper, December, 2000.

12. Dertouzos, M.L., J. Moses, The Computer Age, MIT Press (Cambridge, MA), 1979.

13. Dworkin, R., Law's Empire, Harvard University Press (Cambridge, MA), 1986.

14. Eisenbach, J.A., Does Government Belong in the Telecom Business, The Progress and Freedom Foundation, Release 8.1, January, 2001.

15. FCC, High Speed Services for Internet Access, Status December 2001, FCC Report, June 2002.

16. FCC, Industry Analysis Division Common Carrier Bureau, "High-Speed Services for Internet Access: Subscribership as of June 30, 2002", February 2002.

17. FCC, Local Telephone Competition, Status December 2001, FCC Report, June 2002.

18. Fisher, F.M., Antitrust and Regulation, MIT Press (Cambridge, MA), 1985.

19. Frieden, R., Revenge of the Bellheads: How the Netheads Lost Control of the Internet, TPRC, 2001.

20. Garvey, J., Municipal Broadband Networks, CRI White Paper, March 2002.

21. Hayek, F.A., The Road to Serfdom, University of Chicago Press (Chicago, IL), 1994.

22. Henderson, J.M., R.E. Quandt, Microeconomic Theory, McGraw Hill, New York, 1980.

23. Hoffman, M.A., A.I. Winard, Antitrust Law and Techniques, Matthew Bender (Albany, NY), 1963.

24. Holmes, O.W., The Common Law, Back Bay Books (Boston), 1963.

25. Hovenkamp, H., Antitrust, West Publishing (St. Paul, MN), 1986.

26. Hovenkamp, H., Economics and Federal Antitrust Law, West (St. Paul, MN), 1985.

27. Huber, P.W., The Geodesic Network, U.S. Department of Justice, Washington, DC, January, 1987.

28. Hundt, R., Antitrust and Interconnection: Old Wine in New Bottles, Antitrust Conference for Corporate General Counsels, Washington, DC, October 22, 1996.

29. ITU, ITU Internet Reports: IP Telephony, December 2000, ITU, Geneva.

30. J.L. Mindel, M.A. Sirbu, "Regulatory Treatment of IP Transport and Services", TPRC, 2000.

31. Kahn, A.E., The Economics of Regulation, MIT Press (Cambridge, MA), 1989.

32. Kronstein, H. et al, Modern American Antitrust Law, Oceana Publications (New York), 1958.

33. Kukathas, C., P. Pettit, Rawls, Stanford University Press (Stamford, CA), 1990.

34. Laffont, J.J., J. Tirole, Competition in Telecommunications, MIT Press, Cambridge, MA, 2000.

35. McGarty, Peering, Transit, Interconnection: Internet Access In Central Europe, Presented at MIT Internet & Telephony Consortium meeting in Cambridge, January 17, 2002.

36. McGarty, T.P. , “Disaggregation of Telecommunications”, Presented at Columbia University CITI Conference on The Impact of Cybercommunications on Telecommunications, March 8, 1996.

37. McGarty, T.P. , Spectrum Allocation Alternatives; Industrial; Policy versus Fiscal Policy, MIT Universal Personal Communications Symposium, March, 1993.

38. McGarty, T.P., Access Policy and the Changing Telecommunications Environment, Telecommunications Policy Research Conference, Solomon's Island, MD, September, 1993.

39. McGarty, T.P., Access to the Local Loop; Options, Evolution and Policy Implications, Kennedy School of Government, Harvard University, Infrastructures in Massachusetts, March, 1993.

40. McGarty, T.P., Alternative Networking Architectures, B. Kahin Editor, McGraw-Hill (New York), October, 1991.

41. McGarty, T.P., Alternative Networking Architectures; Pricing, Policy, and Competition, Information Infrastructures for the 1990s, John F. Kennedy School of Government, Harvard University, November, 1990.

42. McGarty, T.P., Architectures et Structures de L'Information, Reseaux, No 56, pp. 119-156, December, 1992, Paris.

43. McGarty, T.P., Communications Networks; A Morphological and Taxonomical Approach, Private Networks and Public Policy Conference, Columbia University, New York, October, 1991.

44. McGarty, T.P., Communications Networks; A Morphological and Taxonomical Approach, Private Networks and Public Objectives (Noam, Editor),Elsevier (London), 1996.

45. McGarty, T.P., Communications Networks; A Morphological and Taxonomical Approach, Private Networks and Public Policy Conference, Columbia University, New York, October, 1991.

46. McGarty, T.P., Comparative Deregulation of Far Eastern Telecommunications Markets, Telecommunications Policy Research Conference, Washington, DC, September 28-30, 1997.

47. McGarty, T.P., Disaggregation of Telecommunications, Presented at Columbia University CITI Conference on The Impact of Cybercommunications on Telecommunications, March 8, 1996.

48. McGarty, T.P., Economic Structural Analysis of Wireless Communications Systems, Advanced Telecommunications Institute Policy Paper, Carnegie Mellon University, February, 1993.

49. McGarty, T.P., From High End User to New User: A New Internet Paradigm, McGraw Hill (New York), 1995.

50. McGarty, T.P., Information Architectures and Infrastructures; Value Creation and Transfer, Nineteenth Annual Telecommunications Research Conference, Plenary Address and Paper, Solomon's Island, September, 1991.

51. McGarty, T.P., Internet Architectural and Policy Implications, Kennedy School of Government, Harvard University, Public Access to the Internet, May 26, 1993.

52. McGarty, T.P., PCS Economics, TPRC Solomon’s Island, MD, September, 1994.

53. McGarty, T.P., Spectrum Allocation Alternatives; Industrial; Policy versus Fiscal Policy, MIT Universal Personal Communications Symposium, March, 1993.

54. McGarty, T.P., The Application of IP Telephony to Local Exchange Carriers, MIT, Internet Telephony Consortium, March, 1999.

55. McGarty, T.P., The Economic Viability of Wireless Local Loop, and its Impact on Universal Service, Columbia University CITI seminar on "The Role of Wireless Communications in Delivering Universal Service", October 30, 1996.

56. McGarty, T.P., The Economic Viability of Wireless Local Loop, and its Impact on Universal Service, Telecommunications Policy, Elsevier (London), 1997.

57. McGarty, T.P., Wireless Access to the Local Loop, MIT Universal Personal Communications Symposium, March, 1993.

58. McGarty, T.P., Wireless Architectural Alternatives: Current Economic Valuations versus Broadband Options, The Gilder Conjectures; Telecommunications Policy Research Conference, Solomon's Island, MD, September, 1994

59. McGarty, T.P., Wireless Communications Economics, Advanced Telecommunications Institute Policy Paper, Carnegie Mellon University, February, 1992.

60. Porter, M., Competitive Strategy, Free Press (New York), 1980.

61. Posner, R.A, The Problems of Jurisprudence, Harvard University Press (Cambridge, MA), 1990.

62. Posner, R.A. Overcoming Law, Harvard University Press (Cambridge, MA), 1995.

63. Posner, R.A., Antitrust Law, University of Chicago Press (Chicago, IL), 1976.

64. Posner, R.A., Economic Analysis of :Law, Little Brown and Co. (Boston, MA), 1992.

65. Posner, R.A., The Economics of Justice, Harvard University Press (Cambridge, MA), 1983.

66. Pound, R., The Spirit of the Common Law, Marshall Jones Co (Boston, MA), 1921.

67. Pucknett. T.F.T., A Concise History of the Common Law, Little Brown (Boston, MA), 1956.

68. Rawls, J., A Theory of Justice, Harvard University Press (Cambridge, MA), 1971.

69. Rawls, J., Political Liberalism, Columbia University Press (New York), 1996.

70. Rockefeller, E.S., Antitrust Questions and Answers, Bureau of National Affairs,(Washington), 1976.

71. Schumpeter, J.A., Capitalism, Socialism, and Democracy, Harper & Bros. (New York), 1942.

72. Shepherd, W.G., The Treatment of Market Power, Columbia University Press (New York) 1975.

73. Shinman, D.R., J. Rosenworcel, Assessing the Effectiveness of Section 271 Five Years After the Telecommunications Act of 1996, TPRC, 2001.

74. Sowell, T., A Conflict of Visions, Wm. Morrow (New York), 1987.

75. Spulber, D.F., Regulation and Markets, MIT Press (Cambridge, MA),1990.

76. Stocking, G.W., M.W. Watkins, Monopoly and Free Enterprise, Twentieth Century Fund (New York), 1951.

77. Sullivan, L.A., Antitrust, West Publishing (St Paul, MN), 1977.

78. Thorne, J., The 1996 Telecom Act, What Went Wrong and Protecting the Broadband Buildout, Columbia University, CITI, 2001.

79. Weinhaus, C.L., A.G. Ottenger, Behind the Telephone Debates, Ablex Pub. (Norwood, NJ), 1988.

80. Willig, R.D., Consumer Equity and Local Measured Service, in Perspectives on Local Measured Service, J.A. Baude Eds, Telecommunications Workshop Kansas City 1979.