The Concept of Internet Neutrality;

An Analysis of Property Rights In Cyber Space

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Abstract

Internet Neutrality is a term which means many things to many people. In this paper we look at the Internet from a technical, legal, and economic perspective. We look at the ways the various players are trying to position their view and we attempt to apply the factual elements of what actually exists as a set of tests and tools to analyze the options. We as a result of this detailed analysis have come up with a set of conclusion ans principles which re-interpret the concepts of Internet neutrality and present a set of principles which are based on the technological facts, the market realities, and legal precedents which go back more than a thousand years. Our concern is that some of the proposal are so self serving that if accepted of if implemented will do irreparable harm to what has been created in the Internet.

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1 EXECUTIVE SUMMARY

The problem of "*Internet Neutrality*" can best be defined by asking the question: what rights does the consumer have when using the Internet? The service providers have their rights under contract law which exists between them. The focus of all the discussions seem to be on what each of the other players will get out of the Internet and there seems to be little of any discussion of what the consumer, the one ultimately paying for the service, will obtain. The issue was brought to the fore by the statements of Ed Whitacre of AT&T who in our opinion has basically stated two things:

1. He, in our opinion, believes that AT&T and the local incumbent have property rights in the local connectivity, rights that go beyond just ownership, but which extend to whoever else can compete and how they can compete;

2. He, in our opinion, desires to "share" in the wealth of the providers of content and services, which he perceives, are benefiting from the presence of his network[3].

The ***"Whitacre Conjectures",*** as we shall call them, frame the discussion of the Internet and its future[4]. Key to this future is also the issue of who will build a true broadband network. Key to that question is; what is the best broadband network that we can have? People analyze some of these issues by looking at what other countries, such as Korea, are doing and then look at the United States and remark that we are behind.

In this Note we look at the issue in terms of property rights, and how they can be enforced under common law. We look at this issue not from a classic Washington perspective, namely attempting to write a new law as is commonly done, but from a customer and consumer litigation perspective, one where we see this as a consumer rights issue and we further see that the remedies are available under common law via litigation. In fact, we see that the success of the FCC in mediating these issues is clearly lacking. In fact, as we summarize herein, they have generally delayed and distorted the intents and market effects. Rather we see that the courts via consumer litigation can be a more efficient mediator and maker of an efficient market. In particular we have seen in the recent debate between Vint Cerf from Google and Dave Farber representing what may be the incumbent RBOC positions, that both of the debaters were seeking remedies at new FCC law or in old

[3] What is critical to note here is that in the second part of the Whitacre Conjectures there is an expectation to share in the wealth of another having contributed nothing to the generation of that wealth. The expectation in sharing is based upon the fact that he has the "pipes" which facilitate that wealth. This is akin to a cab driver in New York expecting to share the wealth of an Investment Banker because he carried the Banker to a deal. They do have legal terms for such an expectation. In the Verizon case the argument is based upon the theory of multi sided markets, which is a set of mathematical equations based upon the Second Whitacre Conjecture. It has been developed by Darby. He states that since FTTH is good and needed, and tacitly assumes that AT&T and Verizon are the only ones who can do this deployment that they should receive part of the benefit from anyone who uses it. The truth is they can do that expressly by charging Transit fees to their Internet backbone. However, they want a percent of the gross revenue received not just a fee for transport. Viewed in this manner it appears as if it were a tax. It is a tax by a non-Government entity and without representation. We can remember what happened to George II when he tried such an action!

[4] The irony about the Whitacre Conjectures is that SBC in 1994 acquired one of the best small cable systems in the United States for the purpose of getting then SBC into cable. In less than two years of less than sterling management, SBC sold the system and the whole experience was for naught. He had a golden opportunity, which he did not take advantage of. Likewise, AT&T bought TCI, a system quite the opposite of the one SBC acquired. In addition, AT&T overpaid dramatically. AT&T then managed to run what was left into the ground until it was acquired by Comcast and resurrected. Thus in both cases the incumbent had the clear opportunity to position itself in the strategic role in the distribution channel and fumbled. One may ask what right they may have to seek remuneration from those who succeed. In a Darwinian sense, they should be allowed to fade off to the sunset.

Antitrust law[5]. We do not see that as the only or even best alternative. There are better remedies and cleaner remedies we argue in the common law[6].

1.1 A Framework at Law

The consumer's use of the Internet is paid for by the consumer directly. The consumer uses it for transactions, information and entertainment. We first look at the current state of the Internet and then look at what rights the consumer may have in this new electronic media.

1.1.1.1 THE FCC, IN DECISIONS MADE OVER THE PAST THREE YEARS, HAS COMMENCED TO PLACE DUTIES ON THE INTERNET, WHICH MAKE IT COMPARABLE TO THE CLASSIC MONOPOLY TELEPHONE NETWORK. THIS IS A CHILLING EFFECT ON THE GROWTH OF THE INTERNET.[7]

Since late 2002 and thru the current period the FCC has made substantial rulings, which dramatically position the Internet and the services, which it provides under stricter regulatory control. These actions fall into two areas; (i) those which empower the incumbent and materially reduce the ability of new entrants to prosper, (ii) those which apply regulations upon Internet uses which make them more regulatable and controllable by the FCC. These two general actions by the FCC in toto to create an environment where the old monopolist incumbent has strengthened its position while at the same time creating an environment in which the Internet and its players must comply with rules with which the incumbent is so familiar. This double spiral created by the FCC forces all of the Internet players into the playing field of the incumbent, a strengthened incumbent. It is akin to feeding the wolf, and then herding the sheep into the wolves den.

Specifically, as to strengthening the incumbent, the rules on broadband allow the incumbent not to unbundle many of the key network elements which would have empowered new entrants, despite the 1996 Act, and moreover, it protects the incumbent's network elements which are merely backbone elements such as their dark fiber. These steps by the FCC make certain that no new entrant can use elements on an unbundled basis to reach the customer, and moreover, the dark fiber restriction forces new entrants to build all of the facilities, even if the marginal costs to use the incumbent would be more beneficial.

As to the herding of the Internet into an incumbent regulatory den, the application of universal service charges and CALEA are but a start. The FCC is applying all of the tools, which it has employed to regulate the incumbent to establish its ability to regulate the new entrant.

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[5] See www.cspan.org for the debate. The Communicators: The Great Debate - What is Net Neutrality? This week on "The Communicators", the Center for American Progress hosts "The Great Debate: What is Net Neutrality?" Vinton G. Cerf, Google, V.P. & Chief Internet Evangelist and Dave **Farber**, Carnegie Mellon University, Distinguished Career Professor of Computer Science and Public Policy debate the issue of net neutrality. "The Communicators" is a new C-SPAN series that focuses on the people and events that shape telecommunications policy. 7/22/2006: WASHINGTON, DC: 1 hr. 20 min.: C-SPAN

[6] We call this the Washington School versus the New York School of law. In the Washington School one seeks to create new laws assuming that they can be accomplished in some fair and balanced manner. In reality we know that these new laws are almost written by the lobbyists for the incumbents to preserve their positions. In addition when an agency such as the FCC reduces the law to Administrative Code it against goes through a process of lobbyist influence. This engenders delay and confusion and great market uncertainty. However, litigation at common law (property, contract and torts) allows the use of hundreds of years of common law precedent in the court. It is what is used in what we call the New York School versus the Washington School.

[7] See FCC Rulings: FCC 02-77 Broadband over Cable Declaratory Ruling; FCC 04-179 Unbundling of Incumbents Order; FCC 04-290 Unbundling of Incumbents Order on Remand; FCC 05-78 Un-regulating Broadband Order; FCC 05-150 Universal Service Order; FCC 05-153 CALEA and Broadband Access; FCC 06-56 CALEA on VOIP; FCC 06-94 Universal Service and VOIP.

1.1.1.2 THE CONSUMER, PERFORCE OF HIS INVESTMENT AND LABORS, HAS CREATED A PROPERTY RIGHT IN THE PACKETS THAT HE CREATES AND SENDS ACROSS THE INTERNET.

Property and property rights are well-established elements of common law. The definition of what is property has gone through extensive evolution over the past four hundred years since Locke first wrote in his Treatises. There are various approaches to defining property; approaches that are Lockeian based which look at adding value by labor, those of Hohfeld as regards to rights and duty, and many more. We examine all of these and conclude that the packets generated by the Consumer for effecting transactions on the Internet are the property of the Consumer who has created them. Issues relating to privacy and otherwise can be left for future discussion[8]. By looking at Internet usage and operations as a handling of the Consumer's property right in their packets we have developed an alternative paradigm for establishing relationships between the parties. The Whitacre Conjectures we believe fall asunder when one looks at the issue in these terms.

1.1.1.3 THE CONSUMER PROPERTY RIGHT IMPOSES A DUTY ON THE CARRIER OF THE PACKET, THE LOCAL BROADBAND PROVIDER, WHICH IS AKIN TO THAT OF A BAILMENT. IT IS A DUTY OF CARE AND A DUTY NOT TO OPEN THE PACKET AND TAMPER WITH IT.[9]

Property rights convey to a person's Internet traffic. The packets are the personal property of the individual under the understanding of common law. The historical common law concept of bailment provides a basis for understanding the duties and obligations of the transporters of the data packets in an Internet environment. More specifically, we as the creators and owners of the Internet packet property retain ownership as the bailor and the bailee, namely the carrier, has duties based on over a thousand years of common law.

Common carriage is both a legal administrative law construct and a constructed accepted at common law. In fact the current administrative law construct, as stated in 47 USC, the rules of the FCC, being circular should be interpreted primarily at common law. Thus we can look to the transporter of our packets as a special type of bailee, namely a common carrier. This means that we can then use the duties of common carriers at common law for remedies and recourse. Common law, as separate from administrative law, provides us individually with remedies in the event of damages. Damages may result by the carrier applying an unlawful tax, a separate surcharge, on our packets. To do this clearly the carrier must open the packets and thus violating the duties of a bailee. Common law then is the proper ground for redress. Administrative law is a way for the Government to view its relationship to the carrier. Common law is the way the individual view their relationship. Thus there may, and frequently is, a variance between the two.

1.1.1.4 THE LOCAL CARRIER HAS THE DUTIES OF A COMMON CARRIER AT COMMON LAW, NOT AT FCC ADMINISTRATIVE DICTA. THE DUTIES OF A COMMON CARRIER ARE SIMPLY TO SELL EQUALLY AND EQUITABLY TO ANY AND ALL WHO COME ALONG WITHOUT DISCRIMINATION.

The local carrier, and in fact all carriers, accept the packets and these are the personal property of the Consumer. The ***common law*** for a thousand years understands that such handling of another's property has certain duties. We pay the carriers to transport the packets. The carrier has a duty under centuries of common law as regards to those packets. We pay them for a service and if they do so as a common carrier, a form of

[8] See McGarty, Privacy. The author examines the privacy rights in an Internet world. We also look in the body of this paper at a Coasian view of property rights and the implications as regards to the Internet. There is also the discussion about the existence of the property rights of the other parties we see in any transaction. In fact, we conclude that they exist but are dealt with via forms of contract law.

[9] The tampering issue has both a technical and legal imperative. Technically, we use the Saltzer, Reed and Clark argument of end-to-end control. If the packet were tampered with to ascertain what is in or other such details such tampering raises the risk that the packet would not get to the other end correctly or in a timely fashion. The legal issue is that if we accept the bailment concept, we show herein, then it breaks the duty of the bailee if the packet is open-end and examined, it increases their liability, and is actionable.

bailment created in the late sixteenth century, we expect them to honor the duties related thereto. The duties are that they deliver the packet unopened and take care not to loose it or allow it to be stolen. As a common carrier, we agree to limit the loss to the cost of transport, not the loss incurred if the packet creates a loss in some valuable transaction. Using the end-to-end argument of Saltzer Reed and Clark, we take the responsibility at the end points, namely at the TCP level, they handle the IP level. This is not an issue of privacy but an issue of bailment.

1.1.1.5 THE FCC IS BUT ONE VENUE FOR THE REGULATION AND CONTROL OF THE INTERNET. A SECOND VENUE IS COMMON LAW AND THE COURTS. CUSTOMER PROPERTY RIGHTS UNDER COMMON CARRIER BAILMENTS AT COMMON LAW CAN ALLOW REMEDIES TO BE SOUGHT AND OBTAINED AND THROUGH THIS VEHICLE, A TRUE OPEN MARKET OPPORTUNITY, THE BALANCE IN THE MARKET CAN BE OBTAINED.

The FCC is strongly influenced by the incumbents, as of course is Congress. However, at common law in the courts with juries, one can seek redress of breach of duties of the local carriers.[10]

1.2 Technical Options and Realities

To understand the issues and to understand what the rights are, one has to have a clear understanding of the technical issues as relates to the Internet. We review some of the key ones below.

1.2.1.1 EXISTENCE OF AN INTERNET BACKBONE MARKET: THE TIER 1 CARRIERS ARE MULTIPLE AND THEY HAVE A LIMITED FORM OF COMPETITION. IT IS SOMEWHAT OF AN OLIGOPOLY MARKET BUT WITH LIMITED COMPETITION. A CUSTOMER MAY SEEK ACCESS AND INTERCONNECTION IN A REASONABLY WELL ESTABLISHED EQUITABLE MARKET. THERE DOES NOT APPEAR TO BE EXCESS PROFITS, AS ONE WOULD FIND A PURE MONOPOLY.

The Tier 1 market has become competitive. It is a market based on contractual relationships not regulation. It is in many ways a Coasian market. There is no FCC regulation, no mandated access or interconnection; it is based upon competition and open pricing. This is a counter example to what the incumbent telcos and cable companies seek in the local market.

1.2.1.2 LACK OF OPENNESS IN INCUMBENT LOCAL NETWORKS: THE CABLE OPERATORS AND THE INCUMBENT MONOPOLISTS HAVE NETWORK ARCHITECTURE FOR LOCAL ACCESS, WHICH ARE ALL INHERENTLY CLOSED AND HIERARCHICAL. THEY ARE NOT OPEN NETWORKS AND DELIBERATELY PROHIBIT OPEN ON NET ACCESS AND INTERCONNECTIVITY . THIS ESTABLISHES A BARRIER TO ENTRY FOR WHAT THEY MAY PERCEIVE AS COMPETITORS SEEKING TO DISINTERMEDIATE THEIR SERVICES.

Openness is a powerful concept. It means that there is no proprietary control, that anyone may interconnect via a portal and that peer-to-peer communications is readily achievable. Moreover, openness means that anyone wanting commercial access can gain that access in a standard and predictable fashion.

[10] There is a discussion of common law and the various political schools relating to it. The recent work of Feinman, Un-Making Law, The Conservative Campaign to Roll Back the Common Law, discusses the issues of recent court decisions to strengthen property rights with the loss of public goods. We discuss this herein but in a sense, we accept the Feinman argument that common law has substantial benefits to the individual, but we also argue for strong property rights as regards to the individual. The Feinman argument is related more to corporate property rights and the general issues of takings in environmental cases. We believe that one must be careful to balance property rights since if they are lost then the individual suffers the most. The takings argument will become a strong corollary of our argument. If we accept property rights in the packet then anything the FCC or the Government does to weaken them is a takings and cane be adjudicated thereunder.

Openness further implies an open and free flow of communications on both a global and local landscape. The localism element must become an integral part of openness.

Openness means that the network allows any user to communicate with any and all other users. It further means a minimalism of implementation of broadband, as it is with the Internet, and an ability to move all of the intelligence and creativity to the edge of the network, in the hands of the user. The essence of the Internet has always been openness. This was accomplished via the use of the minimalistic approach of IP technology and allowing the intelligence to move to the edge of the net. Furthermore, openness also has the characteristic of empowering and enabling any user to connect to any other user or sets of users. Thus openness means that the network deployed should be IP based and should allow individual access to any and all other users of the network in the broadest sense.[11]

Localism is a similar characteristic. Localism means that the power to create is left in the hands of the user. It is the complement of openness, which is the network looking outward. Localism is the complement of the network looking inwards. This paper describes how one can view broadband not just as a local or regional embodiment of openness and localism, but how it can play as both a national and international fabric for these concepts.

Localism further means a participatory process driven by some form of co-ownership in the MBN. The participatory process and the ownership issue go hand in hand. The ownership may mean nothing more than a seat at the table with guarantees of openness. The participatory process demands an ability to allow those with vested interest to have their voices heard. Localism also means that there can be a focusing of the interactions and communications on a local level.

The major observation here is that as little as five years ago 95% or more of Internet traffic went to MAE East or West and then back again. Thus Europe communicated with web sites in the US and then back. India had over 99% of its traffic sent back and forth to the US. This has changed. Poland talks to Poland more than 50% of the time, France to France in excess of 70% of the time and now India has over 70% of its Internet traffic to and from itself. Localism thus has a second dimension of internal communications and facilitating the process as well.

If one were to look at the Internet traffic over the past fifteen years one would observe a fascinating pattern of change. In 1994, for example, over 98% of the Internet traffic from Mexico went to the US and back. In 1998, the same amount went from India to the US and back. The tremendous flow was driven by two factors; lack of local content and lack of local infrastructure. At the present time the flow in India is now less than 50% to the US, the majority if to and from India. This means a growth of Indian content and a growth of Indian infrastructure. Similar but even more dramatic changes are prevalent in Europe. Czech traffic was predominantly to the US and Western Europe, today it is predominantly to and from Czech. This is the result again of local content and local infrastructure. This moreover is an example of localism. Namely, that there exist natural communities of interest wherein the predominant communications occur. There are thus natural clusters of commonality. The question then is can these cluster be brought down more locally, albeit by expanding the communications local fabric.

1.2.1.3 OPENNESS IS OBTAINABLE IN CERTAIN WIRELESS NETWORKS: IN THE MUNICIPAL AND PRIVATE NON-INCUMBENT WIRELESS ARCHITECTURE THERE IS INHERENT OPENNESS IN THE NETWORKS. THIS MAY ALLOW FOR SIGNIFICANT CHANGE IN THE MARKET POSITIONING AND ENTRY.

Wireless networks using 802.11 mesh routers are naturally open. Every node is a router and every node is an entry point. This is not the case for FTTH or Cable modems. The open network paradigm extends the Internet to a local environment. This is a critical change. This makes the local network a true local Internet!

[11] There is no reason, however, to compel the local carrier to be open, nor is there any reason to demand it from a regulatory perspective. Our argument is that each of these players should act in a free open market environment. Our arguments about openness is related to what is best for the market.

1.2.1.4 EXISTENCE OF MULTIPLE PLAYERS AND COMPETITION IN ALL ELEMENTS OF THE CHANNEL IS CLEAR: THE DISTRIBUTION CHANNEL COMPOSED OF ALL MARKET ELEMENTS AND PLAYERS SHOWS CONSIDERABLE EXISTENCE OF MULTIPLE ALTERNATIVES. THERE ARE MANY TIER 1 PLAYERS, THERE IS AN EVOLVING MARKET FOR LOCAL ACCESS PLAYERS, WIRE AND WIRELESS, AND THERE OF COURSE ARE MANY CONTENT PROVIDERS. THE CONSUMER HAS THE POTENTIAL FOR CHOICE.

There is a school of thought, based on the old school of the Bell System Journal of Economics, which was the mouthpiece of the old AT&T to justify their actions in the days of monopoly, which holds that there exist network externalities, and that the incumbent should benefit from those externalities. The school is composed of a great deal of ad hoc propiter hoc argument, arguments of justifications for the maintenance of monopoly power of the incumbent. The influence of the school is significant. We argue the contrary. Externalities are non-existent. Take the simple example of how Verizon makes money today. The copper side of the business, the old access lines, charges the wireless carriers interconnection or access fees based on the externality concept. Namely, the wireless carrier benefit by connecting to the customers. Since January of 2004, however, there are more wireless customers in the US than wireline. This would mean that as of that date, the externality shifts to the wireless carrier. It did not. It remains now a subsidy for the old wireline business. With multiple players at all levels of the distribution channel, and with consumer choice, the only true externality, if such exists, is the customer. The customer can choose, and the providers of service then compete in an open market, one that should be free from regulation and interconnection fees.

THERE ARE MULTIPLE OPTIONS TO PROVIDE LOCAL CONNECTIVITY; CABLE, DSL, FTTH, WIMAX AND WIFI TO NAME A FEW. OF ALL OF THESE OPTIONS THE FTTH OPTION IS THE MOST COSTLY, WELL IN EXCESS OF $3,500 PER HH PLUS THE FRANCHISE COSTS. THE INCUMBENT RBOCS ARE SEEKING A MECHANISM TO UNDERWRITE THIS OVERPRICED OPTION AT THE EXPENSE OF OTHER PLAYERS IN THE DISTRIBUTION CHANNEL AND AT THE EXPENSE OF COMPETITORS.

It is clear that there is no single option and it is clear that there is no monopoly structure. There are multiple options and new ones arriving every day[12].

1.3 Principles for Operations and Implementation

Based upon the analysis of the Internet herein and elsewhere we recommend adherence to the following principles[13]:

1.3.1.1 USE OF A MINIMALIST ARCHITECTURE IS AN ESSENTIAL AND PROVEN METHOD TO OPTIMIZE INNOVATION AND MINIMIZE COSTS.

The Internet can operate over different, changing underlying technologies, and applications are free to evolve above the transport layer. This has been described as the “hour glass” architecture. In this architecture, bits

[12] The recent announcement by McCaw of the Intel and Motorola (see Business Week, July 24, 2006) investment in his Clearwire WiMax business is but one example. The cellular companies have options themselves, and the growth of WiFi municipal and private networks in another. Cable itself can lay fiber the last few hundred feet if necessary. However, the issue raised does beg the question as to why Verizon and possibly AT&T would want to build FTTH if it is so costly. If the investment is $3,500 per subscriber then this requires a substantial revenue stream ARPU to amortize. Furthermore this number is at 30-35% penetration by year 3 and reaching a penetration level in excess of 60% by year 10. How will Verizon do this? It is not at all clear.

[13] See McGarty, Municipal Broadband Networks, A Local Paradigm. This paper details many of the proposed design and openness issues we have highlighted herein.

are bits and the network does not optimize for any class of applications. The network is minimal at its heart and the intelligence, via appliances or whatever is at the edges.

The Internet is a very complex system of computers, protocols, and applications. This tends toward complexity in individual components as well. However, this tendency towards complexity works against both the complex hardware or software, and against the systems, which depend on its correct behavior, as it, becomes difficult for those who designed it to debug, and for those who depend on it to deploy and use. For this reason, components and protocols must be designed with serviceability in mind, which means that they must be simple to deploy and use. We note that much in the Internet today is not as simple as the end user would like; the trend must be towards increased simplicity in the components.

Decentralized and global in scope, the Internet is difficult to control. Governments are now considering regulation but in an environment designed for maximum freedom, regulation and control are and will continue to be difficult.

1.3.1.2 ENSURE EASY MANY-TO-MANY TRANSMISSION VIA PACKET ADDRESSING AND ENSURE PERFORMANCE QUALITY BY OBSERVING AND END-TO-END DESIGN.

If I connect anywhere, I have access everywhere. There are no segregated communities: all networks are interconnected and share the same address and name spaces.

The Internet is drastically different from the traditional hierarchical and one to one telecommunications services. It is a packet system, allowing control and enhancement at the periphery of the network and allowing for the “broadcasting” of packet to many destinations simultaneously. In many ways the Internet is the blending of characteristics peculiar to telephony and broadcast.

1.3.1.3 ALLOW INNOVATION TO TAKE PLACE AT THE EDGE VIA OPEN INTERFACES WILL ENSURE THE MAXIMUM RETURN AND WILL PERMIT AND SUPPORT MAXIMUM CREATIVITY.

The Internet is highly creative and innovative. This is because the point of innovation is at the edge of the network, through software running on devices connected to the network. Because of the hourglass architecture, the interface used by edge devices is standardized and open to all. Placing the intelligence at the ends permits rapid change (e.g., by adding new devices or loading new software into existing devices) that do not have to wait for changes or investment in the network infrastructure.

The Internet has already gone through several iterations. Routing protocols have been deployed in bounded domains, for example, and replaced with other protocols as technology has matured. IP addresses were at one time given out in blocks of fixed sizes, whereas today they are assigned in blocks defined by economic penalties and demonstrated needs. What has worked, over a period of twenty-five years, has been continual gradual change, with interoperate*ion between newer and older hardware and software. Sudden revolutionary changes have not worked as well, such as the sudden phasing out of one protocol in favor of another. For this reason, it is unrealistic to believe that major infrastructure components, hardware or software, can be changed without a significant period of coexistence and interoperation.

1.3.1.4 ENSURE SCALABILITY IN THE NETWORK FOR EXPANSION AND AVOID THE INSERTION OF ANY ELEMENTS, WHICH CAN BECOME BOTTLENECKS.

Design with scalability in mind and strong architecture supervision guarantees future evolution. This is particularly important for "infrastructure" applications (a.k.a. middleware) and is guaranteed, today, by the open discussions in the IETF standard process.

1.3.1.5 PROVIDE A DISTRIBUTED AND ADAPTIVE DESIGN FOR INNOVATION AND SURVIVABILITY

The Internet is more distributed and adaptive than other information networks. The Internet Protocol (IP) enables distributed control of the network except for the assignment of the highest level of addresses and Domain Name System (DNS) names. This distributed control provides for more rapid development and introduction of innovative applications and services.

1.4 Proposals

1.4.1.1 THE FCC OR ANY REGULATORY OR LEGISLATIVE BODY SHOULD AVOID PICKING, INFLUENCING, SUGGESTING, OR FACILITATING ANY WINNERS IN A TECHNICAL COMPETITION. IT IS THE FUNCTION OF THE MARKET TO DO SO.

The argument is frequently given that the FCC did the correct action when it did not get in the way of CDMA versus TDMA[14]. In the current approach of the FCC, especially in their recent ruling making the Internet look more like the old regulated telephone system, they are effectively making choices. The issue of the Internet should be a hands off issue, letting the market select the choices.

1.4.1.2 THE CONSUMER'S PROPERTY RIGHTS IN THE DATA THEY GENERATE SHOULD BE PROTECTED. THE CONSUMER IS THE PERSON CREATING VALUE AND PAYING FOR THE SERVICE. THE CONSUMER'S PROPERTY RIGHT EXTENDS END TO END IS ESTABLISHED UNDER COMMON LAW.

All of the current arguments regarding the Internet and its neutrality fail to look at the consumer. We argue herein that the Consumer is the key element and that the Consumer has perforce of many historical and legal precedents a property right in the packets the they transport across the Internet. Rights imply duties and when the Consumer hands the packet off to the local carrier there is created a duty of care, based upon the principles of bailment.

Predicated upon the Consumer's property rights, the Consumer should be free to ENTER into any for a legal transaction as the consumer so desires to seek goods and services over the Internet[15].

The Consumer may select whatever means of access and purchase he seeks, subject to general principles of law; no illegal acts such as child pornography, terrorism etc. The consumer can seek whatever option of local access he desires. Thus this is an argument for multiple local access including but not necessarily limited to such alternatives as municipal networks; fiber or WiFi. If the consumer seeks to have access to a service demanding large amounts of bandwidth at high level of quality then the consumer would seek a local provider to provide that service at a price determined by the market. This means that if a provider can only provide the service at some high cost of capital, then the provider should rationally select a price to charge, consistent with their business practice. The provider has no right to charge third parties in the distribution

[14] The senior author was personally involved in that process when he was COO of NYNEX Mobile and was one of the key proponents of CDMA. The FCC knew nothing of the operational concerns and we argued frequently that they should just sit back and let people have their money at risk make the choice.

[15] In the view held herein, the premise is that the consumer has a property right, that the local carrier has a common carriage position at common law and that the remedy available to the consumer at common law for any harm is available under common law. Common law covers torts, property and contract. These three elements are all part of this concept that we have developed. There is another set or means for remedies; antitrust law. The issue of tying agreements comes to the fore. However one must be careful so seek remedies there due to the weak position put on the consumer by the Supreme Court in the Verizon v. Trinko case. See McGarty, Competition in the Local Exchange Market (1996), Municipal Broadband (2002) and Collapse of Telecom (2002).

channel via some taxation of takings by a third party such as a Government agency[16]. Thus if the incumbent telco spends $4,000 per subscriber for installation, it is their problem is the market price is $30 per month for broadband, and if they cannot ever profitably operate at that point the market should clear that alternative. If a municipality can do the connection at $2,000 per subscriber and can provide $30 access then the municipality should be the efficient market answer.

1.4.1.3 THE INTERNET SHOULD BE AN OPEN NETWORK WHERE CONNECTIVITY IS PERMITTED AT ANY POINT. THIS IMPLIES THAT LOCAL OPENNESS SHOULD BE FOSTERED SO AS TO ENABLE LOCAL CONTENT AND SERVICES.

The concept of openness is critical to the future of the Internet especially when we see it becoming a local entity. Openness means that anyone can connect locally to the network and interconnect locally to anyone else on the network. It means local IP connectivity, it means no Transit fees. Localism is also a strong element.[17]

1.4.1.4 PRICING OF ANY ELEMENT OF THE DISTRIBUTION CHANNEL SHOULD BE DONE AT MARKET RATES TO THE CONSUMER. THUS ANY LOCAL TRANSPORT SUPPLIER SHOULD BE ABLE TO CHARGE FOR GREATER DATA CARRYING CAPACITY, INCREASED QUALITY OF SERVICE OR SIMILAR FACTOR. THE LOCAL CARRIER HAS NO RIGHT TO INTERFERE IN THE TRANSACTION BETWEEN THE CONSUMER AND THE SUPPLIER, AND AS A COROLLARY, THE LOCAL CARRIER HAS NO RIGHT TO SEEK ADDITIONAL REMUNERATION FROM THE SUPPLIER.

In fact we argue that the local carrier has a duty under bailment principles not to look within the secure packet at all. The local carrier has a duty to carry the packet from point A to point B. The local carrier violates its duty and the Customer can seek remedies under common law for that violation.

As to local access payment, if the Consumer wants to view 5 HDTV stations on a streaming basis that requires 100 Mbps service at a high QoS level. Then the Consumer must purchase that level of service from the local carrier at whatever price the carrier charges. If the charge is too great then there is no market. The local carrier has no right to charge the content provider unless the local carrier directly touches the content provider and then only by contract; in fact we consider that relationship a secure relationship. The interesting issue is that the marginal cost to a carrier is dramatically different between cable and telco. If the telco incumbent uses a FTTH design then the marginal cost just for local transport is near zero. However the marginal cost for Tiering may be quite substantial, unless of course the local carrier is a Tier 1 carrier such as AT&T or Verizon; in that case their marginal cost is zero!

If the Content supplier were not a Tier 1 ISP then the content provider would be charge perforce of its Transit Agreement with its Tier 1 carrier for the transmittal of the videos, and that would be a substantial amount! Thus one could look at how the Internet works today, and in fact if Verizon, as a Tier 1 carrier, used its local carrier and its Tier 1 backbone, then it would be sharing in the revenue perforce of the Transit Fee it charges the Content provider. Does it desire to collect several times? The mechanism, a contract vehicle, is already in place!

[16] The charging of the other players in the channel by the FTTH entrant assumes that FTTH is the best solution, it makes a technology choice, and it further assumes that there is some agent, such as the FCC, which has the authority to implement this. On the other hand if the local carrier is also a Tier 1 provider, then if these Tier 1 providers can work together to re-negotiate the Tier 1 peering agreements to account for this flow, namely making them transiting with fees, then the cost would flow downward to the suppliers via their transit fees.

[17] See McGarty, Internet Architectures, the author develops at length the concepts of Openness and Localism. This paper was prepared for the Dutch Government Panel looking at broadband. The ideas have been adopted and the Dutch approach is unique. It is ahead of the US.

2 ISSUES AND POSITIONS

Internet Neutrality is a war cry for those who desire to control the evolution of the Internet. The Internet was originally conceived as an open network, a network where the intelligence was at the edge of the network. It was conceived and implemented in stark contrast to the existing telephone network which was a hierarchical network with a central control.[18] The issues currently being focused on are economic issues yet their resolution may have a strong negative effect on the growth of the Internet.

We approach this analysis by first establishing the world views of several players in this effort; RBOCs, CATV operators, and content providers. Underlying this, of course, is the customer.

2.1 Schools of Thought

Let us first try to phrase some of the positions of the various camps as they have been presented:

2.1.1 RBOC Camp

Despite the fact that they come from the common carrier world, they now want to "share" in what any purveyor of services makes on the Internet. They do not want to just get paid for the access they provide, they believe that such an arrangement is unfair. They want to have a piece of the action of anyone who creates value[19],[20]. This implies a "tax" being levied on the consumer since, if such an arrangement were to occur, there would be a passing down of the costs. The result would be a distortion to the Internet market as we know it. We argue herein that the RBOCs are proposing this approach because they are in a business whose economics are being destroyed by alternatives. The RBOCs argue that they cannot build a broadband infrastructure unless they "tax" the purveyors of services which, in turn, will be passed down to the

[18] We have discussed this in details in the 1990 Harvard paper which focused on the NREN, the National Research and Educational Network, which became what we now call the Internet. At that time we looked a multiple network architectures and we argued that the TCP/IP approach was optimal. That is we argued that pushing the intelligence to the edge of the network allowed for explosive growth in applications and services. The reality of the subsequent history proved this correct.

[19] Recently, however, the ILECs, via their spokespersons, have voiced a new concept of common carriage, or possibly a total ignorance of it or its outright unilateral denial. Specifically Ed Whitacre, the CEO of SBC, now AT&T, is quoted as stating:[19]

"Now what they would like to do is use my pipes free, but I ain't going to let them do that because we have spent this capital and we have to have a return on it," says Whitacre. "So there's going to have to be some mechanism for these people who use these pipes to pay for the portion they're using. Why should they be allowed to use my pipes?".....“The Internet can't be free in that sense, because we and the cable companies have made an investment and for a Google or Yahoo! or Vonage or anybody to expect to use these pipes [for] free is nuts!” See http://www.dslreports.com/shownews/69002 and Business Week November 7, 2005 ***Rewired And Ready For Combat*** http://www.businessweek.com/magazine/content/05_45/b3958089.htm

[20] One just has to read the Whitacre quote to see what he is explaining. The recent, July 17, 2006 debate on CSPAN between Vint Cerf and Dave Farber was a clear example of the debate. Cerf was clear and articulate as regards to the need for neutrality. Farber. an apologist for the incumbent RBOCs based upon his position and background, seemed to hold that there is no problem and would never be one. However the issue of sharing in the profits of the profitable became a cornerstone of the Farber argument. see www.cspan.org The Communicators: The Great Debate - What is Net Neutrality?

consumer. Why not just raise their price to cover their costs? Then they could not compete with the cable incumbent. This is not an economically logical method.[21]

One of the more recent arguments in the RBOC camp is the argument based upon the principle of multi-sided markets as propounded by Rochet and Tirole and specifically by the RBOC polemicist Darby. The essence of this argument is that it is costly to build fiber to the home. The cost of this exceeds what may be gained for the service in an open market. Thus, since the other parties benefiting from this service, such as Google et al. are making potentially a significant amount from it, they should be charged as a player in this multi-sided market. The implications of this are; first, that such a charge becomes a "tax" on the consumer since all such charges flow down to the ultimate player; second, the whole premise assumes that the RBOC belief and execution of a FTTH network is the sine qua non of broadband is open to pure speculation from economic basis. FTTH may actually be "best" technically from a data point of view, however, but even that is open to debate. Do the RBOCs truly believe that taxing is permitted if you're providing a "vital service to society" as they believe that they are doing, albeit at a high cost? That is to be seen, but doubted.

There are wireless options and there are independent small fiber operators who present open market competition. Why should we allow a large incumbent to tax everyone for what is a proven inefficient means of distribution? Perhaps FTTH is a better long term solution, perhaps not. Wireless can provide 100 Mbps and more and FTTH can do 10 Gbps and more. Do we have a need for 10 Gbps at this time, no but the demand may follow. Is this the reason to create a tax, in anticipation, and to advantage just one player? We feel not. We follow this argument in detail herein.[22]

The view from an incumbent is that, in order for them to survive, they must be able to provide video and broadband in a greater degree than is done with DSL. They realize that DSL is a cumbersome and limiting technology and that the Cable companies have greater capacity. They desire to build FTTH but they understand that this is very costly and delay prone with the franchise problem. In addition, they view the cable business model as one to their liking; they perceive the cable model as one where the cable company gets a piece of the total revenue generated; namely, the video content providers get a percentage of the revenues from video content distribution. The perception is one of sharing in the gross sales and they would like to emulate this model. They see Google making money every time someone clicks on an ad which Google has on its screen and they would like a share in that revenue. This is regardless of the fact that they have no claim to it, putatively owing to their designation as common carriers. This is also regardless of the fact that they could never create this also; just look at the fact that the RBOCs owned the yellow pages and they let this asset miss the Internet revolution. Also just look at Verizon' loss of more than $250 million on its failed attempt to get into video content as a studio. Clearly their record is dismal when it comes to content. They fail to understand that the cable companies themselves created most of the content; MTV, HBO, Showtime, Nickelodeon, etc. were all investments and creations of cable companies.[23] Notwithstanding any

[21] We show in this paper the economics of CATV and FTTH. The analysis of the economics is compelling. The CATV players can achieve for far less what the incumbent RBOC can for excessive amounts.

[22] Even more significant is the fact that in the wireless domain we have just seen almost a billion dollars spent on a McCaw wireless WiMax system by Intel and Motorola. We also have first-hand knowledge of FTTH as builders of them and we see that the main costs is the franchise, a government tax if you will on any new entrant. The new telco laws being proposed eliminate this but they still leave behind an large inefficient carrier spending grand sums in a highly questionable economic manner. The market should determine the correct technologies not government regulation.

[23] Cable history is telling. In the late 1940s in town like Altoona, PA, rebroadcast of TV was important since the town was in a valley and could not get over the air. The local entrepreneur used an antenna, captured the signal and transmitted it over coax. Then in the late 1970s and early 1980s Cable began to go for large municipal franchises, the large cities; New York, Boston, Chicago, Pittsburgh, Houston. Dallas, and many more. The senior author was deeply involved in many of these at the time. These required providing more and more channels but there was not the content. Thus the Cable companies "invented" and "created" the content at their own cost. From this came MTV, Showtime, HBO, Nickelodeon, and many more. The Cable companies invested in the future. One should also remember that HBO almost died but for RCA and

sense of reality or the facts, one can see and hear in Whitacre's statements and in the Verizon remarks and comments that they want to share in the upside.

2.1.2 Cable TV Camp

The CATV providers are starting to find themselves in a bit of a bind. They never were a common carrier and in fact eschewed any resemblance to that at all turns for reasons of exemption from regulation. They are packagers of entertainment. They are the intermediaries between the content makers and the customers, in that they put entertainment packages together and present them to the consumer. In addition, the CATV carriers use coax -which has limited bandwidth, most of which is already occupied with video - to the home and rarely do any fiber direct to the home. Thus, in a CATV broadband service, one shares a channel with many other homes and there is no way to achieve any bandwidth comparable to that of the fiber plant directly to the home. Thus, cable companies have two "advantages" in this battle; they were never common carriers and they don't have much bandwidth to allocate even if they were expand takings 750 MHz illegal demand more manage local network risk of liability for discriminate change[24]. However, there is a bit of a problem looming on the horizon for the cable companies. The mere fact that content providers can provide video on the Internet implies that the cable companies could be disintermediated by an Internet distribution strategy. That is, a third party, possibly the studios themselves, could use the Internet to establish a distribution channel which fails to compensate the CATV company properly for its assets, namely the "get" transport only. This is the risk that CATV players see arising.

The cable companies are more interested in avoiding disintermediation. They don't want to see the Internet used as a way to go around their basic business model. The see themselves as a packager and local distributor, bringing and offering content. They do not want to have to lose that by allowing content providers to reach the customer directly over the Internet. If the content could be provided over the Internet, then they feel they would lose the core of their business. They have a point. Of all the players, the cable companies seem the most logical.

2.1.3 Internet Content Providers Camp

The content providers sell content, or whatever is in their business model, directly to the end user. They use the Internet to connect to the customers but the connection is precipitated by the customer. Content providers do NOT at this time target customers. For example, if I were to buy a printer on-line from Staples, then I shop around and select Staples, place my order to Staples, and Staples consummates the transaction. They may use UPS to deliver the product. UPS charges based upon weight, distance, and time to deliver. A small package over a short distance with no time restriction ma costs one price to UPS, and then to me; or a large package from a distance delivered in one day may cost me, ultimately, a greater price. Content providers have used this model for centuries. We shall discuss this later. UPS does not charge by what is inside the package, unless of course it is hazardous and requires special handling, such as hydrochloric acid shipments.

This is the most difficult to understand. Clearly, they do not want to be taxed by the RBOCs. One might also conclude that, as content providers, they would want as many distribution channels for their products as possible. But anyone familiar with basic marketing knows that one can have channel conflicts. Thus DVDs conflict with theatres, and conflict with cable. Over the years the players have reached agreements to sort this out. This may occur between cable and content providers. But one may ask does this model go further? Do

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Scientific Atlanta. It was 1976 when RCA launched the satellite and SA provide low costs receive only terminals, before that the distribution costs and market share of HBO were minimal, after that it grew hyper exponentially. Cable made the investments in content, it created content. The RBOC have a dismal record in doing that, in fact we have seen that they have actually been content destroyers. Now they want a piece of that content.

[24] The CATV system inherently has limited bandwidth. As example there may be fiber to local subhubs but coax from there to the user. As such it may have little excess capacity. Any demand to add more capacity without any additional recovery from revenue is a takings.

some of the players in this model world truly desire that there should be no charge for increased bandwidth or service. Does this group argue for unbundling and common carriage? Frankly that is what we explore herein.

The three schools of thought are important to understand. The content provider school is the classic approach based upon seven hundred years of English law. It was the basis for establishing the whole construct of transport of goods and was the basis for the English law system which allowed England, and then America, to flourish as centers of world trade. The only attempt to negate this was the taxes by George III called the Tea Tax, and anyone familiar with US history knows the impact that had: the Boston Tea Party and ultimately a revolution.

2.2 Basic Principles

The principles that guide the remainder of this work are as follows:

1. The Government should not get in the middle of deciding technologies or market winners. The Government's role should be de minimis and focused on protecting rights of the consumer.

The history of the FCC interfering directly or otherwise and getting it wrong are too numerous to mention all. The FCC for example stayed out of the TDMA and CDMA debate. The FCC did get into the issue of digital television, a project still not complete, if ever. The FCC after much struggle stayed out of the HDTV debate, and the result was somewhat positive.[25]

2. The market will often be the best selector of the best alternative. Any interference with a free and open market will bias the result and will generally end in an unbalanced and not at all survivable alternative.

One could argue however that the antitrust issues should be the sole purview of the Government. We argue herein that the Government even here is at best weak and at worst destructive (see Trinko case discussion latter in this paper). We argue that litigation on behalf of the consumer is the true key.

3. The consumer is key and the consumer has certain rights which have not been clearly explicated. We will argue herein that the consumer indeed has property rights in the packets that he sends out across the network; that the packets are enclosed and packaged for security purposes; and that when these packets are handed over to a carrier bailment is established, a duty on the part of the bailor to care for the package (in essence, common carriage duty).

These basic principles lead us to major conclusions. Key to these conclusions is that the incumbent RBOC has no right to look inside any of a person's packets to determine their content or where they are going, as this would be a breach of the bailment and is protected under common law. This argument we will develop in detail.

[25] The classic case of indirect control by the FCC was the story told by Bob Kahn about how AT&T lost the Internet at the very beginning. Kahn relates how when he was at ARPA in the early 1970s he went to Bell Labs, Murray Hill I believe, and met with a large group of Bell Labs folks, always a large group in those days since that is what distinguished AT&T, large attendance at any meeting. He asked that they share with him the AT&T 300 bps modem design so he could have it modified to support the ARPA net use. They not only said no but effectively hell no. They said they were a Government monopoly and that they and only they could deploy such devices. Further they would never share with the Government. Third, if the Government wanted to do this then it should give Bell Labs a big contract and Bell Labs would do what it thought best. Kahn politely said no thanks. Out of they came such companies as Codex (acquired by Motorola), Linkabit (now the Qualcomm folks) and the Meade-Carver designs for ICs. Kahn used the ARPA funds to create the industry which demolished the arrogance of Bell Labs. Ironically it is now the same Bell Labs, what little is left, which supports Whitacre and his broadband goals. They, namely AT&T, rejected the Internet, they rejected content, and now they want to be compensated.

2.3 Approach

In this paper we take the following approach:

First, we take an overview approach to the Internet reviewing its key elements and then using the construct developed to analyze directions for growth and change. We also use the constructs to establish definitions and understanding for analyzing issues regarding interconnection and control. Our approach in this review is to place the technical and business elements of the Internet into a framework which allows for common use of terms.

Second, we review the issues regarding interconnection and access. The issue here will become a key factor in understanding the relationships among the parties. There is a well established school of thought which has provided a set of analytical tool which justify the status quo. We reject those classic tools and re-examine the interconnection issue from a business perspective while respecting the technical elements which make the separate parts function.

Third, we address the concepts of property, bailment, common carriage, and common law. Here we argue that the packets we personally create in communicating on the Internet are our property and that any carrier is indeed a common carrier. In addition, we argue that the true legal venue may very well be common law since common carriage, property, bailment, and damages are over a thousand years old in the well accepted set of common law principles. Thus, the way the Government may want to control the telecom world is via administrative law, but the way to seek redress remedies is via common law.

Fourth, we review the current FCC rulings and recent Supreme Court rulings as regards to the world of the Internet. It is clear that the FCC has taken a stronger position of supporting the incumbent at the adverse result to new entrants. We review those elements. The FCC, under the current administration, has clamped down on opening the network and has added to the Internet purveyors the burdens of the well established telecommunications providers. The new changes to the telecommunications act we suspect will further increase that burden.

Fifth, we lay out several recommendations to be considered by policy makers in this area. When the net telecommunications law is enacted - and we suspect it may very well be this Session of Congress, but one never know - the FCC will have the authority and responsibility to interpret and manage it. This will be another great challenge. We look at several of the challenges in this area and we see that the issue of Internet Neutrality is not a separate issue in its own right; but rather a fundamental issue regarding the individual and his property rights.

3 HOW THE INTERNET WORKS

The Internet is a collection of networks and subnetworks using the TCP/IP protocol. It is a relatively dumb network wherein end users have an address called the IP address. In the early 1990s, several large carriers ganged together to provide a backbone. The backbone providers such as AT&T and BB&N, now Level 3, had actual backbone network facilities and agreed to interconnect their networks. Each of these large carriers provided access to some subset of IP addresses. In this section, we present the structure of these carriers and how they relate to one another. In the subsequent section, we talk about interconnection and access, and then tie the elements together into a legal framework.

3.1 Internet Structure

Let us now consider the actual structure of the Internet. The Internet is simply a network of networks which have agreed to use the TCP/IP set of protocols as specified by the Internet Engineering Task Force (IETF). The specifics are contained in what are called Requests for Comments (RFCs). The RFCs are consensus and living document specifications which describe how one gets around the Internet. There is no real central control. It does not exist and, in fact, is anathema to the Internet construct.

There are several general elements that need defining. They are:

3.1.1 IP Addresses

IP addresses are the way one user on the Interne connects to any other user. They provide a sense of unique identity to any entity on the Internet. The IP address is a set of numbers in the range of 0.0.0.0 to 255.255.255.255. This is 2^8 times 2^8 times 2^8 times 2^8 possible numbers, or a total of 4.3 billion possible addresses.

Consider a simple fictitious example, in which there are two Tier 1 carriers: AT&T and Level 3 which cover a set of IP addresses as follows:[26]

AT&T covers 000.000.000.000 to 128.128.128.128
Level 3 covers 129.0.0.0 to 255.255.255.255

Inn this simple and hypothetical example, the two ISPs cover all possible IP addresses, and if they further agree to interconnect, then any customer of one can connect to any customer of the other, and thus there is full Internet connectivity. If, however, there are many such addresses but they are clustered in a different and separate manner then there must be another way to ensure full connectivity.

For example let us define a sample IP address co-location as:

$$IPA_k = \{\text{all IP addresses belonging to ISP}_k\} = \bigcup_{n=1}^{N} IPA_{n,k}$$

Then to cover all IP addresses we must select all the ISPs which cover all the addresses. Namely;

[26] In order for a computer to connect to the Internet it must have an IP address. There are around 4 billion possible IP addresses between **0.0.0.0** and **255.255.255.255** and, excluding a few set aside for special purposes, most are valid for use on the Internet. (See http://www.rhebus.com/techinfo/iprange.htm)

$$IPA_{Total} = \bigcup_{k=1}^{K} \bigcup_{n_k=1}^{N_k} IPA_{k,n}$$

must be the total set of IP addresses. Otherwise we will have a small island of unreachable addresses. Now the question is how do we treat these various ISPs and do they have some form of pecking order. If there are several large ISPs and many small ones, is their any form of parity? What are the policy and legal issues regarding these relationships?

3.1.2 Tier 1 ISPs

At the beginning of what has become the Internet, the period of the late 1980s, there was a collection of large players including such companies as IBM and MCI who banded together to assist in the development and operations of the backbone. These players expanded and became what we call Tier 1 ISPs. A Tier 1 ISP generally is a facilities based carrier which has global coverage and has in its own network adequate traffic to bring to the table to appear as a peer to the other larger carriers. The Tier 1 ISPs are effectively a closed club of carriers who have agreed to interconnect and when one looks at the IP addresses that these carriers cover it represents almost all of the Internet. It is important that one recognizes that they are almost all and not all: there are small islands of IP addresses which may not be covered (these will be discussed later).

The current list of Tier 1 ISPs includes the following:

1. AOL Transit Data Network (ATDN) AS 1668
2. AT&T AS 7018
3. Global Crossing (GX) AS 3549
4. Level 3 AS 3356
5. Verizon Business AS 701
6. Nippon Telegraph and Telephone Corp. (NTT) (Verio in the US) AS 2914
7. Qwest AS 209
8. SAVVIS AS 3561
9. Sprint Nextel Corporation AS 1239
10. Google [27]

In the above list we also have provided the carriers AS number which stands for Autonomous System. This is the number which the ISP has for overall network interconnection purposes.

3.2 Peering, Transit and Overall Interconnection[28]

The issue of interconnection in an IP framework is described by the terms peering and transit.

Peering is usually a bilateral business and technical arrangement, where two providers agree to accept traffic from one another, and from one another's customers (and thus from their customers' customers). Peering does not include the obligation to carry traffic to third parties. Peering relationships are costless, as all Tier 1 ISPs agree to carry each others traffic for no cost.

Transit is usually a bilateral business and technical arrangement, where one provider (the transit provider) agrees to carry traffic to third parties on behalf of another provider or an end user (the customer). In most

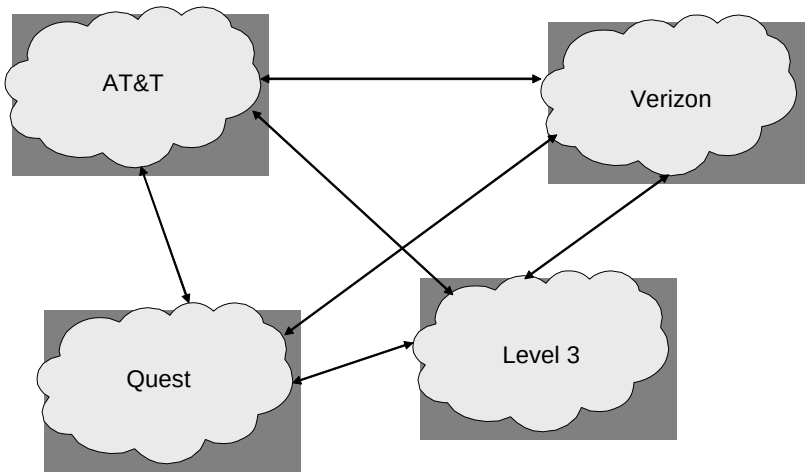
[27] The senior author was informed of this while meeting management at Google in Mountain View. It is not at all clear that this is true. We have tried to verify this but to no avail.

[28] See McGarty, *Peering*, 2002 for a full discussion as well as details on the agreements and legal standing of peering agreements. Also see McGarty, MAE Europe Business Plan, 2002, for a constructive model of how the Tier 1 carriers could be disintermediated.

cases, the transit provider carries traffic to and from its other customers, and to and from every destination on the Internet, as part of the transit arrangement. Transit involves one party paying the other. Thus, a Tier 2 ISP must pay a Tier 1 ISP to carry their traffic.

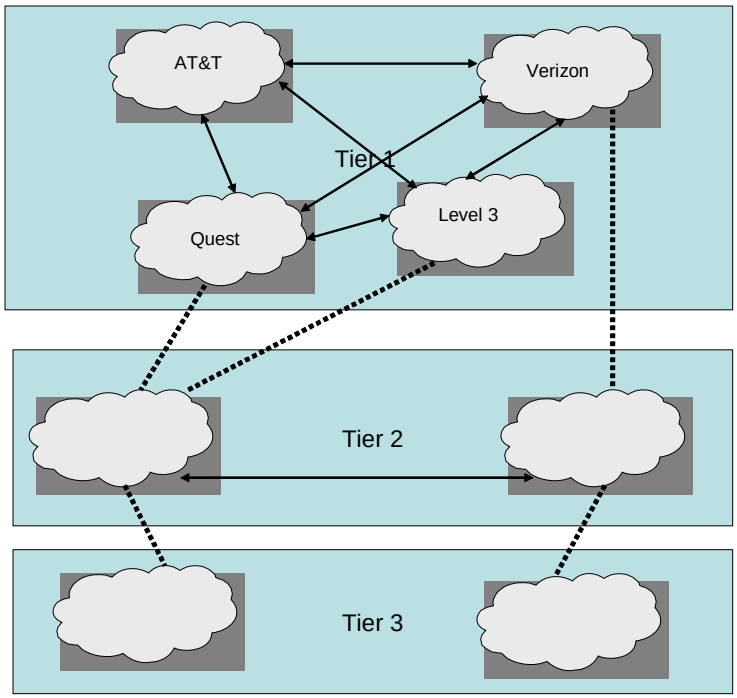
Peering thus offers a provider access only to a single provider's customers; transit, by contrast, usually provides access at a defined price to the entire Internet. Peering is done on a bill-and-keep basis, without cash payments, where both parties perceive roughly equal exchange of value; however, there is often an element of barter.

The Internet backbone, as defined by the collection of all Tier 1 ISPs, can be viewed as below. Each domain of a Tier 1 can also be considered as what is defined as an Autonomous System (AS) and they are assigned an AS number. Within an AS, the routing is controlled by the Tier 1 carrier. The routing between the AS domains is performed by Border Gateway Protocol (BGP). Each AS has a BGP which allows them to interconnect with each other, and ultimately any IP can connect to any other IP - almost. There may exist orphan IP addresses. An orphan address is not part of the connectivity of the BGP and AS networks, and is thus unconnectable. For example, there may exist National Internet Exchanges (NIXs) which are totally contained within a country. For example, in Poland and the Czech Republic early on the local ISPs connected in a single point but they did not connect to any Tier 1 carrier. They just connected to each other. Local email could be sent and local web pages viewed, and it was cheap - because no Tier 1 carrier needed to be paid - but it was limited. If, however, any one of the small ISPs did have a Tier 1 connection then all the traffic leaked through that portal.



Tier 1 ISPs: All connections are "peering" connections and are at no cost between the Tier 1 Carriers. Each Tier 1 carrier connects to some bundle of IP addresses. Thus if one wants to get to all IP addresses then one connects to a Tier 1 who putatively connects to all via peering.

Now, we can expand the concept of Tier 1 to Tier 2 to Tier N. Tier 1 entities all peer, and Tier 2 entities may peer with each other but transit with the Tier 1 entities.

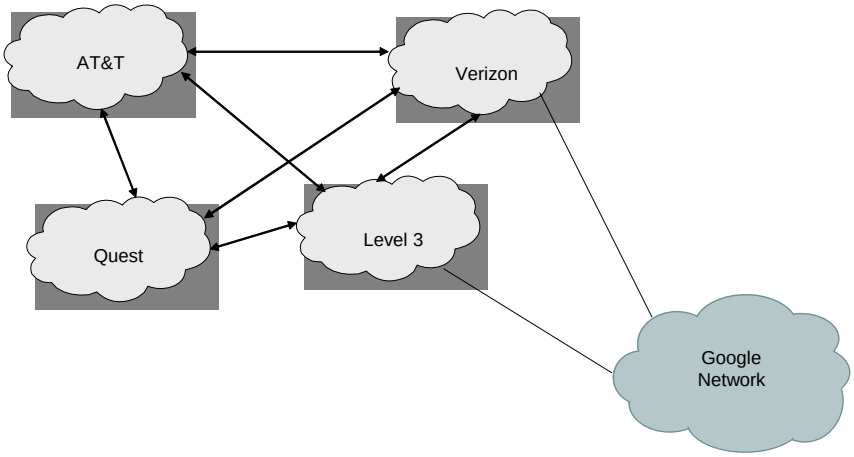


3.3 Connections to the ISPs

The next element to understand is where a content provider connects in this world of the Internet. The following Figure depicts this connectivity. Let us assume Google connects to Level 3 and also to Verizon. The two connections are for redundancy and reliability, just in case one of the Tier 1 carriers fails.

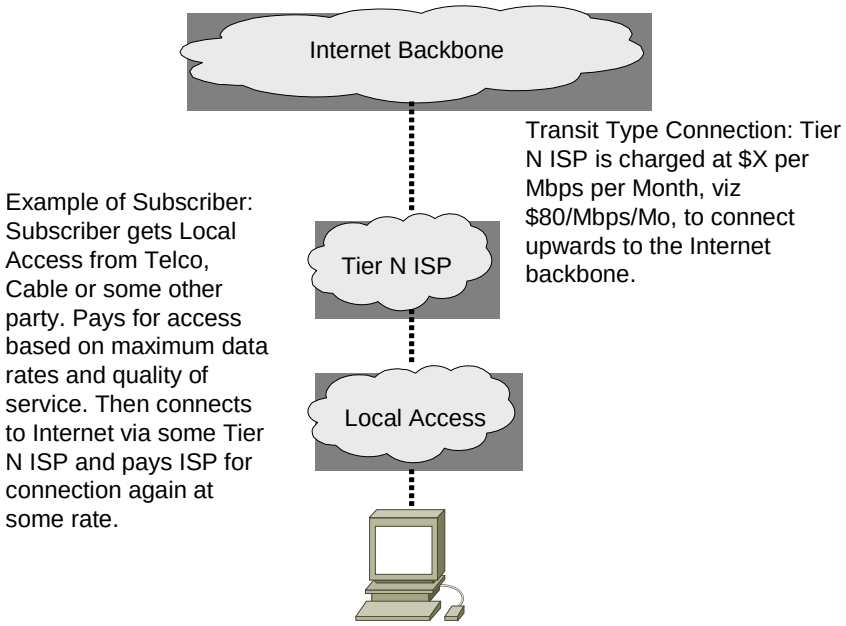
Google pays these Tier 1 carriers a fee for interconnection.[29] It is very much like any other Internet player; namely, it is on the basis of dollars per Mbps per month. It is competitive since there are a reasonable number of ISPs and they are all looking for the traffic. Thus, with a small market, there is some reasonable basis for price competition. It is clearly not a monopoly but is not a fully open market either; it can be viewed as a weak oligopoly.

[29] This assumes that Google was a non-Tier 1 ISP. If, however, Google is indeed a Tier 1 ISP then there is no cost. In fact the whole basis of the argument between AT&T and Google regarding content would be vacuous. In the case a peering agreement, then by contract the agreement would provide for costless interconnection. In addition AT&T would have no standing if such an agreement exists since it would become a fait accompli in terms of contract law.



Google Connects to the Internet Backbone at a Tier 1 Level. It pays the Tier 1 Carrier a Rate for access on the basis of $X/Mbps/Mo. It may have multiple connections for diversity purposes.

At the other end, we look at what the customer is buying. The customer buys two things: i) transport to or from an ISP meet point, namely a point where the ISP has a router and a presence, and ii) transport from their residence of place of business to the meet point. A local ISP may or may not also be the transport entity. For example if I buy Verizon DSL then Verizon is my local ISP and my Tier 1 ISP. However, if I have a dial up connection then the local access may be from Verizon but the Internet access may be from Earthlink. In that case, Verizon has a connection to my home and Earthlink has a set of connections which may be co-located at a Verizon Central Office. Now consider another possibility, say I get my access from Cablevision. It provides a connection to its facilities and to its Internet node. I may not have a Cablevision account, since I may have a separate IP address at say Verio, owned by NTT, and they provide a server and support my IP account. Unlike the Verizon dial-up and Earthlink example, the Cablevision example has Cablevision doing both, they bundle me to my Verio account, even though they do not provide me with any direct internet service.



Now let's explore this a bit further. What am I buying from each of these entities? I am buying access to the Internet backbone and anyone who is on it. But more importantly, I am buying a limited amount of access, not an unlimited amount. Let's see why.

Assume that I buy my access from Cablevision. They connect to the Internet backbone and they pay a Tier 1 carrier say $25 per month per Mbps. This means that, depending on the formula, they take all the traffic in Mps per unit time, call this T(t), and they integrate over a month and divide by the number of seconds to yield an average rate. Let this total traffic be:

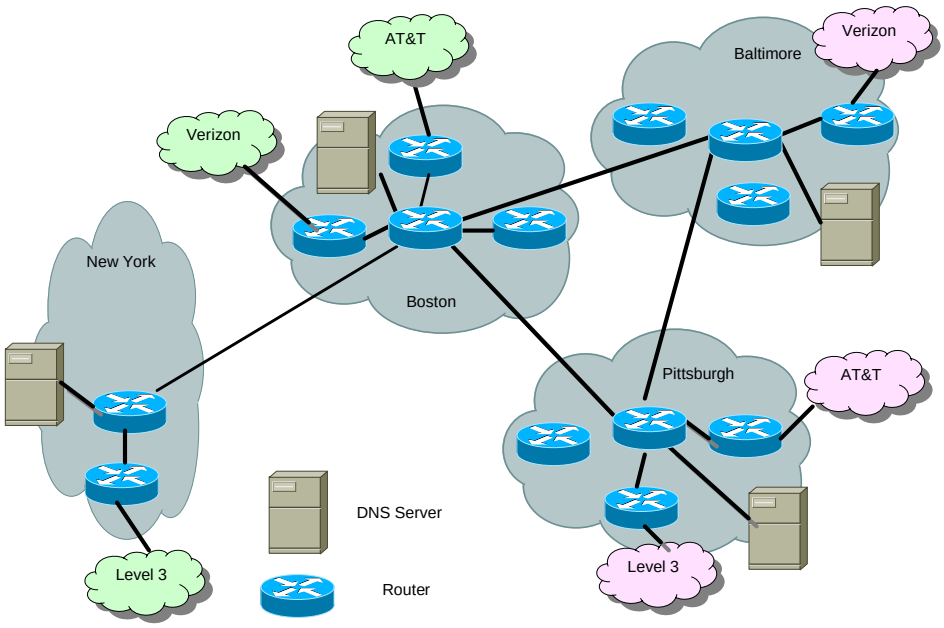
$$T_{Traffic} = \frac{\int_{Day1}^{Day30} T(t)dt}{30\text{days}\times 24\text{hours}\times 60\text{min}}$$

As long as this is less than 1 Mbps average then they pay $25. If I decide to look at an HDTV movie on streaming video at 20 Mbps for 3 hours a day every day of the month then my usage is 1/8 of 20 Mbps, or almost 3 Mbps! That means that I am using three times the maximum capacity. That also is not what Cablevision is selling. What they are selling for a $29.00/month rate is, at best, my access to the 1 Mbps circuit share with ten other users, or 100 Kbps on average. Namely for me:

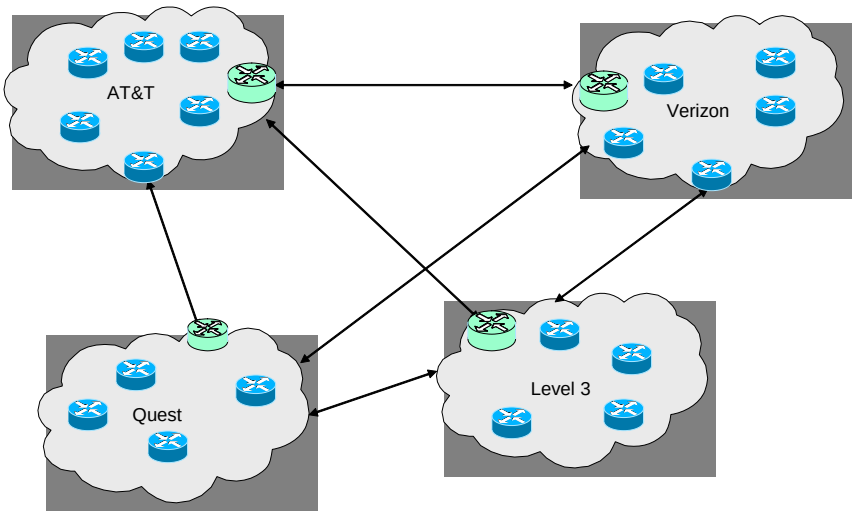
$$T_{Traffic,Me} = \frac{\int_{Day1}^{Day30} T(t)dt}{30\text{days}\times 24\text{hours}\times 60\text{min}} \le 100Kbps$$

This is what I have really purchased. This if I were to watch an HDTV 20 Mbps video, I could see the video only for 216 seconds and then I ran out of capacity! If I wanted to see more I would have to pay more to Cablevision; otherwise they would be losing money on me.
One of the questions regarding Internet access is do I have the "right" to get as much as I want from my provider or does my provider have the right to charge based upon usage. Clearly, usage-based charging is the only way to work, because there are usage-based costs which must be covered. Thus, if I want to get

something from the Internet where the Tier 1 Carrier charges, then I must pay that cost plus for the cost for that access. What the “plus” is, is open to negotiations but no company can be in a business where it loses money.



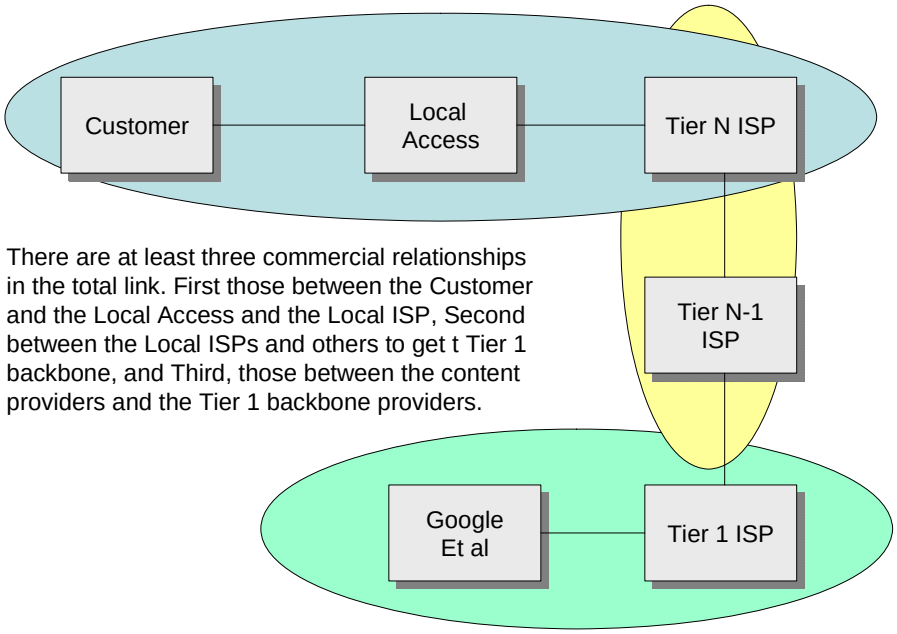
A more general structure of the Tier 1 players is shown below. We show here two key ideas. First, we see that each Tier 1 ISP interconnects to each other at some one or many points. The interconnections are performed generally through use of the BGP. The second idea is to observe that within each Tier 1 ISP’s network, there are routers and routing tables which they control with which they manage their network but as a result of which quality of service is dictated. Within the network of any Tier 1 ISP there may be many specific control elements, limitations of bandwidth, blockages, data and traffic overflows, so that in going from one point to another and with some Tier 1 ISP in the middle, one may suffer significant delay.



Within each AS there are many multiple router hops and a routing strategy which may be totally unknown to the outside. The BGP in the edge routers control between AS, Flow within the AS are optimized for each separate Tier 1 carrier.

Is there a way around the delay? The answer is generally yes. One can move the sources of content closer and go around the Tier 1 carrier that is blocked. This is the Akamai approach of placing remote servers and content caches in remote locations so as to manage service quality. This is a backbone solution not a local solution. It can be extended locally but there are architecture issues which are critical.

Putting all of these elements together we obtain a Figure shown below.

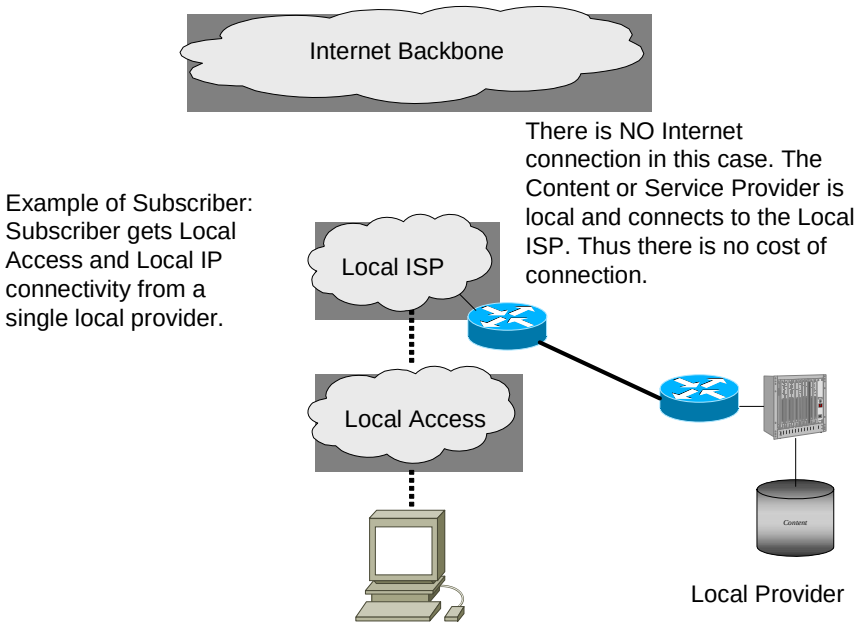


There are at least three commercial relationships in the total link. First those between the Customer and the Local Access and the Local ISP, Second between the Local ISPs and others to get t Tier 1 backbone, and Third, those between the content providers and the Tier 1 backbone providers.

What we see in the above figure is a depiction of the players from a supplier to a user and the interaction of all the players in between. Google, if it were a Tier 1 ISP as alleged to the authors, then would be its own Tier 1 interface and its connection to all other Tier 1 players would be a matter of contract. If that were the case all the issue of Network Neutrality, whatever that is, would be moot, since the issue is not telecommunications law but contract law.

3.4 Local On Net Connectivity

This discussion of the backbone, its capacity, its performance, and is control begs another question: what if there is no Internet cost and that all the backbone players were irrelevant. Let us consider the following example as shown in the figure below. Here we have a local content provider connected to the local ISP. There is no Internet backbone connection. What becomes of the economics of the local ISP and access provider in this case? The costs to this provider are the costs of his transport. Let us look at two cases: FTTH, fiber to the home and cable television. They are fundamentally different. We shall call Case 1 the FTTH case and Case 2 the CATV case.



3.4.1 Case 1 (FTTH):

In this case, the local operator, say Verizon, has built and deployed a FTTH system. It consists of a single strand of fiber to a residence. The capacity of the fiber is at least 10 Gbps. The telco charges say $40 per month for Internet access. Recall that this rate is based on a competitive rate assuming that there is a backbone Tier 1 interconnect, albeit Verizon is interconnecting with itself. Let us assume they still have some imputed rate.[30] However if I desire to have access to a local content provider with no interconnection costs, then if I use 100 Kbps continuously or even 10 Gbps continuously there is not marginal increase in cost. Thus, putatively I need not be charged for that element. If for example Warner Studios wants to put a

[30] This may be a critical issue however. If Verizon connects as Tier 1 to itself then the logic we went through before does not imply. They have a de minimis cost of interconnection as a Tier 1 provider. The same does not apply to the CATV companies, none of which are Tier 1 providers.

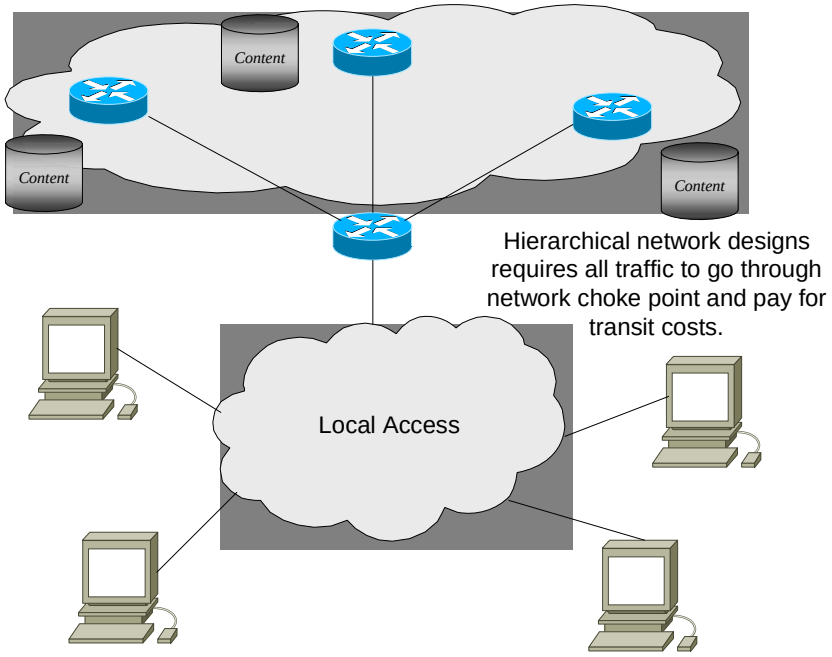
server in my town and I can then get access to al the Warner products at 20 Mbps per TV set and I have 10 TV sets this is 200 Mbps and is still a fraction of my capacity even if I watch it continuously!

3.4.2 Case 2 (CATV):

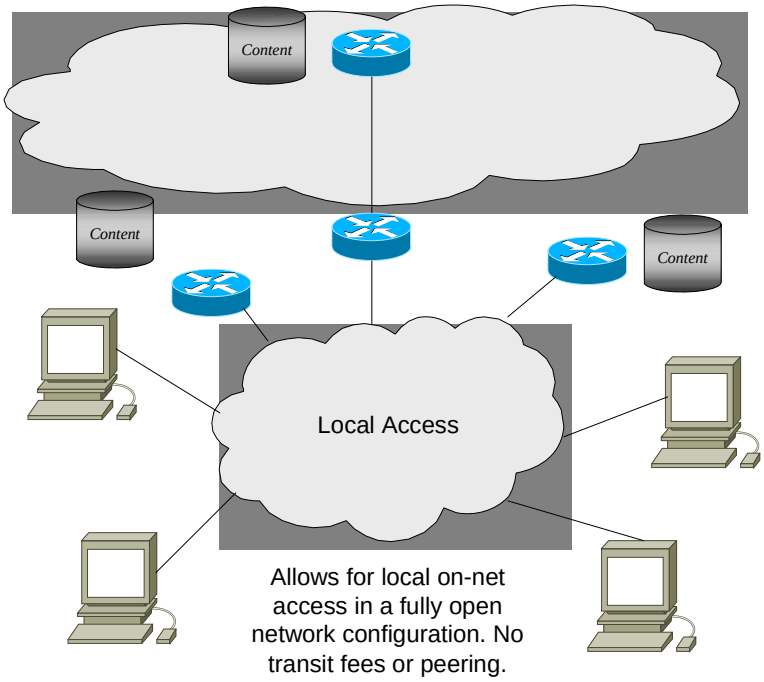
The CATV network architecture is comparable to the Telco in that it is a hierarchical network structure. Namely there is a headend and then the network is deployed in what is tiered a tree and branch design. This means that if any user or user set desires to communicate with any other user or user set then this can only be accomplished via an interconnection through the backbone Internet. In asking to place a call across the street, the call may have to go through Bangkok as a hub. Not a wise choice. Furthermore, the CATV carrier has very limited bandwidth to the home if they are employing a coax system for the last distribution capability.

3.5 Local Networking Extensions

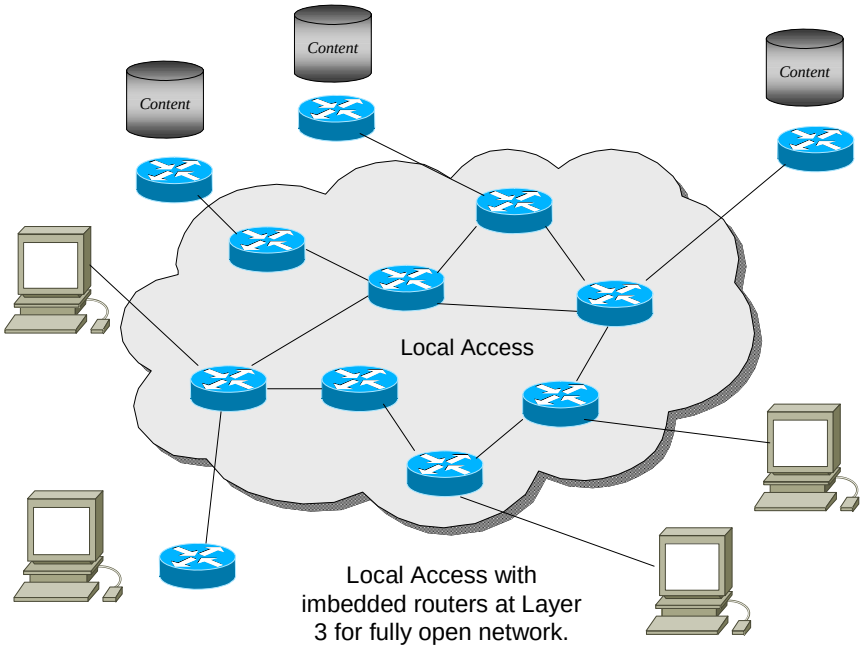
A typical local network of an RBOC or CATV carrier is shown below. All content is accessed on the backend of the headend or other central facility. Providers of local content must make separate arrangements on that side to connect and such arrangements impair the local entrant by adding costs and other overhead expenses such as co-location and operations support.



In contrast, the local operators in an open network should be able to interconnect locally and be able to interconnect via the local network. Thus, there is no travelling over the Internet backbone and the transit costs are reduced to zero. The problem for an RBOC or CATV operator in this design is that it opens their network up for significant disintermediation. Thus, almost universally such a network design would be discouraged if not outright prevented. However with the advent of certain municipal and WiFi mesh networks, this design may be in the development and deployment stages. Such a network creates a local Internet where now the small local, or even regional, network takes on the flavor of an "AS" as one sees in the Tier 1 carrier networks; namely sub net routing in the network.

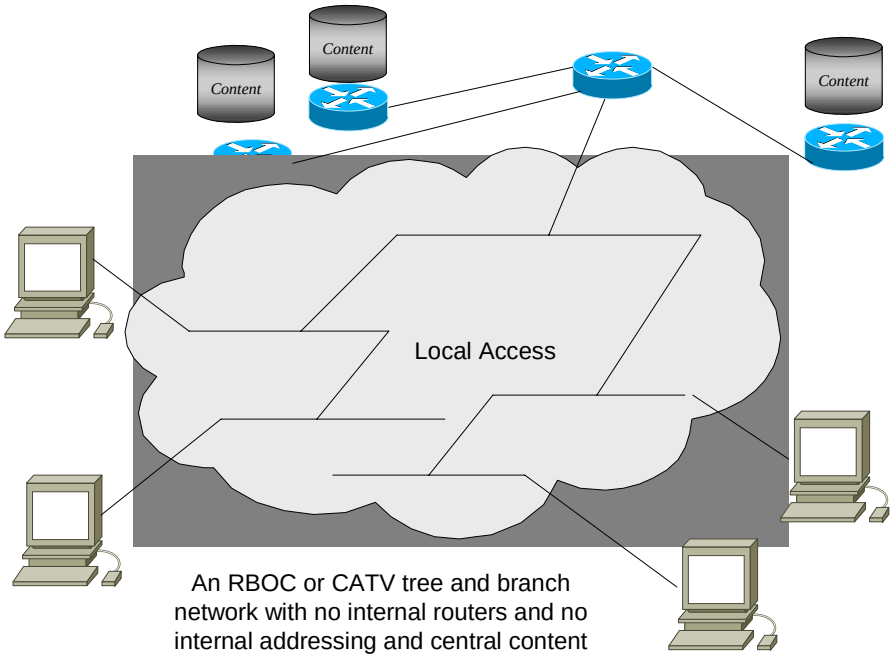


To show the details of the sub-netting permissible the following figure depicts that architecture. It shows the local network with routers. Those routers may each be part of an 802.11 or 802.16 mesh access point which performs a Layer 3 or IP level function. The router capability so deployed allows for improved network access, better load balancing, improved security and potentially improved quality of service.



To contract the above with the incumbent RBOC and CATV players, the following figure shows the typical tree and branching architecture. This is classic CATV co-ax layout but also is inherent in most of the RBOC

fiber designs. This approach again forces all the IP functionality back to a headend and the network is at best a layer 2, MAC layer approach.

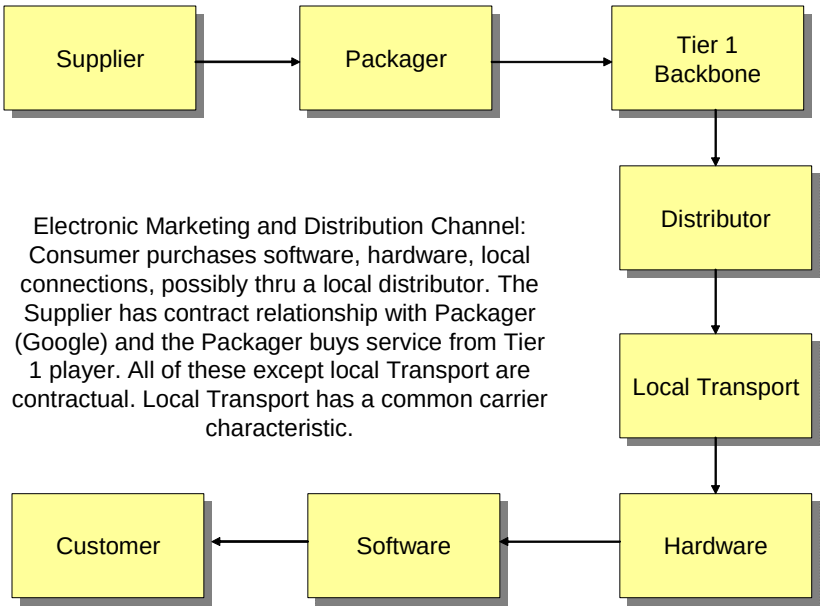


An RBOC or CATV tree and branch network with no internal routers and no internal addressing and central content control.

3.6 Market Forces

The next question we look at is the issue of who are the players in Internet transactions, what are their relationships, and what is the economic environment they find themselves in? One of the issues we keep seeing in Internet Neutrality arguments is a focus on one player and total disregard of the total food chain. The one player tries to make their role out as special and then uses that perceived special role as the basis for special treatment.

Consider the link of players shown below. This is the collection we see when looking at what we call the electronic marketing and distribution channel called the Internet.



The players in the above chart are described below:

Player	*Function*	*Relationships*
Supplier	The supplier is the basic provider of a product or service. It may be a movie studio or a game company, a seller of clothing, a book dealer. The supplier may be Continental Airlines, McGraw Hill Books, Chase Bank. They are the fundamental suppliers of products and services.	The supplier has a contractual relationship with the Packager.
Packager	The packager is the entity which facilitates the supplier's access to the customer. In one sense, it is a wholesaler, and in another sense it is a retailer. The Packager facilities the access of any supplier, and may bundle suppliers together.	The Packager has a contractual relationship with the Tier 1 provider. This is generally a bulk data transport relationship. The more traffic, the lower the per unit costs. There are many Tier 1 players as we have shown and thus there is a competitive market of sorts here. The market has oligopolistic features but it is somewhat efficient in price.

Player	*Function*	*Relationships*
Tier 1 Transport	The Tier 1 transport is the facility or set of facilities we have been discussing. They take the packager's electronic storefront and allow it to be spread out over a large area.	The Tier 1 carriers generally have agreements with packagers on one end and local Transport on the other. The local transport agreements are transit agreements and again since there are many Tier 1 players, there is somewhat of an efficient market at work.
Distributor	The distributor is a role which may or may not be played. For example, the CATV company is a local distributor of video content. It puts a local package together, and it is the distributor with whom the customer relates to the facilitation of the services. In the physical world, this may actually best be seen as the shopping mall operator.	The distributor may have customer agreements, such as with a CATV company. The agreement may be for bundling. The distributor may add substantial value, as in the case of a CATV company which packages video channels, or it may not.
Local Transport	Local transport is like the Tier 1 carrier; it is indeed a common carrier. It carries requests back and forth and charges a fee based solely on total volume, speed, and quality of service. In many ways, it is the UPS or USPS for local contact. In fact, there may be Tier N carriers in this category as well.	This is the entity which gets the consumer from where they are to the Internet backbone and then to the world. It may also facilitate local networking. It is a network company with which the consumer enters into a contract to provide interconnection. The contract is implied under common law as a common carrier. Common carriage protects the carrier from significant liability which would apply if this were a bailment.
Hardware	In the case at hand this is a computer, mobile phone, PDA, or other end device.	There are multiple ways to get hardware. I can buy it from Dell, Apple, etc. or get it from Verizon wireless, or buy it from Amazon....or many other options, all of which are evolving over time.
Software	This is the software operating on the hardware.	Customer buys hardware and bundled software. The bundling may be done by the hardware provider or the local distributor, or any third party.
User	This is the customer, the one paying for all the stuff we just described!	

The key observations to be made here are as follows:

1. There are multiple players at all levels so there is some form of competition. Markets exists and they are changing all the time.

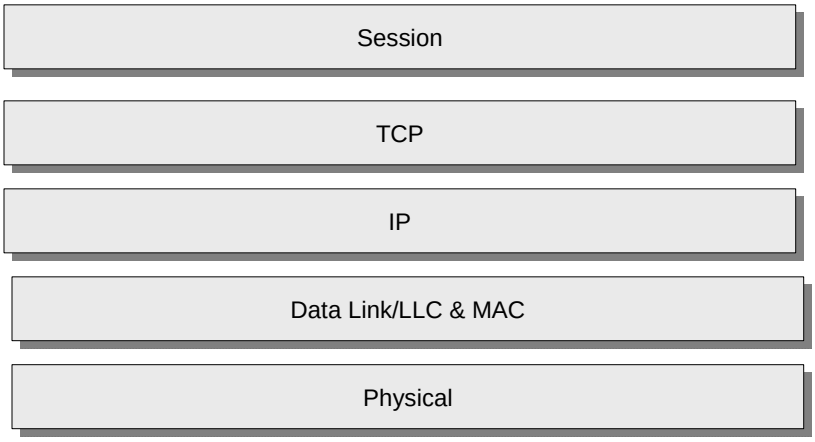
2. There are multiple players along the chain. All or most of them must be available for the process to work.

3. The goal is to get a transaction between supplier and customer (user).

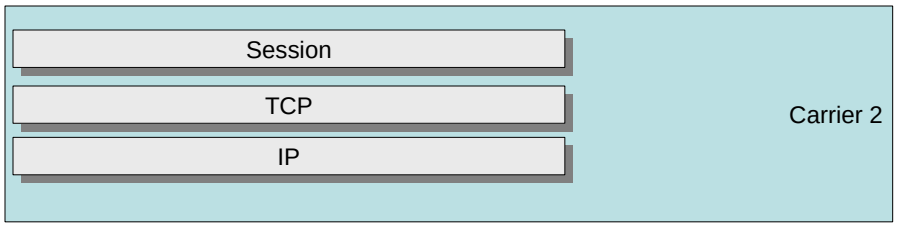
4. The transport players have common analogs in the world of physical marketing and sales; they are UPS, FedEx, USPS. They are carriers, and as we shall show, common carriers when viewed under common law principles.

Now one can look at a sub-variant of this process. Namely look at local transport. It can be viewed in several ways. One is that the local transport is just that, transport. But there is another local transport player who does the IP work. Consider the following figure showing the bottom layers of the protocols required. They are Physical through Session.

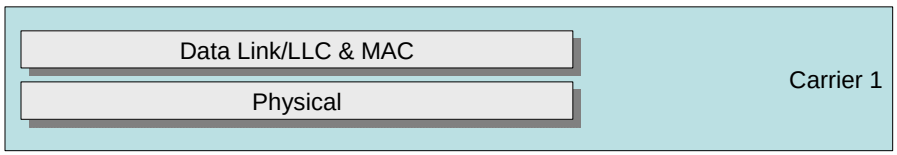
The bottom five layers in a TCP/IP based network are shown below. The Physical layer is the local transport which may be supported by the MAC layer as well. The TCP/IP layers are in between. All of these must be in place to function. Both TCP and Session are end to end.



Now, we could say that there are two players who provide parts of these layers. They are Carrier 1 and Carrier 2 as shown below. This was the old dial up ISP model. However, no one unbundles the layers as shown below anymore. One ,ay ask should the Government force such unbundling? The clear answer is no since it has demonstrated its gross incompetence in doing such with the FCC and the 1996 Act.



Here we assume that there may exist two separate carriers who provide portions of the service, namely an IP carrier, ISP, and a telco or cable transport entity



Now we can ask, does the analysis we performed above apply? Is there some reasons why the consumer buys from Carrier 1 and then Carrier 2. This is what happened in dial-up ISPs. This is the world view used by Yoo in his analysis of Internet Neutrality[31]. Yoo uses this schema to analyze the Internet neutrality problem by focusing on the potential externalities that Carrier 1 brings to Carrier 2. We argue herein, however, that the existence of this model, never truly explicated by Yoo, no longer exists. What exists is a local carrier which provides IP connectivity from the customer's computer to the Tier 1 backbone. The consumer gets to choose and select that carrier in an open market framework. Namely the consumer can choose telco DSL, telco FTTH, municipal networks, WiFi (municipal and private), WiMax, and even satellite. There is a market for local IP connectivity.

3.7 General Observations

Based upon the above review and analysis of the Internet and its relationships, we can reach a set of key observations which will be important going forward:

1. Existence of an Internet Backbone Market: The Tier 1 carriers are multiple and they have a limited form of competition. It is somewhat of an oligopoly market, but with limited competition. A customer may seek access and interconnection is a reasonably well established equitable market. There does not appear to be excess profits as one would find a pure monopoly.

2. Lack of Openness in Incumbent Local Networks: The cable operators and the incumbent monopolists have network architecture for local access which are all inherently closed and hierarchical. They are not open networks and deliberately prohibit open on net access and interconnectivity. This establishes a barrier to entry for what they may perceive as competitors seeking to disintermediate their services.

[31] See Yoo, Mandating Broadband Neutrality, 2004, p. 38. Yoo approaches this without clearly understanding the technical details and like many attorneys and economists, looks backward rather than looking forward. In fact, DSL and Cable modems provide a bundled set of layers so there is no Carrier 1 or Carrier 2. In fact, the technology has changed so that the economics of having the multiple set of players which cause this problem to arise is no longer viable. Thus one is solving a non-existent problem.

3. Openness is obtainable in Certain Wireless Networks: In the municipal and private non-incumbent wireless architecture, there is inherent openness in the networks. This may allow for significant change in market positioning and entry.

4. Existence of Multiple Players and Competition in All Elements of the Channel is Clear: The distribution channel composed of all market elements and players shows considerable existence of multiple alternatives. There are many Tier 1 players, there is an evolving market for local access players, wire and wireless, and there, of course, are many content providers. The consumer has the potential for choice. The consumer has potential choice in many local carriers; cable, DSL, fiber, wireless, municipal, and others. There is a free market. The concern, however, is such choice is not pervasive, it may at best exists in 30-50% of the markets. How does it get to all markets? The very markets themselves will perform that act.[32]

[32] This does raise the question of what if we had a 10 Gbps backplane, backbone network, what would that gain us. This means that we could have totally different computer architectures; memory would be at other locations, as would be much of our software. Could we achieve this with an integrated fiber and wireless, perhaps, we have argued this elsewhere. The content would also be dramatically different as well. The question of what would the computer look like if one had ubiquitous 10 Gbps fully interconnected and open backplanes all over, begs an interesting architectural question for the computer scientist. Things would change, and change dramatically.

4 CABLE VERSUS TELCO VERSUS WIRELESS

In this section we provide a general overview of the difference in cable, FTTH, and wireless last mile. We have assumed that DSL will be slowly eliminated as these other options arise.

4.1 Services Offered

There are a wide variety of services that can be deployed. The first focus is Internet access. However, video such as cable TV, telephony, emergency signaling, meter reading, medical monitoring, library access, enhanced school, services are just a few extra. The local broadband system may provide, at a minimum, the following general services:

***Voice*:** The system may provide toll grade quality voice service. The voice quality must be telephone toll grade or better and there may be no delays in speech that are perceptible to the user. The telephony service may be IP based voice or any other "toll grade" acceptable voice technology.

Very Low Speed Data: This service is 100 bps to 50 Kbps types of service and may be used for such applications as meter reading and other types of services which require low speed, polling, or other similar techniques. This may include such services as meter reading and the like.

***Low Speed Data*:** The system may be able to provide data at the rates of 1.5 Mbps to 10 Mbps on a transparent basis and have this data stream integrated into the overall network fabric.

***Medium Speed Data*:** The network may be able to handle medium speed data ranging from 10 Mbps to 100 Mbps.

High Speed Data: Data rates at and in excess of 100 Mbps and frequently in excess of 1 Gbps may also be provided on an as needed basis and a dedicated basis. The data rates may be between 1 Gbps and a maximum of 10 Gbps. Included in this class would be any and all municipal support service provided on a intra-net network.

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. This would also support High Definition TV (HDTV). The video service should be capable of supporting both analog and digital video distribution. The video services would be analog and digital video, video on demand, HDTV and other video premium services.

Wireless: The services considered here are the application of an integrated WiFi type network using a strand or more of the trunk and feeder fibers. This would be a fully integrated service platform providing 802.11, 802.16, or like type services.

Cellular Support: This is a service which allows cellular carriers to have capacity and coverage expansion using the fiber trunks and feeder networks. It would deploy a distributed cell site technology and again would be fully integrated from an operational perspective.

Other Wireless: This service would entail any other wireless access capability for the access to and from the end users.

Dark Fiber Services: These services would be a compilation of any and all potential uses of the dark fiber for commercial applications.

A Municipal Broadband Network (MBN) is best characterized as Fiber to the Home (FTTH) providing 100 Mbps capacity or higher to the home or local business, open to all service providers, but financed and controlled by the municipality. This type of network is uniquely different from the current DSL or cable modem networks, which use older technologies. DSL utilizes copper wires, or "twisted pair". The technology

of copper wires dates to before the founding of the Bell System by Alexander Graham Bell in 1875, actually originating with the telegraph. The physical attributes of the copper medium severely limit both speed as well as range of broadband capabilities.

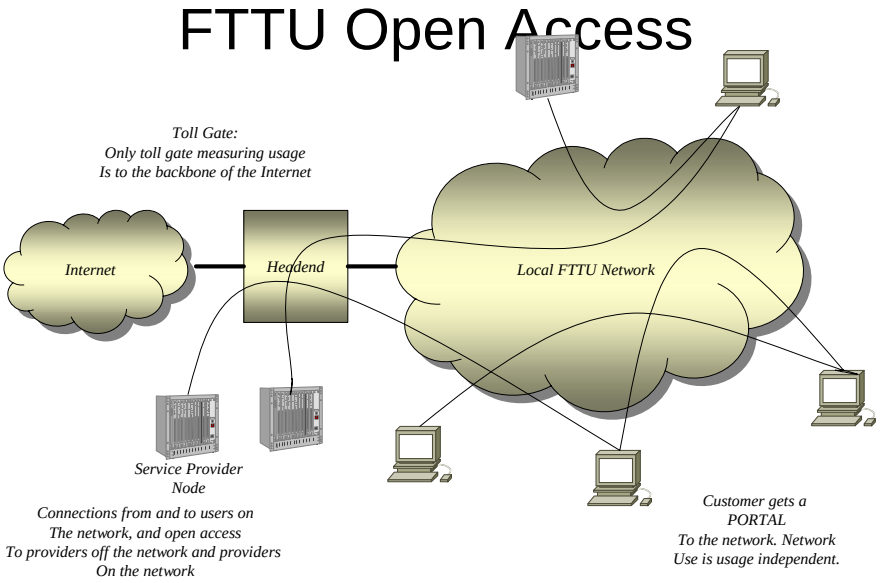
The overall network can be perceived in three steps; local network with generic boundaries, local network as an open infrastructure, interconnected open networks.

4.2 Local Network Interconnection

The MBN can be depicted as below. One end of the MBN, the head end, has an open interface suitable for interconnection to a variety of service providers. The interface is open to any and all, and is not proprietary in any fashion. The other end of the MBN has an interconnection to the home. The interconnection may also be to educational institutions, fire, police, libraries, municipal facilities, and to commercial entities as they may request. The network in-between the two interconnecting points is an optical fiber network with drops of fiber to each subscriber. The fiber drops are provided on an as-requested basis. The network does not have to be deployed fully day one. It can be built out as demand warrants.

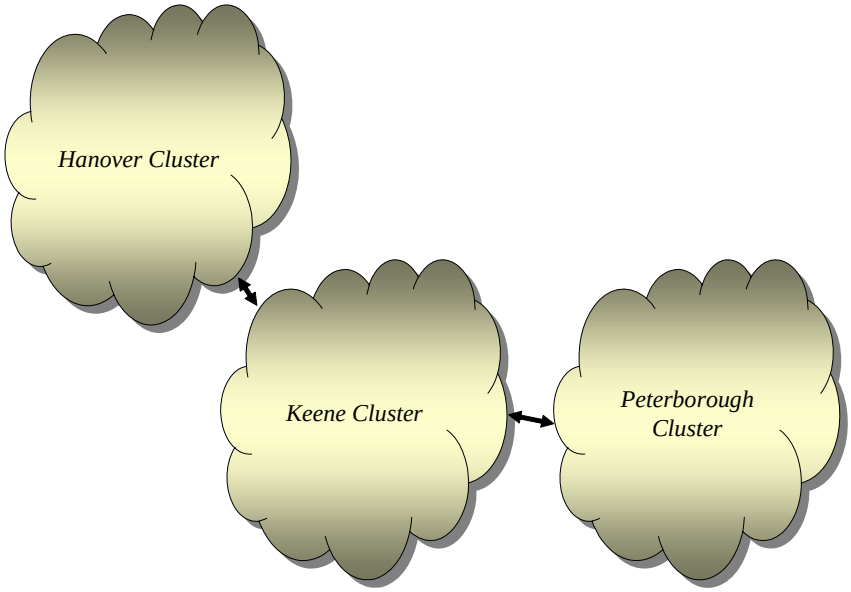
4.2.1 Local Open Networks

The following depicts the local openness of the network. Each user of the network can connect to any and all other local users via the IP capabilities of the network. Each connection to the network has an IP or IP addressable port. The connection is via ports, elements which can enable communications and interconnectivity between any user. The network is flat and open not hierarchical and closed. This is a key fundamental difference in network architecture design and implementation.



4.2.2 Interconnected Open Networks

The following depicts the interconnection of three regional MBNs. This interconnection is readily achievable via the use of the IP standard interface. Clearly some form of DNS, Domain Name Servers must also be employed and naming and address management will be an issue however the ability to interconnect at layer 3 is critical.



4.2.3 Network Elements

The network infrastructure that allows more bandwidth, quick provisioning of services, and guaranteed quality of service (QoS) in a cost-effective and efficient manner is now required. Today's telephone access network, the portion of a public switched network that connects CO equipment to individual subscribers, is characterized by predominantly twisted-pair copper wiring.

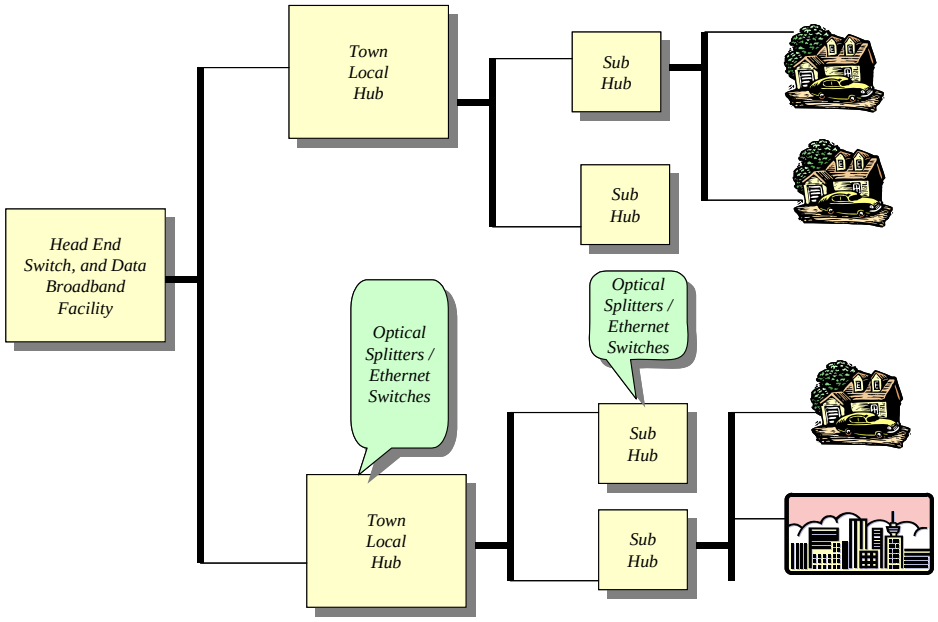
The following Figure depicts the generic approach to the deployment of broadband electronics in a FTTH or a CATV system. It is composed of four elements:

1. Head End: This may or may not be in a town and can serve one or several towns. There is significant scalability in head ends and these are point of presence or interconnection for service providers or the backhaul systems which connects to service providers.

2. Hubs: These are town located and generally central facilities which represent the specific town's point of presence. It may be at some convenient town location such as a police facility, fire department location, town hall or the like. It is the point at which the backbone fiber network connects to the system

3. Sub-Hub: These are the units in the field which allow for branching. There may be one or several levels of sub hubs. The sub hub provides a 1:N branching or splitting of the signal, and this may be done at several points allowing for a $1:N^m$ multiplication of backbone fiber to customer connection. This splitting is a key factor in the reduction of bandwidth available to the end user. In CATV there may be multiple 750 MHz fiber bundles which go to a sub-hub and then from there only one 750 MHz channel goes by each home. In contrast the fiber goes to each home but there may be some sharing at a hub, for example on a 1o Gbps backbone then going 100 Mbps to each home.

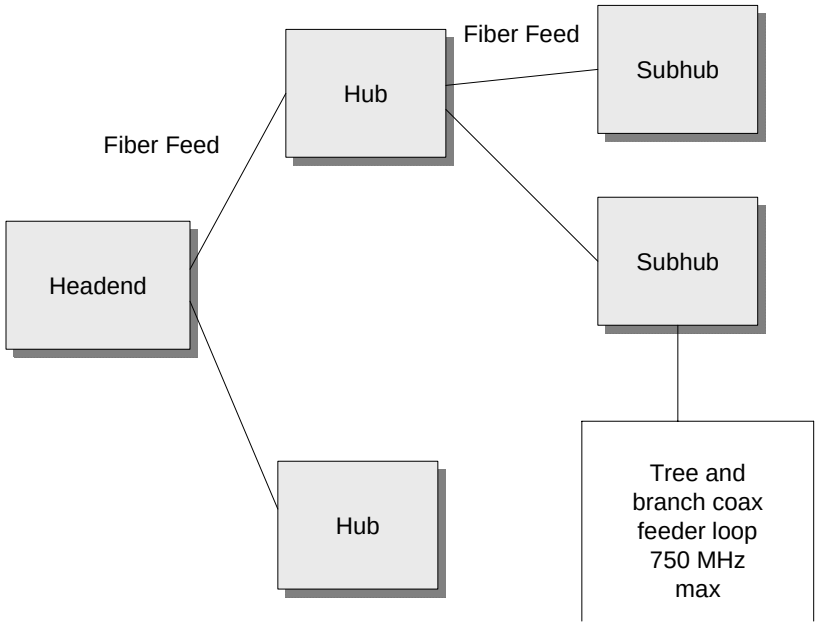
4. Home Unit: This is the device in the home. It provides for a broadband internet connection of 10-100 Mbps, a telephony connection and a CATV or digital video connection, using all existing home wiring.



The above architecture is common in most systems.

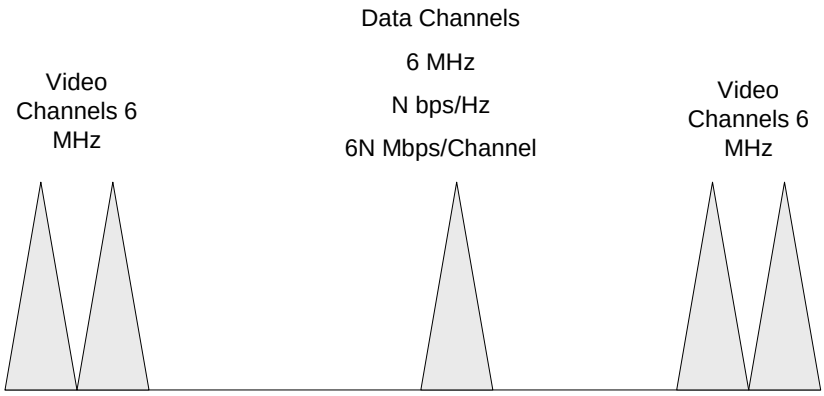
4.3 CATV

The CATV design is shown below. The first Figure depicts the typical general architecture we have just described above. The Headend, hub, subhub and feeder design. Most cable systems use fiber frequently upon to the subhubs. Then from there to the homes they use co-axial cable. The coax has a maximum bandwidth of 750 MHz.



Now passing each home is the same 750 MHz bandwidth coax. As shown below the CATV company uses the coax by segmenting it into 6 MHz sections for analog video distribution. Digital cable is slightly different. However they also use a channel or two for data. The channel has a limited bandwidth. That bandwidth, say 6 MHz, can support N bits per second per MHz. Say we use an very efficient modulation technique with 6 bits per second per MHz. The we have a 24 Mbps channel which is shared amongst many homes. Say there are 200 homes on this system and each home has a wireless router with 3 computers. This is 600 computers sharing 24 Mbps. There will be the issue of peak congestion.

CATV Bandwidth Channelization. The CATV system passes a single coax cable by each home and the group of home on the same coax share the same bandwidth and in turn the same maximum data rate.



Now in the CATV world, there is limited data rate due to the limited bandwidth. This means that CATV has limited capacity inherent in this design. We shall see that this is not the case of fiber. In fact no matter what fiber does it has near unlimited capacity. CATV could remedy this by expanding from the subhubs to the home with fiber. That is nothing more than an incremental economic decision. When we complete the analysis of the fiber design we shall see what that incremental cost could be.

4.4 FTTH

The FTTH, fiber to the home, designs are currently still in flux. We have chosen for analysis one which we have worked with in actual implementation and one which we believe will be sustained.

4.4.1 Architecture

The basic architecture for local PON or Gigabit Ethernet is shown below. The elements are:

1. Central Unit or Hubs: This is at a headend or some similar central location and provides for central management and interface.

2. Field Units or Sub Hubs: These units are the n:1 splitting devices, active or passive, which take a backbone signal and share it amongst several home units. In GigE the backbone rate is 1 Gbps down and up using two fibers, in ATM PON it is a single fiber using several wavelengths, one up and one down, using SONET and ATM formats. SONET is a layer 1 protocol.

3. Home Units: These are the devices in the home made to support data, voice, and video.

In general, the optical section of a local access network can either be a point-to-point, ring, or passive point-to-multipoint architecture.

As these components are ordered in volume for potentially millions of fiber-based access lines, the costs of deploying technologies such as FTTH, FTTH/C, and FTTH/Cab become economically viable.
One optical-fiber strand appears to have virtually limitless capacity. Transmission speeds in the terabit-per-second range have been demonstrated. The speeds are limited by the endpoint electronics, not by the fiber itself.

Telecommunications equipment vendors offer service providers a number of broadband access technology platform choices, but an access technology solution must be capable of providing:

1. Multiple voice, data and video services
2. Reliability consistent with expectations of customers
3. Low cost and price-competitive operations
4. Network scalability to meet expanding demands for bandwidth
5. New, differentiable services that enable high margin revenue sources

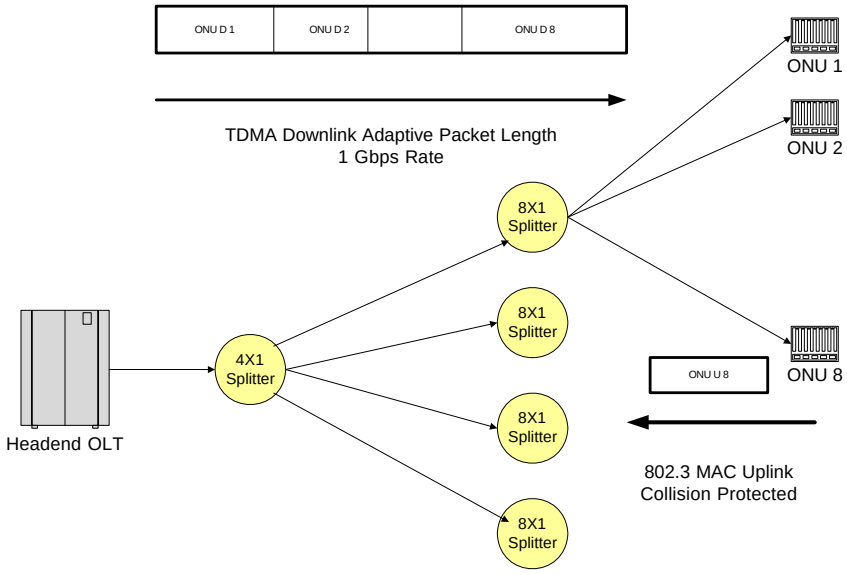
The proliferation of fiber combined with advances in optical technology positions GigE technologies as an ideal broadband access platform. This is particularly true for serving small to medium business customers. GigE offers ILEC/PTT service providers a cost effective and virtually unlimited bandwidth access platform capable of supporting legacy voice and data services.

In addition, because GigE supports multiple Ethernet/IP, ATM, and/or TDM services, GigE delivery platforms can uniquely support the introduction of new, bandwidth intensive enhanced services without costly upgrades.

The other issues are about whether the fiber cables should be pole-mounted or buried (trenched). Pole-mounted is generally less costly, but is potentially subject to delays in obtaining access depending on current configuration of existing telecom, cable TV and power system cables on the poles. However, in most cases, this “make-ready” process of reconfiguring existing cables on poles may not be an issue. Buried fiber may be more expensive but could be less of a delay depending on pole “make-ready” requirements, and has somewhat less life cycle maintenance.

The above electronics shows the element breakout. From the Hub Remotes the end derive is the in home element. These are individually installed and require interconnection in the home.

We depict an E PON design below. We use Ethernet protocol as the down link and up link. Down link is TDMA with each user having as much capacity as it may demand at any one time, and on the up link from the ONU each user can demand as much but must contend with Ethernet like collisions. IP sits atop of this layer 2 protocol.



We can now apply these models to a E PON example. The following is an expanded version of the basic architecture applied to the E PON solution. We have detailed the fixed and variable elements.

The fiber costs are based upon a per foot cost element for comparable market deployments. The following table summarizes the key input assumptions to those cost elements, which are used in the model. The details of the model have been show previously.

4.4.2 FTTH CAPEX

The cost elements for an E PON are summarized in the following charts. These are representative costs for the total network elements. Also shown are the capacities, maximum and minimum and the fixed and variable costs factors.

Cost Element	Description	Cost Metric	Cost / User 10 Subs/Mile	Cost / User 40 Subs/Mile	Cost Changes
Equipment:					
CPE	Customer Premise Equipment	$500 per CPE	$500	$407	5% decrease per year
Passive Field Elements	Passive optical splitters (1x4, 1x8), cabinets to house splitters in field; includes installation	Various	$79	$66	Scale + 5% decrease/yr
Headend: Internet	Optical Line Terminals, Switch Card Modules, chassis, racks, EMS, power, installation.	Various	$160	$151	Scale + 5% decrease/yr
Headend: Video	Video Headend Elements, fully loaded; includes install costs	Apprx. $1M per Headend	$109	$11	Scale
NOC	Equipment for Network Operations Center	Various	$22	$8	Scale
Misc. Equipment	Interfaces, backup power, etc.	Various	$22	$6	Scale
Digital Set Top Box	Digital set top box required for premium programming, VoD	$200 Per Box	$230	$201	5% decrease per year
Outside Plant:					
Fiber Plant Engineering and Construction/Labor	Design, engineering and installation of fiber network, including cables & hardware	$2/ft aerial, $5/ft trenching	$1,393	$343	Scale
Make-Ready	Preparation of poles to accommodate new cables	$4.00/ft	$332	$82	Scale
Fiber Material	Fiber strands, cables, connectors and hardware	$0.75/ft for 64 strand cable	$449	$154	Scale
Home Drop	Fiber drop to home, material and labor	$150/user, $0.25/ft fiber	$181	$183	None
Total			**$3,476**	**$1,612**	

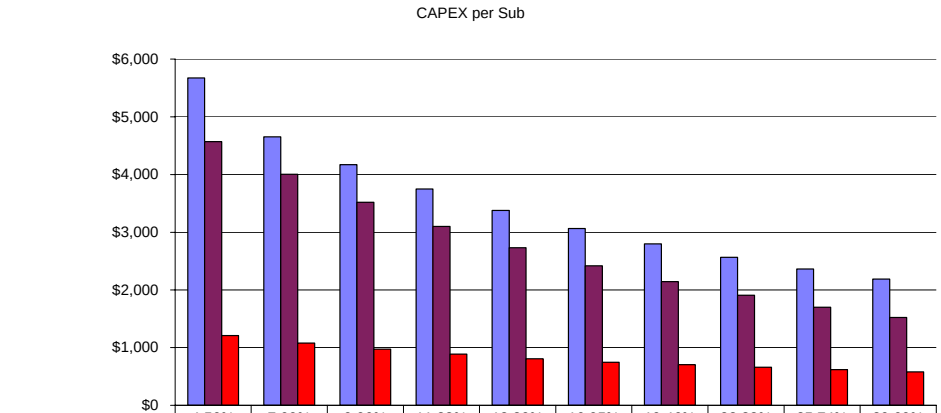
We have performed multiple detailed analyses on over 35 towns and cities and the following Figure shows the capex per sub as a percent penetration[33]. There are several key observations which must be made:

1. These costs do not include any franchise costs which increase the per sub number by up to $1,000 per sub.
2. The do not include head end costs.
3. They do not include multiple video converters, there is only one video converter per HH
4. They assume a mostly aerial design, 85% or greater and they assume only about 15% make ready costs. Any change in either of those variable could dramatically increase the capex.
5. Our net experience is that the capex per subscriber is generally between $2,000 and $4,500. This is a great number and when one adds the franchise costs, obtaining and complying with the franchise,

[33] See www.telmarc,com where we have placed detailed feasibility studies for 20 of the towns used in this analysis.

then one readily sees $5,000 capex equivalent per subscriber. This is dramatically greater than any costs ever to be incurred by cable!

6.



	4.50%	7.00%	9.06%	11.23%	13.29%	16.05%	19.46%	22.38%	25.74%	29.60%
Total CAPEX per Sub	$5,673	$4,653	$4,172	$3,750	$3,380	$3,065	$2,799	$2,565	$2,364	$2,188
Fiber CAPEX per Sub	$4,570	$4,006	$3,520	$3,099	$2,734	$2,417	$2,144	$1,907	$1,700	$1,521
Elec CAPEX per Sub	$1,209	$1,079	$975	$889	$809	$748	$705	$663	$621	$580

4.5 Wireless

Wireless has become an emerging and potent competitor in broadband.[34] Wireless broadband has at least three major and dietetic varieties:

1. WiFi : The WiFi world is an unlicensed world. It is also a consumer product world. These two elements are very powerful factors. Anyone can be creative and the prices are commodity prices. One can obtain a WiFi router at any retail store for less than $30. Consumers can install them and many of them are software upgradeable. The price curve is already down dramatically in this technology. It is shorter range but not really that short. The FCC Part 15 regulations limit power transmitted but this limit is not that low. The problem can be one of interference but ultimately signal processing can help here as well. This platform is evolving into mesh architectures with 802.11 s.

2. WiMax: Wi Max is a licensed and much more expensive band. It has recently attracted attention with the McCaw-Intel-Motorola arrangement. However, we have experimented with this and the risks are that the technology is still quite costly and further it requires a license. Plus, and this is a big risk, it follows on the heels of cellular with no strategic sustainable advantage.

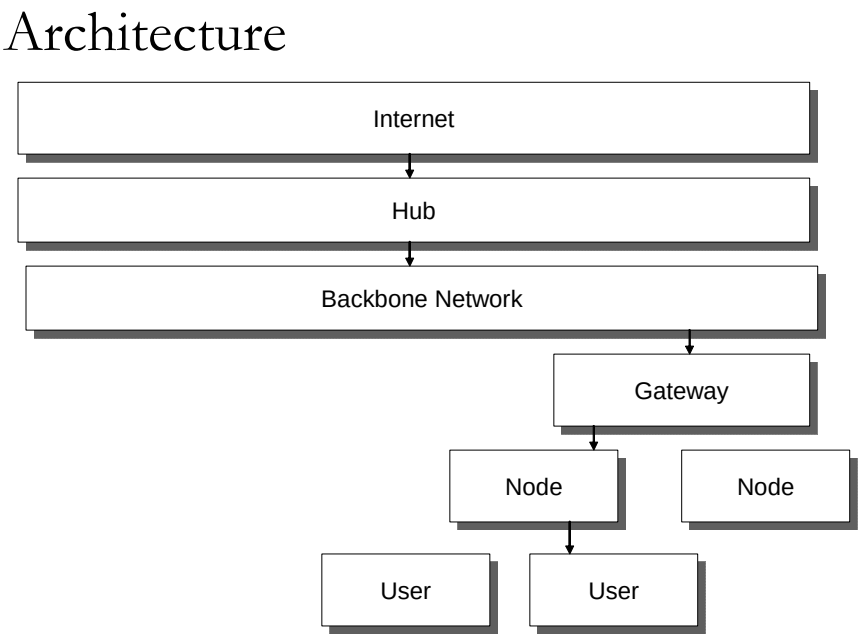
3. Cellular: The cellular carriers have for several years now provided data. They provide Internet access and the use of CDMA plus OFDM offer significant spectral capacity expanding features. However it is costly, technology evolves centrally from the carriers and the usage fees can be quite high. Also since most of the cellular carriers are owned by the incumbent RBOCs one can envision the same set of issues we see with the wireline carriers as regard the Internet.

In this section we look at an overview of the WiFi mesh technologies. We believe that they offer the most organic consumer opportunity for broadband at this time.

The overall architecture for a wireless service deployment is shown below. At the top level is the Internet backbone. This connects to a local hum. The Hub then uses a fiber backbone network as a high speed data

[34] See Lee et al 2006. This paper presents an excellent overview of all of the emerging broadband mesh standards.

plane to extend to a set of Gateways. The gateways cover regions whose traffic demands can be serviced by the fiber backbone and wireless network elements. The Gateway then connects to Nodes which act as repeaters in the wireless network. These Nodes are highly interactive repeaters establishing a meshed IP network using 802.11 or similar technology. In this plan we use initially 802.11b as the connection system at a peak of 11 Mbps per Node. However any newer 802.11 system such as 802.11n can be employed when readily available. The Nodes then connect to the users. Security is employed to make this a subscription only network which is also secured for end user use as well.



The network elements in the wireless side are composed of three parts as was discussed above. This section presents those pats in some further detail.

4.5.1 Backbone

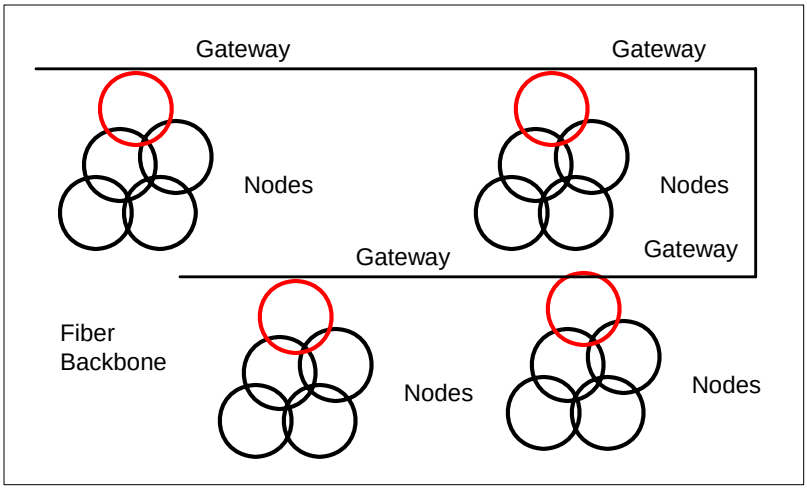
The backbone is that portion of the network which connects the Internet backbone to the gateways. We also call the collection of gateways and nodes a cluster. The backbone can be fiber or wireless.

There are two types of backhaul which can be used; fiber and all optical. We have performed tests and we believe that the all wireless is the best design. We consider both here.

4.5.2 Fiber Network

The fiber network connects the hub to the gateways. The fiber allows for a high speed backplane for communicating over the network. The typical format for such a design is shown below. The use of limited amounts of fiber allows for choosing the least cost routes and allows for expanding capacity and upgrading to a 802.11 n system when available. The overall topology is shown below.

Elements



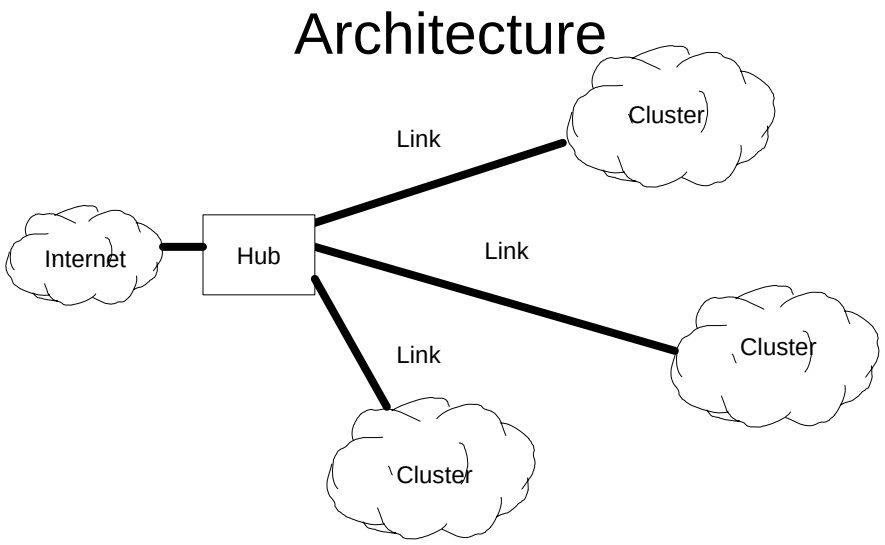
4.5.3 All Wireless Backhaul

A detailed field data analysis was performed. The team used a Belkin router connected to a PC as a source and it was roof mounted on one vehicle called the base station. A second 802.11 PCMCIA card was used in a second vehicle with a PC and a signal strength monitor. The second element was called the sample site. The data collected is detailed below.

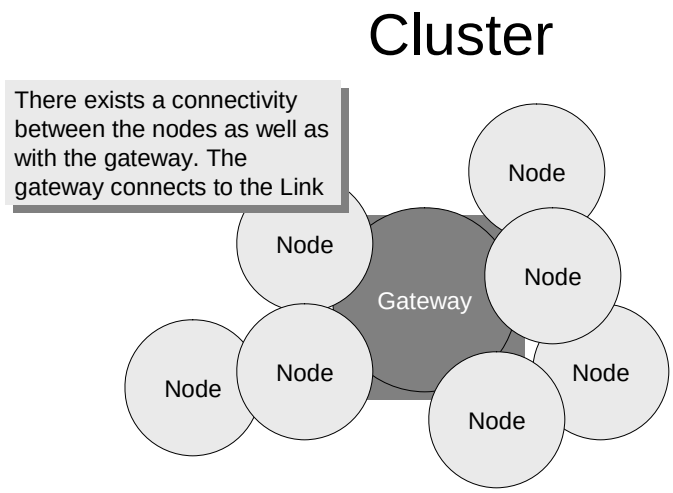
The field tests led to the following observations:

1. 30-54 Mbps can be achieved if >-65dbm
2. If follow FCC Part 15, max power is 125 mw and with 6 db antenna
3. However, can use directional antenna, for each 3 db antenna gain reduce power by 1 db
4. So use 30 db parabola reduce power 24 db. 6 mw.
5. Range now is easily 2500 ft, 0.5 mile

The overall architecture is shown below. It consists of links, clusters (gateways and nodes), and a hub connecting to the internet. We now use wireless for the links. From our experimentation we believe that this is doable.



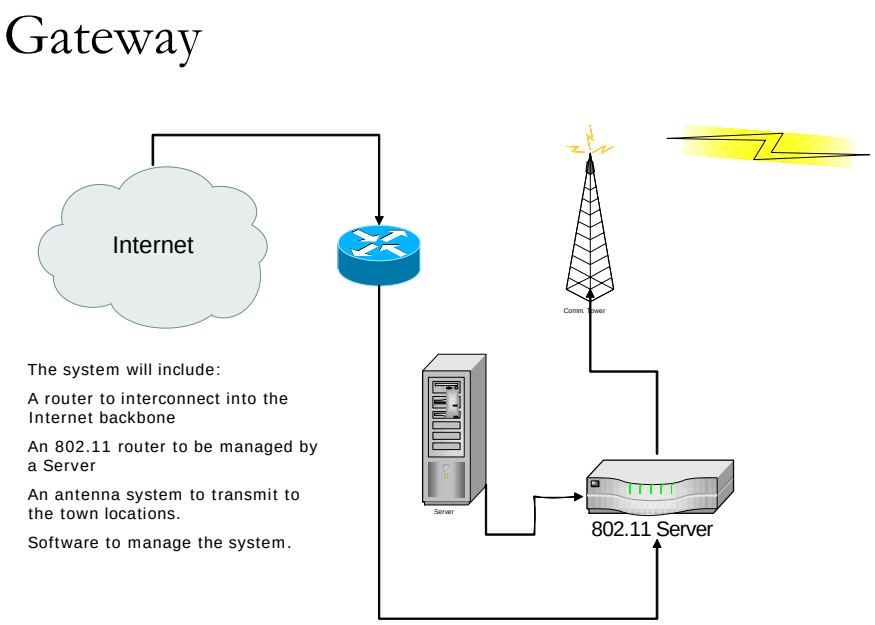
The cluster is shown below. We have performed detailed traffic loading analysis on these for streaming environments.



4.5.4 Gateway

The gateway is an element which interconnects to the Internet backbone via a fiber connection to a hub location. Each gateway is fed by a separate strand of fiber allowing 1 Gbps or more of data to flow to the gateway. The gateway then connects via a 802.11 router to a server which supports the Roofnet software and also to an antenna which is used to interconnect to the local mesh.

The Figure below depicts a typical mesh. The antenna may be modified to improve coverage and capacity. Using an 802.11b approach we can achieve up to 11 Mbps per beam of the transmit antenna. The initial configurations are composed of omni beams but using direction beams one can achieve higher gain and thus better capacity for grater coverage. This is permitted under Part 15 of th FCC regulations.

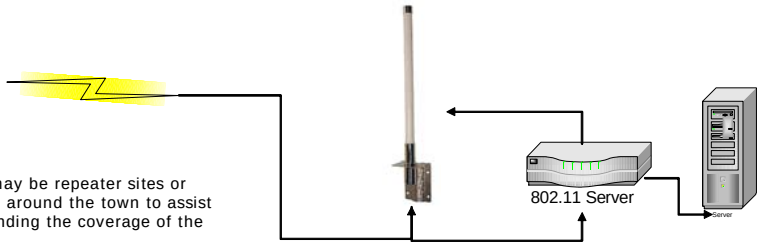


4.5.5 Node

The node is an element in a mesh which connects to the gateway and is most likely at a customer site. It is provided to the customer and the customer agrees to have a node participate in the network connectivity. Nodes connect to gateways and all users connect to nodes and then to the gateway. The odes may be one or multiple hop elements in a mesh.

The figure below depicts a typical node.

Node



There may be repeater sites or "Nodes" around the town to assist in expanding the coverage of the system.

We would anticipate using simple 8 dB gain dipole antennas at these sites.

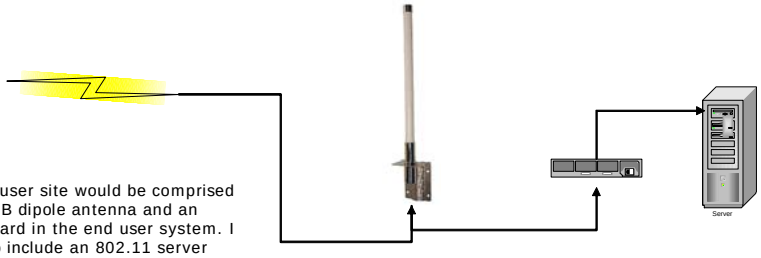
This creates a mesh network

The software would reside on servers at these sites.

4.5.6 User Site

The User site is simply an 802.11 card in a customers PC. The Figure below depicts a user site.

User Site

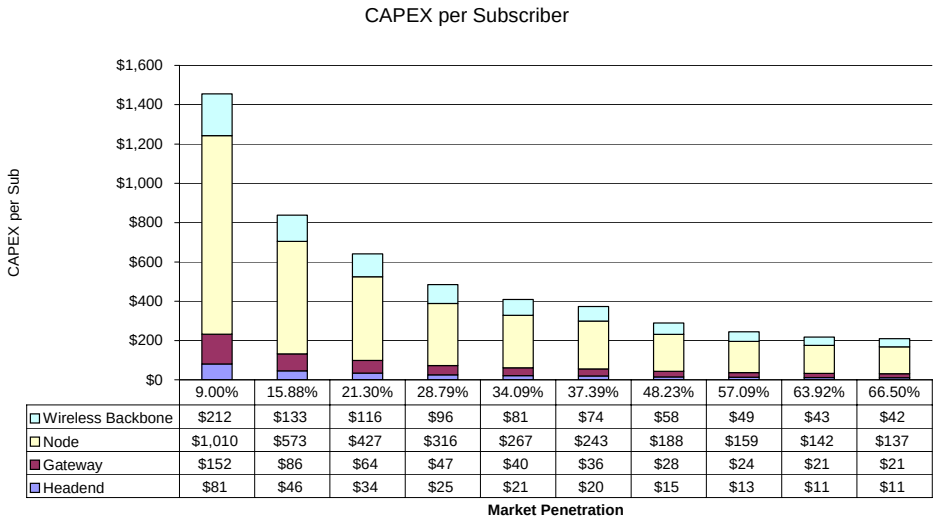


The end user site would be comprised of an 8 dB dipole antenna and an 802.11 card in the end user system. I may also include an 802.11 server which would be both a repeater for the end user site and interface to the server at the site.

802.11 Card

4.5.7 Wireless CAPEX

The capex per sub using an 802.11 type system is shown below. As with the FTTH design we have used the same towns in this analysis. It is clear that the capex is orders of magnitude lower.



	9.00%	15.88%	21.30%	28.79%	34.09%	37.39%	48.23%	57.09%	63.92%	66.50%
Wireless Backbone	$212	$133	$116	$96	$81	$74	$58	$49	$43	$42
Node	$1,010	$573	$427	$316	$267	$243	$188	$159	$142	$137
Gateway	$152	$86	$64	$47	$40	$36	$28	$24	$21	$21
Headend	$81	$46	$34	$25	$21	$20	$15	$13	$11	$11

4.6 Comparison of Options

We summarize the options in the following Table. This is a critical analysis of where the market could go. Let us describe the options first and then we summarize.

1. Cable: In this case we assume the Cable company either uses its existing network or expands to a final 1,000 for fiber plant effectively providing a FTTH solution.

2. FTTH: This scenario is what we discussed above. It is a green field FTTH design. One should note that an incumbent telco has a strategic advantage of no make ready costs. However, this is a small part of the total. It must be remembered that all telco networks as wit cable networks are closed designs.

3. FTTH Municipal: In this case we assume a municipal design such as those in UTOPIA and other systems. These are open networks.

4. WiFi: This is a commercial WiFi. The costs are low but there is always the issue of interference and of potentially limited coverage and capacity.

5. Wi Municipal: This is WiFi but one owned and operated by a municipality.

6. WiMax: This is the WiMax networks. They are yet to be deployed but our costs estimates are based upon vendor numbers.

Option	*CAPEX/Sub*[35]	*Maximum Data Rate*
Cable	$500-750	50 Mbps not change in coax and it is shared
FTTH	$2,000-5,000	100 Mbps in low end designs, 1 Gbps in standard E PON and 10 Gbps in upgrade E PON or active networks.
FTTH Municipal	$2,200-6,000	100 Mbps in low end designs, 1 Gbps in standard E PON and 10 Gbps in upgrade E PON or active networks.
WiFi	$75-500	Based upon operational experience an average rate of 5-10 Mbps can be achieved per cluster assuming a broadband 108 Mbps backbone. This assumes a true mesh WiFi like a roofnet design.
Wi Municipal	$500-2,400	Due to fundamental design differences the data rate are between 250 Kbps and 5 Mbps. The systems are in public spaces and thus do not have the penetration density of true mesh WiFi.
WiMax	$1,200-2,700 for equipment alone $2,200-5,000 with license allocation.	This is a dedicated and non shared spectrum approach. It requires a license which will add substantially to CAPEX.[36]

[35] Again, see the Telmarc web site. We have direct first hand deployment and operational knowledge in actually designing, deploying and operating the systems. Unlike most other analyses, which are done by academics or consultant with no business experience, the number contained herein reflect detailed experience and designs.

[36] The senior author has been tin the process of obtaining license in many international markets and the costs will be substantial.

5 ACCESS AND INTERCONNECTION

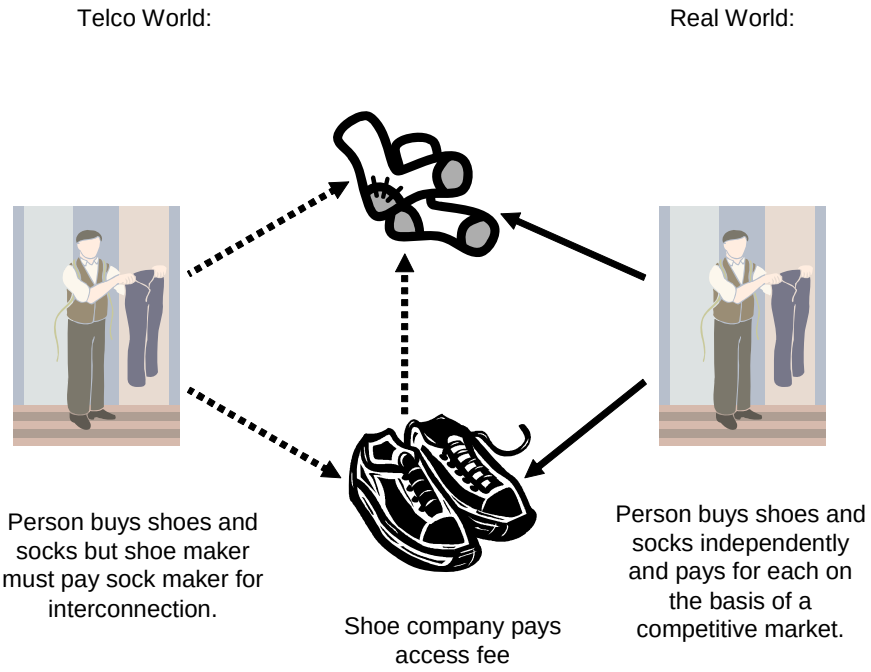
Interconnection of networks in an economic sense has been a concern of regulators, economists, entrepreneurs, and customers for many years. All too typically, the regulators rely upon the economists to create models to justify certain regulatory decisions. The entrepreneurs try and find ways around these artifacts that allow competitive markets to thrive. The customers really just want to buy a price-competitive quality service. The consumers are also even willing to put their total end-to-end service together by purchasing the elements separately.

At the time of the breakup of the Bell System in 1984, the press had many articles as to how difficult it was for the poor consumer to deal with the purchase of a physical telephone, the purchase from their local telephone monopoly, and the selection of one of two or three long distance carriers. Now, almost twenty years later, we change long distance carriers at the drop of a hat, we have more phones in our homes, cars, briefcases than electrical outlets in our houses, we have ten digit dialing just to keep up with all of the growth; we have Internet carriers, cable carriers, DSL lines, and a panoply of other disaggregated services and suppliers. The cries have been muted by the benefits provided. The only thing that has not changed has been the dominance of the local monopoly carrier.

Interconnection, oftentimes also termed access, is the process of connecting one network to another and transferring traffic of some form. It may be voice traffic, IP traffic, data traffic, video content, or whatever. A central issue is that each network owner wants to ensure that the other is not is getting a free ride. Thus, there is a great deal of effort developing access or interconnection pricing schemes. These have taken a life of their own in the economic literature, and, as we shall demonstrate, the life typically revolves around a view dictated by the incumbent. It almost always ignores the subscriber. Perhaps a reason for this is that this issue was originally faced in the 19th century with railroads, where the tracks were owned by many separate companies and rates to traverse such tracks were developed, and the mindset focused on the 19th century capitalist railway owners as consumers were not even invented then.

Interconnection can be stated in a very broad context. Consider any type of network providing services to end users. The networks may be local telephone networks, long distance networks, IP networks, CATV networks, or wireless networks. Let us assume that each provides a selection of services such as voice, video, data, IP transport. Let us assume that each supplies services directly or indirectly to end users, and that the end users can identify the provider and the service, either by a market presence or via some billing mechanism. Let us assume that there is a meet point, some artifact that allows one network to interconnect with any other and allows for the transparency of service provision from one end user to another. The question then is: what should one service provider, network operator, or ultimately any end user pay at the meet point to the other network for the services provided to effect completion of service provision? How does one pose the problem so that it benefits the consumer in the long run and in the short run?

Before we begin, let us consider a simple thought experiment. Consider a consumer in New York who chooses to call his friend in California. The New York consumer has chosen the lowest cost local telephone carrier to get him to the lowest cost long distance carrier. His choices up to this point have determined the "cost" of the call. However, his friend in California has no interest in cost savings, and he has selected the highest cost carrier. One of two things could happen: i) if incoming calls to California are charged to the caller, then the New York penny pincher will be forced to pay an exorbitant rate for the final part of the call; ii) if, however, the "meet point" for the service is where the long distance company meets the California local carrier and the California friend pays for everything to and from this meet point, then the costly selection will remain a cost of the California friend and will not burden the New York penny pincher. This simple experiment is from the perspective of the consumer, who cares little, if at all, about the economics of the carriers. This is not how economists generally think; they are still focused on railroad barons of the 19th century and the lack of selection by end users.



In the remainder of this chapter, we present a brief chronology of interconnection in telecommunications - its implementation and its theoretical alternatives. The book by Coll is still the best standard to read to understand the context in which this issue evolved; namely, the development of MCI and the struggles of Bill McGowan against the entrenched monopolist AT&T. The following are merely highway markers along the road of opening the network. They apply to all elements of information interconnectivity.

Consider first what was written by a Bell System scientist in 1977 at the 100th anniversary of the Bell System at MIT. The author was John R. Pierce, Executive Director at Bell Labs, who stated:

" Why shouldn't anyone connect any old thing to the telephone network? Careless interconnection can have several bothersome consequences. Accidental connection of electric power to telephone lines can certainly startle and might conceivable injure and kill telephone maintenance men and can wreak havoc with telephone equipment. Milder problems include electrically imbalanced telephone lines and dialing wrong and false numbers, which ties up telephone equipment. An acute Soviet observer remarked: "In the United States, man is exploited by man. With us it is just the other way around." Exploitation is a universal feature of society, but universals have their particulars. The exploitation of the telephone service and companies is little different from the exploitation of the mineral resources, gullible investors, or slaves." (de Sola Pool Ed, Pierce, pp 192-194).

The reader should note that this was written nine years after the Carterfone decision and five years before the announced divestiture. Pierce had a world view of an unsegmented telephone network. The current view is of a highly segmented communications system. The world view of the architecture has taken us from "exploitation" of Pierce to the freedom of the distributed computer networks of today. This, however, was the way the most enlightened viewed networks twenty five years ago.

5.1 A Brief History of the Courts' and Regulators' Views on Competition and Interconnection

The motivation behind antitrust and anticompetition law in the US is to guard against restrictions and impediments to competition that are not likely to be naturally corrected by competitive forces. Regulation in the US has also traditionally been employed if at least one of the following three, admittedly vague, criteria are met, see Economides:

"(i) for those markets where it is clear that competition cannot be achieved by market forces; (ii) where deviation from efficiency is deemed socially desirable; and (iii) where the social and private benefits are clearly different."

In Faulhaber, the author presents an alternative, but still vague, taxonomy of two types of scenarios in which regulatory intervention in the market may be necessary: essential facilities situations and network effect situations. The famous *United States vs. Terminal Road Association (1912)* case set an important precedent in which an essential facility – a facility that could not be feasibly duplicated – must be shared among competitors. Indeed, this was the precedent invoked in the breakup of AT&T in the early 1980s. However, according to Faulhaber, such scenarios are not likely to appear very frequently in the New Economy of high-technology:

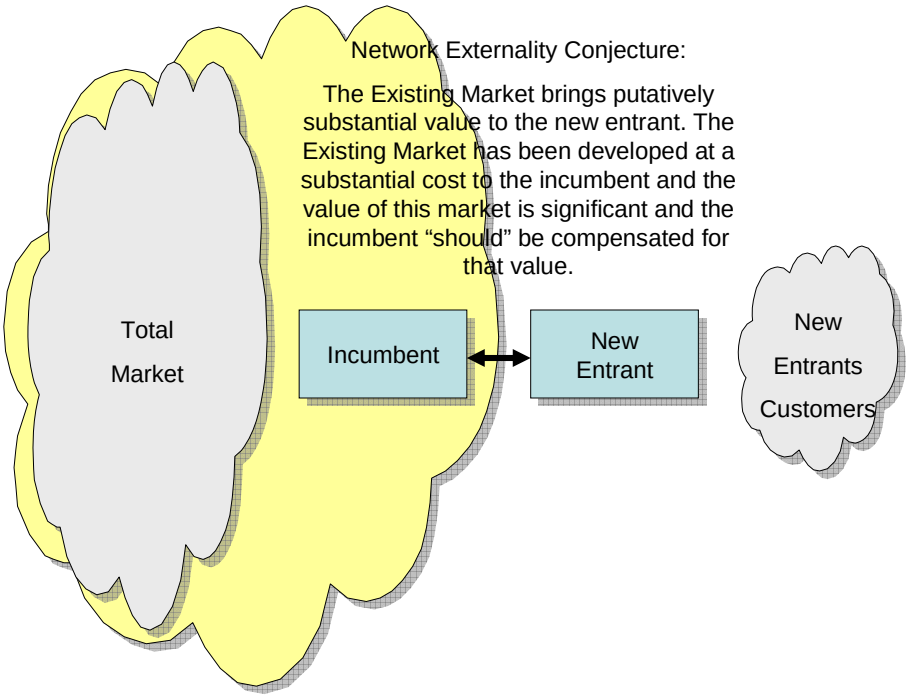
"Looking forward to a world of inexpensive and readily available capital, temporary technology-based monopolies that could be overturned by next-generation systems, customers with lots of options, it is difficult to see a justifiable essential facilities case being successfully prosecuted."

This lends credence to the argument that market forces should be allowed to take their natural course in determining pricing in future high-tech markets, as a credible essential facilities problem is unlikely to arise. Having said this, Faulhaber argues that the essential facilities argument was tacitly (although perhaps unwisely) invoked in the AOL-Time Warner merger in 2000 when the Federal Trade Commission imposed the condition that "open access" to the IP channel be provided on Time-Warner's cable systems to ISPs. Thus, it appears as though essential facilities issues may indeed arise in the New Economy.

The second issue that has been prominent in the New Economy is how to deal with network effects (also known as network externalities) – access via interconnection to customers, and the consequent increasing returns to scale in consumption[37]. It can be simply stated by referring to the following figure. Consider the case of an incumbent who has built a market which in some way is universal. Consider now a new entrant, who now is competing with the incumbent, and now the two carriers must interconnect. Since the new entrant, in order to provide services, needs the universal connectivity, that capability has value and thus the incumbent must interconnect. But if the government mandates that connection there is the argument that the government under the US Constitution cannot take from the incumbent and give to the new entrant without just compensation. Specifically, the Fifth Amendment states:

Amendment V *"..... nor shall private property be taken for public use, without just compensation."*

[37] Network effects are obviously present in concrete networks such as the telephone network and the internet, but they are also present in *virtual* networks where users are not physically connected but are indirectly linked by, for example, common standards (e.g. VHS standard, computer operating systems).



Network effects actually predate the New Economy as they first arose about a century ago in the context of the telephone and railroad industries when large incumbents refused to interconnect with smaller competitors in order to drive them out of business. This aggressively anticompetitive behavior prompted regulators to require interconnection of the different competitors in these industries, and to also determine the prices at which they must interconnect (which was no simple task). The intervention in these two markets, however, did not result in the subsequent indiscriminant interference in US markets exhibiting network effects. The absence of overwhelming market power by any one of the players in the wireless telephony and internet markets, for example, obviated a strong regulatory presence in these markets[38]. It should be noted, however, that internet backbone providers forged their own interconnection (also known as peering) agreements, noting that this would be a common good for all parties involved.

A study of how the US government treated AOL in regard to its instant messaging technology is rather telling of the American government's position in enforcing interconnection among competitors[39]. By 1999, AOL possessed the majority of the instant messaging market and refused to interoperate with its much smaller competitors, such as Microsoft and Yahoo!, and US regulators did not interfere. However, upon the announcement of the AOL-Time Warner merger, the FCC imposed a condition requiring AOL to interoperate its instant messaging software with that of competitors prior to offering advanced messaging services. This position is actually consistent with traditional American regulation on monopolies: earned monopolies are permitted, but monopolies as a result of mergers (or anticompetitive practices) are forbidden. Furthermore, it has been argued that the New Economy operates at such a fast pace that monopolies, even if prevalent, are temporary, "soon to be overtaken or at least disciplined by the Next Big Thing." Such arguments make a case for unfettered markets in the New Economy[40].

[38] Regulatory abstention was supported by Faulahaber's analytic, though simplistic, treatment of broadband markets in Faulhaber. In this work, he showed that oligopoly competition was likely to arise in an unfettered broadband market.

[39] See Faulhaber.

[40] See Faulhaber.

Owing to the economic complexities inherent to markets which exhibit network effects, an argument can be made that regulatory intervention will always be fraught with inequities to the parties involved. Indeed, this is evidenced by the decades spent by the FCC in regulating pricing first in the context of wireline telephone communication, and subsequently in wireless telephone communication. Thus, the argument goes, the only equitable and efficient way for the government to handle these complicated markets is to abstain from them altogether and to let market forces run their natural course[41]. Indeed, Darby presents a plethora of examples of markets exhibiting network effects in which private agreements among the parties involved have led to functional, competitive markets. Darby further emphasizes that the architectures of these pricing agreements follow no common principles and are idiosyncratic to the market. This argument, though perhaps convincing from a purely economic perspective, sidesteps the issue of how the US government may honor its mandate of protecting the greater social good in such markets.

A closer look

The position of US regulators on network externalities is actually more nuanced, and even contradictory. We will restrict our attention to common carriage, which, roughly speaking is a blanket term for infrastructure industries, such as letter post, railroad, telephone, and the internet. Note, however, that the boundary between common carriage and no common carriage industries is still a nebulous one. Common carriage industries, owing to their close relationship to social welfare, are subject to extensive regulation.

Though the history of common carriage law and regulation may appear contradictory at times, a general rule that has been respected is that interconnection is not a right, but discriminating against traffic that previously traversed a competitor's network (hand-off) is prohibited see Candeub. To be more specific, a network has no right to impose another network to spend money on special equipment to interconnect with it. However, should a network present customers to a second network in a manner which is identical to that of the general public, then the second network may not discriminate against these customers. Thus, if regulators, for reasons of fostering competition within an industry, mandate interconnection, then compensation for the interconnecting networks is required since interconnection constitutes a taking. This rule has generally held for the last century, with the exception of the long-distance telephone industry in which local exchanges were required to interconnect with long-distance companies.

Recent FCC Thinking

The FCC OPP in September 2000 issues one of its working papers entitled "Connecting Internet Backbones". This paper states that interconnection of IP backbones should be open, open meaning that they will allow local interconnection and local peering without any connection via an Internet transit. This is driven not by any new breakthrough of economic theory or policy but due to the fact that the ILECs are getting hit by ISPs dumping traffic on them via Internet schemes. For example, if a CLEC gets an ISP as a customer, all the CLEC then has to do is collect the interconnect fees from the RBOC since all the ISP customers will be calling that number. This then places great cost on the ILEC. Under the guise if IP interconnectivity, the FCC moves. It will need a second shoe to drop to make it final.

December 2000. FCC OPP Paper on "Bill and Keep at the Central Office As the Efficient Interconnection Regime". The FCC OPP issues a second working paper and this is the second shoe. It now recommends that bill and keep is really the best way to go. Now the ILECs will not have to pay the CLECs and the bill and keep approach accrues to their benefit. This now is consistent with the McGarty (1993) request and totally rejects others. So much for consistency. It really is about whose ox is gored and who has the regulatory muscle to influence results.

In November 2001[42], Verizon states that it "is worried that saboteurs masquerading as technicians from competing company could gain access to and damage a large central office" This is a restatement of the

[41] See Darby

[42] NY Times, p. B5, "Attacks at Hubs Could Disrupt Phone Lines", Simon Romero.

Pierce complaint at the 1977 symposium. Namely there are great dangers from the likes of CLECs and they must be banned. The corollary is that all ILEC employees are better and more trustworthy than CLEC people. This was a totally uncalled for use of the tragedy of the September 11, 2001 attack on the United States. It was another step in attempting to eliminate unbundling.[43]

5.2 The Externalities View

We begin by quoting Demsetz[44]:

"Externality is an ambiguous concept. For the purposes of this paper, the concept includes external costs, external benefits, and pecuniary as well as nonpecuniary externalities. No harmful or beneficial effect is external to the world. Some person or persons always suffer or enjoy these effects. What converts a harmful or beneficial effect into an externality is that the cost of bringing the effect to bear on the decisions of one or more of the interacting persons is too high to make it worthwhile, and this is what the term shall mean here. "Internalizing" such effects refers to a process, usually a change in property rights, that enables these effects to bear (in greater degree) on all interacting persons.

A primary function of property rights is that of guiding incentives to achieve a greater internalization of externalities. Every cost and benefit associated with social interdependencies is a potential externality. One condition is necessary to make costs and benefits externalities. The cost of a transaction in the rights between the parties (internalization) must exceed the gains from internalization. In general, transacting cost can be large relative to gains because of "natural" difficulties in trading or they can be large because of legal reasons. In a lawful society the prohibition of voluntary negotiations makes the cost of transacting infinite."

Economides uses the following definition for externalities[45]:

"We start with a simple model in expectations. Suppose that the expected size of sales in the market is S. Let the network externality function f(S) measure the increase in the aggregate willingness to pay because of the existence of the network externality. Thus, the aggregate willingness to pay for quantity Q increases from P(Q) to P(Q; S) = P(Q) + f(S). We place the following restrictions on f(S).

- *(i) f(0) = 0, so that no expected sales produce no network externality. This is a normalization of the f(S) function and it could have been done at a different level of S.*
- (ii) *f(S) is a continuous function of S.*
- (iii) *f′(S) ≥ 0, so that higher expected network sales do not produce a lower externality.*
- (iv) $\lim_{S\to\infty} then\_ f'(S) \le \theta$ *, so that eventually, for large expected sales, the marginal network externality, created by an increase in the expected sales by one unit, does not exceed a constant θ. This rules out fulfilled expectations equilibria with infinite sales."*

Using the Economides model one obtains profit as:

$$P(Q;S) = R - C + f(S)$$

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[43] Again Hausman has written recently on the unbundling of CATV assets. McGarty had addressed this in a TPRC Paper on the Gilder Conjectures in 1994. In that paper it was shown that the Gilder conjectures, relating to wireless or CATV were false in part and the conclusion that either bandwidth for wireless or CATV could be treated as disaggregatable utility element were false.

[44] See Demsetz, Property Rights, p. 1

[45] See Economides, Monopolist's Incentive, p 4.

Then one can perform various economic analyses including this externality. The challenge is how to actually measure and model this. Let us consider a simple example. There exists a large monopoly telephone company. It has access to all the customers in the US. A new company comes along. It wants to interconnect. The monopolist says no, not unless you pay me for the externality I have. Who owns this externality? In reality, without the customers the monopolist has nothing. Thus, one could argue the customer has ownership of the externality not the monopolist. In fact, the monopolist was granted the monopoly at no cost by the government. Does the government own it since it may have transferred the right? In fact, it transferred an additional right, namely of not being subject to Antitrust laws, then it seems the monopolist has no right to the externality at all. This conundrum is the essence of externalities.

5.2.1 Utility Functions and Externalities

If we consider, as an example, the utility to an individual of owning a word processing program. It has to me the user a certain utility or value given by two factors, the first it helps me write a letter or report and second it has the utility or value in that I may share that letter or report with someone else who then could edit or manage that document. Thus the utility of a word processing program has a utility which is composed of two elements; self utility and utility as a result of external use. This utility can be modeled as follows:[46]

$$U(n,t) = b_0 + k_0 f(n,t)$$

Where U is the utility and n the number of other people having the same word processing package and t some specific time. The constant b is the value or utility to me alone, assuming no other person has the word processing package and the function f is a measure of how much more it has utility if there are n other people with this same word processing program.

This simple idea can be expanded to state that if a company has a telephone network with N users and another company has a network with M users, and M<N, then the larger network has more value than the smaller. There are in addition certain constraints on the elements of the utility function.[47]

Now we define a broader function:

$$U(N_{External}, N_{Internal}, t) = k_1 + f_1(N_{External}, N_{Internal}, t))$$

where we have separated internal and external users. This expression begs the question: is utility dependent on internal and external users or just on the sum of the two?. An argument can be made that there is substantially different value depending on the user class, so that network externality utility will be dependent on the number in any class of users.

For example, if I have an accounting program, then the utility is clearly much more reliant on the number of accountant who use the program not just the total number of users, those of my peers and all others. Thus the analysis of utility of externalities are based upon both external users as well as internal users. We call this latter class the *internalities* of a network as contrasted to its externalities.[48] The question is which of these factors is the most valuable; externalities or internalities.

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[46] We use the approach of Mason as well as Economides (June, 2003) for this development.

[47] See Economides, 1995 pp-6-7 for externality structure.

[48] One can note that the restrictions as discussed by Economides can be expanded to this argument for the two classes. In addition the consideration of $\frac{\partial U}{\partial N_{Internal}} \geq \frac{\partial U}{\partial N_{External}}$ is also of concern.

5.2.2 Determination of the Demand Function

Demand can be determined by a simple maximization. Namely, we can maximize the utility subject to some price constraint. Let us first relate a quantity q purchased to the number of entities connected to a network, namely:

$$q_{on} = h_{on}(N_{on}), q_{off} = h_{off}(N_{off})$$

Here the function h is monotonic for both relationships. Furthermore we assume there exists an inverse:

$$\exists h_k^{-1}(N_k) = q_k \forall h, N, q$$

Then we have:

$$U = U(N_{on}, N_{off}, t) = U(h_{on}^{-1}(N_{on}), h_{off}^{-1}(N_{off}), t) = U(q_{on}, q_{off}, t)$$

Assume a price per quantity, p, for each quantity, q, and assume some fixed total expenditure amount for the purchase of both quantities. The we can pose the constrained optimization equation as:

$$V = U(q_{on}, q_{off}) + \lambda(y^0 - p_{on}q_{on} - p_{off}q_{off})$$

Consider a simple example:

Let

$$U(q_{on}, q_{off}) = k_0 q_{on} q_{off}$$

Then simple optimization yields:[49]

$$q_{on} = \frac{y^0}{2p_{on}}$$

$$q_{off} = \frac{y^0}{2p_{off}}$$

This is a simple demand equation for the two network quantities. The actual demand is more complex.

Several additional observations are important:

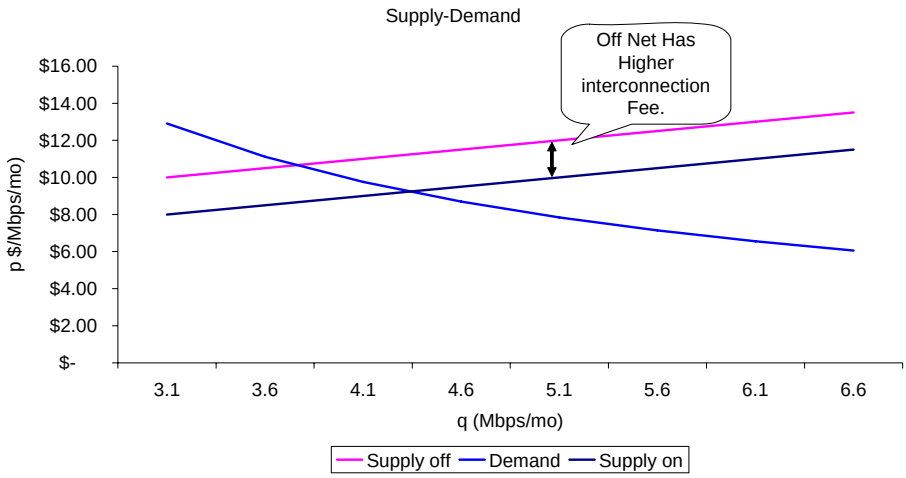
First, in this simple supply-demand world, the higher the price the lower the demand. That means that increased demand will move supply from the off net world to the on net world. Namely there is a disintermediation resulting from the basic economic structure of a MBN architecture. This is a critical observation.

Second, the time dynamics have not been included. It is essential to have them as part of the economics. This will further shown a rapid dynamic flow from off net to on. Namely it will be economically more efficient depending on the cost of interconnection, to place servers via private networks on net rather than to use Tier 1 ISPs!

[49] See p. 19 of Henderson and Quandt.

We can observe these facts in the following supply demand analysis. This is the long term industry supply demand curve. We have justified the demand curve and the supply curve is based upon an industry analysis. They are separated by a difference due to the cost of Tier 1 interconnection. This is a curve as appears to the consumer. Clearly there is greater demand for on net services than off net.

Now one of two things can occur. First, there is greater demand for on net thus driving the off net base down and further increasing its cost. Then the cost to on net providers can actually be reduced thus driving down their costs. This cycle ends with the dramatic reduction of off net connections if the costs of access is not reduced to zero.



We can then also address the issues of marginal substitution of "access" from the Internet backbone to the local point of presence. The issue can be simply stated; if a users has two alternative access modes, via the Internet and a Tier 1 ISP at a price and via a local on net node, what will be the dynamics of market substitution.[50] Using the standard microeconomic tools of substitution based on costs, one can see that there will be a drive to migrate suppliers from the Internet backbone via a Tier 1 interconnect to the local "costless" on net interface. Namely there would be a economic advantage to provide a video server at local clusters of MBN on net interfaces and avoid the costs of the Tier 1 carriage. This can have a potentially unstable effect on the Internet architecture.

5.3 The Pigou vs. Coase View

The issue of externalities, if they exist at all, can be phrased as a contrast between Pigou and Coase. This has been done by Candeub[51]:

" The choice between intercarrier payments and these new interconnection approaches mirrors the great debate on social cost between A.C. Pigou and Ronald Coase. The traditional, social welfarist approach—espoused by A.C. Pigou in the early part of the last century, thus "Pigovian,"—would be to tax one party for the cost "imposed" on the other party. Thus, the polluter would pay the landowner. Intercarrier payments are Pigovian: the regulator attempts to calculate the cost imposed by interconnection (the Pigovian "externality") and to assign them to one party, in the case of long-distance access charges, the long distance company; in the case of the Telecommunication Act of 1996's reciprocal compensation, the originating carrier.

[50] See Henderson and Quandt, p. 73 or Pindyck and Rubinfeld pp. 131-132.

[51] See Candeub, Network Interconnection, pp. 24-25.

On the other hand, Ronald Coase's famous critique of Pigou would suggest an entirely different approach. Coase would likely view mandatory interconnection as an externality of production—a cost of production—like the air pollution from a factory that invades an adjacent private party's home. As Coase observed, given the regulator's limited information, there is a good probability that damages would be calculated incorrectly, creating an inefficient result. More important, however, Coase pointed out that it was arbitrary to choose the polluter automatically to bear the cost of its pollution. Consider the example of a factory that had manufactured its goods for years without complaint, until a kennel for highly sensitive, neurasthenic Pomeranian dogs moved next door, and the dogs got sick from the emissions. As Coase pointed out, externalities are a joint product of "polluter" and "aggrieved party": both the manufacturer and the hypochondriacal Pomeranians are "responsible" for the externality.

Applying this insight to interconnection, it seems absurd to assign the cost to one network. Both networks benefit from interconnection; both are "responsible" for the creation of the cost or externality of interconnection. Therefore, the assumption of intercarrier payments that one party should "pay" for one call's interconnection cost is not tenable. Rather, the cost must be shared in some fashion."

The Coase argument is simple. There exists some property right. There are two players and each has some potential economic gain based upon some action it can take. Then Coase says that given this game, the result is the same no matter who has the property right as long as the Government stays out of the way. An example is a fisherman and a factory. There being a lake which the fisherman uses and which the factory may dump into. There is a property right to the lake. The fisherman may have it or the factory may have it. The Coasian result is that no matter who has the right the parties will enter into a negotiation and their positions will be the same at then end of the negotiations.

Pigou says that there is a role for the Government to decide and to do so via a tax to maximize the overall public benefit.

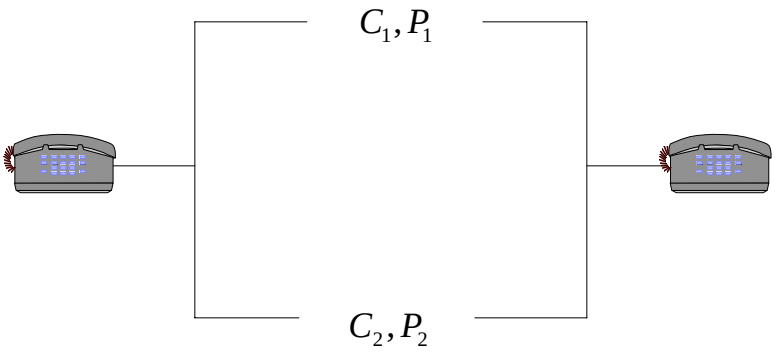
5.4 Efficient Component Pricing (ECPR) View

In the context of the AT&T network with the presence of the then small MCI, regulators and economists were working on ways to "price" this right to interconnect. One of the landmark players in this was Willig, who in 1979 presented a theorem for Efficient Component Pricing (ECPR). Simply, the theory goes as follows, let us assume that there is a consumer and that that consumer has some welfare function, say keep as much money as possible. Then, assume that there is an incumbent who has things called network externalities, valuable things resulting from his monopolistic position. Assume that a new player comes into the market. What should the new player pay the incumbent to keep the consumer happy, while assuring the incumbent adequate return on its assets. In the case where the incumbent, such an incumbent RBOC who has had a monopolistic return for years, then the answer is nothing.

The constraint is on the incumbent getting a return, not the new entrant. The new entrant must make money by being much more efficient than the incumbent, despite the fact the allegedly the incumbent was a monopolist because they had tremendous scale economies. This paper started off the mathematical binge on enhancing on extending this theorem. The work of Willig was formalized in conjunction with Baumol and became the bulwark for many interconnection schemes. It was an extension of what had been created in 1979. The Baumol Willig Theorem can be stated as follows[52]:

Consider a local carrier and two long distance carriers, one of which is owned by the local carrier. What should the new entrant pay the local incumbent for access to that network? The network is drawn below:

[52] This is taken from Laffont and Tirole, p. 102. It is presented by those authors in the context of Ramsey pricing. It essentially reflects the Baumol Willig rule.



From La Font and Tirole p. 101

In the above example, which can and will be used again for Internet interconnectivity, the theory states that the new entrant, who has costs C_2 and price P_2, as compared to the incumbent with costs C_1 and Price P_1, should pay the incumbent a fee, α, for access. Note all fees and costs and prices are per minute of access. The Baumol Willig approach is as follows: Assume that there is a consumer surplus, or welfare function, that measures consumer benefit; that is $S_0(p_0)$ for the local loops and $S(p_1,p_2)$ for the long distance. Assume that the profit of the incumbent is measured as π (p_0, p_1, p_2). Then the access fee should be that which maximizes:

$$\max_{\{p_0, p_1, p_2\}} \{S_0(p_0) + S(p_1, p_2) + \lambda\pi(p_0, p_1, p_2)\}$$

subject to

$$\pi(p_{0,} p_1, p_2) \geq 0$$

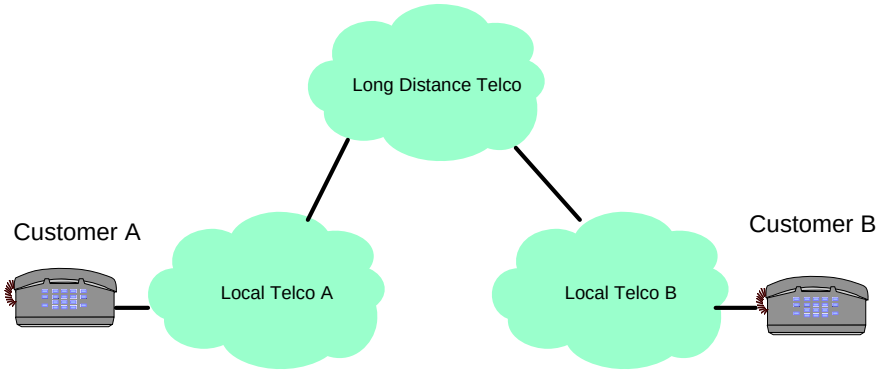
Namely, choose the access which benefits the consumer subject to ensuring the incumbent is always profitable. It states that, quite frankly, we needn't care about the new entrant. This is what all interconnection theory states up until late 2000, other than that of a few writers who were strongly opposed.[53]

If we followed Baumol or Tirole we would tax the consumer to the level where the local on net carrier would pay the Tier 1 ISP a fee to compensate for the fact that the local network is more efficient than the backbone, actually the prices are extortionary and unrealistic, and it would sustain the backbones oligopoly. This logic can only come from academics who have little to no understanding of the business or little or no regard for the consumer. However, this logic enters the regulatory fray due to the panache of academia.

The issue of access and interconnection fees has also been discussed at length by others. One view is to look at this problem a one which is a Coase Conjecture problem. Simply stated the Coase conjecture is that any

[53] See McGarty papers on access; 1993-1996.

monopolist, such as an ILEC or collection of Tier 1 ISPs will be forced to marginal cost pricing in a dynamic fashion. [54]



Interconnection and Access: Customer A wants to communicate with customer B. Customer A pays Local Telco A for local access. Customer B pays local Telco B for local access. Customer A pays LD Carrier for transport between Local Telco A and Local Telco B. However Local Telco A and Local Telco B charge LD Carrier for access or interconnection a both ends. Why?

5.5 Paradigm Summary for Interconnection

There are many views for establishing interconnection. We present here three. Before we commence we remind the reader to consider this whole process in terms of what we would do in our normal life. Consider also the reality of externalities in competitive markets. If one bakes a cake, one needs flour, sugar, salt, and each is essential, but frankly non have externalities, they are all commodities. It is clear than externalities do not exist for any single player in a commodity market. Externalities are artifacts of monopolistic structure of Governments establishing property rights.

5.5.1 Free Market Interconnection

The Free Market Interconnection model assumes the consumer, or any entity whom the consumer enters into a purchase with, can purchase the elements required for the service desired in a free and open market. Thus if I need to purchase the following:

1. Software
2. Hardware
3. Local IP Connection
4. Local Layer 1 and 2 connection
5. Tier 1 Backbone
6. Service or Content

then each of these is a separate transaction. I may decide to bundle and the market should permit many options. There should be no concept of externalities here. I can transact with any one of multiple suppliers in

[54] See papers by Inderest or that by McAfee and Wiseman. Both address the issue of the Coase Conjecture and the issue of interconnection and access.

each market and the price is then set. If any player in any element of the market sets a price that I do not desire to pay and there is an option then I seek out that option. As a consumer I have a welfare function which simply stated means that I get to keep more if I have a higher welfare, unlike taxation.

The Free Market school is exemplified in the bill and keep concept used in interconnection. It is what the Tier 1 carriers do between each other. Namely as a provider of some element in what the consumer needs I charge the consumer a market price for my element of the service and the consumer can decide to buy or not buy.

5.5.2 Baumol Willing Interconnection

Interconnection and access fee pricing is a key elements in the overall process of network evolution. [55] The major work here is the classic tautology of Baumol and Baumol and Willing. Namely the form as describes as follows.[56] Let us assume a consumer surplus for using a network as S. Let us assume that there is a local service and two long distance services, one being an incumbent. That is S is the consumer surplus. Let:[57]

Let the consumer surplus for local telephone calls be: $= S(p_0)$

and:

Let the consumer surplus for long distance with carrier 1 and carrier 2 be: $= S(p_1, p_2)$

Then we want to maximize overall consumer surplus:

$$\max_{\{p_0, p_1, p_2\}} \{S_0(p_0) + S(p_1, p_2) + \lambda\pi(p_0, p_1, p_2)\}$$

Subject to the constraint that the incumbents profit is always positive

$$\pi(p_0, p_2, p_2) \geq 0$$

If we followed Baumol or Tirole we would tax the consumer to the level where the local on net carrier would pay the Tier 1 ISP a fee to compensate for the fact that the local network is more efficient than the backbone, actually the prices are extortionary and unrealistic, and it would sustain the backbones oligopoly. This logic can only come from academics who have little to no understanding of the business or little or no regard for the consumer. However, this logic enters the regulatory fray due to the panache of academia.

The issue of access and interconnection fees has also been discussed at length by others. One view is to look at this problem a one which is a Coase Conjecture problem. Simply stated the Coase conjecture is that any

[55] See Mason, Internet Telephony, for the application to IP traffic. Also see Economides and Lopomo on issues relating to Reciprocity of Interconnection Pricing.

[56] See Economides and White and their discussion of the Efficient Component Pricing Rule, ECPR, which is the Baumol Willig Theorem. Simply stated the ECPR states that the access fee to a new entrant should be adequate to compensate the inefficient old incumbent for their inefficiencies. Since Baumol and Willig consulted for the incumbent one could wonder why the result would ever be anything else but pay the incumbent.

[57] See Laffont and Tirole, pp 102-103. This is a classic ad hoc propiter hoc argument. They state “plus subject to the constraint that the incumbent breaks even” Who cares about the incumbent in a competitive market. Adam Smith desires to clear the market by efficient production means. The authors have a clear continental socialistic bent on retain incumbents and having the consumer pay for their inefficiencies.

monopolist, such as an ILEC or collection of Tier 1 ISPs will be forced to marginal cost pricing in a dynamic fashion. [58]

5.5.3 Multi Sided Market Interconnection

Multisided market theory is espoused by Rochet and Tirole and by Darby. Multisided markets theory simply is as follows[59]:

I assume that there are several players as necessary to make a market. Say they are the list we have shown above. Then assume that one element in this list cannot deliver at a competitive or market acceptable price. Let us assume that Verizon builds FTTH and it costs too much and they cannot price it to compete with cable, but someone, say the Government, or some other deus ex machina, decided that the FTTH approach is better. Then in a multisided market world, this deus ex machina charges other providers a fee based upon the assumption that they will benefit if Verizon has the FTTH and that their benefiting should be used to pay Verizon. Thus we take from the other players and give to the inefficient competitor so that they will become profitable.

This argument is socialism if ever there was one[60].

5.6 Conclusions

In the event of interconnection, the following important questions remain:

1. Which costs are to be compensated?
2. How are these costs to be compensated?

Regarding the first question, some feel that only the costs incremental to interconnection should be compensated for since it believed that by virtue of interconnection all parties benefit see Candeub, DeGraba, and Atkinson. If only the costs incremental to interconnection need to be compensated, then these costs can be simply split in some fashion among the interconnecting networks and no further inter-network payments are necessary. A criticism of this model is that it cannot be generalized that every network benefits from interconnection. As a counter-example, recall that the reason that Bell, after its patent expired in the late 19th century, refused to interconnect with the smaller carriers because it was clearly not in their best interest do so. More generally, any network with market power is better off not interconnecting. Thus, mandating interconnection may constitute a taking and it is insufficient to only compensate for the incremental cost of interconnection. A proposed method of compensating incumbent networks for the opportunity cost of interconnecting is known as Efficient Component Pricing Rule (ECPR), and its effectiveness is analyzed in Economides (disadvantages of EPCR is that it acts as a guardian for the incumbents future inefficiencies and possible nefarious motivations with respect to pricing). Another criticism of paying only for incremental interconnection cost is that its fairness hinges on the assumption that a network's cost is independent, or a

[58] See papers by Inderest or that by McAfee and Wiseman. Both address the issue of the Coase Conjecture and the issue of interconnection and access.

[59] See Rochet and Tirole and Darby. It should be noted that Darby is affiliated with a consultancy supported by the RBOCs.

[60] For Reference the senior author's grandmother was head of the New York Socialist party in the early 1900s and as a result of may lectures and debates understands socialism better than most historians. http://memory.loc.gov/cgi-bin/query/r?ammem/mnwp:@field(DOCID+@lit(mnwp000296)) The writings of Tirole and his associates, The French Telecom School, all contain elegant but generally anti competitive and socialistic approaches to managing telecommunications. The Tirole approach appears to be that some unseen central hand has all wisdom and that this unseen hand using a plethora of mathematics and with no input from reality shall decide what is best.

weak function, of the volume of traffic it carries. It is debatable whether this is a good assumption for the internet, and whether it will be in the future.

A different response to the first question leads to a different approach. The present model for interconnection compensation involves an originating carrier paying the interconnecting carrier for access to it. This paradigm, known as Pigovian, leads to a complicated set of inter-carrier payments on a per-call or per-minute basis. The Pigovian approach to telephone yields many problems: inter-carrier payments can be gamed through regulatory arbitrage, inter-carrier payments confer a termination monopoly on local exchanges, per minute rates recover flat costs, creating intractable problems for cost allocation, and they require one party to pay when both clearly benefit see Candeub.

I am in agreement with the authors that market forces should determine the details of the agreements, including the rates charged, among network players – but I do think that the Coasian alternative is grossly simplified in that it does not consider the usage dependence of the network and does not allocate compensation for opportunity cost. I suspect that what the FCC did with telephone is half correct in that they tried to embrace the economic complexities of interconnection (e.g. rate dependence), but since they are ill-equipped to measure and understand the distribution of benefits among all parties involved, they should have refrained from imposing their rates for the parties to abide by.

6 COMMON CARRIAGE AND COMMON LAW

In this section we review the concepts of common carriage and its history and related legal precedents. To understand common carriage we must first take a step backwards and better understand the concepts of property, possession, contract and bailments. The question may be why we must understand these issues as regard to common carriage and why is common carriage an important element of the issue related to the Internet. Why ones, for example, understanding the transition from Salic law to the way we perceive our current rights under the use of the Internet have any bearing on current reality. The answer is quite simple, we are a country of laws, despite what we may see from time to time in the press and blogs, and as a country of laws we must best understand them.

Our laws are of a varying nature but simply put they are of a form based upon laws passed by our Legislatures and laws based upon common law. The latter holds for countries based upon English law. Common Law is the basis of key elements in our legal system. For example in the Supreme Court Case of Western Union v Call Publishing[61], the Court stated:

"But this question is not a new one in this court. In Interstate Commerce Commission v. Baltimore & O. R. Co. 145 U.S. 263, 275 , 36 S. L. ed. 699, 704, 4 Inters. Com. Rep. 92, 96, 12 Sup. Ct. Rep. 844, 847, a case which involved interstate commerce, it was said by Mr. Justice Brown, speaking for the court:

"Prior to the enactment of the act of February 4, 1887, to regulate commerce, commonly known as the Interstate Commerce Act (24 Stat. at L. 379, chap. 104), railway traffic in this country was regulated by the principles of the common law applicable to common carriers""

Thus common law was used to enforce the concept of common carriage. We shall discuss the history of common carriage as well. But what is key about this case and what the Court stated over a hundred years ago is: (i) as a country of laws we make our decisions based upon the law, both statutory and common; (ii) common law is an accepted part of the precedent base we use to ascertain the validity of our claims, (iii) the Court accepts those claims and has done so since the commencement of our legal system, (iv) common carriage is a well established element of our common law system and it is a key element in how we look at and expect our telecommunications systems to function.

We will also see that statutory law can precede and dominate any common law claims. But we will argue herein that common law was a key element in regulating our rights under common carriage before the 1934 Telecommunications Act, and since the 1996 Act they may very well become key again, especially as we see the changes potentially developing under the new proposed legislative changes.

Our argument will progress as follows. Let us assume that we desire to perform a transaction over the Internet. We create a transaction composed of bits, packets, which we transfer across an Internet connection facilitated by a transport entity. We have entered into an agreement with the transport entity to carry our bits to a third party not necessarily related in any manner to the transport entity. Then we desire to complete a transaction by handing our packets to a third party who will accept them and convert them into some good or service which we have selected. We may even encrypt our transaction to ensure both privacy and security. We do not want the transport carrier to carry our packets in the clear, if you will. Let us now consider the steps:

[61] 181 US 92, Western Union v Call Publishing, 1901. In this case Call was charged a significant amount more than a competing new paper and the sued Western Union claiming under the concept of common carriage, that they had been harmed. The basis was the existence of common carriage and its ensuing rights under common law. There was limited statutory laws at the time for such protection. Call won the case at the Court.

Property, intangible property such as our information in data bits or packets, is both property and personal, our personal intangible property. We possess it and in fact we may even create it so it becomes our intellectual property. But let's not go down that road yet. It is clearly property and our property.

We then enter into an agreement with a third part, the carrier in this case, whose service is to transport the property between us and some third party. Indeed there is a contract, all elements are present; offer, acceptance, and consideration. The third party is some data carrier. There may be multiple other third parties some of which we could enter into an agreement with separately subject to some set of transactions costs which we shall discuss separately.

The third party we have "contracted" with then transports the bits from place A to place B for a price and in transporting them takes possession of them. In taking possession they become in a certain way a bailee and we are the bailor, and the bits are bailment. This concept dates back to at least 1315 under Edward II. It will become a key concept which we will build upon.

Common carriage is a special type of bailment and a certain specific economic relationship between the parties.

6.1 Common Law

I[62] once had a dinner in Vienna Austria with executives from Telkom Austria, Telcom Italia and my partners from Prague. During the course of the meal the question, or perhaps observation, came up as to why the United States has so many lawyers. I had the opportunity to explain to my European brethren the difference in the legal systems, which frankly is also a difference in world view; centralized power versus distributed power. I said that in the United States we have three major ways to make law. The first way is via our elected legislatures. Most of our written and codified laws originate in this arena and this is the generally well understood manner in which we believe our laws are made or created[63]. The second way is when the Supreme Court decides what has been made law is not, and they then take it upon themselves to rewrite the law based upon their personal understandings of what it should be.

That shocked my Austrian colleagues, because it was very European, bodies of unelected jurors deciding what is in the best interest of all, classic Napoleonic law. The third way I told them is suing under common law principles. I said that having access to the courts and to common law we can always have recourse when we have been aggrieved to the courts, and sue another party, the one damaging us, and from that process come precedent in many cases. The precedent then becomes law. Thus even the least of us in a common law society has the right to redress our grievances in the courts, and with a jury seek a remedy. In this third case the judge is not making the law, the jury, namely our peers, is the judgment maker. The Europeans had never understood that principle, people having individual rights and the uneducated and untrained, namely a plaintiff and jury, having the direct right of redress. Furthermore the redress process was a collection of rules and precedents of the very culture we were living in. It becomes a time averaging process[64].

Let us begin by defining what common law is. Posner defines common law in terms of three elements[65]:

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[62] This is the senior author (McGarty) speaking.

[63] It should be noted however that in the United States the actual writing of the laws may in reality reside in the hands of lobbyists and their attorneys, in "support" of the Legislative staff. This has been a pandemic exercise when it comes to the development of the telecommunications law. Frequently the law becomes what the last lobbyist "in" managed to get into the word processor.

[64] The point of English common law and the use of English as the language should not be overlooked. Clearly as precedent the use of a term, word, phrase has great historic meaning. We could not easily if at all admit the use of multiple languages into our legal system because it would then demand the rewriting and reinterpretation of all our common law elements.

[65] See Posner, *Economic Analysis of Law*, p. 31.

"Common law ... can be conceived ... as having three parts:

1. *the law of property, concerned with creating and defining property rights to the exclusive use of valuable resources*
2. *the law of contracts, concerned with facilitating the voluntary movement of property rights into the hands of those who value them the most;*
3. *the law of torts, concerned with protecting property rights..."*

Now we can state the Internet problem in Posnerian terms of Common Law. Specifically:

1. We have created a valuable personal property right in a packet or collection of packets we wish to exchange with a third party for something of value. This is the exchange between the Internet user and the third party for a specific transaction to occur.
2. We have entered into an agreement with a carrier to transport those packets back and forth and we have agreed to compensate the carrier on the basis of some form of common carriage. The common carriage construct facilitates the transport of the personal property in the exchange between the user and the third party in the transaction. It does not in any way involve a transfer of property rights to the carrier, since we view the carrier as a bailee.
3. We retain our tort rights to see remedies for any damages done us by the carrier in the event that they interfere with the transfer of the property rights between the user and the third party.

The Posnerian view is one of ongoing economic relationships. The view accepts the existence of rights and works from this concepts of accepted rights. All interactions are in his view economic transactions devoid of good and evil. Common law then is a means to balance economic interests and bargaining powers between parties. Specifically Posner views every interaction as an economic transaction and each of these has a cost or return associated. Thus all claims at common law are claims with some underlying economic model.

Another view of common law is that of Eisenberg. Specifically he defines common law as[66]:

"the common law is heavily concerned with the intertwined concepts of injuries and rights....the task of common law is not to determine what is an injury or right but to explore ... the extent to which that are perceived by the community as inflicting wrongful injuries should give rise to remedies at law..."

The Eisenberg view appears to be more expansive. It admits rights but further looks also looks to societal norms which may or may not be reflective of some underlying economic transaction. There would be admitted the societal good in this view.

Eisenberg goes on to state[67]:

"the common law is heavily concerned with the intertwined concepts of injuries and rights, and moral norms largely shape our perception of what constitutes and injury and a right."

Practically speaking common law is a compendium of prior cases and the principles which have devolved from them. The three areas of property, contract, and torts all relate to people and things and their daily interactions. As we have argued herein the data elements we create are property. The relationship we have with a common carrier is in essence a form of contract to transport our property, and the damages we suffer under the actions of the carrier constitute the tort. The common law is clearly the body of law which allows us remedies at law.

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[66] See Eisenberg, Common Law, p.15.

[67] See Eisenberg. Common Law, p. 43.

The concept of *stare decisis* is key to common law[68]. The principle is simply that once decided by a court henceforth to be accepted. We all know that this concept is frequently stated but as frequently ignored, especially by US courts, including the Supreme Court. However it does have some standing and can be used. The true strength of common law is the building of a strong basis of equity. For example[69]:

"... built up as it has been by the long continued and arduous labors, grown venerable with years, and interwoven as it has become with the interests, the habits, and the opinions of the people. [Without the common law a court would] in each recurring case, have to enter upon its examination and decision as if all were new, without any aid from the experience of the past, or the benefit of any established principle or settled law. Each case with its decision being thus limited as law to itself alone, would in turn pass away and be forgotten, leaving behind it no record of principle established, or light to guide, or rule to govern the future." (Hanford v. Archer, 4 Hill, 321.)

Common law is also a methodology as well as a set of precedents. It is a way of approach a set of claims of rights and a set of claims against injuries. It is critical to understanding that the injury element is key to any common law claim; it is an economic injury in the Posner view or a moral injury in the view of Eisenberg. Whatever the view, injury or loss is a key element and restitution is one of the remedies.

Common law works along side of the administrative law which we see in the working of our regulatory system In the case of the Internet, the Government in its wisdom may remain silent and the FCC in its wisdom may enter the fray. However we are arguing that the common law as regards to property, contract and torts is an alternative and powerful element to see remedy and redress.

6.2 Property

The concept of property is key. We understand in our legal system two types of property; real and personal. We will argue herein that the packets that we use in communicating with third parties on the Internet are indeed personal property. They are closed packages of information, whether they are going to or returning from a third party. They are our personal property. Evidence of this belief is even in the CALEA laws which apply the fourth amendment protection of unlawful search and seizure. We may not have a right to privacy expressly in the Constitution, despite what many may believe, but we clearly have rights to property. We shall argue that if viewed in this manner we can then look upon our communications to, from, between, and amongst other Internet players as transfers of our property, and that by applying the theory of property to such communications we now can use the extensive body of well developed common law to seek understanding and protection. The use of the common law element applies only to English law countries, where the establishment of case law and the acceptance of stare decisis is an accepted tradition. To those countries using the more classic types of law, such as Napoleonic statute law, none of this applies. It would have to be written into statutes. The advantage of common law is that it has become a basis for using the development and experience of our culture and society in interpreting and extending the law.

The right to personal and individual property was well established in the writings of Locke, specifically in his Second Treatise, Chapter V, Of Property. Written at a time when there was still a residual belief, and often compelling that the sovereign permitted property usage, but that ultimately the sovereign was the owner of the property, Locke established the view which we see in most of our current understandings of property. We in essence take something which is of a common element of nature and through our hard work we add value and thus obtain a natural right, a right which conveys to us the individual, in that property. For example, we cultivate a field and grow a crop, then the crop is ours, in fact the acreage is our. We create a packet of information pursuant to an electronic transaction, then the packet is ours, and no right conveys as we have that packet transmitted to a third party as party of a transaction. It is clear that the carrier adds no value to the

[68] One should be careful in using common law and even in using any precedent since in almost all cases where precedent is used it must be Shepardized, namely it must be looked at again against all subsequent rulings to see if the court's changed their minds. see www.lectlaw.com/files/lwr17.htm

[69] See: http://www.blupete.com/Literature/Essays/BluePete/LawCom.htm#Tradition

packet. In fact he is paid for service. It would be like the movers of Michelangelo's Pieta claiming ownership and creation rights for all eternity because they pushed the statue from one end of the room to the other. The property we create is transferred and we and a third party exchange it for value, we then receive another element of personal property in return. At no time do we convey any rights to our property to the carrier.

The first question we pose is what is property and the second question is what is the basis of this definition of property. The third question then extends the first two to the domain of information and the Internet; namely what property rights do we have when we are interacting on the Internet. Let us commence with the definition.

Cunningham et al use the Bentham approach to defining property[70]:

...property is a legally protected "expectation...of being able to draw such and such an advantage from a thing" in question. "according to the nature of the case"[71].

Cunningham goes on to state the consequence:

"if property is a legally protected expectation of deriving certain advantages from a thing it follows that property is comprised of legal relations between persons with respect to things..."

The Bentham school of thought, which is a major basis of the laws of property as we understand them in the English law world. Sprankling defines property as follows[72]:

"the law defines property as rights among people that concern things....the legal definition ...has two parts: (1) rights among people (2) that concern things...while property is discussed in terms of "rights' perhaps "relationships" would be a better term...law is the foundation of property rights in the United States..."

As Pipes has stated[73]:

"The whole concept of privacy derives from the knowledge that we can withdraw, partly or wholly, into our own space; the ability to isolate oneself is an important aspect of property rights. Where property does not exist, privacy is not respected."

Pipes goes on to define property as follows[74]:

"Property refers to the right of the owner...formally acknowledged by authority both to exploit assets to the exclusion of everyone else and to dispose of them by sale or otherwise... "property" has come to encompass everything that properly belongs to a person...including life and liberty...under the influence of Marx...define "property"...not as a right over things but as relations among persons in respect to things."

The approach to property of Pipes establishes an important distinction between what the law does in interpreting property and what society does in interpreting property. To Pipes the Sprankling definition has

[70] See Cunningham et al, p. 1.

[71] See Cunningham et al. Property, p 1 and the authors' references to Bentham and his work Theory of Legislation. Bentham had developed his theory of property on the basis that property is a manifest expression of the law as compared to Locke who postulated property rights as being inherent to the human, as a result of their labors.

[72] See Sprankling, Understanding Property Law, Chapter 1.

[73] See Pipes, Property and Freedom, p. 76.

[74] See Pipes, Property, p xv.

Marxian overtones. True property is what I own and as a result what I control. Property is not just the relationships between myself and others regarding some thing. The distinction is a critical distinction.

There have been many limitations on the rights to property. Pipes relates two Supreme Court cases, Dolan v City of Tigard (1994) and Lucas v South Carolina Coastal Council (1992) wherein the Court ruled for the plaintiff and their rights in property. However, the most recent case relating to eminent domain, Kelo et al. v. City Of New London et al (2005), and the Court in the Kelo case stated:

"Two polar propositions are perfectly clear. On the one hand, it has long been accepted that the sovereign may not take the property of A *for the sole purpose of transferring it to another private party* B, *even though* A *is paid just compensation. On the other hand, it is equally clear that a State may transfer property from one private party to another if future "use by the public" is the purpose of the taking; the condemnation of land for a railroad with common-carrier duties is a familiar example. Neither of these propositions, however, determines the disposition of this case."*

The statement of the State having the power and authority to transfer private property from one private owner to another is a striking comments without basis. Clearly the Constitution has been taken to mean that the Government, with just compensation, may take property. The Constitution does not seem to say that the Government has the right to reassign property rights. The Court in this case seems to be saying that. However the Court does go on to state:

"As for the first proposition, the City would no doubt be forbidden from taking petitioners' land for the purpose of conferring a private benefit on a particular private party. See Midkiff, *467 U. S., at 245 ("A purely private taking could not withstand the scrutiny of the public use requirement; it would serve no legitimate purpose of government and would thus be void");* Missouri Pacific R. Co. *v.* Nebraska, *164 U. S. 403 (1896)."*

Thus the Court rephrases its statement of transferring from a private entity to another. It does now state that it cannot do this for a particular private party. Thus the Court reaffirms the position that the Government cannot take property to be given to another. Finally the Court states:

"In affirming the City's authority to take petitioners' properties, we do not minimize the hardship that condemnations may entail, notwithstanding the payment of just compensation.[21] We emphasize that nothing in our opinion precludes any State from placing further restrictions on its exercise of the takings power. Indeed, many States already impose "public use" requirements that are stricter than the federal baseline. Some of these requirements have been established as a matter of state constitutional law,[22] while others are expressed in state eminent domain statutes that carefully limit the grounds upon which takings may be exercised.[23] As the submissions of the parties and their amici *make clear, the necessity and wisdom of using eminent domain to promote economic development are certainly matters of legitimate public debate.[24] This Court's authority, however, extends only to determining whether the City's proposed condemnations are for a "public use" within the meaning of the Fifth Amendment to the Federal Constitution. Because over a century of our case law interpreting that provision dictates an affirmative answer to that question, we may not grant petitioners the relief that they seek."*

Specifically, they have chosen to allow New London to take the property in light of the towns preparation of a plan and in light of an overriding public interest. However as stated above they clearly indicate that the States may delimit the powers ever more strictly, and that the States have the powers to do so.

Justice Thomas in his dissent states:

"Long ago, William Blackstone wrote that "the law of the land ... postpone[s] even public necessity to the sacred and inviolable rights of private property." ..... The Framers embodied that principle in the Constitution, allowing the government to take property not for "public necessity," but instead for "public use." ... Defying this understanding, the Court replaces the Public Use Clause with a " '[P]ublic [P]urpose' " Clause, ... a restriction that is satisfied, the Court instructs, so long as the purpose is "legitimate" and the means "not irrational,"... This deferential shift in phraseology enables the Court to hold, against all common

sense, that a costly urban-renewal project whose stated purpose is a vague promise of new jobs and increased tax revenue.... The most natural reading of the Clause is that it allows the government to take property only if the government owns, or the public has a legal right to use, the property, as opposed to taking it for any public purpose or necessity whatsoever. At the time of the founding, dictionaries primarily defined the noun "use" as "[t]he act of employing any thing to any purpose." .... The term "use," moreover, "is from the Latin utor, which means 'to use, make use of, avail one's self of, employ, apply, enjoy, etc." ...When the government takes property and gives it to a private individual, and the public has no right to use the property, it strains language to say that the public is "employing" the property, regardless of the incidental benefits that might accrue to the public from the private use. The term "public use," then, means that either the government or its citizens as a whole must actually "employ" the taken property."

The Thomas dissent clearly harkens back to the original interpretation of the Constitution and the Fifth Amendment. Takings and rights go hand in hand. If one has property, then one has a right to the property, its use, its sale, its very survival. The Government cannot transfer that property, even with just compensation, to a third party, unless for a "public use". However in the New London case, the Court in its wisdom has watered this down to a public purpose and has further placed a broad arms length to that purpose as being nothing more than a plan which says another private owner can make better use of the property in the opinion of the town and as such is a public purpose, and in the Courts eyes, is a public use in accord with the Fifth Amendment.

What does this have to do with the Internet and data transfer. We argue that the packets are our property, the property of the creator of the packets. They thus have protection as property and the Government, even under the wide interpretation of the New London case, still have a modicum of protection under what is left of the Fifth Amendment. The Government cannot transfer that property from the owner to a third party without just compensation, except under the case as defined in New London. Thus I would have a right to my packets, and the right conveys as I move it across the Internet.

Thus we have argued that we have a property right in the packets we send across the Internet. The packet is a real "thing" and we have a right of ownership because we created this thing; this is a clear statement of the Locke view of property. Specifically Locke states[75]:

"....the improvement of labor makes the far greater part of the value (of the property)..."

Specifically in a Lockeian world if we take something, labor over it to increase its value, then that something is our property. Locke in this part of his work incorporates two ideas; (i) labor as creating value of property, (ii) labor creating the very property in and of itself, and (iii) labor creating a clear and definable nexus of the property to the person performing the labor. Thus we, when laboring creating the packet we do to send over the Internet, are clearly according to Locke, adding our labors and creating property which is ours.

In 444 US 164 Kaiser v US the Court ruled that property is characterized by the right to exclude others, as follows[76]:

"For over a century, a long line of cases decided by this Court involving Government condemnation of "fast lands" delineated the elements of compensable damages that the Government was required to pay because the lands were riparian to navigable streams. The Court was often deeply divided, and the results frequently turned on what could fairly be described as quite narrow distinctions. But this is not a case in which the Government recognizes any obligation whatever to condemn "fast lands" and pay just compensation under the Eminent Domain Clause of the Fifth Amendment to the United States Constitution. It is instead a case in which the owner of what was once a private pond, separated from concededly navigable water by a barrier beach and used for aquatic agriculture, has invested substantial amounts of money in making improvements. The Government contends that as a result of one of these improvements, the pond's connection to the

[75] Locke, Two Treatises, Chapter 5 Paragraph 40.

[76] See the discussion in Cole and Grossman, Meaning of Property, p 10.

navigable water in a manner approved by the Corps of Engineers, the owner has somehow lost one of the most essential sticks in the bundle of rights that are commonly characterized as property - the right to exclude others."

Indeed, when we send our packets from our computer to Google or whomever we have a right and the power to exclude others, we can encrypt as we do with the transaction itself. The carrier by precedent does not add any value to the packet. A ship carrier, for example, does in no way add value to some precious work of art. The are merely third parties whose duty is to move it. Would the people who move Michelangelo's marble have the claim to his art on the same basis as he did, we think not.,

Cole and Grossman state further:

"According to the predominant view, if person X holds a "right" to something, at least one other person must have a corresponding duty not to interfere with X's possession and use. If X claims a "right," but cannot point to a corresponding "duty" that is enforceable against at least one other person, then what X possesses may not be a "right" at all but some lesser entitlement such as a privilege, liberty, or mere use..... In Hohfeld's system, to claim that an industrial facility has a right to emit noxious substances into the air would necessarily be to claim that others have an enforceable duty not to interfere with their polluting activity. A legally enforceable "right" presumes a corresponding legally enforceable duty."

Thus in furtherance of the argument, to have a property right in say a data packet, and there is there a duty; yes indeed, we argue that the carrier has a duty equivalent to a bailee, a duty of care, both to indiscriminately sent the packet anywhere or permit anyone access to it, and to the supplier to protect the transaction[77]. We expect that in our Internet transactions. A duty exists and from that the property right.

6.3 Possession

Possession is an extension of the concept of property. We will focus here on the concept of possession under common law as presented by Holmes. As Holmes states in Chapter 5:

"The test of the theory of possession which prevails in any system of law is to be found in its mode of dealing who have a thing within their power, but not own it, or assert the position of an owner for with regard to it, bailees, in a word. It is therefore, as a preliminary to understanding the common-law theory of possession, to study the common law with regard to bailees."

We will be focusing on the issues related to a third party possession of information, bits, packets, the essence of Internet communications.

"I may here return to the case of goods in a chest delivered under lock and key, or in a bale, and the like. It is a rule of the criminal law, that, if a bailee of such a chest or bale wrongfully sells the entire chest or bale, he does not commit larceny, but if he breaks bulk he does, because in the former case he does not, and in the latter he does, commit a trespass./ The reason sometimes offered is, that, by breaking bulk, the bailee determines the bailment, and that the goods at once revest in the possession of the bailor. This is, perhaps, an unnecessary, as well as inadequate fiction. The rule comes from the Year Books, and the theory of the Year Books was, that, although the chest was delivered to the bailee, the goods inside of it were not, and this theory was applied to civil as well as criminal cases. The bailor has the power and intent to exclude the bailee from the goods, and therefore may be said to be in possession of them as against the bailee."

6.4 Bailments

We can begin with the definition of bailment. From Dukeminier we have[78]:

[77] This duty of care is as we have stated on multiple times herein based upon common law and the use of common carriage therein.

[78] Dukeminier et al, Propret, p. 66.

"a bailment is a rightful possession of goods by one who is not the owner"

Bailments go back quite a way in English law. Bracton discussed them at length in his works in the thirteenth century. They were already understood and were a key part of what would become a growing economy based on trade and the transport of goods. The concept of bailment was one which was critical to commerce. The owner or merchandise, goods or property often accompanied the goods as they were shipped from place to place, since he had no way to transfer temporray control until the construct of bailment was developed. Bailment allowed a third party to transport the goods without the owner being present and did not transfer ownership from the owner to the buyer, or the new owner. The bailor would then be the merchant and the bailee would be the captain of the ship transporting the goods. The ship captain never took title to the goods, but moreover, the captain had a high level or duty of care as regards to the goods, namely if they were stolen it was the captains fault. Bailments became the corner stone upon which our economy of commerce was to be built. Markets could become distributed, goods made in one location could be sent out to others without the manufacturer travelling personally from market to market. Third parties, the bailees were permitted to make these transfers.

Remember where we are going, we are looking at our packets, and the packets we have already argued are our property, in effect our goods, and we want to get them from one place to another. Thus we would need the use of the bailment principles so well developed over the past thousand years.

Why discuss bailments? Because the have historical import, because they lead to common carriage, because the establish precedent, and because the have over a thousands years of legal precedence from which we can learn about the transports of property.

What are the responsibilities of a bailee? One of the best and probably still current discussion of bailment is the work by Holmes on Common Law[79]. We shall rely upon Holmes to provide insight to the issue.

One of the classic cases was the Marshall case, where the jailor was holding a prisioner as a bailment and had a duty of care.[80] This occurred under the reign of Henry IV in 1455. The case is fairly simple and gets to the issue of liability. The jailor was being sued for having lost a prisioner. The court ruled that if the prisoner was let loose by the French or as a result of the jail having burned down for some reason, the jailor would have no recourse under law and thus having no recourse would have no liability. But in fact the prisoner was let loose

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[79] See Holmes, Common Law, pp. 130-162. Also see Emanuel, Property, pp. 12-16 for a simple explanation. In Emanuel presentation the bailee has a duty during the possession and a duty to redeliver. During possession the duties depend on who is benefiting and as a result there may be varying levels of care required. If there is a mutual benefit, say the bailor get the property delivered and the bailee gets paid for the transport, then the level of care is ordinary diligence; if the bailor is the sole beneficiary, say the transporter is doing a favor, then gross negligence is the standard; if it benefits the bailee only, this requires extraordinary care; and if it is involuntary bailment, say the packet just ends up on my network and nobody pays me and I agree to just hand it off, there is a standard of slight care, namely I can't just throw it away.

[80] See Pluncknett, Common Law, p 478 and Holmes, Common Law, p. 140. Pluncknett provides a more up to date analysis and Pluncknett also integrates bailment with common carriage. We shall discuss that issue next. Holmes when he discusses Marshal has preceded it with the case of the locked chest, in 1315 under Edward II. The locked chest case was one where the bailee had a chest which was locked and the goods or property was in the locked chest. The chest was stolen but while locked. If the goods had been stolen with the chest open the bailee was liable but since the chest was closed when stolen then the bailee had kept his duty and was not liable. Thus in the Internet world one could say if I encrypted my packet and a third party intercepted it the carrier was not liable unless he decrypted the packet. However it does not release the bailee or carrier from a duty. The next case was once under Edward III which we leave to the reader. http://www.law.harvard.edu/library/collections/special/online-collections/common_law/index.php

by a subject of the King, and the jailor had recourse against these subjects and thus was liable. The issue is that as a bailee the responsibility is great to hold the package of goods.

In today's world we still have many cases of bailment. A simple case is when we take our car and place it in a garage where it is parked for us. The bailment is the car, the bailor is ourselves and the bailee is the garage. The garage has a duty of care. Both we and the garage benefit; we obtain a parking space and the garage gets paid. Also the garage may have a claim against us and use the care as a means to collect if we do not pay.

Thus bailment is a long standing concept in which one party having a property, personal property, such as a chattel, establishes a bailment with a bailee to transport or hold the property for a period of time. This results in multiple duties of care and also bailment has a history of over a thousand years and is a key element of our common law system.

Most importantly, bailment was a means to allow commerce. It allows the ideas of property law, possession and contract to be combined to have goods move from one point to another. We will argue that the principles of bailment are key to understanding the Internet.

6.5 Carriage and Common Carriage

Common carriage has been around since at least 1601[81]. However the name "Carryer" was first seen in 1563, thus we know that there may have been a presence of such at that time. In fact Pluncknett notes that the actual term common carrier was earliest found in 1392. Thus we know that the concept of a common carrier has been around for quite a long time. Common carriage was developed to limit the liability of the bailment concept. Ships were to be treated as common carriers and their liability was limited by Acts of God, a termed allegedly coined just for that purpose. Pluncknett further notes:

"...in Forward v Pittard (1785) he (Lord Mansfield) treated the words literally....held a (common) carrier liable for what was certainly an inevitable accident....he(Lord Mansfield) used a striking phrase..."a (common) carrier is in the nature of an insurer""[82]

Noam defines common carriage as follows[83]:

" .... "[w]hether a carrier is a common carrier ... does not depend upon whether its charter declares it to be such, ... but upon what it does."[84] *The following factors are important in determining common carriage: service is regular, customers are not readily predictable and are changeable, the carrier solicits business from the general public, for example by advertising, law and regulations define the responsibilities of the parties."*

Holmes then goes and defines what he means by common carriers:

"... who are common carriers...Besides, hoymen and masters of ships were not originally held because they were common carriers, and they were all three treated as co-ordinate species...We do not get a new and single principle by simply giving a single name to all the cases to be accounted for. If there is a sound rule of public policy which ought to impose a special responsibility upon common carriers, as those words are now understood, and upon no others, it has never yet been stated. If, on the other hand, there are considerations which apply to a particular class among those so designated,--for instance, to railroads, who may have a

[81] See Pluncknett, Common Law, p.480.

[82] See Pluncknett, Common Law, p. 482.

[83] See Noam, Beyond Liberalization II, 1994.

[84] *United States v. Brooklyn Eastern Distr. Terminal,* 249 U.S. 296 (1919).

private individual at their mercy, or exercise a power too vast for the common welfare,--we do not prove that the reasoning extends to a general ship or a public cab by calling all three common carriers."

Namely Holmes is cautious in extending the term too broadly. He then continues;

"If there is no common rule of policy, and common carriers remain a merely empirical exception from general doctrine, courts may well hesitate to extend the significance of those words. Furthermore, notions of public policy which would not leave parties free to make their own bargains are somewhat discredited in most departments of the law. Hence it may perhaps be concluded that, if any new case should arise, the degree of responsibility, and the validity and interpretation of any contract of bailment that there may be, should stand open to argument on general principles, and that the matter has been set at large so far as early precedent is concerned."

Finally Holmes states:

"I have treated of the law of carriers at greater length than is proportionate, because it seems to me an interesting example of the way in which the common law has grown up..."

Now we will use what is currently accepted definition of common carriage. The law defines a common carrier as follows:

***"47 USC 5, I, 153, (10) Common carrier** The term "common carrier" or "carrier" means any person engaged as a common carrier for hire, in interstate or foreign communication by wire or radio or interstate or foreign radio transmission of energy, except where reference is made to common carriers not subject to this chapter; but a person engaged in radio broadcasting shall not, insofar as such person is so engaged, be deemed a common carrier."*

This is a classic, but somewhat circular, definition and it is an artifact of the Interstate Commerce Commission ("ICC") legislation which predated the FCC. In fact it was the ICC which managed telecommunications until 1934. Thus physical commerce was, and to many a degree is, the paradigm against which common carriage in telecommunications is viewed.[85]

The FCC has from time to time attempted to provide more clarity on the term and more importantly the Courts have intervened and assisted in this process. In one attempt in the NARUC v FCC decision (1976, 533 F.2nd 601 D.C. Circuit) the Court stated[86]:

"...we set forth our understanding of the common carrier concept...we concluded the circularity and uncertainty of the common carrier definitions set forth in the statute...an examination of the common carrier law reveals the primary sine qua non of common carrier status is a quasi-public character, which arises out of the undertaking "to carry for all people indifferently...this done not mean that the particular services offered must be practicably available to the entire public...a second prerequisite...it is the requirement...that the system be such that customers" transmit intelligence of their own design and choosing"."

The D.C. Court in this case provides two requirements: (i) carrying in an indifferent manner, (ii) customers choose what the want to send. There is the stare decisis issue here by having the Courts define what Congress did not. More importantly, there is a long list of common law interpretations which are the basis for the Court's decisions.

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[85] See Brenner, *Law and Regulation of Common Carriers*, Westlaw 1992; this provides an excellent summary of the field. The work by Huber, Kellogg and Thorne. *Federal Telecommunications Law*, Aspen, 1999, is a bit biased in the opinion of the author since Thorne is a General Counsel of Verizon and has taken public polemical positions in favor of Verizon.

[86] See Brenner, Common Carrier, p.40. Brenner has developed a detailed analysis of common carriage prior to the 1996 Act changes. The work of Brenner is an excellent historical overview of the issues at that time.

This then leads to the final issue. Under a common law regime, as we shall discuss i this section, is the telecommunications carrier who provides broadband a common carrier? The answer is clearly yes, it is in their very nature to carry in an indifferent manner and allowing the buyer to assemble the communications. The elements are there mainly because the elements are at the heart of the Internet. The Internet pushes the intelligence to the edge of the network, not in the center, and the ability to discriminate any packet from another is non-existent.

Recall from the bailment discussion, the bailee is given a locked packet, in this case an encrypted packet, and the duty of care incumbent on the bailee, in this case the common carrier, is to keep the package closed. Open the packet and look and the bailee has many liabilities. As we shall also see, this may not be a fact under administrative code, namely the FCC can declare something a common carrier for regulatory reasons. The declaration for common law reasons is different and stands on its own. Thus it is in the nature of what any Internet transport providers that under the aegis of common law they are by precedent a common carrier, albeit cable is expressly by administrative law not one[87].[88]

As we have noted above Common Carriage law has been in place in the English speaking world since 1250 AD, at the least.[89] It is a part of common law and tort law.[90] The reasons for its institution are several fold and many are based in the process of transporting property from one point to another. One of the first reasons for having to establish common carriage was that it establishes a legal relationships between three parties; the sender of some property, the receiver of some property and the transporter of that property between the two parties. Thus I may want to send a package from Oxford to Cambridge and I do not want to go there myself. I thus hire a third party to whom I entrust my package. The third party takes the package, but does not own it or take any rights in the package, transports it to the destination and then hands it over to the party in Cambridge.

Simple idea, but like so many things in Common Law, it took many years and centuries to work through the common law legal system and work out the details. These ideas focused on all the issues relating to the sending of "my" property to another by using a third party, without changing title of the property and while having the third party carrier of my property having a certain degree of responsibility. The third party never took legal possession of my property. It was mine and remained mine even though I gave it to that third party for transport only. The third party did however assume a duty and responsibility.

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[87] See Huber, Telecom Law, p. 1165.

[88] This argument does raise an interesting issue. If one accepts the construct: common law, leads to property, leads to bailment, leads to common carriage leads to tort protection, then what of the cable company. We argue the telco is protected by a common carriage position. Is the cable company then liable under bailment, namely are they liable not for the common carrier liability of the cost to carry, but the cost of the loss. We believe that indeed that may very well be. They have accepted the property, transported, eschewed common carriage, and are acting as a bailee. They have substantial liability unless then can argue exemptions under contract law, which may be the case.

[89] The term common carriage was originally understood as bailment. Bailment is the delivery of goods or personal property of one person to another. The person doing the delivery is did not won the property but was in trust of the property. Oliver Wendell Holmes, in *The Common Law*, 1881, Chapter V spends the entire chapter o this concept. Bailment dates back to Salic Law and the legal ownership and property provisions for cows wandering fields obtaining feed.

[90] See Pluncknett, *A Concise History of the Common Law*, 1929. In Plunckett, p. 482 he notes that the first recorded time in English history there was a family called Carryer, whose trade was carriage, and this was in 1563. He also relates a statement in 1392 also relating to carriage. The concept was well founded at that time in Common Law. Edward III in both 1368 and 1373 (Plunckett p 481) also establishes a common carriage.

Second, it affects smooth and effective commerce. It means that transporters of goods from docks pay a going rate and that the transporter does not take any liability for what is inside the container. Lloyds of London was established to insure the cargo. It was not the owner of the ship who inspected and took responsibility for the cargo. It was a separate entity which got involved in what was inside the packages. In fact the ship owners were held harmless for the packages based upon the fact that the transported sealed goods and had no control of the contents.

Third, is the issue of efficient interconnection between common carriers. In 1816, in New Hampshire, there was a case typifying such interconnection, between two horse carriage lines.[91] The courts in New Hampshire ruled in favor of efficient and open interconnection of these two separate carriers. Thus the many elements of common carriage that we know and accept are the retention of ownership, the anonymity of the contents to the carrier and the ability and requirement to interconnect between carriers.

There is an important issue to be discussed in the context of common carriage. The issue is the one relating statutory common carriage as defined in 47 USC and the common carriage under common law. We have been discussing the latter. However. the former has changed for Verizon and expectedly the other incumbents. In December 2004 Verizon requested forbearance under 47 USC 160 from statutory common carriage requirements. Those requirements would require Verizon to list a tariff, to provide an interface, possibly unbundle, and many of the other requirements of common carriers.[92] The FCC looked at the petition and did not act. By not acting the FCC tacitly gave Verizon the forbearance. It was a two to two deadlock that had the two Republicans in the Verizon camp and the two Democrats in the people's camp.[93]

Verizon used 47 USC 160 requirements as follows:

"§ 160. Competition in provision of telecommunications service

(a) Regulatory flexibility

Notwithstanding section 332 (c)(1)(A) of this title, the Commission shall forbear from applying any regulation or any provision of this chapter to a telecommunications carrier or telecommunications service, or class of telecommunications carriers or telecommunications services, in any or some of its or their geographic markets, if the Commission determines that—

***(1)** enforcement of such regulation or provision is not necessary to ensure that the charges, practices, classifications, or regulations by, for, or in connection with that telecommunications carrier or telecommunications service are just and reasonable and are not unjustly or unreasonably discriminatory;*
***(2)** enforcement of such regulation or provision is not necessary for the protection of consumers; and*
***(3)** forbearance from applying such provision or regulation is consistent with the public interest."*

The FCC forbearance was based upon the Commissioners view that the three conditions were met. Let us look at them:

1. No regulation needed to ensure proper and fair charges, practices or classification. Clearly this whole debate goes to the heart of charges and practices! One would have to ask what was in the mind of the FCC in this failure to decide.

[91] Refer to 10 N.H. 481 (1839) as noted in an unpublished paper by Adam Candeub, *Common, Carriage at the Crossroads*, TPRC 2004.

[92] See Verizon Petition to FCC December 20, 2004 for forbearance under 47 USC § 160.

[93] See FCC News Release March 20, 2006.

2. Not required for protection of consumers: Clearly what we have been discussing herein is only consumer protection. We have argued property rights and consumer protection. Why has the FCC foresworn this duty. The Whitacre Conjectures were already well publicized at the time of the FCC's failure to act.

3. Consistent with the public interest. The public interest is best serviced by having a vibrant and competitive Internet. The FCC's actions clearly have destroyed that option.

However. we have argued herein that common carriage at common law is preserved. It is common law litigation by the consumers to seek their own protection.

6.6 Statutory Law and Transport

There are many statutory laws, rule, regulations as regards to telecommunications and its impact on the Internet[94]. The law in this area is 47 USC, the code which has been developed predicated on the law itself. This is administrative code law. When we discuss the issues of common carriage we are doing so under the rubric of common law not necessarily the administrative law as administered by the FCC.

6.7 Summary of Issues

In this section we have addressed multiple issues. Let us summarize our arguments and conclusions:

1. Property rights convey to a persona Internet traffic. The packets are the personal property of the individual under the understanding of common law.
2. The historical common law concept of bailment provides a basis for understanding the duties and obligations of the transporters of the data packets in an Internet environment. More specifically, we as the creators and owners of the Internet packet property retain ownership as the bailor and the bailee, namely the carrier, has duties based on over a thousand years of common law.
3. Common carriage is both a legal administrative law construct and a constructed accepted at common law. In fact the current administrative law construct, as stated in 47 USC, the rules of the FCC, being circular should be interpreted primarily at common law. Thus we can look to the transporter of our packets as a special type of bailee, namely a common carrier. This means that we can then use the duties of common carriers at common law for remedies and recourse.
4. Common law, as separate from administrative law, provides us individually with remedies in the invent of damages. Damages may result by the carrier applying an unlawful tax, a separate surcharge, on our packets. To do this clearly the carrier must open the packets and thus violating the duties of a bailee. Common law then is the proper ground for redress.
5. Administrative law is a way for the Government to view its relationship to the carrier. Common law is the way the individual view their relationship. Thus there may, and frequently is, a variance between the two.

[94] See Huber et al, Federal Telecommunications Law. The authors, especially Thorne, as a Verizon executive, bring a clearly biased view to this text but notwithstanding the text represent one of the more comprehensive accumulations of telecommunications law. There are however views and interpretations which one must be careful to place in context because of the author's relationships and loyalties.

7 REGULATORY CHANGES

In 1996 the Congress passed a new Telecom Act to update the FCC Act of 1934. This was one of the largest changes in the history of the Act. However over the past ten years the FCC has made drastic changes as well as the Courts making similar changes. In this section we outline those changes and how they relate to the Internet. The FCC's approach is to encroach more and more on the Internet and where possible make it look more and more like the old regulated telephone world. One could expect such a change but one is surprised as to how quickly this occurred. The collapse of the Telecom Market in 2001-2202 was just a opportunity for the FCC and the incumbents to create barriers to entry and establish new burdens while at the same time shedding burdens that the incumbent had to bar under the new Act. We review some of the recent changes as regards to the Internet in this Section and then attempt to analyze their impact.

7.1 FCC Decisions

The following eight decisions by the FCC to further clarify and implement the 1996 Telecom Act actually do more to demonstrate a severe regressive move from deregulation to regulation. In the more than seventy two years of the existence of the FCC these rulings have established the base for what may be viewed a regressive policy, one which we will attempt to show will slow broadband growth more than anything else.

7.1.1 FCC 02-77 Broadband over Cable Declaratory Ruling (March 2002)

The following summarizes the FCC decision making a cable modem an information service rather than a telecommunications service.

"In considering the issues before us we are guided by several overarching principles. First, consistent with statutory mandates, the Commission's primary policy goal is to "encourage the ubiquitous availability of broadband to all Americans."... we seek "to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation.".

Second, we believe "broadband services should exist in a minimal regulatory environment that promotes investment and innovation in a competitive market." In this regard, we seek to remove regulatory uncertainty that in itself may discourage investment and innovation. And we consider how best to limit unnecessary and unduly burdensome regulatory costs.

Third, in this proceeding, ... we seek to create a rational framework for the regulation of competing services that are provided via different technologies and network architectures. We recognize that residential high-speed access to the Internet is evolving over multiple electronic platforms, including wireline, cable, terrestrial wireless and satellite. By promoting development and deployment of multiple platforms, we promote competition in the provision of broadband capabilities, ensuring that public demands and needs can be met. We strive to develop an analytical approach that is, to the extent possible, consistent across multiple platforms.

For the reasons discussed below, we conclude that cable modem service, as it is currently offered, is properly classified as an interstate information service, not as a cable service, and that there is no separate offering of telecommunications service."

To better understand this we present the definitions of information and telecommunications services as used by the FCC[95]:

"(*41) INFORMATION SERVICE- The term information service means the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any*

[95] See 1996 Telecom Act, Definitions.

such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service....

(*48) TELECOMMUNICATIONS- The term telecommunications means the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received.*

(*49) TELECOMMUNICATIONS CARRIER- The term telecommunications carrier means any provider of telecommunications services, except that such term does not include aggregators of telecommunications services* ***(****as defined in section 226). A telecommunications carrier shall be treated as a common carrier under this Act only to the extent that it is engaged in providing telecommunications services, except that the Commission shall determine whether the provision of fixed and mobile satellite service shall be treated as common carriage...*

(*51) TELECOMMUNICATIONS SERVICE- The term telecommunications service means the offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used."*

The key to understanding the FCC is that one starts with the definition of Telecommunications and that the form or content is changing. This is clear. The Telecommunications Carrier and the Telecommunications Service follow from the fist definition. Now as to Information Service, it is not everything but Telecommunications Service, it does not say a change must occur, it was historically related to wars between the telephone companies and newspapers. This definition was to protect the newspaper industry in the context of the world in the 1980s. It was not designed to deal with the Internet world. In the 1995-1996 time period Congress and more particularly the FCC had not yet seen no less understood what the Internet would do. Thus one could argue that the service is clearly not Telecommunications due to the change clause but it begs the question if it is Information. The FCC says so for two reasons.

To free up the cable companies from cable regulation, another part of the code which the FCC rules over, but also to enable the FCC to have dominion over this technology. In reality the FCC in its wisdom could have reached an altogether different decision, Namely it could have decided that a cable modem was not a Telecommunications Service, was not controlled as a cable service under the Act, and the FCC had no interest in it at all. If a cable company wanted to run an amusement park, why should the FCC care. However this decision represents the continuing attempt to regulate everything despite the words of intent as shown above.

7.1.2 FCC 04-179 Unbundling of Incumbents Order (August 2004)

The 1996 Telecom Act had an unbundling clause. Namely it required the incumbent monopolist to unbundle essential elements of the network to permit competition. Such an element would be a local copper wire from the central office to the customer's premise. The monopolist would be required to provide a meet point, provide the element in a timely manner and at a reasonable price. Needless to say this never occurred and the FCC never even tried to enforce it. However certain large carriers such as AT&T did manage to obtain via litigation unbundled service elements, and the collection of these elements became a fully bundled local service (called a UNE, unbundled network element, or simply a fully equipped local loop). Thus AT&T could compete head to head with the monopolist and via the litigation rout could bundle their service elements at a competitive price....for a time. However the litigation resulted in the FCC being requested to deal with the issue. This ruling is the FCC's response.

The FCC states:

"Although we initiate a new proceeding to craft final unbundling rules that address the requirements of USTA II, we find that the pressing need for market certainty until we issue final unbundling rules warrants the implementation of a plan that will preserve for six months certain obligations as they existed on June 15, 2004, and then, during a subsequent six-month period, permit competitive LECs to access from incumbent LECs certain network elements at increased rates. Specifically, we conclude that the appropriate interim

approach here is to require incumbent LECs to continue providing unbundled access to switching, enterprise market loops, and dedicated transport under the same rates, terms and conditions that applied under their interconnection agreements as of June 15, 2004.... We emphasize at the outset that the twelve-month transition described herein is essential to the health of the telecommunications market and the protection of consumers.

While carriers can address short-term instability through negotiated modification of interconnection agreements, it appears that the change of law provisions found in carriers' interconnection agreements vary widely. While some agreements provide for periods of renegotiation in which parties would work to amend them, others immediately invalidate the affected provisions while renegotiations are proceeding...

There is credible evidence before us that some incumbents have informed competitive LECs of their intention to initiate proceedings to curtail their UNE offerings, and that at least one BOC has announced its intention to withdraw certain UNE offerings immediately. While such actions are permitted under the court's holding in USTA II, they would likely have the effect of disrupting competitive provision of telecommunications services to millions of customers.

Moreover, whether competitors and incumbents would seek resolution of disputes arising from the operation of their change of law clauses here, in federal court, in state court, or at state public utility commissions, and what standards might be used to resolve such disputes, is a matter of speculation. What is certain, however, is that such litigation would be wasteful in light of the Commission's plan to adopt new permanent rules as soon as possible. Therefore, consistent with our statutory mandate to protect the public interest, we adopt the following interim and transition requirements.

***.....** 18. Our plan to issue revised unbundling rules on an expedited basis does not alone provide the requisite market stability in the near term. The absence of clear rules, as stated above, threatens to disrupt the business plans of competitive carriers and their service to millions of customers that rely on competitive service offerings. This is a risk to the public interest too great to bear unheeded.*

The public interest is best served by clarity with regard to the rates, terms and conditions under which network elements must be made available to requesting carriers. Specifically, we require that... incumbent LECs shall continue providing unbundled access to switching... In order to allow a speedy transition in the event we ultimately decline to unbundle switching, enterprise market loops, or dedicated transport, we expressly preserve incumbent LECs' contractual prerogatives to initiate change of law proceedings to the extent consistent with their governing interconnection agreements..."

7.1.3 FCC 04-290 Unbundling of Incumbents Order on Remand (February 2005)

"3. This Order imposes unbundling obligations in a more targeted manner where requesting carriers have undertaken their own facilities-based investments and will be using UNEs in conjunction with self provisioned facilities. By adopting this approach, we spread the benefits of facilities-based competition to all consumers, particularly small- and medium-sized enterprise customers. We believe that the impairment framework we adopt is self-effectuating, forward-looking, and consistent with technology trends that are reshaping the industry. As we recognize below, the long distance and wireless markets are sufficiently competitive for the Commission to decline to unbundle network elements to serve those markets. Our unbundling rules are designed to remove unbundling obligations over time as carriers deploy their own networks and downstream local exchange markets exhibit the same robust competition that characterizes the long distance and wireless markets. ....

6. 5. The executive summary of this Order is as follows:

> *• **Unbundling Framework.** We clarify the impairment standard adopted in the Triennial Review Order in one respect and modify our application of the unbundling framework in three respects. First, we clarify that we evaluate impairment with regard to the capabilities of a reasonably efficient competitor. Second, we set aside the Triennial Review Order's "qualifying service" interpretation of section 251(d)(2), but prohibit the use of UNEs exclusively for the provision of telecommunications services in*

the mobile wireless and long distance markets, which we previously have found to be competitive. Third, in applying our impairment test, we draw reasonable inferences regarding the prospects for competition in one geographic market based on the state of competition in other, similar markets. Fourth, we consider the appropriate role of tariffed incumbent LEC services in our unbundling framework, and determine that in the context of the local exchange markets, a general rule prohibiting access to UNEs whenever a requesting carrier is able to compete using an incumbent LEC's tariffed offering would be inappropriate.

• ***Dedicated Interoffice Transport.*** *Competing carriers are impaired without access to DS1 transport except on routes connecting a pair of wire centers, where both wire centers contain at least four fiber-based collocators or at least 38,000 business access lines. Competing carriers are impaired without access to DS3 or dark fiber transport except on routes connecting a pair of wire centers, each of which contains at least three fiber-based collocators or at least 24,000 business lines. Finally, competing carriers are not impaired without access to entrance facilities connecting an incumbent LEC's network with a competitive LEC's network in any instance. We adopt a 12-month plan for competing carriers to transition away from use of DS1- and DS3- capacity dedicated transport where they are not impaired, and an 18-month plan to govern transitions away from dark fiber transport. These transition plans apply only to the embedded customer base, and do not permit competitive LECs to add new dedicated transport UNEs in the absence of impairment. During the transition periods, competitive carriers will retain access to unbundled dedicated transport at a rate equal to the higher of (1) 115 percent of the rate the requesting carrier paid for the transport element on June 15, 2004, or (2) 115 percent of the rate the state commission has established or establishes, if any, between June 16, 2004 and the effective date of this Order.*

• ***High-Capacity Loops.*** *Competitive LECs are impaired without access to DS3-capacity loops except in any building within the service area of a wire center containing 38,000 or more business lines and 4 or more fiber-based collocators. Competitive LECs are impaired without access to DS1-capacity loops except in any building within the service area of a wire center containing 60,000 or more business lines and 4 or more fiber-based collocators. Competitive LECs are not impaired without access to dark fiber loops in any instance. We adopt a 12-month plan for competing carriers to transition away from use of DS1- and DS3-capacity loops where they are not impaired, and an 18-month plan to govern transitions away from dark fiber loops. These transition plans apply only to the embedded customer base, and do not permit competitive LECs to add new high-capacity loop UNEs in the absence of impairment. During the transition periods, competitive carriers will retain access to unbundled facilities at a rate equal to the higher of (1) 115 percent of the rate the requesting carrier paid for the unbundled loops on June 15, 2004, or (2) 115 percent of the rate the state commission has established or establishes, if any, between June 16, 2004 and the effective date of this Order.*

• ***Mass Market Local Circuit Switching.*** *Incumbent LECs have no obligation to provide competitive LECs with unbundled access to mass market local circuit switching. We adopt a 12-month plan for competing carriers to transition away from use of unbundled mass market local circuit switching. This transition plan applies only to the embedded customer base, and does not permit competitive LECs to add new switching UNEs. During the transition period, competitive carriers will retain access to the UNE platform (i.e., the combination of an unbundled loop, unbundled local circuit switching, and shared transport) at a rate equal to the higher of (1) the rate at which the requesting carrier leased that combination of elements on June 15, 2004, plus one dollar, or (2) the rate the state public utility commission establishes, if any, between June 16, 2004, and the effective date of this Order, for this combination of elements, plus one dollar."*

What this decision did was to gut any attempt by a new entrant to obtain unbundled back haul networks. Thus, for example, if a small CLEC wanted to interconnect towns with dark fiber and wanted to obtain a dark fiber from say Verizon, this order prohibited that practice. Now, on a going forward basis, if one wanted to have a fiber backbone one needed to build the total facility. This in one way creates a potential for gross overbuilding if it were economically viable, and on the other hand it re-enforces the monopoly strength of the RBOC.

7.1.4 FCC 05-78 Un-regulating Broadband Order (March 2005)

The issue in this order is the fact that DSL competitors wanted to have DSL elements covered under the unbundling regulations. The Commission in its wisdom in this order totally deregulates DSL, and further the FCC takes sole and total control over the DSL market. Thus companies like Covad and others are placed in a less economically favorable position on a going forward basis. Specifically the FCC states:

"16. On December 9, 2003, BellSouth filed its request for a declaratory ruling requesting that the Commission preempt state commission decisions that require incumbent LECs to provide DSL service to end users utilizing competitive LEC UNE voice lines. Specifically, BellSouth bases its request on three grounds. First, BellSouth asserts that the state decisions conflict with, and substantially prevent the implementation of, the Commission's unbundling rules in the Triennial Review Order. Second, BellSouth argues that the state commission decisions are an unlawful regulation of information services. Third, BellSouth avers that the state commission decisions conflict with the Commission's jurisdiction as the exclusive regulator of the provision of interstate DSL services..."

The following is the rather less than clear statement of the FCC that they will not force unbundling of the loop for DSL. Namely if a competitor wants the loop they must pay for a fully bundled loop at the then going rate even though they want a portion of it. The FCC states that the loop, albeit dividable into frequency bands, must be sold as a non-disaggregated element. The FCC states this as follows:

"24. As an initial matter, we find that the state commission requirements that BellSouth provide DSL Internet access service over the high frequency portion of a competitive LEC's UNE loop establish unbundling requirements that are properly evaluated under section 251(d)(3)(A). .... We find that state decisions that require BellSouth to provide DSL service over the HFPL while a competitive LEC provides voice service over the low frequency portion of a UNE loop facility effectively require unbundling ....Although a competitive LEC officially leases the entire loop, state commission requirements that require BellSouth to provide DSL over the same loop effectively take back the HFPL from the competitive LEC, thus leaving the competitive LEC with only the remaining LFPL. In effect, therefore, this scenario requires an incumbent LEC to provide unbundled access to only the LFPL, an element that the Commission expressly declined to unbundle....

26. Specifically, state commission decisions that require BellSouth to provide DSL service over the high frequency portion of a competitive LEC's UNE loop violate section 251(d)(3)(B) because such decisions directly conflict and are inconsistent with the Commission's rules and policies implementing section 251. The Commission concluded in the Triennial Review Order that unbundling the LFPL "is not necessary to address the impairment faced by requesting carriers because we continue (through our line splitting rules) to permit a narrowband service-only competitive LEC to take full advantage of an unbundled loop's capabilities by partnering with a second competitive LEC that will offer xDSL service." Importantly, the Commission supported its determinations with rules that enable a competing carrier that does not provide all of the services a customer may want, to team with another competing carrier in order to provide other complementary services over the same loop facility. This determination directly addresses incumbent LECs' 251(c) unbundling obligations relating to the provision of DSL service. We note that the D.C. Circuit affirmed these conclusions.

27. State requirements that impose on BellSouth a requirement to unbundle the LFPL do exactly what the Commission expressly determined was not required by the Act and thus exceed the reservation of authority under section 251(d)(3)(B). Indeed, a U.S. District Court recently held that a state commission requirement for an incumbent LEC "to continue to provide all existing data services in the [HFPL] . . . to any customer that chooses [the competitive LEC] as their local service carrier for voice . is functionally identical to compelled unbundling of the HFPL and LFPL and therefore cannot be sustained as consistent with federal law." State decisions that require BellSouth to provide its DSL service over a competitive LEC's leased UNE loop facility impose a condition on the UNE facility that effectively unbundles the LFPL, and is therefore inconsistent with federal law.....

30. As stated above, the Commission based it decision not to unbundle the LFPL on the availability of line splitting between competing carriers in order to advance the goals of the Act by spurring "innovative arrangements between voice and data competitive LECs and greater product differentiation between the incumbent LECs' and the competitive LECs' offerings." Under these state commission decisions, incumbent LECs and competitive LECs would face a decidedly different set of incentives for the deployment of broadband facilities. Thus, these state requirements undermine the effectiveness of the incentives for deployment, including the advancement of section 706 goals that were at the heart of the Commission's mass market loop unbundling rules, and therefore do not pass muster under section 251(d)(3)(C) of the Act."

7.1.5 FCC 05-150 Universal Service Order (September 2005)

The issue of universal service is one which has seen a significant amount of debate[96]. Universal Services is the mandate to provide services by any carrier to any person not individually financially able to obtain the service in the area in which the inhabit. Namely the low income and rural customers. The universal services provisions are as follows from FCC:

" (b) UNIVERSAL SERVICE PRINCIPLES- The Joint Board and the Commission shall base policies for the preservation and advancement of universal service on the following principles: (1) ***QUALITY AND RATES.....****-(2)* ***ACCESS TO ADVANCED SERVICES****- ..... (3)* ***ACCESS IN RURAL AND HIGH COST AREAS****- ..... (4)* ***EQUITABLE AND NONDISCRIMINATORY CONTRIBUTIONS*****.....**

(c) DEFINITION (1) IN GENERAL- Universal service is an evolving level of telecommunications services that the Commission shall establish periodically under this section, taking into account advances in telecommunications and information technologies and services..... such telecommunications services; (A) are essential to education, public health, or public safety; (B) have, through the operation of market choices by customers, been subscribed to by a substantial majority of residential customers; (C) are being deployed in public telecommunications networks by telecommunications carriers; and (D) are consistent with the public interest, convenience, and necessity....."

Universal service has been in effect de facto since the Kingsbury decision of 1913.[97]This implicitly allowed AT&T to retain its monopoly subject to the agreement to provide, ultimately, universal service. The universal service would mean that there would be access to all people to telephone services and that for poor people that service would be subsidized. The state PUCs then followed up on this and embodied this in state regulatory requirements. In effect, AT&T and the BOCs were transferring wealth fro the "rich" to those who could not pay for such services, either because of their income or because the costs to provide services to that individual would be prohibitive. This was then an enforced payment, established and managed by the BOCs, for the purpose of collecting moneys from the haves for redistribution by the BOCs to what was perceived as the have nots. Needless to say this is per se taxation. From a Constitutional perspective such rights inure solely to the states and the Federal governments and under the Commerce Clause it is highly problematic that any independent third party has any right to tax especially as regards to interstate commerce. Needless to say there has never been a challenge her.

The Universal services fund was and still is a taxation by the BOCs to redistribute income. It also is a pool of funds to be used by them as a vehicle to bar competition. The universal services issue however goes to the heart of the interconnection issue. The RBOCs have used this ruse as a means to control competition in two ways. First, in interexchange access they have charged an access fee disproportionately higher than costs since it was then used as a basis for universal services. This was the taxation issue. Second, they have used a

[96] See McGarty, Universal Service, 1996. In this paper the author looks at the universal service issue from a historical and a going forward basis. It was the authors view that this funds was a form of taxation and that in reality for every dollar the monopolist collected only ten cents actually went to provide true universal service. The remainder went into the pockets of the management of the monopolist not even to the shareholders.

[97]See Weinhaus, p. 9.

unilateral fee for any other interconnect player. Thus cellular companies, arguable providing local services, pay for initiating ad terminating calls. This has been changed by the new Act.

The Act has mandated a separate Universal Services fund to be managed by the Government, and thus the Governments powers to tax are valid and this is a legal act in contrast to the arguably illegal actions of the RBOCs in the pursuit of taxation. Second, the Act mandates balanced interconnection.

In late 2005 the FCC mandated that Universal Service now cover the Internet segments as well, namely VOIP. Their ruling walked a narrow line. On one hand they tried to justify their calling cable modems an information service and then call VOIP one subject to Universal service fees.

"5. In accordance with our responsibilities under the Act, and in light of the competitive and technical characteristics of the broadband Internet access market today, we take the following actions to establish a comprehensive regulatory framework for facilities-based providers of wireline broadband Internet access service:

• Consistent with the Supreme Court's opinion in NCTA v. Brand X, we determine that facilities-based wireline broadband Internet access service is an information service.

• Facilities-based wireline broadband Internet access service providers are no longer required to separate out and offer the wireline broadband transmission component (i.e., transmission in excess of 200 kilobits per second (kbps) in at least one direction) of wireline broadband Internet access services as a stand-alone telecommunications service under Title II, subject to the transition explained below. In addition, the Bell Operating Companies (BOCs) are immediately relieved of all other Computer Inquiry requirements with respect to wireline broadband Internet access services.

• Facilities-based wireline carriers are permitted to offer broadband Internet access transmission arrangements for wireline broadband Internet access services on a common carrier basis or a non-common carrier basis.

• Facilities-based wireline Internet access service providers must continue to provide existing wireline broadband Internet access transmission offerings, on a grandfathered basis, to unaffiliated ISPs for a one-year transition period.

• We affirm that neither the statute nor relevant precedent mandates that broadband transmission be a telecommunications service when provided to an ISP, but the provider may choose to offer it as such. We determine that the use of the transmission component as part of a facilities-based provider's offering of wireline broadband Internet access service to end users using its own transmission facilities is "telecommunications" and not a "telecommunication service" under the Act. 6.

We also address other important areas relating to the provision of broadband Internet access services including:

• We maintain the status quo for universal service during for a 270-day period pending resolution of the USF Contribution Methodology proceeding.

• We ensure no adverse impact on public safety through the continued requirement that voice over IP (VoIP) providers using wireline broadband Internet access facilities comply with E911 obligations.

• We confirm that this Order does not affect disability access obligations the Commission has adopted pursuant to its Title I ancillary jurisdiction, and we will continue to exercise our Title I authority, as necessary, to give full effect to the accessibility policy embodied in section 255.

• Nothing in this Order changes requesting telecommunications carriers' rights to access unbundled network elements (UNEs) under section 251 and our related implementing rules."

This ruling as seen in the writings above takes just another, but very potent element of telecommunications regulation and taxation and applies it to the Internet. The issue is what is IP based voice. The FCC creates a bright line where in the future no such line may exist[98].

7.1.6 FCC 05-153 CALEA and Broadband Access (September 2005)

CALEA is the Federal law requiring that all telecommunications service providers permit Federal Agencies to wiretap communications. It actually has been broadened to include any and all Internet communications. In the Fall of 2005 the FCC mandated that CALEA apply to all of the Internet.

"1. In this Order, we conclude that the Communications Assistance for Law Enforcement Act (CALEA) applies to facilities-based broadband Internet access providers and providers of interconnected voice over Internet Protocol (VoIP) service. This Order is the first critical step to apply CALEA obligations to new technologies and services that are increasingly relied upon by the American public to meet their communications needs"

This ruling is another step to control the Internet. CALEA is a burdensome regulation since the carrier must have installed hardware and software in anticipation of the Government seeking whatever it wants. The equipment may sit idle forever, and the cost then come out of the pockets of the carrier, and ultimately from the consumer.

7.1.7 FCC 06-56 CALEA on VOIP Order (May 2006)

In mid 2006 the FCC added specific rules that the Internet providers must meet in order to comply with CALEA. Specifically the FCC states:

"1. In the Second Report and Order (Second R&O), we address several issues regarding CALEA implementation raised in the Notice of Proposed Rulemaking (Notice) in this proceeding. In particular, the Second R&O addresses the assistance capabilities required, pursuant to section 103 of the Communications Assistance for Law Enforcement Act (CALEA), for facilities-based broadband Internet access providers and providers of interconnected Voice over Internet Protocol (VoIP). Telecommunications industry standard-setting bodies, working in concert with law enforcement agencies (LEAs) and other interested parties, are developing technical requirements and solutions for these providers, and we conclude that, absent the filing of a deficiency petition under CALEA section 107(b), it would be premature for the FCC to intervene in the standards development process. Additionally, we permit all carriers providing facilities-based broadband Internet access and interconnected VoIP services until May 14, 2007 to come into compliance with CALEA. Further, we require that all carriers providing facilities-based broadband Internet access and interconnected VoIP service to submit interim reports to the Commission to ensure that they will be CALEA-compliant by May 14, 2007. We also require that all facilities-based broadband Internet access and interconnected VoIP providers to whom CALEA obligations were extended in the First R&O come into compliance with the system security requirements in our rules within 90 days of the effective date of this Second R&O.

2. More generally, we herein specify mechanisms to ensure that telecommunications carriers comply with CALEA. Specifically, under the express terms of the statute, all carriers subject to CALEA are obliged to become CALEA-compliant...."

[98] See McGarty, IP Telephony and Multimedia Communications. In the IP paper the author presents a detailed description of what VOIP is. This paper was prepared ten years ago when the senior author constructed and operated one of the first global IP voice networks. The Multimedia paper addresses the issue of combining voice in a full multimedia environment. This paper was a result of research at MIT in the late 1980s. At that time the issue was that in a true multimedia environment one cannot distinguish voice from video from image etc. Thus we argue that the FCC's ruling is a best a niche ruling and ultimately has no relationship to reality. In fact the ruling we argue is just another step to attempt to regulate the Internet as it has the classic monopolistic telephone network.

7.1.8 FCC 06-94 Universal Service and VOIP (June 2006)

This ruling in mid 2006 finalizes the Universal Service tax on all VOIP carriers.

"2. In this Order, we take two critical actions to ensure the stability and sufficiency of the Fund. First, we raise the interim wireless safe harbor from its current 28.5 percent level to 37.1 percent. Second, we establish universal service contribution obligations for providers of interconnected voice over Internet Protocol (VoIP) service."

7.1.9 Summary of Recent FCC Actions

In the following Table we summarize the recent FCC actions.

FCC Ruling	*Action On Internet*	*Implication*
FCC 02-77 Broadband over Cable Declaratory Ruling	The FCC rules that cable modem broadband is an information service and not a telecommunications service	This means that Cable companies were now free from any potential telecommunications service provider regulation per the FCC. It does not mean than under common law that they cannot be held as a common carrier. The Cable companies were free from any duties of a telecommunications service provider such as access. Cable companies are not forced to open their networks. The Cable companies retain closed networks.
FCC 04-179 Unbundling of Incumbents Order	This is the FCC's first step in delimiting the unbundling. The FCC rules that the monopolist is not forced to sell unbundle the UNEs.	This is one of the final nails in the coffin of AT&T. Before this AT&T was trying to sell local access as part of its service offerings. It did so through UNE. This ruling stopped that process.
FCC 04-290 Unbundling of Incumbents Order on Remand	This is the FCC second step in stopping unbundling of broadband elements.	This order was the last unbundling order but the first to be directed at broadband. The monopolists were now allowed to not sell dark fiber to other competitors. This means that anyone who wants to compete with the monopolist must build a totally redundant facility in all its parts.

FCC 05-78 Un-regulating Broadband Order	The FCC takes the step in totally un-regulating the monopolists broadband. It allows them henceforth not to have any duty under the 1996 Act to provide access, interconnection or unbundling.	This was a key element in the monopolists strategy. Before this the monopolists argued that they would not build any broadband because they could be disintermediated by competitors who could get access to prices of their network at a marginal cost. The FCC folded and gave them monopoly power again. This ruling may be seen as a corollary of Kingsbury.
FCC 05-150 Universal Service Order	Universal services is a tax applied to monopoly services. In return for the monopoly the carrier agreed to provide service to everyone. The way the carrier did this was not out of its profits but by taxing the consumer and then using the tax itself. Universal service tax is the only tax in the US which is collected and used by a non Government entity. The FCC now burdened the Internet with this tax, specifically VOIP.	This eliminates any cost difference and forces prices up to the consumer. It takes away another advantage to a new entrant. The FCC again plays directly into the hands of the monopolists establishing another barrier to entry for new entrants.
FCC 05-153 CALEA and Broadband Access	The FCC applies the CALEA requirements.	This adds the costs to Internet providers no matter where they are to comply with CALEA.
FCC 06-56 CALEA on VOIP	The FCC specifies CALEA on VOIP.	Now makes VOIP fully compliant with all elements of classic monopolistic telephone service.
FCC 06-94 Universal Service and VOIP	This is the final taxing order on VOIP for universal service.	With this order VOIP now is taxes, it must meet CALEA, it is regulated like a telecommunications service and ultimately will be controlled in detail by the FCC. The FCC takes no note of that fact that such a service can be integrated as one of many mixed and indistinguishable elements in a multimedia communications network. The FCC, under the Martin Chairmanship, is retains a centrally controlled regulatory stranglehold on the Internet.

7.2 Supreme Court Rulings

The Supreme Court has had more and more to deal with the way telecommunications functions. Part of that is a result of interpreting the law and part is in dealing with people who have brought suit against the incumbents. We consider a few key ruling herein to provide a perspective of what the Court's recent thinking is.

7.2.1 NCTA et al v. Brand X No 04-277 June 27, 2005

The Brand X case was a case where a DSL seller wanted access to unbundled elements pursuant to the 1996 Act. The incumbent argued that the service was information and not telecommunications and not subject to the Act. The FCC held a hearing and went through the regulatory process and came up with the conclusion that indeed it was information and brand X had no rights. The Court's ruling was on the process the FCC used not on the merits of the conclusion. Specifically the Court said;

"Held: The Commission's conclusion that broadband cable modem companies are exempt from mandatory common-carrier regulation is a lawful construction of the Communications Act under Chevron and the Administrative Procedure Act. Pp. 8–32. 1. Chevron's framework applies to the Commission's interpretation of "telecommunications service.... (a) Chevron governs this Court's review of the Commission's construction.... Chevron requires a federal court to defer to an agency's construction, even if it differs from what the court believes to be the best interpretation, if the particular statute is within the agency's jurisdiction to administer, the statute is ambiguous on the point at issue, and the agency's construction is reasonable. .... The Commission's statutory authority to "execute and enforce" the Communications Act...give the Commission power to promulgate binding legal rules; the Commission issued the order under review in the exercise of that authority; and there is no dispute that the order is within the Commission's jurisdiction...."

7.2.2 535 US 467 Verizon v FCC May 2002

This case relates to the methods that the FCC used to establish rates for unbundling. The case like the previous goes through the issues of the FCC's process and authority. The result is that the Court agrees that the FCC has come up with a procedure using and accepted process. The Court holds:

In order to foster competition between monopolistic carriers providing local telephone service and companies seeking to enter local markets, provisions of the Telecommunications Act of 1996... and direct the Federal Communications Commission ...to prescribe methods for state utility commissions to use in setting rates for the sharing of those elements, ... "just and reasonable rates" must, inter alia*, be "based on the cost ....define the "forward-looking economic cost of an element [as] the sum of (1) the total element long-run incremental cost of the element [TELRIC,] and (2) a reasonable allocation of forward-looking common costs," ..., "incurred in providing a group of elements that "cannot be attributed directly to individual elements," ... and, most importantly, specify that the TELRIC "should be measured based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent['s] wire centers.....*

Held:

1. The FCC can require state commissions to set the rates charged by incumbents for leased elements on a forward-looking basis untied to the incumbents' investment. Because the incumbents have not met their burden of showing unreasonableness to defeat the deference due the FCC, see Chevron U. S. A. Inc. *v.* Natural Resources Defense Council, Inc., ...

(A) This Court rejects the incumbents' argument that "cost" ... requirement that "the ... rate ... be ... based on the cost ... of providing the ... network element" can only mean, in plain language and in this

particular technical context, the past cost to an incumbent of furnishing the specific network element actually, physically, to be provided, as distinct from its value or the price that would be paid for it on the open market. At the most basic level of common usage, "cost" has no such clear implication. A merchant asked about the "cost" of his goods may reasonably quote their current wholesale market price, not the cost of the items on his shelves, which he may have bought at higher or lower prices. ....”

7.2.3 *540 U.S. 398 (2004) Verizon Communications Inc. v. Law Offices Of Curtis V. Trinko, LLP*

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 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.

However the Supreme Court ruled as follows:

“Held: Respondent's complaint alleging breach of an incumbent LEC's 1996 Act duty to share its network with competitors does not state a claim under §2 of the Sherman Act. Pp. 5-16.

(a) The 1996 Act has no effect upon the application of traditional antitrust principles. Its saving clause--which provides that "nothing in this Act ... shall be construed to modify, impair, or supersede the applicability of any of the antitrust laws," ...

(b) The activity of which respondent complains does not violate pre-existing antitrust standards. The leading case imposing §2 liability for refusal to deal with competitors is Aspen Skiing Co. v. Aspen Highlands Skiing Corp.,... the Court concluded that the defendant's termination of a voluntary agreement with the plaintiff suggested a willingness to forsake short-term profits to achieve an anticompetitive end. ...

(c) Traditional antitrust principles do not justify adding the present case to the few existing exceptions from the proposition that there is no duty to aid competitors. Antitrust analysis must always be attuned to the particular structure and circumstances of the industry at issue. When there exists a regulatory structure designed to deter and remedy anticompetitive harm, the additional benefit to competition provided by antitrust enforcement will tend to be small, and it will be less plausible that the antitrust laws contemplate such additional scrutiny. Here Verizon was subject to oversight by the FCC and the PSC, both of which agencies responded to the OSS failure raised in respondent's complaint by imposing fines and other burdens on Verizon. Against the slight benefits of antitrust intervention here must be weighed a realistic assessment of its costs. ....."

What this ruling states is that the Court, although possibly accepting Trinko, felt Trinko too small and insignificant to apply the Antitrust laws and that the FCC and PUCs would be good enough. This clearly shows than any remedies available under even the antitrust laws are unenforceable to an individual.

There are however many options that the Antitrust laws could provide an aggrieved party assuming that one can get around the restrictions of Trinko.[99]

[99] See McGarty, Competition in the Local Exchange Markets (1996).

8 REFERENCES

1. Areeda, P., L. Kaplow, Antitrust Analysis, Little Brown and Co (Boston), 1988.
2. Atkinson, J. M., Barnekov, C. C., A Coasian Alternative to Pigovian Regulation, FCC Staff September 2004.
3. Baumol and Sidak, Toward Competition in Local Telephony, MIT Press (Cambridge, MA), 1994.
4. Bierman, H.S., L. Fernandez, Game Theory with Economic Applications, Addison Wesley (Reading, MA) 1998.
5. Bierman, H.S., L. Fernandez, Game Theory, Addison Wesley (Reading MA) 1998.
6. Block, W., Coase and Demsetz on Private Property Rights, Journal of Libertarian Studies, Vol 1No 2 pp 111-115 1977.
7. Bosselman F. et al., The Takings Issue, A Study of the Constitutional Limits of Government Authority to Regulate the Use of Privately-Owned Land Without Paying Compensation to the Owners (1973).
8. Brenner, D. L., Law and Regulation of Common Carriers, West (Boulder, CO) 1992.
9. Brousseau, E., Internet Regulation, University of Paris, 2002.
10. Candeub, A., Network Interconnection and Takings, Syracuse Law Review, No 329 2004.
11. Cantor, N. F., Imagining the Law, Harper (New York) 1999.
12. Coase, R. H., The Nature of the Firm, 1937.
13. Coase, R. H., The Problem of Social Cost, Journal of Law and Economics, October 1960.
14. Cole, D. H., P. Z. Grossman, The Meaning of Property Rights, January 2001.
15. Cunningham, R. A., The Law of Property, West (Boulder) 1993.
16. Darby, L. F. Darby, “Consumer Welfare, Capital Formation and Net Neutrality: Paying for Next Generation Broadband Networks,” 2006.
17. Darby, L. F., Consumer Welfare, Capital Formation and Net Neutrality. American Consumer Institute, June 2006.
18. Demsetz, H., Towards a Theory of Property Rights, The American Economic Review, Vol 57, May 1967.
19. Durkeminier, J., J. E. Krier, Property, Little Brown (Boston) 1988.
20. Dutta, P.K., Strategies and Games, MIT Press (Cambridge) 1999.
21. Economides, N. Network Externalities, NYU European Journal of Political Economy, January 1995.
22. Economides, N., A Monopolists Incentive to Invite Competitors, Global Communications, Elsevier (Amsterdam) 1993.
23. Ehrlich, J. W., Blackstone, Norse (San Carlos, CA) 1959.
24. Eisenberg, M. A. , The Nature of the Common Law, Harvard (Cambridge) 1988.
25. Emanuel, S., Property, West, 1993.
26. Epstein, R., Private Property and the Power of Eminent Domain (1985).

27. Faulhaber, G. R. Faulhaber and C. Hogendorn, “The Market Structure of Broadband Telecommunications”, The Journal of Industrial Economics, September 2000.

28. Faulhaber, G. R. Faulhaber, “Bottlenecks and Bandwagons: Access Policy in the New Telecommunications.”

29. Feinman, J. M., Un Making Law, Beacon (Boston) 2004.

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

31. Fried, C., "Protecting Property--Law & Politics," 13 Harvard Journal of Law and Public Policy 44 (1990).

32. Frieden, R., A Workable Analogy for Assessing Net Neutrality, Penn State.

33. Fudenberg, D., J. Tirole, Game Theory, MIT Press (Cambridge, MA), 1991.

34. Fulhaber, G., Bottlenecks and Bandwagons, The Law Review of Michigan State University, 677, 2002.

35. Fulhaber, G., C. Hogendorn, The Market Structure of Broadband Telecommunications, Journal of Industrial Economics, Vol XLVIII September 2000.

36. Fundenberg, D., J. Tirole, Game Theory, MIT Press (Cambridge) 1991.

37. Gibbons, R., Game Theory for Applied Economics, Princeton Univ Press (Princeton) 1992.

38. Gilo, D., Y. Spiegel, Network Interconnection with Competitive Transit, Information and Economic Policy. Vol 16 2004 pp. 439-458.

39. Hart, F. "Colonial Land Use Law and its Significance for Modern Takings Doctrine," 109 Harvard Law Review 1252 (1996).

40. Hayek, F. A., The Road to Serfdom, Chicago (Chicago(1994.

41. Henderson, J. M., R. E. Quandt, Microeconomic Theory, McGraw Hill (New York) 1971.

42. Holmes, O. W., The Common Law, Little Brown (Boston) 1963.

43. Holmes, Q.W., The Common Law, (Boston) Little Brown, 1881.

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

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

46. Huber, P., et al, Federal Telecommunications Law, Aspen (Boulder) 1999.

47. IP Telecommunications QoS (Quality of Service), Is Service Quality a Sustainable Metric?, MIT Internet Consortium, Aquila, Italy, June 2000.

48. Justinian, The Digest of Roman Law, Penguin (New York) 1979.

49. Kahn, A. E., The Economics of Regulation, MIT Press (Cambridge) 1988.

50. Kahn, R. E., V. G. Cerf, A Protocol for Packet Network Interconnection, IEEE COM 22, 1974.

51. Labovitz, C., et al, The Impact of Internet Policy and Topology, Microsoft.

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

53. Lee M. J., et al Emerging Standards for Wireless Mesh Technology, IEEE Wireless Comm April 2006 pp. 56-63.

54. Locke, J,, Two Treatises of Government, Cambridge (Cambridge) 1960.

55. McGarty, T. P. , Business Plans, Wiley (New York) 1988.

56. McGarty, T. P., A Précis on PCS Economics and Access Fees, presented at the NPC SC Seminar on "Wireless Technology and Policy Implications" at MIT Lincoln Laboratory, in Lexington, MA, May 18, 1994

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

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

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

60. 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.

61. McGarty, T. P., Applications of Multimedia Communications Systems for Health Care Transaction Management, HIMMS Conference, San Francisco, CA, January, 1991.

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

63. McGarty, T. P., Broadband Alternatives, Synergies of Fiber and Wireless, MIT Working Paper October, 2005

64. McGarty, T. P., Broadband Telecom Rate Projections, AMIA Conference, Spring, 1992 (Portland, OR).

65. McGarty, T. P., Cable Based Metro Area Networks, IEEE, JSAC-1, November, 1983.

66. McGarty, T. P., CATV for Computer Communications Networks, IEEE Computer Conference, Washington, DC, 1982.

67. McGarty, T. P., Communications Network Morphological and Taxonomical Policy Implications, Telecommunications Policy Research Conference, Solomon's Island, MD, September, 1992.

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

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

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

71. McGarty, T. P., Competition in the Local Exchange Market: An Economic and Antitrust Perspective, *MIT ITC Working Paper, September, 1977.*

72. McGarty, T. P., Current Telecommunications Legal Issues, Litigation v. Legislation: Is the 1996 Act a Beginning or an End?, MIT ITC Working Paper, December 2002.

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

74. McGarty, T. P., Economic Factors on International Internet/Intranet Telecommunications, MIT Research Program on Communications Policy Conference Internet Telephony Interoperability Forum, Bristol, England, June 11, 1997

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

76. McGarty, T. P., EFT Networks and Systems, CASHFLOW Magazine, November, 1981.

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

78. McGarty, T. P., Hybrid Cable and Telephone Computer Communications, Computer Conference, Washington, DC, 1983.

79. McGarty, T. P., Image Processing in Full Multimedia Communications, Advanced Imaging, pp 28-33, November, 1990.

80. McGarty, T. P., Impacts of Consumer Demands on CATV Local Loop Communications, International Communications Conference, Boston, MA, 1983.

81. 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.

82. McGarty, T. P., International IP Telephony, MIT ITC Working Paper, September, 1999.

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

84. McGarty, T. P., Internet Telephony Markets and Services, in Internet Telephony, MIT Press (Cambridge), 2001.

85. McGarty, T. P., Internet Voice: Regulatory and Legal Implications, Presented at the VocalTec Seminar on September 9, 1996, New York, NY.

86. McGarty, T. P., Local Area Wideband Data Communications Networks, IEEE EASCON, Washington, DC, 1981.

87. McGarty, T. P., Multimedia Communications: Architectural Alternatives, SPIE Conference, Boston, MA, September, 1991.

88. McGarty, T. P., Multimedia Session Management, IEEE Proceedings on Communications, 1990.

89. **McGarty, T. P.,** Municipal Broadband Networks, A Local Paradigm, Working Paper for Dutch Government, July, 2004.

90. McGarty, T. P., Municipal Broadband Networks: A Revised Paradigm of Ownership, MIT ITC Conference, December, 2002.

91. McGarty, T. P., Network Management and Control Systems, IEEE NOMS Conference, 1988.

92. McGarty, T. P., New Wireless Spectrum Policies, Alternatives to Outdated Spectrum Management, MIT Working Paper, March 2005.

93. McGarty, T. P., Peering, Transit, Interconnection: Internet Access In Central Europe, MIT Internet Consortium, January 2002.

94. McGarty, T. P., Privacy in the Internet Environment, MIT ITC Conference, December, 2002.

95. McGarty, T. P., Privacy in the Internet Environment, MIT ITC Working Paper, November 2002.

96. McGarty, T. P., QUBE: The Medium of Interactive Direct Response, Direct Marketers Compendium, Direct Marketing Association (New York), pp 162-165, 1982.

97. McGarty, T. P., Some Important Problems in Communications Theory, MIT Working Paper November 2005.

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

99. McGarty, T. P., Telecommunications Infrastructure, Technology, and Policy in Russia, A Plan for the Development of an Information Based Economy, Russian Freedom Channel Report, September, 1997.

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

101. McGarty, T. P., The Confluence of Policy and Technology in Cable Communications, Communications Symposium, Harvard University, New York, 1982.

102. 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.

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

104. McGarty, T. P., The Evolution of International Internet Telephony, TPRC, Arlington VA, September 2000.

105. McGarty, T. P., The Evolutionary Processes in Telecommunications, MIT Working Paper, January 2006

106. McGarty, T. P., The Hidden Cost of Broadband, "The Franchise", Working Paper Telmarc, November, 2004.

107. McGarty, T. P., The Imminent Collapse of the Telecommunications Industry, MIT ITC Working Paper, August, 2002.

108. McGarty, T. P., The Impact of Broadband Options on the Disaggregation of the Media Industry, Telmarc Working Paper, September, 2004.

109. McGarty, T. P., The Internet Protocol (IP) and Global Telecommunications Transformation, Tufts University, Fletcher School, March, 1999.

110. McGarty, T. P., Virtual Global Telcos: International Internet Telephony Architectures, in Internet Telephony, MIT Press (Cambridge), 2001.

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

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

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

114. McGarty, T. P., Wireless: The Challenge of Using Bandwidth Intelligently, presented at the Symposium on Communications , Optics and Related Topics, held in honor of the 60th birthday of Professor Robert S. Kennedy, at Endicott House of the Massachusetts Institute of Technology, June 4, 1994

115. Noam, E., Beyond Liberalization II: The Impending Doom of Common Carriage, Columbia University CITI White Paper, March 1994.

116. Pipes, R., Property and Freedom, Knopf (New York) 1999.

117. Plucknett, T. F., History of Common Law, Little Brown (Boston) 1929.

118. Posner, R. A., Economic Analysis of Laws, Little Brown (Boston) 1992.

119. Posner, R.A., Overcoming Law, Harvard Press (Cambridge) 1995.

120. Pound, R., The Spirit of the Common Law, Marshall Jones (Boston) 1922.

121. Rial J. S., Origins of Common Law, December 2002.

122. Robert Bork, The Tempting of America: The Political Seduction of the Law (1990).

123. Rochet, J., J. Tirole, Platform Competition in Two Sided Markets, IDEI, November 2001.

124. Rochet, J., Tirole, J., Two Sided Markets, IDEI, March 2004.

125. Saltzer, J. H., et al. End to End Arguments in System Design, IEEE 1981.

126. Schumpeter, J. A., Capitalism, Socialism, and Democracy, Harper (New York) 1975.

127. Sprankling, J. G., Understanding Property Law, Bender (Danvers, MA) 1999.

128. Spulber, D. F., Regulation and Markets, MIT (Cambridge) 1989.

129. Stake, J. E., The Property Instinct, The Royal Society (London) November 2004.

130. Stein, P. Roman Law, Cambridge (New York) 1999.

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

132. The Internet Protocol and the Creative Destruction of Revenue, in Creative Destruction, MIT Press (Cambridge), 2001.

133. Thomas, D. A., Locke, Routledge (London) 1995.

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

135. Tirole, J., The Theory of Industrial Organization, MIT Press (Cambridge, MA), 1988.

136. Tirole, J., The Theory of Industrial Organization, MIT Press (Cambridge) 1990.

137. Treanor, W. M. "The Original Understanding of the Takings Clause and the Political Process," 95 Columbia Law Review 782 (1995).

138. Van Caenegem, R. C., The Birth of the English Common Law, Cambridge (New York) 1988.

139. Viscusi, W.K., et al, Economics of Regulation and Antitrust, MIT Press (Cambridge) 2000.

140. Vives, X, Oligopoly Pricing, MIT Press (Cambridge) 1999.

141. Weber, M. Social and Economic Organization, Free Press (New York) 1947.

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

143. Xia, J., L. Gao, On the Evaluation of AS Relationship Inferences, Univ Mass.

144. Yoo, C. S., Would Manipulating Broadband Network Neutrality Help or Hurt Competition, Journal Telecom and High Tech Law, 2004.

145. Yoo, C., Beyond Network Neutrality, Harvard Journal of Law and Technology, Fall 2005.

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9 APPENDIX A INTERNET DATA

Internet Carriers

From: http://www.renesys.com/products_services/market_intel/rankings/

Customer Base

From a global perspective, view the top 25 service providers who have the largest number of customer networks:

Last updated on 27 Jun 2006

Customer Base (Top 25)

1 Sprint AS 1239

2 Level 3 Communications, LLC AS 3356

3 UUNET Technologies, Inc. AS 701

4 AT&T WorldNet Services AS 7018

5 NTT America, Inc. AS 2914

6 Global Crossing AS 3549

7 Savvis AS 3561

8 Qwest AS 209

9 TeliaNet Global Network AS 1299

10 Cogent Communications AS 174

11 Teleglobe Inc. AS 6453

12 Cable & Wireless AS 1273

13 KDDI Corporation AS 2516

14 China Telecom AS 4134

15 Deutsche Telekom AG AS 3320

16 France Telecom AS 5511

17 Telecom Italia Sparkle AS 6762

18 Abovenet Communications, Inc AS 6461

19 DoD Network Information Center AS 721

20 JAPAN TELECOM CO.,LTD. AS 4725

21 Level 3 Communications, Inc. AS 7911

22 Beyond The Network America, Inc. AS 3491

23 MCI EMEA - Commercial IP service provider in Europe AS 702

24 BB TECHNOLOGY Corp. AS 17676

25 CNCGROUP China169 Backbone AS 4837

Customer Growth

From a global perspective, view the top 25 service providers who have increased the number of customer networks they provide service to over the past month:

Last updated on 27 Jun 2006

Customer Growth (Top 25)

1 Sprint AS 1239

2 UUNET Technologies, Inc. AS 701

3 AT&T WorldNet Services AS 7018

4 Comcast Cable Communications, Inc. AS 7922

5 KDDI Corporation AS 2516

6 Deutsche Telekom AG AS 3320

7 Reach Network Border AS 4637

8 Comcast Cable Communications, Inc. AS 23253

9 Cogent Communications AS 174

10 Abovenet Communications, Inc AS 6461

11 Beyond The Network America, Inc. AS 3491

12 France Telecom AS 5511

13 Savvis AS 3561

14 Cable & Wireless AS 1273

15 Asia Netcom Corporation AS 10026

16 Comcast Cable Communications, Inc. AS 33651

17 KPN Internet Backbone AS 286

18 IIJNET AS 2497

19 KDDI Corporation AS 4716

20 Comcast Cable Communications, Inc. AS 33668

21 Allstream Corp. Corporation Allstream AS 15290

22 MCI EMEA - Commercial IP service provider in Europe AS 702

23 China Telecom AS 4134

24 Core Internet AT&T Chile AS 6429

25 Broadwing Communications Services, Inc. AS 6395

Extended Customer Base
From a global perspective, view the top 25 service providers whose customers and peering partners reach the largest number of networks:
Last updated on 27 Jun 2006
Extended Customer Base (Top 25)

1 Level 3 Communications, LLC AS 3356

2 Sprint AS 1239

3 UUNET Technologies, Inc. AS 701

4 AT&T WorldNet Services AS 7018

5 Qwest AS 209

6 NTT America, Inc. AS 2914

7 China Telecom AS 4134

8 Global Crossing AS 3549

9 TeliaNet Global Network AS 1299

10 DoD Network Information Center AS 721

11 Cogent Communications AS 174

12 Savvis AS 3561

13 BB TECHNOLOGY Corp. AS 17676

14 France Telecom AS 5511

15 Cable & Wireless AS 1273

16 KDDI Corporation AS 2516

17 BellSouth.net IP Backbone. AS 6389

18 Teleglobe Inc. AS 6453

19 Telecom Italia Sparkle AS 6762

20 CNCGROUP China169 Backbone AS 4837

21 Deutsche Telekom AG AS 3320

22 Telefonica Backbone AS 12956

23 AOL Transit Data Network AS 1668

24 Verizon Internet Services Inc. AS 19262

25 SBC Internet Services AS 7132