Internet Voice: Regulatory and Legal Implications[1]

Terrence P. McGarty[2]
The Telmarc Group, Inc.

Abstract

This paper presents an overview of the regulatory and legal implications of Internet Voice. The implications are that Internet Voice is at one time a product and at another time a service. The product characterization is protected based upon the Carterphone decision of 1968. The service aspect is more problematical. We argue herein that there are significant advantages of Internet Voice and that these implications are significant in terms of their ability to provide a strong competitor to the existing carriers.

1. OVERVIEW

The development of complex information networks has been accelerated by many factors; technical, operational, institutional, and sociological. It is goal of this paper to address certain elements of these factors that have the most significant influence on these changes. These observations will be based upon two observations that frequently occur in such change mechanisms; namely, changes that we believe will occur in the short term frequently take much longer or never occur, and changes that we expect will take many years have the habit of occurring all too quickly. The example of the first is electronic banking, which every bank thought would be a reality in two years in the 1982 time frame, and the example of the latter is the Web on Internet, which is the embodiment of the electronic marketing and distribution channel.

The author owes this observation of change to Bob Kahn. He made this observation, now called ***Kahn's Rule of Technology Expectation,*** at a conference the author sponsored at NYNEX in June of 1987 at which time Bob told the NYNEX officers all about the Internet opportunities. At that time the author was told by the head of MIS for the company that Bob was "totally un-realistic" and that "distributed networks" and the Internet had "no place in reality" in her lifetime. So much for having "keen insight into the obvious". As usual Bob was correct and his observation concerning the timing of the expected was right on target.

1.1 Internet Evolution

Phase 1, The Simple Internet (1968-1974): Beginning as an experiment in networking, 'the ultimate petri dish', in this period the Internet, as ARPANET was a simple interconnection of at most 56 Kbps circuits interconnected by Intermediate Message Processors, IMPs. The user community was a collection of large scale computer processing facilities, called ***Hosts***, with end users who were uniquely identified with their host computers. The concept of time sharing in an operational context was not present. The original thoughts of the INTERNET users was to have access to complex computer resources, called remote hosts, from afar. The typical example was access to an ILIAC IV at the University of Illinois from a user at U.C. Berkeley. The concept was one of a human user having access to one of a variety of host machines, namely large remote computer facilities. There was no concept of user to user communications in the first stage.

Phase 2, INTERNET Goes Global (1973-1981): In this period the TCP/IP protocol is developed and added on top of the existing datagram network. Although originally aimed at remote login and file transfer (FTP),

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[1]Presented at thew Vocaltec Seminar on September 9, 1996, New York, NY.

the afterthought, Email, became 95% or more of the total network traffic. Email users could now expand their relationships from not only their remote host computers but now to many other individual users, thus creating a community of interest. This allowed INTERNET to become a distributed conversational medium, not just a remote processing vehicle. This was a seminal change in the paradigm. Furthermore, the INTERNET goes international with satellite connections to Goonhilly in the U.K. COMSAT is used as an access node to the European community. Initially the international use is justified by the seismic data transfer needs and the requirement to backhaul large volumes of traffic. Ultimately Email still dominates in all areas.

Phase 3, Military and Non Military Split (1982-1986): During this phase the non-military INTERNET evolves. DoD separates its network and the residual is spun off into a larger user community. Unauthorized accesses are found and user scares from hacking are observed. The user community expands allowing access to new user communities. The backbone grows to T1 rate, namely 1.544 Mbps.

Phase 4, The Mitotic Period (1986-1992): "Cell" division of the network occurs. DS3 or 45 Mbps circuits are added and local and regional networks are adopted. The proliferation of access closer to the end user is generated and hosts grow explosively. Networks seen by the INTERNET grow from about 100 in 1988 to over 5,000 in 1992. Personal computers proliferate, and access to the end user is now growing. Identity is still with the host. The dominant traffic is still Email and it derivatives, and the first virus, a self replicating 'worm', ran amok for several days in 1988.

Phase 5, *Consumer* Access Era (1993-1996): This era is the era of ***consumer*** access and the proliferation of commercial user hosts and networks. The user community is expanding from the computer literate and comfortable to the infrequent user community, and those whose expertise is frequently exceeded by their enthusiasm and expectations.

Phase 6, The Distributed Open Network (1996-) : The network moves into a Giga bit per second backbone allowing for the first time real-time access to such applications as multimedia processing, video, and supercomputer networking. The protocols for access allow expansive addressing and accessibility. End user access costs are reduced by access costs enablement/control policies and the introduction of 64 Kbps end user transport access to all terminals. Host identity is now made consistent with user identity. Specifically, in this phase, the end user may have all of the processing power and memory capability, as well as communications access capabilities, to be a host. In addition, we anticipate that there will be a further migration to the point where there are multiple hosts per end user, rather than the prior paradigm of multiple users per host. This challenge will dramatically stress the INTERNET in directions not seen previously.

1.2 Packet Voice

The author first was involved with packet voice in 1975 at MIT. At that time we used the ARPA Net and were using vocoders and LPC devices. Since that time three factors have changes: TCP/IP has become more efficient, compression of speech, and the costs of silicon processing. The proof of the acceptance of this has come strangely from a separate area, namely wireless communications. The CDMA VCELP approach to compression using a packetized voice, by Qualcomm, has clearly demonstrated tool grade quality at 13 Kbps over a wireless medium. There is currently an 8 Kbps modem and there will in eighteen months bee a 4 Kbps voice codec modem. Packet voice is efficient and low costs. The ability of silicon to process at 200 MIPS, for TCP/IP to handle synchronization and other factors will allow for a significant growth of packet voice.

1.3 Multimedia Communications

This area of multimedia communications is generally the least understood and most discussed area in both computers and communications. The challenge of multimedia communications is to create what we have called "displaced conversationality". This means the provision of all sensory inputs and outputs to any human user at any time and place required for the transmission of information in order to transact a series of events, leading ultimately to an agreed consensus amongst the parties involved in the transaction. Simply put, it means that I can talk in simple terms with anybody else, using whatever displays, video, data, voice or other annotations I desire, either simultaneously of at a delayed period of time. This will place significant new demands on the Internet. It begs the question of whether the Internet must now consider raising the level of protocols it supports above just TCP (***transport control protocol***) into what we have called the ***session control protocol***, SCP. Does Internet evolve into a SCP/TCP/IP network?[3] The author believes that with systems such as Vocaltec's hat such displaced conversationality is now a reality.

1.4 Consumer User

The evolution of the Internet into the broad ***consumer*** community will require changes to the current architecture in three areas; multimedia communications, access expansion and host migration. These three technological and architectural changes are discussed in detail. Multimedia communications is in its infancy. We present several of the key challenges that Internet faces if it were to provide these capabilities to the ***consumer***. Access is the second, but in the short term, the most driving issue. Access is an issue of cost combined with flexibility. It is the issue of through what means does the ***consumer*** obtain real time communications access to the Internet. The last issue is host migration. It begs the question of whether a Personal Digital Assistant, in its broadest sense, is or may become a host on the Internet. This then leads us to focus on the issue; ***what are the driving technologies to increase access to and applications of the resources available to the consumer community, and what can the current Internet community do to facilitate these?***

The author believes that the migration is doable and can be readily achieved in the context of the current design and design methodology. The policy challenge is to answer the questions of Internet evolution; ***namely, is Internet a scaleable economic entity that creates value that will be accessible to the widest possible collection of users, while retaining the value already provided to the high end user community?***

There are currently a set of five user communities which can be considered as ***consumers***. Each of these user communities has different needs and requirements from the INTERNET. Each of these groups see INTERNET offering access to a different variety of services and applications. They are summarized as follows:

(i) **Commercial Casual Users:** The casual user is the user who has recognized that Internet provides a community of interest and access to information in its broadest base. The commercial casual user is the one in a corporate environment whose initial desire is to use Internet for Email and other such limited applications. If one recalls the ARPA Net in the mid 1970s, the dominant use was Email, being well in excess of 95% of all use for ARPA Net users. Now Email is below 30% and dropping as other uses are discovered. The Email functionality is an entry point into the Internet. It is the service that will capture the casual

[3]McGarty [11]. The Session Control Protocol, SCP, suite has been developed in the mentioned paper, 1991. It uses the OSI seven layer model that has been the basis of many of the communications system protocols. TCP is a layer four protocol and SCP is a layer five protocol. SCP is used to handle complex multimedia objects that are generated by many dispersed users at different times. It enables the concept called displaced conversationality in a multimedia environment.

commercial user, say an R&D Manager or Executive, whose staff of researchers are already high volume users of Internet.

(ii) **K-12 user Community:** The K-12 is an explosive area. There are examples in many districts of schools at all levels encouraging students to use the Internet as both an educational tool as well as a cultural learning device. Internet, as a global network, allows students to communicate with others around the world. The classic story is the student who wrote an 'A' graded paper on Aborigines by communicating with Australia directly over the Internet. There are two countervailing factors, however, that are pressing at this opportunity. One, is the growth of the multimedia curriculum exemplified by in class video education that is real time. The other is the fact that over 98% of classrooms have no telephone access. In most if not all cases of education through new electronic media, it is easier to get the satellite dish, the VCR, the television, and the computer, then to get the RJ-11 telephone jack! We will argue in this paper that CATV and wireless will make a dramatic change in this area.[4]

(iii) **Health Care User Community**: The Internet is a data backbone network that is in essence the basis of a multimedia transaction based infrastructure. Internet will eventually allow the transport of images and voice communications. It already encourages spatially and temporally displaced conversationality. Furthermore, Internet is a transaction network, transacting everything from data transport to Email. Health Care is an industry in search of productivity improvements. It has been shown elsewhere, that over 35% of the expenses in Health Care are due to the handling of paper for patient billing and non critical record management.[5] Also, quality of care, as contrasted to cost of care, is improved with increased flow of information and displaced conversationality between not only the specialties but also the total Health Care Team. It is argued that the Internet can be that catalyst that enables the internetting of Health Care for both productivity improvements and quality of care improvements.

(iv) **Higher Education User Community**: Not all Universities have access to the Internet, nor do all students have either the proficiency or knowledge of what the Internet can do for them. In many ways it has been the "techy's" toy that is now expanding its way into other areas. This can bee seen with the number of user groups exploding in many non technical academic areas as well as with the explosive growth of electronic publishing. The latter is the first true example of the growth of an electronic industry with the enabling capability of an electronic marketing and distribution channel, namely the Internet.

(v) **Residential Casual Users**: The residential user is becoming one of the largest growing segments. The residential user has had access to such networks as Compuserve over the years and also Prodigy, the erstwhile videotext attempt by Sears and IBM which has never been profitable. Ironically Compuserve, a text driven system, is successful because it meets the consumers needs. The Compuserve user is migrating to the Internet since the Internet is a broader community of users and also because University students can communicate home via the Internet. Thus access to the Internet via Compuserve or direct access via Gateways such as General Videotex, are opening doors for the residential user.

2. LEGAL IMPLICATIONS

This section is a brief overview of the legal implications regarding INet voice. The reader must be ware that in the regulatory environment legal issue are frequently more complex and cause greater problems than any technical factors.

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[4]In fact, the Burnaby South Secondary School, which opened in British Columbia in February 1993, has built its visionary 'village of learners' campus around a communications infrastructure of coaxial cable in every room to take advantage of multimedia learning aids. It refers to its embedded network capabilities as its 'information highway'.

[5]McGarty, Health Care Policy Alternatives, Telmarc Group Report, 93-004, May, 1993.

2.1 The 96' Telecommunications Act

The Telecommunications Act of 1996 has provide for the open competition in the Local Exchange Carrier markets. There are several factors that make this new competitive environment dramatically different from that of the Inter Exchange Carrier markets in which AT&T and MCI and others found themselves in 1984. Specifically, there is a technological change wherein the issue of economic scale has been eliminated, namely there are de minimis entry barriers from an economic perspective. The barrier to entry is the issue of Interconnection, which simply stated is the need to connect from one new LEC entrant to the existing monopoly LEC player, specifically the RBOC. Thus there exist many new and significant legal issues relating to the implementation of such fair and equitable interconnection. The FCC in its role as Administrative Agency has taken steps effective August 8, 1996 to promulgate rules of behavior.[6] The alternatives available if such rule fail to provide for a competitive framework ar the antitrust laws. This new area for antitrust law is one that rejoins many of the issues that were thought to be left behind at the time of the AT&T divestiture.

The Act as amended in 1996 has removed antitrust protection from the telecommunications industry.[7] In light of that fact, it is necessary to reexamine the implications of the many arrangements that have been customary practice, and view those arrangements in the light that all other similar arrangements can be viewed in all other industries. From an historical perspective, the Antitrust laws have been used to manage the gross misconduct of larger entities in existing competitive markets. In the case of local exchange telecommunications, however, there is a sharp distinction. Namely, the existing entities are the only player in the market and thus have essentially full monopoly control. The 1996 Act in Sections 251 and Sections 252 provide a vehicle that allows new entrants into the market so that a competitive environment may evolve. The issues however focus around the approaches taken in the new Act and how they may be interpreted.

There seems to be no question but that Congress had the intent to create competition in the Local Exchange markets. The wording of the Act and its reflection in the Commission's attempt to clarify certain issues leads directly to that belief. However, it has been seen that the Incumbent LECs, namely the RBOCs, have a strong and vested interest in delaying or prolonging that effort. The track record of companies such as NYNEX are clear in their continued attempts to delay the entry of companies such as MFS and Teleport ,especially through the process of state regulatory delay. The Commission has the sets of certain authorities in the new Act to facilitate this process and create a more competitive environment but the States retain certain controls and interests.

Furthermore, telecommunications has, as a result of the Act, become potentially a more competitive environment. Despite the intention to allow competition, the industry also has certain existing structures and interlocking relationships that permit the incumbents to retain significant share by blocking the entrance of new players. This paper focuses on the local exchange market in which the local exchange carrier, "LEC", is the principal player. Twelve years ago the interexchange market was opened up to full competition. The result is an network that allows for strong competition with even stronger competitors. The local exchange market is closed. This paper provides an overview framework for this market, the technological change agents that make it dramatically different from other markets, and the re-application of antitrust law from the perspective of maximizing the public welfare, independent of the individual competitors.

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[6]See FCC First Report and Order on the Implementation of the Local Competition Provisions in the Te;ecommunications Act of 1996. These relate expressly to Sections 251 and 252 of the Act.

[7]See Section 601 of the Act.

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There are several significant changes that are also occurring in the delivery of these types of products that will allow for the dramatic entry of new competitors. These will also be explored. Specifically, technology allows for disaggregation of functions in the delivery of the product. Technology also allows these functions or product elements to be delivered at marginal prices since the inherent scale in the industry is disappearing. Namely the scale economies of copper wire and large switches is now being replaced by the scale-less technology of wireless and ATM or frame relay switching.

2.2 US Administrative Code 47

The implementation of the 1996 Act is done in the Code of Federal Regulations ("CFR"), the US Code, expressly Title 47. The regulation process in the US is a several fold process. First the law reflects the demands of Congress and the approval of the President. Thus the law is the underlying document. Then the FCC, or any other administrative body, interprets the law in terms of the Federal Regulation, which is the operative document. One can reflect on the Law but one must rely on the CFR. It is this final document that reflects the governments position and how industry must operate.

To go from law to a regulation the FCC, as does most other federal agencies, goes first to a Notice of Public Rule Making ("NPRM") and then to a Report and Order ("R&O"). The R&O then has attached to it the modifications to the CFR. This is what has happened in the 1996 Act. The Act became law on February 8, 1996, and the new CFR rules became effective on August 8, 1996. The latter are the controlling documents.

The new CFRs regarding the interconnection issue will be the most significant ones in this business of INet voice.

2.3 Philosophical Implications

The issues of political philosophy may seem a far cry from INet voice but it is clearly in the middle of it. Any process which provides a service which the government is in the middle of will perforce have a political element and in turn an overriding political philosophy. We consider two philosophies and their implications.

The first is the Rawls philosophy of John Rawls. His philosophy has three elements. The first is his concept of an Original Position. The Original Position is that all governments are based on a "contract" between its

[8]The FCC has issue a Notice of Public Rulemaking ("NPRM") CC 96-98 which focuses on the implementation via the Sections 251 and 252 of the Act.

citizens and that the ideal contract is one developed in a consensus between all its citizens that allow it and them to agreement on principles of government. This is like Rousseau and the Social Contract. It is a contract amongst and between the citizens and the government, one and indistinguishable. From this follows the two Rawls principles of justice; First Principle, each persons shall have equal rights to the most extensive total system of equal basic liberties with a similar system of liberty for all, and Second Principle, social and economic inequalities are to be arranged so that they both, (I) provide the greatest benefit to the least advantaged, and (ii) attached to offices and positions open to all under conditions of fair equality of opportunity.[9]

One may say what does this have to do with the Internet. Simply stated this philosophy controls access prices and who "must have" access. As to access prices, this is reflected in the Baumol Willig theorem of access pricing. They have used the concept of Ramsey pricing, also know as second best pricing. This is a sub-optimal version of Pareto pricing. Pareto pricing is a pricing mechanism in the market whereby any change in one person to increase their welfare will not diminish the welfare of any other person. Thus something is Pareto optimal if I give you one more candy bar, that increase your welfare or happiness, and that their result of doing so does not upset anyone else. Hardly a reasonable assumption but a key basis of economic. The Ramsey scheme tries to balance welfare and profit.

The Baumol Willig theorem states that we want to maximize the welfare of the populace while keeping the profits of the monopolies high. This is a classical example of an ad hoc propiter hoc theorem. Clearly the result is that we tax the people and subsidize the monopoly.

The other issue is how do we measure welfare. If we are a Rawlsian then we measure welfare as the welfare of the least of us and not the average welfare. Rawls states that if we maximize average welfare then we disadvantage the least of us and this is not just. Thus as a Rawlsian we demand Universal Service. We must insist that all people have access to all service elements, whether it makes economic senses or not, we do so via wealth transfer.

Hopefully, this political theory should now not seem too foreign. Ralwsians favor the implementation of access fees and the implementation of Universal Service. Indeed, the true Rawlsian would impute Universal Service to even computer terminals as has been stated by Vice President Gore.

In contrast is the classic liberal, now called libertarian view. It is more a combination of minimal government involvement and maximizing utility to the consumer. This is the philosophy of the utilitarian. Here we assume that government has a de minimis role and that the market follows of its own accord and that the market, in an Adam Smith fashion, will clear any inefficiencies of distribution and pricing mechanisms. It assumes that each business should stand on its own stead and that utility is maximized on average. The result from the libertarian school, as opposed to the contractarians or Rawlsians, is the elimination of access fees and the elimination of universal Service.

It will be important to recognize that these political philosophies dominate the overall play of regulation is all markets. These two schools of thoughts, the libertarians versus the contractarians, whether they know they are one or not, will have a great deal to do with our development as an industry.

3. PROBLEM AREAS

There are two main problem areas for the full implementation of INet voice. The first is a minor problem reflected in the ACTA petition. The second is more fundamental and is a reflection of a philosophical interpretation of society as we discussed earlier. This latter is will not go away quickly since as all political issues it is about power and control and does not reflect the issue of market efficiencies.

[9]See Kukathas, Rawls, Stanford University Press.

3.1 ACTA Petition

On March 4, 1996 ACTA, the America's Carriers Telecommunications Association, filed a Petition with the FCC requesting an injunction against VocalTec and others. This was based upon their allegation that VocalTec et al were carriers and telecommunications services providers and that pursuant to the FCC, under the rules of the Communications Act of 1934 as amended, must pursuant to Sections 203 and 214 mandate that VocalTec et al cease and desist from their delivery of telecommunications services.
Section 203 requires that a common carrier file a tariff or similar document and Section 214 requires that a common carrier obtain a "certificate of convenience" ("COC") from the FCC before any construction.

ACTA alleged that the following were true:

- *VocalTec et al were telecommunications carriers and common carriers.*
- *VocalTec et al must file with the FCC pursuant to 203.*
- *VocalTec et al must obtain the COC before "constructing" its software.*

Let us examine the facts in this Petition. First what is a telecommunications carrier. From the 1996 Act we have;

(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.

"(44) LOCAL EXCHANGE CARRIER- The term "local exchange carrier" means any person that is engaged in the provision of telephone exchange service or exchange access. Such term does not include a person insofar as such person is engaged in the provision of a commercial mobile service under section 332(c), except to the extent that the Commission finds that such service should be included in the definition of such term."

From 47 USC Section 203:

(r) "Telephone exchange service" means service within a telephone exchange, or within a connected system of telephone exchanges within the same exchange area operated to furnish to subscribers intercommunicating service of the character ordinarily furnished by a single exchange, and which is covered by the exchange service charge.

Clearly VocalTec et al never provide a service, they sell a product. As we shall show in the next section, the mindset of the Carter Phone and Hush A Phone decisions are still with the old line telecommunications community. The case should be summarily dismissed as having no merit or standing. A request for summary dismissal, if this were a Federal District Court, would be readily obtained. However, this is an administrative body, the FCC, and the administrative law follows a slower course.

3.2 RBOC Mindsets

Consider what was written by a Bell System polemicist 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." (deSola Pool Ed, Pierce, pp 192-194).

This may equally be applied to the position of may in the LEC and IEC areas towards the use of INet voice and specifically the software.

The readers 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 unsegmentable telephone network. This paper has the view of a highly segmentable communications system. The world view of the architecture has taken us from "slavery" of Pierce to the freedom of the distributed computer networks of today. Kuhn has described technologists as Pierce as the "Old Guard", defenders of the status quo. They defend the old paradigms and are generally in controlling positions for long periods of time.

The Computer Scientists view has been epitomized in the quote, *"Every Packet is an Adventure"*. This is said with glee, in that each data packet is set out across the network and it is through the best of hacking that the Computer Scientist saves the packet from the perils of Scylla and Charybdis. The third view is that of the user, who is interested in developing an interconnect capability that meets the needs and minimizes cost. This is minimization of both obsolescence and cost strategy.

The other problem of the RBOC and LEC mentality is the abborhence to alien attachments. The were also called alien interfaces. Interfaces were originally called "Alien Attachments". In Kahn (II p. 140-145,) he discusses the history of the interface leading up to the Carterfone decision. The most significant position in CPE control was the Hush-A-Phone debate from 1921 to 1946. The Bell System at that time took total and full control over the quality of the delivery of the service of voice. The Hush-A-Phone company provided a mechanical cup device that could be placed over the mouthpiece of the telephone to assist in making the conversation more private. AT&T took the position that it interfered with the network and the quality of service and battled this for 25 years. Such is not the case today. CPE computer equipment has proliferated and the current costs for 289,600 bit per second modems are comparable to high end voice telephone devices.

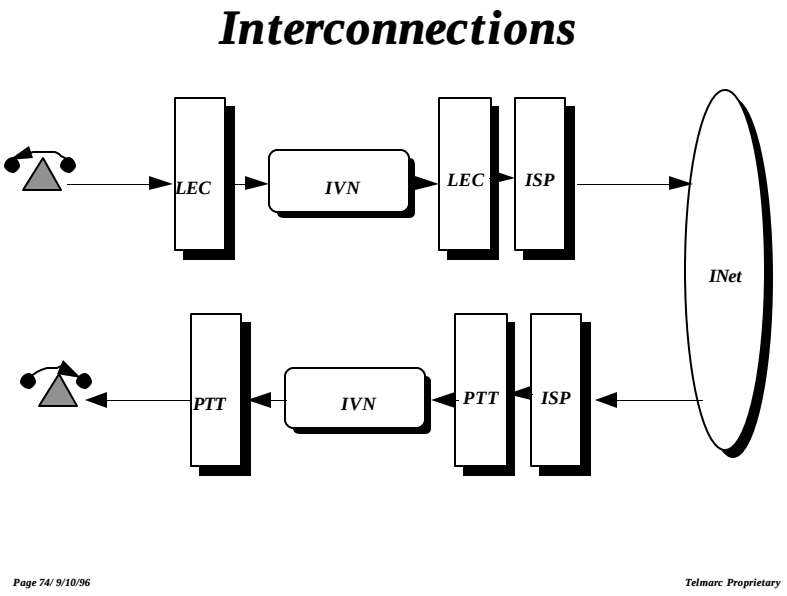
3.3 Bundling

The main development of the 96 Act was the requirement to unbundle network elements. We take this a step further and call it the “shoes and socks” approach. If one were to purchase shoes and socks, one would be surprised to have to pay a subsidy on each pair of socks which in turn is paid to the shoe makers so that the price of shoes can be kept low. The assumption is two fold on the part of the governmental authorities who have applied this tariff on socks. First they assume that all people wear shoes but only rich people wear socks. Second, they want all poor people to be able to get shoes at the lowest possible price. Thus they tax socks and sell shoes at a subsidized price. Clearly this is an absurd policy.

However, this is the policy that takes place in telecommunications. In the long distance market the government assumes that rich people use long distance so that income transfer from them to the poor via the local telephone access fees is proper. They then allow the local rates to be reduced by this amount. What s the measure of this reduction. Simply put local telephone service is a $120 billion annual business. The local access fees are approximately $40 billion. This one third of the local rates are subsidized by the "rich" people making long distance calls.

We have argued elsewhere, and the FCC seems about ready to accept the fact, that each service should be priced on its totally disaggretgated costs. This is called "Bill and Keep" by the FCC. What this means is as follows. If I am in the long distance business, and I sell that service to a customer, and if the point of demarcation is a trunk line between my switch and the LEC switch, then my price should reflect my costs between those two points and nothing else. The LEC should have a price that reflects its costs totally.

The following figure depicts that concept. The principle is simple. Each service must reflect all of its costs to its customers and there should be no transfer of wealth between entities to distort market pricing.



This issue is even more relevant in the area of LEC competition. If there are several LECs in a market, as there will be with wireless and CAP bypass, then each LEC should reflect its costs solely to its customers. There should be no transfer of wealth between the players. This is the libertarian view and not the contractarian view of justice as we discussed before.

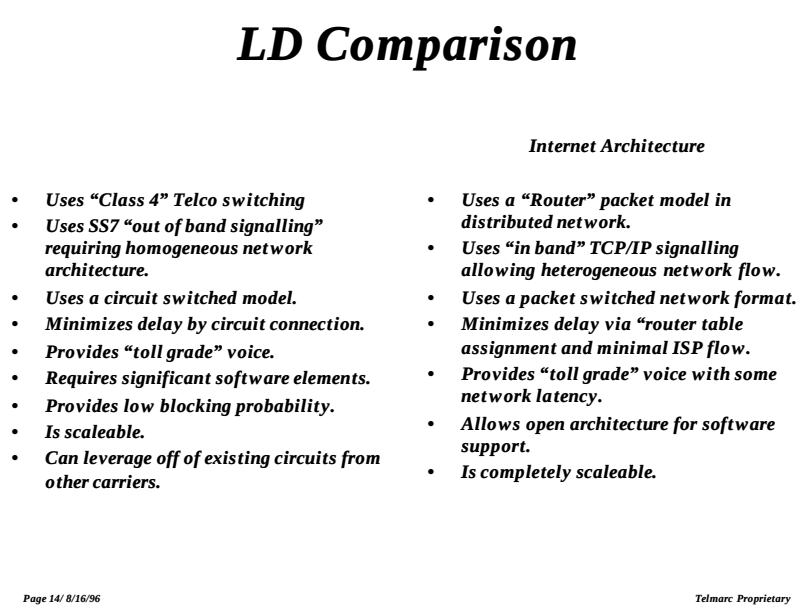
The main issue in this unbundling approach is the ultimate commoditization of the services. The long distance service is just long distance transport and local service is local transport. ***Commoditization theory states that there exists a primitive service element that can be provided and that if such exists then competition is based solely upon the price that a provider of that commoditized element can provide.*** Namely in a market for oats competition is based on the price of oats and in an efficient market the price is cleared in such a market. However, one may consider making oat bran muffins or oatmeal cookies. This does not preclude product differentiation and differential pricing. This does not change the status of the commoiditization theorem.

4. INTERNET VOICE SERVICES

This sections presents some of the issue regarding the actual implementation of the INet voice business.

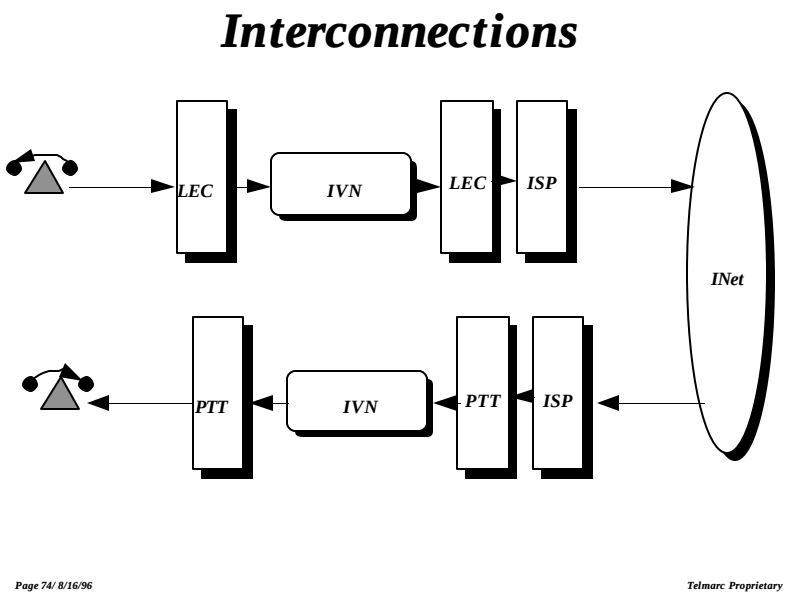
4.1 Comparison of INet Voice

The following Table depicts the comparison between Internet LD and IEC long distance. One key observation of this industry is that the comp uter types are not telco knowledgeable and the telco types are not computer literate. Thus most of the competitors do not recognize the overall differences. The Internet is a packet network with control at the periphery and the signaling is in-band TCP/IP. This allows for great efficiencies in packet transport. The IEC network uses SS-7 out of band signaling and is structured for inefficient use of voice.



This prior comparison of INet voice with Telco voice is a very critical issue. They are different in all essential ways. INet voice is a distribute platform, Telco voice is a hierarchical platform. One is a democratic way to operate amongst peers, the other is a monarchical fashion with a single player in control, namely the RBOC or PTT. It takes little insight to see the world and technology are becoming more democratic.

The following Figure depicts the overall interconnections. This reiterates what has been stated above but presents it in terms of the overall end to end call.



4.2 Service vs Product

The development of the Internet has provided a dramatically different set of alternative for the provision of long distance voice. Three factors have establishes this basis. First, the Internet is a packet network that uses network resources only when these resources are required and not all of the time. Second, speech compression allows for the transmission of voice in a highly compressed form while retaining the quality that the consumer demands. This compression allows for the integration of speech with the Internet. Third, technology is now available that allows for the simple integration of the normal telephone network with the speech compression systems and in turn with the Internet. Thus the Internet universality and low cost, the speech quality and ease of implementation, and the system proposed in this business plan, establishes a basis for a new and innovative market, namely long distance Internet voice.

This plan is dramatically different than all others currently proposed. The current model for Internet voice is to use one's own personal computer as the access point and then to access the Internet and then to obtain the long distance service. This plan make four key assumptions; first, to obtain universal access the use must access the system via their own telephone, even if that is a rotary dial telephone. Second, the access to the Internet must be transparent to the user, namely they must just dial their numbers and never know that there is another virtual long distance carrier in place. Third, there must be all of the infrastructure elements in place, such as billing and customer service to ensure that the quality of the overall offering is a first class service. Fourth, the service must be of a sound and voice quality that is as indistinguishable from the telephone network as possible.

This plan develops two opportunities. The first is the development and integration of the hardware and software platform for the delivery of this service. The second part is the delivery of the services to the end actual end users via the platform and the Internet.

The platform, termed the Internet Voice Node, IVN, is simply the integration of three technologies: (I) an automatic call distributor, ACD, as used commonly in customer services systems; (ii) the Internet Voice Processor, IVP, as provided by VocalTec and others working on a Pentium based processor; and, (iii) a packet assembler dissassembler, PAD, to effectively interconnect to and Internet Service Provider, ISP, such

as PSI. The IVN is the integration of these elements with certain additional software to ensure the ability to bill, provide customer service, and perform network management.

The service works as follows:

- *A customer calls the IVN from their local telephone. The receive a second dial tone from the ACD and then place their long distance call. They may or may not use a PIN number for identification.*

- *The IVP then provides for an Internet connection between the calling party and the called party. The called party is identified by a telephone number which is automatically matched with an Internet address. The ISP to IVN connection is on at all occasions and will identify calls attempting to terminate on this location.*

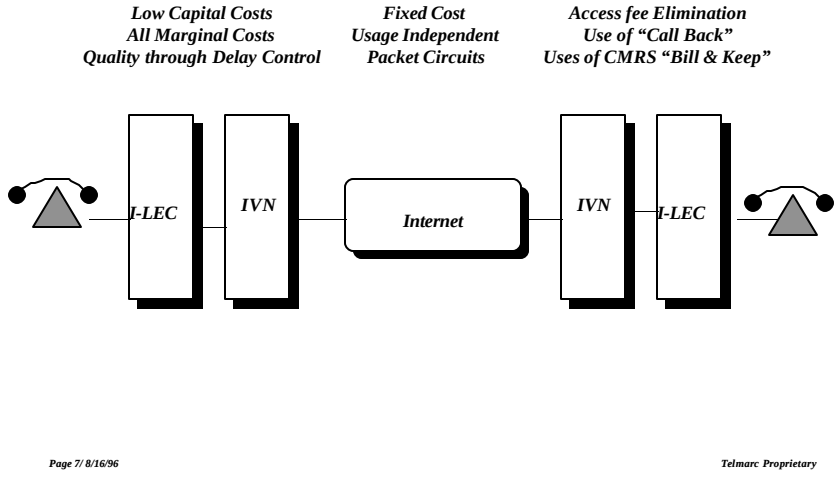
- *The IVN at the terminating location then dials the local number via the ACD as an outbound call. This is identical to what an outbound Telemarketing autodialer may do in outbound telemarketing.*

- *The called is then completed, the call is monitored for time and terminations and a billing and system record are made for each call.*

This approach is critically different than all other current approaches. The opportunity is to enter the ***services market*** as quickly as possible. The IVN is an enabling technology but it is not the end objective of the business. The business is to establish a service business to allow sales entities to sell the services to end users. The Company has applied this approach in the PCS markets and it sees this as a successful approach to the market.

The advantage to this approach is that the IVN shares common capital costs, the Internet ISP access is also shared and the overall effective cost per minute of anywhere to anywhere calling is less than $0.035 per minute.

Internet LD Architecture



To deliver this service, the Internet Voice Node, IVN, must be integrated and deployed. The IVN is shown in the following Figure. The node has a sending and receiving mode. A sending mode is when a local customer desires to send a call. The receiving mode is when a local customer is receiving a call.

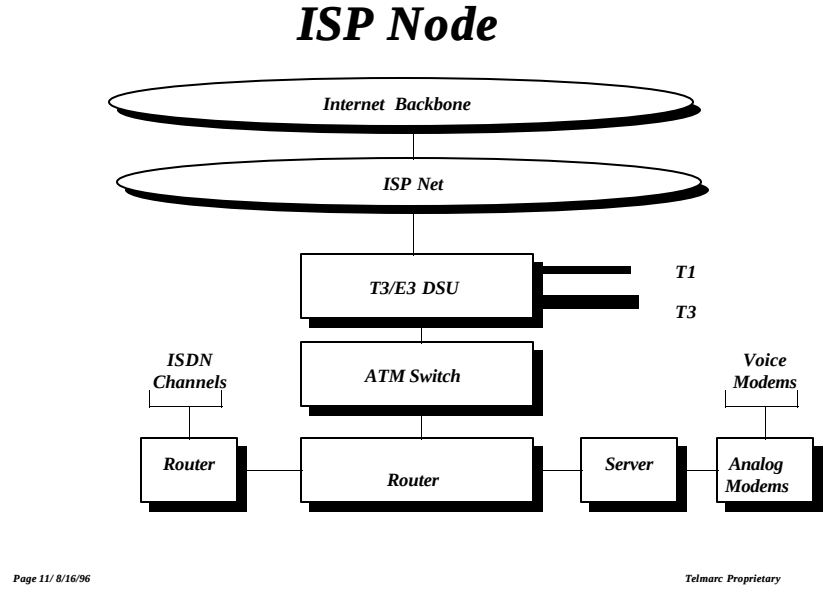
The IVN consists of three elements:

i. Local Control Unit (LCU): This is a device that connects to the local telephone network on initiation and termination. It allows for the provisioning of dial tone or other similar functions. VocalTec uses a PBX in this mode.

ii. IVP: This is the Internet Voice Processor or the voice card. It is made by VocalTec and Dialogics and there are various versions by other companies. It compresses or decompresses the speech, turns it into a packet, a nd the sequences, schedules, and protocol converts it for Internet access. It also converts between a local telephone number and an Internet address.

iii. *Internet Control Unit (ICU): This unit converts and packages the Internet packets to and from the ISP. It converts the single line outputs from the IVP into a multiplexed higher speed line to and from the ISP. This IVN is then interconnected to an ISP.*

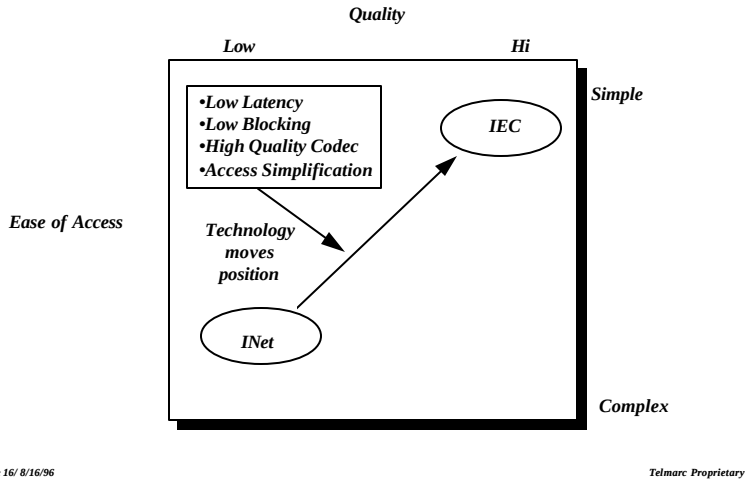
The ISP, or Internet Service Provider node is shown below. In current systems the end user would dial into the ISP and connect to the analog modem pool. This is time consuming and costly and increases the overall delay. The approach in the Company's IVN is to use the PAD and connect directly into the router or preferably the ATM switch or Frame Relay switch. This reduces cost, reduces delay, and ensures an end to end controllable network.



The following Figure depicts the perceived relationship in the market between Internet Voice and telco type long distance. The two dimensions are complexity of the call and the quality. The complexity of IEC long distance is low. The caller dials the digits and the call is set up. The complexity of the current Internet voice is high. The user must have a PC and the user must set the call up over the PC and must coordinate with the end user at the terminating end. Furthermore, the quality has been poor. This is due to two factors. The voice compression has had long delays and has been a poor algorithm. The VocalTec design eliminates most of that factor. Second, if the ISP was different on both ends and there were dial up circuits, the end to end voice delay was high. Thus there were significant delays in excess of 200 msec. The IVN approach

eliminates these by using the VocalTec software, directly connecting to the ISP, a nd by using the IVN from simplicity of call set up.

Positioning of IN LD and IECLD



The following Table depicts the comparison between Internet LD and IEC long distance. One key observation of this industry is that the computer types are not telco knowledgeable and the telco types are not computer literate. Thus most of the competitors do not recognize the overall differences. The Internet is a packet network with control at the periphery and the signaling is in-band TCP/IP. This allows for great efficiencies in packet transport. The IEC network uses SS-7 out of band signaling and is structured for inefficient use of voice.

4.3 Loading

The following demonstrates the loading of the system.

Internet Voice Loading

Factor	***Value***
Internet Voice	
Connect Time per Call	3 min
Data Rate per Call	13 Kbps coded speech
Voice Load per Call	50% load maximum
Effective Data Rate	6.5 Kbps
Packet Length	1KB
Packet/Sec	0.8
Packets/Call	144
Number of Calls/Month	200
Number of Packets per month	28,800

Factor	*Value*
Internet Web Access	
Connect Time per Call	30 min
Data Rate per Call	28.8 Kbps coded speech
Data Load per Call	20% load maximum
Effective Data Rate	5.6 Kbps
Packet Length	1KB
Packet/Sec	0.5
Packets/Call	9,000
Number of Call/Month	40
Number of Packets per month	360,000

Factor	*Value*
Internet Multimedia Access	
Connect Time per Call	30 min
Data Rate per Call	64 Kbps coded speech
Voice Load per Call	30% load maximum
Effective Data Rate	22 Kbps
Packet Length	1KB
Packet/Sec	20
Packets/Call	360,000
Number of Call/Month	40
Number of Packets per month	14,400,000

It should be noted that these loading numbers differ drastically from those of Newbridge networks.[10] The reason is that we went from the bottom up rather than from the top down. They assumed that all voice stayed as is. We assumed that VocalTec compresses, a minor fact. We also approached it from a packet perspective. The Newbridge results are blatantly fallacious and do a disservice to the business. However this seems to be the industry standard approach. The author has heard Bob Metcalff state that the Internet could never carry voice and Pete Wills tell him that the Internet is the "most costs form of voice transport". If all else fails they should run the numbers. INet voice increase the INet load by 10%.

4.4 Costs and Pricing

A simple mode for Internet Voice processing is based upon the following assumptions. The costs are;

- *Operations costs including billing, customer service, network management, and other operations support system s costs: $6.00 per month per subscriber. This is $0.0100 per minute.*

- *IP Access costs for 600 minutes per month at the rate of $6.00 per month per user in bulk buys. This is $0.0100 per minute.*

- *Sales costs of 15% the gross revenue based upon a commission based sales force. If we sell the service at $0.0400 per minute, in competition with the lowest cost domestic long distance, this is $0.0050 per minute. If the price is $0.10 per minute then the sales cost is $0.0150 per minute.*

[10]Presented by CEO of Newbridge, Frankfurt Interop, June 12, 1996.

- *Local Access Fees of an amount that is equal to all other providers or zero, whichever is selected. We shall assume zero for the moment.*

- *Capital per Subscriber of approximately $50. This is based upon a $1,000 per line cost, with a 5% loading factor. The means an average monthly amortization, at 16% interest and 5 year payout, of $1 per month per user and for 600 minutes this is $0.002 per minute.*

- *This means a cost of between $0.0270 and $0.0370 per minute. I we add access, at say $0.0350 per minute, then we can sell anywhere to anywhere domestic long distance at $0.0600 to $0.0800 per minute. This is 5% to 20% less than the existing bulk buy long distance rates. This is not a great margin!*

However, the same numbers apply to international wherein the opportunity leis.

5. FUTURE IMPLICATIONS

The is a significant future for Internet Voice and companies such as VocalTec will be possible leaders in that market. The business will focus on two areas; the home PC user and the business PC user, and the service bureau player. Where the ultimate success will be is uncertain. However, the challenges will continue to be regulatory and not technical. We see voice modems and codecs reducing the delay to less than 40 msec and that access to the High Speed backbone will reduce transport packet delay to a similar numbers. Voice quality will have low delay and high recognizability. Access to INet voice will also be a mad simpler with IVN architectures. Finally, pricing will make this highly costs competitive to the existing alternatives, however the major conclusion is that the INet architecture enables multimedia communications via TCP/IP more than SS7 will ever be able to do. TCP/IP is a "natural" effect of integrating voice and data. The existing Telco architecture is archaic and will not survive. The author presented this case in 1990 at Harvard and the only conclusion is that it is even more so now than it was then.

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