

November 19, 2002 RECEIVED

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20554

NOV 19 2002

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

**Re: Ex Parte Presentation in CC Docket Nos. 02-33; 95-20; 98-10**

Dear Ms. Dortch:

On November 18, 2002, Richard Whitt of WorldCom, Inc. met with Dan Gonzalez, senior legal advisor to Commissioner Martin, to discuss the issue of Internet service provider (ISP) access to DSL networks. The meeting focused largely on issues covered in previous filings submitted by WorldCom in the above-referenced proceedings, including the many legal infirmities attending the suggested redefinition of DSL services as “telecommunications,” and any consequent elimination of the Computer Inquiry rules. In particular, Mr. Whitt explained, in response to a recent SBC ex parte presentation, that:

- Intermodal competition for consumer broadband services is a fallacy. For example, based on figures presented by the Bell Operating Companies (BOCs), only one-third of American consumers currently can choose from between the cable and local telephone companies for broadband services. Moreover, as recent press reports show, the satellite companies *are* retreating from any earlier intention to deploy competing broadband platforms. At best, then, consumers currently face a limited telephone/cable duopoly, which hardly qualifies as robust intermodal competition.
- The BOCs’ “level playing field” argument holds no water, for many reasons articulated in WorldCom’s previous filings. In addition: (1) the FCC (rightly or wrongly) utilized historical and statutory reasons for not imposing common carriage requirements on the cable companies for the first time; (2) closed access to the cable modem platform makes it all the more critical for the Commission to leave the BOC platform open to competing ISPs; (3) the debacle created by @Home’s precipitous service shutdown in 2001 can be directly attributed to consumers’ inability to access competing ISPs, which in turn can be traced to the FCC’s failure to require cable open access; and (4) allowing the BOCs to serve as the sole DSL-based broadband provider, and sole DSL-based ISP, constitutes a single point of failure that raises serious concerns about critical infrastructure protection and risks to network security.
- The BOCs already are openly flouting the existing Computer Inquiry rules and safeguards. This noncompliance is demonstrated by the fact that the BOCs’

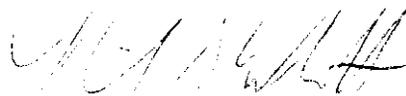
affiliated ISPs control between 85 and 90 percent of the DSL-based Internet access market. in stark contrast to their meager 1 to 2 percent share of the narrowband dial-up Internet access market. Elimination of the Computer Inquiry rules will only cement this discriminatory and anticompetitive outcome, to the ultimate detriment of American consumers.

- No “radical surgery” would be required to maintain and enforce the existing Computer Inquiry rules; in fact, the separation between wholesale DSL telecommunications service inputs and retail information services is required currently, and already exists technically in the BOC networks. Moreover, the Computer Inquiry rules themselves constitute an effective deregulatory regime, by limiting necessary regulation only to facilities-based common carriers, and leaving unregulated all information services, applications, and content which utilize **the** carriers’ telecommunications services.
- Aside from general rhetoric about restricting “integration” and “network design,” the BOCs continue to provide no actual evidence of any economic costs or technical constraints resulting from application of the Computer Inquiry rules. In contrast, the Information Technology Association of America (ITAA), the BroadNet Alliance, Earthlink, WorldCom, and numerous other organizations and companies have touted the many specific market benefits of those rules, and the very real harm to the public interest should they be removed.
- The United States Internet Industry Association (USIIA) – with its purported support for replacing the Computer Inquiry safeguards with “commercial arrangements” and “market agreements” between BOCs and ISPs – does not fairly represent **the** views of independent ISPs. Indeed, the USIIA membership does not appear to include any independent ISPs, and instead operates largely as a front group for its BOC member companies. Nearly all independent ISPs, including hundreds of dues-paying members of ITAA and BroadNet, strongly oppose any effort to eliminate the Computer Inquiry safeguards for broadband services.

Copies of the attached documents were distributed during the meeting

Pursuant to Section 1.206(b)(2) of the Commission’s Rules, an original and one copy of this letter are being provided for inclusion in the dockets of the above-referenced proceedings.

Sincerely,

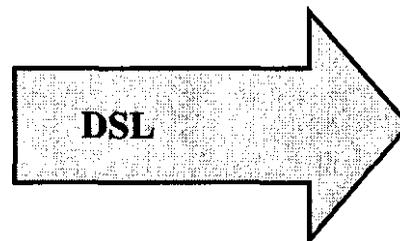
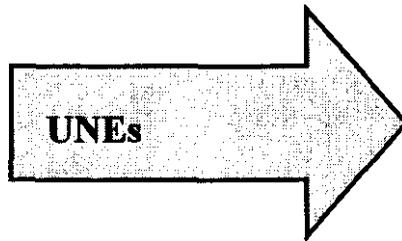


Richard S. Whitt

cc: Dan Gonzalez

Attachments

## UNEs, DSL and Internet Access



**What is it:** Network piece parts (*e.g.*, loops, transport, etc.) that CLECs use to provide telecom services.

•It is a telecommunications service that can be provided by competitive LECs using a combination of UNEs and their own facilities.

•An information service provided using telecommunications inputs, including network elements and telecommunications services (including DSL), combined with computer processing, information storage and protocol conversion to enable users to access Internet content and services

**Who gets it:** •Available only to telecommunications providers (not ISPs).

•Offered to ISPs as an input to dedicated Internet access and at retail to end-users as a private line service (*e.g.*, a DS-1 substitute).

•Provided to end-user customers

**Who offers it:** •Offered only by incumbent LECs

•Offered by telecom carriers including both incumbent LECs and competitive LECs.

•Offered by ISPs, including ISPs affiliated with incumbent LECs.

**Regulatory treatment:** •ILECs must provide access to UNEs at cost-based rates when lack of access would impair requesting carrier's ability to provide the telecommunications service it seeks to offer.

•Regulated as a telecommunications service; ILECs are currently considered dominant in the provision of DSL.

•Internet access is not a telecommunications service regulated under Title II.

May 21, 2002

**EX PARTE**

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Suite TW-A325  
Washington, D.C. 20554

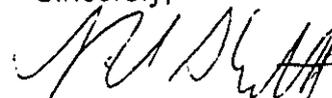
Re: Ex Parte Letter in CC Docket No. 02-33; CC Docket No. 01-338; CC Docket No. 01-337; CC Docket No. 98-147; CC Docket No. 98-10; CC Docket No. 96-98; CC Docket No. 95-20; CS Docket No. 02-52; GN Docket No. 00-185

Dear Ms. Dortch:

On May 20, 2002, Vint Cerf of WorldCom, Inc. delivered the attached letter to Chairman Michael Powell, with copies delivered to Commissioner Michael Copps, Commissioner Kathleen Abernathy, and Commissioner Kevin Martin, and their wireline competition staff.

Pursuant to Section 1.106(b)(1) of the Commission's Rules, two copies of this letter are being provided to you for inclusion in each of the dockets of the above-referenced proceedings.

Sincerely,



Richard S. Whitt



**Vinton C. Cerf**  
Senior Vice President  
Internet Architecture &  
Technology

May 20, 2002

22001 Loudoun County Parkway  
Ashburn, VA 20147  
703 886 1690  
Fax 703 886 0047  
[www.wcom.com/cerfsup](http://www.wcom.com/cerfsup)  
[vinton.g.cerf@wcom.com](mailto:vinton.g.cerf@wcom.com)

The Honorable Michael Powell  
Chairman  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20554

Dear Chairman Powell:

I have watched with considerable interest as the FCC and Department of Commerce grapple with the daunting policy challenges associated with the deployment of broadband services. Having devoted much of my career to the creation and evolution of the Internet. I thought it might be potentially useful to you and Secretary Evans if I outlined my personal vision for the future of high-speed Internet access and my growing concern over **proposed** changes in public policies regarding broadband deployment. The more comprehensive attached **letter** to both of you attempts to do just that.

**As** you move forward with various FCC rulemaking proceedings. I hope you will take these thoughts into consideration. It is my sincere hope that under your Chairmanship the FCC will ensure that the Internet remains openly accessible and continues to flourish.

My letter makes the following central points:

- The policy direction suggested in particular by the broadband "framework" NPRM could have a profoundly negative impact on the Internet. and the availability of the high-capacity telecommunications connections so necessary) to its current and future openness and competitive nature.
- The notion that open, nondiscriminatory telecommunications platforms no longer serve the public interest when they are used to provide so-called "broadband" services is mistaken. Preventing competitive telephone companies from leasing elements of the incumbent carriers' networks at cost-based rates to provide competing services, and barring Internet service providers from utilizing the underlying telecommunications services necessary to serve consumers. could deny competitors the very capabilities they need to survive, let alone flourish, in the market. Such an approach would effectively wall off the local telephone network from competitive entry and eviscerate any chance of fostering competition and innovation in these interrelated worlds
- Contrary *to* the assumptions of some, "broadband" is no different than "narrowband" in terms of being a bottleneck on-ramp to the Internet that requires appropriate regulation in order to protect consumers and businesses from monopoly abuses. Also, the belief that extension of fiber further into the network somehow creates a wholly new network that should be closed off to competitors is equally without merit.

May 20, 2002

- **The** concept of “intermodal” competition, like many appealing notions, appears profound on the surface, but quickly loses credibility upon closer inspection. Potential modalities – such as satellite and fixed wireless systems – offer the future promise of niche services in the broadband market but lack the technical characteristics that would enable them to offer a viable third or fourth alternative to DSL and cable modems.
- There is no possible justification for effectively closing competitors’ access to the local telephone network and effectively terminating the robust “intramodal” competition that competitive carriers seek to bring to the market. The residential broadband market is at best a telco/cable duopoly, while the vast majority of American businesses continue to rely solely on the incumbent local telephone network. Open access to all transmission media is the only way to guarantee that every ISP can reach every possible subscriber by every means available.
- The notion that the local telephone companies need any additional incentives to deploy broadband services is especially puzzling. **All** competitive enterprises know that competition is its own incentive, and no company can afford to sit on the sidelines and watch its competitors take the market. To the extent the ILECs believe they can choose to do so, of course, it is yet another sign that they have market power in providing broadband services. Further, as the Supreme Court just held, the TELRIC standard provides ample compensation to the ILECs for CLECs’ **use** of their facilities. Of course, the fundamental observation is that there is no lack of broadband deployment in the United States; the only cogent public policy issue concerns the competitive deployment of broadband facilities.

In closing, there appears to be no viable reason to step back from the requirements of the Act, the FCC’s **own** pro-competitive legacy, and the pro-competitive economic policies of the Bush Administration, to embrace a future where, at best, consumers can only receive what unregulated monopolies and/or duopolies **are** willing to give them. Certainly such a retrograde step would not be consistent with my own personal vision.

I hope that you might find these thoughts useful as you undertake your policy deliberations. Please do not hesitate to let me know if further discussion seems merited.

Sincerely,



Vint Cerf



Vinton G. Cerf  
Senior Vice President  
Internet Architecture &  
Technology

22001 Loudoun County P  
Ashburn, VA 20147  
703886 1690  
Fax 703 886 0047  
[www.wcom.com/cerfsup](http://www.wcom.com/cerfsup)  
[vinton.g.cerf@wcom.com](mailto:vinton.g.cerf@wcom.com)

May 20, 2002

The Honorable Donald Evans  
Secretary  
United States Department of Commerce  
1401 Constitution Avenue, N.W.  
Washington, D.C. 20230

The Honorable Michael Powell  
Chairman  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20554

Dear Secretary Evans and Chairman Powell:

I am writing you both today out of a desire to assist in your deliberations regarding proposed changes in this nation's public policies governing the deployment and use of so-called "broadband" telecommunications technologies. As the Department of Commerce considers adopting a national broadband policy, the Federal Communications Commission has embarked on a number of rulemaking proceedings pertaining to broadband deployment. From my perspective, the Commission appears poised to take certain steps which could undo much of the pro-competitive promise of the Telecommunications Act of 1996, and consign American consumers to a broadband future controlled by the dominant telephone and cable bottlenecks. As I explain below, I believe strongly that U.S. policymakers should heed important historical lessons about the rise and success of the Internet, and ensure that competitors and consumers alike have access to the still-developing broadband world through open, nondiscriminatory telecommunications platforms.

Over the course of twenty-five years of working with the Department of Commerce and the FCC, my experience has proven that regardless of the issue, both agencies have stood steadfastly for a vision of public policy that fosters robust competition and innovation in all Internet and telecommunications-related markets. Over the past few months I have engaged in especially helpful meetings on a number of issues with Assistant Secretary Nancy Victory. I was particularly honored to be included as a participant in her broadband "roundtable" last October, which served as a precursor to the broadband deployment proceeding initiated by NTIA in November. I also was honored to address the Commission this past February as part of the Chairman's "Distinguished Lecture" series, and to have the opportunity to meet and talk with Chairman Powell.

Today, I want to offer you my view of key elements of broadband policy, and convey my concerned observations about several broadband-related regulatory proceedings now underway at the FCC. In my view, the policy direction suggested by these proceedings could have a profoundly negative impact on the Internet, and the availability of the high-capacity telecommunications connections so necessary to its current and future openness and competitive nature. I believe the FCC direction is paradoxically self-inconsistent and at odds with the pro-competition philosophy of the Administration in general.

**As** both of you may know, I have a long history of involvement in the initiation and growth of the “network of networks” we now call the Internet. I derived great satisfaction as an engineer in the mid-1970s from my collaboration with Bob Kahn on the development of a suite of networking protocols, the Transmission Control Protocol and Internet Protocol (“TCP/IP”). The IP protocol in particular proved to be a remarkably potent realization of a multi-network open architecture. By its very design, the protocol was intended to be ubiquitous and open to all types of applications, carrying all kinds of content, over all forms of transmission technology, by all sorts of service providers. Over the intervening years scores of protocols have been layered on top of IP and its adjunct protocol, TCP -- from the Domain Name System (DNS) protocols to the World Wide Web protocols (notably HTTP) -- but the role of IP as the open standard transcending technologies and modalities remains.

Of course, merely inventing a particular protocol for delivering bits of information from one end of the country to another does not guarantee that one can create applications, services, and content that are able to actually utilize this delivery system. Although the IP protocol has allowed the creation of open, interconnected networks, in reality the networks can only be as open as the various conduits used to reach them. It is here, at the “edge” of these otherwise-open networks, where the dictates of public policy can have such a profound impact. In this regard, the FCC first helped set the stage for small pieces of protocol to leap from blackboards and laboratories into the vibrant marketplace.

The FCC has a long and distinguished legacy of support for non-regulation of information services generally and the internet in particular. Part of this legacy entails embracing the straightforward concept that all provider of information services, content, and applications have an equal right to use the local telephone network to reach their customers. This policy of nondiscriminatory treatment was established back in the late 1970s in the so-called Computer Inquiry proceedings, and the resulting rules governing how the telephone companies must unbundle and offer their basic transmission services to unregulated enhanced service providers (“ESPs”) on the same rates, terms, and conditions that they offer such basic services to themselves. These Computer Inquiry interconnection and unbundling rules have been in place for nearly a quarter century now, and have had a profoundly positive and far-reaching impact on this country’s economic and social landscape. In particular, literally thousands of players were free to unleash their creative, innovative, and inspired product and service ideas in the competitive information services marketplace, without artificial barriers erected by the local telephone companies. I am firmly convinced that the Commission’s foresight in this area contributed strongly towards the commercial introduction, rise, and incredible success of the Internet.

The 1996 Act built on this regulatory legacy in the information services area (as well as the long distance and equipment markets), by mandating that the local telephone network monopolies be broken open once and for all. Through the establishment of various pro-competitive requirements, such as interconnection, unbundling, collocation, and resale, Congress sought to give would-be competitors the tools they would need to pry open a market that had never seen the light of competition (in that vein, it is especially gratifying that the U.S. Supreme Court last week reaffirmed the FCC’s “TELRIC” (Total Element Long Run Incremental Cost) standard as fully consistent with the Telecommunications Act). Indeed, the 1996 Act essentially mirrored the FCC’s conclusion in the Computer Inquiry proceedings: access to monopoly-controlled facilities must be provided so that non-monopolies may compete. While we still are a long way from significant competition in the local market, the tools are available – if the regulators are prepared to act on this mandate.

Unfortunately, I am beginning to see troubling signs that the FCC's pro-competitive legacy, and the resulting benefits to American consumers and businesses, may be in serious jeopardy. Over the past few months, the FCC has initiated several interrelated rulemaking proceedings that appear to have at their core the single-minded but mistaken notion that open, nondiscriminatory telecommunications platforms no longer serve the public interest when they are used to provide so-called "broadband" services. In particular, the Commission has suggested an intention to prevent competitive telephone companies ("CLECs") from leasing elements of the incumbent telephone companies' ("ILECs") networks to provide competing services, contrary to the dictates of the Telecommunications Act. Moreover, the Commission has suggested that its longstanding Computer Inquiry rules -- which allow Internet service providers (ISPs) to utilize the underlying telecommunications services necessary to serve consumers -- no longer are necessary in a broadband world. In other words, the FCC appears determined to deny CLECs and ISPs the very capabilities they need to survive, let alone flourish, in the market. Together the proposals, if adopted, would effectively wall off the local telephone network from competitive entry and eviscerate any chance of fostering competition and innovation in these interrelated worlds.

As far as I can discern, the Commission appears to premise its suggested approach on a few key mistaken "factual" assumptions: (1) "broadband" is a different sort of animal from "narrowband;" (2) robust "internodal" competition exists or soon will exist between different facilities-based providers of broadband services; and (3) the incumbent local phone companies in particular require additional incentives to deploy Digital Subscriber Line ("DSL")-based broadband services. From this engineer's perspective, none of these assumptions have any merit.

First, my engineering training and instincts chafe at the notion that something we choose to call "broadband" is something wholly separate and apart from narrowband or, indeed, from the underlying network that supports it. In the context of the local telephone network, DSL technology is merely the latest in a continuing stream of incremental improvements to the use of the existing telephone network. DSL constitutes a group of copper-based technologies that encompasses a family of related protocols, all of which collectively have one job: transmitting information over existing copper local loops. DSL technologies can do this job at higher bit rates than more traditional "dial-up" modems, but there is little else to distinguish them. Moreover, this transmission path should not in any way be confused with one of the more common applications of DSL: Internet access. While DSL essentially is an "edge" technology that can be and is used to reach the Internet, DSL is not in any way equivalent to the Internet. Building an anticompetitive telecommunications policy around the ordinary capabilities of DSL, and one of its many applications, makes no sense to me. Also, the notion that extension of fiber further into the network somehow creates a wholly new network that should be closed off to competitors is equally without merit.

This observation is particularly crucial in the context of new "last mile" access technologies such as Gigabit Ethernet ("GE"). There are two important facts to keep in mind about GE as a means of accessing data networks: (1) it is a thousand times faster than the best cable modem or DSL services, and (2) it is symmetric, meaning it can deliver data at these same speeds in both directions. These are vital differences from currently available high-speed access technologies that tend to be asymmetric, typically supporting higher delivery speeds towards subscribers and slower ones from them. The significant point, of course, is that all of these various "competing" services are delivered on monopoly-controlled channels.

Second, the concept of "intermodal" competition, like many appealing notions, appears profound on the surface, but quickly loses credibility upon closer inspection. Physics gets in the way of the supposed competition. It is true that the phone companies and cable companies compete today in many places to provide high-speed, asymmetric Internet access to residential customers. However, this competition is not ubiquitous. Even with comparatively wider coverage, DSL is still not available to many consumers because of distance from their central offices, while some cable providers may not have invested in the requisite hybrid fiber/coax technology to provide cable modem service.

Moreover, other potential modalities — such as satellite and fixed wireless systems — lack the technical characteristics that would enable them to offer a viable third or fourth alternative to these near-ubiquitous modalities. In particular, satellite-based broadband service (1) is only available by line-of-sight, (2) is vulnerable to precipitation effects and latency problems, (3) utilizes expensive or inefficient technology (including either costly two-way dishes or separate telephone "dial-up" return), and (4) typically yields lower quality and bandwidth. Fixed wireless service (such as MMDS) possesses many of the same technical drawbacks as satellite service, as well as the additional factors of the limited availability of spectrum and shared spectral bands. In short, while these technologies offer the promise of niche services in the broadband market, neither comes close to the widespread reach of the local telephone networks and cable networks.

At best, the residential broadband market is a duopoly—and in the worst case, consumers have only one choice or, in poorly served areas, *no* choice at all. This circumstance seems hardly likely to result in driving the benefits of lower prices and innovative service offerings that would come from a more thoroughly competitive market. Indeed, the Consumer Federation of America recently released a detailed report exposing the myth of intermodal competition in the residential high-speed Internet market, and demonstrating the negative consequences to consumers of a cable/telco duopoly. In addition, cable systems generally do not serve businesses, so the vast majority of American businesses continue *to* rely solely on the incumbent local telephone network. In my view, then, there is no possible justification for effectively closing competitors' access to this network that would result in termination of the robust "intramodal" competition that CLECs seek to bring to the market. Indeed, I *am* persuaded that open access to *all* transmission media is the only way to guarantee that every ISP can reach every possible subscriber by every means available. Of course, open access does not mean free access. The suppliers of the alternative transmission media should be fairly compensated for providing such access, as required by the Telecommunications Act. As the Supreme Court held last week, the TELRIC standard provides ample compensation to the ILECs for CLECs' use of their facilities.

Third, I am genuinely puzzled by the notion that the local telephone companies need any additional incentives to deploy broadband services. To begin with, as all competitive enterprises know well, competition is its own incentive. The local telephone companies claim they are battling fiercely with the cable companies, and the few remaining CLECs, to provide broadband services to American consumers. In such an environment, no company can afford to sit on the sidelines and watch its competitors take the market. To the extent the ILECs believe they can choose *to* do so, of course, it is yet another sign that they have market power in providing broadband services.

The Honorable Donald Evans  
and The Honorable Michael Powell

Page 5  
May 20, 2002

In addition, the ILECs' argument that they are not adequately compensated for *providing* wholesale broadband functionalities, which in turn fails to stimulate facilities-based investment by both ILECs and CLECs, does not bear close scrutiny. No less an authority *than* the Supreme Court concluded that the ILECs' "lack of incentives" argument "founders on fact." Among other things, the TELRIC standard includes direct and overhead costs, depreciation expense, and risk-adjusted cost of capital. As Justice Souter observed, "TELRIC rates leave plenty of room for differences in the appropriate depreciation rates and risk-adjusted capital costs depending on the nature and technology of the specific element to be priced." The Court ultimately determined that it is reasonable to prefer TELRIC over "alternative fixed-cost schemes that preserve home-field advantages for the incumbents."

More fundamentally, however, there is no lack of broadband deployment. As Assistant Secretary Victory, Under Secretary Bond, and FCC officials uniformly have attested in recent months, broadband deployment in this country is robust. Current figures from numerous studies demonstrate that between 70 to 85 percent of all Americans have ready access to some broadband services. If their claims to shareholders and Wall Street **are** any indication, the ILECs certainly show no signs of slowing deployment, especially as a result of complying with the Act. Any public policy issue pertaining to broadband should focus on the comparatively low take-rates (somewhere around 10 percent of American consumers), excessive pricing by the two dominant providers, and a lack of compelling consumer applications, are market realities that cannot be blamed on pro-competitive regulation.

Thus, there appears to be no viable reason for the **FCC** to step back from the requirements **of** the Act, its **own** pro-competitive legacy, and the pro-competitive economic policies of the Bush Administration, to embrace a future where, at best, consumers can only receive what *unregulated* monopolies and/or duopolies are willing to give them. Certainly such a retrograde step would not be consistent with **my** own personal vision. I **am** well aware that some may not share **my** conviction that consumers are best served by open platforms spread across many competing modalities. Nonetheless, should the United States Government decide that it does not have the will or inclination to require that one of the two dominant modalities -- cable -- create **an** open platform, it should not lack the wisdom to ensure that the one remaining platform -- telephony -- remains open to all. In fact, as I have suggested above, the openly accessible platform of all modalities is the heart and soul of the Internet, and was Congress' intention for the local telecom market when it adopted the Telecommunications Act.

I thank both of you for your attention to this most important public policy matter. I look forward to the opportunity to discuss with you and your staff the constructive ways in which the U.S. Government can help promote and defend competition and innovation within the telecommunications networks residing at the "edge" of the dynamic -- and open -- Internet.

Sincerely,



Vint Cerf

**Broadband Policy  
and Delivery Options**

*Dr. Vinton G. Cerf  
Senior Vice President of Internet  
Architecture and Technology  
WorldCom*



**International Engineering Consortium**  
549 West Randolph • Suite 600 • Chicago, Illinois 60661-2208 USA  
312-559-4100 • 312-559-4111 Fax • [publications@iec.org](mailto:publications@iec.org)



# Broadband Policy and Delivery Options

*Dr. Vinton G. Cerf*  
*Senior Vice President of Internet Architecture and Technology*  
*WorldCom*

## Introduction

My intention here is to discuss my views on broadband policy. I wrote a letter recently to the Secretary of Commerce, Donald Evans, and to the Chairman of the Federal Communications Commission (FCC), Michael Powell, expressing grave concern over the competitive regulatory structure that is operating or, in effect, nor operating well here in the United States. We know that there are myriad ways to deliver broadband services to our customers. There are digital subscriber lines (DSLs) of various types: integrated services digital network DSL (IDSL), asymmetric DSL (ADSL), very-high-data rate DSL (VDSL), symmetric DSL (SDSL), and so on. You can use hybrid fiber/coax (HFC), which the cable companies supply. You can use digital satellite, both one-way and two-way. You can use microwave multipoint distribution systems (MMDSs); you can use fiber rings; and you can use various fiber access circuits running synchronous optical network (SONET) or sometimes just optical add/drop multiplexers (OADMs). You can use point-to-point optical laser links. And then there are some newer delivery means that are under development, such as ultra wideband (UWB) and digital signaling over power lines, which to my understanding has not been very successful in the United States because of the way in which our power distribution system works so that the signals go through transformer boxes and are filtered out. I have heard that digital signaling might work better in Europe, but I don't know enough about power engineering to be very thoughtful about how exactly that would work out. Some people have the idea that you can drop the signal off before it gets to the transformer, and then use some type of radio link or other mechanism for reaching a residence. Then, there are some other broadband services that are more like science fiction, such as ion transmission, or sub-space transmission for you Star Trek fans, or maybe even neutrino transmission. Now don't laugh, but when I was with the U.S. Department of Defense's Advanced Research Projects Agency (DARPA) in the 1970s, I received a serious proposal from someone who

*This keynote address was made on June 3, 2002, at SUPERCOMM 2002 in Atlanta, Georgia. Mr. Cerf is Senior Vice President of Internet Architecture and Technology at WorldCom and is widely known as a "father of the Internet."*

*As part of its overall mission, the International Engineering Consortium, through its periodic Executive Perspectives, reviews various aspects of the communications industry that are of critical current interest to industry executives, the examination of which may help in their business forecasting and planning.*

*Founded in 1944, the nonprofit Consortium catalyzes positive change in the information industry, serves academia, and conducts industry-university cooperative programs, research projects, and continuing education.*

wanted to transmit using neutrinos through the Earth. He said that there would be no problem because there would be no interference—you couldn't stop it: it could go through 250 million miles of lead and the neutrino would penetrate with no trouble at all. Of course, that means that it doesn't interact with anything very well, which means that the transceiver is a bit of a problem. You would need a cubic mile of seawater in order to detect the possible interaction of a neutrino with a sodium atom, as well as a fairly hairy detector. Now, perhaps this would be possible in a submarine, but then the other problem would be the source—the only place that can produce neutrinos in the quantity that would be required is Batavia National Laboratory. Also, you could not aim the stream very well, as a neutrino could only go through the Earth directly to one place. Thus, it was an interesting idea for low-bandwidth communication that DARPA did not fund.

### Asymmetry and Symmetry

One important thing about most of the broadband delivery options that I listed is that they tend to be asymmetric in their implementations—that is, generally you can receive at higher data rates than you can send. However, there are cases in which that isn't true—SDSL, digital signal (DS)-1, optical carrier (OC)-3, fiber links, and Gigabit Ethernet are all examples of more symmetric communications, and I would argue that symmetry may turn out to be a very important key to unlocking the utility of broadband communication. However, today asymmetry is acceptable because, for all practical purposes, most applications on the Net involve pulling substantial amounts of information in and not pushing as much out. Even with respect to e-mail, you are commonly pulling a file or an e-mail with a big attachment, but you don't send as many as you receive. So asymmetry is probably okay, but there is an irony associated with these asymmetric services—the irony being that you can be sitting on a high-speed cable modem and your friend could be on a high-speed cable modem, each of you capable of receiving a megabit per second, yet neither of you is capable of generating anything comparable to that. So, the high-quality video that each of you receive over the Internet via the cable modem works fine inbound but yet neither of you can transmit it outbound—so much for videoconferencing via the Net. So it seems to me that symmetry is needed in those cases in which both parties need to be able to generate and receive at high bandwidth.

### Competition

However, the most important message that I am trying to deliver to Secretaries Evans and to Chairman Powell, and now to you, is that these technologies are effectively not competing with each other. You hear a great deal about competitive inter-modal services—the theory being that MMDS, satellite, DSL, and cable are all competing with each other. Well, let's take this apart. They are indeed technologically competitive because they are different ways of delivering broadband service, but whether they effectively compete is another story. Suppose, for example, that not all subscribers are able to receive all of these different services. For instance, if you happen to be too far away from the central office (CO), you cannot get DSL—at least not at any reasonable data rate. And a great many of my friends in the communications industry, who happen to live in the suburbs, complain bitterly about the fact that they are more than 18,000 feet away from the CO and can't get reasonable DSL. In other cases, you can't get cable-modem service, and it's not because there's a technical problem—it's because the cable company hasn't invested in HFC. If you want MMDS service, but you live at the bottom of a hill and are surrounded by trees (causing a foliage problem during the spring and summer), or if you live in a highly dense urban environment and are trying to aim an antenna to look at a satellite, then you may very likely have difficulty receiving MMDS service or satellite service, unless you can get risers to go up to the top of your building. So, there are a variety of reasons why you may not have access to all of the competing technologies, and that means that you don't have a choice.

### Proffered Solution

My view is that there's a simple equation to solve the problem: If you can't get inter-modal competition to work for a variety of technical and economic reasons, then put the competition in the medium so that the medium is open for access to all of the Internet service providers (ISPs), and so that every ISP has access to every customer. Now, of course it's not free competition if one happens to own the physical resource—and by the way, all of those resources tend to be monopolies, right? There is only one guy that owns the twisted pair: there is only one guy that owns the coaxial cable: there is only one guy that has the frequency allocation: and those are monopoly services. I am not suggesting that they should give those away for free to the ISPs, but rather that the ISPs should

be able to buy access to those underlying transmission systems and therefore give the customers complete choice of which ISP should serve them, regardless of which medium is being used to carry the transmission. So it seems to me very fundamental that if we want competition to serve us as it has so well in the interexchange business, then we need to open up the transmission media to make them accessible.

In 1984 AT&T broke itself up into a core interexchange carrier (IXC) and a regional Bell operating company (RBOC). One of the terms that MCI used at that time was "equal access." They wanted anyone to be able to dial "1," to get access to an IXC, regardless of which one it was. I suggest that it is worth thinking about the same model for broadband services—the model where everyone has a choice as to which ISP is going to serve them regardless of which medium is used to send and receive the Internet packets. Unfortunately, I am beginning to see troubling signs that the FCC's pro-competitive legacy and the resulting benefits to American consumers and businesses may be in serious jeopardy. During the past few months, the FCC has initiated several inter-related rule-making proceedings that appear, at their core, to embody the single-minded but mistaken notion that open nondiscriminatory telecommunications platforms no longer serve the public interest when they are used to provide so-called broadband services. Preventing the leasing of elements of the incumbent carrier networks, at cost-based price rate, to provide competing services, and barring ISPs from utilizing the underlying telecommunication services necessary to serve consumers, could deny competitors the very capabilities that they need to survive, let alone flourish in the market. Such an approach would effectively wall off the local telephone companies from competitive entry and, at this rate, any chance of fostering competition and innovation in these inter-related worlds.

### Conclusion

Now, I do recognize that there is much debate on this subject. But I would urge you to give serious thought to a regime in which the IXCs or the ISPs do pay and compensate the holders of broadband services—not just the incumbent local-exchange carriers (ILECs), but also the others, for access to their facilities on a reasonable basis. When it is an unreasonable basis—that is, when you are charged more for wholesale access than is charged to retail customers—then you do not have a reasonable business proposition, and you do not foster competition. The landscape is littered with the bodies of broadband DSL resellers that were unable to obtain reasonable

access to twisted pair in a timely manner and at reasonable prices in order to conduct business. This is not to say that they had perfect business models or that their models were executed perfectly. But I do think that the dying off of that breed of business is a side effect of not having effective access to the facilities.

### Addendum: Internet-Enabled... Wine Corks?

Now, having discussed regulatory issues, I would like to shift into one other mode. I want to talk about an Internet-enabled wine cork. Now you understand that there is a high probability of the Internet enabling almost everything, which is a side effect of all the hardware that is being built that uses the Internet protocols. So, once you build the hardware as such, it shrinks down in size, gets less and less expensive, and runs faster, which is a wonderful side effect of Moore's Law. So, I was thinking the other day, what would happen if we could Internet-enable a wine cork? Well, let's imagine what would happen if you were to have a passive memory running all of the protocols—even a passive memory in a wine cork could be pretty interesting. Because when you bottle the wine, you could record, in that memory, where the wine was bottled, at what time, at what temperature and humidity bottle was stored, maybe even the location of merchants through whose hands it may have passed. And when you finally uncork the wine, if it is not very good, you might be able to refer to the cork to find out what it was that went wrong during the course of production and handling.

So it seems to me that notions such as these of the Internet enabling things that you wouldn't normally think of as being Internet-enabled might open up some interesting possibilities for new products and services, not the least of which may be monitoring your wine collection. And if you are like me, and you have a few thousand bottles of wine and travel a lot, then you may very well be wondering about what is happening back at the wine cellar—did the electricity go off... has the wine cooler suddenly turned into a heater? So for me, anyways, this would be a very important development. One of the reasons that I broached something like this is that I opened up a bottle of Kendall Jackson Chardonnay just last week, and stamped on the cork I had pulled was www.kj.com. Now to be fair, it also said 1-800 something else, but they are clearly trying to cover both sides, and so I can tell you truthfully that even the wine industry is starting to notice that maybe the Internet has something for them as well.